Discrete Semiconductors Selection Guide 2012

Diodes, protection and signal conditioning devices, bipolar transistors, MOSFETs, thyristors, standard linear products

NXP

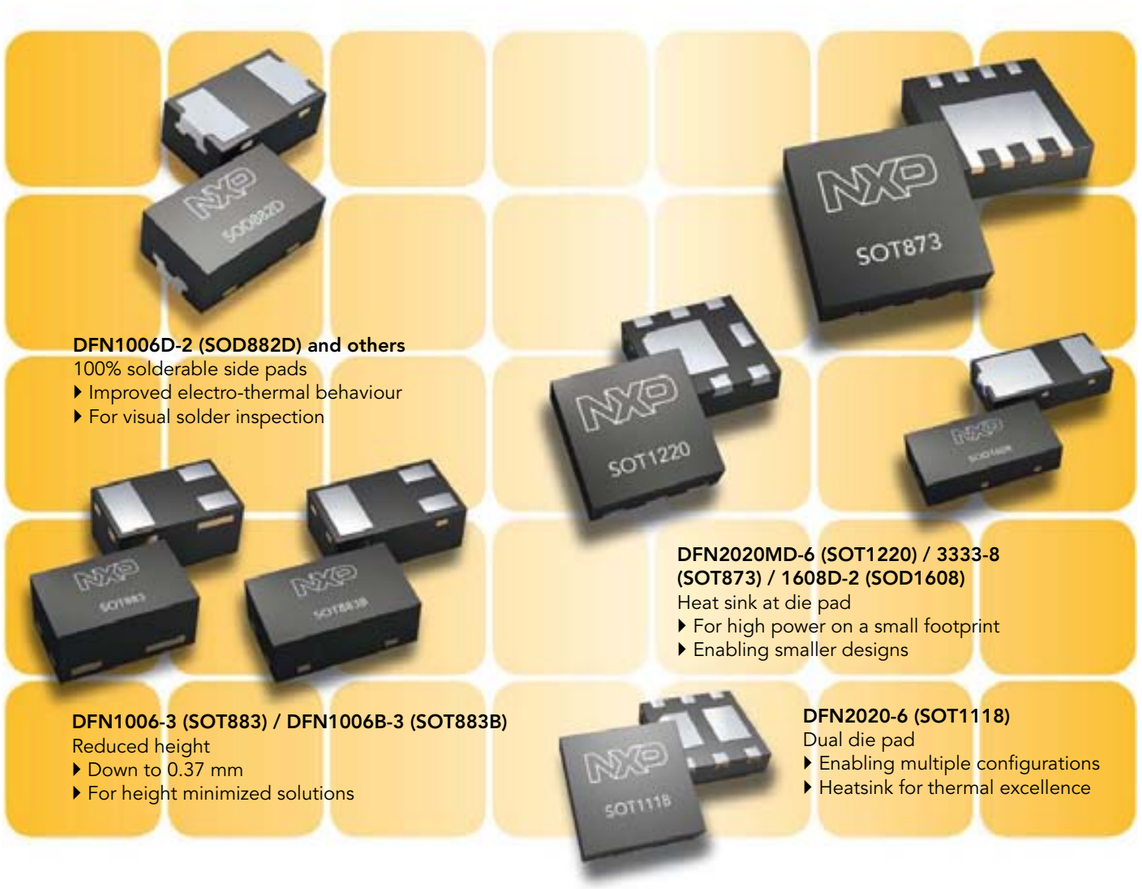
Small SMD packages

	Ultra small	Very small	Small	Medium power
2 Pins	DSN0603-2 0.6 x 0.3 x 0.3 WLCSP2 0.7 x 0.52 x 0.4 DFN1006D-2 1.0 x 0.6 x 0.37 DFN1006-2 1.0 x 0.6 x 0.5 SOD523 1.2 x 0.8 x 0.6 DFN1608D-2 1.6 x 0.8 x 0.37	SOD323 1.7 x 1.25 x 0.95 SOD323F 1.7 x 1.25 x 0.7	SOD123F 2.6 x 1.6 x 1.1 SOD123W 2.6 x 1.7 x 1.0	SOD80C 3.5 x 1.5 x 1.5 SOD128 3.8 x 2.6 x 1.0
3 Pins	DFN1006B-3 1.0 x 0.6 x 0.37 DFN1006-3 1.0 x 0.6 x 0.5 SOT663 1.6 x 1.2 x 0.55 SOT416 1.6 x 0.8 x 0.77	SOT323 2.0 x 1.25 x 0.95 DFN2020-3 2.0 x 2.0 x 0.65	SOT23 2.9 x 1.3 x 1.0	SOT89 4.5 x 2.5 x 1.5
4/5 Pins	WLCSP4* 0.76 x 0.76 x 0.61 DFN1010C 1.0 x 1.0 x 0.55 WLCSP5* 1.51 x 1.14 x 0.65 SOT665 1.6 x 1.2 x 0.55	SOT353 2.0 x 1.25 x 0.95 DFN2020MD-6 2.0 x 2.0 x 0.65	SOT143B 2.9 x 1.3 x 1.0 SOT753 2.9 x 1.5 x 1.0	SOT223 6.5 x 3.5 x 1.65 Power-SO8 4.9 x 3.95 x 1.0
6/8 Pins	DFN1010B-6 1.0 x 1.0 x 0.35 DFN1010-6 1.0 x 1.0 x 0.5 DFN1410-6 1.45 x 1.0 x 0.5 SOT666 1.6 x 1.2 x 0.55 WLCSP6* 1.6 x 1.15 x 0.65	SOT363 2.0 x 1.25 x 0.95 DFN2020-6 2.0 x 2.0 x 0.65	SOT457 2.9 x 1.5 x 1.0 SOT505 3.0 x 3.0 x 1.1	DFN3333-8 3.3 x 3.3 x 1.0 SOT96 4.9 x 3.9 x 1.75
> 8 Pins	WLCSP9* 1.16 x 1.16 x 0.61 DFN1712-8 1.7 x 1.2 x 0.5 DFN1714U-8 1.7 x 1.35 x 0.5	WLCSP16* 1.9 x 1.97 x 0.65 DFN2110-9 2.1 x 1.0 x 0.5 WLCSP24* 2.45 x 2.4 x 0.65	DFN2510A-10 2.5 x 1.0 x 0.5 DFN2512-12 2.5 x 1.2 x 0.5 DFN2521-12 2.5 x 2.1 x 0.5	SOT552 3.0 x 3.0 x 1.1 DFN5050-32 5.0 x 5.0 x 1.0 SOT510 9.7 x 4.4 x 1.1

* This is only an example. The exact position of the balls varies.

Actual size of DFN2020-6 and DFN1006D-2 package shown

NXP's new DFN package portfolio
DFN: Discrete Flat No-lead



DFN1006D-2 (SOD882D) and others
100% solderable side pads
- Improved electro-thermal behaviour
- For visual solder inspection

DFN2020MD-6 (SOT1220) / 3333-8 (SOT873) / 1608D-2 (SOD1608)
Heat sink at die pad
- For high power on a small footprint
- Enabling smaller designs

DFN1006-3 (SOT883) / DFN1006B-3 (SOT883B)
Reduced height
- Down to 0.37 mm
- For height minimized solutions

DFN2020-6 (SOT1118)
Dual die pad
- Enabling multiple configurations
- Heatsink for thermal excellence

The largest supplier of leadless DFN packages with solutions for almost every discrete application

Discrete Semiconductors Selection Guide 2012

Benefit from interactive features in the online edition of this selection guide: A click on a product type takes you to the corresponding product information page on the NXP website. There you'll find data sheets and other design-support documents. To access the online selection guide, go to www.nxp.com/discrete_selection_guide

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Quality is our top priority

Zero-Defect Program

- Ongoing quality improvement process to eliminate complaints and incidents in production. Originally established to fulfill the stringent automotive business requirements. Performance measured in CPB (Complaints per Billion)

Six Sigma Program NXP

- Structured process-improvement strategy involving the entire organization by identifying and removing defects and minimizing any spillover within the manufacturing process

Safe-Launch (DfX)

- Achieve low CPB (Complaints per Billion) at product launch from the beginning

Advanced complaint handling

- Continual process improvement to achieve 'best in class' performance in complaint handling and problem solving

Green products

- Halogen and lead free, environmental friendly portfolio – Dark Green products are fully RoHS compliant with European Union directive 2002/95/EC

Automotive quality mindset

- Nearly all products are qualified acc. to AEC-Q101 standard

Highly qualified design-in and customer support

- Direct customer support line: Short reaction time to build and preserve strong customer relationships

Certification & Standards

- All internationial certification standards of note achieved such as ISO9001, ISO/TS 16949 for automotive sites, ISO14001, OHSAS18001

Exceeding quality standards is our expectation

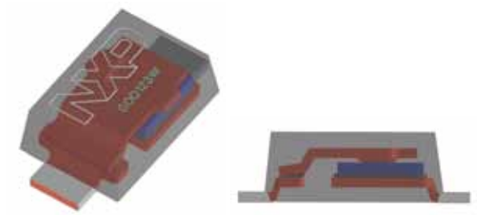
Diodes

FlatPower packages: SOD123W and SOD128 NXP's medium power solution for shrinking designs

SOD123W and SOD128 package

Small SMD packages for shrinking designs

- Flat geometry, only 1 mm height
- Halogene free mold compound
- AEC-Q101 qualified

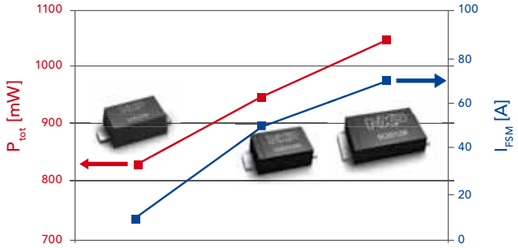


SOD123W and SOD128 design

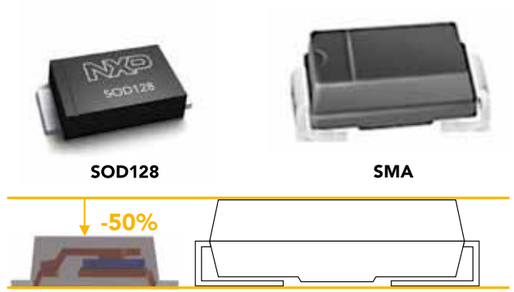
Robust design

- High surge capability due to clip bond technology
- Excellent electro-thermal behaviour

Power dissipation (@ 1 cm²), and I_{FSM} per package



Package name	SOD123F wire bond	SOD123W small clip	SOD128 large clip
Body size (w x l x h)	2.6 x 1.6 x 1.1	2.6 x 1.7 x 1.0	3.8 x 2.5 x 1.0



Schottky diodes

Enabling superior high P_{tot} and I_{FSM}

- Huge portfolio of Schottky diodes available
- 20 V – 60 V, 1 A – 5 A, very low V_F
- Junction temperature up to 175 °C

TVS diodes

Can replace SMA and SMB products

- Complete TVS series available
- 3.5 V – 64 V, 400 W and 600 W
- Junction temperature up to 185 °C

Large supplier of more than 170 products in FlatPower packages for a lot of medium power rectification and surge protection applications.

NEW low V_F Schottky rectifiers in our superflat second generation leadless DFN package

A new portfolio of low V_F MEGA Schottky diodes with outstanding performance in an ultra-small and flat package of 0.37 mm height. The package has tin plated, 100% solderable side pads for easy visual inspection after soldering.

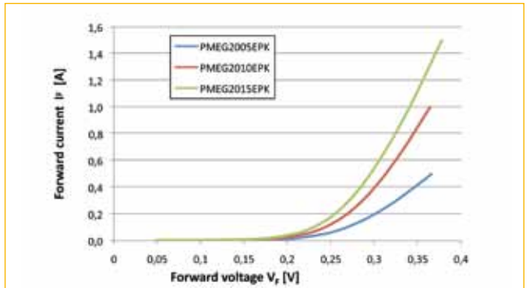
Features and benefits

- 33% lower V_F on same footprint
- Low profile of 0.37 mm height
- Solderable side pads
- Visual solder inspection

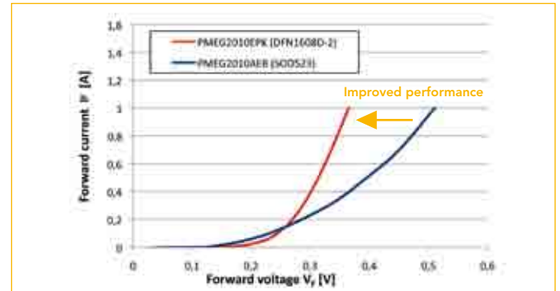
Applications

- Handheld equipment
- Backlighting for smart phone
- Battery charging
- Shrinked PCB design

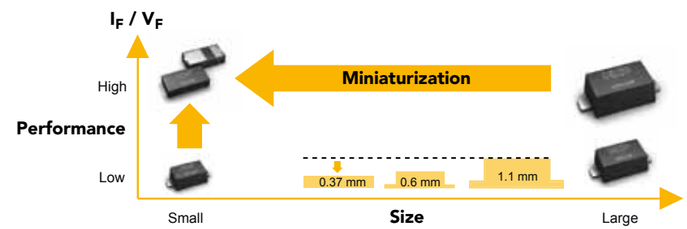
Differentiated portfolio…



with best performance



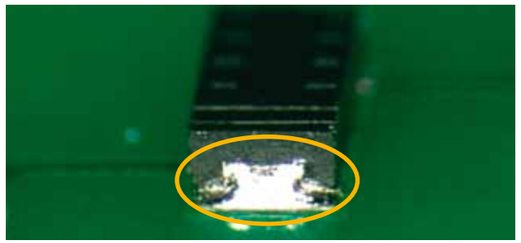
DFN1608D-2 combines improved performance with reduced size



Portfolio of 0.5 A – 1.5 A with low V_F and low I_R types

Type	Main parameters		
	Optimization	V_{Rmax} (V)	$I_{F(av)max}$ (A)
PMEG2005EPK	low V_F	20	0.5
PMEG2010EPK	low V_F	20	1.0
PMEG2015EPK	low V_F	20	1.5
PMEG4005EPK	low I_R	40	0.5
PMEG4010EPK	low I_R	40	1.0
PMEG4015EPK	low I_R	40	1.5

Soldered products onto pcb

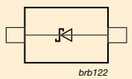
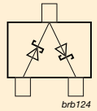
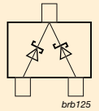
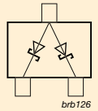
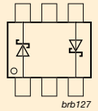
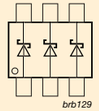
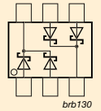
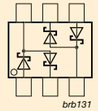
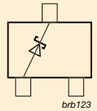
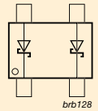


Schottky barrier diodes and rectifiers

General purpose Schottky diodes ≤ 250 mA

types in **bold** represent new products

I_F max (mA)	V_R max (V)	V_F max (mV)	@ I_F (mA)	I_R max (µA)	@ V_R (V)	Package	SOD80C (MiniMelf)	SOD68 (DO-34)	SOT23	SOT143B		SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	DFN1006-2 (SOD882)/ DFN1006-3 (SOT883)
						Size (mm)	3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0		2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5
						P_{tot} (mW)	300	500	250	250		830	250	300	550	400	300	150	500	250
70	70	750	10	0.1	50	single			BAS70			BAS70H	BAS70W			1PS76SB70			1PS79SB70	BAS70L
						dual series			BAS70-04				BAS70-04W							
						dual c.c.			BAS70-05				BAS70-05W							
						dual c.a.			BAS70-06				BAS70-06W							
						dual isolated				BAS70-07				BAS70-07S			BAS70-07V			
						triple isolated											BAS70VV			
						quad 2x series								BAS70XY						
120	40	370	1	0.5	30	single										RB751V40			RB751S40	RB751CS40
		500	10	1	30	single			BAS40			BAS40H	BAS40W			1PS76SB40			1PS79SB40	BAS40L
						dual series			BAS40-04				BAS40-04W							
						dual c.c.			BAS40-05				BAS40-05W					1PS75SB45		
						dual c.a.			BAS40-06				BAS40-06W							
						dual isolated				BAS40-07							BAS40-07V			
						quad c.c./c.c.								1PS88SB48			BAS40-05V			
						quad 2x series								BAS40XY						
200	30	300	10	30	10	single													1PS79SB31	
		340	10	2	25	single			BAT754											
						dual series			BAT754S											
						dual c.c.			BAT754C											
						dual c.a.			BAT754A											
						triple isolated								BAT754L						
						single	BAS85	BAT85	BAT54			BAT54H	BAT54W		BAT54J	1PS76SB10		BAT54T	1PS79SB10	BAT54L
						dual series			BAT54S				BAT54SW							
						dual c.c.			BAT54C				BAT54CW							BAT54CM
						dual c.a.			BAT54A				BAT54AW							
						dual isolated				BAT74				BAT74S			BAT74V			
						triple isolated											BAT54VV			
						quad c.c./c.c.											BAT54CV			
						quad 2x series								BAT54XY						
		500	200	30	10	single													RB521S30	**RB521CS30L**
		600	200	1	10	single													RB520S30	**RB520CS30L**
	40	300	10	15	30	single			BAT721							1PS76SB21				
						dual series			BAT721S											
						dual c.c.			BAT721C											
						dual c.a.			BAT721A											
		360	10	0.5	25	single													1PS79SB30	
		420	30	0.5	25	single							BAT854W							
						dual series							BAT854SW							
						dual c.c.							BAT854CW							
						dual c.a.							BAT854AW							
	50	450	10	5	40	single	BAS86	BAT86												
250	100	850	250	4	75	single						**BAT46WH**			**BAT46WJ**					

single	dual series	dual c.c.	dual c.a.	dual isolated	triple isolated	quad c.c./c.c.	quad 2x series
 brb122	 brb124	 brb125	 brb126	 brb127	 brb129	 brb130	 brb131
 brb123				 brb128			
 aaa-001765							

Low capacitance Schottky diodes

I_F max (mA)	V_R max (V)	V_F max (mV)	@ I_F (mA)	C_d max (pF) @ V_R = 0 V	Package	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	DFN1006-2 (SOD882)
					Size (mm)	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5
					P_{tot} (mW)	250	250	300	400	300	500	250
30	4	450	1	1	single	BAT17			1PS76SB17		1PS79SB17	
					triple isolated					1PS66SB17		
					dual series	PMBD353 PMBD354 [1]						
	15	340	1	1	single		1PS70SB82					1PS10SB82
					triple isolated			1PS88SB82		1PS66SB82		
					dual series		1PS70SB84					
					dual c.c.		1PS70SB85					
					dual c.a.		1PS70SB86					

[1] Diodes have matched capacitance

Schottky barrier diodes and rectifiers

Medium power low V_F Schottky rectifiers single ≥ 200 mA – Part 1

types in **bold** represent new products - types in *italic* and **bold** represent new produts for high temperature application $T_j \leq 175$ °C

I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Package	SOD128	SOT457 (SC-74)	SOT23	SOD123W	SOD123F		DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	DFN1608D-2 (SOD1608)	SOD523 (SC-79)	DFN1006-2 (SOD882)	DFN1006D-2 (SOD882D)
				Size (mm)	3.8 x 2.5 x 1.0	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.7 x 1.0	2.6 x 1.6 x 1.1		2.0 x 2.0 x 0.6	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.37	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
				P_{tot} (mW) @ 1 cm²	1050	540	420	950	830		960	400	830	570	570	780	500	565	660
				Optimization															
0.2	30	480	0.05	low V_F									PMEG3002EJ				PMEG3002AEB	PMEG3002AEL	PMEG3002AELD
		500	0.03	low V_F															
	40	600	0.01	low I_R									PMEG4002EJ				PMEG4002EB	PMEG4002EL	PMEG4002ELD
	60	600	0.1	low V_F									PMEG6002EJ				PMEG6002EB		
0.5	20	390	0.2	low V_F			PMEG2005ET		PMEG2005EH				PMEG2005EJ	PMEG2005AEA	PMEG2005AEV				**PMEG2005BELD**
		410	0.3	low V_F												**PMEG2005EPK**			
		440	1.5	low V_F														PMEG2005AEL	PMEG2005AELD
		480	0.03	low I_R													PMEG2005EB		
		500	0.03	low I_R														PMEG2005EL	PMEG2005ELD
	30	430	0.15	low V_F			PMEG3005ET		PMEG3005EH				PMEG3005EJ	PMEG3005AEA	PMEG3005AEV				
		500	0.5	low V_F													PMEG3005EB	PMEG3005EL	PMEG3005ELD
	40	470	0.1	low V_F			PMEG4005ET		PMEG4005EH				PMEG4005EJ	PMEG4005AEA	PMEG4005AEV				
		550	1.1	low V_F			BAT720					1PS70SB20							
		590	0.01	low I_R												**PMEG4005EPK**			
1.0	20	340	1.0	low V_F				PMEG2010ER											
		375	1.9	low V_F							PMEG2010EPA								
		415	0.6	low V_F												**PMEG2010EPK**			
		430	0.2	low V_F			PMEG2010AET		PMEG2010AEH										
		450	0.05	low I_R				PMEG2010BER											
		500	0.2	low V_F			PMEG2010ET		PMEG2010EH				PMEG2010EJ	PMEG2010BEA BAT760	PMEG2010BEV BAT960				
		550	0.07	low V_F									PMEG2010AEJ	PMEG2010EA	PMEG2010EV				
		620	1.5	low V_F													PMEG2010AEB		
	30	450	1.0	low V_F		1PS74SB23													
		360	1.5	low V_F	PMEG3010EP			PMEG3010ER											
		450	0.05	low I_R	PMEG3010BEP			PMEG3010BER											
		520	0.1	low I_R					PMEG3010CEH				PMEG3010CEJ						
		560	0.15	low V_F			PMEG3010ET		PMEG3010EH				PMEG3010EJ	PMEG3010BEA	PMEG3010BEV				
		680	0.5	low V_F													PMEG3010EB		
	40	490	0.05	low V_F	PMEG4010EP			PMEG4010ER											
		490	0.05	low V_F	***PMEG4010ETP***														
		570	0.1	low I_R					PMEG4010CEH				PMEG4010CEJ						
		600	0.02	low I_R												**PMEG4010EPK**			
		640	0.1	low V_F			PMEG4010ET		PMEG4010EH				PMEG4010EJ	PMEG4010BEA	PMEG4010BEV				
	60	530	0.06	low V_F	PMEG6010EP			PMEG6010ER											
		650	0.35	low V_F		PMEG6010AED													
		660	0.05	low I_R					PMEG6010CEH				PMEG6010CEJ						

Schottky barrier diodes and rectifiers

Medium power low V_F Schottky rectifiers single ≥ 200 mA – Part 2

types in **bold** represent new products - types in *italic* and **bold** represent new produts for high temperature application $T_j \leq 175$ °C

I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Package	SOD128	SOT457 (SC-74)	SOT23	SOD123W	SOD123F		DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	DFN1608D-2 (SOD1608)	SOD523 (SC-79)	DFN1006-2 (SOD882)	DFN1006D-2 (SOD882D)
				Size (mm)	3.8 x 2.5 x 1.0	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.7 x 1.0	2.6 x 1.6 x 1.1		2.0 x 2.0 x 0.6	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.37	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
				P_{tot} (mW) @ 1 cm²	1050	540	420	950	830		960	400	830	570	570	780	500	565	660
				Optimization															
1.5	20	420	0.9	low V_F												**PMEG2015EPK**			
		660	0.2	low I_R					PMEG2015EH				PMEG2015EJ	PMEG2015EA	PMEG2015EV				
	30	500	1.0	low V_F					PMEG3015EH				PMEG3015EJ		PMEG3015EV				
	40	610	0.0	low I_R												**PMEG4015EPK**			
2.0	10	460	3.0	low V_F					PMEG1020EH				PMEG1020EJ	PMEG1020EA	PMEG1020EV				
	20	420	1.9	low V_F							PMEG2020EPA								
		525	0.2	low V_F					PMEG2020EH				PMEG2020EJ	PMEG2020AEA					
	30	360	3.0	low V_F	PMEG3020EP														
		420	1.5	low V_F	PMEG3020CEP			PMEG3020ER											
		450	0.1	low I_R	PMEG3020BEP														
		470	2.5	low V_F							PMEG3020EPA								
		520	0.05	low I_R	PMEG3020DEP			PMEG3020BER											
		620	1.0	low V_F					PMEG3020EH				PMEG3020EJ						
	40	490	0.1	low V_F	***PMEG4020ETP***			***PMEG4020ETR***											
		535	0.1	low V_F							PMEG4020EPA								
	60	530	0.2	low V_F	PMEG6020EP			PMEG6020ER											
		575	0.25	low V_F							PMEG6020EPA								
3.0	10	530	3.0	low V_F					PMEG1030EH				PMEG1030EJ						
	30	360	5.0	low V_F	PMEG3030EP														
		450	0.15	low I_R	PMEG3030BEP														
	40	490	0.2	low V_F	PMEG4030EP														
		490	0.2	low V_F	***PMEG4030ETP***														
		540	0.1	low I_R				PMEG4030ER											
	60	530	0.2	low V_F	PMEG6030EP														
5.0	30	360	8.0	low V_F	PMEG3050EP														
		450	0.25	low I_R	PMEG3050BEP														
	40	490	0.3	low V_F	PMEG4050EP														
		490	0.3	low V_F	***PMEG4050ETP***														

In the Spotlight

New low V_F Schottky rectifier portfolio in DFN1608D-2 (SOD1608)

- Leadless ultra small and flat SMD package (1.6 x 0.8 x 0.37 mm)
- 3 low V_F devices with V_R = 20 V and I_F up to 1.5 A
- 3 low I_F devices with V_R = 40 V and I_F up to 1.5 A
- Solderable side pads for visual soldering inspection
- AEC-Q101 qualified

In the Spotlight

Low height, high performance – save board space by replacing SMA & SMB with FlatPower packages

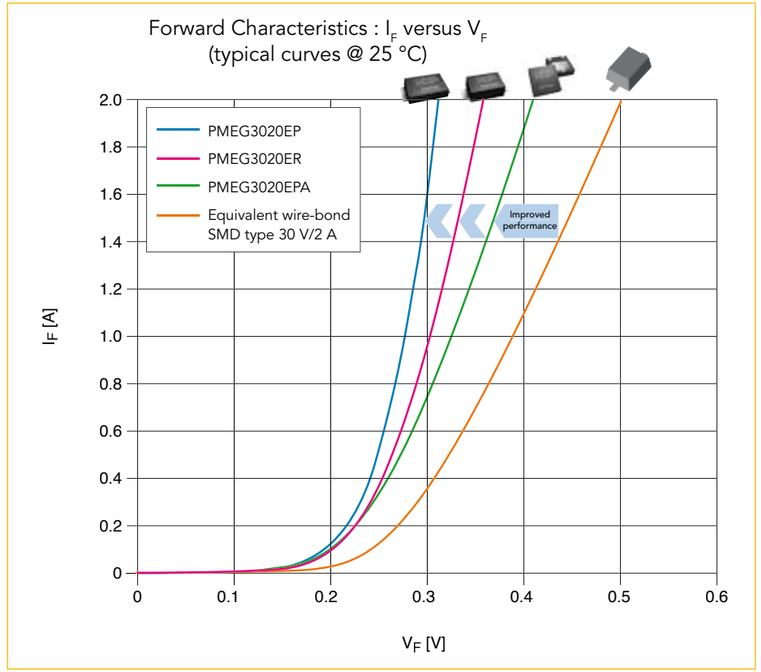
- Max. junction temperature up to 175 °C
- Maximum rectified current range of 1 A up to 5 A
- Low V_F spec. combined with low I_R characteristics
- 5 devices with V_R = 40 V in low profile SOD123W and SOD128
- AEC-Q101 qualified

Medium power low V_F Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Optimization	Package	SOT223 (SC-73)	SOT23	DFN2020-3 (SOT1061)	SOT666
					Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	1.6 x 1.2 x 0.55
					P_{tot} (mW)	1500	250	1000	300
0.2	30	480	0.03	low V_F	dual isolated				PMEG3002TV
	60	600	0.1	low V_F					PMEG6002TV
0.5	20	390	0.2	low V_F	dual c.c.		PMEG2005CT		
	30	430	0.15	low V_F			PMEG3005CT		
	40	470	0.1	low V_F			PMEG4005CT		
1.0	25	450	1.0	low V_F	dual series	BAT120S			
				low V_F	dual c.c.	BAT120C			
				low V_F	dual c.a.	BAT120A			
	40	500	0.05	low V_F	dual c.c.			**PMEG4010CPA**	
	60	540	0.06	low V_F	dual c.c.			**PMEG6010CPA**	
		650	0.35	low V_F	dual series	BAT160S			
				low V_F	dual c.c.	BAT160C			
				low V_F	dual c.a.	BAT160A			
2.0	20	420	1.0	low V_F	dual c.c.			**PMEG2020CPA**	
	30	440	2.0	low V_F	dual c.c.			**PMEG3020CPA**	

Improved forward characteristics of (MEGA)[1] Schottky rectifiers in new packages



[1] Maximum Efficiency General Application

In the Spotlight

PMEG2005BELD

- 0.5 A low V_F Schottky rectifier in DFN1006D-2 (SOD882D)
- Extremely low V_F combined with low I_R due to new wafer fab process module using optimized shallow diffusion
- V_F, typ = 353 mV @ 0.5 A
- I_R, typ = 28 µA @ 10 V
- Solderable side pads for visual soldering inspection
- AEC-Q101 qualified

Nomenclature of low V_F (MEGA) Schottky rectifiers

PMEG 40 10 A E T P

NXP MEGA Schottky rectifier

Max. reverse voltage in V
e.g. 40 = 40 V

Cont. foward current in A
e.g. 10 = 1.0 A

Variant number (optional)

Internal configuration:
A = CA
C = CC
E = single
P = double, parallel
R = tripple, antiparallel
S = series
V = tripple
W = CA and CC
X = 2 x series
Y = 2 x CC
Z = 2 x CA

Variant number (optional)
T = high temperature

Package indicator:
A = SOD323
B = SOD523
D = SOT457
H = SOD123
J = SOD323F
L = DFN1006-2 (SOD882)
LD = DFN1006D-2 (SOD882D)
P = SOD128
PA = DFN2020-3 (SOT1061)
PK = DFN1608D-2 (SOD1608)
R = SOD123W
T = SOT23
V = SOT666

General purpose Zener diodes

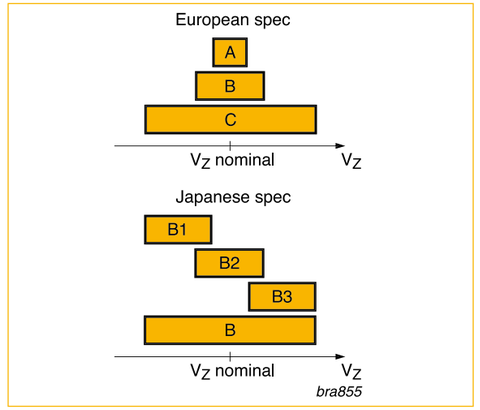
types in **bold** represent new products

I_F max (mA)	P_{ZSM} (W)	V_Z nom (V)	V_Z tolerance	Note	Configuration	Series	Package	Size (mm)	P_{tot} (mW)
500	-	3.3~24	C	Eur	single	1N47xxA series	SOD66 (DO-41)	4.8 x 2.6 x 0.81	1000
	60	3.6~75				BZV85 series			
250	-	2.1~36	about 2%	special	single	NZX series	SOD27 (DO-35)	4.25 x 1.85 x 0.56	400
	40	2.4~75	B, C	Eur		BZX79 series			
400	40	2.4~75	C	Eur	single	BZV90 series	SOT223 (SC-73)	6.5 x 3.5 x 1.65	1500
250	40	2.4~75	C	Eur	single	BZV49 series	SOT89 (SC-62)	4.5 x 2.5 x 1.5	1000
250	40	2.4~75	B, C	Eur	single	BZV55 series	SOD80C (MiniMelf)	3.5 x 1.5 x 1.5	300
200	40	2.4~75	B, C	Eur	dual c.a.	BZB84 series	SOT23	2.9 x 1.3 x 1.0	250
			A, B, C		single	BZX84 series			
250	30	5~6.8	0.2 V	Ave		PLVA600A series			
			0.2 V	Ave	dual c.a.	PLVA2600A series			
250	-	3.0~30	about 2.5%	special	single	NZH series	SOD123F	2.6 x 1.6 x 1.1	830
	40	2.4~75	B, C	Eur		BZT52H series			
200	40	2.7~24	B2	Jap	dual isolated	PZUxDB2 series	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	300
200	40	2.4~15	C	Eur	dual c.a.	BZB784 series	SOT323 (SC-70)	2.0 x 1.25 x 0.95	350
200	30	100	C	Eur	back-to-back	BZB100A	SOD323 (SC-76)	1.7 x 1.25 x 0.95	300
	40	2.4~36	B2	Jap	single	PDZ-B series			
250	40	2.4~75	B, C	Eur		BZX384 series			
200	40	2.4~36	B, B1, B2, B3	Jap		PZUxBA series			
200	60	100	C	Eur	single	BZX100A	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~36	B, B1, B2, B3	Jap		PZUxB series			
250	40	2.4~75	B, C	Eur		BZX84J series			
200	40	2.4~15	C	Eur	dual c.a.	BZB984 series	SOT663	1.6 x 1.2 x 0.55	350
200	40	2.4~75	B, C	Eur	single	BZX585 series	SOD523 (SC-79)	1.2 x 0.8 x 0.6	300
200	40	2.4~75	B, C	Eur	single	BZX884 series	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.5	250
		2.4~36	B, B2	Jap		PZUxBL series			
250	40	2.4~30	B	Eur	single	**TDZxJ series**	SOD323F	1.7 x 1.25 x 0.7	500

Notes:
Jap: B selection: app. 5% V_z tolerance, B1, B2, B3 selections: app. 2% V_z tolerance in sequential intervals
Eur: A selection: app. 1% V_z tolerance, B selection: app. 2% V_z tolerance, C selection: app. 5% V_z tolerance; the selections are in overlapping intervals
Ave: low voltage avalanche regulator diodes
dual c.a.: dual common anode

Zener diodes specifications

Differences in Zener specifications



Japanese spec (PZU, PDZ)

y =	B-series	B1-series	B2-series	B3-series
	± 5%	± 2%	± 2%	± 2%
	V_z (V)	V_z (V)	V_z (V)	V_z (V)
PZU2.4y	2.3 - 2.6	-	-	-
PZU2.7y	2.5 - 2.9	2.5 - 2.75	2.65 - 2.9	-
PZU3.0y	2.8 - 3.2	2.8 - 3.05	2.95 - 3.2	-
PZU3.3y	3.1 - 3.5	3.1 - 3.35	3.25 - 3.5	-
PZU3.6y	3.4 - 3.8	3.4 - 3.65	3.55 - 3.8	-
PZU3.9y	3.7 - 4.1	3.7 - 3.97	3.87 - 4.1	-
PZU4.3y	4.01 - 4.48	4.01 - 4.21	4.15 - 4.34	4.28 - 4.48
PZU4.7y	4.42 - 4.9	4.42 - 4.61	4.55 - 4.75	4.69 - 4.9
PZU5.1y	4.84 - 5.37	4.84 - 5.04	4.98 - 5.2	5.14 - 5.37
PZU5.6y	5.31 - 5.92	5.31 - 5.55	5.49 - 5.73	5.67 - 5.92
PZU6.2y	5.86 - 6.53	5.86 - 6.12	6.06 - 6.33	6.26 - 6.53
PZU6.8y	6.47 - 7.14	6.47 - 6.73	6.65 - 6.93	6.86 - 7.14
PZU7.5y	7.06 - 7.84	7.06 - 7.36	7.28 - 7.6	7.52 - 7.84
PZU8.2y	7.76 - 8.64	7.76 - 8.1	8.02 - 8.36	8.28 - 8.64
PZU9.1y	8.56 - 9.55	8.56 - 8.93	8.85 - 9.23	9.15 - 9.55
PZU10y	9.45 - 10.55	9.45 - 9.87	9.77 - 10.21	10.11 - 10.55
PZU11y	10.44 - 11.56	10.44 - 10.88	10.76 - 11.22	11.1 - 11.56
PZU12y	11.42 - 12.6	11.42 - 11.9	11.74 - 12.24	12.08 - 12.6
PZU13y	12.47 - 13.96	12.47 - 13.03	12.91 - 13.49	13.37 - 13.96
PZU14y	-	-	13.7 - 14.3	-
PZU15y	13.84 - 15.52	13.84 - 14.46	14.34 - 14.98	14.85 - 15.52
PZU16y	15.37 - 17.09	15.37 - 16.01	15.85 - 16.51	16.35 - 17.09
PZU18y	16.94 - 19.03	16.94 - 17.7	17.56 - 18.35	18.21 - 19.03
PZU20y	18.86 - 21.08	18.86 - 19.7	19.52 - 20.39	20.21 - 21.08
PZU22y	20.88 - 23.17	20.88 - 21.77	21.54 - 22.47	22.23 - 23.17
PZU24y	22.93 - 25.57	22.93 - 23.96	23.72 - 24.78	24.54 - 25.57
PZU27y	25.1 - 28.9	-	-	-
PZU30y	28 - 32	-	-	-
PZU33y	31 - 35	-	-	-
PZU36y	34 - 38	-	-	-

European spec (BZV, BZX, BZB, 1N47)

y =	C-series	B-series	A-series
	± 5%	± 2%	± 1%
	V_z (V)	V_z (V)	V_z (V)
BZX84-y2V4	2.2 - 2.6	2.35 - 2.45	2.37 - 2.43
BZX84-y2V7	2.5 - 2.9	2.65 - 2.75	2.67 - 2.73
BZX84-y3V0	2.8 - 3.2	2.94 - 3.06	2.97 - 3.03
BZX84-y3V3	3.1 - 3.5	3.23 - 3.37	3.26 - 3.34
BZX84-y3V6	3.4 - 3.8	3.53 - 3.67	3.56 - 3.64
BZX84-y3V9	3.7 - 4.1	3.82 - 3.98	3.86 - 3.94
BZX84-y4V3	4 - 4.6	4.21 - 4.39	4.25 - 4.35
BZX84-y4V7	4.4 - 5	4.61 - 4.79	4.65 - 4.75
BZX84-y5V1	4.8 - 5.4	5 - 5.2	5.04 - 5.16
BZX84-y5V6	5.2 - 6	5.49 - 5.71	5.54 - 5.66
BZX84-y6V2	5.8 - 6.6	6.08 - 6.32	6.13 - 6.27
BZX84-y6V8	6.4 - 7.2	6.66 - 6.94	6.73 - 6.87
BZX84-y7V5	7 - 7.9	7.35 - 7.65	7.42 - 7.58
BZX84-y8V2	7.7 - 8.7	8.04 - 8.36	8.11 - 8.29
BZX84-y9V1	8.5 - 9.6	8.92 - 9.28	9 - 9.2
BZX84-y10	9.4 - 10.6	9.8 - 10.2	9.9 - 10.1
BZX84-y11	10.4 - 11.6	10.8 - 11.2	10.8 - 11.11
BZX84-y12	11.4 - 12.7	11.8 - 12.2	11.88 - 12.12
BZX84-y13	12.4 - 14.1	12.7 - 13.3	12.87 - 13.13
BZX84-y15	13.8 - 15.6	14.7 - 15.3	14.85 - 15.15
BZX84-y16	15.3 - 17.1	15.7 - 16.3	15.84 - 16.16
BZX84-y18	16.8 - 19.1	17.6 - 18.4	17.82 - 18.18
BZX84-y20	18.8 - 21.2	19.6 - 20.4	19.8 - 20.2
BZX84-y22	20.8 - 23.3	21.6 - 22.4	21.78 - 22.22
BZX84-y24	22.8 - 25.6	23.5 - 24.5	23.76 - 24.24
BZX84-y27	25.1 - 28.9	26.5 - 27.5	26.73 - 27.27
BZX84-y30	28 - 32	29.4 - 30.6	29.70 - 30.30
BZX84-y33	31 - 35	32.3 - 33.7	32.67 - 33.33
BZX84-y36	34 - 38	35.3 - 36.7	35.64 - 36.36
BZX84-y39	37 - 41	38.2 - 39.8	38.61 - 39.39
BZX84-y43	40 - 46	42.1 - 43.9	42.57 - 43.43
BZX84-y47	44 - 50	46.1 - 47.9	-
BZX84-y51	48 - 54	50 - 52	50.49 - 51.51
BZX84-y56	52 - 60	54.9 - 57.1	-
BZX84-y62	58 - 66	60.8 - 63.2	-
BZX84-y68	64 - 72	66.6 - 69.4	-
BZX84-y75	70 - 79	73.5 - 76.5	74.25 - 75.75

NZX-series in SOD27

	V_z (V)		V_z (V)		V_z (V)
NZX2V1B	2.0 - 2.2	NZX6V2D	6.1 - 6.4	NZX14C	13.8 - 14.3
NZX2V4A	2.3 - 2.5	NZX6V2E	6.3 - 6.6	NZX15A	14.1 - 14.7
NZX2V4B	2.4 - 2.6	NZX6V8A	6.4 - 6.7	NZX15B	14.5 - 15.1
NZX2V7A	2.5 - 2.7	NZX6V8B	6.6 - 6.9	NZX15C	14.9 - 15.5
NZX2V7B	2.6 - 2.8	NZX6V8C	6.7 - 7	NZX15X	14.35 - 15.09
NZX2V7C	2.7 - 2.9	NZX6V8D	6.9 - 7.2	NZX16A	15.3 - 15.9
NZX3V0A	2.8 - 3	NZX7V5A	7 - 7.3	NZX16B	15.7 - 16.5
NZX3V0B	2.9 - 3.1	NZX7V5B	7.2 - 7.6	NZX16C	16.3 - 17.1
NZX3V0C	3 - 3.2	NZX7V5C	7.3 - 7.7	NZX18A	16.9 - 17.7
NZX3V3A	3.1 - 3.3	NZX7V5D	7.5 - 7.9	NZX18B	17.5 - 18.3
NZX3V3B	3.2 - 3.4	NZX7V5X	7.07 - 7.45	NZX18C	18.1 - 19
NZX3V3C	3.3 - 3.5	NZX8V2A	7.7 - 8.1	NZX20A	18.8 - 19.7
NZX3V6A	3.4 - 3.6	NZX8V2B	7.9 - 8.3	NZX20B	19.5 - 20.4
NZX3V6B	3.5 - 3.7	NZX8V2C	8.1 - 8.5	NZX20C	20.2 - 21.2
NZX3V6C	3.6 - 3.8	NZX8V2D	8.3 - 8.7	NZX22A	20.9 - 21.9
NZX3V9A	3.7 - 3.9	NZX9V1A	8.5 - 8.9	NZX22B	21.6 - 22.6
NZX3V9B	3.8 - 4	NZX9V1B	8.7 - 9.1	NZX22C	22.3 - 23.3
NZX3V9C	3.9 - 4.1	NZX9V1C	8.9 - 9.3	NZX24A	22.9 - 24
NZX4V3A	4 - 4.2	NZX9V1D	9.1 - 9.5	NZX24B	23.6 - 24.7
NZX4V3B	4.1 - 4.3	NZX9V1E	9.3 - 9.7	NZX24C	24.3 - 25.5
NZX4V3C	4.2 - 4.4	NZX10A	9.5 - 9.9	NZX24X	22.61 - 23.77
NZX4V3D	4.3 - 4.5	NZX10B	9.7 - 10.1	NZX27A	25.2 - 26.6
NZX4V7A	4.4 - 4.6	NZX10C	9.9 - 10.3	NZX27B	26.2 - 27.6
NZX4V7B	4.5 - 4.7	NZX10D	10.2 - 10.6	NZX27C	27.2 - 28.6
NZX4V7C	4.6 - 4.8	NZX11A	10.4 - 10.8	NZX27X	26.99 - 28.39
NZX4V7D	4.7 - 4.9	NZX11B	10.7 - 11.1	NZX30A	28.2 - 29.6
NZX5V1A	4.8 - 5	NZX11C	10.9 - 11.3	NZX30B	29.2 - 30.6
NZX5V1B	4.9 - 5.1	NZX11D	11.1 - 11.6	NZX30C	30.2 - 31.6
NZX5V1C	5 - 5.2	NZX12A	11.4 - 11.9	NZX30X	29.02 - 30.51
NZX5V1D	5.1 - 5.3	NZX12B	11.6 - 12.1	NZX33A	31.2 - 32.6
NZX5V6A	5.2 - 5.5	NZX12C	11.9 - 12.4	NZX33B	32.2 - 33.6
NZX5V6B	5.3 - 5.6	NZX12D	12.2 - 12.7	NZX33C	33.2 - 34.5
NZX5V6C	5.4 - 5.7	NZX12X	11.44 - 12.03	NZX36A	34.2 - 35.7
NZX5V6D	5.5 - 5.8	NZX13A	12.4 - 12.9	NZX36B	35.3 - 36.8
NZX5V6E	5.6 - 5.9	NZX13B	12.6 - 13.1	NZX36C	36.4 - 38
NZX6V2A	5.7 - 6	NZX13C	12.9 - 13.4	NZX36X	35.36 - 37.19
NZX6V2B	5.8 - 6.1	NZX14A	13.2 - 13.7		
NZX6V2C	6 - 6.3	NZX14B	13.5 - 14		

Switching diodes

General purpose switching diodes ≤ 100 V

types in **bold** represent new products

V_R max (V)	V_F max (V)	@ I_F (mA)	I_R max (nA)	@ V_R (V)	t_{rr} max (ns)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMelf)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)		SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	DFN1006-2 (SOD882)	DFN1006-3 (SOT883)	DFN1006D-2 (SOD882D)
						Size (mm)	4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95		2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
						P_{tot} (mW)	500	500	500	250	250	830	200		300	400	550	180	170	500	250	250	250
50	1	50	100	50	4					BAL74													
										BAV74													
70	1	50	1000	70	4					BAL99													
75	1	10	25	20	4			1N4531															
		50	1000	75	4						BAS28												
		100	5000	75	4				BAS32L														
80	1	50	500	80	4								1PS300										
													1PS301										
													1PS302										
90	1	50	500	80	4					BAW56			BAW56W						BAW56T			BAW56M	
															BAW56S								
															BAV756S								
100	1	10	25	20	4		1N4148																
		50	500	80	4							BAS16H				BAS316	BAS16J			BAS516	BAS16L		BAS16LD
										BAS16			BAS16W						BAS16T				
															BAS16VY			BAS16VV					
										BAV70			BAV70W						BAV70T			BAV70M	
															BAV70S								
										BAV99			BAV99W										
															BAV99S								

General purpose switching diodes > 100 V

V_R max (V)	V_F max (V)	@ I_F (mA)	I_R max (nA)	@ V_R (V)	t_{rr} max (ns)	Package	SOD27 (DO-35)	SOD80C (MiniMelf)	SOT457 (SC-74)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOD523 (SC-79)
						Size (mm)	4.25 x 1.85 x 0.56	3.5 x 1.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.2 x 0.8 x 0.6
						P_{tot} (mW)	500	300	500	250	250	830	350	300	400	550	500
150	1	100	100	150	50		BAV20										
≥200	1	100	100	150	50		BAV21	BAV103				BAS21H			BAS321		
				200	50					BAS21			BAS21W				
											BAV23						
										BAV23A			BAS21AW				
										BAV23C							
										BAV23S			BAS21SW				
									BAS21AVD								
									BAS21AD								
300	1.1	100	150	250	50											BAS21J	BAS521
										BAS101							
										BAS101S							
											BAW101						
														BAW101S			

Controlled avalanche switching diodes

V_R max (V)	V_F max (V)	@ I_F (mA)	I_R max (nA) @ V_R max	I_{FSM} max (A)	I_{FRM} max (mA)	C_d max (pF)	t_{rr} max (ns)	Package	SOT23	SOT143B
								Size (mm)	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0
								P_{tot} (mW)	250	250
60	1	200	100	9	600	2.5	6			BAS56
90	1	200	100	10	600	35	50		BAS29	
									BAS31	
									BAS35	

Low leakage current switching diodes

V_R max (V)	V_F max (V)	@ I_F (mA)	I_R max (nA) @ V_R max	t_{rr} max (µs)	Package	SOD80C (MiniMelf)	SOD68 (DO-34)	SOT23	SOD123F	SOT323 (SC-70)	SOD323 (SC-76)	SOT416 (SC-75)	SOD523 (SC-79)
					Size (mm)	3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6
					P_{tot} (mW)	300	500	250	830	250	400	170	500
75	1	10	5	3					BAS116H		BAS416		BAS716
								BAS116				BAS116T	
								BAV199		BAV199W			
								BAW156					
								BAV170					
125	1	100	1	1.5 typ		BAS45AL	BAS45A						

Ultrafast recovery power diodes

types in **bold** represent new products

V_{RRM} (V)	$I_{F(AV)}$ (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_{rr} (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOD141 (DO201AD)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT226 (I²PAK)	SOT404 (D²PAK)	SOT428 (DPAK)
100	8	0.8	8	20	BYW29E-100								
	2 x 10	0.72	8	20				BYV32E-100					
150	2 x 0.75	0.5	0.5	10						BYV40E-150			
	8	0.8	8	20	BYW29E-150								
	2 x 10	0.72	8	20				BYV32E-150					
	2 x 15	0.78	15	20				BYV42E-150					
200	8	0.8	8	20	BYW29E-200	BYW29EX-200							BYW29ED-200
	2 x 5	0.8	5	15				BYQ28E-200	BYQ28X-200				BYQ28ED-200
	2 x 5	0.8	5	15				**BYQ28E-200E**					
	14	0.83	14	20	BYV79E-200								
	2 x 8	0.84	8	20				BYQ30E-200					
	2 x 10	0.72	8	20				BYV32E-200			**BYV32G-200**	BYV32EB-200	
	2 x 15	0.78	15	20				BYV42E-200			**BYV42G-200**	BYV42EB-200	
300	2 x 5	0.95	5	50				BYT28-300					
400	9	0.9	8	50	BYV29-400								
	2 x 10	0.87	10	50				BYV34-400					
500	9	0.9	8	50	BYV29-500	BYV29X-500						BYV29B-500	
	2 x 5	0.95	5	50				BYT28-500					
	15	0.9	15	50	BYT79-500								
	2 x 10	0.87	10	50				BYV34-500					
	2 x 15	0.95	15	50				BYV44-500					
600	4	0.88	4	33			**NUR460**						
	5	0.97	5	50		BYV25X-600					BYV25G-600		BYV25D-600
	8	1.07	8	60	BYR29-600	BYR29X-600							
	9	0.97	8	50	BYV29-600	BYV29X-600					BYV29G-600	BYV29B-600	
	15	1	15	50	BYT79-600	BYT79X-600							
	2 x 10	0.92	10	50				BYV34-600	BYV34X-600		BYV34G-600		
	5	1.1	5	17.5	**BYV25F-600**	**BYV25FX-600**						**BYV25FB-600**	**BYV25FD-600**
	9	1.25	8	17.5	**BYV29F-600**	BYV29FX-600						**BYV29FB-600**	**BYV29FD-600**
	2 x 10	1.3	10	20				BYV410-600	BYV410X-600				
800	8	1.07	8	60	BYR29-800	BYR29X-800							

Ultrafast diodes for Discontinuous Current Mode or Critical Conduction Mode PFC

Enhanced ultrafast diodes for interleaved PFC and dual mode DCM/CCM

Hyperfast recovery power diodes

types in **bold** represent new products

V_{RRM} (V)	$I_{F(AV)}$ (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_{rr} (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOT78 (TO220AB)	SOT404 (D²PAK)
500	5	1.4	5	16	**BYC5D-500**	**BYC5DX-500**		
600	5	1.4	5	19	BYC5-600	BYC5X-600		BYC5B-600
	8	1.4	8	19	BYC8-600	BYC8X-600		BYC8B-600
	8	1.4	8	18	**BYC8D-600**	**BYC8DX-600**		
	10	1.4	10	19	BYC10-600	BYC10X-600		BYC10B-600
	10	1.4	10	18	**BYC10D-600**	**BYC10DX-600**		
	2 x 5	1.4	5	19			BYC10-600CT	
	15	1.4	15	19	BYC15-600	BYC15X-600		
	20	1.4	20	19	BYC20-600	BYC20X-600		

Hyperfast diodes for Continuous Current Mode PFC

Casco diodes (employing series die technology for the lowest possible t_{rr})

types in **bold** represent new products

V_{RRM} (V)	$I_{F(AV)}$ (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_{rr} (typ) @ 25C (ns)	SOD113 (2-pin SOT186A)
600	8	2	8	12.5	**BYC58X-600**

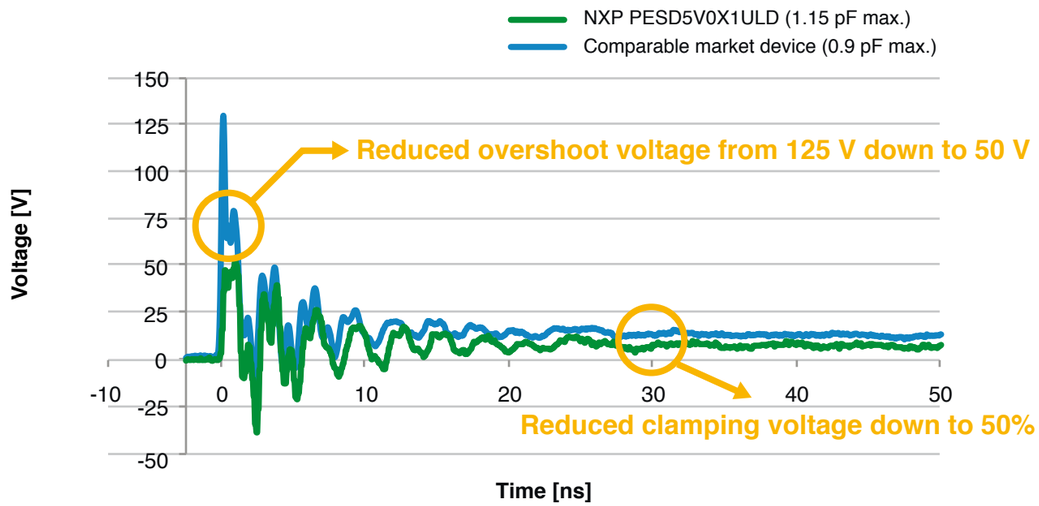
Casco diodes for Continuous Current Mode PFC

Protection and signal conditioning

Ultra low clamping ESD protection for highly sensitive devices

- Modern IC process technology nodes feature ultra small structure widths which are highly sensitive to high voltages and currents
- The excellent clamping performance of the new NXP family reduces dangerous clamping/ transient voltages during an ESD strike to a minimum

Optimal clamping performance: 8 kV ESD clamping graph



Electrical specifications

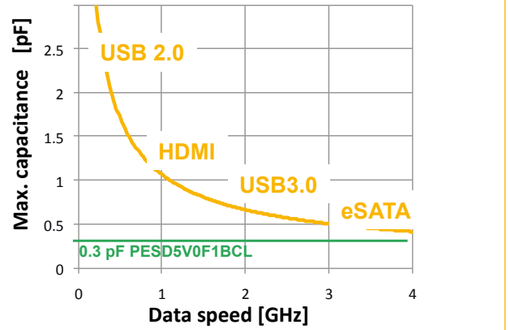
Product	V_{RWM}	C_d typ	C_d max	ESD rating max	V_{CL} @ 8 kV ESD pulse after 30 ns	Package	Configuration
PESD5V0X1UB	5 V	0.95 pF	1.15 pF	8 kV	7.5 V	SOD523 (1.2 x 0.8 x 0.6)	
PESD5V0X1UAB	5 V	1.55 pF	1.75 pF	15 kV	11 V		
PESD5V0X1ULD	5 V	0.95 pF	1.15 pF	8 kV	7.5 V	DFN1006D-2 (SOD882D) (1.0 x 0.6 x 0.37)	
PESD5V0X1UALD	5 V	1.55 pF	1.75 pF	15 kV	11 V		
PESD5V0X1BCL	5 V	0.49 pF	0.6 pF	8 kV	18 V	DFN1006-2 (SOD882) (1.0 x 0.6 x 0.5)	
PESD5V0X1BCAL	5 V	0.85 pF	0.95 pF	15 kV	13.3 V		

Ultra low capacitance devices for high-speed dataline protection

- Ultra high-speed interfaces allow only a minimum of additional line capacitance for ESD protection
- NXP new ultra low capacitance ESD protection diodes offer a line capacitance of only 0.3 pF, thereby increase PCB design flexibility

Features
- Ultra low capacitance down to 0.3 pF (uni) / 0.4 pF typical (bi)
- Ultra low clamping voltage
- AEC-Q101 qualified

Applications
- Ultra high-speed interfaces
- USB 3.0, HDMI, USB 2.0



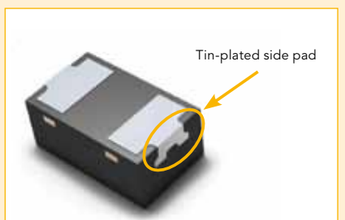
Electrical specifications

Product	Configuration	V_{RWM}	C_d typ	C_d max	ESD rating max	Package	Configuration
PESD5V01UCLD	1 x uni	5 V	0.4 pF	0.55 pF	8 kV	DFN1006D-2 (SOD882D) (1.0 x 0.6 x 0.37)	
PESD5V01UCL	1 x uni	5 V	0.4 pF	0.55 pF	8 kV	DFN1006-2 (SOD882) (1.0 x 0.6 x 0.5)	
PESD5V01BCL	1 x bi	5 V	0.3 pF	0.45 pF	8 kV		

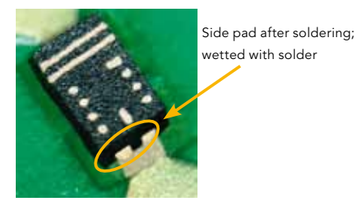
Available in new innovative DFN1006D-2 (SOD882D) package

Features
- Reduced height of 0.37 mm typ.
- Solderable tin-plated side pads

SOD882D

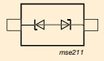


SOD882D (mounted on PCB)



Standard ESD protection devices

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{PP} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	5	35	42	40	30	0.1		PESD5V0S1USF	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3
		3.3	207	300	150	30	2		PESD3V3S1UL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	152	200	150	30	1		PESD5V0S1UL		
		12	38	75	150	30	0.05		PESD12VS1UL		
		15	32	70	150	30	0.05		PESD15VS1UL		
		24	23	50	150	23	0.05		PESD24VS1UL		
		36	18	30	150	30	0.01		**PESD36VS1UL**		
		5	152	200	150	30	1		PESD5V0S1ULD	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		12	38	75	150	30	0.05		PESD12VS1ULD		
		15	32	70	150	30	0.05		PESD15VS1ULD		
		24	23	50	150	23	0.05		PESD24VS1ULD		
		3.3	207	300	330	30	2		PESD3V3S1UB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	152	200	260	30	1		PESD5V0S1UB		
		12	38	75	180	30	0.05		PESD12VS1UB		
		15	32	70	160	30	0.05		PESD15VS1UB		
		24	23	50	160	23	0.05		PESD24VS1UB		
		5	480	530	890	30	4		PESD5V0S1UA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		12	160	180	600	30	0.1		PESD12VS1UA		
		24	23	50	160	23	0.05		**PESD24VS1UA**		
		5	480	530	890	30	4		PESD5V0S1UJ	SOD323F (SC-90) 	1.7 x 1.25 x 0.7
		12	160	180	600	30	0.1		PESD12VS1UJ		
		5	68	75	150	30	1		PESD9X5.0L	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		7	62	70	150	30	1		PESD9X7.0L		
		2.5	229	300	260	30	6		PESD5Z2.5	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		3.3	172	200	260	30	0.05		PESD5Z3.3		
		5	89	150	180	30	0.05		PESD5Z5.0		
		6	78	150	180	30	0.01		PESD5Z6.0		
		7	69	150	180	30	0.01		PESD5Z7.0		
		12	35	75	200	30	0.01		PESD5Z12		
0	1	5.5	35	45	100	30	0.1		**PESD5V0S1BSF**	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3
		5	35	45	130	30	0.1		PESD5V0S1BL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	35	45	130	30	0.1		PESD5V0S1BLD	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		5	35	45	130	30	0.1		PESD5V0S1BB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	35	45	130	30	0.1		PESD5V0S1BA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95

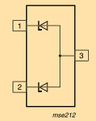
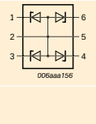
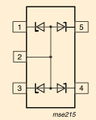
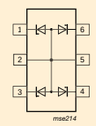
[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

Standard ESD protection devices

Standard ESD protection devices

types in **bold** represent new products

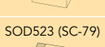
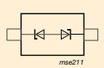
Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{PP} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
2	1	3.3	200	275	150	23	3		PESD3V3S2UQ	SOT663 	1.6 x 1.2 x 0.55
		5	150	215	150	30	0.3		PESD5V0S2UQ		
		12	38	100	150	30	0.03		PESD12VS2UQ		
		15	32	70	150	30	0.05		PESD15VS2UQ		
		24	23	50	150	23	0.05		PESD24VS2UQ		
		3.3	207	300	330	30	2		PESD3V3S2UT	SOT23 	2.9 x 1.3 x 1.0
		5.2	152	200	260	30	1		PESD5V2S2UT		
		12	38	75	180	30	1		PESD12VS2UT		
		15	32	70	160	30	1		PESD15VS2UT		
		24	23	50	160	23	1		PESD24VS2UT		
		36	17	35	160	30	1 (@ 30 V)		PESD36VS2UT		
		3.3	207	300	330	30	2		PESD3V3S2UAT		
		5	152	200	260	30	1		PESD5V0S2UAT		
		12	38	75	180	30	0.05		PESD12VS2UAT		
		15	32	70	160	30	0.05		PESD15VS2UAT		
		24	23	50	160	23	0.05		PESD24VS2UAT		
4	3	5.5	45	60	-	15	0.1	-	**IP4342CX5/LF**	WLCSP5	1.06 x 0.76 x 0.61
		5.5	30	40	-	15	0.1		**IP4042CX5/LF**		1.28 x 0.91 x 0.65
		3.3	110	300	110	30	1 (@ 3 V)		PESD3V3S4UF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	85	220	110	30	0.1 (@ 4.3 V)		PESD5V0S4UF		
		3	107	125	-	8	1		BZA956A	SOT665	1.6 x 1.2 x 0.55
		4	90	105	-	8	0.5		BZA962A		
		4.3	78	90	-	8	0.1		BZA968A		
		3	200	240	-	8	2		BZA856A	SOT353 (SC-88A) 	2.0 x 1.25 x 0.95
		3	107	125	-	8	1		BZA856AL		
		4	165	200	-	8	0.7		BZA862A		
		4	90	105	-	8	0.5		BZA862AL		
		4.3	145	180	-	8	0.2		BZA868A		
		4.3	78	90	-	8	0.1		BZA868AL		
		15	37	50	-	8	0.1		BZA820A		
		3	200	240	-	8	2		BZA456A	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		4	165	200	-	15	0.7		BZA462A		
		14	37	48	-	8	0.075		BZA418A		
		15	37	48	-	8	0.1		BZA420A		
		3.3	215	300	200	30	0.8		PESD3V3S4UD		
		5	165	220	200	30	0.2		PESD5V0S4UD		
		12	73	100	200	30	0.015		PESD12VS4UD		
		15	60	90	200	30	0.015		PESD15VS4UD		
		24	40	70	200	23	0.015		PESD24VS4UD		
5	4	3.3	215	300	200	30	0.8		PESD3V3S5UD		
		5	165	220	200	30	0.2		PESD5V0S5UD		
		12	73	100	200	30	0.015		PESD12VS5UD		
		15	60	90	200	30	0.015		PESD15VS5UD		
		24	45	70	200	23	0.015		PESD24VS5UD		
0	4	5	45	75	-	15	0.1		BZA408B		
18	17	5.2	100	120	-	8	2		BZA100	SOT163 (SO20) 	12.8 x 7.5 x 2.65

[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

Low capacitance ESD protection devices – Part 1

types in **bold** represent new products

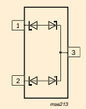
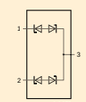
Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{PP} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	25	30	42	26	0.1		PESD5V0L1UL		
		5	25	30	42	26	0.1		PESD5V0L1ULD	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		3.3	34	40	45	30	0.3		PESD3V3L1UB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	25	30	42	26	0.1		PESD5V0L1UB		
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		5	25	30	42	26	0.1		PESD5V0L1UA		
		5	12	15	10	30	0.1		PESD5V0L1USF-H250	DSN0603B-2 (SOD962B) 	0.6 x 0.3 x 0.25
		5	12	15	10	30	0.1		PESD5V0L1USF	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3
		5	4	5	8	14	0.1		PESD5V0V1USF		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	2	2.6	-	9	0.1		PESD5V0U1UL		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	2	2.6	-	9	0.1		PESD5V0U1UB		
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		5	2	2.6	-	9	0.1		PESD5V0U1UA		
0	1	3.3	101	-	500	30	2		PESD3V3L1BA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		5	75	-	500	30	1		PESD5V0L1BA		
		12	19	-	200	30	0.05		PESD12VL1BA		
		15	16	-	200	30	0.05		PESD15VL1BA		
		24	11	-	200	23	0.05		PESD24VL1BA		
		5.5	12	15.4	35	30	0.1		**PESD5V0L1BSF**	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3
		5	11	13	45	30	0.01		PESD5V0V1BL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	11	13	45	30	0.01		PESD5V0V1BLD	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		5	11	13	45	30	0.01		PESD5V0V1BB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	11	13	45	30	0.01		PESD5V0V1BA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		5	5.3	6	10	20	0.1		PESD5V0V1BCSF	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3
		5	5.3	6	20	25	0.1		PESD5V0V1BDSF		
		5.5	3.5	4.5	8	15	0.1		**PESD5V0V1BSF**		
		5	3.5	4	8	15	0.1		**PESD5V0V1BSF-H250**	DSN0603B-2 (SOD962B) 	0.6 x 0.3 x 0.25
		15	8	10	-	15	0.1		IP4302CX2/A	WLCSP2	0.7 x 0.52 x 0.40

[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

Low capacitance ESD protection devices – Part 2

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{PP} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	1	5	2.9	3.5	-	10	0.1		PESD5V0U1BL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U1BLD	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		5	2.9	3.5	-	10	0.1		PESD5V0U1BB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	2.9	3.5	-	10	0.1		PESD5V0U1BA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
2	1	3.3	22	28	30	15	0.3		PESD3V3L2UM	DFN1006-3 (SOT883) 	1.0 x 0.6 x 0.5
		5	16	19	30	15	0.025		PESD5V0L2UM		
		5	16	19	-	15	0.025		**PESD5V0L2UMB**	DFN1006B-3 (SOT883B) 	1.0 x 0.6 x 0.37
		5	38	46	70	30	0.09 (@ 4 V)		PESD5V0L2UU	SOT323 (SC-70) 	2.0 x 1.25 x 0.95
		6	34	40	60	30	0.018 (@ 4.3 V)		PESD6V0L2UU		
0	2	3.3	101	-	350	30	2		PESD3V3L2BT	SOT23 	2.9 x 1.3 x 1.0
		5	75	-	350	30	1		PESD5V0L2BT		
		12	19	-	200	30	0.05		PESD12VL2BT		
		15	16	-	200	30	0.05		PESD15VL2BT		
		24	11	-	200	23	0.05		PESD24VL2BT		
		5	35	45	130	30	0.1		PESD5V0S2BT		
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT		
		5	2.9	3.5	-	10	0.1		PESD5V0U2BM	DFN1006-3 (SOT883) 	1.0 x 0.6 x 0.5
		5	2.9	3.5		10	0.1		**PESD5V0U2BMB**	DFN1006B-3 (SOT883B) 	1.0 x 0.6 x 0.37
		15	13	15	-	15	0.1	-	IP4303CX4/P	WLCSP4 	0.76 x 0.76 x 0.40

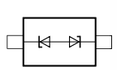
[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

In the Spotlight

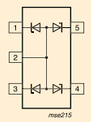
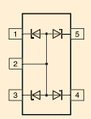
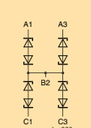
ESD device for antenna protection: PESD16VF1BL

- Bidirectional V_{RWM} = 16 V ESD protection device in DFN1006-2 (SOD882) package
- Ultra low capacitance of C_d = 0.65 pF max.
- ESD robustness V_{ESD} = 8 kV
- AEC-Q101 qualified
- Applications: e.g. **NFC** antenna protection



Low capacitance ESD protection devices – Part 3

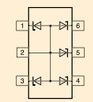
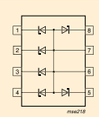
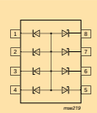
types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{pp} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
3	0	5.5	3	4	-	15	0.1	-	**IP4059CX5/LF**	WLCSP5	1.34 x 0.96 x 0.65
4	3	3.3	22	28	30	20	0.3		PESD3V3L4UF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	16	19	30	20	0.025		PESD5V0L4UF		
		3.3	22	28	30	20	0.3		PESD3V3L4UW	SOT665 	1.6 x 1.2 x 0.55
		5	16	19	30	20	0.025		PESD5V0L4UW		
		3.3	22	28	30	20	0.3		PESD3V3L4UG	SOT353 (SC-88A) 	2.0 x 1.25 x 0.95
		5	16	19	30	20	0.025		PESD5V0L4UG		
		3.3	13	17	25	10	1		PESD3V3V4UK	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.5
		5	12	15	25	15	0.3		PESD5V0V4UK		
		9	6.5	10	28	8	0.1		PESD9V0V4UK		
		3.3	15	18	16	12	0.3		PESD3V3V4UF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	12	15	16	12	0.025		PESD5V0V4UF		
		3.3	15	18	16	12	0.3		PESD3V3V4UW	SOT665 	1.6 x 1.2 x 0.55
		5	12	15	16	12	0.025		PESD5V0V4UW		
		3.3	15	18	16	12	0.3		PESD3V3V4UG	SOT353 (SC-88A) 	2.0 x 1.25 x 0.95
		5	12	15	16	12	0.025		PESD5V0V4UG		
0	4	5.5	18	20	-	15	0.1		**IP4343CX5/LF**	WLCSP5	1.06 x 0.76 x 0.61
		5.5	18	20	-	15	0.1		IP4043CX5/LF		1.12 x 1.12 x 0.65

[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

Low capacitance ESD protection devices – Part 4

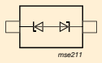
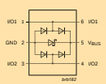
Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{pp} [1] max (W)	ESD rating [2] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U4BW	SOT665 	1.6 x 1.2 x 0.55
5	4	3.3	20	24	28	15	2		PESD3V3L5UK	DFN1010-6 (SOT891) 	1.0 x 1.0 x 0.5
		5	18.5	22	30	20	0.5		PESD5V0L5UK		
		3.3	22	28	25	20	0.3		PESD3V3L5UF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	16	19	25	20	0.025		PESD5V0L5UF		
		3.3	22	28	25	20	0.3		PESD3V3L5UV	SOT666 	1.6 x 1.2 x 0.55
		5	16	19	25	20	0.025		PESD5V0L5UV		
		3.3	22	28	25	20	0.3		PESD3V3L5UY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		5	16	19	25	20	0.025		PESD5V0L5UY		
0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U5BV	SOT666 	1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6US	SOT96 (SO8) 	4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8) 	4.9 x 3.9 x 1.75

[1] 8/20 µs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

[2] acc. to IEC 61000-4-2 (contact discharge)

ESD protection for very high-speed interfaces (< 2 pF) – Part 1

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	ESD rating [1] max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
1	0	5	0.4	0.55	8		**PESD5V0F1UCL**	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	0.4	0.55	8		**PESD5V0F1UCLD**	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		5	0.95	1.15	8		PESD5V0X1ULD		
		5	1.55	1.75	15		PESD5V0X1UALD		
		5	0.95	1.15	8		PESD5V0X1UB	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	1.55	1.75	15		PESD5V0X1UAB		
		16	0.83	0.98	8		PESD16VX1UL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5.5	1	1.5	8		PRTR5V0U1T	SOT23 	2.9 x 1.3 x 1.0
		80	0.6	0.75	30		NUP1301		
		80	0.6	0.75	30		NUP1301U	SOT323 	2.0 x 1.25 x 0.95
0	1	5.5	0.25	0.3	10		**PESD5V0F1BSF**	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3
		5	0.3	0.45	8		**PESD5V0F1BCL**	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		5	0.4	0.55	8		**PESD5V0F1BLD**	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37
		5.5	0.4	0.55	10		PESD5V0F1BL	DFN1006-2 (SOD882) 	1.0 x 0.6 x 0.5
		16	0.5	0.65	8		**PESD16VF1BL**		
		3.3	1.3	1.6	9		PESD3V3X1BL		
		5	0.85	0.95	15		**PESD5V0X1BCAL**		
		5	0.55	0.65	8		**PESD5V0X1BCL**		
		5	0.9	1.3	9		PESD5V0X1BL		
2	1	5	0.9	1.3	9		PESD5V0X1BQ	SOT663 	1.6 x 1.2 x 0.55
		5	0.9	1.3	9		PESD5V0X1BT	SOT23 	2.9 x 1.3 x 1.0
	0	5.5	1	1.5	8		PRTR5V0U2X	SOT143B 	2.9 x 1.3 x 1.0
		5.5	1.8	-	12		PRTR5V0U2AX		
		5.5	1	1.5	8		PRTR5V0U2D	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		5.5	1	1.5	8		PRTR5V0U2F	DFN1410-6 (SOD886) 	1.45 x 1.0 x 0.5

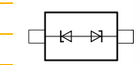
[1] acc. to IEC 61000-4-2 (contact discharge)

ESD protection for very high-speed interfaces (< 2 pF) – Part 2

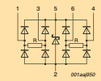
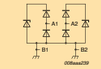
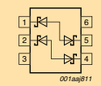
In the Spotlight

Ultra low clamping ESD Protection: PESD5V0X1BCAL

- Bidirectional 5 V ESD protection device in DFN1006-2 (SOD882) package
- Ultra low capacitance of C_d = 0.95 pF max.
- ESD robustness V_{ESD}= 15 kV
- Ultra low clamping V_{CL}= 13.3 V @ 8 kV after 30 ns
- AEC-Q101 qualified



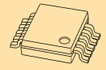
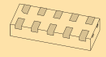
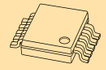
types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	ESD rating [1] max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
2	0	5.5	2	-	15		IP4234CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		5.5	0.7	-	8		IP4282CZ6	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5.5	1.3	-	15		IP4359CX4/LF	WLCSP4 	0.76 x 0.76 x 0.61
4	0	5.5	1.4	1.5	15	-	**IP4319CX10**	WLCSP10	1.56 x 1.05 x 0.61
		5.5	1	-	8		IP4220CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		5.5	1	-	8		IP4221CZ6-S	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5.5	1	-	8		**IP4233CZ6**	SOT363 (SC-88) 	2.0 x 1.25 x 0.95

[1] acc. to IEC 61000-4-2 (contact discharge)

ESD protection for very high-speed interfaces (< 2 pF) – Part 3

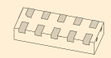
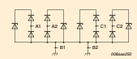
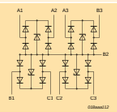
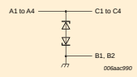
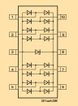
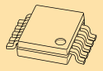
types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	ESD rating [1] max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
4	0	5.5	1	-	8		PRTR5V0U4D	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		5.5	1	-	8		PRTR5V0U4Y	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		5.5	0.8	-	12		**IP4285CZ9-TBB**	DFN2110-9 (SOT1178) 	1.0 x 2.1 x 0.5
							IP4285CZ6-TD	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
							IP4285CZ6-TY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		5.5	0.7	-	8		IP4280CZ10	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		5.5	0.6	-	8		**IP4283CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		5.5	0.6	-	8		IP4283CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		5.5	0.5	-	8		**IP4284CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5

[1] acc. to IEC 61000-4-2 (contact discharge)

ESD protection for very high-speed interfaces (< 2 pF) – Part 4

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	ESD rating [1] max (kV)	I_R max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.55	-	8	-		**IP4292CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		5.5	0.5	-	10	-		**IP4294CZ10-TBR**		
5	4	5	0.5	0.65	8	0.1		**PESD5V0F5UF**	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		5	0.5	0.65	8	0.1		**PESD5V0F5UUW**	SOT666 	1.6 x 1.2 x 0.55
5	0	5.5	1.3	-	15	-		**IP4358CX6**	WLCSP6 	0.76 x 1.16 x 0.61
8	0	5.5	1.3	-	15	-		**IP4309CX9**	WLCSP9	1.16 x 1.16 x 0.61
4	0	5.5	1.4	1.5	15	0.1		**IP4319CX10**	WLCSP10	1.56 x 1.05x 0.61
8	0	5.5	1	-	8	-		PRTR5V0U8S	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1

[1] acc. to IEC 61000-4-2 (contact discharge)

In the Spotlight

NXP Wafer-Level Chip Scale Package (WLCSP)

- Smallest possible solution for ESD and EMI circuits, saving maximum of space
- Lowest parasitic inductance to GND contact, ensures best performance
- High mechanical robustness

Audio interfaces

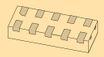
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Remark	Type	Package	Size (mm)
		R_{line}	C_{line} (pF)				
Audio	2	0.9 Ω	290	Low-ohmic speaker (< ~8 Ω)	IP4047CX6/LF	WLCSP6	1.56 x 1.01 x 0.65
		10 Ω	200	Low-ohmic speaker (> ~8 Ω)	IP4048CX5/LF	WLCSP5	0.91 x 1.28 x 0.65
		68 Ω	110	Single-ended or differential microphone	IP4049CX5/LF		
		470 Ω	20	Single-ended or differential microphone	IP4355CX6/LF	WLCSP6	1.16 x 0.76 x 0.65
		50 Ω / 2.2 kΩ	2000	Single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF	WLCSP8	1.67 x 1.67 x 0.65
		0.25 Ω, 3 nH	-	Inductive, low-ohmic differntial channel LC filter	**IP3047CX6**	WLCSP6	1.60 x 1.15 x 0.65
		0.25 Ω, 3 nH	-	Inductive, low-ohmic differntial channel LC filter	**IP3048CX5**	WLCSP5	1.51 x 1.14 x 6.65
	5	2.9 kΩ, 1 kΩ / 10 Ω	-	5-channel filter interface with integrated RC-filters and biasing network for audio interfaces	**IP4327CX15**	WLCSP15	1.05 x 2.36 x 0.61
	6	40 Ω / 1450 Ω / 10 Ω	50 / 20 / 200	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4027CX20/LF	WLCSP20	1.91 x 2.52 x 0.65

ESD protection acc. to IEC 61000-4-2 (level 4)

Video interfaces – Part 1

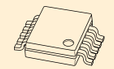
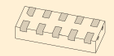
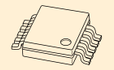
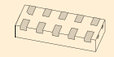
types in **bold** represent new products

Baseband interface	Number of protected lines	C_{line} (pF)	Remark	Type	Package	Size (mm)
Display port	4	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		0.55	ESD protection for ultra high-speed interfaces	**IP4292CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		0.5	ESD protection for ultra high-speed interfaces	**IP4294CZ10-TBR**		
		0.8	ESD protection for ultra high-speed interfaces	**IP4285CZ9-TBB**	DFN2110-9 (SOT1178) 	1.0 x 2.1 x 0.5

ESD protection acc. to IEC 61000-4-2 (level 4)

Video interfaces – Part 2

types in **bold** represent new products

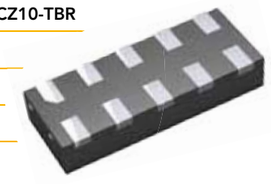
Baseband interface	Number of protected lines	C_{line} (pF)	Remark	Type	Package	Size (mm)
HDMI	2	0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
	4	0.7	ESD protection for ultra high-speed interfaces	IP4280CZ10	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		0.6	ESD protection for ultra high-speed interfaces	**IP4283CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		0.6	ESD protection for ultra high-speed interfaces	**IP4283CZ10-TT**	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		0.8	ESD protection for ultra high-speed interfaces	**IP4285CZ9-TBB**	DFN2110-9 (SOT1178) 	1.0 x 2.1 x 0.5
		0.55	ESD protection for ultra high-speed interfaces	**IP4292CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5

ESD protection acc. to IEC 61000-4-2 (level 4)

In the Spotlight

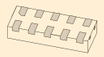
HDMI: High-speed 4 channel ESD protection – IP4292CZ10-TBR

- Provides low capacitance 4 channel ESD protection in an array
- Optimized for high level ESD protection of HDMI ports
- Straight-through routing → best signal integrity
- 10 pin QFN package DFN2510A-10 (SOT1176)



Video interfaces – Part 3

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C_{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
HDMI	4	-	-	0.5	-	ESD protection for ultra high-speed interfaces	**IP4292CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
	5	-	-	10	1.75 k, 100 k	HDMI, DDC, CEC, hot plug ESD protection and biasing	**IP4310CX8/P**	WLCSP8 	1.16 x 1.16 x 0.61
		yes	yes	-	internal	Fully integrated solution for HDMI low-speed signals, buffer and level shifter for DDC, CEC, HP	**IP4791CZ12**	DFN2521-12 (SOT1156) 	2.5 x 2.1 x 0.5
	8	-	-	1.3	-	HDMI, TMDS line ESD protection	**IP4309CX9**	WLCSP9 	1.16 x 1.16 x 0.61
	12	-	yes	0.7	-	ESD protection and level shifting for a complete HDMI port	IP4776CZ38	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1
		yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and hot plug application for a complete HDMI source port	IP4777CZ38		
	13	yes	yes	100 Ω differential impedance	internal	Fully integrated HDMI Tx solution with current limiter, buffer and level shifter for DDC, CEC, HP	**IP4786CZ32**	DFN5050-32 (SOT617) 	5.0 x 5.0 x 1.0
		yes	yes	100 Ω differential impedance	internal	Fully integrated HDMI Rx solution with current limiter, buffer and level shifter for DDC, CEC, HP	**IP4787CZ32**		
LVDS	2	-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	**IP3348CX5**	WLCSP5 	0.76 x 1.06 x 0.61
	4	-	-	0.8	10	Very low clamp ESD protection with 12 kV IEC ruggedness	**IP4285CZ6-TD**	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		-	-	0.8	10	Very low clamp ESD protection with 12 kV IEC ruggedness	**IP4285CZ6-TY**	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	**IP3348CX10**	WLCSP10	1.56 x 1.06 x 0.61
	6	-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	**IP3348CX15**	WLCSP15	2.36 x 1.06 x 0.61
	8	-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	**IP3348CX20**	WLCSP20	3.16 x 1.06 x 0.61

ESD protection acc. to IEC 61000-4-2 (level 4)

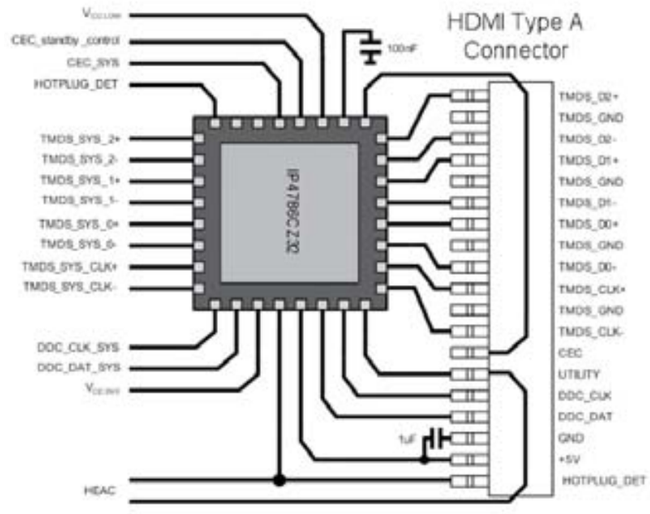
Video interfaces – Part 4

Baseband interface	Number of protected lines	Buffer	Level shifter	C_{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
VGA	7	yes	yes	5	10	H&V sync buffer, DDC level shifter	IP4772CZ16	SOT519 (SSOP16) 	4.9 x 3.9 x 1.73

ESD protection acc. to IEC 61000-4-2 (level 4)

Please find more ESD protection diodes for very high-speed interfaces on pages 34 - 37

Transmitter HDMI companion chip IP4786CZ32



Multichannel EMI filters, ESD protection for LCD and camera – Part 1

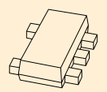
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	1	75	36	-	~50	155	IP4307CX4/LF	WLCSP4	0.76 x 0.76 x 0.61
		20	40	-	~50	153	**PEMI1QFN/CT**	DFN1006-3 (SOT883) 	1.0 x 0.6 x 0.5
		20	36	-	~55	170	**PEMI1QFN/CR**		
		20	32	-	~60	185	**PEMI1QFN/CP**		
		20	28	-	~70	218	**PEMI1QFN/CM**		
		20	23	-	~90	264	**PEMI1QFN/CK**		
		20	19	-	~105	317	**PEMI1QFN/CG**		
		20	15	-	~130	397	**PEMI1QFN/CE**		
		45	40	-	~50	145	**PEMI1QFN/HT**		
		45	36	-	~55	161	**PEMI1QFN/HR**		
		45	32	-	~60	175	**PEMI1QFN/HP**		
		45	28	-	~70	206	**PEMI1QFN/HM**		
		45	23	-	~80	249	**PEMI1QFN/HK**		
		45	19	-	~100	300	**PEMI1QFN/HG**		
		45	15	-	~125	376	**PEMI1QFN/HE**		
		65	40	-	~45	139	**PEMI1QFN/LT**		
		65	36	-	~50	155	**PEMI1QFN/LR**		
		65	32	-	~55	168	**PEMI1QFN/LP**		
		65	28	-	~65	197	**PEMI1QFN/LM**		
		65	23	-	~80	239	**PEMI1QFN/LK**		
		65	19	-	~95	288	**PEMI1QFN/LG**		
		65	15	-	~120	361	**PEMI1QFN/LE**		
		100	40	-	~45	131	**PEMI1QFN/RT**		
		100	36	-	~50	145	**PEMI1QFN/RR**		
		100	32	-	~55	159	**PEMI1QFN/RP**		
		100	28	-	~60	187	**PEMI1QFN/RM**		
		100	30	-	~65	200	**IP4256CZ3-M**		
		100	23	-	~75	227	**PEMI1QFN/RK**		
		100	19	-	~90	272	**PEMI1QFN/RG**		
		100	15	-	~115	343	**PEMI1QFN/RE**		
		200	40	-	~40	119	**PEMI1QFN/WT**		
		200	36	-	~45	132	**PEMI1QFN/WR**		
		200	32	-	~50	143	**PEMI1QFN/WP**		
		200	28	-	~55	169	**PEMI1QFN/WM**		
		200	23	-	~70	205	**PEMI1QFN/WK**		
		200	19	-	~80	247	**PEMI1QFN/WG**		
		200	15	-	~105	311	**PEMI1QFN/WE**		
	2	10	35	15	~115	350	**IP3348CX5**	WLCSP5	0.76 x 1.06 x 0.61
		18	65	40	~60	175	**IP3088CX5**		0.96 x 1.28 x 0.65
		100	45	35	~50	150	**IP3053CX5**		
		20	40	-	~50	153	**PEMI2STD/CT**	SOT665 	1.6 x 1.2 x 0.5
		20	36	-	~55	170	**PEMI2STD/CR**		
		20	32	-	~60	185	**PEMI2STD/CP**		
		20	28	-	~70	218	**PEMI2STD/CM**		

ESD protection acc. to IEC 61000-4-2 (level 4)

Multichannel EMI filters, ESD protection for LCD and camera – Part 2

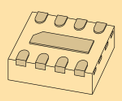
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	2	20	23	-	~90	264	**PEMI2STD/CK**	SOT665 	1.6 x 1.2 x 0.5
		20	19	-	~105	317	**PEMI2STD/CG**		
		20	15	-	~130	397	**PEMI2STD/CE**		
		45	40	-	~50	145	**PEMI2STD/HT**		
		45	36	-	~55	161	**PEMI2STD/HR**		
		45	32	-	~60	175	**PEMI2STD/HP**		
		45	28	-	~70	206	**PEMI2STD/HM**		
		45	23	-	~80	249	**PEMI2STD/HK**		
		45	19	-	~100	300	**PEMI2STD/HG**		
		45	15	-	~125	376	**PEMI2STD/HE**		
		65	40	-	~45	139	**PEMI2STD/LT**		
		65	36	-	~50	155	**PEMI2STD/LR**		
		65	32	-	~55	168	**PEMI2STD/LP**		
		65	28	-	~65	197	**PEMI2STD/LM**		
		65	23	-	~80	239	**PEMI2STD/LK**		
		65	19	-	~95	288	**PEMI2STD/LG**		
		65	15	-	~120	361	**PEMI2STD/LE**		
		100	40	-	~45	131	**PEMI2STD/RT**		
		100	36	-	~50	145	**PEMI2STD/RR**		
		100	32	-	~55	159	**PEMI2STD/RP**		
		100	30	-	~65	200	IP4256CZ5-W		
		100	28	-	~60	187	**PEMI2STD/RM**		
		100	23	-	~75	227	**PEMI2STD/RK**		
		100	19	-	~90	272	**PEMI2STD/RG**		
		100	15	-	~115	343	**PEMI2STD/RE**		
		200	40	-	~40	119	**PEMI2STD/WT**		
		200	36	-	~45	132	**PEMI2STD/WR**		
		200	32	-	~50	143	**PEMI2STD/WP**		
		200	28	-	~55	169	**PEMI2STD/WM**		
		200	23	-	~70	205	**PEMI2STD/WK**		
		200	19	-	~80	247	**PEMI2STD/WG**		
		200	15	-	~105	311	**PEMI2STD/WE**		
		20	40	-	~50	153	**PEMI2QFN/CT**	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		20	36	-	~55	170	**PEMI2QFN/CR**		
		20	32	-	~60	185	**PEMI2QFN/CP**		
		20	28	-	~70	218	**PEMI2QFN/CM**		
		20	23	-	~90	264	**PEMI2QFN/CK**		
		20	19	-	~105	317	**PEMI2QFN/CG**		
		20	15	-	~130	397	**PEMI2QFN/CE**		
		45	40	-	~50	145	**PEMI2QFN/HT**		
		45	36	-	~55	161	**PEMI2QFN/HR**		
		45	32	-	~60	175	**PEMI2QFN/HP**		
		45	28	-	~70	206	**PEMI2QFN/HM**		

ESD protection acc. to IEC 61000-4-2 (level 4)

Multichannel EMI filters, ESD protection for LCD and camera – Part 3

types in **bold** represent new products

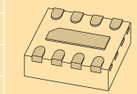
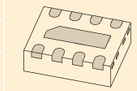
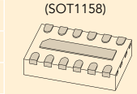
Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	2	45	23	-	~80	249	**PEMI2QFN/HK**	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
		45	19	-	~100	300	**PEMI2QFN/HG**		
		45	15	-	~125	376	**PEMI2QFN/HE**		
		65	40	-	~45	139	**PEMI2QFN/LT**		
		65	36	-	~50	155	**PEMI2QFN/LR**		
		65	32	-	~55	168	**PEMI2QFN/LP**		
		65	28	-	~65	197	**PEMI2QFN/LM**		
		65	23	-	~80	239	**PEMI2QFN/LK**		
		65	19	-	~95	288	**PEMI2QFN/LG**		
		65	15	-	~120	361	**PEMI2QFN/LE**		
		100	40	-	~45	131	**PEMI2QFN/RT**		
		100	36	-	~50	145	**PEMI2QFN/RR**		
		100	32	-	~55	159	**PEMI2QFN/RP**		
		100	30	-	~65	200	IP4256CZ6-F		
		100	28	-	~60	187	**PEMI2QFN/RM**		
		100	23	-	~75	227	**PEMI2QFN/RK**		
		100	19	-	~90	272	**PEMI2QFN/RG**		
		100	15	-	~115	343	**PEMI2QFN/RE**		
		200	40	-	~40	119	**PEMI2QFN/WT**		
		200	36	-	~45	132	**PEMI2QFN/WR**		
		200	32	-	~50	143	**PEMI2QFN/WP**		
		200	28	-	~55	169	**PEMI2QFN/WM**		
		200	23	-	~70	205	**PEMI2QFN/WK**		
		200	19	-	~80	247	**PEMI2QFN/WG**		
		200	15	-	~105	311	**PEMI2QFN/WE**		
	4	10	35	15	~115	350	**IP3348CX10**	WLCSP10	1.56 x 1.06 x 0.61
		18	65	40	~60	175	**IP3088CX10**		1.96 x 1.28 x 0.65
		100	54	-	~30	98	**PEMI4CSP/RW**		1.56 x 1.06 x 0.61
		100	45	35	~20	150	**IP3053CX10**		1.96 x 1.28 x 0.65
		100	41	-	~40	125	**PEMI4CSP/RT**		1.56 x 1.06 x 0.61
		20	40	-	~50	153	**PEMI4QFN/CT**	DFN1712-8 (SOT1157) 	1.7 x 1.2 x 0.5
		20	36	-	~55	170	**PEMI4QFN/CR**		
		20	32	-	~60	185	**PEMI4QFN/CP**		
		20	28	-	~70	218	**PEMI4QFN/CM**		
		20	23	-	~90	264	**PEMI4QFN/CK**		
		20	19	-	~105	317	**PEMI4QFN/CG**		
		20	15	-	~130	397	**PEMI4QFN/CE**		
		45	40	-	~50	145	**PEMI4QFN/HT**		
		45	36	-	~55	161	**PEMI4QFN/HR**		
		45	32	-	~60	175	**PEMI4QFN/HP**		
		45	28	-	~70	206	**PEMI4QFN/HM**		
		45	23	-	~80	249	**PEMI4QFN/HK**		
		45	19	-	~100	300	**PEMI4QFN/HG**		

ESD protection acc. to IEC 61000-4-2 (level 4)

Application-specific ESD and ESD/EMI solutions

Multichannel EMI filters, ESD protection for LCD and camera – Part 4

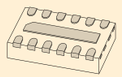
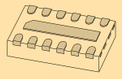
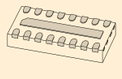
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	4	45	15	-	~125	376	**PEMI4QFN/HE**	DFN1712-8 (SOT1157) 	1.7 x 1.2 x 0.5
		65	40	-	~45	139	**PEMI4QFN/LT**		
		65	36	-	~50	155	**PEMI4QFN/LR**		
		65	32	-	~55	168	**PEMI4QFN/LP**		
		65	28	-	~65	197	**PEMI4QFN/LM**		
		65	23	-	~80	239	**PEMI4QFN/LK**		
		65	19	-	~95	288	**PEMI4QFN/LG**		
		65	15	-	~120	361	**PEMI4QFN/LE**		
		100	40	-	~45	131	**PEMI4QFN/RT**		
		100	36	-	~50	145	**PEMI4QFN/RR**		
		100	32	-	~55	159	**PEMI4QFN/RP**		
		100	28	-	~60	187	**PEMI4QFN/RM**		
		100	23	-	~75	227	**PEMI4QFN/RK**		
		100	19	-	~90	272	**PEMI4QFN/RG**		
		100	15	-	~115	343	**PEMI4QFN/RE**		
		200	40	-	~40	119	**PEMI4QFN/WT**		
		200	36	-	~45	132	**PEMI4QFN/WR**		
		200	32	-	~50	143	**PEMI4QFN/WP**		
		200	28	-	~55	169	**PEMI4QFN/WM**		
		200	23	-	~70	205	**PEMI4QFN/WK**		
		200	19	-	~80	247	**PEMI4QFN/WG**		
		200	15	-	~105	311	**PEMI4QFN/WE**		
		15	43	18	~60	175	**IP3253CZ8-4-TTL**	DFN1714-8 (SOT1166) 	1.7 x 1.35 x 0.5
		15	50	18	~50	145	**IP3254CZ8-4-TTL**		
		40	18	-	~100	300	**IP4252CZ8-4 -TTL**		
		100	45	-	~40	130	**IP4254CZ8-4-TTL**		
		100	15	-	~110	330	**IP4251CZ8-4-TTL**		
		200	45	-	~35	110	**IP4253CZ8-4-TTL**		
	6	10	35	15	~115	350	**IP3348CX15**	WLCSP15	2.36 x 1.06 x 0.61
		18	65	40	~60	175	**IP3088CX15**		2.96 x 1.28 x 0.65
		100	60	-	~40	120	IP4053CX15/LF		2.96 x 1.32 x 0.65
		100	60	-	~40	120	IP4353CX15/LF		2.38 x 1.05 x 0.61
		100	54	-	~30	98	**PEMI6CSP/RW**		2.36 x 1.06 x 0.61
		100	45	35	~20	150	**IP3053CX15**		2.96 x 1.28 x 0.65
		100	41	-	~40	125	**PEMI6CSP/RT**		2.36 x 1.06 x 0.61
		100	30	-	~70	210	IP4153CX15/LF		2.91 x 1.28 x 0.65
		20	40	-	~50	153	**PEMI6QFN/CT**	DFN2512-12 (SOT1158) 	2.5 x 1.2 x 0.5
		20	36	-	~55	170	**PEMI6QFN/CR**		
		20	32	-	~60	185	**PEMI6QFN/CP**		
		20	28	-	~70	218	**PEMI6QFN/CM**		
		20	23	-	~90	264	**PEMI6QFN/CK**		
		20	19	-	~105	317	**PEMI6QFN/CG**		
		20	15	-	~130	397	**PEMI6QFN/CE**		
		45	40	-	~50	145	**PEMI6QFN/HT**		

ESD protection acc. to IEC 61000-4-2 (level 4)

Multichannel EMI filters, ESD protection for LCD and camera – Part 5

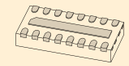
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	6	45	36	-	~55	161	**PEMI6QFN/HR**	DFN2512-12 (SOT1158) 	2.5 x 1.2 x 0.5
		45	32	-	~60	175	**PEMI6QFN/HP**		
		45	28	-	~70	206	**PEMI6QFN/HM**		
		45	23	-	~80	249	**PEMI6QFN/HK**		
		45	19	-	~100	300	**PEMI6QFN/HG**		
		45	15	-	~125	376	**PEMI6QFN/HE**		
		65	40	-	~45	139	**PEMI6QFN/LT**		
		65	36	-	~50	155	**PEMI6QFN/LR**		
		65	32	-	~55	168	**PEMI6QFN/LP**		
		65	28	-	~65	197	**PEMI6QFN/LM**		
		65	23	-	~80	239	**PEMI6QFN/LK**		
		65	19	-	~95	288	**PEMI6QFN/LG**		
		65	15	-	~120	361	**PEMI6QFN/LE**		
		100	40	-	~45	131	**PEMI6QFN/RT**		
		100	36	-	~50	145	**PEMI6QFN/RR**		
		100	32	-	~55	159	**PEMI6QFN/RP**		
		100	28	-	~60	187	**PEMI6QFN/RM**		
		100	23	-	~75	227	**PEMI6QFN/RK**		
		100	19	-	~90	272	**PEMI6QFN/RG**		
		100	15	-	~115	343	**PEMI6QFN/RE**		
		200	40	-	~40	119	**PEMI6QFN/WT**		
		200	36	-	~45	132	**PEMI6QFN/WR**		
		200	32	-	~50	143	**PEMI6QFN/WP**		
		200	28	-	~55	169	**PEMI6QFN/WM**		
		200	23	-	~70	205	**PEMI6QFN/WK**		
		200	19	-	~80	247	**PEMI6QFN/WG**		
		200	15	-	~105	311	**PEMI6QFN/WE**		
		15	50	18	~50	145	**IP3254CZ12-6-TTL**	DFN2514-12 (SOT1167) 	2.5 x 1.35 x 0.5
		15	43	18	~60	175	**IP3253CZ12-6-TTL**		
		40	18	-	~100	300	**IP4252CZ12-6-TTL**		
		100	45	-	~40	130	**IP4254CZ12-6-TTL**		
		100	15	-	~110	330	**IP4251CZ12-6-TTL**		
		200	45	-	~35	110	**IP4253CZ12-6-TTL**		
	7	70	25	-	~75	220	IP4337CX18/LF	WLCSP18	1.96 x 1.61 x 0.61
		125	25	60	~60	180	IP3337CX18/LF		2.06 x 1.66 x 0.61
	8	10	35	15	~115	350	**IP3348CX20**	WLCSP20	3.16 x 1.06 x 0.61
		18	65	40	~60	175	**IP3088CX20**		3.96 x 1.28 x 0.65
		100	54	-	~30	98	**PEMI8CSP/RW**		3.16 x 1.06 x 0.61
		100	50	-	~40	120	IP4088CX20/LF		3.91 x 1.28 x 0.65
		100	45	35	~20	150	**IP3053CX20**		3.96 x 1.28 x 0.65
		100	41	-	~40	125	**PEMI8CSP/RT**		3.16 x 1.06 x 0.61
		20	40	-	~50	153	**PEMI8QFN/CT**	DFN3312-16 (SOT1159) 	3.3 x 1.2 x 0.5
		20	36	-	~55	170	**PEMI8QFN/CR**		
		20	32	-	~60	185	**PEMI8QFN/CP**		
		20	28	-	~70	218	**PEMI8QFN/CM**		
		20	23	-	~90	264	**PEMI8QFN/CK**		
		20	19	-	~105	317	**PEMI8QFN/CG**		
		20	15	-	~130	397	**PEMI8QFN/CE**		

ESD protection acc. to IEC 61000-4-2 (level 4)

Multichannel EMI filters, ESD protection for LCD and camera – Part 6

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21~ -3 dB (MHz)	Type	Package	Size (mm)
		R_{line} (Ω)	C_{line} (pF)	L_{line} (nH)					
LCD display, camera, keypad	8	45	40	-	~50	145	**PEMI8QFN/HT**	DFN3312-16 (SOT1159) 	3.3 x 1.2 x 0.5
		45	36	-	~55	161	**PEMI8QFN/HR**		
		45	32	-	~60	175	**PEMI8QFN/HP**		
		45	28	-	~70	206	**PEMI8QFN/HM**		
		45	23	-	~80	249	**PEMI8QFN/HK**		
		45	19	-	~100	300	**PEMI8QFN/HG**		
		45	15	-	~125	376	**PEMI8QFN/HE**		
		65	40	-	~45	139	**PEMI8QFN/LT**		
		65	36	-	~50	155	**PEMI8QFN/LR**		
		65	32	-	~55	168	**PEMI8QFN/LP**		
		65	28	-	~65	197	**PEMI8QFN/LM**		
		65	23	-	~80	239	**PEMI8QFN/LK**		
		65	19	-	~95	288	**PEMI8QFN/LG**		
		65	15	-	~120	361	**PEMI8QFN/LE**		
		100	40	-	~45	131	**PEMI8QFN/RT**		
		100	36	-	~50	145	**PEMI8QFN/RR**		
		100	32	-	~55	159	**PEMI8QFN/RP**		
		100	28	-	~60	187	**PEMI8QFN/RM**		
		100	23	-	~75	227	**PEMI8QFN/RK**		
		100	19	-	~90	272	**PEMI8QFN/RG**		
		100	15	-	~115	343	**PEMI8QFN/RE**		
		200	40	-	~40	119	**PEMI8QFN/WT**		
		200	36	-	~45	132	**PEMI8QFN/WR**		
		200	32	-	~50	143	**PEMI8QFN/WP**		
		200	28	-	~55	169	**PEMI8QFN/WM**		
		200	23	-	~70	205	**PEMI8QFN/WK**		
		200	19	-	~80	247	**PEMI8QFN/WG**		
		200	15	-	~105	311	**PEMI8QFN/WE**		
		15	43	18	~60	175	**IP3253CZ16-8-TTL**	DFN3314-16 (SOT1168) 	3.3 x 1.35 x 0.5
		15	50	18	~50	145	**IP3254CZ16-8-TTL**		
		40	18	-	~100	300	**IP4252CZ16-8-TTL**		
		100	45	-	~40	130	**IP4254CZ16-8-TTL**		
		100	15	-	~110	330	**IP4251CZ16-8-TTL**		
		200	45	-	~35	110	**IP4253CZ16-8-TTL**		
	10	70	25	-	~75	220	IP4338CX24/LF	WLCSP24	1.96 x 2.01 x 0.61
		125	25	60	~60	180	IP3338CX24/LF		2.11 x 2.11 x 0.61
		1000	50	-	~7	22	IP4035CX24/LF		2.41 x 2.41 x 0.65
		80	40	-	~30	100	IP4032CX25/LF	WLCSP25	2.41 x 2.41 x 0.65
		200	50	-	~35	105	IP4041CX25/LF		

ESD protection acc. to IEC 61000-4-2 (level 4)

PEMI-series nomenclature

PEMI--x--yyy/zz — ESD protection and multichannel EMI filters (1-, 2-, 4-, 6-, and 8-channels)

x: no. of channels

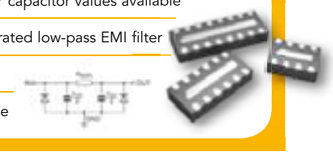
zz: R-, C- or L- value

yyy:
QFN: Plastic Quad Flat No-leads package
CSP: Wafer-level Chip-Scale-Package
STD: Standard Leaded Package

In the Spotlight

Ultra-small, highly flexible RC filters with superior ESD protection: PEMI-family

- Any combination of 5 resistor and 7 capacitor values available
- Superior ESD protection with integrated low-pass EMI filter
- 1.2 mm wide QFN packages
- Models for simulation tools available



SD-, SIM-card and MMC

types in **bold** represent new products

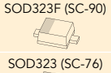
Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R_{line}	C_{line} (pF)					
SIM card	3 + 2	47 Ω / 100 Ω	10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	**IP4365CX11**	WLCSP11	1.16 x 1.56 x 0.61
	3	47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	WLCSP8	1.46 x 1.49 x 0.65
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4064CX8/LF/P		1.41 x 1.41 x 0.65
		47 Ω / 100 Ω	20	~20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF/P		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	10	~20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	IP4366CX8/P		
		47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-40-TTL	DFN1714-8 (SOT1166) 	1.7 x 1.35 x 0.5
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-20-TTL		
		47 Ω / 100 Ω	10	~20	Integrated SIM-card EMI filter and ESD protection	**IP4264CZ8-10-TTL**		
		-	1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
SD-card / MMC	4	47 Ω / 13 kΩ / 56 kΩ	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	WLCSP11	1.44 x 1.96 x 0.65
		50 Ω / 75 kΩ / 7 kΩ	18	~50	High-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	WLCSP16	1.96 x 1.97 x 0.65
	6	40 Ω	12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	**IP4252CZ12-6-TTL**	DFN2514-12 (SOT1167) 	2.5 x 1.35 x 0.5
	6 + 2	40 Ω	12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	**IP4252CZ16-8-TTL**	DFN3314-16 (SOT1168) 	3.3 x 1.35 x 0.5
	7	40 Ω / 50 kΩ / 25 kΩ	18	~20	(Mini) SD/trans flash card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	WLCSP20	2.54 x 1.96 x 0.65
		-	5	~24	Memory stick PRO ESD protection	IP4067CX9/LF	WLCSP9	1.46 x 1.52 x 0.65
	6 (+3)	40 Ω / 50 kΩ / 15 kΩ	20	>52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF	WLCSP24	2.02 x 2.01 x 0.61
		-	-	>52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	WLCSP25	2.01 x 2.01 x 0.61

ESD protection acc. to IEC 61000-4-2 (level 4)

Please find more ESD protection diodes for very high-speed interfaces on pages 34 - 37

Battery and charger protection

types in **bold** represent new products

Baseband interface	Number of protected lines	C_{line} (pF)	Diode voltage	Remark	Type	Package	Size (mm)
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4	WLCSP4 	0.91 x 0.91 x 0.65
		450	Breakdown 7 V	Power diode	IP4385CX4		0.76 x 0.76 x 0.61
		160	Breakdown 16 V	Power diode	**IP4386CX4**		
		290	Breakdown 10 V	Power diode	**IP4387CX4**		
		160	V_{RWM} = 12 V	Power diode with 2 A integrated fuse	**IP4389CX4**		
		160	V_{RWM} = 12 V	Power diode	PESD12VS1UJ	SOD323F (SC-90) 	1.7 x 1.25 x 0.7
		160	V_{RWM} = 12 V	Power diode	PESD12VS1UA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		480	V_{RWM} = 5 V	Power diode	PESD5V0S1UJ	SOD323F (SC-90) 	1.7 x 1.25 x 0.7
		480	V_{RWM} = 5 V	Power diode	PESD5V0S1UA	SOD323 (SC-76) 	1.7 x 1.25 x 0.95

ESD protection acc. to IEC 61000-4-2 (level 4)

USB, SATA, LAN – Part 1

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB (CSP package)	2	33 Ω / 1.3 kΩ	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4056CX8/LF	WLCSP8	1.27 x 1.83 x 0.65
		33 Ω / 1.3 kΩ / 10 kΩ	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4057CX10/LF	WLCSP10	1.56 x 1.91 x 0.65
		33 Ω / 1.3 kΩ / 17 kΩ / 15 kΩ	27	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4065CX11/LF	WLCSP11	1.47 x 1.97 x 0.65
		33 Ω / 1.5 kΩ	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4058CX8/LF	WLCSP8	0.91 x 1.91 x 0.65
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	**IP4359CX4/LF**	WLCSP4	0.76 x 0.76 x 0.61
	3+2	47 Ω / 100 Ω	10	~20/6	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11/P	WLCSP11	1.16 x 1.56 x 0.61
	4	-	3	>240	USB2.0 high-speed ESD protection	IP4059CX5/LF	WLCSP5	0.96 x 1.34 x 0.65
			1.3	~1 GHz	USB2.0 high-speed ESD protection	**IP4358CX6**	WLCSP6	0.76 x 1.16 x 0.41
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	**IP4319CX10**	WLCSP10	1.56 x 1.05 x 0.61
USB2.0 (Plastic package)	2	0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		-	1.0	-	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2X	SOT143B 	2.9 x 1.3 x 1.0
		-	1.8	-	ESD protection for up to 2 ultra high-speed datalines with 12 kV ESD robustness	PRTR5V0U2AX		
		-	0.7	-	ESD protection for ultra high-speed interfaces	IP4282CZ6	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5

ESD protection acc. to IEC 61000-4-2 (level 4)

USB, SATA, LAN – Part 2

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
USB2.0 (Plastic package)	2	-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2K	DFN1010-6 (SOT891) 	1.0 x 1.0 x 0.5
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2D	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2F	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5
	3 + 1	-	1	USB protection for USB OTG with 5.5 V Vbat protection	**PUSBM5V5X4-TL**	DFN1616-6 (SOT1189) 	1.6 x 1.6 x 0.5
		-	1	USB protection for USB OTG with 12 V Vbat protection	**PUSBM12VX4-TL**		
		-	1	USB protection for USB OTG with 15 V Vbat protection	**PUSBM15VX4-TL**		
		-	1	USB protection for USB OTG with 30 V Vbat protection	**PUSBM30VX4-TL**		
	4	-	0.8	Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection	**IP4285CZ6-TY**	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		-	1	Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection	**IP4285CZ6-TD**	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		-	1	Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4220CZ6		
		-	1	Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4D		
		-	1	Dual ESP protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4Y	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		-	1	ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-S	DFN1410-6 (SOT886) 	1.45 x 1.0 x 0.5

ESD protection acc. to IEC 61000-4-2 (level 4)

USB, SATA, LAN – Part 3

In the Spotlight

USB3.0 ESD protection: IP4294CZ10-TBR

- Extremely low capacitance of 0.5 pF with minimized voltage dependency
- Highest protection for the most sensitive system chips
- RF-optimized DFN2510A-10 (SOT1176) package
- Pass-through routing
- Extremely low crosstalk

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
USB3.0 SuperSpeed USB	4	-	0.5	ESD protection for ultra high-speed interfaces	**IP4294CZ10-TBR**	DFN2510A-10 (SOT1176) 	1.0 x 2.5 x 0.5
		-	0.55	ESD protection for ultra high-speed interfaces	**IP4292CZ10-TBR**		

ESD protection acc. to IEC 61000-4-2 (level 4)

USB, SATA, LAN – Part 4

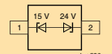
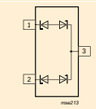
types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
Display port	11	-	0.7	ESD protection	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
SATA	2	-	0.7	ESD protection for ultra high-speed interfaces	**IP4282CZ6**	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.5
	4	-	0.6	ESD protection for ultra high-speed interfaces	**IP4283CZ10-TBR**	DFN2510A-10 (SOT1176)	1.0 x 2.5 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		-	0.5	ESD protection for ultra high-speed interfaces	**IP4284CZ10-TBR**	DFN2510A-10 (SOT1176)	1.0 x 2.5 x 0.5
		-	0.8	ESD protection for ultra high-speed interfaces	**IP4285CZ9-TBB**	DFN2110-9 (SOT1178)	1.0 x 2.5 x 0.1
		-	0.55	ESD protection for ultra high-speed interfaces	**IP4292CZ10-TBR**	DFN2510A-10 (SOT1176)	1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	**IP4294CZ10-TBR**		
LAN	1	-	0.6	Ethernet ESD protection V_{RWM} = 3.3 V	PESD3V3U1UT	SOT23	2.9 x 1.3 x 1.0
		-	0.6	Ethernet ESD protection V_{RWM} = 5.0 V	PESD5V0U1UT		
		-	0.6	Ethernet ESD protection V_{RWM} = 12 V	PESD12VU1UT		
		-	0.6	Ethernet ESD protection V_{RWM} = 15 V	PESD15VU1UT		
		-	0.6	Ethernet ESD protection V_{RWM} = 24 V	PESD24VU1UT		
	4	-	1	Ethernet ESD protection	IP4220CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		-	1	Ethernet line surge ESD protection	**IP4233CZ6**	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		-	3	Ethernet line surge ESD protection 25 A	**IP4238CZ10**	DFN2626-10 (SOT1197)	2.6 x 2.6 x 0.5

ESD protection acc. to IEC 61000-4-2 (level 4)

Please find more ESD protection diodes for very high-speed interfaces on pages 34 - 37

Automotive LIN/CAN/FlexRay

Number of protected lines bidirectional	V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	P_{PP} [1] max (W)	ESD rating [2] max (kV)	I_R max [µA] @ V_{RWM}	Configuration	Type	Package	Size (mm)
1	15 (diode 1) 24 (diode 2)	13	17	160	23	0.05		PESD1LIN	SOD323 (SC-76)	1.7 x 1.25 x 0.95
2	24	11	17	200	23	0.05		PESD1CAN	SOT23	2.9 x 1.3 x 1.0
		25	30	230	30	0.01		PESD2CAN		
		11	17	200	23	0.05		PESD1FLEX		

[1] 8/20 µs surge pulse acc. to IEC 61000-4-5 [2] acc. to IEC 61000-4-2 (contact discharge)

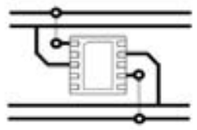
Automotive high-speed networks

Number of protected lines bidirectional	V_{RWM} (V)	C_{line} typ (pF)	I_{RM} max @3V (µA)	V_{ESD} (kv)	ESD rating [2] max (kV)	Configuration	Type	Package	Size (mm)
4	5.5	0.6	1	160	8		PESD1LVDS	DFN2510-10 (SOT1165)	2.5 x 1.0 x 0.5

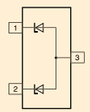
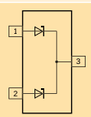
In the Spotlight

Ethernet surge protection: IP4238CZ10

- 8/20 surge protection > 25 A
- Very low capacitance of C_d = 3 pF
- Extremely low clamping
- Industry standard DFN2626-10 (SOT1197) package



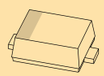
TVS diodes, 24 W / 40 W

Power (W) (10/1000 µs waveform) [1]	V_{RWM} (V)	V_{BR} min (V) @ I_R	V_{BR} typ (V) @ I_R	V_{BR} max (V) @ I_R	I_R (mA)	ESD rating [2] max (kV)	C_{line} typ (pF)	V_{CL} max (V) @ I_{PP}	I_{PP} (A)	I_{RM} max (µA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
24	3	5.32	5.6	5.88	20	30	210	8	3	5		MMBZ5V6AL	SOT23 	2.9 x 1.3 x 1.0
	3	5.89	6.2	6.51	1	30	175	8.7	2.76	0.2		MMBZ6V2AL		
	4.5	6.48	6.8	7.14	1	30	150	9.6	2.5	0.3		MMBZ6V8AL		
	6	8.65	9.1	9.56	1	30	155	14	1.7	0.1		MMBZ9V1AL		
	6.5	9.5	10	10.5	1	30	130	14.2	1.7	0.02		MMBZ10VAL		
40	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VAL		
	12	14.25	15	15.75	1	30	85	21	1.9	0.005		MMBZ15VAL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VAL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VAL		
	22	25.65	27	28.35	1	30	48	40	1	0.005		MMBZ27VAL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VAL		
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VDL		
	12.8	14.3	15	15.8	1	30	85	21.2	1.9	0.005		MMBZ15VDL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VCL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VCL		
	22	25.65	27	28.35	1	30	48	38	1	0.005		MMBZ27VCL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VCL		

[1] acc. to IEC 61643-321 [2] acc. to IEC 61000-4-2 (contact discharge)

TVS diodes, 400 W

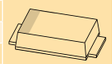
types in **bold** represent new products

Power (W) (10/1000 µs waveform) [1]	V_{RWM} (V)	V_{BR} min (V) @ I_R	V_{BR} typ (V) @ I_R	V_{BR} max (V) @ I_R	I_R (mA)	V_{CL} max (V) @ I_{PP}	I_{PP} (A)	I_{RM} typ (µA) @ V_{RWM}	I_{RM} max (µA) @ V_{RWM}	Type (T_j max = 150 °C)	Type (T_j max = 185 °C)	Package	Size (mm)
350	3.5	5.20	5.60	6.00	10	8.0	43.8	5	600	PTVS3V3S1UR	**PTVS3V3S1UTR**	SOD123W 	2.6 x 1.7 x 1.0
400	5.0	6.40	6.70	7.00	10	9.2	43.5	5	400	PTVS5V0S1UR	**PTVS5V0S1UTR**		
	6.0	6.67	7.02	7.37	10	10.3	38.8	5	400	PTVS6V0S1UR	**PTVS6V0S1UTR**		
	6.5	7.22	7.60	7.98	10	11.2	35.7	5	250	PTVS6V5S1UR	**PTVS6V5S1UTR**		
	7.0	7.78	8.20	8.60	10	12.0	33.3	3	100	PTVS7V0S1UR	**PTVS7V0S1UTR**		
	7.5	8.33	8.77	9.21	1	12.9	31.0	0.2	50	PTVS7V5S1UR	**PTVS7V5S1UTR**		
	8.0	8.89	9.36	9.83	1	13.6	29.4	0.03	25	PTVS8V0S1UR	**PTVS8V0S1UTR**		
	8.5	9.44	9.92	10.40	1	14.4	27.8	0.01	10	PTVS8V5S1UR	**PTVS8V5S1UTR**		
	9.0	10.00	10.55	11.10	1	15.4	26.0	0.005	5	PTVS9V0S1UR	**PTVS9V0S1UTR**		
	10	11.10	11.70	12.30	1	17.0	23.5	0.005	2.5	PTVS10VS1UR	**PTVS10VS1UTR**		
	11	12.20	12.85	13.50	1	18.2	22.0	0.005	2.5	PTVS11VS1UR	**PTVS11VS1UTR**		
	12	13.30	14.00	14.70	1	19.9	20.1	0.005	2.5	PTVS12VS1UR	**PTVS12VS1UTR**		
	13	14.40	15.15	15.90	1	21.5	18.6	0.001	0.1	PTVS13VS1UR	**PTVS13VS1UTR**		
	14	15.60	16.40	17.20	1	23.2	17.2	0.001	0.1	PTVS14VS1UR	**PTVS14VS1UTR**		
	15	16.70	17.60	18.50	1	24.4	16.4	0.001	0.1	PTVS15VS1UR	**PTVS15VS1UTR**		
	16	17.80	18.75	19.70	1	26.0	15.4	0.001	0.1	PTVS16VS1UR	**PTVS16VS1UTR**		
	17	18.90	19.90	20.90	1	27.6	14.5	0.001	0.1	PTVS17VS1UR	**PTVS17VS1UTR**		
	18	20.00	21.00	22.10	1	29.2	13.7	0.001	0.1	PTVS18VS1UR	**PTVS18VS1UTR**		
	20	22.20	23.35	24.50	1	32.4	12.3	0.001	0.1	PTVS20VS1UR	**PTVS20VS1UTR**		
	22	24.40	25.60	26.90	1	35.5	11.3	0.001	0.1	PTVS22VS1UR	**PTVS22VS1UTR**		
	24	26.70	28.10	29.50	1	38.9	10.3	0.001	0.1	PTVS24VS1UR	**PTVS24VS1UTR**		
	26	28.90	30.40	31.90	1	42.1	9.5	0.001	0.1	PTVS26VS1UR	**PTVS26VS1UTR**		
	28	31.10	32.80	34.40	1	45.4	8.8	0.001	0.1	PTVS28VS1UR	**PTVS28VS1UTR**		
	30	33.30	35.10	36.80	1	48.4	8.3	0.001	0.1	PTVS30VS1UR	**PTVS30VS1UTR**		
	33	36.70	38.70	40.60	1	53.3	7.5	0.001	0.1	PTVS33VS1UR	**PTVS33VS1UTR**		
	36	40.00	42.10	44.20	1	58.1	6.9	0.001	0.1	PTVS36VS1UR	**PTVS36VS1UTR**		
	40	44.40	46.80	49.10	1	64.5	6.2	0.001	0.1	PTVS40VS1UR	**PTVS40VS1UTR**		
	43	47.80	50.30	52.80	1	69.4	5.8	0.001	0.1	PTVS43VS1UR	**PTVS43VS1UTR**		
	45	50.00	52.65	55.30	1	72.7	5.5	0.001	0.1	PTVS45VS1UR	**PTVS45VS1UTR**		
	48	53.30	56.10	58.90	1	77.4	5.2	0.001	0.1	PTVS48VS1UR	**PTVS48VS1UTR**		
	51	56.70	59.70	62.70	1	82.4	4.9	0.001	0.1	PTVS51VS1UR	**PTVS51VS1UTR**		
	54	60.00	63.15	66.30	1	87.1	4.6	0.001	0.1	PTVS54VS1UR	**PTVS54VS1UTR**		
	58	64.40	67.80	71.20	1	93.6	4.3	0.001	0.1	PTVS58VS1UR	**PTVS58VS1UTR**		
	60	66.70	70.20	73.70	1	96.8	4.1	0.001	0.1	PTVS60VS1UR	**PTVS60VS1UTR**		
	64	71.10	74.85	78.60	1	103.0	3.9	0.001	0.1	PTVS64VS1UR	**PTVS64VS1UTR**		

[1] 10/1000 µs acc. to IEC 61643-321

TVS diodes, 600 W

types in **bold** represent new products

Power (W) (10/1000 µs waveform) [1]	V_{RWM} (V)	V_{BR} min (V) @ I_R	V_{BR} typ (V) @ I_R	V_{BR} max (V) @ I_R	I_R (mA)	V_{CL} max (V) @ I_{PP}	I_{PP} (A)	I_{RM} typ (µA) @ V_{RWM}	I_{RM} max (µA) @ V_{RWM}	Type (T_j max = 150 °C)	Type (T_j max = 185 °C)	Package	Size (mm)
600	3.5	5.20	5.60	6.00	10	8	75	5	600	PTVS3V3P1UP	**PTVS3V3P1UTP**	SOD128 	3.8 x 2.6 x 1.0
	5	6.40	6.70	7.00	10	9.2	65.2	5	400	PTVS5V0P1UP	**PTVS5V0P1UTP**		
	6	6.67	7.02	7.37	10	10.3	58.3	5	400	PTVS6V0P1UP	**PTVS6V0P1UTP**		
	6.5	7.22	7.60	7.98	10	11.2	53.6	5	250	PTVS6V5P1UP	**PTVS6V5P1UTP**		
	7	7.78	8.20	8.60	10	12	50	3	100	PTVS7V0P1UP	**PTVS7V0P1UTP**		
	7.5	8.33	8.77	9.21	1	12.9	46.5	0.2	50	PTVS7V5P1UP	**PTVS7V5P1UTP**		
	8	8.89	9.36	9.83	1	13.6	44.1	0.03	25	PTVS8V0P1UP	**PTVS8V0P1UTP**		
	8.5	9.44	9.92	10.40	1	14.4	41.7	0.01	10	PTVS8V5P1UP	**PTVS8V5P1UTP**		
	9	10.00	10.55	11.10	1	15.4	39	0.005	5	PTVS9V0P1UP	**PTVS9V0P1UTP**		
	10	11.10	11.70	12.30	1	17	35.3	0.005	2.5	PTVS10VP1UP	**PTVS10VP1UTP**		
	11	12.20	12.85	13.50	1	18.2	33	0.005	2.5	PTVS11VP1UP	**PTVS11VP1UTP**		
	12	13.30	14.00	14.70	1	19.9	30.2	0.005	2.5	PTVS12VP1UP	**PTVS12VP1UTP**		
	13	14.40	15.15	15.90	1	21.5	27.9	0.001	0.1	PTVS13VP1UP	**PTVS13VP1UTP**		
	14	15.60	16.40	17.20	1	23.2	25.9	0.001	0.1	PTVS14VP1UP	**PTVS14VP1UTP**		
	15	16.70	17.60	18.50	1	24.4	24.6	0.001	0.1	PTVS15VP1UP	**PTVS15VP1UTP**		
	16	17.80	18.75	19.70	1	26	23.1	0.001	0.1	PTVS16VP1UP	**PTVS16VP1UTP**		
	17	18.90	19.90	20.90	1	27.6	21.7	0.001	0.1	PTVS17VP1UP	**PTVS17VP1UTP**		
	18	20.00	21.00	22.10	1	29.2	20.5	0.001	0.1	PTVS18VP1UP	**PTVS18VP1UTP**		
	20	22.20	23.35	24.50	1	32.4	18.5	0.001	0.1	PTVS20VP1UP	**PTVS20VP1UTP**		
	22	24.40	25.60	26.90	1	35.5	16.9	0.001	0.1	PTVS22VP1UP	**PTVS22VP1UTP**		
	24	26.70	28.10	29.50	1	38.9	15.4	0.001	0.1	PTVS24VP1UP	**PTVS24VP1UTP**		
	26	28.90	30.40	31.90	1	42.1	14.2	0.001	0.1	PTVS26VP1UP	**PTVS26VP1UTP**		
	28	31.10	32.80	34.40	1	45.4	13.2	0.001	0.1	PTVS28VP1UP	**PTVS28VP1UTP**		
	30	33.30	35.10	36.80	1	48.4	12.4	0.001	0.1	PTVS30VP1UP	**PTVS30VP1UTP**		
	33	36.70	38.70	40.60	1	53.3	11.3	0.001	0.1	PTVS33VP1UP	**PTVS33VP1UTP**		
	36	40.00	42.10	44.20	1	58.1	10.3	0.001	0.1	PTVS36VP1UP	**PTVS36VP1UTP**		
	40	44.40	46.80	49.10	1	64.5	9.3	0.001	0.1	PTVS40VP1UP	**PTVS40VP1UTP**		
	43	47.80	50.30	52.80	1	69.4	8.6	0.001	0.1	PTVS43VP1UP	**PTVS43VP1UTP**		
	45	50.00	52.65	55.30	1	72.7	8.3	0.001	0.1	PTVS45VP1UP	**PTVS45VP1UTP**		
	48	53.30	56.10	58.90	1	77.4	7.8	0.001	0.1	PTVS48VP1UP	**PTVS48VP1UTP**		
	51	56.70	59.70	62.70	1	82.4	7.3	0.001	0.1	PTVS51VP1UP	**PTVS51VP1UTP**		
	54	60.00	63.15	66.30	1	87.1	6.9	0.001	0.1	PTVS54VP1UP	**PTVS54VP1UTP**		
	58	64.40	67.80	71.20	1	93.6	6.4	0.001	0.1	PTVS58VP1UP	**PTVS58VP1UTP**		
	60	66.70	70.20	73.70	1	96.8	6.2	0.001	0.1	PTVS60VP1UP	**PTVS60VP1UTP**		
	64	71.10	74.85	78.60	1	103	5.8	0.001	0.1	PTVS64VP1UP	**PTVS64VP1UTP**		

[1] 10/1000 µs acc. to IEC 61643-321

In the Spotlight

High temperature TVS series in FlatPower package

- Available in 400 W (PTVSxS1UTR) and 600 W (PTVSxP1UTP) power classes with 35 devices each
- Very high maximal junction temperature of 185 °C
- Reverse standoff voltages from 3.3 V to 64 V
- Low height, high performance - save board space by replacing SMA & SMB packages with low profile SOD123W and SOD128 packages
- AEC-Q101 qualified

Protection and signal conditioning nomenclature

NXP **PESD** **5V0** **S** **1** **U** **C*** **L**

- **ESD** (ESD protection)
- **RTR** (rail-to-rail ESD protection)
- **TVS** (10/1000 µs pulse)

5V0 — Reverse stand-off voltage*

C* — *Optional
- Ultra low **C**lamp
- **A**lternative
- High **T**emperature

U — **U**ni-directional* / **B**i-directional*
*not for rail-to-rail devices

1 — Number of protected lines

S — **For TVS – Power class**
- **S** 400 Watt series
- **P** 600 Watt series

For ESD – Capacitance class

>50 pF	**S**tandard capacitance
<=50 pF	**L**ow capacitance
<=20 pF	**V**ery low capacitance
<=5 pF	**U**ltra low capacitance
<=1 pF	**X**-extremely low capacitance
<=0.6 pF	**F**emtofarad capacitance

Packages

A	SOD323	
B	SOD523	
D	SOT457	
F	SOT886	DFN1410-6
G	SOT353	
K	SOT891	DFN1010-6
L	SOD882	DFN1006-2
LD	SOD882D	DFN1006D-2
M	SOT883	DFN1006-3
MB	SOT883B	DFN1006B-3
P	SOD128	FlatPower
Q	SOT663	
R	SOD123W	FlatPower
SF	SOD962	DSN0603-2
T	SOT23	
U	SOT323	
V	SOT666	
W	SOT665	
X	SOT143B	
Y	SOT363	

IP - - - - - - - - xx - - - - yy - - - - CX - - - - zz

- **IP**: Integrated Discretes
- **yy**: identifier
- **zz**: no. of balls/pins
- **CX**: chip scale package (CSP)
- **CZ**: plastic package

xx:

30:	passive ESD protection/EMI filter with integrated coils in 0.5 mm pitch CSP
32:	passive ESD protection/EMI filter with integrated coils in plastic package
33:	passive ESD protection/EMI filter with integrated coils in 0.4 mm pitch CSP
40, 41:	passive ESD protection/EMI filter in 0.5 mm pitch CSP
42:	passive ESD protection/EMI filter in plastic package
43:	passive ESD protection/EMI filter in 0.4 mm pitch CSP
47:	active device in plastic package with ESD protection/EMI filter
48:	active ESD protection/EMI filter in 0.4 mm pitch CSP

Bipolar transistors

Single transistors NPN

Package					SOT23	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
									
Size (mm)					2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)					250	200	150	250	250
V_{CEO} (V)	I_C (mA)	h_{FE} min	h_{FE} max	f_T min (MHz)					
25	100	450	1200	100		PMST5089			
30	100	110 - 200	450 - 800	100	BC848B	BC848W			
		350	900	100		PMST5088			
32	100	110 - 420	220 - 800	100	BCW31 / 32 / 33				
		180 - 380	310 - 630	250	BCW60B / C / D				
40	100	120 - 270	270 - 560	100				2PC4617QM / RM	2PC4617QMB / RMB
45	100	110 - 420	220 - 800	100	BC847 / A / B / C	BC847W / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM	BC847AMB / BMB / CMB
		120 - 380	220 - 630	100	BCX70G / H / J / K				
		110 - 200	220 - 450	100	BCW71 / 72				
		500	1250	100	PMBT6429	PMST6429			
50	100	210 - 290	340 - 460	100 - 150	2PD601ART 2PD601ARL 2PD601ASL	2PD601ARW / SW			
		250	650	100	PMBT6428	PMST6428			
60	100	110 - 200	220 - 450	100	BCV71 / 72				
65	100	110 - 200	220 - 450	100	BC846 / A / B	BC846W / AW / BW	BC846T / AT / BT		BC846BMB
80	100	20	80	60	BSS64				
50	150	120 - 270	270 - 560	100		2PC4081Q / R / S	2PC4617Q / R		
	200	210	340	100	2PD601BRL				
		290	460	100	2PD601BSL				
45	500	100 - 250	250 - 600	100	BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W			
		100	600	100	BCX19				
50	500	85 - 170	170 - 340	140 - 180	2PD602AQL 2PD602ARL 2PD602ASL	2PD1820AR / S			
60	500	50	-	100		PMSTA05			
80	500	100	-	50	PMBTA06	PMSTA06			

Single transistors PNP

Package					SOT23	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
									
Size (mm)					2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)					250	200	150	250	250
V_{CEO} (V)	I_C (mA)	h_{FE} min	h_{FE} max	f_T min (MHz)					
30	100	125 - 220	500 - 800	100	BC858B	BC858W			
32	100	120 - 215	260 - 500	100	BCW29 / 30				
		180 - 380	310 - 630	100	BCW61B / C / D				
40	100	120 - 270	270 - 560	100				2PA1774QM / RM / SM	2PA1774QMB / RMB / SMB
45	100	210 - 290	340 - 460	70 - 80	2PB709ART 2PB709ARL 2PB709ASL	2PB709ARW / SW			
		180 - 380	310 - 630	100	BCX71H / J / K				
		120 - 215	260 - 500	100	BCW69 / 70				
		125 - 420	250 - 800	100	BC857 / A / B / C	BC857W / AW / BW / CW	BC857T / AT / BT / CT	BC857AM / BM / CM	BC857AMB / BMB / CMB
60	100	120	260	150	BCW89				
65	100	125 - 200	250 - 475	100	BC856 / A / B	BC856W / AW / BW	BC856T / AT / BT		
100	100	30	-	50	BSS63				
50	150	120 - 270	270 - 560	100		2PA1576Q / R / S	2PA1774Q / R / S		
	200	210	340	100	2PD601BRL				
		290	460	100	2PD601BSL				
25	500	100	600	80	BCX18				
45	500	100 - 250	250 - 600	80	BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W			
		100	600	80	BCX17				
50	500	85 - 170	170 - 340	100 - 140	2PB710ARL 2PB710ASL	2PB1219AQ / R / S			
60	500	100	-	50		PMSTA55			
80	500	100	-	50	PMBTA56	PMSTA56			

Double transistors

Package						SOT457 (SC-74)	SOT363 (SC-88)	SOT666
								
Size (mm)						2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P_{tot} (mW)						600	300	300
Polarity	V_{CEO} (V)	I_C (mA)	h_{FE} min	h_{FE} max	f_T min (MHz)			
NPN	40	100	120	450	100		PUMX1	PEMX1
	45	100	200	450	100	BC847DS	BC847BS	BC847BV
	65	100	110	-	100		BC846S	
			200	450	100	BC846DS	BC846BS	
	50	150	120	560	100		PUMX2	
	45	500	160	400	80	BC817DS		
PNP	40	100	120	450	100	PIMT1	PUMT1	PEMT1
	45	100	200	450	100		BC857BS	BC857BV
	65	100	110	-	100		BC856S	
			200	450	100		BC856BS	
	45	500	160	400	80	BC807DS		
NPN/PNP	40	100	120	450	100		PUMZ1	PEMZ1
	45	100	200	450	100		BC847BPN	BC847BVN
	50	100	120	560	100	PIMZ2	PUMZ2	
	65	100	200	450	100		BC846BPN	
	12	500	200	-	250/100			PEMZ7
	45	500	160	400	100/80	BC817DPN		

Single and double switching transistors

Package							SOT223 (SC-73)	SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT666	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
														
Size (mm)							6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)							1700	1300	250	200	300	300	250	250
Configuration							single	single	single	single	double	double	single	single
Polarity	V_{CEO} (V)	I_C (mA)	h_{FE} min	h_{FE} max	f_T min (MHz)	t_{off} (ns)								
NPN	12	100	40	120	400	20			BSV52					
	40	100	100	300	180	1200			PMBS3904	PMSS3904				
					300	250		PXT2222A						
	15	200	40	120	500	20			PMBT2369	PMST2369				
	40	200	100	300	300	250			MMBT3904					
									PMBT3904	PMST3904	PMBT3904YS	PMBT3904VS	PMBT3904M	PMBT3904MB
	30	600	100	300	250	250			PMBT2222	PMST2222				
	40	600	100	300	250	250	PZT4401	PXT4401	PMBT4401	PMST4401				
					300	250			MMBT2222A					
							PZT2222A		PMBT2222A	PMST2222A				PMBT2222AMB
	40	800	100	300	300	250			BSR14					
PNP	40	100	100	300	150	700			PMBS3906	PMSS3906				
	40	200	100	300	250	300			MMBT3906					
									PMBT3906	PMST3906	PMBT3906YS	PMBT3906VS	PMBT3906M	PMBT3906MB
	40	600	100	300	200	350	PZT4403	PXT4403	PMBT4403	PMST4403				
						365			PMBT2907					
	60	600	100	300	200	300				PMST2907A				
						365			BSR16					
							PZT2907A	PXT2907A	PMBT2907A					
NPN/PNP	40	200	100	300	300/250	250/300					PMBT3946YPN	PMBT3946VPN		

Medium power general purpose transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	DFN2020-3 (SOT1061)
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.0 x 2.0 x 0.65
P_{tot} (mW)						1700	1300	1100
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**h_{FE} min**	**h_{FE} max**	**f_T min (MHz)**			
NPN	20	1000	85 - 160	375	40	BCP68 / -25	BC868 / -25	BC68PA / BC68-25PA
	45	1000	63 - 100	160 - 250	100	BCP54 / -10 / -16	BCX54 / -10 / -16	BC54PA / BC54-10PA / BC54-16PA
	60	1000	63 - 100	160 - 250	100	BCP55 / -10 / -16	BCX55 / -10 / -16	BC55PA / BC55-10PA / BC55-16PA
			100	300	100	BSP41	BSR41	
	80	1000	63 - 100	160 - 250	100	BCP56 / -10 / -16	BCX56 / -10 / -16	BC56PA / BC56-10PA / BC56-16PA
			40 - 100	120 - 300	100	BSP43	BSR42 / 43	
PNP	20	1000	85 - 160	250 - 375	40	BCP69 / -16 / -25	BC869 / -16 / -25	BC69PA / BC69-16PA / BC69-25PA
	45	1000	63 - 100	160 - 250	115 [1] - 145 [1]	BCP51 / -10 / -16	BCX51 / -10 / -16	BC51PA / BC51-10PA / BC51-16PA
	60	1000	63 - 100	160 - 250	100	BCP52 / -10 / -16	BCX52 / -10 / -16	BC52PA / BC52-10PA / BC52-16PA
			40 - 100	120 - 300	100	BSP31	BSR30 / 31	
	80	1000	63 - 100	160 - 250	115 [1] - 145 [1]	BCP53 / -10 / -16	BCX53 / -10 / -16	BC53PA / BC53-10PA / BC53-16PA
			40 - 100	120 - 300	100	BSP32 / 33	BSR33	

[1] typical value

In the Spotlight

Medium power transistors in DFN2020-3

- Excellent electrical perfomance on a small 2 x 2 mm footprint
- 80% board space reduction (DFN2020-3 vs. SOT89)
- V_{CEO} ranging from 20 to 80 V
- High collector current capability I_C up to 2 A
- AEC-Q101 qualified

High voltage transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT323 (SC-70)
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P_{tot} (mW)						1700	1300	600	250	200
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**h_{FE} min**	**h_{FE} max**	**f_T min (MHz)**					
NPN	80	100	20	-	60				BSS64	
	140	300	60	250	100				PMBT5550	PMST5550
	160	300	80	250	100				PMBT5551/BSR19A	PMST5551
	250	100	50	-	60	BF722	BF622		BF822	
	300	100	50	-	60	BF720	BF620		BF820	BF820W
			40	-	50	PZTA42	PXTA42		PMBTA42	PMSTA42
	350	100	40	-	70	BSP19	BST39			
	400	300	50	200	20	PZTA44			PMBTA44	
PNP	100	100	30	-	50				BSS63	
	250	100	50	-	60	BF723				
			50	-	60		BF623		BF823	
	300	100	50	-	60		BF621		BF821	
			40	-	50	PZTA92	PXTA92		PMBTA92	PMSTA92
2 x NPN	300	100	40	-	50			PMBTA42DS		

For high voltage transistors with increased performance please refer to our high voltage low V_{CEsat} (BISS) transistor portfolio on page 72.

Matched pair transistors

Package							SOT143B	SOT457 (SC-74)	SOT353 (SC-88A)	SOT363 (SC-88)		SOT666	
Size (mm)							2.9 x 1.3 x 1.0	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95		1.6 x 1.2 x 0.55	
P_{tot} (mW)							250	380	300	300		300	
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**h_{FE} min**	**h_{FE} max**	**h_{FE1}/h_{FE2}**	**V_{BE1} - V_{BE2} (mV)**							
NPN	30	100	110	800	0.7 [1]	n.a.	BCV61/A/B/C [1]						
	45	100	200	450	0.9 [1]	n.a.	BCM61B [1]						
						2		BCM847DS		BCM847BS		BCM847BV	
					0.95	2			PMP4501G		PMP4501Y		PMP4501V
					0.98	2			PMP4201G		PMP4201Y		PMP4201V
	Configuration												
PNP	30	100	100	800	0.7 [1]	n.a.	BCV62/A/B/C [1]						
	45	100	200	450	0.9 [1]	n.a.	BCM62B [1]						
						2		BCM857DS		BCM857BS		BCM857BV	
					0.95	2			PMP5501G		PMP5501Y		PMP5501V
					0.98	2			PMP5201G		PMP5201Y		PMP5201V
	65	100	200	450	0.9	2		BCM856DS		BCM856BS			
	Configuration												

[1] I_{C1}/I_{E2}

Key features

- Current gain matching to 10%, 5% or 2%
- Base-emitter voltage matching to 2 mV
- Choice of standard double transistor pinout or application-optimized pinout
- Common-emitter configuration for 5-pin type
- Range of small, very small and ultra small packages

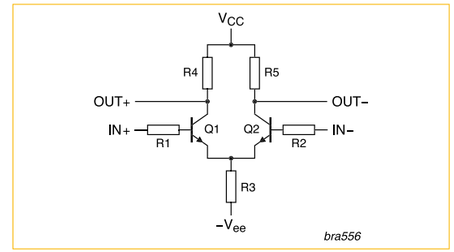
Key benefits

- Improved performance of current mirror and differential amplifier circuits
- Drop-in replacement for standard double transistors (BCM series)
- Simplified board layout (PMP series)
- Eliminates the need for costly additional trimming

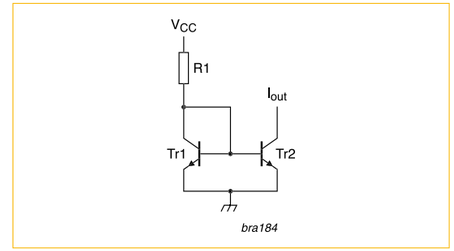
Key applications

- Current mirrors
- Differential and instrumentation amplifiers
- Logarithmic amplifiers
- Comparators

Differential amplifier



Current mirror



Darlington transistors

Package					SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Size (mm)					6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
P_{tot} (mW)					1700	1300	250
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**h_{FE} min**	**f_T min (MHz)**			
NPN	30	500	10000	125			PMBTA13
			20000	125	PZTA14	PXTA14	PMBTA14
				220		BCV29	BCV27
	45	1000	2000	200	BSP50	BST50	
	60	500	10000	220		BCV49	BCV47
		1000	2000	200	BSP51	BST51	
	80	1000	2000	200	BSP52	BST52	
PNP	30	500	20000	125			PMBTA64
				220		BCV28	BCV26
	45	1000	2000	200	BSP60	BST60	
	60	500	10000	220		BCV48	BCV46
		1000	2000	200	BSP61	BST61	
	80	1000	2000	200	BSP62	BST62	

Schmitt trigger

Package							SOT143B
Size (mm)							2.9 x 1.3 x 1.0
P_{tot} (mW)							250
Polarity	**V_{CEO} (V) TR1**	**V_{CEO} (V) TR2**	**I_C (mA)**	**h_{FE} min**	**h_{FE} max**	**V_{CEsat} typ (mV)**	
NPN	30	6	100	110	800	250	BCV63 / B
PNP	30	6	100	220	475	250	BCV64B

Low noise transistors

Package							SOT23	SOT323 (SC-70)
Size (mm)							2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P_{tot} (mW)							250	200
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**Noise figure max (dB)**	**h_{FE} min**	**h_{FE} max**	**f_T min (MHz)**		
NPN	30	100	4	200	450	100	BC849B	BC849BW
				420	800	100	BC849C	BC849CW
	45	100	4	200	450	100	BC850B	BC850BW
				420	800	100	BC850C	BC850CW
PNP	30	100	4	220	475	100	BC859B	BC859BW
				420	800	100	BC859C	BC859CW
	45	100	4	220	475	100	BC860B	BC860BW
				420	800	100	BC860C	BC860CW

MOSFET driver

V_{CEO} (V)	I_C (mA)	I_{cm} [A]	Type	Package	Remark	Configuration
30	0.1	0.2	BCV65	SOT143B	General purpose transistors	5, 6 Tr1 1 Tr2 2, 3 bra84
40	0.6	1	PMD2001D	SOT457	Switching transistors with reduced storage time	
	1	2	PMD3001D		Low V_{CEsat}	

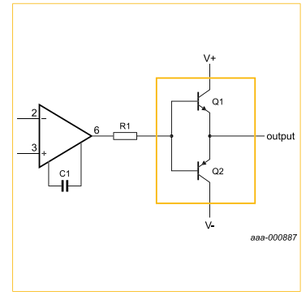
Key features and benefits

- Three different configurations
- Types available with standard, switching, and low V_{CEsat} (BISS) transistors
- Small footprint

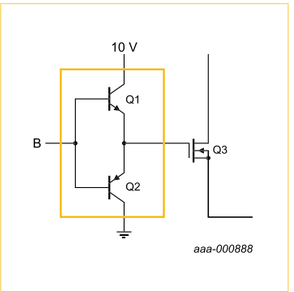
Key applications

- Power management
  - (Half) bridge push-pull driver
  - Isolated DC/DC converters
  - Secondary synchronous rectification
- Peripheral driver
  - (Half) bridge push-pull driver
  - Motor driver
  - Brushless DC motor driver
  - Operational amplifier (Op-amp) output current booster

Op-amp booster



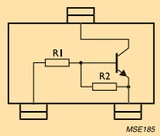
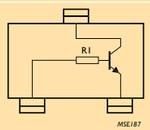
MOSFET driver Faster switching, lower losses

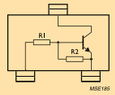
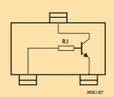


Medium frequency transistors

Package						SOT23	SOT323 (SC-70)
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P_{tot} (mW)						250	200
Polarity	**V_{CEO} (V)**	**I_C (mA)**	**h_{FE} min**	**h_{FE} max**	**f_T typ (MHz)**		
NPN	15	100	40	-	500	BF570	
	20	25	40	85	>275	BFS20	BFS20W
		30	65	225	260	BFS19	
	40	25	67	220	380	BF840	
PNP	30	25	25	50	250	BF824	BF824W
	40	25	50	-	>325	BF550	

RETs 100 mA single

Package					SOT23		SOT323 (SC-70)	
Size (mm)					2.9 x 1.3 x 1.0		2.0 x 1.25 x 0.95	
P_{tot} (mW)					250		200	
V_{CEO} (V)	I_C (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP
50	100		1	1		PDTA113ET		PDTA113EU
			2.2	2.2	PDTC123ET	PDTA123ET	PDTC123EU	PDTA123EU
			4.7	4.7	PDTC143ET	PDTA143ET	PDTC143EU	PDTA143EU
			10	10	PDTC114ET	PDTA114ET	PDTC114EU	PDTA114EU
			22	22	PDTC124ET	PDTA124ET	PDTC124EU	PDTA124EU
			47	47	PDTC144ET	PDTA144ET	PDTC144EU	PDTA144EU
			100	100	PDTC115ET	PDTA115ET	PDTC115EU	PDTA115EU
			1	10		PDTA113ZT		PDTA113ZU
			2.2	10	PDTC123YT	PDTA123YT	PDTC123YU	PDTA123YU
			2.2	47	PDTC123JT	PDTA123JT	PDTC123JU	PDTA123JU
			4.7	10	PDTC143XT	PDTA143XT	PDTC143XU	PDTA143XU
			4.7	47	PDTC143ZT	PDTA143ZT	PDTC143ZU	PDTA143ZU
			10	47	PDTC114YT	PDTA114YT	PDTC114YU	PDTA114YU
			22	47	PDTC124XT	PDTA124XT	PDTC124XU	PDTA124XU
			47	10	PDTC144VT	PDTA144VT	PDTC144VU	PDTA144VU
			47	22	PDTC144WT	PDTA144WT	PDTC144WU	PDTA144WU
			2.2	-	PDTC123TT	PDTA123TT	PDTC123TU	PDTA123TU
			4.7	-	PDTC143TT	PDTA143TT	PDTC143TU	PDTA143TU
			10	-	PDTC114TT	PDTA114TT	PDTC114TU	PDTA114TU
			22	-	PDTC124TT	PDTA124TT	PDTC124TU	PDTA124TU
			47	-	PDTC144TT	PDTA144TT	PDTC144TU	PDTA144TU
			100	-	PDTC115TT	PDTA115TT	PDTC115TU	PDTA115TU

Package					SOT416 (SC-75)		DFN1006-3 (SOT883)		DFN1006B-3 (SOT883B)	
Size (mm)					1.6 x 0.8 x 0.77		1.0 x 0.6 x 0.5		1.0 x 0.6 x 0.37	
P_{tot} (mW)					150		250		250	
V_{CEO} (V)	I_C (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP	NPN	PNP
50	100		1	1		PDTA113EE		PDTA113EM		PDTA113EMB
			2.2	2.2	PDTC123EE	PDTA123EE	PDTC123EM	PDTA123EM	PDTC123EMB	PDTA123EMB
			4.7	4.7	PDTC143EE	PDTA143EE	PDTC143EM	PDTA143EM	PDTC143EMB	PDTA143EMB
			10	10	PDTC114EE	PDTA114EE	PDTC114EM	PDTA114EM	PDTC114EMB	PDTA114EMB
			22	22	PDTC124EE	PDTA124EE	PDTC124EM	PDTA124EM	PDTC124EMB	PDTA124EMB
			47	47	PDTC144EE	PDTA144EE	PDTC144EM	PDTA144EM	PDTC144EMB	PDTA144EMB
			100	100	PDTC115EE	PDTA115EE	PDTC115EM	PDTA115EM	PDTC115EMB	PDTA115EMB
			1	10		PDTA113ZE		PDTA113ZM		PDTA113ZMB
			2.2	10	PDTC123YE	PDTA123YE	PDTC123YM	PDTA123YM	PDTC123YMB	PDTA123YMB
			2.2	47	PDTC123JE	PDTA123JE	PDTC123JM	PDTA123JM	PDTC123JMB	PDTA123JMB
			4.7	10	PDTC143XE	PDTA143XE	PDTC143XM	PDTA143XM	PDTC143XMB	PDTA143XMB
			4.7	47	PDTC143ZE	PDTA143ZE	PDTC143ZM	PDTA143ZM	PDTC143ZMB	PDTA143ZMB
			10	47	PDTC114YE	PDTA114YE	PDTC114YM	PDTA114YM	PDTC114YMB	PDTA114YMB
			22	47	PDTC124XE	PDTA124XE	PDTC124XM	PDTA124XM	PDTC124XMB	PDTA124XMB
			47	10	PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM	PDTC144VMB	PDTA144VMB
			47	22	PDTC144WE	PDTA144WE	PDTC144WM	PDTA144WM	PDTC144WMB	PDTA144WMB
			2.2	-	PDTC123TE	PDTA123TE	PDTC123TM	PDTA123TM	PDTC123TMB	PDTA123TMB
			4.7	-	PDTC143TE	PDTA143TE	PDTC143TM	PDTA143TM	PDTC143TMB	PDTA143TMB
			10	-	PDTC114TE	PDTA114TE	PDTC114TM	PDTA114TM	PDTC114TMB	PDTA114TMB
			22	-	PDTC124TE	PDTA124TE	PDTC124TM	PDTA124TM	PDTC124TMB	PDTA124TMB
			47	-	PDTC144TE	PDTA144TE	PDTC144TM	PDTA144TM	PDTC144TMB	PDTA144TMB
			100	-	PDTC115TE	PDTA115TE	PDTC115TM	PDTA115TM	PDTC115TMB	PDTA115TMB

RETs 100 mA double

Package					SOT457 (SC-74)		SOT363 (SC-88)			SOT666		
Size (mm)					2.9 x 1.5 x 1.0		2.0 x 1.25 x 0.95			1.6 x 1.2 x 0.55		
P_{tot} (mW)					600		300			300		
V_{CEO} (V)	I_C (mA)		R1 (kΩ)	R2 (kΩ)	NPN/NPN	NPN/PNP	NPN/NPN	NPN/PNP	PNP/PNP	NPN/NPN	NPN/PNP	PNP/PNP
50	100	R1 = R2	2.2	2.2			PUMH20	PUMD20	PUMB20	PEMH20	PEMD20	PEMB20
			4.7	4.7			PUMH15	PUMD15	PUMB15	PEMH15	PEMD15	PEMB15
			10	10		PIMD3	PUMH11	PUMD3	PUMB11	PEMH11	PEMD3	PEMB11
			22	22		PIMD2	PUMH1	PUMD2	PUMB1	PEMH1	PEMD2	PEMB1
			47	47			PUMH2	PUMD12	PUMB2	PEMH2	PEMD12	PEMB2
			100	100			PUMH24	PUMD24	PUMB24	PEMH24	PEMD24	PEMB24
		R1 ≠ R2	2.2	47			PUMH10	PUMD10	PUMB10	PEMH10	PEMD10	PEMB10
			4.7	10			PUMH18	PUMD18	PUMB18	PEMH18	PEMD18	PEMB18
			4.7	47			PUMH13	PUMD13	PUMB13	PEMH13	PEMD13	PEMB13
			10	47	PIMH9		PUMH9	PUMD9	PUMB9	PEMH9	PEMD9	PEMB9
			22	47			PUMH16	PUMD16	PUMB16	PEMH16	PEMD16	PEMB16
			47	22			PUMH17	PUMD17	PUMB17	PEMH17	PEMD17	PEMB17
			47/2.2	47/47				PUMD48			PEMD48	
		Only R1	2.2	-			PUMH30	PUMD30	PUMB30	PEMH30	PEMD30	PEMB30
			4.7	-			PUMH7	PUMD6	PUMB3	PEMH7	PEMD6	PEMB3
			10	-			PUMH4	PUMD4	PUMB4	PEMH4	PEMD4	PEMB4
			22	-			PUMH19	PUMD19	PUMB19	PEMH19	PEMD19	PEMB19
			47	-			PUMH14	PUMD14	PUMB14	PEMH14	PEMD14	PEMB14

RETs 500 mA

Package				SOT457 (SC-74)		SOT23	
Size (mm)				2.9 x 1.5 x 1.0		2.9 x 1.3 x 1.0	
P_{tot} (mW)				600		250	
V_{CEO} (V)	I_C (mA)		R1 (kΩ)	R2 (kΩ)	NPN/NPN	NPN/PNP	NPN	PNP
50	500	R1 = R2	1.0	1.0			PDTD113ET	PDTB113ET
			2.2	2.2			PDTD123ET	PDTB123ET
		R1 ≠ R2	1.0	10	PIMN31	PIMC31	PDTD113ZT	PDTB113ZT
			2.2	10			PDTD123YT	PDTB123YT
		Only R1	2.2	-			PDTD123TT	PDTB123TT

Low V_{CEsat} (BISS) RETs

Package						SOT23
Size (mm)						2.9 x 1.3 x 1.0
P_{tot} (mW)						250
Polarity	V_{CEO} (V)	I_C (mA)		R1 (kΩ)	R2 (kΩ)	
NPN	40	600	R1 = R2	1	1	PBRN113ET
				2.2	2.2	PBRN123ET
			R1 ≠ R2	1	10	PBRN113ZT
				2.2	10	PBRN123YT
PNP	40	600	R1 = R2	1	1	PBRP113ET
				2.2	2.2	PBRP123ET
			R1 ≠ R2	1	10	PBRP113ZT
				2.2	10	PBRP123YT

Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors single NPN

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)		SOT23	DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
																						
Size (mm)											6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0		2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)											1700	1650	750		480	1400	350	430	250	500	250	250
V_{CEO} (V)	I_C (A)	I_{CM} (A)	h_{FE} min/typ	@ I_C (A)	@ V_{CE} (V)	R_{CEsat} typ (mΩ); I_C/I_B = 10	V_{CEsat} typ (mV); I_C = 0.5 A; I_B = 0.05 A	V_{CEsat} max (mV)	@ I_C (A)	@ I_B (A)												
12	5.3	10.6	300/530	0.5	2	27 [1]	18	200	5.3	0.265		PBSS301NX										
	5.8	11.6	300/530	0.5	2	29 [1]	18	235	5.8	0.29	PBSS301NZ											
	6.0	7.0	280/440	0.5	2	33 [1]	20	275	6	0.3						PBSS4612PA						
15	0.5	1.0	200/325	0.01	2	360	-	250	0.5	0.05											PBSS2515M	PBSS2515MB
			200/425	0.01	2	300	200	250	0.5	0.05									PBSS2515E			
20	1.0	3.0	350/470	0.1	2	220	110 [2]	250	1	0.05					PBSS4120T							
	2.0	4.0	220/410	0.5	2	140	70	350	2	0.2										PBSS4220V		
		5.0	220/330	0.1	2	80	45	310	3	0.3					PBSS4320T							
	3.0	5.0	220/390	0.5	2	85	40	310	3	0.3		PBSS4320X										
	4.0	15.0	300/450	0.5	2	50	30	280	4	0.4			PBSS301ND									
	4.3	8.0	300/550	0.5	2	36	21	220	4	0.2					PBSS4021NT							
	5.0	10.0	300/450	0.5	2	32	35	220	5	0.5		PBSS4520X										
	5.3	10.6	300/570	0.5	2	27 [1]	20	200	5.3	0.265		PBSS302NX										
	5.8	10.2	300/570	0.5	2	30 [1]	20	250	5.8	0.29	PBSS302NZ											
	6.0	7.0	280/440	0.5	2	33 [1]	20	275	6	0.3						PBSS4620PA						
	7.0	15.0	300/550	0.5	2	19	12	210	7	0.35		PBSS4021NX										
	8.0	20.0	300/550	0.5	2	14	9	170	8	0.4	PBSS4021NZ											
30	1.0	3.0	300/450	0.5	2	240	120 [2]	270	1	0.05					PBSS4130T							
	2.0	3.0	300/450	0.5	2	120	70	320	2	0.2					PBSS4230T							
	2.6	5.0	300/500	0.5	2	76	80	320	3	0.3					PBSS4032NT [3]							
	3.0	5.0	300/490	0.5	2	80	45	300	3	0.3		PBSS4330X										
	3.0	5.0	300/465	0.5	2	75	40	300	3	0.3						PBSS4330PA						
	3.5	6.0	300/500	0.5	2	50	70	300	4	0.4			PBSS4032ND [3]									
	4.7	10.0	300/500	0.5	2	45	57	250	4	0.4		PBSS4032NX [3]										
	5.1	10.2	300/480	0.5	2	30 [1]	20	220	5.1	0.255		PBSS303NX										
	5.4	10.0	300/500	0.5	2	45	57	340	4.9	0.27	PBSS4032NZ [3]											
	5.5	11.0	300/480	0.5	2	31 [1]	20	240	5.5	0.275	PBSS303NZ											
	6.0	7.0	280/450	0.5	2	35 [1]	21	275	6	0.3						PBSS4630PA						
40	0.5	1.0	200/550	0.01	2	380	200 [2]	250	0.5	0.05											PBSS2540M	PBSS2540MB
			200/350	0.01	2	380	190	250	0.5	0.05									PBSS2540E			
	1.0	3.0	300/ -	0.5	5	150	70	440	2	0.2										PBSS4140V		
		2.0	300/440	0.5	5	240	130	500	1	0.1							PBSS4140U					
			300/510	0.5	5	230	120	500	1	0.1					PMMT491A							
			300/420	0.5	5	150	130	500	1	0.1					PBSS4140T							
	2.0	3.0	300/400	0.5	5	150	70	400	2	0.2										PBSS4240V		
			350/470	0.1	2	120	70	320	2	0.2								PBSS4240Y				
			300/450	0.5	2	120	70	320	2	0.2					PBSS4240T							
	4.0	15.0	300/520	0.5	2	55	35	300	4	0.4			PBSS302ND									
		10.0	300/500	0.5	2	40	21	355	5	0.5		PBSS4540X										
	5.0	10.0	300/500	0.5	2	42	25	355	5	0.5	PBSS4540Z											
50	2.0	5.0	300/495	0.5	2	100	60	260	2	0.2					PBSS4350T							
			300/ -	0.5	2	160	90 [2]	320	2	0.2		PBSS4250X										
	3.0	5.0	200/280	0.5	2	110	65	290	2	0.2			PBSS4350D									
			300/460	0.5	2	75	50	370	3	0.3		PBSS4350X										
			200/280	0.5	2	110	60 [1]	290	2	0.2	PBSS4350Z											
60	1.0	2.0	200/400	0.5	5	200	110	250	1	0.1										PBSS4160V		
			200/420	0.5	5	230	120	280	1	0.1							PBSS4160U					
			200/350	0.5	5	200	110	250	1	0.1					PBSS4160T							
	3.0	6.0	345/570	0.5	2	65	40	260	3	0.3			PBSS303ND									
	3.8	8.0	300/500	0.5	2	46	29	200	3	0.3					PBSS4041NT							
	4.7	9.4	300/520	0.5	2	37 [1]	25	245	4.7	0.235		PBSS304NX										
	5.2	10.4	300/520	0.5	2	39 [1]	25	280	5.2	0.26	PBSS304NZ											
	6.0	7.0	280/440	0.5	2	34 [1]	22	290	6	0.3						PBSS4560PA						
	6.2	15.0	300/500	0.5	2	25	17	230	6	0.3		PBSS4041NX										
	7.0	15.0	300/500	0.5	2	17.5	13	195	7	0.35	PBSS4041NZ											
80	3.0	6.0	240/360	0.5	2	67	40	255	3	0.3			PBSS304ND									
	4.0	10.0	250/400	0.5	2	43 [1]	25	230	4	0.2		PBSS4480X										
	4.6	9.2	300/470	0.5	2	37 [1]	25	240	4.6	0.23		PBSS305NX										
	5.1	10.2	300/470	0.5	2	38 [1]	25	270	5.1	0.255	PBSS305NZ											
	5.6	7.0	270/425	0.5	2	40 [1]	25	320	5.6	0.28						PBSS4580PA						
100	1.0	3.0	150/400	0.25	10	160	80	200	1	0.1								PBSS8110Y				
			150/300	0.25	10	165	70	200	1	0.1					PBSS8110T							
			150/290	0.25	10	160	75	200	1	0.1			PBSS8110D									
			150/290	0.25	10	165	73	200	1	0.1		PBSS8110X										
			150/290	0.25	10	160	73	200	1	0.1	PBSS8110Z											
	3.0	4.0	170/275	0.5	2	72	45	360	4	0.4			PBSS305ND									
	4.5	9.0	200/330	0.5	2	38 [1]	27	245	4.5	0.225		PBSS306NX										
	5.1	10.2	200/330	0.5	2	43 [1]	27	300	5.1	0.255	PBSS306NZ											
	5.2	6.0	180/285	0.5	2	48 [1]	30	340	5.2	0.26						PBSS8510PA						

[1] I_C/I_B = 20
[2] V_{CEsat} (max)
[3] optimized for high speed switching

Bipolar transistors

Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors single PNP

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)		SOT23	DFN2020-3 (SOT1061)	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
																						
Size (mm)											6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0		2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)											1700	1650	750		480	1400	350	430	250	500	250	250
V_{CEO} (V)	**I_C (A)**	**I_{CM} (A)**	**h_{FE} min/typ**	**@ I_C (V)**	**@ V_{CE} (V)**	**R_{CEsat} typ (mΩ); I_C/I_B = 10**	**V_{CEsat} typ (mV); I_C = 0.5 A; I_B = 0.05 A**	**V_{CEsat} max (mV)**	**@ I_C (A)**	**@ I_B (A)**												
12	5.3	10.6	250/400	0.5	2	28 [1]	20	210	5.3	0.265		PBSS301PX			PBSS5120T							
	5.7	11.4	250/400	0.5	2	30 [1]	20	245	5.7	0.285	PBSS301PZ											
	6.0	7.0	220/335	0.5	2	33 [1]	20	300	6	0.3						PBSS5612PA						
15	0.5	1.0	200/260	0.01	2	300	150	250	0.5	0.05											PBSS3515M	PBSS3515MB
			200/325	0.01	2	300	150	250	0.5	0.05									PBSS3515E			
20	1.0	2.0	300/450	0.1	2	250	125 [2]	250	1	0.05					PBSS5120T							
	2.0	4.0	220/440	0.1	2	140	75	390	2	0.2										PBSS5220V		
		3.0	225/ -	0.5	2	115	80 [2]	225	2	0.2					PBSS5220T							
		5.0	220/420	0.5	2	75	50	210	2	0.2					PBSS5320T							
	3.0	5.0	200/ -	0.5	2	85	80 [2]	400	3	0.3			PBSS5320D									
			220/450	0.5	2	90	50	300	3	0.3		PBSS5320X										
	3.5	8.0	250/400	0.5	2	55	35	375	4	0.2					PBSS4021PT							
	4.0	15.0	250/400	0.5	2	50	35	280	4	0.4			PBSS301PD									
	5.0	10.0	300/430	0.5	2	34	45	270	5	0.5		PBSS5520X										
	5.1	10.2	250/370	0.5	2	32 [1]	25	230	5.1	0.255		PBSS302PX										
	5.5	11.0	250/370	0.5	2	34 [1]	25	265	5.5	0.275	PBSS302PZ											
	6.0	7.0	230/345	0.5	2	39 [1]	25	350	6	0.3						PBSS5620PA						
	6.2	15.0	250/400	0.5	2	23	18	240	6	0.3		PBSS4021PX										
	6.6	20.0	250/400	0.5	2	22	16	240	7	0.35	PBSS4021PZ											
30	1.0	3.0	260/350	0.5	2	220	110	225	1	0.05					PBSS5130T							
	2.0	3.0	300/450	0.1	2	160	70	350	2	0.2					PBSS5230T							
	2.4	5.0	200/320	0.5	2	110	95	330	2	0.2					PBSS4032PT [3]							
	2.7	5.0	200/350	0.5	2	88	87	395	3	0.3			PBSS4032PD [3]									
	3.0	5.0	200/380	0.5	2	80	50	320	3	0.3		PBSS5330X										
	3.0	5.0	200/320	0.5	2	75	45	320	3	0.3						PBSS5330PA						
	4.2	10.0	200/350	0.5	2	58	70	345	4	0.4		PBSS4032PX [3]										
	4.4	10.0	200/350	0.5	2	58	70	400	4	0.2	PBSS4032PZ [3]											
	5.1	10.2	250/400	0.5	2	32 [1]	25	230	5.1	0.255		PBSS303PX										
	5.3	10.6	250/400	0.5	2	35 [1]	25	265	5.3	0.265	PBSS303PZ											
	6.0	7.0	200/335	0.5	2	39 [1]	25	350	6	0.3						PBSS5630PA						
40	0.5	1.0	200/380	0.01	2	440	220	350	0.5	0.05											PBSS3540M	PBSS3540MB
			200/380	0.01	2	440	230	350	0.5	0.05									PBSS3540E			
	1.0	2.0	300/ -	0.1	5	200	120	310	1	0.1										PBSS5140V		
			300/520	0.1	5	230	130	500	1	0.1							PBSS5140U					
			300/800	0.1	5	250	130	500	1	0.1					PMMT591A							
			300/510	0.1	5	230	130	500	1	0.1					PBSS5140T							
	1.8	3.0	300/450	0.1	5	185	100	530	2	0.2										PBSS5240V		
	2.0	3.0	300/ -	0.1	2	200	110 [2]	350	2	0.2								PBSS5240Y				
			300/450	0.1	2	150	70	350	2	0.2					PBSS5240T							
	4.0	15.0	200/310	0.5	2	55	46	300	4	0.4			PBSS302PD									
		10.0	250/370	0.5	2	45	33	375	5	0.5		PBSS5540X										
	5.0	10.0	250/350	0.5	2	55	40 [1]	160	2	0.2	PBSS5540Z											
50	2.0	3.0	200/ -	0.5	2	150	90 [2]	300	2	0.1					PBSS5250T							
		5.0	200/360	0.5	2	90	55	270	2	0.2					PBSS5350T							
			200/ -	0.5	2	160	90 [2]	320	2	0.2		PBSS5250X										
	3.0	5.0	200/300	0.5	2	120	70	300	2	0.2			PBSS5350D									
			200/375	0.5	2	120	70	390	3	0.3		PBSS5350X										
			200/300	0.5	2	120	70	300	2	0.2	PBSS5350Z											
60	1.0	2.0	150/250	0.5	5	220	120	330	1	0.1										PBSS5160V		
			150/250	0.5	5	255	135	340	1	0.1							PBSS5160U					
			150/250	0.5	5	220	120	330	1	0.1					PBSS5160T							
	2.7	8.0	200/300	0.5	2	80	49	360	3	0.3					PBSS4041PT							
	3.0	6.0	180/265	0.5	2	70	55	290	3	0.3			PBSS303PD									
	4.2	8.4	200/295	0.5	2	53 [1]	35	310	4.2	0.21		PBSS304PX										
	4.5	9.0	200/295	0.5	2	59 [1]	35	375	4.5	0.225	PBSS304PZ											
	5.0	6.0	170/260	0.5	2	35 [1]	35	450	5	0.25						PBSS5560PA						
		15.0	200/300	0.5	2	40	30	300	5	0.5		PBSS4041PX										
	5.7	15.0	200/300	0.5	2	29	22	285	6	0.3	PBSS4041PZ											
80	3.0	5.0	155/225	0.5	2	71	55	290	3	0.3			PBSS304PD									
	4.0	5.0	180/265	0.5	2	65 [1]	40	420	4	0.2						PBSS5580PA						
		10.0	200/300	0.5	2	50	35	380	5	0.5		PBSS5480X										
		8.0	200/280	0.5	2	43	36	240	4	0.4		PBSS305PX										
	4.5	9.0	200/280	0.5	2	69 [1]	36	450	4.5	0.225	PBSS305PZ											
100	1.0	3.0	150/ -	0.25	5	170	93	320	1	0.1								PBSS9110Y				
			150/350	0.5	5	170	95	320	1	0.1					PBSS9110T							
			150/350	0.5	5	170	100	320	1	0.1			PBSS9110D									
			150/350	0.5	5	170	90	320	1	0.1		PBSS9110X										
			150/ -	0.5	5	170	90	320	1	0.1	PBSS9110Z											
	2.0	3.0	175/275	0.5	2	88	65	250	2	0.2			PBSS305PD									
	2.7	4.0	180/295	0.5	2	110 [1]	45	450	2.7	0.135						PBSS9410PA						
	3.7	7.4	200/300	0.5	2	52	45	300	4	0.4		PBSS306PX										
	4.1	8.2	200/300	0.5	5	57	45	325	4.1	0.41	PBSS306PZ											

[1] I_C/I_B = 20
[2] V_{CEsat} (max)
[3] optimized for high speed switching

Bipolar transistors

In the Spotlight

Low V_{CEsat} (BISS) transistors

- Industry's first combination of reduced switching times (down to 125 ns) with minimized saturation voltage (below 50 mV)
- Voltage range from 12 V to 100 V
- Flexible package options, from standard SMD to brand new medium power leadless package DFN2020-3 (SOT1061) (2 x 2 x 0.65 mm)
- Provides benchmark reduced on-state-resistance

Low V_{CEsat} (BISS) double transistors

Package										SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666
Size (mm)										4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P_{tot} (mW)										2000 [2]	750	430	500
V_{CEO} (V)	I_C (A)	Polarity	h_{FE} min	@ I_C (A)	@ V_{CE} (V)	V_{CEsat} typ (mV); I_C = 0.5 A; I_B = 0.05 A	V_{CEsat} max (mV)	@ I_C (A)	@ I_B (A)				
15	0.5	2 x PNP	200	0.01	2	170 [1]	250	0.5	0.05				PBSS3515VS
		NPN/PNP	200	0.01	2	170 [1]	250	0.5	0.05				PBSS2515VPN
		NPN/PNP	200	0.01	2	170 [1]	250	0.5	0.05			PBSS2515YPN	
20	7.5	NPN/NPN	300	0.5	2	15	150	4	0.2	PBSS4021SN			
	6.3	PNP/PNP	250	0.5	2	24	225	4	0.2	PBSS4021SP			
	7.5 / 6.3	NPN/PNP	300/250	0.5	2	15/24	150/225	4	0.2	PBSS4021SPN			
30	5.7	NPN/NPN	300	0.5	2	57	250	4	0.4	PBSS4032SN [3]			
	4.8	PNP/PNP	200	0.5	2	70	390	4	0.4	PBSS4032SP [3]			
	5.7 / 4.8	NPN/PNP	300/200	0.5	2	57/70	250/390	4	0.4	PBSS4032SPN [3]			
40	1.0	NPN/PNP	300/250	0.5	5	130/150	500	1	0.1		PBSS4140DPN		
	2.0	NPN/PNP	300/250	0.5	5	80/100	400/530	2	0.2		PBSS4240DPN		
50	2.7	2 x NPN	300	0.5	2	50	340	2.7	0.27	PBSS4350SS			
		2 x PNP	200	0.5	2	60	370	2.7	0.27	PBSS5350SS			
		NPN/PNP	300/200	0.5	2	50/60	340/370	2.7	0.27	PBSS4350SPN			
60	1.0	2 x NPN	200	0.5	5	115	250	1	0.1		PBSS4160DS		
		2 x PNP	150	0.5	5	120	330	1	0.1		PBSS5160DS		
		NPN/PNP	200/150	0.5	5	115/120	250/330	1	0.1		PBSS4160DPN		
	6.7	NPN/NPN	300	0.5	2	20	190	4	0.2	PBSS4041SN			
	5.9	PNP/PNP	200	0.5	2	35	330	4	0.2	PBSS4041SP			
	6.7 / 5.9	NPN/PNP	300/200	0.5	2	20/35	190/330	4	0.2	PBSS4041SPN			

[1] I_c/I_b=20
[2] Device mounted on a ceramic PCB, Al2O3, standard footprint.
[3] Optimized for high speed switching

Low V_{CEsat} (BISS) load switches

Package				SOT96 (SO8)	SOT457 (SC-74)		SOT363 (SC-88)	SOT666
Size (mm)				4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0		2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P_{tot} (mW)				1500 [1]	750 [1]	600 [1]	300 [2]	300 [2]
V_{CEO} (V)	I_C (A)	V_{CEsat} max (mV); I_C = 0.5 A; I_B = 0.05 A	R1, R2 (kΩ)					
15	0.5	250	2.2				PBLS1501Y	PBLS1501V
			4.7				PBLS1502Y	PBLS1502V
			10				PBLS1503Y	PBLS1503V
			22				PBLS1504Y	PBLS1504V
20	1	150	2.2			PBLS2001D		
			4.7			PBLS2002D		
			10			PBLS2003D		
			22			PBLS2004D		
	1.8	70	2.2		PBLS2021D			
			4.7		PBLS2022D			
			10		PBLS2023D			
			22		PBLS2024D			
	3	75	2.2	PBLS2001S				
			4.7	PBLS2002S				
			10	PBLS2003S				
40	0.5	350	2.2				PBLS4001Y	PBLS4001V
			4.7				PBLS4002Y	PBLS4002V
			10				PBLS4003Y	PBLS4003V
			22				PBLS4004Y	PBLS4004V
			47				PBLS4005Y	PBLS4005V
	1	170	2.2			PBLS4001D		
			4.7			PBLS4002D		
			10			PBLS4003D		
			22			PBLS4004D		
			47			PBLS4005D		
60	1	180	2.2			PBLS6001D		
			4.7			PBLS6002D		
			10			PBLS6003D		
			22			PBLS6004D		
			47			PBLS6005D		
	1.5	100	2.2		PBLS6021D			
			4.7		PBLS6022D			
			10		PBLS6023D			
			22		PBLS6024D			

[1] Device mounted on a ceramic PCB, Al_2O_3, standard footprint
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint

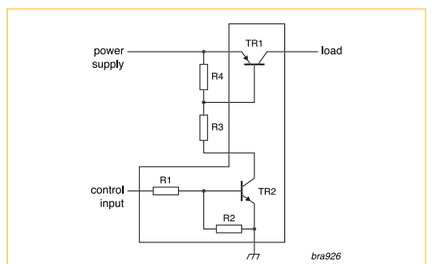
Key features and benefits

- Very small input current drives high load current
- High efficiency and low voltage drop due to low V_{CEsat} (BISS) pass transistor
- Replaces expensive P-MOSFETs
- Inherent reverse current blocking
- Automotive qualified according to AEC-Q101

Key applications

- Fan driver
- Battery charge switch
- Supply line switch
- High side load

Low V_{CEsat} (BISS) load switch – the optimal choice for supply-line and high-side switches



High voltage low V_{CEsat} (BISS) transistors

Package				SOT223 (SC-73)	SOT89 (SC-62)	SOT23
						
Size (mm)				6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
P_{tot} (mW)				1700	1300	250
Polarity	V_{CESM} [1]	V_{CEO} (V)	I_C (A)			
NPN	-	150	1	PBHV8115Z		PBHV8115T
			2	PBHV8215Z		
		180	1			PBHV8118T
	500	400	0.5	PBHV8540Z		PBHV8540T
			1	PBHV8140Z		
		500	0.15			PMBTA45
PNP	-	150	1	PBHV9115Z	PBHV9115X	PBHV9115T
			2	PBHV9215Z		
	500	400	0.25	PBHV9040Z		PBHV9040T
			0.5	PBHV9540Z		
		500	0.15			PBHV9050T
			0.25	PBHV9050Z		

[1] Collector-emitter peak voltage

In the Spotlight

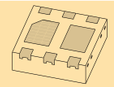
High voltage low V_{CEsat} (BISS) transistors in SOT223 & SOT23

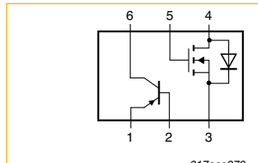
- Voltage V_{CEO} up to 500 V
- Current I_C up to 1 A (continuous), 2 A (peak)
- V_{CEsat} down to 33 mV at I_B = 20 mA
- AEC-Q101 qualified

Low V_{CEsat} (BISS) RETs

Package					SOT23	
						
Size (mm)					2.9 x 1.3 x 1.0	
P_{tot} (mW)					250	
V_{CEO} (V)	I_C (mA)		R1 (kΩ)	R2 (kΩ)	NPN	PNP
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET
			2.2	2.2	PBRN123ET	PBRP123ET
		R1 ≠ R2	1	10	PBRN113ZT	PBRP113ZT
			2.2	10	PBRN123YT	PBRP123YT

Low V_{CEsat} (BISS) transistor PNP – N-channel MOSFET combination

Package											DFN2020-6 (SOT1118)
											
Size (mm)											2.0 x 2.0 x 0.65
P_{tot} (mW)											1300
V_{CEO} (V)	I_C (A)	h_{FE} min	h_{FE} max	@ I_C (mA)	@ V_{CE} (V)	R_{CEsat} typ (mΩ)	V_{DS} (V)	V_{GS} (V)	I_D (A)	R_{Dson} typ (mΩ)	
40	2	300	800	100	5	240	30	0.7	0.66	390	PBSM5240PF



Combination of Low V_{CEsat} transistor with N-channel MOSFET in the very small and ultra thin leadless package DFN2020-6 (SOT1118)

Advantages of low V_{CEsat} (BISS) technology

Our BISS (Breakthrough In Small-Signal) transistors show lowest V_{CEsat} values due to an innovative mesh-emitter technology and further technology improvement. Benefit from:

Reduction in board space

- Stable performance at smaller footprint
- I_C = 0.5 A; V_{CEO} = 40 – 45 V

SOT23 | 8.15 mm² | BC817xx | General purpose transistor

SOT416 (SC-75) | 4.4 mm² | PBSS2540E | BISS transistor technology

DFN1006-3 (SOT883) | 1.17 mm² | PBSS2540M | BISS transistor technology

Improved collector current capabilities

- 17.87 mm² footprint

SOT89 (SC-62) | 1 A | BCX51 | General purpose transistor

SOT89 (SC-62) | 3 A | PBSS5350X | BISS transistor technology

SOT89 (SC-62) | 6.2 A | PBSS4021PX | BISS transistor technology

High voltage power bipolar transistors

types in **bold** represent new products

V_{CESM} (V)	$I_{C(DC)}$ (max) (A)	25 °C ind. t_f (typ) (ns)	@ I_C (A)	h_{FE} (typ)	@ I_C (A)	SOT54 (TO92)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D^2PAK)	SOT428 (DPAK)
										
700	1	80	1	7.5	0.8	BUJ100LR				
700	1	80	1	7.5	0.8	PHE13003A				
700	1	50	1	14	0.75	BUJ100				
700	1.5	100	0.5	9	1	PHE13003C				
700	1.5	100	0.5	9	1	PHD13003C*				
700	4	30	2	12.5	3		BUJ103A	BUJ103AX		BUJ103AD
700	4	30	2	12.5	3					BUJD103AD*
700	4	100	2	17	2		PHE13005	PHE13005X		
700	4	100	2	17	2		PHD13005*			
700	8	20	5	11	4		BUJ105A		BUJ105AB	BUJ105AD
700	8	20	5	11	4					BUJD105AD*
700	8	40	5	9	5		PHE13007			
700	10	20	5	11	6		BUJ106A			
700	12	100	5	6 min - 30 max	8		PHE13009			
850	4	30	2	12.5	3		**BUJD203A***	**BUJD203AX***		**BUJD203AD***
1000	5	145	2.5	12	3		BUJ303A	**BUJ303AX**		**BUJ303AD**
1050	4	370	2.5	41	0.8		**BUJ302A**	**BUJ302AX**		**BUJ302AD**
1050	5	200	2.5	10.5	3		BUJ303B			
1200	6	170	2.5	15.5	3		BUJ403A	BUT11APX-1200		

* Integrated freewheeling diode

Key features and benefits

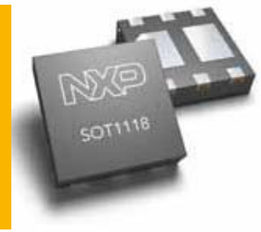
- Planar technology for voltage blocking stability and long-term reliability at elevated temperature
- Fast & smooth turn-off performance for low switching losses and improved efficiency
- Low saturation voltage for low conduction losses and improved efficiency
- Lowest overall power dissipation for lowest temperature rise and improved reliability
- Tightly-controlled manufacturing process for narrower gain (h_{FE}) spread and easier circuit optimization
- Flat gain (h_{FE}) vs current characteristic for correct circuit operation under all conditions
- Transistor design possesses inherent avalanche ruggedness

Key applications

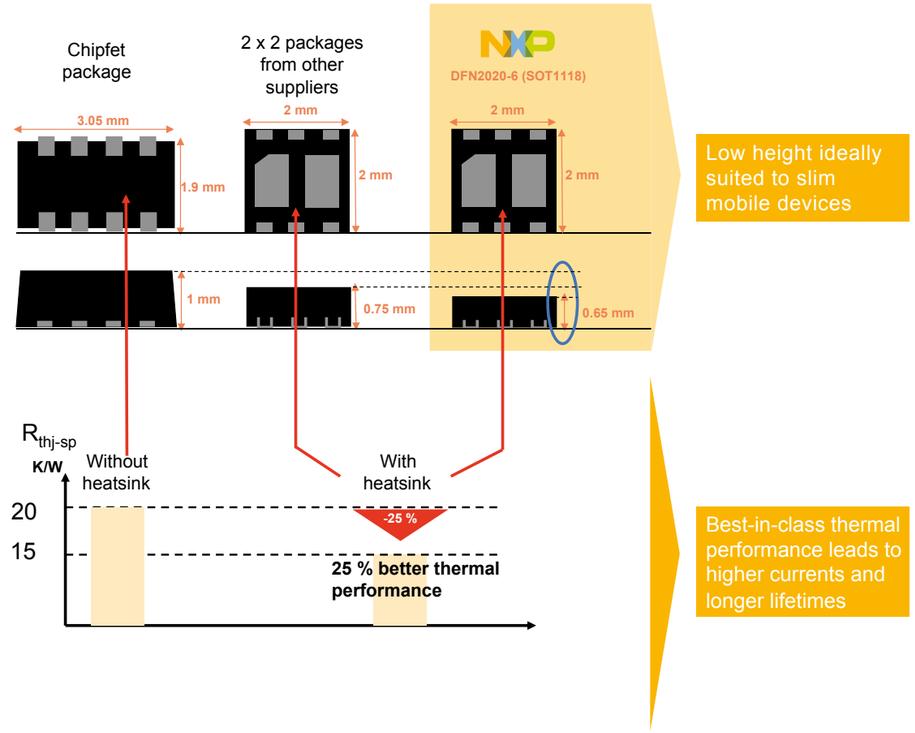
- Compact Fluorescent Lamps
- Electronic ballasts for fluorescent lamps
- Electronic transformers for Low Voltage Tungsten Halogen lighting
- Power supplies and chargers – e.g. for mobile phones.

MOSFETs

Fit more functions on a PCB with small, thin medium-power packages



Package market comparison



Small-signal MOSFETs in new DFN2020-6 (SOT1118) dual package

Configuration	Polarity	V_{DS} (V)	V_{GS} (V)	I_D (A)	$V_{GS}(th)$ min (V)	$V_{GS}(th)$ max (V))	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	R_{DSon} typ (mOhm) @V_{GS} =				DFN2020-6 (SOT1118)
															2.0 x 2.0 x 0.65
											10 V	4.5 V	2.5 V	1.8 V	>500
dual	P	20	8	3.3	0.5	1.5	15	92	4.5	1		58	72	100	PMDPB65UP
dual	N	20	8		0.4	1				-		28			PMDPB28UN*
dual	N	20	8	5.1	0.4	1	36	35	2	-		40	53	82	**PMDPB42UN**
dual	N	20	12	4	0.5	1.5	25	23	1.9	-		55	86		**PMDPB56XN**
dual	N	30	20		1	2.5				-		70			PMDPB70EN*
dual	P	20	12	4.5	0.5	1.5	28	56	8.1	-		55	75		PMDPB55XP*
dual	P	30	12		0.7	1.3				-		70			PMDPB70XP*
dual	P	20	8		0.5	1.5				-		80			PMDPB80UP*
dual	N	20	12							-		30			PMDPB30XN*
MOS + RET	P	30	12		0.7	1.3				-		85			PMC85XP*
complementary	N	20	12							-		30			PMCPB5530X*
complementary	P	20	12							-		60			

* Products to be released in 2012

NextPower 25 V & 30 V MOSFETs in LFPAK (Power-SO8)

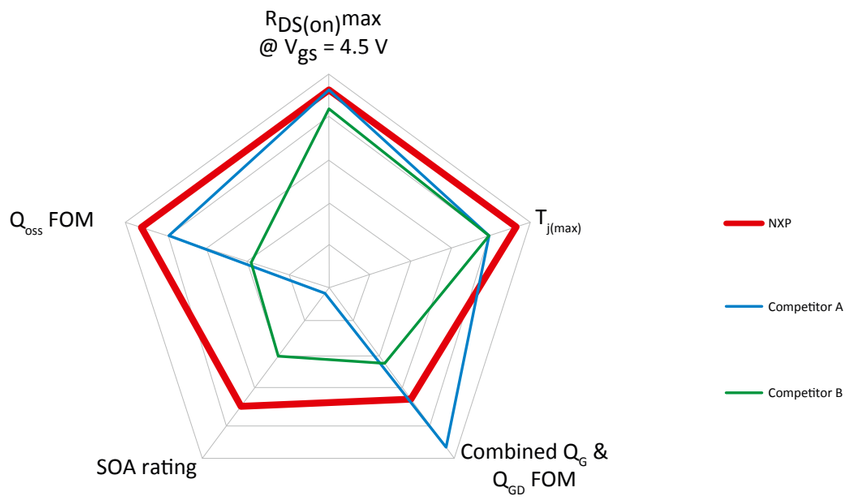
NXP introduces a range of high performance N-channel, logic-level MOSFETs in LFPAK

As a power design engineer, compromise is never far from your mind. Do I choose a low $R_{DS(on)}$ device and accept the higher output capacitance? Do I demand the lowest gate charge characteristics to reduce switching losses but then find that the package options are no longer ideal in my application?

The NextPower range of MOSFETs from NXP provides uniquely balanced characteristics across the six most important parameters essential for your latest high efficiency and high reliability designs. More performance, less compromise…

Many competitors focus only on optimising $R_{DS(on)}$ and Q_g. As Q_g gets lower then losses due to Q_{oss} and Q_{gd} become more significant. NextPower uses Superjunction technology to provide the optimum balance between low $R_{DS(on)}$, low Q_{oss}, low $Q_{g(tot)}$ and Q_{gd} to give optimum switching performance. NextPower delivers superior SOA performance, and low Q_{oss} reduces the losses between the output DRAIN & SOURCE terminals. NextPower also delivers the lowest $R_{DS(on)}$ with sub 1 mΩ types at both 25 V and 30 V.

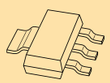
Comparison of NextPower technology with key competitor types



Small-signal MOSFETs

Small-signal MOSFETs single (N-channel) < 50 V

types in **bold** represent new products

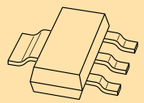
Package									SOT223 (SC-73)		SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
																	
Size (mm)									6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)									1700		600	250	300	200	150	250	250
V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	R_{DSon} typ (mΩ) @ V_{GS} = 10 V	4.5 V	2.5 V	1.8 V					
12	8	5.7	0.4	-	23	67	10.1	-	-	28	-	39	**PMN28UN**						
20	8	7	0.4	1				-	-	15		-	PMN15UN*						
		5.8	0.4	1	55	255	7.4	-	-	15	18	25		**PMV16UN** [1]					
		6.3	2	4	23	71	10.6	-	-	23	-	37	PMN23UN						
		5.7	0.4	-	23	71	10.6	-	-	27	-	39	PMN27UN						
		3.3	0.4	1	34	186	5.8	-	-	25	30	39		**PMV28UN**					
		6	0.4	1	44	168	6.4	-	-	27	35	58	**PMN25UN**						
		5.7	0.45	-	20	66	7.4	-	-	30	-	44		PMV30UN [1]					
		2.8	0.4	1				-	-	45		-			PMG45UN*				
		3.76	0.65	-	35	84	5.4	-	-	56	77	-		PMV56XN [1]					
		2.5	0.65	-	35	84	5.4	-	-	56	77	-		SI2302DS					
		2.3	0.4	1	26	83	2.4	-	-	64	78	110		**PMV65UN**					
		2	0.4	1				-	-	63		-				PMF63UN*			
		1.05	0.4	-	6.5	65	-	-	-	140	-	240		BSH105					
		1.4	0.4	1				-	-	170		-		PMV170UN*					
		2.28	0.45	0.95	14.5	23.5	0.89	-	-	250	-	420						PMZ250UN	**PMZB290UN**
		1	0.45	1	14.5	23.5	0.89	-	-	280	-	460				PMF280UN	PMR280UN		
		0.7	0.5	0.95	10	117	0.45	-	-	380	620	1100					**PMR290UNE**		
		1	0.5	0.95				2	-	290		-							**PMZB290UNE**
	12	1.3	0.5	1.5				-	-	180		-		PMV180XN*					
		1.8	0.5	1.5				-	-	77		-				PMF77XN*			
		3.2	0.5	1.5	39	144	4.9	-	-	28	39	-		**PMV30XN**					
		5.9	0.5	1.5	25	37	5.8	-	-	31	44	-		PMV31XN [1]					
		2.2	0.5	1.5				-	-	63	89	-		**PMV62XN**					
		2.15	0.5	1.5	16	17	0.72	-	-	270	440	-						PMZ270XN	**PMZB300XN**
		1	0.5	1.5	16	17	0.72	-	-	290	460	-				PMF290XN	PMR290XN		
	15	5.7	1	2	24	35	13.1	-	28	34	-	-	PMN34LN						
		4.1	1	2	24	35	13.1	-	55	70	-	-	PMN55LN						
30	8	4.9	0.45	-	22	60	9.9	-	-	38	-	54	PMN34UN						
		4.9	0.45	-	18	50	9.3	-	-	40	-	55		PMV40UN [1]					
		0.9	0.5	1.05				2	-	370		-							**PMZB370UNE**
		1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550						PMZ390UN	**PMZB420UN**
		0.85	0.4	-	6	27	-	-	-	400 [2]	-	600 [2]		BSH103					
		0.8	0.45	1	11.5	22.5	0.89	-	-	400	-	580				PMF400UN	PMR400UN		
		0.4	0.6	1.1	26	88	0.52	2	-	1000	1400	2000		**NX3008NBK**	**NX3008NBKS**	**NX3008NBKW**	**NX3008NBKT**		**NX3008NBKMB**
	12	4.8	0.5	1.5	39	176	6.4	-	-	19	26	-		**PMV20XN** [1]					
		5.7	0.5	1.5	39	196	6.4	-	-	27	37	-	**PMN22XN**						
		0.9	0.5	1.5	23	19	0.74	-	-	234	324	-				**PMF250XN**			
		1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-						PMZ350XN	**PMZB380XN**
		0.87	0.35	-	16	19.5	-	-	-	370	550	-				PMF370XN			
		0.9	0.5	-	16	19.5	0.65	-	-	370	550	-			PMG370XN		PMR370XN		
	15	5.4	1	2	12	27	13.8	-	32	40	-	-	PMN40LN						
	20	6.7	1	2.5	15	285	12.4	-	16	20	-	-	**PMN20EN**						
		5.2	1	2.5	19	140	8.6	-	17	22	-	-		**PMV22EN** [1]					
		7.4	1	2.5	33	249	12.5	-	21	26	-	-	**PMT21EN**						
		10	1	2.8	18	44	24	-	20	30	-	-	BSP030						
		6.2	1	2.5	33	134	9.6	-	23	31	-	-		**PMN25EN**					
		6	1	2.5	33	134	9.6	-	29	36	-	-	**PMT29EN**						
		3.1	1	2.5	18	78	6.5	-	28	37	-	-		**PMV37EN**					
		5.1	1	2.5	19	77	6.2	-	25	32	-	-		**PMN35EN**					
		5.4	1	2	33	44	6.1	-	31	38	-	-		PMN38EN					
		5.2	1	2	33	44	6.1	-	32	42	-	-		PMN45EN					
		5.4	1	2	12	21.5	9.4	-	35	45	-	-							
		4.6	1	2	8.4	17.8	8.8	-	40	49	-	-		PMN49EN					
		4.7	1	2	12	23.5	9.4	-	47	60	-	-							
		2.3	1	2.5	12	20	3.1	-	53	73	-	-		**PMV77EN**					
		2.1	1	2.5	11	20	2.6	-	70	90	-	-		**PMV90EN**					
		1.9	1	2.5				-		87	-	-				PMF87EN*			
		1.9	1	2	11	41	6.4	-	77	102	-	-		BSH108					
		2.5	1.5	-	12	23.5	4.6	-	74	117	-	-		PMV117EN					
		6	1	2.8	14	36	-	-	80	120	-	-	BSP100						
		1.7	1.5	-	11.5	31	4.6	-	117 [2]	190 [2]	-	-		SI2304DS					

[1] Enhanced thermal capability [2] Max values * Products to be released in 2012

Small-signal MOSFETs

Small-signal MOSFETs single (N-channel) ≥ 50 V

types in **bold** represent new products

Package									SOT223 (SC-73)		SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
																
Size (mm)									6.5 x 3.5 x 1.65		4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)									1700		1300	250	200	150	250	250
V_{DS} (V)	**V_{GS} (V)**	**I_D (A)**	**V_{GS}(th) min (V)**	**V_{GS}(th) max (V)**	**t_{on} typ (ns)**	**t_{off} typ (ns)**	**Q_G typ (nC)**	**ESD protection (kV)**	**R_{DSon} typ (mΩ) @ V_{GS} =**							
									10 V	**4.5 V**	**2.5 V**	**1.8 V**				
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 [3]	-	-		BSN20						
55	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100			BSH121			
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100		BSH111				
	13	2.5	2	4	-	-	-	2	120	-	-	-	PHT6N06T					
		3.5	1	2	-	-	-	2	-	65	-	-	PHT8N06LT					
		2.5	1	2	-	-	-	2	-	120	-	-	PHT6N06LT					
60	15	0.26	1	3.3	3	9	-	1	2800	3800	-	-			PMF3800SN			
	20	0.25	0.8	3	-	-	-	-	2500	-	-	-		PMBF170				
		0.36	0.9	1.5	5	13	0.72	-	900	1000	-	-		**BSS138P**	**BSS138PW**			
		0.36	0.48	1.6	10	58	0.6	1.5	1000	1100	1400	-		**BSS138BK**	**BSS138BKW**			
		1.22	1	3	6	7.2	1.05	-	760	1100	-	-					PMZ760SN	**PMZB790SN**
		0.57	1	-	6	7.2	-	-	780	1100	-	-			PMF780SN			
		0.55	1	3	6	7.2	1.05	-	780	1100	-	-				PMR780SN		
		0.3	1	2.5	7	15	0.6	-	1000	1300	-	-		**2N7002P**	**2N7002PW**	**2N7002PT**		
		0.3	1	2.5	11	19	0.5	2	1000	1300	-	-		**2N7002BK**	**2N7002BKW**	**2N7002BKT**	**2N7002BKM**	**2N7002BKMB**
		0.3	1	2.5	16	60	1.09	3	1100	1300	-	-		**2N7002CK**				
		0.34	1	-	3	9	-	1	2800	3800	-	-		2N7002K				
	30	0.385	1	2.5	2.5	11	0.69	-	780	1200	-	-		2N7002E				
		0.475	1	2.5	2.5	11	0.69	-	780	1200	-	-		2N7002F				
		0.3	1	2.5	2.5	11	-	-	2800	3800	-	-		2N7002				
100	16	3.5	1	2	14	73	-	-	-	200	-	-	PHT4NQ10LT					
	20	3	2	4	-	-	-	-	57	-	-	-	PHT6NQ10T					
		3.5	2	4	21	31	7.4	-	200	-	-	-	PHT4NQ10T					
		0.85	2	4	19	13	4.6	-	400	-	-	-		BSH114				
		0.15	1	2.8	3	12	-	-	3500	-	-	-		BSS123				
		0.19	1	-	3	12	-	-	-	5000	-	-		BST82				
		0.52	1	-	3	12	-	-	-	5000	-	-	BSP110					
	30	1.9	2	4	10.5	12.5	7	-	213	-	-	-		PMV213SN [1]				
200	20	0.4	0.8	2.8	6	49	-	-	1600	-	-	-				BSS87		
		0.55	0.4	2	10	45	-	-	1700	-	3000	-	BSP122					
240	20	0.375	0.8	2	6	47	-	-	2800	7500 [2]	-	-	BSP89					
250	20	0.35	0.8	2	6	47	-	-	2800	-	-	-	BSP126					
300	20	0.35	0.8	2	6	46	-	-	3700	-	4800	-	BSP130					

[1] Enhanced thermal capability
[2] Max values
[3] @ V_{gs} = 5 V

In the Spotlight

2N7002BKx - 2N7002 ESD-protected 60 V N-channel MOSFET-series in several SMD packages

- ESD protection up to 2 kV in several SMD packages
- Available in single and dual configuration
- Very fast switching
- TrenchMOS technology
- AEC-Q101 qualified

MOSFETs

Small-signal MOSFETs dual

types in **bold** represent new products

	Package									R_{DSon} typ (mΩ) @ V_{GS} =				SOT363 (SC-88)	SOT666
															
	Size (mm)													2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
	P_{tot} (mW)													300	300
	V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	10 V	4.5 V	2.5 V	1.8 V		
N-channel dual	20	8	1.2	0.4	1				-	-	130		-	PMGD130UN	
			0.87	0.45	1	14.5	23.5	0	-	-	280	-	460	PMGD280UN	
			0.8	0.5	0.95	10	117	0.45	2	-	290	420	600		**PMDT290UNE**
		12	0.86	0.5	1.5	16	17	0.72	-	-	290	460	-	PMGD290XN	
	30	8	0.71	0.45	1	11.5	22.5	0.89	-	-	400	-	580	PMGD400UN	
			0.35	0.6	1.1	26	88	0.52	2	-	1000	1400	2000	**NX3008NBKS**	**NX3008NBKV**
		12	1	0.5	1.5				-	-	175		-	PMGD175XN*	
			0.74	0.5	1.5	17	19.5	0.65	-	-	370	550	-	PMGD370XN	
		15	0.125	0.8	1.5	17	22	0.35	-	-	1800	2900	-	PMGD8000LN	
	60	20	0.36	0.9	1.5	5	13	0.72	-	900	1000	-	-	**BSS138PS**	
			0.32	0.48	1.6	10	58	0.6	1.5	1000	1100	1400	-	**BSS138BKS**	
			0.3	1	2.5	7	15	0.6	-	1000	1300	-	-	**2N7002PS**	**2N7002PV**
			0.3	1	2.5	11	19	0.5	2	1000	1300	-	-	**2N7002BKS**	**2N7002BKV**
			0.49	1		6	7.2	1.05	-	780	1100	-	-	PMGD780SN	
P-channel dual	20	8	0.55	0.5	1.3	48	152	0.76	2	-	670	1200	1800		**PMDT670UPE**
	30	8	0.2	0.6	1.1	49	103	0.55	2	-	2800	5300	-	**NX3008PBKS**	**NX3008PBKV**

* Products to be released in 2012

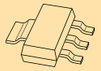
In the Spotlight

20 V, 100 mΩ P-channel enhancement mode Field-Effect Transistor (FET) – NX2301P

- Housed in a small SMD plastic package SOT23
- Very fast switching
- TrenchMOS technology
- AEC-Q101 qualified
- 1.8 V R_{DSon} rated for Low Voltage Gate Drive

Small-signal MOSFETs single (P-channel)

types in **bold** represent new products

Package									R_{DSon} typ (mΩ) @ V_{GS} =				SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	DFN1006-3 (SOT883)	DFN1006B-3 (SOT883B)
																					
Size (mm)													6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
P_{tot} (mW)													1700	1300	600	250	300	200	150	250	250
V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	10 V	4.5 V	2.5 V	1.8 V									
12	8	1.52	0.4	-	6.5	65	-	-	-	80	-	140			BSH207						
		0.75	0.4	-	6.5	65	-	-	-	180	-	420				BSH205 [1]					
20	8	5.7	0.45	0.95	39	122	21	-	-	27	36	57			**PMN27UP**						
		5/4	0.45	0.95	34	128	15.5	-	-	34	42	57			**PMN34UP**	**PMV32UP**					
								-	-	80						PMV75UP*					
		1.2	0.45	0.95	33	52	3.3	-	-	170	210	280				**PMV160UP**					
		0.48	0.5	1.3	48	152	0.76	2	-	670	1200	1800							**PMR670UPE**		**PMZB670UPE**
		2	0.5	1.1	7	50	6	-	-	100	-	-				**NX2301P**					
	12	4.8	0.55	0.95	16	117	10	-	-	48	65	-									
		4.1/3.5	0.75	1.25	24	84	8.5	-	-	48	71	-			**PMN48XP**	**PMV48XP**					
		3.9	0.55	0.95	28	101	7.6	-	-	65	90	-				PMV65XP [1]					
								-	-	80					PMN80XP*	PMV80XP*					
		2	0.65	1.15	48	64	4.8	-	-	90	125	-					**PMG85XP**				
		1	0.65	1.15	26	44	2.6	-	-	175	240	-						**PMF170XP**			
30	8	0.23	0.6	1.1	49	103	0.55	2	-	2800	5300	-				**NX3008PBK**		**NX3008PBKW**	**NX3008PBKT**		**NX3008PBKMB**
		0.47	0.4	-	6.5	65	-	-	-	660	-	1100				BSH203					
	20	3	1	2.8	20	50	-	-	220	330	-	-	BSP250								
		0.52	1	-	6.5	65	-	-	630	890	-	-				BSH202					
50	20	0.2	1.1	2.1	24	73	0.26	1	5300	6000	-	-				**BSS84AK**		**BSS84AKW**	**BSS84AKT**	**BSS84AKM**	**BSS84AKMB**
		0.13	0.8	2	3	7	-	-	6000	-	-	-				BSS84					
60	20	0.3	1	-	6.5	65	-	-	2100	2700	-	-				BSH201					
200	20	0.225	0.8	2.8	5	20	-	-	10000	-	-	-	BSP220								
240	20	0.2	0.8	2.8	5	20	-	-	10000	-	-	-		BSS192							
250	20	0.225	0.8	2.8	5	10	-	-	10000	-	-	-	BSP225								
300	20	0.21	1.95	2.8	5	15	-	-	17000 [2]	-	-	-	BSP230								

[1] Enhanced thermal capability [2] Max values * Products to be released in 2012

Small-signal MOSFET – Schottky combination

Package																DFN2020-6 (SOT1118)
Size (mm)																2.0 x 2.0 x 0.65
P_{tot} (mW)																>500
Configuration	V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	I_F (A)	V_R (V)	V_F typ. (mA)	R_{DSon} typ (mΩ) @ V_{GS} = 4.5 V	2.5 V	1.8 V	
single + schottky	20	8	3.3	0.5	1.5	15	92	4.5	1	2	30	455	58	72	100	PMFPB6545UP
			3.3	0.5	1.5	15	92	4.5	1	2.2	30	325	58	72	100	PMFPB6532UP
			3						1	2.2	30	325	80			PMFPB8045XP*
			3						1	2.2	30	325	80			PMFPB8032XP*

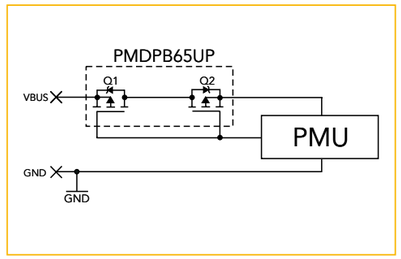
* Products to be released in 2012

Small-signal MOSFETs in new DFN2020-6 (SOT1118) dual package

Package														DFN2020-6 (SOT1118)
Size (mm)														2.0 x 2.0 x 0.65
P_{tot} (mW)														>500
Configuration	Polarity	V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	R_{DSon} typ (mΩ) @ V_{GS} = 10 V	4.5 V	2.5 V	1.8 V	
dual	P	20	8	3.3	0.5	1.5	15	92	4.5	1	-	58	72	100	PMDPB65UP
dual	N	20	8		0.4	1				-	-	28			PMDPB28UN*
dual	N	20	8	5.1	0.4	1	36	35	2	-	-	40	53	82	**PMDPB42UN**
dual	N	20	12	4	0.5	1.5	25	23	1.9	-	-	55	86	-	**PMDPB56XN**
dual	N	30	20		1	2.5				-		70	-	-	PMDPB70EN*
dual	P	20	12	4.5	0.5	1.5	28	56	8.1	-	-	55	75	-	PMDPB55XP*
dual	P	30	12		0.7	1.3				-	-	70		-	PMDPB70XP*
dual	P	20	8		0.5	1.5				-	-	80		-	PMDPB80XP*
dual	N	20	12							-	-	30		-	PMDPB30XN*
MOS+RET	P	30	12		0.7	1.3				-	-	85		-	PMC85XP*
Complementary	N	20	12							-	-	30		-	PMCPB5530X*
Complementary	P	20	12							-	-	60		-	

* Products to be released in 2012

USB OTG Vbus protection



In the Spotlight

Dual P-channel ESD protected MOSFET in small 0.65 mm flat, 2 x 2 mm leadless package (PMDPB65UP)

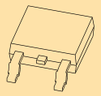
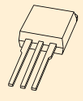
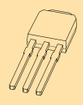
- ESD protected MOSFET of >1 kV HBM
- Very low R_{DSon} of <70 mΩ at V_{GS} = 4.5 V
- 1.8 V R_{DSon} rating for operation at low voltage gate drive levels
- Best-in-class thermal performance due to extra heatsink
- Smallest 2 x 2 mm leadless package dual P-channel; 0.65 mm package height

Small-signal MOSFETs in new DFN2020MD-6 (SOT1220) single package

Package														DFN2020MD-6 (SOT1220)
Size (mm)														2.0 x 2.0 x 0.65
P_{tot} (mW)														>1500
Polarity	V_{DS} (V)	V_{GS} (V)	I_D (A)	V_{GS}(th) min (V)	V_{GS}(th) max (V)	t_{on} typ (ns)	t_{off} typ (ns)	Q_G typ (nC)	ESD protection (kV)	R_{DSon} typ (mΩ) @ V_{GS} = 10 V	4.5 V	2.5 V	1.8 V	
Nch	20	8							-		12			PMPB12UN*
Nch	20	8							-		20			PMPB20UN*
Nch	20	12							2		10			PMPB10XNE*
Nch	20	12							-		15			PMPB15XN*
Nch	20	12							2		23			PMPB23XNE*
Nch	30	12							-		16			PMPB16XN*
Nch	30	12							2		13			PMPB13XNE*
Nch	30	12							2		29			PMPB29XNE*
Nch	30	12							-		33			PMPB33XN*
Nch	30	20							-		11			PMPB11EN*
Nch	30	20	8.5	1.1	2.2	24	11	7.2	-	16	20			PMPB20EN*
Nch	60	16							-		40			PMPB40SNA*
Pch	12	12							-		15			PMPB15XP*
Pch	20	12							-		19			PMPB19XP*
Pch	20	12							-		33			PMPB33XP*
Pch	20	12							2		20			PMPB20XPE*
Pch	20	12							2		29			PMPB29XPE*
Pch	20	12							2		43			PMPB43XPE*
Pch	30	12							-		47			PMPB47XP*
Pch	30	20							-		27			PMPB27XP*
Pch	30	20							-		48			PMPB48EP*

* Products to be released in 2012

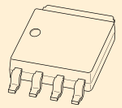
Power MOSFETs (N-channel) – Part 1

Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
D²PAK (SOT404) 	PHB66NQ03LT	25	10.5	-	66
	PHB191NQ06LT	55	3.7	4.4	75
	PHB21N06LT	55	70	-	19
	PHB20N06T	55	75	-	20.3
	PSMN004-60B	60	3.6	-	75
	PHB32N06LT	60	37	43	34
	PSMN005-75B	75	5	-	75
	PSMN008-75B	75	8.5	-	75
	PHB110NQ08T	75	9	-	75
	PHB29N08T	75	-	-	27
	PSMN009-100B	100	8.8	-	75
	PSMN015-100B	100	15	-	75
	PHB45NQ10T	100	25	-	47
	PHB47NQ10T	100	28	-	47
	PHB27NQ10T	100	50	-	28
	PHB18NQ10T	100	90	-	18
	PSMN030-150B	150	30	-	55.5
	PSMN035-150B	150	35	-	50
	PHB45NQ15T	150	42	-	45.1
	PSMN057-200B	200	57	-	39
	PSMN070-200B	200	70	-	35
	PHB33NQ20T	200	77	-	32.7
	PHB20NQ20T	200	130	-	20
DPAK (SOT428) 	PHD38N02LT	20	-	-	44.7
	PHD97NQ03LT	25	6.3	10.6	75
	PHD101NQ03LT	30	5.5	-	75
	PHD71NQ03LT	30	10	-	75
	PHD20N06T	55	77	-	18
	PSMN025-100D	100	25	-	47
	PSMN063-150D	150	63	-	29
	PSMN130-200D	200	130	-	20
	PHD9NQ20T	200	400	-	8.7
I²PAK (SOT226) 	PSMN1R1-30EL	30	1.3	1.4	120
	PSMN1R5-40ES	40	1.6	-	120
	PSMN2R0-60ES	60	2.2	-	120
	PSMN3R0-60ES	60	3	-	100
	PSMN3R3-80ES	80	3.3	-	120
	PSMN3R5-80ES	80	3.5	-	120
	PSMN4R3-80ES	80	4.3	-	120
	PSMN4R3-100ES	100	4.3	-	120
	PSMN5R0-100ES	100	5	-	120
	PSMN7R0-100ES	100	6.8	-	100
	PSMN013-100ES	100	13.9	-	68
IPAK (SOT533) 	PHU97NQ03LT	25	6.6	10.9	75

Power MOSFETs (N-channel) – Part 2

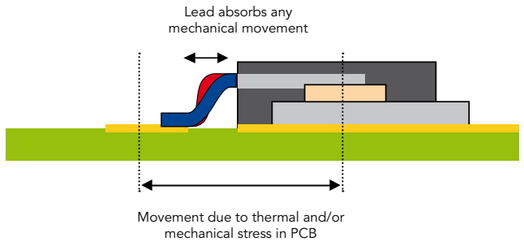
Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
DFN3333-8 (SOT873-1) 	PSMN3R5-30LL	30	3.6	5.6	40
	PSMN3R8-30LL	30	3.7	5.8	40
	PSMN5R8-30LL	30	5.8	8	40
	PSMN9R0-30LL	30	9	13	21
	PSMN013-30LL	30	13	19	21
	PSMN017-30LL	30	17	25	15
	PSMN7R0-40LS	40	7	-	40
	PSMN014-60LS	60	14	-	40
	PSMN023-80LS	80	23	-	34
	PSMN035-100LS	100	32	-	27
	PML260SN	200	294	-	8.8
	PML340SN	220	386	-	7.3
SO8 (SOT96) 	PHKD6N02LT	20	-	-	10.9
	PSMN006-20K	20	-	5	32
	PHK31NQ03LT	30	4.4	5.6	30.4
	PSMN005-30K	30	5.5	8	
	PHK28NQ03LT	30	6.5	7.7	23.7
	PHK18NQ03LT	30	8.9	12.5	20.3
	SI4410DY	30	13.5	20	10
	PHK13N03LT	30	20	26	13.8
	PHKD13N03LT	30	20	26	10.4
	PHN203	30	30	55	6.3
	PHN210T	30	100	200	3.4
	PHK12NQ03LT	30	-	14	11.8
	PHK12NQ10T	100	28	-	11.6
	PSMN038-100K	100	38	-	-
	PHKD3NQ10T	100	90	-	3
	PHK5NQ15T	150	75	-	5
	PSMN085-150K	150	85	-	-
	PSMN165-200K	200	165	-	-

Power MOSFETs (N-channel) – Part 3

Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
Power-SO8 (LFPAK) 	PH3120L	20	2.65	3.7	100
	PH2520U	20	-	2.7	100
	PSMN0R9-25YLC	25	0.99	1.25	100
	PSMN1R1-25YLC	25	1.15	1.5	100
	PSMN1R2-25YL	25	1.2	1.85	100
	PSMN1R2-25YLC	25	1.3	1.7	100
	PSMN1R5-25YL	25	1.5	2.2	100
	PSMN1R7-25YLC	25	1.9	2.5	100
	PSMN1R9-25YLC	25	2.05	2.7	100
	PSMN2R2-25YLC	25	2.4	3.15	100
	PSMN2R9-25YLC	25	3.15	4.1	100
	PSMN3R2-25YLC	25	3.4	4.45	100
	PSMN3R7-25YLC	25	3.9	5.1	97
	PSMN4R0-25YLC	25	4.5	5.8	84
	PSMN6R0-25YLB	25	6.1	7.9	73
	PSMN6R5-25YLC	25	6.5	8.5	64
	PSMN7R5-25YLC	25	7.4	9.8	56
	PSMN9R0-25YLC	25	9.1	12.3	46
	PSMN010-25YLC	25	10.6	14	39
	PSMN012-25YLC	25	12.6	16.6	33
	PH2925U	25	-	3	100
	PSMN1R0-30YLC	30	1.15	1.4	100
	PSMN1R2-30YLC	30	1.25	1.65	100
	PSMN1R3-30YL	30	1.3	1.95	100
	PSMN1R5-30YL	30	1.5	1.9	100
	PSMN1R5-30YLC	30	1.55	2.05	100
	PSMN1R7-30YL	30	1.7	2.1	100
	PSMN2R0-30YL	30	2	2.63	100
	PSMN2R2-30YLC	30	2.15	2.8	100
	PSMN2R5-30YL	30	2.4	3.16	100
	PSMN2R6-30YLC	30	2.8	3.65	100
	PSMN3R0-30YL	30	3	4.04	100
	PSMN3R2-30YLC	30	3.5	4.55	100
	PSMN3R5-30YL	30	3.5	4.61	100
	PSMN3R7-30YLC	30	3.95	5.15	100
	PSMN4R0-30YL	30	4	5.25	100
	PSMN4R1-30YLC	30	4.35	5.7	92
	PSMN4R5-30YLC	30	4.8	6.1	84
	PSMN5R0-30YL	30	5	6.7	91

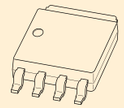
LFPAK for mechanical & thermal ruggedness

NXP LFPAK



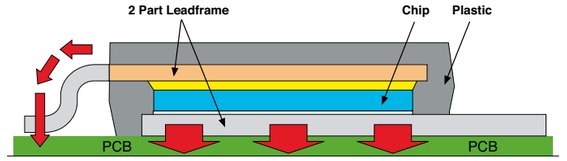
LFPAK pins provide compliance and allow for thermal expansion due to temperature difference between the MOSFET & PCB and also mechanical strain due to PCB bending & flexing

Power MOSFETs (N-channel) – Part 4

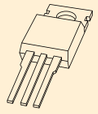
Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
Power-SO8 (LFPAK) 	PSMN6R0-30YL	30	6	7.87	79
	PSMN5R9-30YL	30	6.1	9	78
	PSMN6R0-30YLB	30	6.5	8.1	71
	PSMN7R0-30YL	30	7	9.1	76
	PSMN7R0-30YLC	30	7.1	8.9	61
	PSMN8R0-30YLC	30	7.9	10	54
	PSMN9R0-30YL	30	8	11.03	61
	PSMN8R0-30YL	30	8.3	12.2	62
	PSMN9R1-30YL	30	9.1	13.6	57
	PSMN9R5-30YLC	30	9.8	12.1	44
	PSMN011-30YL	30	10.7	16.1	51
	PSMN011-30YLC	30	11.6	14.5	37
	PSMN013-30YLC	30	13.6	16.9	32
	PSMN2R6-40YS	40	2.8	-	100
	PSMN3R3-40YS	40	3.3	-	100
	PSMN4R0-40YS	40	4.2	-	100
	PSMN5R8-40YS	40	5.7	-	90
	PSMN8R3-40YS	40	8.6	-	70
	PSMN014-40YS	40	14	-	46
	PSMN5R5-60YS	60	5.2	-	100
	PSMN7R0-60YS	60	6.4	-	89
	PSMN8R5-60YS	60	8	-	76
	PSMN012-60YS	60	11.1	-	59
	PSMN017-60YS	60	15.7	-	44
	PSMN030-60YS	60	24.7	-	29
	PSMN8R2-80YS	80	8.5	-	82
	PSMN011-80YS	80	11	-	67
	PSMN013-80YS	80	12.9	-	60
	PSMN018-80YS	80	18	-	45
	PSMN026-80YS	80	27.5	-	34
	PSMN045-80YS	80	45	-	24
	PSMN012-100YS	100	12	-	60
	PSMN016-100YS	100	16.3	-	51
	PSMN020-100YS	100	20.5	-	43
	PSMN028-100YS	100	27.5	-	42
	PSMN039-100YS	100	39.5	-	28.1
	PSMN069-100YS	100	72.4	-	17
	PSMN059-150Y	150	59	-	43
	PSMN102-200Y	200	102	-	21.5

Power-SO8 (LFPAK) Design

- Low Thermal resistance
- Low Electrical resistance
- Low Inductance



Power MOSFETs (N-channel) – Part 5

Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
TO-220AB (SOT78) 	PSMN1R1-30PL	30	1.3	1.4	120
	PSMN1R6-30PL	30	1.7	2.1	100
	PSMN1R8-30PL	30	1.8	2.3	100
	PSMN2R0-30PL	30	2.1	2.8	100
	PSMN2R7-30PL	30	2.7	3.6	100
	PSMN3R4-30PL	30	3.4	4.1	100
	PSMN4R3-30PL	30	4.3	6.2	100
	PSMN022-30PL	30	22	34	30
	PSMN1R5-40PS	40	1.6	-	120
	PSMN2R2-40PS	40	2.1	-	100
	PSMN2R8-40PS	40	2.8	-	100
	PSMN4R5-40PS	40	4.6	-	100
	PSMN8R0-40PS	40	7.6	-	77
	PHP191NQ06LT	55	3.7	4.4	75
	PHP20N06T	55	75	-	20.3
	PSMN2R0-60PS	60	2.2	-	120
	PSMN3R0-60PS	60	3	-	100
	PSMN4R6-60PS	60	4.6	-	100
	PSMN7R6-60PS	60	7.8	-	92
	PSMN015-60PS	60	14.8	-	50
	PHP79NQ08LT	75	16	18	73
	PHP29N08T	75	-	-	27
	PSMN3R3-80PS	80	3.3	-	120
	PSMN3R5-80PS	80	3.5	-	120
	PSMN4R4-80PS	80	4.1	-	100
	PSMN4R3-80PS	80	4.3	-	120
	PSMN5R0-80PS	80	4.7	-	100
	PSMN6R5-80PS	80	6.9	-	100
	PSMN8R7-80PS	80	8.7	-	90
	PSMN012-80PS	80	11	-	74
	PSMN017-80PS	80	17	-	50
	PSMN050-80PS	80	46	-	22
	PSMN4R3-100PS	100	4.3	-	120
	PSMN5R0-100PS	100	5	-	120
	PSMN5R6-100PS	100	5.6	-	100
	PSMN7R0-100PS	100	6.8	-	100
	PSMN009-100P	100	8.8	-	75
	PSMN9R5-100PS	100	9.6	-	89
	PSMN013-100PS	100	13.9	-	68
	PSMN015-100P	100	15	-	75
	PSMN016-100PS	100	16	-	57
	PHP45NQ10T	100	25	-	47
	PSMN027-100PS	100	26.8	-	37
	PSMN034-100PS	100	34.5	-	32
	PHP18NQ10T	100	90	-	18
	PHP45NQ11T	105	25	-	47
	PSMN015-110P	110	15	-	75
	PHP27NQ11T	110	50	-	27.6
	PHP23NQ11T	110	70	-	23
	PHP18NQ11T	110	90	-	18
	PSMN030-150P	150	30	-	55.5
	PSMN035-150P	150	35	-	50
	PHP30NQ15T	150	63	-	29
	PHP28NQ15T	150	65	-	28.5
	PSMN057-200P	200	57	-	39
	PSMN070-200P	200	70	-	35
	PHP33NQ20T	200	77	-	32.7
	PHP20NQ20T	200	130	-	20
	PHP9NQ20T	200	400	-	8.7

P-channel MOSFETs

Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)	I_D [max] (A)
SO8 (SOT96) 	PMK30EP	-30	19	30	-14.9
	PMK35EP	-30	19	35	-14.9
	PHP225	-30	250	400	-
	PMK50XP	-20	-	50	-7.9
	PHK04P02T	-16	-	120	-4.66

For the most up to date product information, please visit **http://standardproducts.nxp.com/mosfets**

Multi-chip MOSFETs

Package	Typenumber	V_{DS} [max] (V)	R_{DSon} [max] @ V_{GS} = 10 V (mΩ)	R_{DSon} [max] @ V_{GS} = 4.5 V (mΩ)
SO8 (SOT96) 	PHC21025	30	250	400
	PHC2300	300	6000	-

For the most up to date product information, please visit **http://standardproducts.nxp.com/mosfets**

TrenchMOS - PH types part numbering

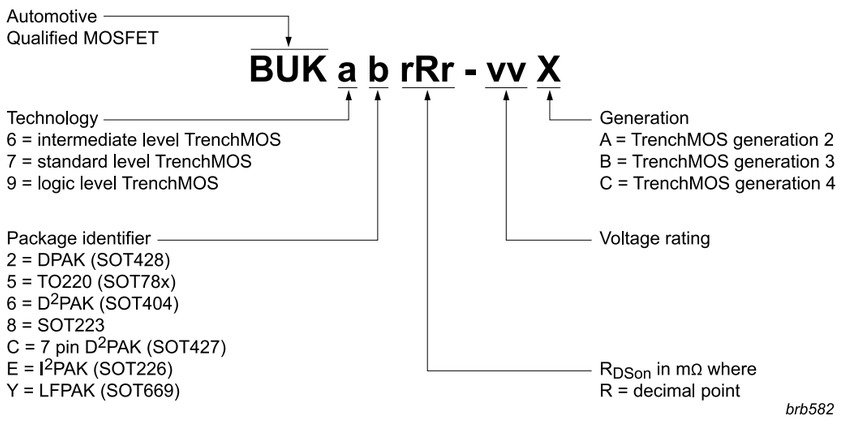
P	H	P	4	4	N	Q	0	3	L	T
MOSFET Brand name		Package type	Current rating I_D (A)		MOSFET type N-ch or P-ch	Q-Trench	MOSFET voltage V_{DSS}		Gate threshold voltage	Trench MOS
PH		B = D^2PAK	44 = 44 A		N = N-ch	Q = low gate charge Q_{GD}	02 = 20 V		'Blank' = Standard level	T = Trench
PH		D = DPAK	33 = 33 A		P = P-ch		03 = 25 - 30 V		L = logic level	
PH		P = TO220AB	20 = 20 A				06 = 55 - 60 V			
PH		T = SOT223	12 = 12 A				08 = 75 - 80 V			
PH		X = SOT186A (isolated TO220AB)					10 = 100 V			
PH		K = SO8					11 = 110 V			
PH		KD = Dual SO8					15 = 150 V			

30 V N-channel Automotive TrenchMOS

types in **bold** represent new products

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK-7 (SOT427)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)
									
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1
1.6	2.5	120	0.49				**BUK661R6-30C**		
1.8	-	100	0.45				BUK761R8-30C		
1.9	2.8	120	0.57				**BUK661R8-30C**		
2.2	3	120	0.45	**BUK652R0-30C**	**BUK6E2R0-30C**				
2.4	2.8	75	0.5	BUK952R8-30B			BUK962R8-30B		
2.4	3	120	0.59	**BUK652R1-30C**					
2.7	-	75	0.5	BUK752R7-30B	BUK7E2R7-30B		BUK762R7-30B		
2.8	3.9	100	0.74				**BUK662R5-30C**		
3.0	4.0	75	0.59		BUK9E04-30B				
3.3	4.4	100	0.74	**BUK653R3-30C**					
3.4	-	75	0.59	BUK753R4-30B			BUK763R4-30B		
3.8	5.8	100	0.95	**BUK653R7-30C**					
3.9	5.2	100	0.95				**BUK663R5-30C**		
4.5	6	90	0.95					**BUK624R5-30C**	
4.5	-	75	0.95					BUK724R5-30C	
4.6	5	75	0.65	BUK9505-30A			BUK9605-30A		
5	7	75	0.95	BUK9507-30B			BUK9607-30B	BUK9207-30B	
5.2	7.5	90	1.17					**BUK625R2-30C**	
6	7	75	1.42						**BUK9Y07-30B**
7	-	75	1.42						**BUK7Y07-30B**
7	-	75	0.95	BUK7507-30B			BUK7607-30B	BUK7207-30B	
9	11	59	2						BUK9Y11-30B
9.8	15	50	1.87					**BUK6209-30C**	
10	-	67	1.76						**BUK7Y10-30B**
11	13	75	1					BUK9213-30A	
12	14	63	1.4					BUK9214-30A	
13	-	55	1.4					BUK6213-30A	
14	22	37	2.52					**BUK6213-30C**	
19	22	37	2.53						**BUK9Y22-30B**
20	-	39	2.53						**BUK7Y20-30B**

Automotive TrenchMOS Part Numbering



40 V N-channel Automotive TrenchMOS

types in **bold** represent new products
types in ***bold italic underline*** represent products in development

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK-7 (SOT427)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)
									
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1
1.44	2.1	220	0.48			***BUK6C1R5-40C***			
1.9	2.6	120	0.45				**BUK661R9-40C**		
2	-	100	0.45				BUK762R0-40C		
2.3	3.1	120	0.45	**BUK652R3-40C**	**BUK6E2R3-40C**				
2.3	3.2	120	0.59				**BUK662R4-40C**		
2.3	-	100	0.45	BUK752R3-40C	BUK7E2R3-40C				
2.7	3.8	120	0.59	**BUK652R6-40C**					
2.8	3.2	100	0.5	BUK953R2-40B	BUK9E3R2-40B		BUK963R2-40B		
3.1	-	75	0.5	BUK753R1-40B			BUK763R1-40B		
3.2	4.8	100	0.74				**BUK663R2-40C**		
3.6	5.3	100	0.74	**BUK653R4-40C**	**BUK6E3R4-40C**				
3.6	-	100	0.74				**BUK763R6-40C**		
4	4.4	75	0.5	BUK9504-40A	BUK9E04-40A		BUK9604-40A		
4	4.4	75	0.59	BUK954R4-40B	BUK9E4R4-40B		BUK964R4-40B		
4	-	100	0.74	**BUK754R0-40C**					
4	-	75	0.74						
4.3	-	75	0.59	BUK754R3-40B			BUK764R3-40B		
4.5	-	75	0.5	BUK7504-40A	BUK7E04-40A		BUK7604-40A		
4.6	6.1	100	0.95				**BUK664R6-40C**		
4.8	6.5	100	0.95	**BUK654R8-40C**					
5.0	6.4	75	0.74	BUK9506-40B			BUK9606-40B		
5.0	6.9	90	0.95					**BUK625R0-40C**	
5.0	-	75	0.95					**BUK725R0-40C**	
5.2	-	75	0.74	BUK755R2-40B			BUK765R2-40B		
6.2	8.8	90	1.17					**BUK626R2-40C**	
7	9	75	0.95	BUK9509-40B			BUK9609-40B	BUK9209-40B	
7	-	75	0.95						
8	9	75	1.42						**BUK9Y09-40B**
8	-	75	0.95	BUK7508-40B			BUK7608-40B		
8	-	75	1.42						**BUK7Y08-40B**
8	-	75	0.95					BUK7208-40B	
11	14	56	1.8						BUK9Y14-40B
11.2	16.3	50	1.87					**BUK6212-40C**	
13	-	58	1.8						BUK7Y13-40B
16	23	42	2.52					**BUK6218-40C**	
24	27	34	2.53						**BUK9Y27-40B**
25	-	35	2.53						**BUK7Y25-40B**

55 V N-channel Automotive TrenchMOS

types in **bold** represent new products

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK-7 (SOT427)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)	SC-73 (SOT223)
										
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1	6.5 x 3.5 x 1.65
2.41	-	170	0.48			**BUK6C2R1-55C**				
2.7	3.8	120	0.45				**BUK662R7-55C**			
3.2	4.2	120	0.45	**BUK653R2-55C**	**BUK6E3R2-55C**					
3.4	4.3	120	0.59	**BUK653R5-55C**			**BUK663R5-55C**			
3.7	4.2	75	0.5	BUK954R2-55B			BUK964R2-55B			
4	-	75	0.5				BUK764R0-55B			
4	-	75	0.5	BUK754R0-55B						
4.9	6.6	100	0.74				**BUK664R4-55C**			
5.4	6	75	0.58	BUK9506-55B	BUK9E06-55B		BUK9606-55B			
5.4	7	92.6	0.74	**BUK654R6-55C**						
5.8	6.3	75	0.58		BUK9E06-55A		BUK9606-55A			
6	-	75	0.59	BUK7506-55B			BUK7606-55B			
6.3	-	75	0.5	BUK7506-55A			BUK7606-55A			
6.5	8.7	100	0.95				**BUK6607-55C**			
7	8.4	75	0.74	BUK9508-55B	BUK9E08-55B		BUK9608-55B			
7	9	72	0.95	**BUK6507-55C**						
7.1	-	75	0.74	BUK7507-55B	BUK7E07-55B		BUK7607-55B			
7.5	8	75	0.59				BUK9608-55A			
7.8	10	90	0.95					**BUK6207-55C**		
8	9	75	0.71				BUK9609-55A			
8	-	75	0.59	BUK7508-55A			BUK7608-55A			
9	10	75	0.75	BUK9510-55A			BUK9610-55A			
9	-	75	0.71	BUK7509-55A			BUK7609-55A			
9.6	13.2	78	1.17					**BUK6210-55C**		
10	11	75	0.9	BUK9511-55A			BUK9611-55A			
10	12	75	0.95	BUK9512-55B			BUK9612-55B	BUK9212-55B		
10	-	75	0.5	BUK7510-55AL			BUK7610-55AL	BUK7210-55B		
11	12	65	1.42						**BUK9Y12-55B**	
11	-	75	0.95	BUK7511-55B	BUK7E11-55B		BUK7611-55B			
12	-	75	0.95					BUK7212-55B		
12	-	64	1.42						**BUK7Y12-55B**	
13	14	73	1	BUK9514-55A			BUK9614-55A			
13.6	15	62	1.3					BUK9215-55A		
14	-	73	0.9	BUK7514-55A			BUK7614-55A			
15	16	66	1.1	BUK9516-55A						
15	-	62	1.3					BUK7215-55A		
16	18	61	1.1	BUK9518-55A			BUK9618-55A			
16	-	65	1.1	BUK7516-55A						
17	19	46	1.8						BUK9Y19-55B	

55 V N-channel Automotive TrenchMOS

types in **bold** represent new products
types in ***bold italic underline*** represent products in development

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK-7 (SOT427)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)	SC-73 (SOT223)
										
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1	6.5 x 3.5 x 1.65
17.6	19	55	1.3					BUK9219-55A		
18	20	54	1.2	BUK9520-55A			BUK9620-55A			
18	-	47	1.76						**BUK7Y18-55B**	
19	24.5	44	1.87					**BUK6217-55C**		
19	-	55	1.3					BUK7219-55A		
20	22	48	1.5					BUK9222-55A		
20	-	54	1.2	BUK7520-55A			BUK7620-55A			
21.7	24	46	1.4	BUK9524-55A			BUK9624-55A			
22	25	43	1.6					BUK9225-55A		
22	-	48	1.5					BUK7222-55A		
25	28	42	1.56				BUK9628-55A			
25	-	43	1.6					BUK7225-55A		
27	30	38	1.7					BUK9230-55A		
28	-	42	1.5	BUK7528-55A			BUK7628-55A			
29	32	12	15							BUK9832-55A
29	38	31	2.52					**BUK6228-55C**		
30	-	38	1.7					BUK7230-55A		
32	35	34	1.8	BUK9535-55A			BUK9635-55A			
33	37	32	1.94					BUK9237-55A		
35	-	35	1.75	BUK7535-55A			BUK7635-55A			
35	-	28	2.53						**BUK7Y35-55B**	
36	40	26	2.5						BUK9Y40-55B	
37	-	32	1.9					BUK7237-55A		
40	45	28	2.1					BUK9245-55A		
68	75	20	2.4	BUK9575-55A			BUK9675-55A			
69	77	18	3					BUK9277-55A		
73	80	7	15							BUK9880-55A
75	-	20	2.4	BUK7575-55A			BUK7675-55A			
77	-	18	2.9					BUK7277-55A		
80	-	7	15							BUK7880-55A
125	140	11	4.1					BUK92150-55A		
137	150	13	2.8	BUK95150-55A						
137	150	5.5	15							BUK98150-55A
150	-	11	4.1	BUK75150-55A				BUK72150-55A		
150	-	5.5	15							BUK78150-55A

75 V N-channel Automotive TrenchMOS

types in **bold** represent new products

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK-7 (SOT427)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)
									
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1
3.56	-	140	0.48			**BUK6C3R3-75C**			
4.0	5.3	120	0.45				**BUK663R7-75C**		
4.0	-	100	0.45				BUK764R0-75C		
4.2	5.3	120	0.45	**BUK654R0-75C**	**BUK6E4R0-75C**				
4.3	-	100	0.45	BUK754R3-75C	BUK7E4R3-75C				
5.0	6.3	120	0.59				**BUK664R8-75C**		
5.3	6.5	120	0.59	**BUK655R0-75C**					
5.5	6.1	75	0.5	BUK9506-75B			BUK9606-75B		
5.6	-	75	0.5	BUK7506-75B			BUK7606-75B		
7.6	9.1	100	0.74	**BUK6507-75C**			**BUK6607-75C**		
8.5	9	75	0.65	BUK9509-75A			BUK9609-75A		
9.0	-	75	0.65	BUK7509-75A			BUK7609-75A		
10.4	12.4	77	0.95	**BUK6510-75C**			**BUK6610-75C**		
11	13.2	74	0.95					**BUK6211-75C**	
13	-	75	0.95	BUK7513-75B			BUK7613-75B		
14	16.4	67	0.95	BUK9516-75B			BUK9616-75B		
14	-	70	0.95					BUK7214-75B	
15	17	64	0.95					BUK9217-75B	
15	18	57	1.17					**BUK6215-75C**	
18	19	48	1.42						**BUK9Y19-75B**
18	-	49	1.42						**BUK7Y18-75B**
22	23	53	1.1	BUK9523-75A			BUK9623-75A		
23	-	53	1.1	BUK7523-75A			BUK7623-75A		
24.6	26	45	1.3					BUK9226-75A	
26	-	45	1					BUK7226-75A	
28	30	34	1.8						BUK9Y30-75B
28	-	35	1.76						**BUK7Y28-75B**
29	35	33	1.87					**BUK6226-75C**	
46	56	16	2.52					**BUK6246-75C**	
53	58	20	2.53						**BUK9Y58-75B**
54	-	21	2.53						**BUK7Y54-75B**

100 V N-channel Automotive TrenchMOS

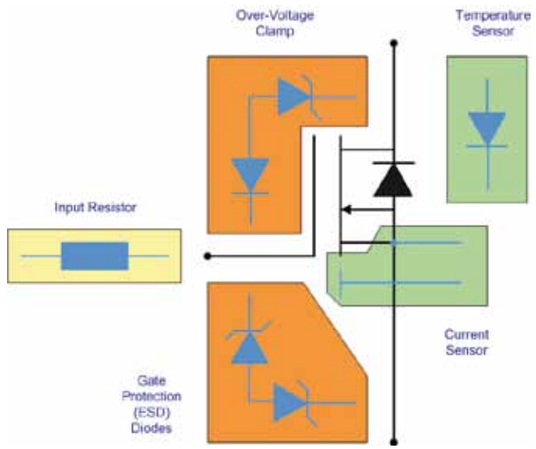
types in **bold** represent new products

R_{DSon} [max] @ 10 V [mΩ]	R_{DSon} [max] @ 5 V [mΩ]	I_D [max] @ 25 °C [A]	$R_{th(j-mb)}$ [max] [K/W]	3-lead TO-220AB (SOT78A)	I²PAK (SOT226)	D²PAK (SOT404)	DPAK (SOT428)	LFPAK (SOT669)	SC-73 (SOT223)
									
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 x 1.1	6.5 x 3.5 x 1.65
9.7	10	75	0.5	BUK9510-100B		BUK9610-100B			
10	-	75	0.5	BUK7510-100B		BUK7610-100B			
14.4	15	75	0.65	BUK9515-100A		BUK9615-100A			
15	-	75	0.65	BUK7515-100A					
18.5	20	63	0.75	BUK9520-100B		BUK9620-100B			
19	20	63	0.75	BUK9520-100A					
19	-	64	0.75			BUK7619-100B			
20	-	63	0.75	BUK7520-100A		BUK7620-100A			
26	-	49	0.95	BUK7526-100B		BUK7626-100B			
27	28	49	0.9			BUK9628-100A			
27	29	46	0.95	BUK9529-100B		BUK9629-100B			
27	-	48	0.95				BUK7227-100B		
28	30	47	0.95				BUK9230-100B		
28	-	47	0.9	BUK7528-100A		BUK7628-100A			
34	35	41	1	BUK9535-100A		BUK9635-100A			
35	-	41	1	BUK7535-100A		BUK7635-100A			
38.6	40	33	1.3				BUK9240-100A		
39	40	39	0.95			BUK9640-100A			
40	-	37	1.1	BUK7540-100A		BUK7640-100A			
40	-	34	1.3				BUK7240-100A		
49	53	23	2					BUK9Y53-100B	
53	-	24	1.76					**BUK7Y53-100B**	
58	60	26	1.4			BUK9660-100A			
60	-	26	1.4			BUK7660-100A			
72	75	23	1.5	BUK9575-100A		BUK9675-100A			
72	75	21	1.7				BUK9275-100A		
72	75	7	15						BUK9875-100A
75	-	23	1.5	BUK7575-100A		BUK7675-100A			
75	-	21	1.7				BUK7275-100A		
99	104	14	2.53					**BUK9Y104-100B**	
102	-	15	2.53					**BUK7Y102-100B**	
173	180	11	2.8	BUK95180-100A		BUK96180-100A			
173	180	4.6	15						BUK98180-100A

TrenchPLUS MOSFETs

TrenchPLUS is a range of standard MOSFETs with additional protection features, such as current and temperature sensing components, overvoltage clamps, and gate protection (ESD) diodes. The system microcontroller can use data gathered from these sensors to implement cost-effective protection features, thus eliminating the need to design with protected power devices. All the standard products listed below offer one or more "PLUS" features. Custom versions can be developed for high-volume applications.

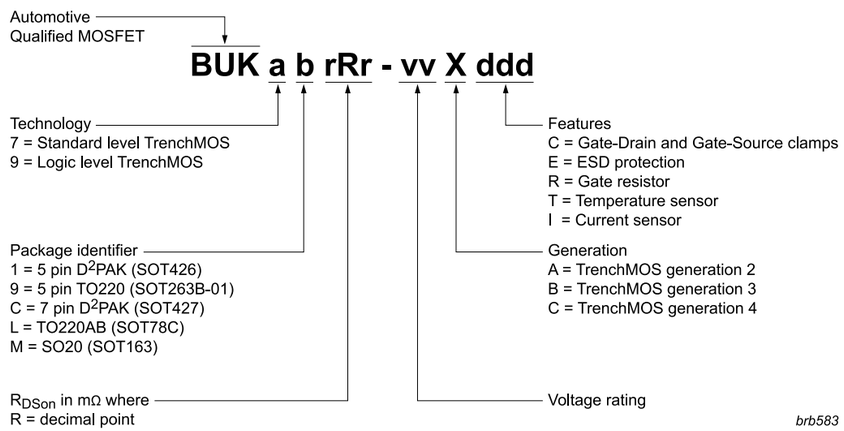
V_{DS} (V)	R_{DSon} (max) @ 10 V (mΩ)	R_{DSon} (max) @ 5 V (mΩ)	I_D (max) @ 25 °C (A)	Temp Sense	Gate Source Clamps	Gate Drain Clamps	Current Sensing	Gate Resistor	Surface Mount Package			Leaded Package	
									7-pin D²PAK (SOT427)	5-pin D²PAK (SOT426)	SO20 (SOT163)	TO220AB (SOT78C)	5-pin TO220 (SOT263B-01)
													
									11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	13.0 x 7.5 x 2.65	15.0 x 10.0 x 4.5	15.0 x 10.0 x 4.5
34	3.3		75		✓	✓		✓				BUK7L3R3-34BRC	
34	6		75		✓	✓		✓				BUK7L06-34ARC	
34	11		75		✓	✓		✓				BUK7L11-34ARC	
40	4.1		75	✓						BUK714R1-40BT			BUK794R1-40BT
40	5		75		✓		✓			BUK7105-40AIE			BUK7905-40AIE
40	5		75	✓	✓					BUK7105-40ATE			BUK7905-40ATE
40	5		75				✓						BUK7905-40AI
40	6		75	✓	✓		✓		BUK7C06-40AITE				
40	6.6	7	75	✓	✓	✓				BUK9107-40ATC			BUK9907-40ATC
40	7		75	✓	✓	✓				BUK7107-40ATC			BUK7907-40ATC
40	8		75		✓		✓			BUK7108-40AIE			BUK7908-40AIE
55	6.6	7	75	✓	✓					BUK9107-55ATE			BUK9907-55ATE
55	7		75		✓		✓			BUK7107-55AIE			BUK7907-55AIE
55	7		75	✓	✓					BUK7107-55ATE			BUK7907-55ATE
55	8		75	✓	✓		✓		BUK7C08-55AITE				
55	9	10	75	✓			✓		BUK9C10-55BIT				



TrenchPLUS MOSFETs

V_{DS} (V)	R_{DSon} (max) @ 10 V (mΩ)	R_{DSon} (max) @ 5 V (mΩ)	I_D (max) @ 25 °C (A)	Temp Sense	Gate Source Clamps	Gate Drain Clamps	Current Sensing	Gate Resistor	Surface Mount Package			Leaded Package	
									7-pin D²PAK (SOT427)	5-pin D²PAK (SOT426)	SO20 (SOT163)	TO220AB (SOT78C)	5-pin TO220 (SOT263B-01)
													
									11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	13.0 x 7.5 x 2.65	15.0 x 10.0 x 4.5	15.0 x 10.0 x 4.5
55	9+23	10+25	17+9	✓			✓				BUK9MGP-55PTS		
55	14+14	15+15	13+13	✓			✓				BUK9MJJ-55PSS		
55	14+14	15+15	13+13	✓			✓				BUK9MJJ-55PTT		
55	14+90	15+100	13+4	✓			✓				BUK9MJT-55PRF		
55	23+23	25 + 25	9+9	✓			✓				BUK9MPP-55PRR		
55	27+27	30+30	8+8	✓			✓				BUK9MMM-55PNN		
55	45+45	50+50	6+6	✓			✓				BUK9MLL-55PLL		
55	56+56	65+65	5+5	✓			✓				BUK9MRR-55PGG		
65	6.5	7	75	✓			✓		BUK9C07-65BIT				
65	9.2	10	75	✓			✓		BUK9C10-65BIT				
65	11+11	12+12	15+15	✓			✓				BUK9MHH-65PNN		
65	13+13	14+14	13+13	✓			✓				BUK9MFF-65PSS		
65	16+16	17+17	11+11	✓			✓				BUK9MJJ-65PLL		
65	25+25	27+27	8+8	✓			✓				BUK9MPP-65PLL		
65	33+33	36+36	7+7	✓			✓				BUK9MNN-65PKK		
65	61+61	67+67	5+5	✓			✓				BUK9MRR-65PKK		
65	90+90	100+100	4+4	✓			✓				BUK9MTT-65PBB		
75	7		75	✓	✓					BUK7109-75ATE			BUK7909-75ATE
75	9		75		✓		✓			BUK7109-75AIE			BUK7909-75AIE
75	10		75	✓	✓		✓		BUK7C10-75AITE				

Automotive TrenchPLUS Part Numbering



Thyristors

AC Thyristor Triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT78 (TO220AB)	SOT186A	SOT226 (I^2PAK)	SOT404 (D^2PAK)	SOT428 (DPAK)
2	800	E		**ACTT2X**			**ACTT2S**
6	800	E	**ACTT6**	**ACTT6X**	**ACTT6G**	**ACTT6B**	

I_{GT} key:
E 10 mA

AC Thyristor Triacs part numbering

Type number — V_{DRM} (V)

ACTT6X-800E

Gate sensitivity I_{GT}max
E = 10, 10, 10 mA

Package identifier
- = TO220AB (SOT78)
X = SOT186A (isolated TO220AB)
G = I^2PAK (SOT226)
B = D^2PAK (SOT404)
S = DPAK (SOT428)

AC Thyristors

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT223	SO8
0.2	600	D			**ACT102H**
0.8	600	D	**ACT108**	**ACT108W**	
	600	E	ACT108	ACT108W	

I_{GT} key:
D 5 mA
E 10 mA

AC Thyristors part numbering

Type number — V_{DRM} (V)

ACT108W-600E

Package identifier
- = TO92 (SOT54)
W = SOT223
H = SO8

Gate sensitivity I_{GT}max
E = 10, 10 mA

3-quadrant triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT404 (D^2PAK)	SOT428 (DPAK)
0.8	600	D					**BTA2008W**		
	600 / 800	D/E	BTA2008						
1	600 / 800	B/E/ER	BTA201						
	600 / 800	E					BTA201W		
	600	B/C/D/E/F					BTA204W*		
	800	C/E					BTA204W*		
2	600 / 800	D/E				BTA202X			
4	600	B/C/D/E/F		BTA204		BTA204X			BTA204S
	800	B/C/E		BTA204		BTA204X			BTA204S
	1000	C				**BTA204X**			**BTA204S**
6	800	CT/ET		**BTA206**		**BTA206X**			
8	600	B/D/E/F		BTA208		BTA208X			BTA208S
	800	B/E/F		BTA208		BTA208X			BTA208S
	1000	B				BTA208X			
	1000	C				BTA208X		BTA208B	
	1000	C0				BTA208X			
12	600	D		BTA312		BTA312X		BTA312B	
	600	CT		BTA312				BTA312B	
	600 / 800	B/C/E		BTA312		BTA312X		BTA312B	
	600 / 800	C			BTA312Y				
	800	CT		**BTA312**					
	800	ET		BTA312				BTA312B	
	600 / 800	B/C			BTA412Y*				
16	600	BT/D		BTA316					
	600 / 800	B/C/E		BTA316		BTA316X		BTA316B	
	600 / 800	ET		**BTA316**					
	800	B0				**BTA316X**			
	600 / 800	B/C			BTA416Y*				
25	600	BT		BTA225					
	600 / 800	B		BTA225				BTA225B	

T: high $T_j$max 150 °C * Large chip / high I_{TSM}

I_{GT} key:
B 50 mA
B0 10 - 50 mA
C 35 mA
C0 5 - 35 mA
D 5 mA
E 10 mA
F 25 mA

3-quadrant triacs part numbering

Type number — V_{DRM} (V) — T = High temperature, R = Reversed pinning

BTA312B-600CT

Package identifier
- = TO220AB (SOT78)
B = D^2PAK (SOT404)
S = DPAK (SOT428)
W = SOT223
X = SOT186A (isolated TO220AB)
Y = SOT78D (internally insulated TO220)
BTA2008, BTA201 use TO92 (SOT54) package

Gate sensitivity I_{GT}max
D = 5, 5, 5 mA
E = 10, 10, 10 mA
F = 25, 25, 25 mA
C = 35, 35, 35 mA
C0 = I_{GT} 5-35 mA
B = 50, 50, 50 mA

MSD849

4-quadrant triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D^2PAK)	SOT428 (DPAK)
										
0.6	400	5/5/5/7	MAC97A6							
	600	5/5/5/7	MAC97A8							
1	600	3/3/3/7						BT131W		
	600 / 800	3/3/3/7	BT131							
	600 / 800	5/5/5/7	BT131-D							
	600 / 800	10/10/10/10	BT131-E							
	600 / 800	3/3/3/5	Z0103MA/NA					Z0103MN/NN		
	600 / 800	5/5/5/7	Z0107MA/NA					Z0107MN/NN		
	600 / 800	10/10/10/10	Z0109MA/NA					Z0109MN/NN		
	600 / 800	3/3/3/5	**Z0103MA0/NA0****					**Z0103MN0/NN0****		
	600 / 800	5/5/5/7	**Z0107MA0/NA0****					**Z0107MN0/NN0****		
	600 / 800	10/10/10/10	**Z0109MA0/NA0****					**Z0109MN0/NN0****		
	600	5/5/5/10	BT132-D*							
	600	D/E/-						BT134W*		
	800	-						BT134W*		
4	600	D/E/-/G				BT134				
	800	E/-				BT134				
	600 / 800	D/E		**BT234***			**BT234X***			
	600	D/-		BT136			BT136X			BT136S
	600	F					BT136X			BT136S
	600 / 800	E		BT136			BT136X		BT136B	BT136S
	800	F								BT136S
	800	-					BT136X			BT136S
6	600	F/-/G					BT236X			
	800	-/G					BT236X			
8	600	D/-/G		BT137			BT137X			BT137S
	600	E		BT137			BT137X		BT137B	BT137S
	600	F					BT137X		BT137B	BT137S
	800	E		BT137			BT137X			BT137S
	800	F							BT137B	BT137S
	800	-		BT137			BT137X		BT137B	
	800	G							BT137B	BT137S
12	600	D		BT138			BT138X			
	600	-/G		BT138			BT138X		BT138B	
	600	F					BT138X		BT138B	
	600 / 800	E		BT138	BT138Y		BT138X		BT138B	
	800	F					BT138X			
	800	-		BT138			BT138X			
	800	G		BT138						
16	600	E/-		BT139			BT139X		BT139B	
	600	F					BT139X		BT139B	
	600	G					BT139X		BT139B	
	800	E		BT139					BT139B	
	800	F							BT139B	
	800	-		BT139			BT139X		BT139B	
	800	G		BT139					BT139B	
20	600	50/50/50/75					MAC223A8X			
25	400	50/50/50/75		MAC223A6						
	600 / 800	-		BTA140						

* Large chip / high I_{TSM} ** Enhanced immunity to false triggering

I_{GT} key:
D 5 mA (10 mA in 3+)
E 10 mA (25 mA in 3+)
F 25 mA (70 mA in 3+)
- 35 mA (70 mA in 3+)
G 50 mA (100 mA in 3+)

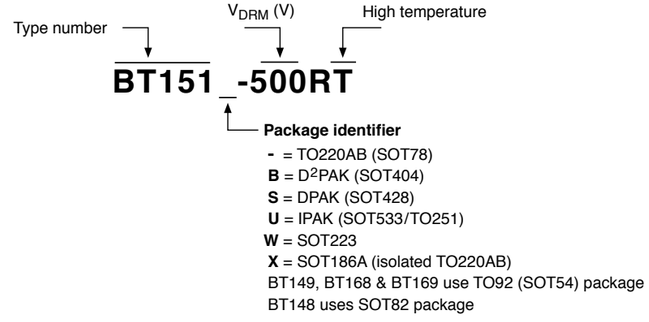
Silicon Controlled Rectifiers

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} & V_{RRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D^2PAK)	SOT428 (DPAK)	SOT533 (IPAK)
										
0.8	600	0.5 µA min - 7 µA max	**N0118GA**							
	400	0.012	EC103D1							
	200 / 400 / 600	0.2	BT149B/D/G							
	200 / 400 / 600	0.2	BT169B/D/G							
	400	0.015 min - 0.05 max	BT169D-L							
	600	0.015 min - 0.05 max	**BT169G-L**							
	800	0.1	BT169H							
	500 / 600	0.02 min - 0.2 max	BT168E/G							
	200	0.2					MCR08BT1			
1	600	0.02 min - 0.2 max					BT168GW			
	600	0.07 min - 0.45 max					**BT168GWF****			
	600	0.2					BT148W-R*			
4	400 / 500 / 600	0.2			BT148-R					
	600	0.2							BT150S-R	
	500	0.2		BT150-R						
8	800	0.05							BT258S-LT	
	500 / 600 / 800	0.2		BT258-R		BT258X-R				
	600	0.2								BT258U-R
	800	0.2							BT258S-R	
	600	5							BT300S-R	
12	500 / 650	5		BT151-L*					BT151S-L*	
	500 / 650 / 800	15		BT151-R*		BT151X-R*			BT151S-R*	
	650	15							BTH151S-R*	
	500 / 650 / 800	15		BT151-C		BT151X-C				BT151U-C
	500 / 1000	15		**BT151-RT***						
20	400 / 600 / 800	32		BT152-R		BT152X-R		BT152B-R		
	500	32		**BT152-RT**						
25	800	35		BT145-R						

* Large chip / high I_{TSM} ** Hi-Com / fast turn-off T: high $T_j$max 150 °C

SCRs part numbering



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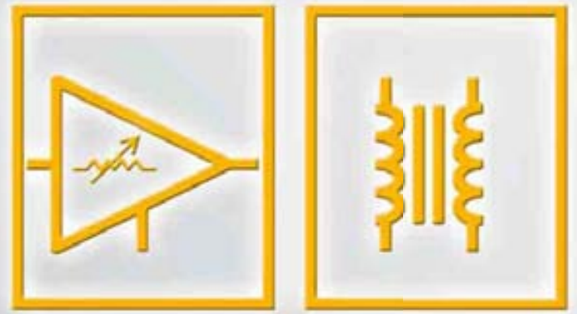


Standard linear products

The Standard Linear Portfolio

Low-voltage

NXP's standard linear portfolio for low-voltage applications

- Low-voltage LDOs
- High frequency DC/DC solutions

Optimized for applications with challenging space requirements, high battery lifetime demands, and a superior operating stability.

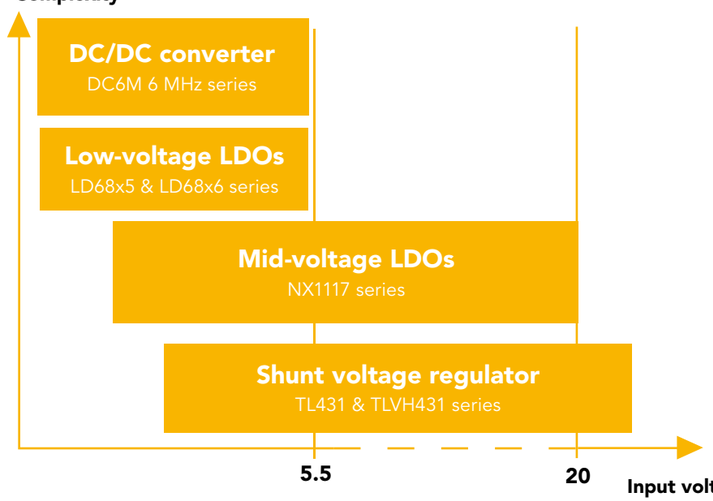
Mid-voltage

NXP's standard linear portfolio for mid-voltage applications

- Adjustable precision shunt regulators
- Mid-voltage LDOs with adjustable and fixed output voltages

To support your expectation for high product quality and supply reliability .

Solutions for your demand



Solutions for different markets

Mobile phones	Game pads	LCD TV
PC tablets	Notebooks	Set top box
DSCs	Netbooks	Power adaptor
Video cameras	Ultrabooks	Shaver

Solutions for different applications

- Voltage regulators, DC/DCs
- Wide range of input & output voltages
- Supply currents from 150 – 1.000 mA
- Thermal shutdown, overcurrent protection
- And even more features…

Solutions in different packages

SOT23	DFN1010C-4
SOT753	WLCSP4
SOT223	WLCSP6
DFN1410-6	And more packages

NXP, your one-stop-shop for high-quality products, supplies an attractive portfolio of **standard linear devices**.

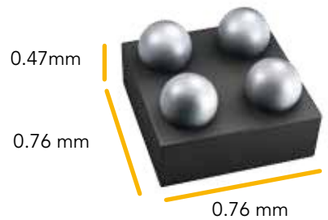
High Performance in ultra small packages

Ultra small wafer-level chipscale package

Low-voltage LDO

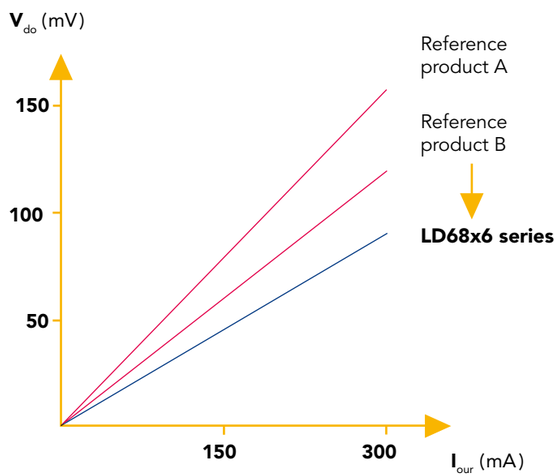
LD68x6 series with ultra small WLCSP package and ultra low-dropout performance

4-Ball WLCSP package



- Ultra small package
- Ultra low-dropout performance
- 150, 200, and 300 mA output current available
- Very good noise performance
- Very low quiescent current
- Thermal shutdown and overcurrent protection
- 0.4 mm pitch and high power dissipation

Dropout performance comparison



The dropout voltage (V_{do}) is the gap between input and output voltage.

Package size comparison

Benchmark performance. The LD68x6 series combines the advantages of ultra small wafer-level chip scale packages with an ultra low-dropout performance.

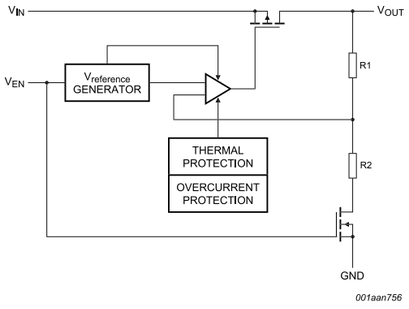
LD6816 ultra low-dropout voltage regulators – 150 mA

types in **bold** represent new products

Package							WLCSP4	
Size (mm)							0.76 × 0.76 × 0.47	
P_{tot} @°C (mW)							770	
V_{IN} (V)	I_{OUT} typ (mA)	Quiescent current (µA)	V_{do} drop @ 150 mA typ (mV)	Output noise typ (µVrms)	PSRR @ 1 kHz dB	Output voltage V*	LD6816CX4/xxH High ohmic output stage	LD6816CX4/xxP Pull down output stage
2.3 - 5.5	150	70	45	30	55	1.2	**LD6816CX4/12H**	**LD6816CX4/12P**
						1.3	**LD6816CX4/13H**	**LD6816CX4/13P**
						1.4	**LD6816CX4/14H**	**LD6816CX4/14P**
						1.5	**LD6816CX4/15H**	**LD6816CX4/15P**
						1.6	**LD6816CX4/16H**	**LD6816CX4/16P**
						1.8	**LD6816CX4/18H**	**LD6816CX4/18P**
						2.0	**LD6816CX4/20H**	**LD6816CX4/20P**
						2.1	**LD6816CX4/21H**	**LD6816CX4/21P**
						2.2	**LD6816CX4/22H**	**LD6816CX4/22P**
						2.3	**LD6816CX4/23H**	**LD6816CX4/23P**
						2.5	**LD6816CX4/25H**	**LD6816CX4/25P**
						2.7	**LD6816CX4/27H**	**LD6816CX4/27P**
						2.8	**LD6816CX4/28H**	**LD6816CX4/28P**
						2.9	**LD6816CX4/29H**	**LD6816CX4/29P**
						3.0	**LD6816CX4/30H**	**LD6816CX4/30P**
						3.3	**LD6816CX4/33H**	**LD6816CX4/33P**
						3.6	**LD6816CX4/36H**	**LD6816CX4/36P**

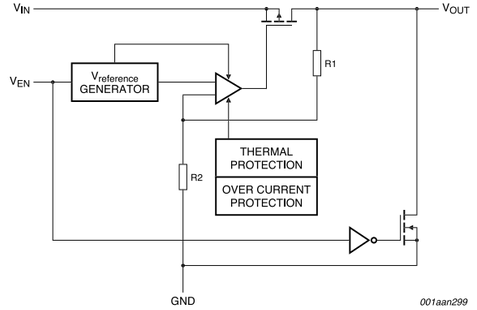
* other output voltages are available on request

Functional diagram: High-ohmic output



Remark: Version with high-ohmic output during disable (e.g. LD6816CX4/12H)

Functional diagram: Auto-discharge (pull-down)



Remark: Version with auto-discharge during disable (e.g. LD6816CX4/12P)

Key features

- Ultra low-dropout voltage (45 mV @ 150 mA)
- Very low output noise (30 µVrms)
- Thermal shutdown protection and current limiter

Key benefits

- Very small WLCSP package
- Very low standby and supply current for battery-powered solutions
- No additional noise bypass capacitor needed

Key applications

- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks

In the Spotlight

LDOs in ultra-small WLCSP package

State of the art wafer-level chip scale technology

Dimensions of only 0.76 x 0.76 x 0.47 mm

High power dissipation of 770 mW

LD6806 ultra low-dropout voltage regulators – 200 mA

types in **bold** represent new products

Package							WLCSP4		DFN1410-6 (SOT886)		SOT753	
Size (mm)							0.76 × 0.76 × 0.47		1.45 x 1.0 x 0.5		2.9 x 1.5 x 1.0	
P_{tot} @°C (mW)							770		450		800	
V_{IN} (V)	I_{OUT} typ (mA)	Quiescent current (µA)	V_{do} drop @ 200 mA typ (mV)	Output noise typ (µVrms)	PSRR @ 1 kHz dB	Output voltage V*	LD6806CX4/xxH High ohmic output stage	LD6806CX4/xxP Pull down output stage	LD6806F/xxH High ohmic output stage	LD6806F/xxP Pull down output stage	LD6806TD/xxH High ohmic output stage	LD6806TD/xxP Pull down output stage
2.3 - 5.5	200	70	60	30	55	1.2	LD6806CX4/12H	LD6806CX4/12P	LD6806F/12H	LD6806F/12P	**LD6806TD/12H**	**LD6806TD/12P**
						1.3	LD6806CX4/13H	LD6806CX4/13P	LD6806F/13H	LD6806F/13P	**LD6806TD/13H**	**LD6806TD/13P**
						1.4	LD6806CX4/14H	LD6806CX4/14P	LD6806F/14H	LD6806F/14P	**LD6806TD/14H**	**LD6806TD/14P**
						1.5	**LD6806CX4/15H**	**LD6806CX4/15P**	**LD6806F/15H**	**LD6806F/15P**	**LD6806TD/15H**	**LD6806TD/15P**
						1.6	LD6806CX4/16H	LD6806CX4/16P	LD6806F/16H	LD6806F/16P	**LD6806TD/16H**	**LD6806TD/16P**
						1.8	LD6806CX4/18H	LD6806CX4/18P	LD6806F/18H	LD6806F/18P	**LD6806TD/18H**	**LD6806TD/18P**
						2.0	LD6806CX4/20H	LD6806CX4/20P	LD6806F/20H	LD6806F/20P	**LD6806TD/20H**	**LD6806TD/20P**
						2.1	**LD6806CX4/21H**	**LD6806CX4/21P**	**LD6806F/21H**	**LD6806F/21P**	**LD6806TD/21H**	**LD6806TD/21P**
						2.2	LD6806CX4/22H	LD6806CX4/22P	LD6806F/22H	LD6806F/22P	**LD6806TD/22H**	**LD6806TD/22P**
						2.3	LD6806CX4/23H	LD6806CX4/23P	LD6806F/23H	LD6806F/23P	**LD6806TD/23H**	**LD6806TD/23P**
						2.5	LD6806CX4/25H	LD6806CX4/25P	LD6806F/25H	LD6806F/25P	**LD6806TD/25H**	**LD6806TD/25P**
						2.7	**LD6806CX4/27H**	**LD6806CX4/27P**	**LD6806F/27H**	**LD6806F/27P**	**LD6806TD/27H**	**LD6806TD/27P**
						2.8	LD6806CX4/28H	LD6806CX4/28P	LD6806F/28H	LD6806F/28P	**LD6806TD/28H**	**LD6806TD/28P**
						2.9	LD6806CX4/29H	LD6806CX4/29P	LD6806F/29H	LD6806F/29P	**LD6806TD/29H**	**LD6806TD/29P**
						3.0	LD6806CX4/30H	LD6806CX4/30P	LD6806F/30H	LD6806F/30P	**LD6806TD/30H**	**LD6806TD/30P**
						3.3	LD6806CX4/33H	LD6806CX4/33P	LD6806F/33H	LD6806F/33P	**LD6806TD/33H**	**LD6806TD/33P**
						3.6	LD6806CX4/36H	LD6806CX4/36P	LD6806F/36H	LD6806F/36P	**LD6806TD/36H**	**LD6806TD/36P**

* other output voltages are available on request

Key features

- Ultra low-dropout voltage (60 mV @ 200 mA)
- Very low output noise (30 µVrms)
- Thermal shutdown protection and current limiter

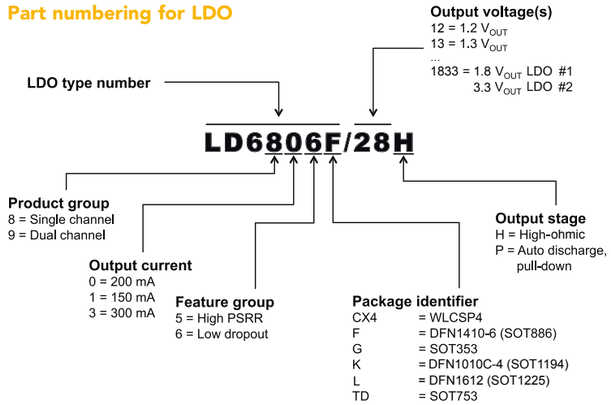
Key benefits

- Very small WLCSP package
- Very low standby and supply current for battery-powered solutions
- No additional noise bypass capacitor needed

Key applications

- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks

Part numbering for LDO



In the Spotlight

LDOs in very small DFN package

State of the art dual-flat no-leads (DFN) package technology

Dimensions of only 1.45 x 1.0 x 0.5 mm

High power dissipation of 450 mW

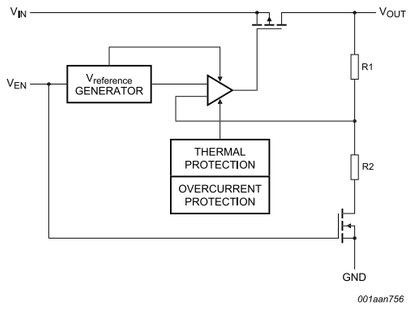
LD6836 ultra low-dropout voltage regulators – 300 mA

types in **bold** represent new products

Package							WLCSP4		SOT753	
										
Size (mm)							0.76 × 0.76 × 0.47		2.9 x 1.5 x 1.0	
P_{tot} @ °C (mW)							770		800	
V_{IN} (V)	I_{OUT} typ (mA)	Quiescent current (µA)	V_{do} drop @ 300 mA typ (mV)	Output noise typ (µVrms)	PSRR @ 1 kHz dB	Output voltage V*	LD6836CX4/xxH High ohmic output stage	LD6836CX4/xxP Pull down output stage	LD6836TD/xxH High ohmic output stage	LD6836TD/xxP Pull down output stage
2.3 - 5.5	300	70	90	30	55	1.2	**LD6836CX4/12H**	**LD6836CX4/12P**	**LD6836TD/12H**	**LD6836TD/12P**
						1.3	**LD6836CX4/13H**	**LD6836CX4/13P**	**LD6836TD/13H**	**LD6836TD/13P**
						1.4	**LD6836CX4/14H**	**LD6836CX4/14P**	**LD6836TD/14H**	**LD6836TD/14P**
						1.5	**LD6836CX4/15H**	**LD6836CX4/15P**	**LD6836TD/15H**	**LD6836TD/15P**
						1.6	**LD6836CX4/16H**	**LD6836CX4/16P**	**LD6836TD/16H**	**LD6836TD/16P**
						1.8	**LD6836CX4/18H**	**LD6836CX4/18P**	**LD6836TD/18H**	**LD6836TD/18P**
						2.0	**LD6836CX4/20H**	**LD6836CX4/20P**	**LD6836TD/20H**	**LD6836TD/20P**
						2.1	**LD6836CX4/21H**	**LD6836CX4/21P**	**LD6836TD/21H**	**LD6836TD/21P**
						2.2	**LD6836CX4/22H**	**LD6836CX4/22P**	**LD6836TD/22H**	**LD6836TD/22P**
						2.3	**LD6836CX4/23H**	**LD6836CX4/23P**	**LD6836TD/23H**	**LD6836TD/23P**
						2.5	**LD6836CX4/25H**	**LD6836CX4/25P**	**LD6836TD/25H**	**LD6836TD/25P**
						2.7	**LD6836CX4/27H**	**LD6836CX4/27P**	**LD6836TD/27H**	**LD6836TD/27P**
						2.8	**LD6836CX4/28H**	**LD6836CX4/28P**	**LD6836TD/28H**	**LD6836TD/28P**
						2.9	**LD6836CX4/29H**	**LD6836CX4/29P**	**LD6836TD/29H**	**LD6836TD/29P**
						3.0	**LD6836CX4/30H**	**LD6836CX4/30P**	**LD6836TD/30H**	**LD6836TD/30P**
						3.3	**LD6836CX4/33H**	**LD6836CX4/33P**	**LD6836TD/33H**	**LD6836TD/33P**
						3.6	**LD6836CX4/36H**	**LD6836CX4/36P**	**LD6836TD/36H**	**LD6836TD/36P**

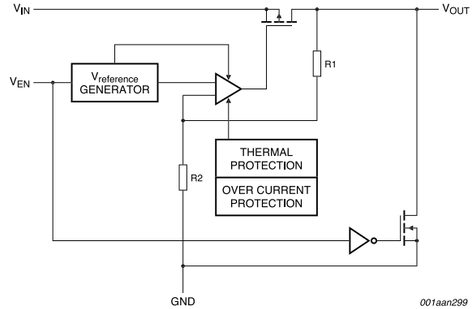
* other output voltages are available on request

Functional diagram: High-ohmic output



Remark: Version with high-ohmic output during disable (e.g. LD6836CX4/12H)

Functional diagram: Auto-discharge (pull-down)



Remark: Version with auto-discharge during disable (e.g. LD6836CX4/12P)

Key features

- Ultra low-dropout voltage (90 mV @ 300 mA)
- Very low output noise (30 µVrms)
- Thermal shutdown protection and current limiter

Key benefits

- Very small WLCSP package
- Very low standby and supply current for battery-powered solutions
- No additional noise bypass capacitor needed

Key applications

- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks

In the Spotlight

SOT753 general purpose package

General purpose package SOT753 (SOT23-5 footprint)

Dimensions of only 2.9 x 1.5 x 1.0 mm

Very high power dissipation of 800 mW

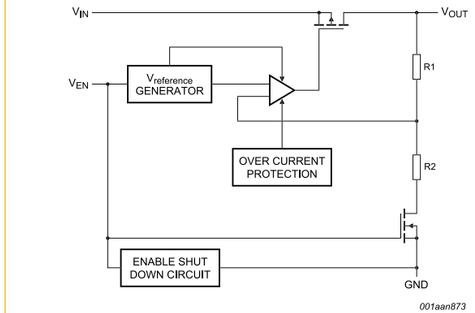
LD6805 high PSRR low-dropout voltage regulators – 150 mA

types in **bold** represent new products

Package							DFN1010C-4 (SOT1194)	
								
Size (mm)							1.0 x 1.0 x 0.55	
P_{tot} @ °C (mW)							400	
V_{IN} (V)	I_{OUT} typ (mA)	Quiescent current (µA)	V_{do} drop @ 150 mA typ (mV)	Output noise typ (µVrms)	PSRR @ 1 kHz dB	Output voltage V*	LD6805K/xxH High ohmic output stage	LD6805K/xxP Pull down output stage
2.3 - 5.5	150	35	250	40	75	1.2	LD6805K/12H	LD6805K/12P
						1.3	LD6805K/13H	LD6805K/13P
						1.4	LD6805K/14H	LD6805K/14P
						1.5	**LD6805K/15H**	**LD6805K/15P**
						1.6	LD6805K/16H	LD6805K/16P
						1.8	LD6805K/18H	LD6805K/18P
						2.0	LD6805K/20H	LD6805K/20P
						2.1	**LD6805K/21H**	**LD6805K/21P**
						2.2	LD6805K/22H	LD6805K/22P
						2.3	LD6805K/23H	LD6805K/23P
						2.5	LD6805K/25H	LD6805K/25P
						2.8	LD6805K/28H	LD6805K/28P
						2.9	LD6805K/29H	LD6805K/29P
						3.0	LD6805K/30H	LD6805K/30P
						3.1	**LD6805K/31H**	**LD6805K/31P**
						3.3	LD6805K/33H	LD6805K/33P
						3.6	LD6805K/36H	LD6805K/36P

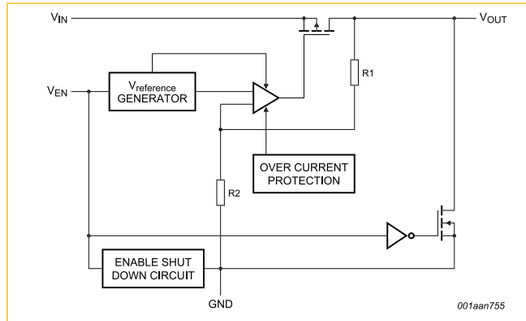
* other output voltages are available on request

Functional diagram: High-ohmic output



Remark: Version with high-ohmic output during disable (e.g. LD6805K/12H)

Functional diagram: Auto-discharge (pull-down)



Remark: Version with auto-discharge during disable (e.g. LD6805K/12P)

Key features

- High power supply ripple rejection (PSRR)
- Very low quiescent current and low noise (40 µVrms)
- Small package size

Key benefits

- Very small package for mobile applications
- Very low standby and supply current for battery-powered solutions
- No additional noise bypass capacitor needed

Key applications

- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks

In the Spotlight

High-PSRR LDO in very small DFN package

State of the art dual-flat no-leads (DFN) package technology

Dimensions of only 1.0 x 1.0 x 0.55 mm

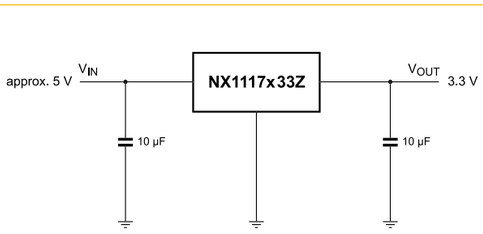
High power dissipation of 400 mW

Low-dropout adjustable and fixed linear voltage regulator NX1117

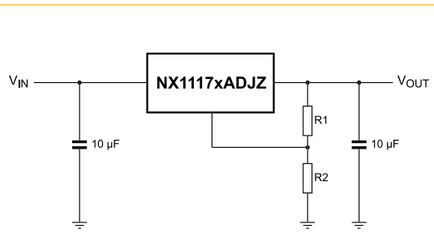
types in **bold** represent new products

Package				SOT223 (SC-73)		
Size (mm)				6.5 x 3.5 x 1.65		
P_{tot} (mW)				1700		
						AEC-Q100 qualified
V_{max} (V)	I_{max} (A)	V_{out} drop (V) @ 800 mA	V_{out} (V)	V_{out} tolerance		V_{out} tolerance
				1%	1.25%	1%
20	1	1.1	1.25 adjustable	NX1117CADJZ	NX1117CEADJZ	**NX1117IADJZ**
			1.2	NX1117C12Z	NX1117CE12Z	**NX1117I12Z**
			1.5	NX1117C15Z	NX1117CE15Z	**NX1117I15Z**
			1.8	NX1117C18Z	NX1117CE18Z	**NX1117I18Z**
			1.9	NX1117C19Z	NX1117CE19Z	**NX1117I19Z**
			2.0	NX1117C20Z	NX1117CE20Z	**NX1117I20Z**
			2.5	NX1117C25Z	NX1117CE25Z	**NX1117I25Z**
			2.85	NX1117C285Z	NX1117CE285Z	**NX1117I285Z**
			3.3	NX1117C33Z	NX1117CE33Z	**NX1117I33Z**
			5.0	NX1117C50Z	NX1117CE50Z	**NX1117I50Z**
			12.0	-	-	**NX1117I120Z**

NX1117x33Z: Typical application for fixed output voltage versions



NX1117xADJZ: Typical application for adjustable output voltage versions



$V_{OUT} = V_{ref} \times (1+R2/R1) + I_{adj} \times R2$

Key applications

- Post regulation for SMPS
- Automotive, industrial and consumer equipment point of load
- Battery charger
- Hard drive controllers
- Core voltage supply: FPGA, PLD, DSP, CPU
- LCD TV
- Set top box
- DVD player
- Automotive multimedia

In the Spotlight

New: NX1117i low-dropout linear voltage regulator

- Adjustable or fixed output voltage options with 1% accuracy in SOT223
- Wide input voltage range up to 20 V
- Maximum output current of 1 A
- Output current limiting and thermal shutdown
- Temperature range from −40 °C to 125 °C
- AEC-Q100 qualified (grade 1)

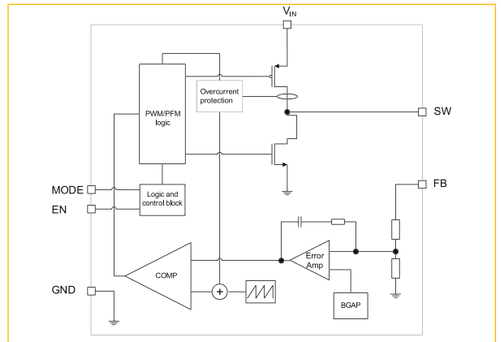
DC6M401, DC6M402 small size 6 MHz DC/DC buck converter – 425 mA

types in **bold** represent new products

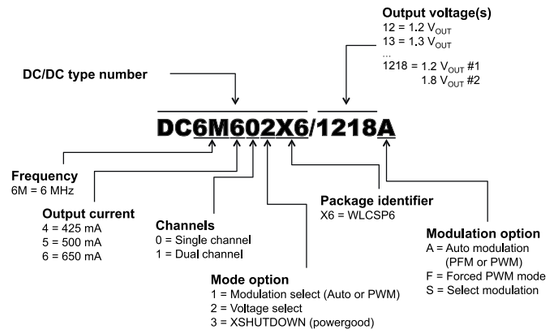
Package							WLCSP6	
Size (mm)							1.36 x 0.96 x 0.47	
P_{tot} @ °C							800	
V_{IN} (V)	I_{OUT} (mA)	Operation frequency (MHz)	Quiescent current typ (µA)	Output voltage ripple (mV)	Efficiency typ (%)	Output voltage V*	DC6M401/xxxS Modulation select	DC6M402/xxxxxA Voltage select auto modulation
2.3 - 5.5	425	6	0.2	20	>90	1.8	**DC6M401X6/18S**	
						2.85	**DC6M401X6/285S**	
						1.8 / 2.85		**DC6M402X6/18285A**

* other output voltages are available on request

Functional diagram



Part numbering for DC/DC converter



Key features

- True 6 MHz operation frequency
- Very low quiescent current
- Inrush current limiter (soft start)
- Protection through thermal shutdown and current limiter

Key benefits

- Very small WLCSP package
- Only very small inductor or PCB R-coil needed (470 nH)
- Optimized for SD card and SIM card applications

Key applications

- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks
- Any battery operated applications requiring a lower than battery voltage supply with high currents and high efficiency down conversion

In the Spotlight

6 MHz DC/DC buck converter in WLCSP package

- High frequency (6 MHz) allows usage of small 470 nH inductor
- 3 mode types available (PWM/PFM, voltage select, XSHUTDOWN)
- Very high efficiency → over 90%
- 425 mA, 500 mA and 650 mA output currents available
- Very small package → Wafer-level chip scale package

DC6M501, DC6M502, DC6M503 small size 6 MHz DC/DC buck converter – 500 mA

types in **bold** represent new products

Package							WLCSP6			
Size (mm)							1.36 x 0.96 x 0.47			
P_{tot} @ °C							800			
V_{IN} (V)	I_{OUT} (mA)	Operation frequency (MHz)	Quiescent current typ (µA)	Output voltage ripple (mV)	Efficiency typ (%)	Output voltage V*	DC6M501/xxxS Modulation select	DC6M502/xxxxxA Voltage select auto modulation	DC6M502/xxxxxF Voltage select forced PWM	DC6M503/xxxA XSHUTDOWN Auto modulation
2.3 - 5.5	500	6	0.2	20	>90	1.2	**DC6M501X6/12S**			**DC6M503X6/12A**
						1.5	**DC6M501X6/15S**			**DC6M503X6/15A**
						1.8	**DC6M501X6/18S**			**DC6M503X6/18A**
						1.2 / 1.5		**DC6M502X6/1215A**	**DC6M502X6/1215F**	
						1.2 / 1.8		**DC6M502X6/1218A**	**DC6M502X6/1218F**	
						1.5 / 1.8		**DC6M502X6/1518A**	**DC6M502X6/1518F**	

* other output voltages are available on request

DC6M601, DC6M602, DC6M603 small size 6 MHz DC/DC buck converter – 650 mA

types in **bold** represent new products

Package							WLCSP6			
Size (mm)							1.36 x 0.96 x 0.47			
P_{tot} @ °C							800			
V_{IN} (V)	I_{OUT} (mA)	Operation frequency (MHz)	Quiescent current typ (µA)	Output voltage ripple (mV)	Efficiency typ (%)	Output voltage V*	DC6M601/xxS Modulation select	DC6M602/xxxxxA Voltage select auto modulation	DC6M602/xxxxxF Voltage select forced PWM	DC6M603/xxxA XSHUTDOWN Auto modulation
2.3 - 5.5	650	6	0.2	20	>90	1.2	**DC6M601X6/12S**			**DC6M603X6/12A**
						1.5	**DC6M601X6/15S**			**DC6M603X6/15A**
						1.8	**DC6M601X6/18S**			**DC6M603X6/18A**
						1.2 / 1.5		**DC6M602X6/1215A**	**DC6M602X6/1215F**	
						1.2 / 1.8		**DC6M602X6/1218A**	**DC6M602X6/1218F**	
						1.5 / 1.8		**DC6M602X6/1518A**	**DC6M602X6/1518F**	

* other output voltages are available on request

Key features

- True 6 MHz operation frequency
- Very low quiescent current
- Inrush current limiter (soft start)
- Protection through thermal shutdown and current limiter

Key benefits

- Very small WLCSP package
- Only a very small inductor or PCB R-coil is needed (470 nH)
- Supports SMIA standard (XSHUTDOWN/powergood)

Key applications

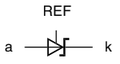
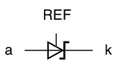
- Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks
- Any battery operated applications requiring a lower than battery voltage supply with high currents and high efficiency down conversion

Adjustable shunt voltage regulator TL431 with V_{ref} = 2.495 V

Package					SOT23	
Size (mm)					2.9 x 1.3 x 1.0	
P_{tot} (mW)					580	
Pinning configuration					Normal pinning*	Mirrored pinning*
V_{KA} (V)	I_K (mA)	V_{ref}		T_{amb} (°C)		
36	100	2.495	2%	0 to 70	TL431CDBZR [1]	
				-40 to 85	TL431IDBZR [1]	
				-40 to 125	TL431QDBZR [1]	
					TL431FDT [2]	TL431MFDT [2]
					TL431SDT [3]	TL431MSDT [3]
			1%	0 to 70	TL431ACDBZR [1]	
				-40 to 85	TL431AIDBZR [1]	
				-40 to 125	TL431AQDBZR [1]	
					TL431AFDT [2]	TL431AMFDT [2]
					TL431ASDT [3]	TL431AMSDT [3]
			0.5%	0 to 70	TL431BCDBZR [1]	
				-40 to 85	TL431BIDBZR [1]	
				-40 to 125	TL431BQDBZR [1]	
					TL431BFDT [2]	TL431BMFDT [2]
					TL431BSDT [3]	TL431BMSDT [3]

[1] Offers enhanced stability area and very low load capacity requirement
[2] Offers higher ElectroMagnetic Interference (EMI) ruggedness, e.g. for Switch Mode Power Supply
[3] Is designed for standard requirements and linear applications

*** Normal pinning vs. mirrored pinning for TL431**

	Pin	Symbol	Description	Simplified outline	Grafic symbol
Normal pinning	1	k	cathode		
	2	REF	reference		
	3	a	anode		
Mirrored pinning	1	REF	reference		
	2	k	cathode		
	3	a	anode		

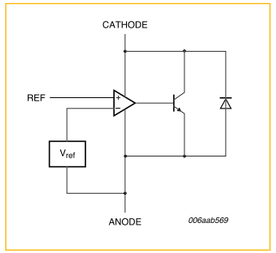
Key benefits

- Simple solution to achive a stabilized voltage
- Any output voltage from 2.5 to 36 V can be set by just two external resistors
- Full temperature range from -40 to 125 °C
- Low temperature drift: typically 6 mV (between 0 and 70 °C)
- Low output noise
- High quality level according AEC-Q100

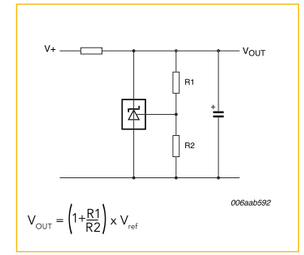
Key applications

- Shunt voltage regulator
- Precision current limiter
- Precision constant current sink
- Isolated feedback loop for Switch Mode Power Supply (SMPS)

Functional diagram



Shunt voltage regulator



Any voltage in the given range can be set by only 2 external resistors

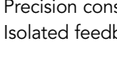
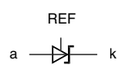
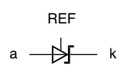
Standard linear products

Adjustable shunt voltage regulator TLVH431 with V_{ref} = 1.24 V

types in **bold** represent new products

Package				SOT23		SOT753
						
Size (mm)				2.9 x 1.3 x 1.0		2.9 x 1.5 x 1.0
P_{tot} (mW)				480		450
Pinning configuration				Normal pinning*	Mirrored pinning*	
V_{KA} (V)	I_K (mA)	V_{ref}	T_{amb} (°C)			
20	80	1.24	1.5% 0 to 70	TLVH431CDBZR		
			1.5% -40 to 85	TLVH431IDBZR		
			1.5% -40 to 125	TLVH431QDBZR	TLVH431MQDBZR	TLVH431QDBVR
			1% 0 to 70	TLVH431ACDBZR		
			1% -40 to 85	TLVH431AIDBZR		
			1% -40 to 125	TLVH431AQDBZR	TLVH431AMQDBZR	TLVH431AQDBVR
			0.75% -40 to 125	TLVH431DQDBZR	TLVH431DMQDBZR	TLVH431DQDBVR

***Normal pinning vs. mirrored pinning for TLVH431**

	Pin	Symbol	Description	Simplified outline	Grafic symbol
 **SOT23** Normal pinning	1	REF	reference		
	2	k	cathode		
	3	a	anode		
 **SOT23** Mirrored pinning	1	k	cathode		
	2	REF	reference		
	3	a	anode		
 **SOT753** Pinning	1	NC	no internal connection		
	2	NC	no internal connection		
	3	k	cathode		
	4	REF	reference		
	5	a	anode		

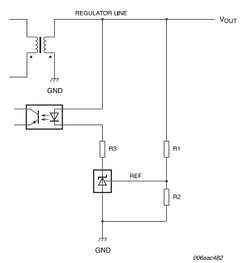
Key benefits

- Enabling regulated voltage down to 1.24 V
- Any higher output voltage up to 18 V can be set by just two external resistors
- Supports feedback loop application for 3.3 V SMPS
- Lowest Ik(min) value of 55 µA (typical) for improved energy efficiency
- Full temperature range from -40 to 125 °C
- Very low temperature drift: typically 4 mV (between -40 and 125 °C)
- Low output noise
- High quality level according AEC-Q100

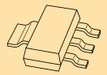
Key applications

- Shunt voltage regulator
- Precision current limiter
- Precision constant current sink
- Isolated feedback loop for Switch Mode Power Supply (SMPS)

Feedback loop application



Discrete voltage regulator

Package					SOT223 (SC-73)	SOT457 (SC-74)
						
Size (mm)					6.5 x 3.5 x 1.65	2.9 x 1.5 x 1.0
P_{tot} (mW)					1300	380
Zener diode			Transistor			
V_{out} (V)	V_z min - V_z max (V) @ I_z = 5 mA	V_{CEO} (V)	I_C (A)	h_{FE} min @ I_C = 100 mA		
2.5	3.23 - 3.37	45	0.1	160	PVR100AZ-B2V5	PVR100AD-B2V5
3.0	3.53 - 3.67	45	0.1	160	PVR100AZ-B3V0	PVR100AD-B3V0
3.3	3.82 - 3.98	45	0.1	160	PVR100AZ-B3V3	PVR100AD-B3V3
5.0	5.49 - 5.71	45	0.1	160	PVR100AZ-B5V0	PVR100AD-B5V0
12.3	12.7 - 13.3	45	0.1	160	PVR100AZ-B12V	PVR100AD-B12V

Key features

- A bipolar transistor and an integrated Zener diode, internally connected to build a voltage regulator
- Output voltage options V_{out}: 2.5 V, 3 V, 3.3 V, 5 V and 12 V

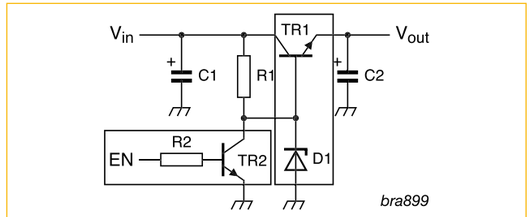
Key benefits

- Component count reduction
- Board space reduction
- Improved reliability

Key applications

- Linear voltage regulation

Discrete voltage regulator. PVR-series already include TR1 and D1, internally connected. A resistor-equipped transistor (RET) adds an output enable function.



Constant current source

Package	SOT353 (SC-88A)
	
Size (mm)	2.0 x 1.25 x 0.95
P_{tot} (mW)	335
Type	PSSI2021SAY

Description	maximum supply voltage	maximum supply current	typical stabilized output current	minimum stabilized output current	maximum stabilized output current	typical load stability of stabilized output current	typical output current change over ambient temperature
Parameter	V_S max (V)	I_S max (mA)	I_{out} typ (µA)	I_{out} min (mA)	I_{out} max (mA)	$\Delta I_{out}/I_{out}$ typ (%)	$\Delta I_{out}/(I_{out_{typ\ (\%/K)}} * \Delta T_{amb})$
Condition		@ V_S = 12 V; I_{out} = 15 µA; V_{out} = 1 V to 10 V	@ V_S = 12 V; V_{out} = 1 V to 10 V; R_{ext} = open			@ V_S = 12 V; V_{out} = 1 V to 10 V	@ V_S = 12 V; V_{out} = 1 V; T_{amb} = -55 °C to 150 °C
Value	75	2.2	15	0.015	50	0.5	0.15

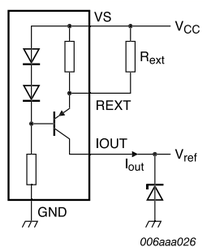
Key features and benefits

- Single-chip constant current source with reduced component count
- Output current set by an external resistor
- Very small footprint package for smaller designs

Key applications

- Constant current LED driver
- Generic constant current source
- Active bias control for audio amplifiers

Voltage reference

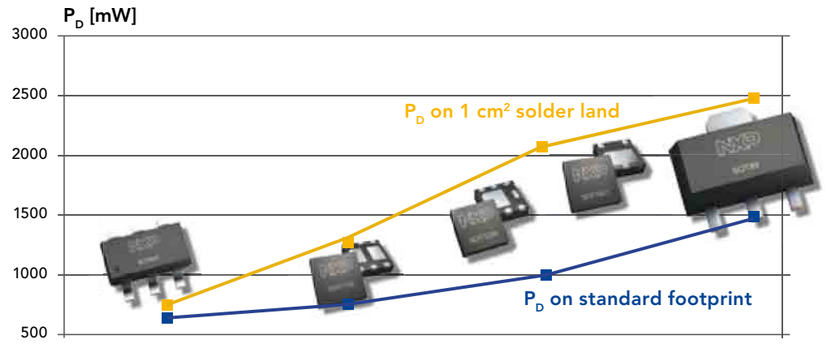


Packages

New DFN packages with best-in-class thermal capabilities

Thermal capability comparison

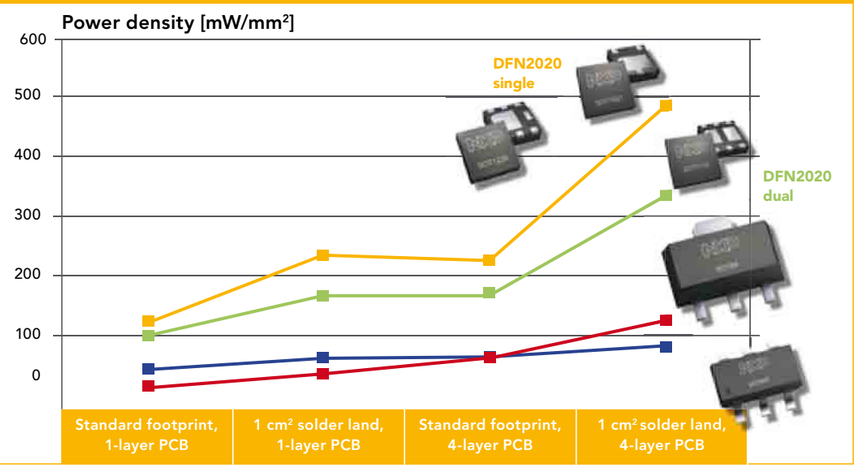
Power dissipation per package based on different 4-layer PCB conditions

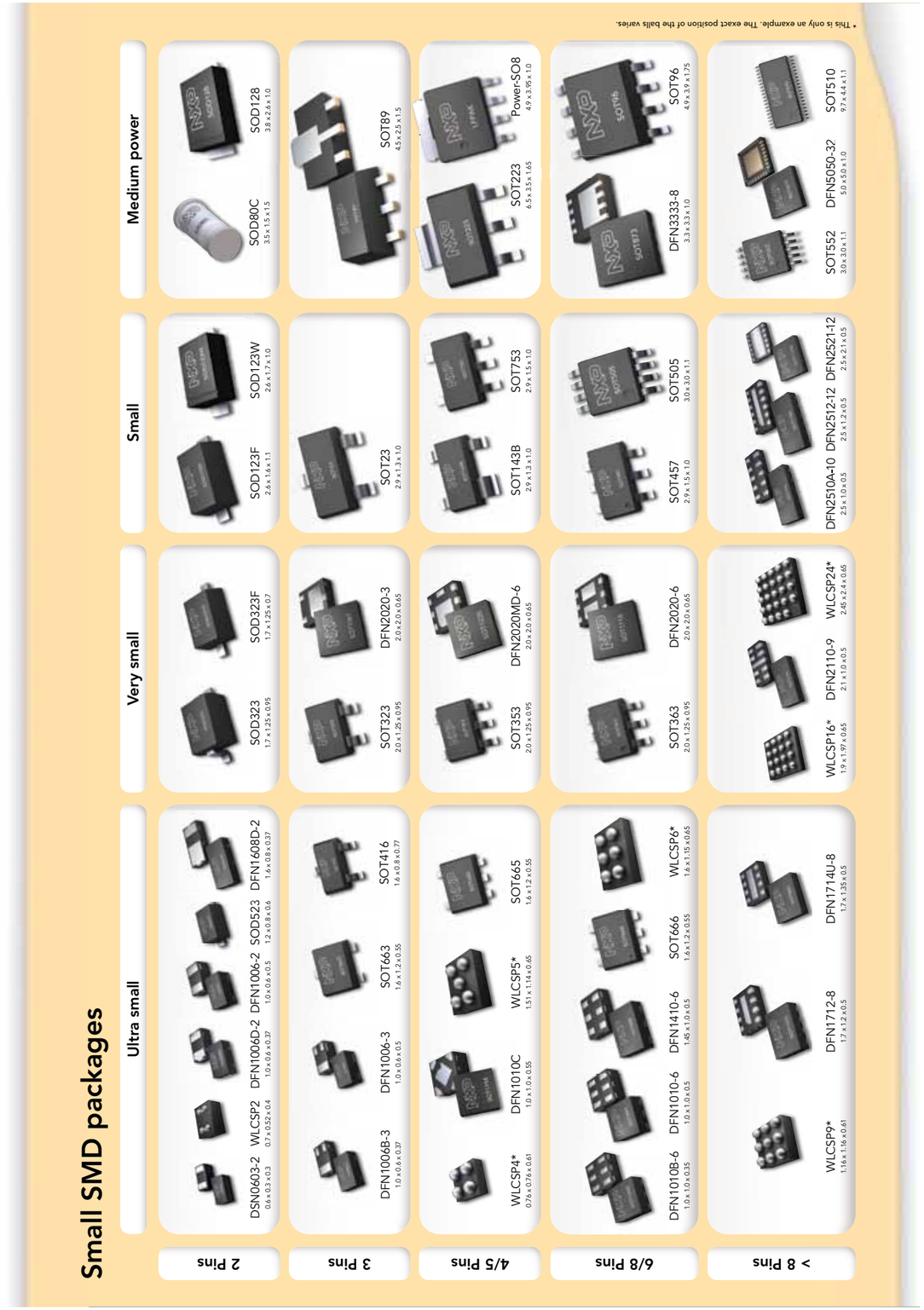


Package name	SOT457	DFN2020-6 SOT1118	DFN2020MD-6/DFN2020-3 SOT1220/SOT1061	SOT89
Footprint size (mm)	2.9 x 2.8 x 1.1	2 x 2 x 0.6	2 x 2 x 0.6	4.5 x 4 x 1.5

DFN packages have the best heat dissipation capabilities

Power density comparison – a big advantage of DFN packages





Package details and packing methods SMD – Part 1

Package details					Packing methods																	
Pins	Package	Package size (l x w x h) (mm)	Lead pitch (mm)	Package	Packing method and tape dimension	Reel dimension (d x w) (mm)	Taping	Packing quantity and ordering code (12NC ending)														
								500	800	1000	1400	1500	2000	2500	3000	4000	4500	5000	6000	8000	9000	10000
2	DFN1006-2 (SOD882)	1.0 x 0.6 x 0.5	0.65		2 mm pitch, 8 mm tape and reel	180 x 8	-															-315
	DFN1006D-2 (SOD882D)	1.0 x 0.6 x 0.37	0.65		2 mm pitch, 8 mm tape and reel	180 x 8	-															-315
	DFN1608D-2 (SOD1608)	1.6 x 0.8 x 0.37	0.94		2 mm pitch, 8 mm tape and reel	180 x 8	-													-315		
	DSN0603-2 (SOD962)	0.6 x 0.3 x 0.3	0.4		2 mm pitch, 8 mm tape and reel	180 x 8	-														-315	
	DSN0603B-2 (SOD962B)	0.6 x 0.3 x 0.25	0.4		2 mm pitch, 8 mm tape and reel	180 x 8	-														-315	
	SOD80C (MiniMelf)	3.5 x 1.5 x 1.5	-		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
					4 mm pitch, 8 mm tape and reel	330 x 8	-															-135
	SOD123F	2.6 x 1.6 x 1.1	-		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	SOD123W	2.6 x 1.7 x 1.0	-		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	SOD128	3.8 x 2.5 x 1.0	-		4 mm pitch, 12 mm tape and reel	180 x 12	-								-115							
	SOD323 (SC-76)	1.7 x 1.25 x 0.95	-		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-135
	SOD323F (SC-90)	1.7 x 1.25 x 0.7	-		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	SOD523 (SC-79)	1.2 x 0.8 x 0.6	-		2 mm pitch, 8 mm tape and reel	180 x 8	-													-315		
					4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-135
3	DFN1006-3 (SOT883)	1.0 x 0.6 x 0.5	0.65		2 mm pitch, 8 mm tape and reel	180 x 8	-															-315
	DFN1006B-3 (SOT883B)	1.0 x 0.6 x 0.37	0.65		2 mm pitch, 8 mm tape and reel	180 x 8	T4															-315
	DFN2020-3 (SOT1061)	2.0 x 2.0 x 0.65	1.3		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	SOT23	2.9 x 1.3 x 1.0	0.95		4 mm pitch, 8 mm tape and reel	180 x 8	-									-215						
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-235
	SOT89 (SC-62)	4.5 x 2.5 x 1.5	1.5		8 mm pitch, 12 mm tape and reel	180 x 12	T1			-115												
					8 mm pitch, 12 mm tape and reel	330 x 12	T1									-135						
					8 mm pitch, 12 mm tape and reel	180 x 12	T3			-146												
					8 mm pitch, 12 mm tape and reel	180 x 12	T4			-147												
	SOT323 (SC-70)	2.0 x 1.25 x 0.95	0.65		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-135
	SOT416 (SC-75)	1.6 x 0.8 x 0.77	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-135
	SOT663	1.2 x 1.6 x 0.55	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-									-115						

Package details and packing methods SMD – Part 2

Package details					Packing methods																	
Pins	Package	Package size (l x w x h) (mm)	Lead pitch (mm)	Package	Packing method and tape dimension	Reel dimension (d x w) (mm)	Taping	Packing quantity and ordering code (12NC ending)														
								500	800	1000	1400	1500	2000	2500	3000	4000	4500	5000	6000	8000	9000	10000
4	DFN1010C-4 (SOT1194)	1.0 x 1.0 x 0.55	0.65		2 mm pitch, 8 mm tape and reel	180 x 8	-															-115
	SOT143B	2.9 x 1.3 x 1.0	1.9		4 mm pitch, 8 mm tape and reel	180 x 8	-								-215							
					4 mm pitch, 8 mm tape and reel	286 x 8	-															-235
	SOT223 (SC-73)	6.5 x 3.5 x 1.65	2.3		8 mm pitch, 12 mm tape and reel	180 x 12	-			-115												
					8 mm pitch, 12 mm tape and reel	330 x 12	-									-135						
	SOT753	2.9 x 1.5 x 1.0	0.95		4 mm pitch, 8 mm tape and reel	180 x 8	T1								-115							
					4 mm pitch, 8 mm tape and reel	180 x 8	T2								-125							
5	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	0.65		4 mm pitch, 8 mm tape and reel	180 x 8	T1								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	T1															-135
					4 mm pitch, 8 mm tape and reel	180 x 8	T2								-125							
					4 mm pitch, 8 mm tape and reel	286 x 8	T2															-165
	SOT665	1.6 x 1.2 x 0.55	0.5		2 mm pitch, 8 mm tape and reel	180 x 8	-													-315		
					4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	DFN1010-6 (SOT891)	1.0 x 1.0 x 0.5	0.35		4 mm pitch, 8 mm tape and reel	180 x 8	T4											-132				
	DFN1010B-6 (SOT1202)	1.0 x 1.0 x 0.35	0.35		4 mm pitch, 8 mm tape and reel	180 x 8	T4											-132				
	DFN1410-6 (SOT886)	1.45 x 1.0 x 0.5	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	T1											-115				
					4 mm pitch, 8 mm tape and reel	180 x 8	T4											-132				
	DFN1616-6 (SOT1189)	1.6 x 1.6 x 0.5	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-									-115						
	DFN2020-6 (SOT1118)	2.0 x 2.0 x 0.65	0.65		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
	DFN2020MD-6 (SOT1220)	2.0 x 2.0 x 0.65	0.65		4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							
6	SOT363 (SC-88)	2.0 x 1.25 x 0.95	0.65		4 mm pitch, 8 mm tape and reel	180 x 8	T1								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	T1															-135
					4 mm pitch, 8 mm tape and reel	180 x 8	T2								-125							
					4 mm pitch, 8 mm tape and reel	286 x 8	T2															-165
	SOT457 (SC-74)	2.9 x 1.5 x 1.0	0.95		4 mm pitch, 8 mm tape and reel	180 x 8	T1								-115							
					4 mm pitch, 8 mm tape and reel	286 x 8	T1															-135
					4 mm pitch, 8 mm tape and reel	180 x 8	T2								-125							
					4 mm pitch, 8 mm tape and reel	286 x 8	T2															-165
	SOT666	1.6 x 1.2 x 0.55	0.5		2 mm pitch, 8 mm tape and reel	180 x 8	-													-315		
					4 mm pitch, 8 mm tape and reel	180 x 8	-								-115							

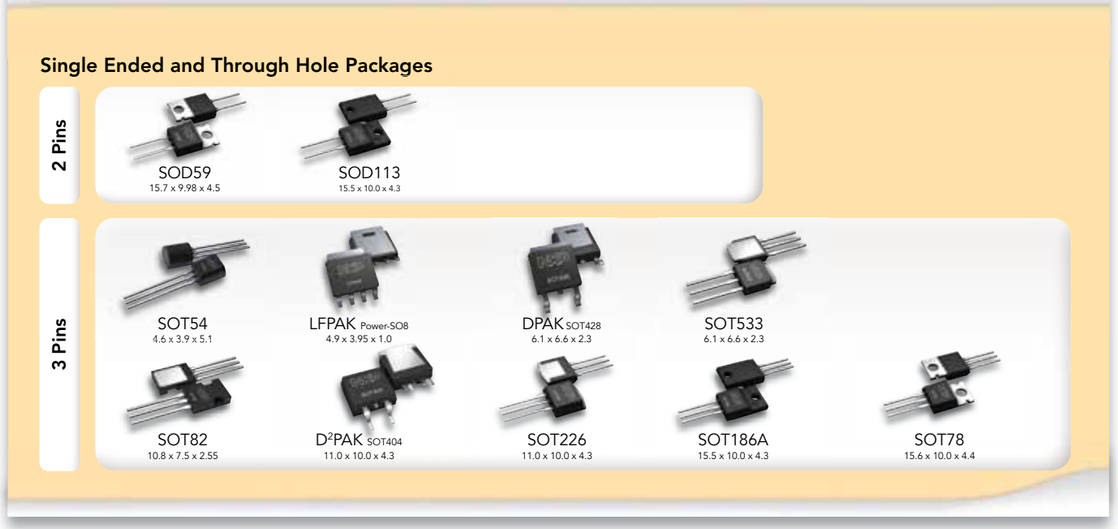
Package details and packing methods SMD – Part 3

Package details					Packing methods																
Pins	Package	Package size (l x w x h) (mm)	Lead pitch (mm)	Package	Packing method and tape dimension	Reel dimension (d x w) (mm)	Taping	Packing quantity and ordering code (12NC ending)													
								500	800	1000	1400	1500	2000	2500	3000	4000	4500	5000	6000	8000	9000	10000
8	DFN3333-8 (SOT873-1)	3.3 x 3.3 x 1.0	0.65		8 mm pitch, 12 mm tape and reel	180 x 12	-				-118											
	SOT96 (SO8)	4.9 x 3.9 x 1.75	1.27		8 mm pitch, 12 mm tape and reel	180 x 12	-			-115												
					8 mm pitch, 12 mm tape and reel	330 x 12	-							-118								
	SOT505 (TSSOP8)	3.0 x 3.0 x 1.1	0.65		8 mm pitch, 12 mm tape and reel	330 x 12	-							-118								
8+1	DFN1712-8 (SOT1157)	1.7 x 1.2 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-132						
	DFN1714-8 (SOT1166)	1.7 x 1.35 x 0.55	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	T1									-115						
					4 mm pitch, 8 mm tape and reel	180 x 8	T2									-132						
	DFN1714U-8 (SOT983)	1.7 x 1.35 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-118						
9	DFN2110-9 (SOT1178)	2.1 x 1.0 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-115						
10	DFN2510-10 (SOT1165)	2.5 x 1.0 x 0.5	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-											-115				
	DFN2510A-10 (SOT1176)	2.5 x 1.0 x 0.5	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-											-115				
	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	0.5		8 mm pitch, 12 mm tape and reel	330 x 12	-							-118								
10+1	DFN2626-10 (SOT1197)	2.6 x 2.6 x 0.5	0.5		4 mm pitch, 8 mm tape and reel	180 x 8	-									-115						
12	DFN2521-12 (SOT1156)	2.5 x 2.1 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-132						
12 + 1	DFN2512-12 (SOT1158)	2.5 x 1.2 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-132						
	DFN2514-12 (SOT1167)	2.5 x 1.35 x 0.55	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-132						
	DFN2514U-12 (SOT984)	2.5 x 1.35 x 0.5	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-118						
14	SOT108 (SO14)	8.65 x 3.9 x 1.75	1.27		8 mm pitch, 16 mm tape and reel	330 x 16	-							-118								
	SOT337 (SSOP14)	6.2 x 5.3 x 2	0.65		12 mm pitch, 16 mm tape and reel	330 x 16	-						-118									
	SOT402 (TSSOP14)	5.0 x 4.4 x 1.1	0.65		8 mm pitch, 12 mm tape and reel	330 x 12	-							-118								
16	SOT519 (SSOP16)	4.9 x 3.9 x 1.73	0.635		8 mm pitch, 12 mm tape and reel	330 x 12	-							-118								
16+1	DFN3312-16 (SOT1159)	3.3 x 1.2 x 0.5	0.4		4 mm pitch, 12 mm tape and reel	180 x 12	-									-132						
	DFN3314-16 (SOT1168)	3.3 x 1.35 x 0.55	0.4		4 mm pitch, 8 mm tape and reel	180 x 8	-									-132						
	DFN3314U-16 (SOT985)	3.3 x 1.35 x 0.5	0.4		4 mm pitch, 12 mm tape and reel	180 x 12	-									-118						
20	SOT163 (SO20)	12.8 x 7.5 x 2.65	1.27		12 mm pitch, 24 mm tape and reel	180 x 24	-	-115														
					12 mm pitch, 24 mm tape and reel	330 x 24	-						-118									
	SOT360 (TSSOP20)	6.5 x 4.4 x 1.1	0.65		12 mm pitch, 16 mm tape and reel	330 x 16	-							-118								
32	DFN5050-32 (SOT617)	5.0 x 5.0 x 1.0	0.5		8 mm pitch, 12 mm tape and reel	330 x 12	T1											-118				
					8 mm pitch, 12 mm tape and reel	330 x 12	T2											-128				
36	SOT357	10.0 x 10.0 x 1.2	0.5		16 mm pitch, 24 mm tape and reel	330 x 24	-					-118										
38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1	0.5		8 mm pitch, 16 mm tape and reel	330 x 16	-							-118								

Packing methods glass diodes, single ended and through hole packages

Pins / leads	Package	Packing method and tape/reel/tube dimensions	Package	Ordering code (12 NC ending)	Packing quantity
2	SOD27	26 mm tape ammo pack, axial		-143	5000 pcs
		52 mm tape ammo pack, axial		-133	10000 pcs
		52 mm reel pack, axial		-113	10000 pcs
	SOD59	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOD66	52 mm tape ammo pack, axial		-133	10000 pcs
		52 mm reel pack, axial		-113	10000 pcs
	SOD68	26 mm tape ammo pack, axial		-143	5000 pcs
		52 mm reel pack, axial		-113	10000 pcs
		52 mm tape ammo pack, axial		-133	10000 pcs
	SOD113	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOD141	52 mm tape ammo pack, axial		-133	12000 pcs
		Bulk pack, 500 pcs. per carrier		-112	20 carriers x 500 pcs
3	SOT54	Bulk pack, 1000 pcs/carrier		-112	5 carriers x 1000 pcs
		55 mm reel packing, 2000 pcs/reel, reel dimensions = 380 x 55 mm		-116	5 reels x 2000 pcs
		Ammo packing, 18 mm tape, 2000 pcs/carrier, reel dimensions = 350 x 55 mm		-126	5 carriers x 2000 pcs
		Bulk pack, 1000 pcs/carrier		-412	5 carriers x 1000 pcs
	SOT78	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOT78D	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOT82	Rail packing, 50 pcs/tube, tube length = 390 mm		-127	20 tubes x 50 pcs
	SOT186A	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOT226	Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOT404	16 mm pitch, 8 mm tape and reel, 330 mm reel		-118	800 pcs
	SOT428	8 mm pitch, 16 mm tape and reel, 186 mm reel		-118	2500 pcs
	SOT533	Rail packing		-127	75 tubes x 50 pcs
4	LFPAK (SOT669)	8 mm pitch, 12 mm tape and reel, 180 mm reel		-115	1500 pcs
5	SOT263B-1	Rail packing		-127	20 tubes x 50 pcs

Single Ended and Through Hole Packages



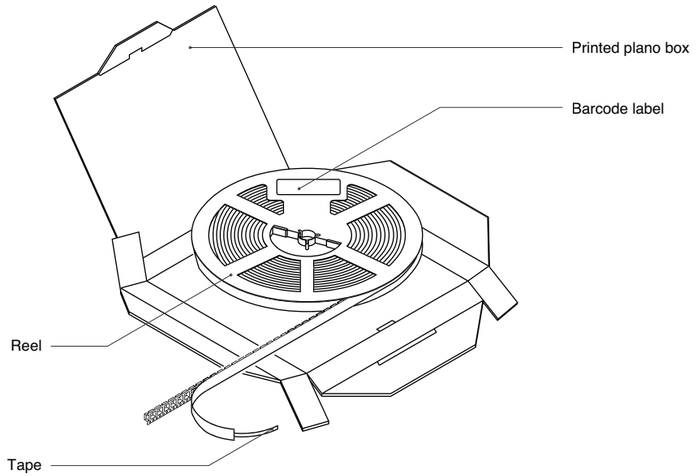
Package cross reference

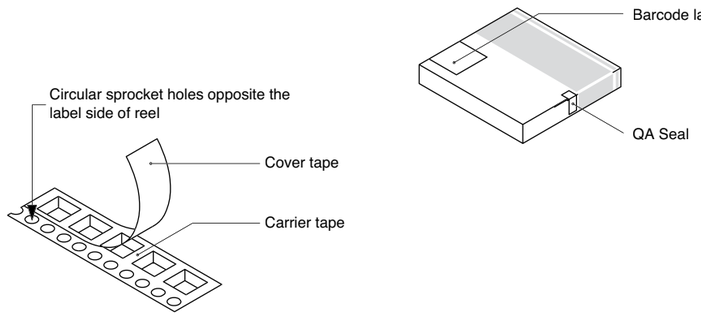
Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P_{tot} (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay	Semtech
2	**DFN1006-2 (SOD882)**	-	1.0 x 0.6 x 0.5	250			CTS2			TSLP-2-1	XI-DFN1006-2	ULP-2		
	DFN1006D-2 (SOD882D)	-	1.0 x 0.6 x 0.37	250		VMN2	CTS2	DSN2, 1.0 x 0.6		TSLP-2-7/ -17	X2-DFN1006-2	ULP-2		
	DFN1608D-2 (SOD1608)	-	1.6 x 0.8 x 0.37	780		KMD2		DSN2 1.6 x 0.8						
	DSN0603-2 (SOD962)	-	0.6 x 0.3 x 0.3	-		GMD2	SC2	DSN2, 0.6 x 0.3 WLCSP2	MP6	TSSLP 2-1	X3-DFN0603-2 0.62 x 0.32 x 0.3	ELP-2	CLP0603	
	SOD27	DO-35	4.25 x 1.85 x 0.56	500		GSD			DO-35		DO-35		DO-204AH	
	SOD66	DO-41	4.8 x 2.6 x 0.81	1300		GSR	DO-41				DO-41		DO-204AL	
	SOD68	DO-34	3.04 x 1.6 x 0.55	500		MSD								
	SOD80C	MiniMelf	3.5 x 1.5 x 1.5	300		LLDS			LLD		MiniMELF		MiniMELF	
	SOD123F	-	2.6 x 1.6 x 1.1	830			S-Flat	SOD-123-FL			PowerDI123			
	SOD123W	-	2.6 x 1.7 x 1.0	900		PMDU	S-Flat	SOD-123-FL	SRP-F		PowerDI123	SMF		
	SOD128	-	3.8 x 2.5 x 1.0	1000		PMDT	M-Flat							
	SOD323	SC-76	1.7 x 1.25 x 0.95	400			USC	SOD-323	URP	SOD323	SOD-323	USC	SOD323	
	SOD323F	SC-90	1.7 x 1.25 x 0.7	830		UMD2	US-Flat				PowerDI323			
	SOD523	SC-79	1.2 x 0.8 x 0.6	500		EMD2	ESC/TESC	SOD-523	UFP	SC79		ESC	SOD523	
3	**DFN1006-3 (SOT883)**	SC-101	1.0 x 0.6 x 0.5	250			SS CSP2			TSLP-3-4	X1-DFN1006-3			
	DFN1006B-3 (SOT883B)	-	1.0 x 0.6 x 0.37	250			CST3			TSLP-3-1, -7,-8	X2-DFN1006-3			
	DFN2020-3 (SOT1061)	HUSON3	2.0 x 2.0 x 0.65	1300				WDFN3			U-DFN2020-3 Type B 2.0 x 2.0 x 0.6		PowerPAK SC706L	
	SOT23	-	2.9 x 1.3 x 1.0	250		SSD3/ SST3		SOT-23		SOT23	SOT-23	SOT-23	SOT23	
	SOT89	SC-62	4.5 x 2.5 x 1.5	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89		SOT-89		
	SOT323	SC-70	2.0 x 1.25 x 0.95	200		UMD3/ UMT3	USM	SC-70	CMAK/CMPAK	SOT323	SOT-323	USM	SC-70 3 leads	
	SOT404 (D^2PAK)	-	11.0 x 11.0 x 4.3	-		LPDS/ LPTS	TO-220SM	D^2PAK D^2PAK 3	TO-220S / SMD TO-263 LDPAK(S)-(1)	TO263-3	TO263 (D^2PAK)	D^2PAK	TO-263 3-lead TO-263AB / D^2PAK	
	SOT416	SC-75	1.6 x 0.8 x 0.77	150		EMD3/ EMT3	SSM	SC-75	SMPAK	SC75			SC-75A	
	SOT428 (DPAK)	-	6.6 x 6.1 x 2.3	-				DPAK	TO-252 (MP-3ZK)	TO-252-3/-3-23		DPAK, - (MOSFET) DPAK (1)	TO-252, TO-252 reverse	
4	**SOT143B**	-	2.9 x 1.3 x 1.0	250			CP4		MPAK-4R	SOT143	SOT-143			
	SOT223	SC-73	6.5 x 3.5 x 1.65	1700				SOT-223		SOT223	SOT-223	SOT-223	SOT223	
5	**SOT353**	SC-88A	2.0 x 1.25 x 0.95	300		UMD5/ UMT5	USV	SC-88A	CMPAK-5(T)			USV	SOT353	
	SOT665	-	1.6 x 1.2 x 0.55	300		EMD5/ EMT5	ESV	SOT-553	VSON-5			TESV		

Package cross reference

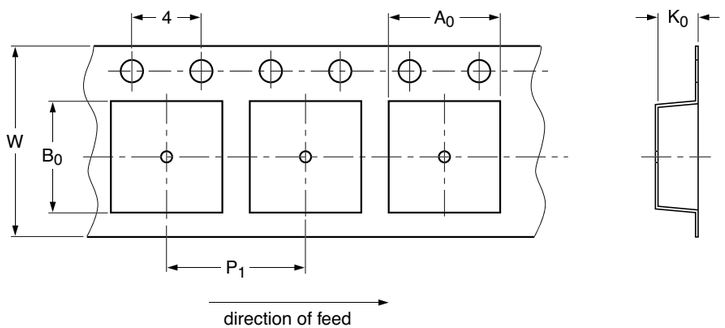
Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P_{tot} (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc.	KEC	Vishay	Semtech
6	**DFN1010-6 (SOT891)**	XSON6	1.0 x 1.0 x 0.5	-			CS6							
	DFN1410-6 (SOT886)	XSON6	1.45 x 1.0 x 0.5	250										SLP1510N6
	DFN2020-6 (SOT1118)	-	2.0 x 2.0 x 0.65	1300				6 Lead DFN			DFN2020-6 DFN2020B-6 DFN2020C-6			
	SOT363	SC-88	2.0 x 1.25 x 0.95	300		UMD6/ UMT6	US6	SC-88	CMPAK-6	SOT363	SOT-363	US6		
	SOT457	SC-74	2.9 x 1.5 x 1.0	750		SMD6/ SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6	TSOP6	
	SOT666	-	1.6 x 1.2 x 0.55	300		EMD6/ EMT6	ES6	SOT-563	SMFPAK-6	SOT666	SOT563	TES6	SC89-6lead	
8	**SOT96**	SO8	4.9 x 3.9 x 1.75	1500		SOP8	FM8	SOIC-8 NB	SOP-8			FLP-8	SO8	
	SOT505	TSSOP8	3.0 x 3.0 x 1.1	-				TSSOP-8				TSSOP8		
8 + 1	**DFN1712-8 (SOT1157)**	HXSON8	1.2 x 1.7 x 0.5	-				UDFN8, 1.8 x 1.2, 0.4P						
	DFN1714-8 (SOT1166)	HUSON8	1.35 x 1.7 x 0.55	-										SLP1713P8
	DFN1714U-8 (SOT983)	HXSON8	1.7 x 1.35 x 0.5	-				UDFN 1.7 x 1.35, 0.4P						SLP1713P8
9	**DFN2110-9 (SOT1178)**	XSON9	1.0 x 2.1 x 0.5	-										SLP2010P8T
10	**DFN2510-10 (SOT1165)**	XSON10	1.0 x 2.5 x 0.5	-				UDFN10 2.5 x 1, 0.5P		TSLP-9-1				SLP1610P4
	DFN2510A-10 (SOT1176)	XSON10	1.0 x 2.5 x 0.5	-				UDFN10 2.5 x 1, 0.5P		TSLP-9-1				SLP1610P4
	SOT552	TSSOP10	3.0 x 3.0 x 1.1	-				Micro10		TSSOP10				MSOP-10L
12 + 1	**DFN2512-12 (SOT1158)**	HXSON12	1.2 x 2.5 x 0.5	-				UDFN12, 2.5 x 1.2, 0.4P						
	DFN2514-12 (SOT1167)	HUSON12	1.35 x 2.5 x 0.55	-				UDFN12, 2.5 x 1.35, 0.4P						SLP2513P12
	DFN2514U-12 (SOT984)	HXSON12	2.5 x 1.35 x 0.5	-										SLP2513P12
14	**SOT108**	SO14	8.65 x 3.9 x 1.75	-		SOP14				DSO14				
16 + 1	**DFN3312-16 (SOT1159)**	HXSON16	1.2 x 3.3 x 0.5	-				UDFN16, 3.5 x 1.2, 0.4P						
	DFN3314-16 (SOT1168)	HUSON16	1.35 x 3.3 x 0.55	-										SLP3313P16
	DFN3314U-16 (SOT985)	HXSON16	3.3 x 1.35 x 0.5	-				UDFN16, 3.3 x 1.35, 0.4P						SLP3313P16
20	**SOT360**	TSSOP20	6.5 x 4.4 x 1.1	-				TSSOP20		TSSOP20				
38	**SOT510**	TSSOP38	9.7 x 4.4 x 1.1	-						TSSOP38				

Tape and reel pack for SMD packages





Carrier tape - tape and reel

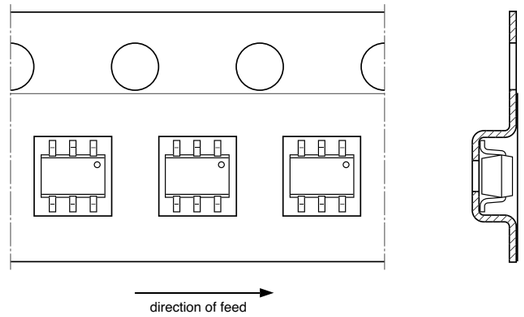


P1 = pitch (see table packing methods)
W = tape width (see table packing methods)

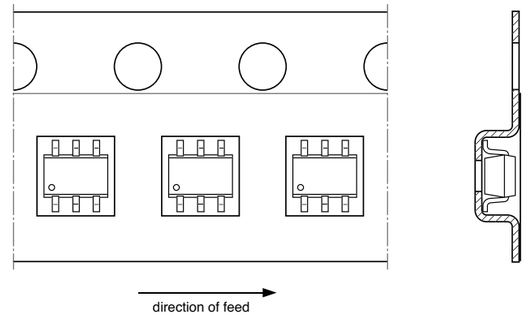
Compartment width (A_0), length (B_0) and depth (K_0) depending on package

Product orientation (tape and reel pack) T1-T4

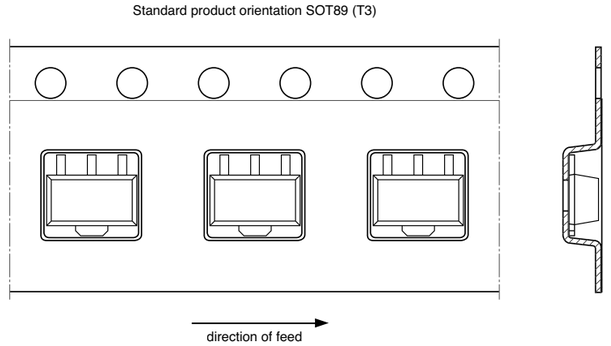
T1 taping



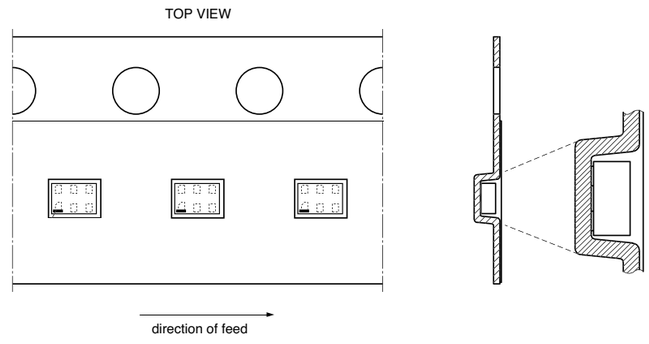
T2 taping



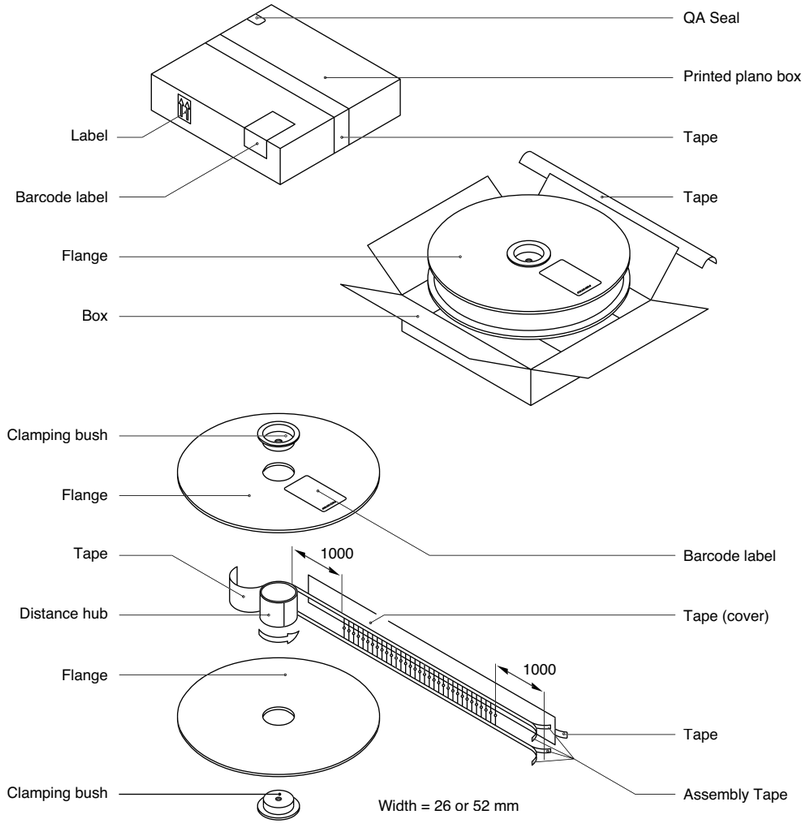
T3 taping

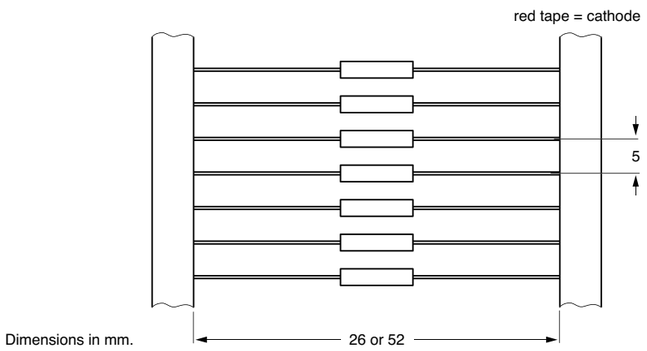


T4 taping

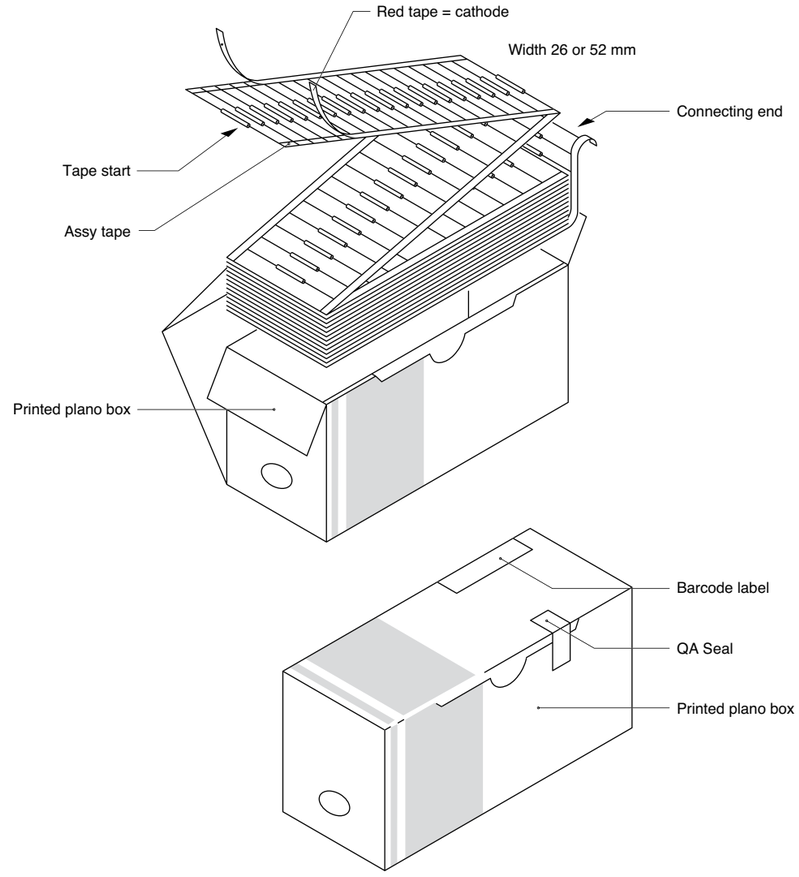


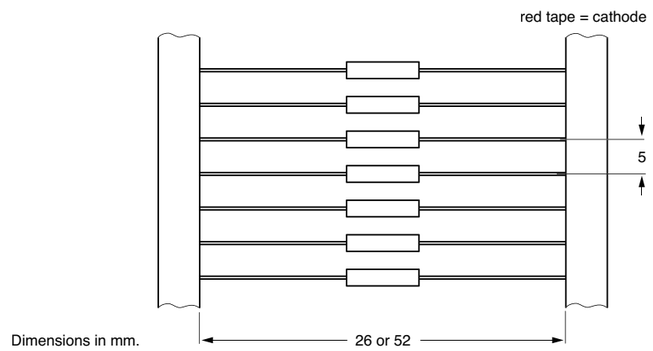
Reel pack axial tape for glass diodes



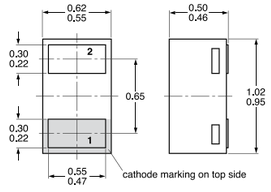


Ammo pack axial tape for glass diodes

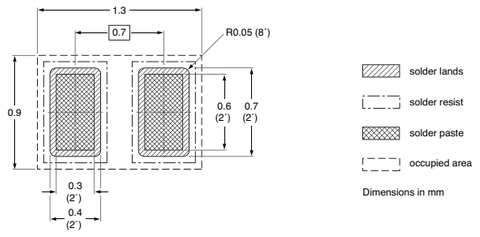




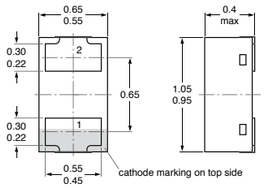
2-Pin SMD Packages



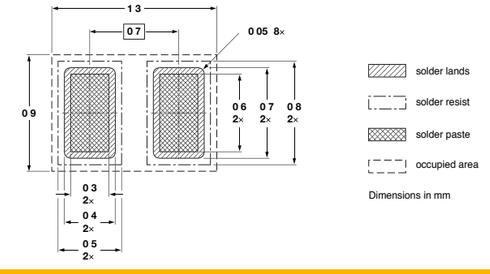
DFN1006-2 (SOD882)



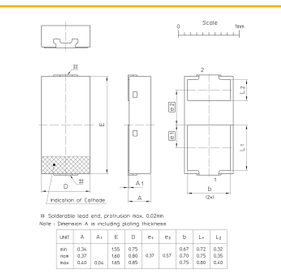
DFN1006-2 (SOD882)



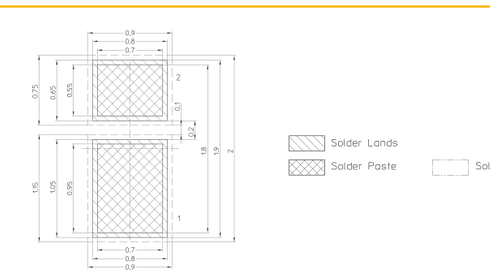
DFN1006D-2 (SOD882D)



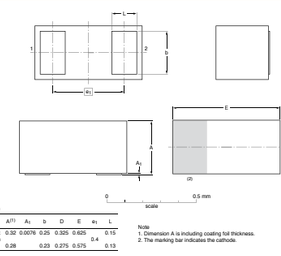
DFN1006D-2 (SOD882D)



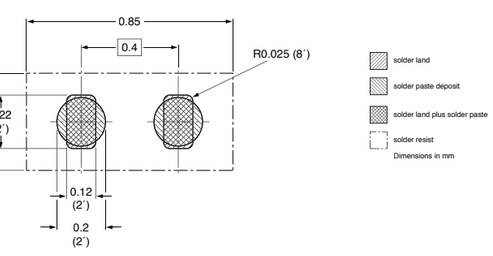
DFN1608D-2 (SOD1608)



DFN1608D-2 (SOD1608)



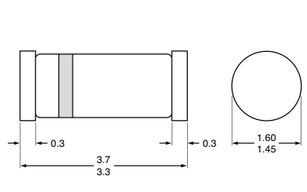
DSN0603-2 (SOD962)



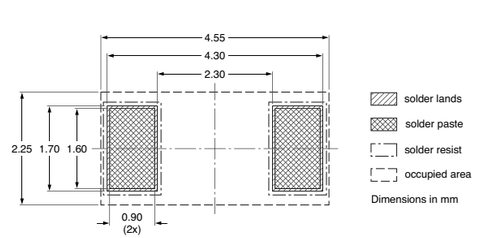
DSN0603-2 (SOD962) and DSN0603B-2 (SOD962B)

Dimensions in mm

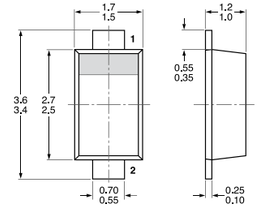
2-Pin SMD Packages



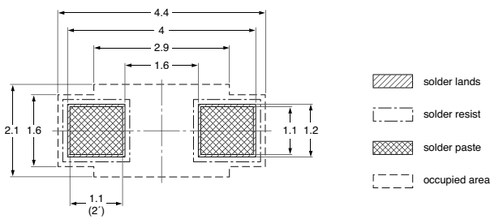
SOD80C



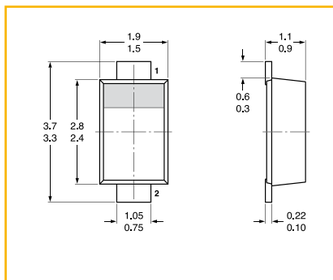
SOD80C



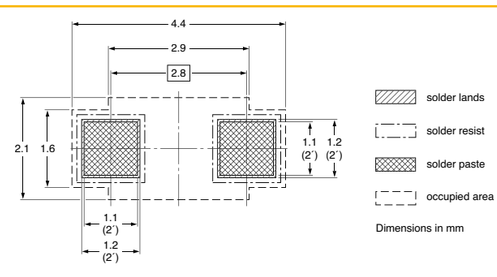
SOD123F



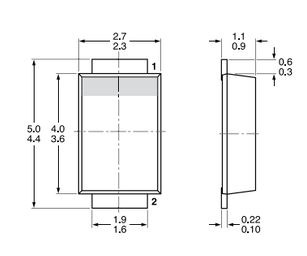
SOD123F



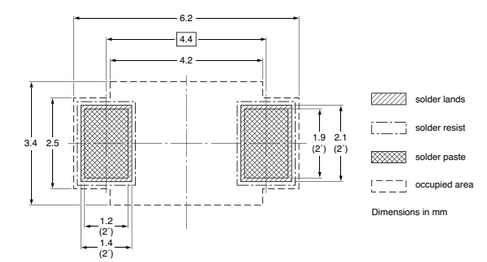
SOD123W



SOD123W



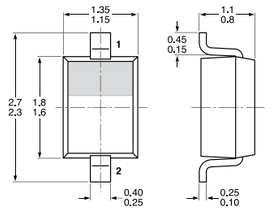
SOD128



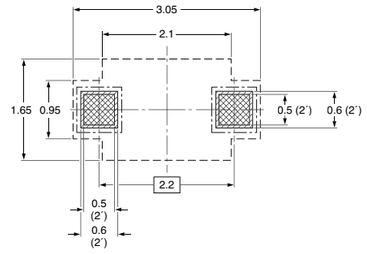
SOD128

Dimensions in mm

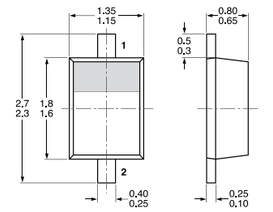
2-Pin SMD Packages



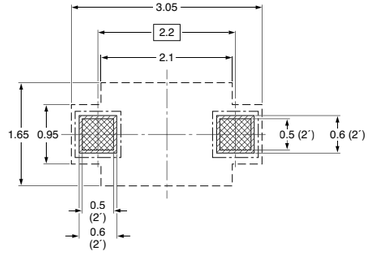
SOD323 (SC-76)



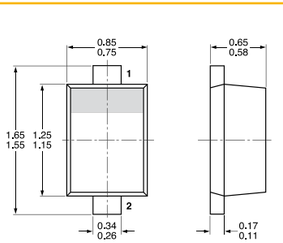
SOD323 (SC-76)



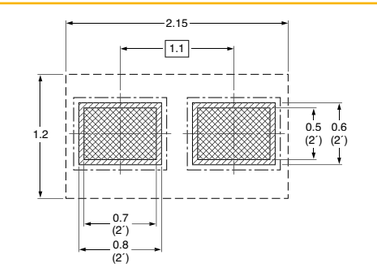
SOD323F (SC-90)



SOD323F (SC-90)

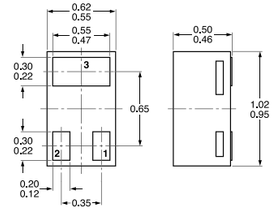


SOD523 (SC-79)

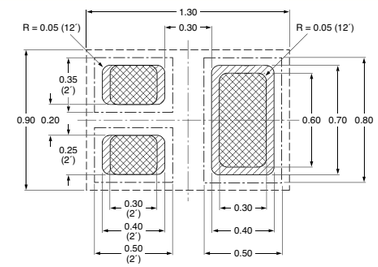


SOD523 (SC-79)

3-Pin SMD Packages



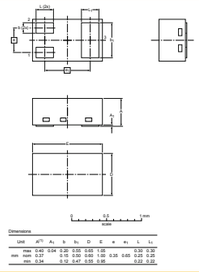
DFN1006-3 (SOT883)



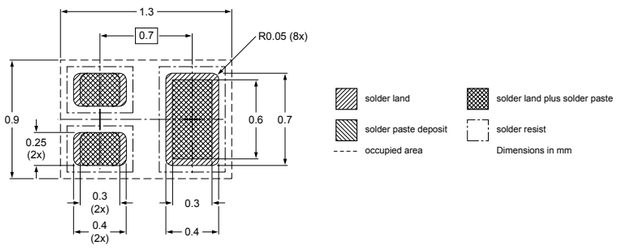
DFN1006-3 (SOT883)

Dimensions in mm

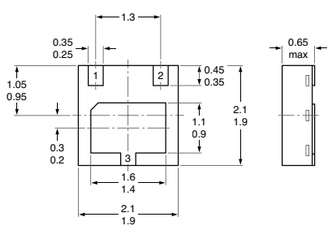
3-Pin SMD Packages



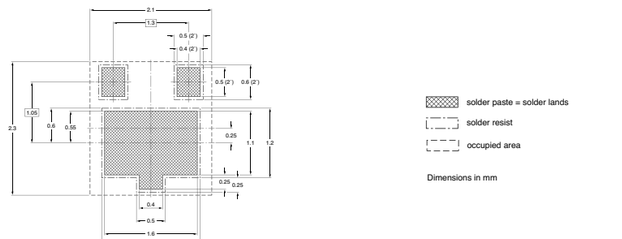
DFN1006B-3 (SOT883B)



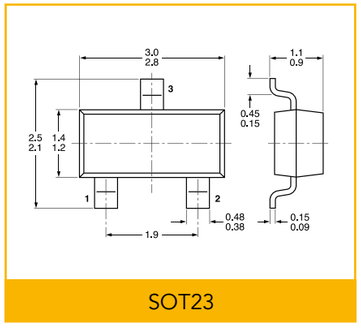
DFN1006B-3 (SOT883B)



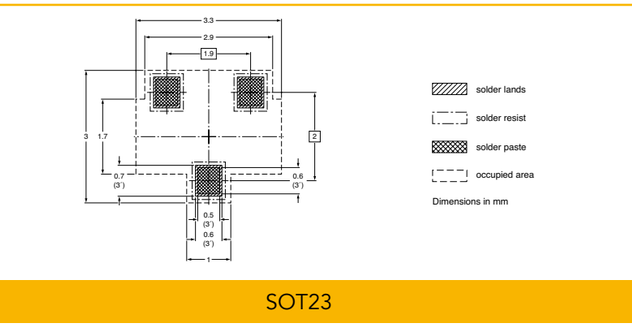
DFN2020-3 (SOT1061)



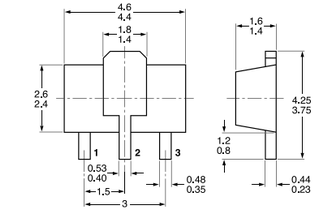
DFN2020-3 (SOT1061)



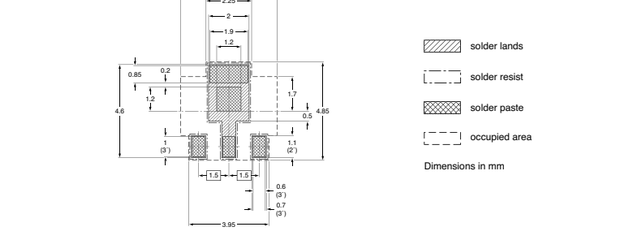
SOT23



SOT23



SOT89 (SC-62)

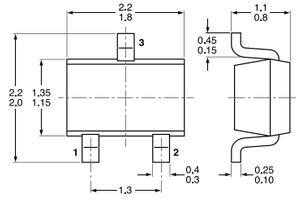


SOT89 (SC-62)

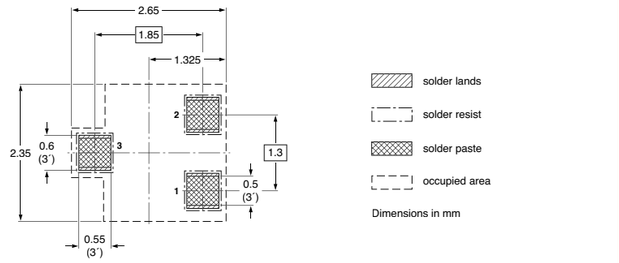
Dimensions in mm

Packages

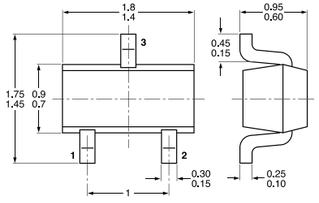
3-Pin SMD Packages



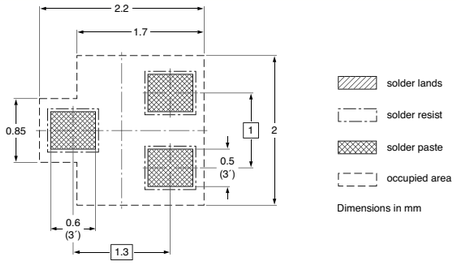
SOT323 (SC-70)



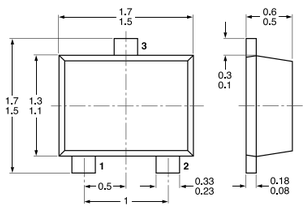
SOT323 (SC-70)



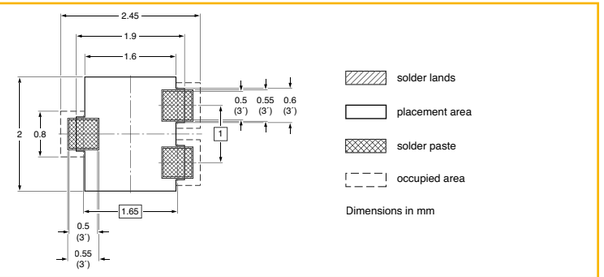
SOT416 (SC-75)



SOT416 (SC-75)

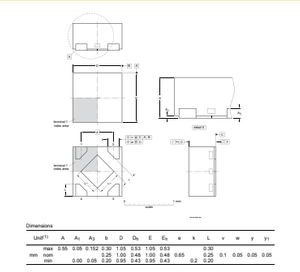


SOT663

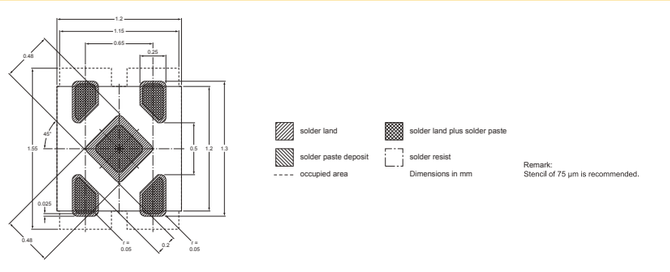


SOT663

4-/5-Pin SMD Packages



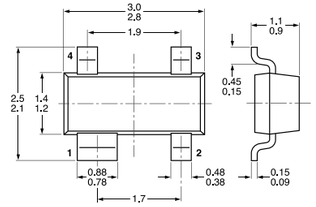
DFN1010C-4 (SOT1194)



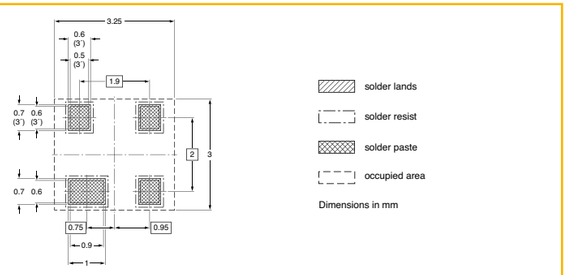
DFN1010C-4 (SOT1194)

Dimensions in mm

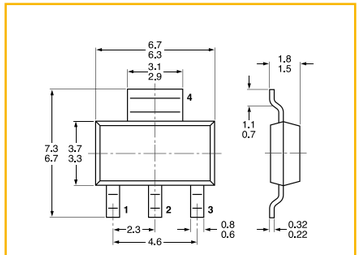
4-/5-Pin SMD Packages



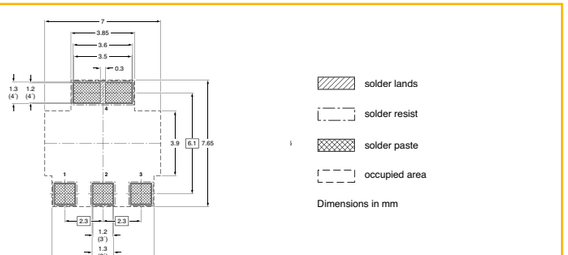
SOT143B



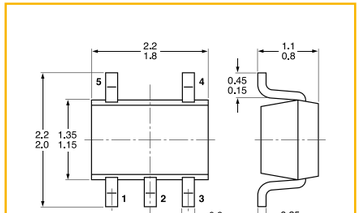
SOT143B



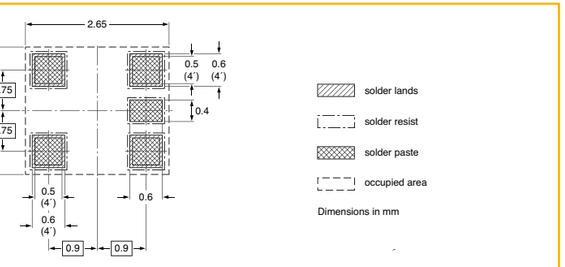
SOT223 (SC-73)



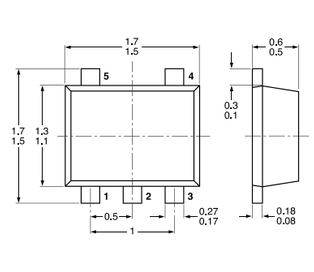
SOT223 (SC-73)



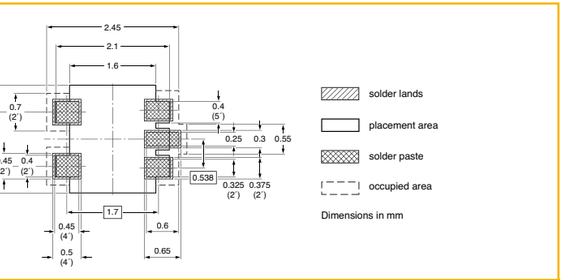
SOT353 (SC-88A)



SOT353 (SC-88A)



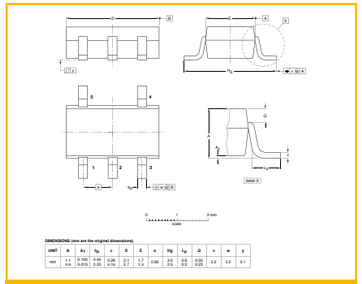
SOT665



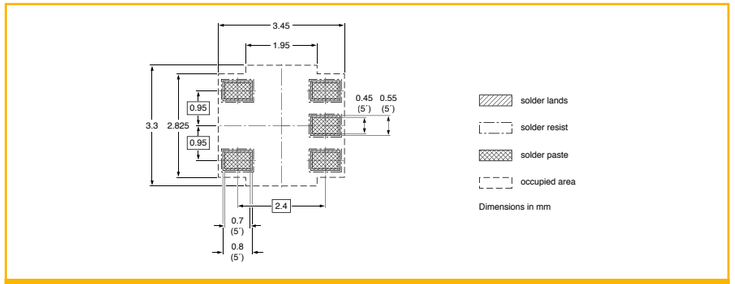
SOT665

Dimensions in mm

4-/5-Pin SMD Packages

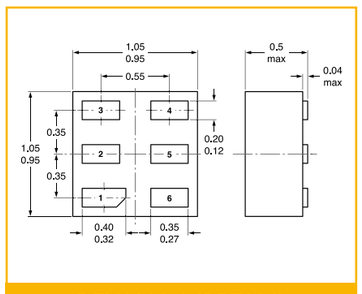


SOT753

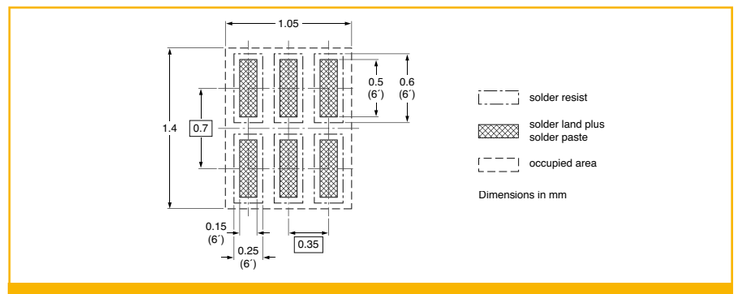


SOT753

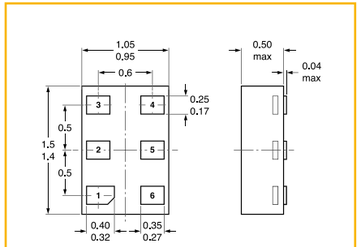
6- to 8-Pin SMD Packages



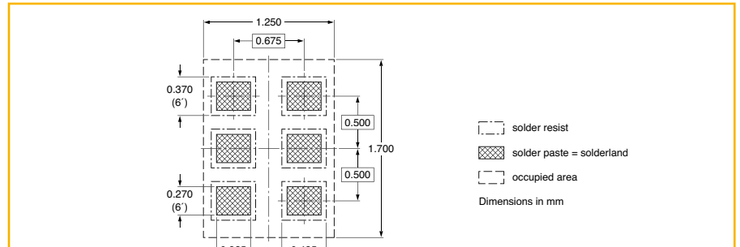
DFN1010-6 (SOT891)



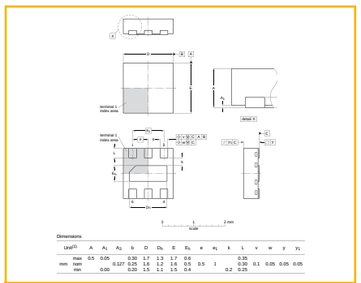
DFN1010-6 (SOT891)



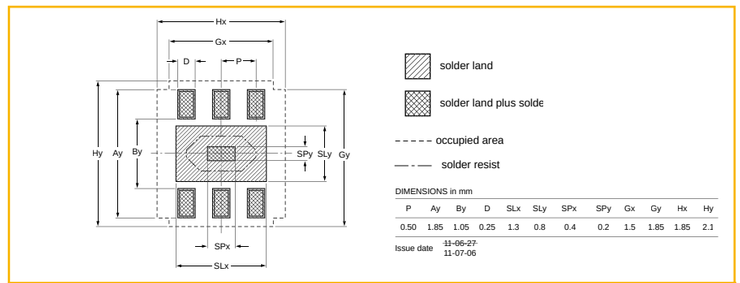
DFN1410-6 (SOT886)



DFN1410-6 (SOT886)



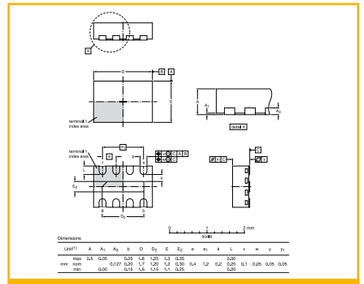
DFN1616-6 (SOT1189)



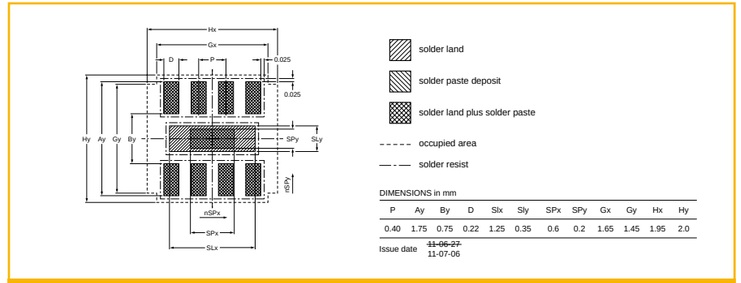
DFN1616-6 (SOT1189)

Dimensions in mm

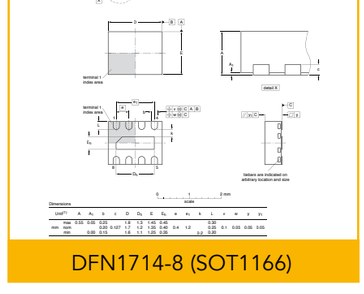
6- to 8-Pin SMD Packages



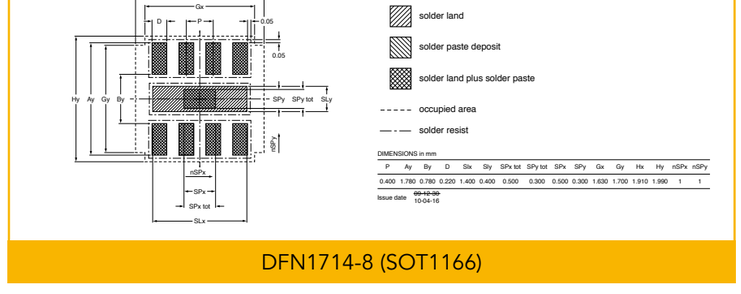
DFN1712-8 (SOT1157)



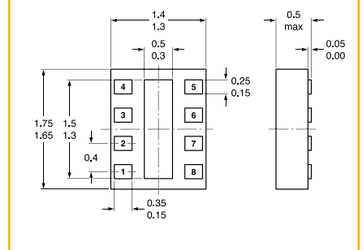
DFN1712-8 (SOT1157)



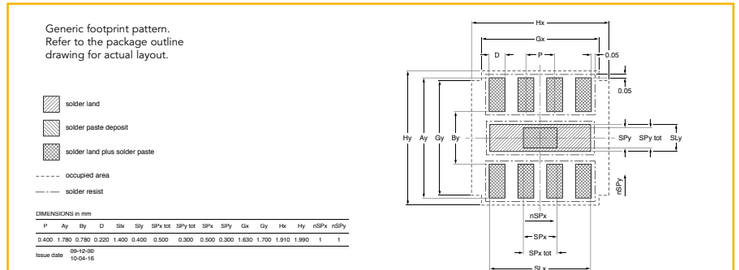
DFN1714-8 (SOT1166)



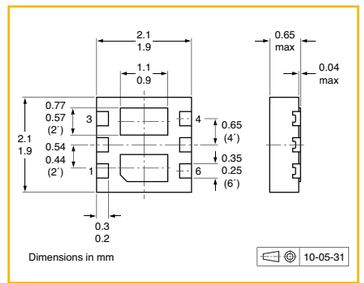
DFN1714-8 (SOT1166)



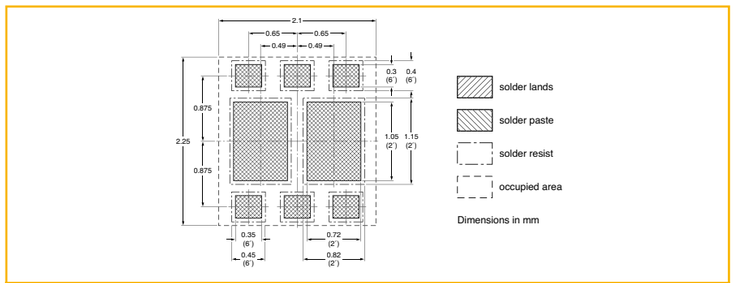
DFN1714U-8 (SOT983)



DFN1714U-8 (SOT983)



DFN2020-6 (SOT1118)

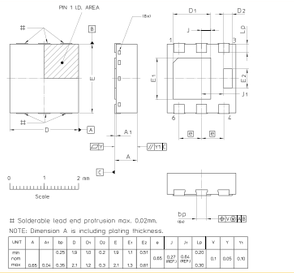


DFN2020-6 (SOT1118)

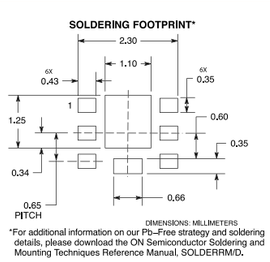
Dimensions in mm

Packages

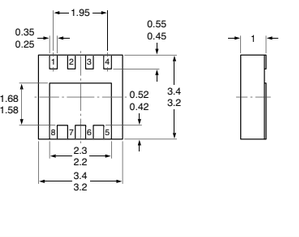
6- to 8-Pin SMD Packages



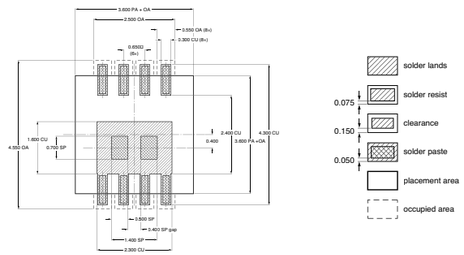
DFN2020MD-6 (SOT1220)



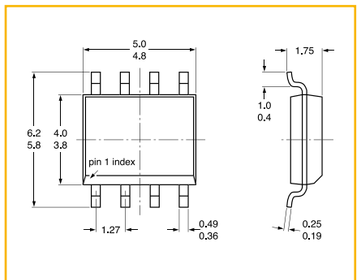
DFN2020MD-6 (SOT1220)



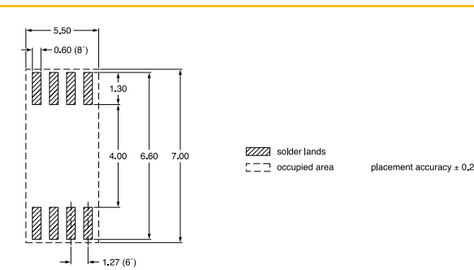
DFN3333-8 (SOT873-1)



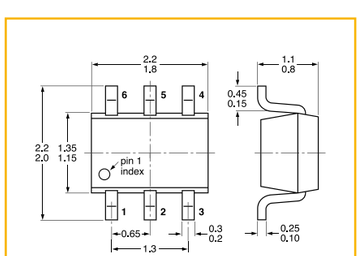
DFN3333-8 (SOT873-1)



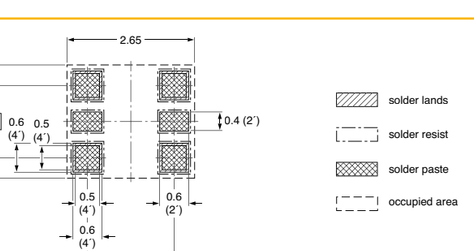
SOT96 (SO8)



SOT96 (SO8)



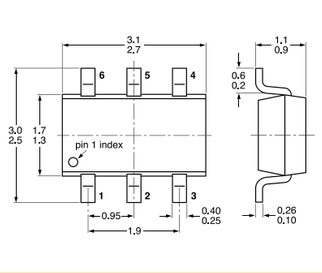
SOT363 (SC-88)



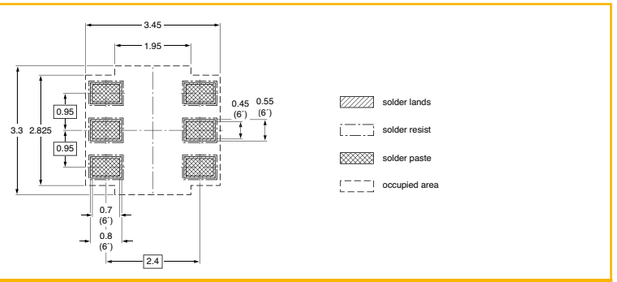
SOT363 (SC-88)

Dimensions in mm

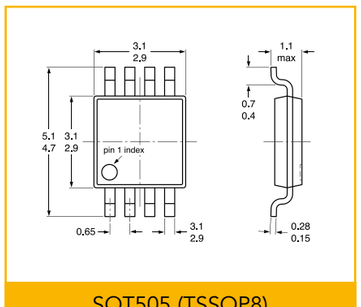
6- to 8-Pin SMD Packages



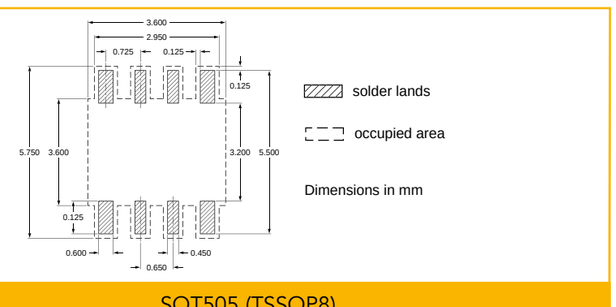
SOT457 (SC-74)



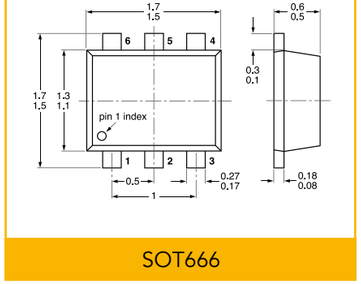
SOT457 (SC-74)



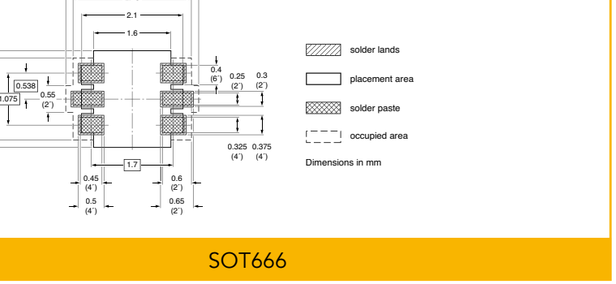
SOT505 (TSSOP8)



SOT505 (TSSOP8)

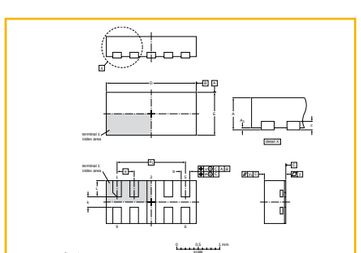


SOT666

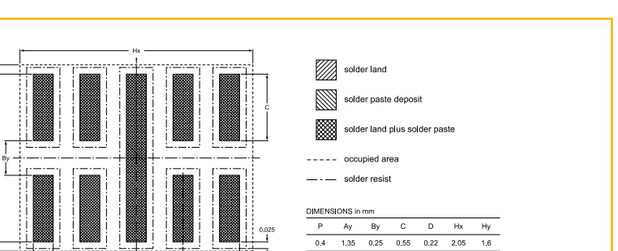


SOT666

More than 8-Pin Packages



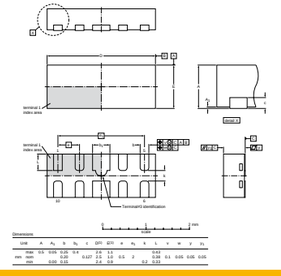
DFN2110-9 (SOT1178)



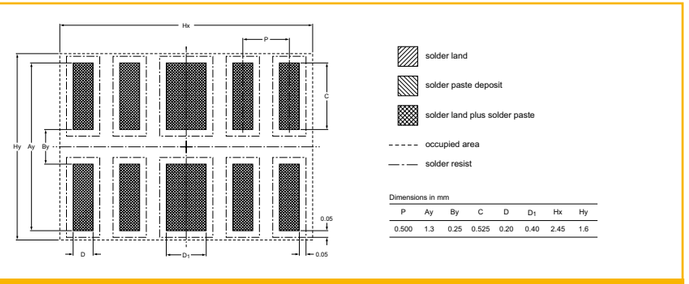
DFN2110-9 (SOT1178)

Dimensions in mm

More than 8-Pin Packages



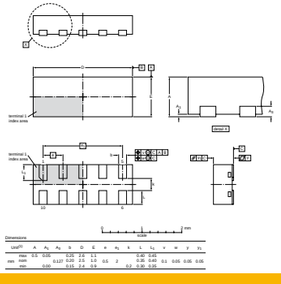
DFN2510-10 (SOT1165)



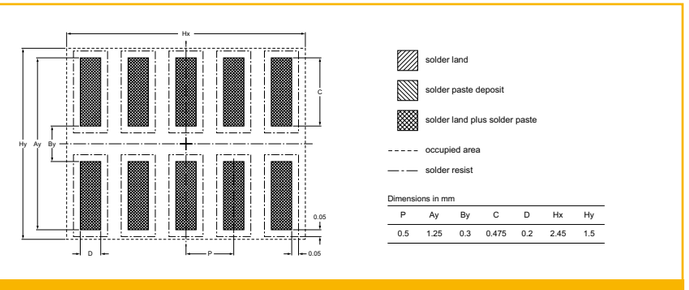
Dimensions in mm

P	Ay	By	C	D	D1	Hx	Hy
0.500	1.3	0.25	0.525	0.20	0.40	2.45	1.6

DFN2510-10 (SOT1165)



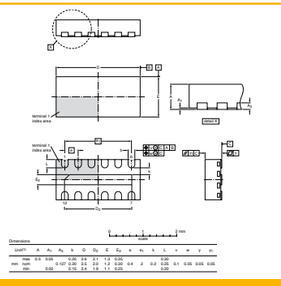
DFN2510A-10 (SOT1176)



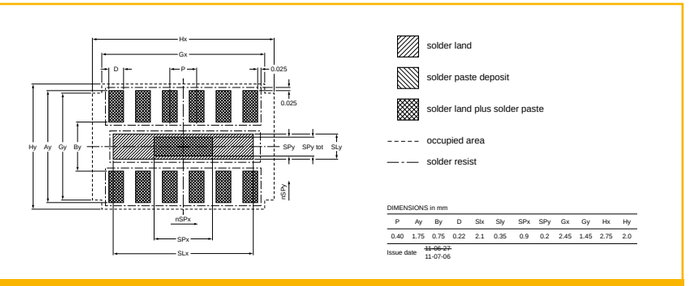
Dimensions in mm

P	Ay	By	C	D	Hx	Hy
0.5	1.25	0.3	0.475	0.2	2.45	1.5

DFN2510A-10 (SOT1176)



DFN2512-12 (SOT1158)

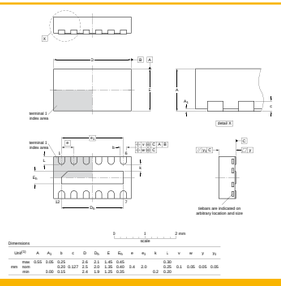


DIMENSIONS in mm

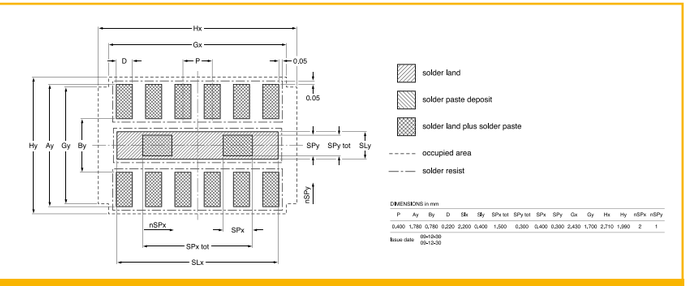
P	Ay	By	D	SLx	SLy	SPx	SPy	Gx	Gy	Hx	Hy
0.40	1.75	0.75	0.22	2.1	0.35	0.9	0.2	2.45	1.45	2.75	2.0

Issue date ~~11-06-27~~ 11-07-06

DFN2512-12 (SOT1158)



DFN2514-12 (SOT1167)



DIMENSIONS in mm

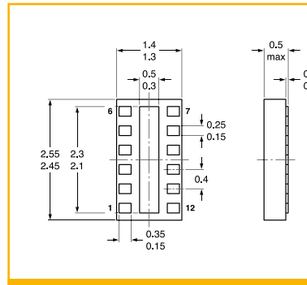
P	Ay	By	D	SLx	SLy	SPx tot	SPy tot	SPx	SPy	Gx	Gy	Hx	Hy	nSPx	nSPy
0.400	1.780	0.780	0.220	2.200	0.400	1.500	0.300	0.400	0.300	2.430	1.700	2.710	1.990	2	1

Issue date 05×10×30
05×13×20

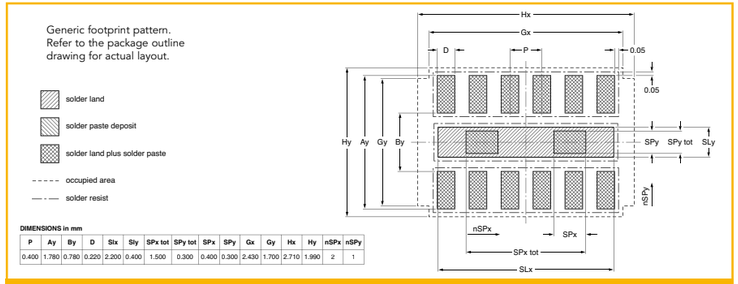
DFN2514-12 (SOT1167)

Dimensions in mm

More than 8-Pin Packages



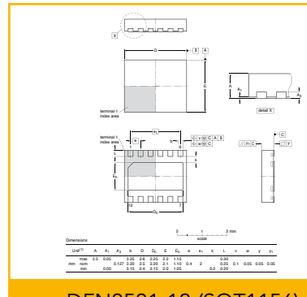
DFN2514U-12 (SOT984)



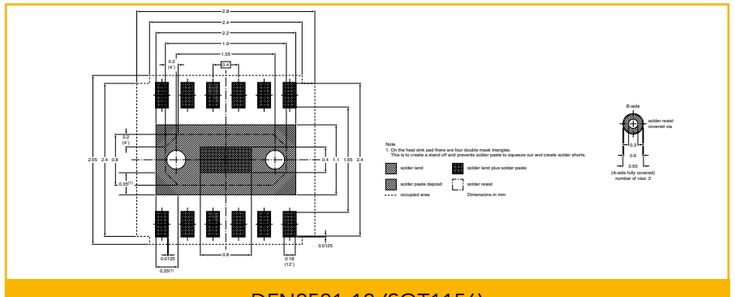
DIMENSIONS in mm

P	Ay	By	D	SLx	SLy	SPx tot	SPy tot	SPx	SPy	Gx	Gy	Hx	Hy	nSPx	nSPy
0.400	1.780	0.780	0.220	2.200	0.400	1.500	0.300	0.400	0.300	2.430	1.700	2.710	1.990	2	1

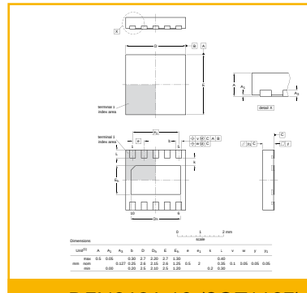
DFN2514U-12 (SOT984)



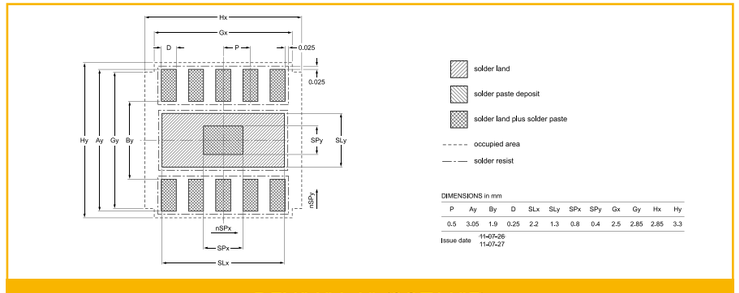
DFN2521-12 (SOT1156)



DFN2521-12 (SOT1156)



DFN2626-10 (SOT1197)

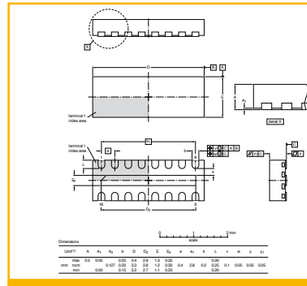


DIMENSIONS in mm

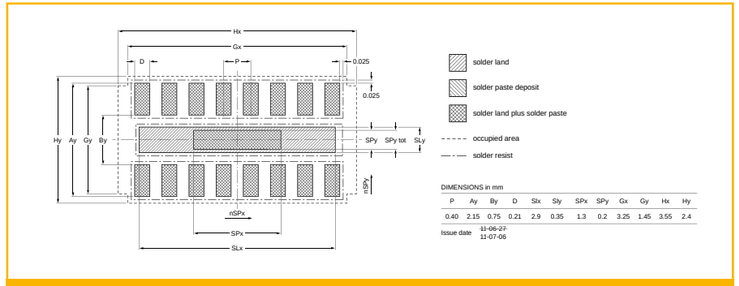
P	Ay	By	D	SLx	SLy	SPx	SPy	Gx	Gy	Hx	Hy
0.5	3.05	1.9	0.25	2.2	1.3	0.8	0.4	2.5	2.85	2.85	3.3

Issue date 11-07-26
11-07-27

DFN2626-10 (SOT1197)



DFN3312-16 (SOT1159)



DIMENSIONS in mm

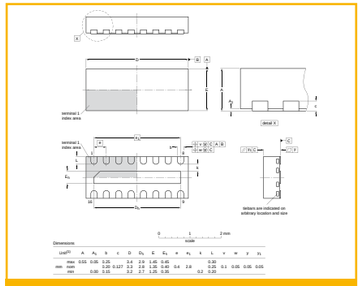
P	Ay	By	D	SLx	SLy	SPx	SPy	Gx	Gy	Hx	Hy
0.40	2.15	0.75	0.21	2.9	0.35	1.3	0.2	3.25	1.45	3.55	2.4

Issue date 11-06-27
11-07-06

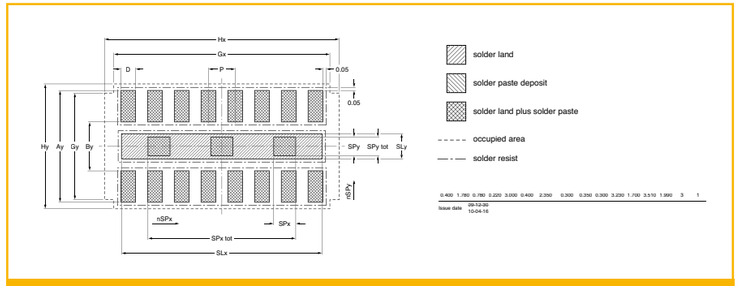
DFN3312-16 (SOT1159)

Dimensions in mm

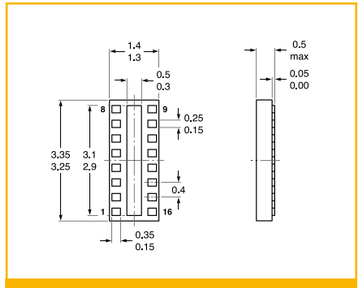
More than 8-Pin Packages



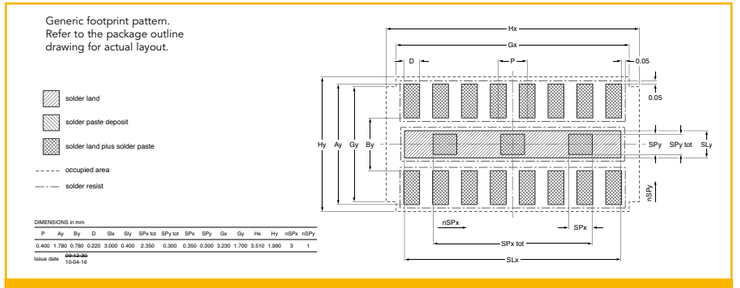
DFN3314-16 (SOT1168)



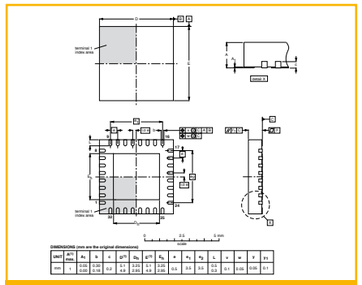
DFN3314-16 (SOT1168)



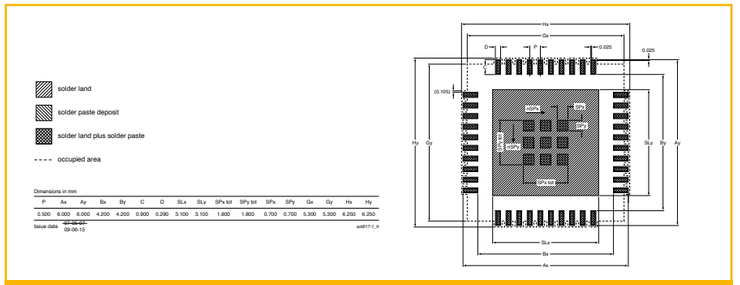
DFN3314U-16 (SOT985)



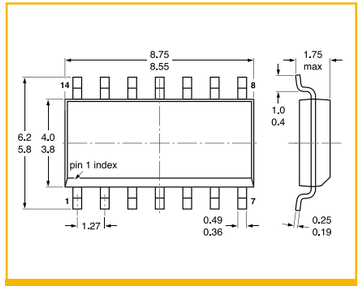
DFN3314U-16 (SOT985)



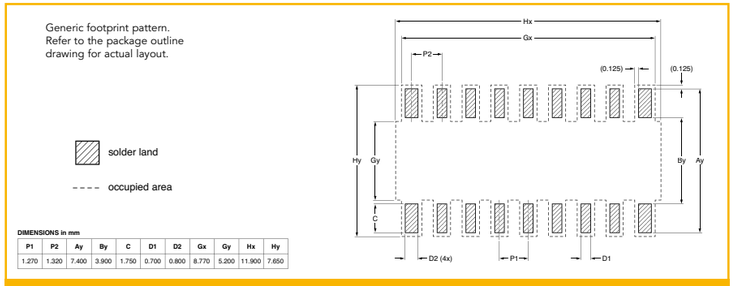
DFN5050-32 (SOT617)



DFN5050-32 (SOT617)



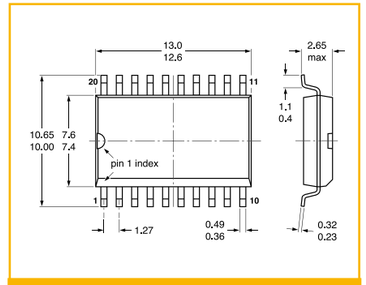
SOT108 (SO14)



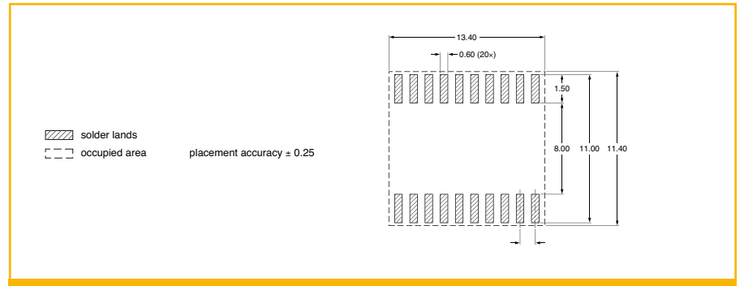
SOT108 (SO14)

Dimensions in mm

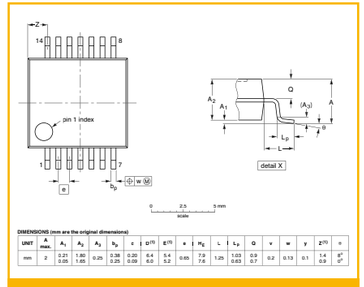
More than 8-Pin Packages



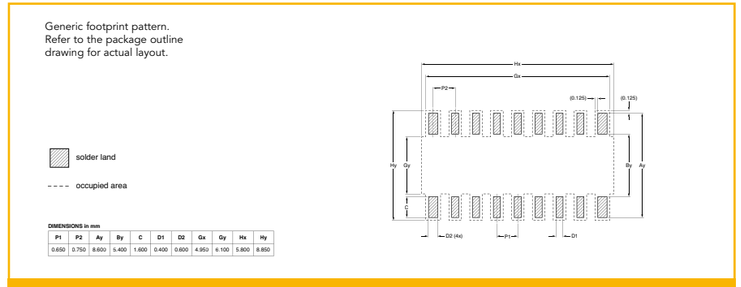
SOT163 (SO20)



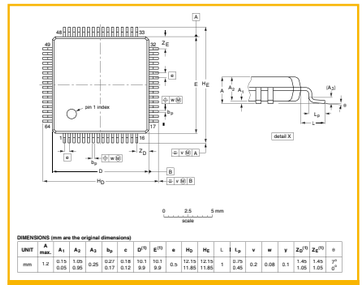
SOT163 (SO20)



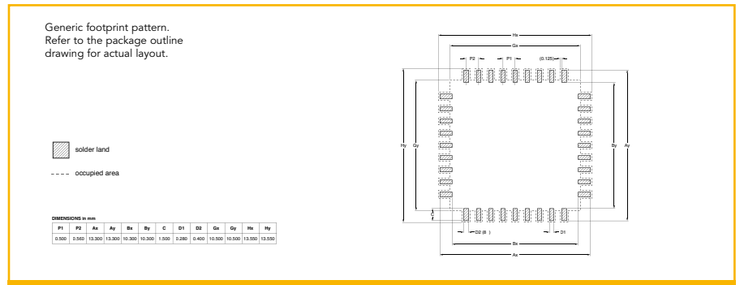
SOT337 (SSOP14)



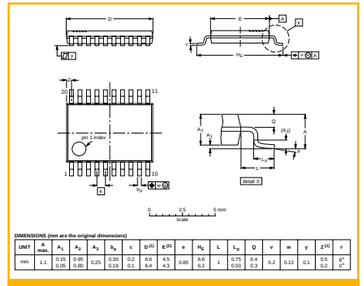
SOT337 (SSOP14)



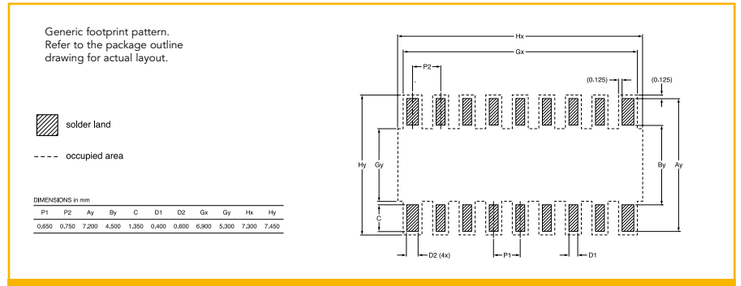
SOT357



SOT357



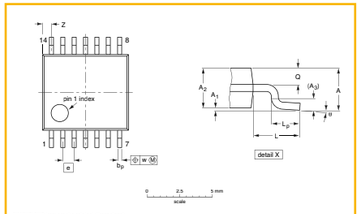
SOT360 (TSSOP20)



SOT360 (TSSOP20)

Dimensions in mm

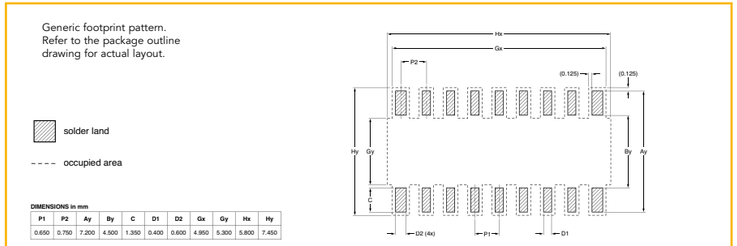
More than 8-Pin Packages



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A1	A2	A3	bp	c	D(1)(2)	E(2)(3)	e	HE	L	Lp	Q	v	w	y	Z(1)(3)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.4	0.2	0.13	0.1	0.72 0.38	8° 0°

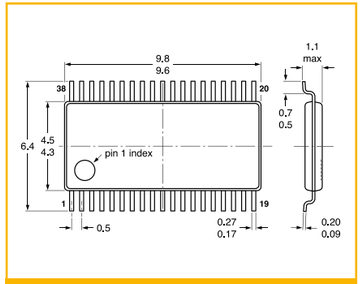
SOT402 (TSSOP14)



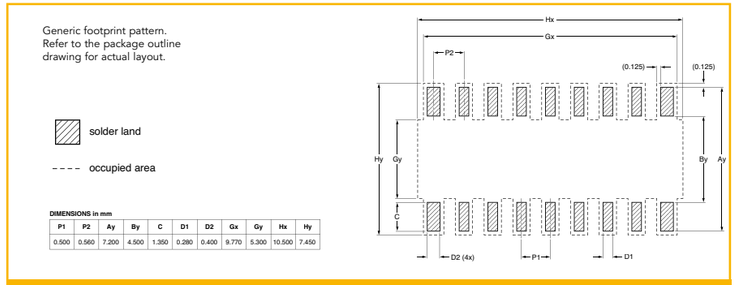
DIMENSIONS in mm

P1	P2	Ay	By	C	D1	D2	Gx	Gy	Hx	Hy
0.650	0.750	7.200	4.500	1.350	0.400	0.600	4.950	5.300	5.800	7.450

SOT402 (TSSOP14)



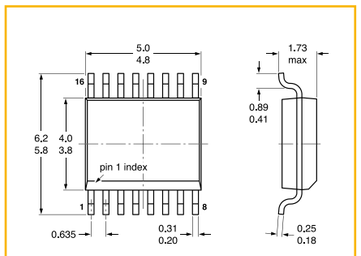
SOT510 (TSSOP38)



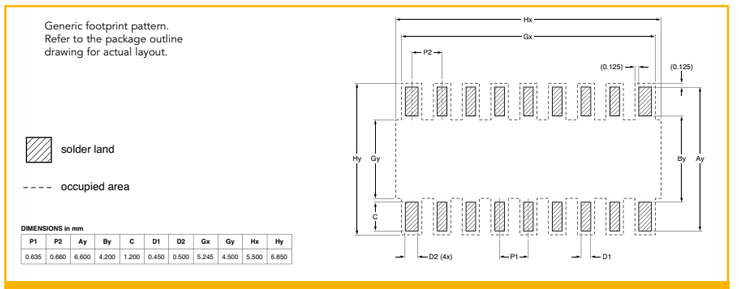
DIMENSIONS in mm

P1	P2	Ay	By	C	D1	D2	Gx	Gy	Hx	Hy
0.500	0.560	7.200	4.500	1.350	0.280	0.400	9.770	5.300	10.500	7.450

SOT510 (TSSOP38)



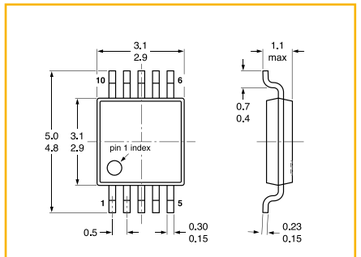
SOT519 (SSOP16)



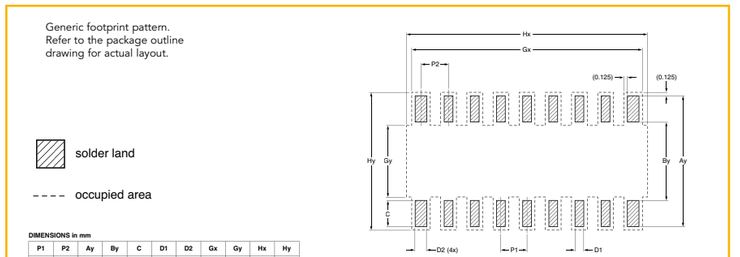
DIMENSIONS in mm

P1	P2	Ay	By	C	D1	D2	Gx	Gy	Hx	Hy
0.635	0.660	6.600	4.200	1.200	0.450	0.500	5.245	4.500	5.500	6.850

SOT519 (SSOP16)



SOT552 (TSSOP10)



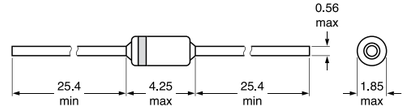
DIMENSIONS in mm

P1	P2	Ay	By	C	D1	D2	Gx	Gy	Hx	Hy
0.500	0.550	5.400	3.200	1.100	0.300	0.400	2.750	3.900	3.700	5.650

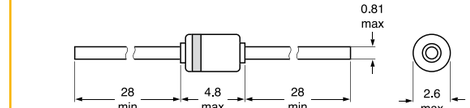
SOT552 (TSSOP10)

Dimensions in mm

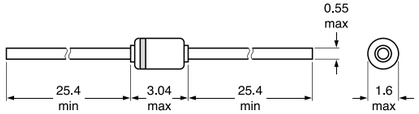
Glass diodes



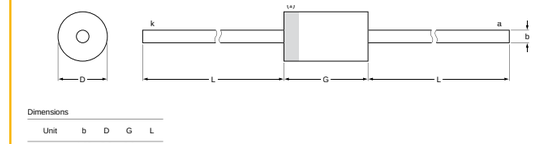
SOD27 (DO-35)



SOD66 (DO-41)



SOD68 (DO-34)

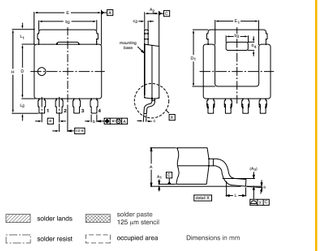


Dimensions

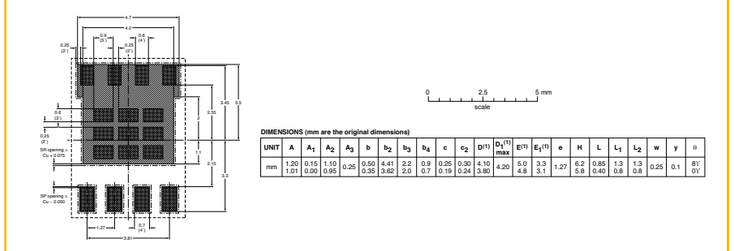
	Unit	b	D	G	L
mm	max	1.30	5.3	9.6	
	nom				
	min	1.18	4.8	7.2	25.4
inches	max	0.052	0.21	0.375	
	nom				
	min	0.046	0.19	0.285	1.00

SOD141 (DO201AD)

Single Ended and Through Hole Packages



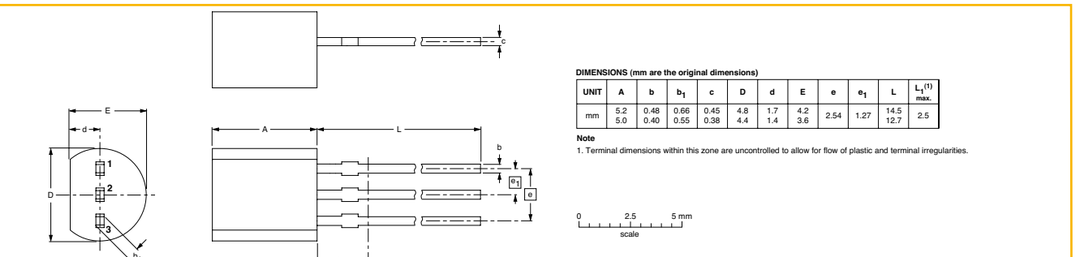
LFPAK (SOT669)



DIMENSIONS (mm are the original dimensions)

UNIT	A	A1	A2	A3	b	b2	b3	b4	c	c2	D(1)	D1(1) max.	E(1)	E1(1)	e	H	L	L1	L2	w	y	θ
mm	1.20 1.01	0.15 0.00	1.10 0.95	0.25	0.50 0.35	4.41 3.62	2.2 2.0	0.9 0.7	0.25 0.19	0.30 0.24	4.10 3.80	4.20	5.0 4.8	3.3 3.1	1.27	6.2 5.8	0.85 0.40	1.3 0.8	1.3 0.8	0.25	0.1	8° 0°

LFPAK (SOT669)



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b1	c	D	d	E	e	e1	L	L1(1) max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

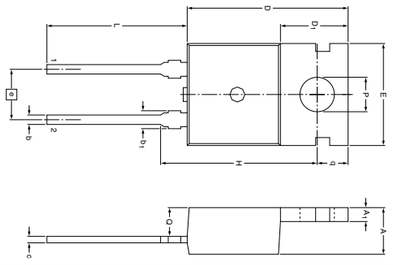
Note
1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

SOT54

Dimensions in mm

Packages

Single Ended and Through Hole Packages



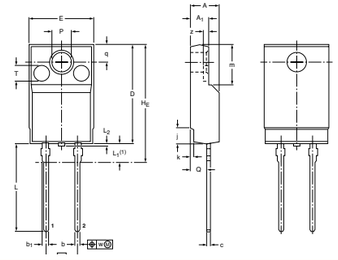
Dimensions

Unit		A	A_1	b	b_1(1)	c	D	D_1	E	e	H	L	P	Q	q
mm	max	4.7	1.40	0.95	1.7	0.65	15.8	6.8	10.30	5.08 (REF)	16.25	15.0	3.7	2.6	2.9
	nom														
	min	4.3	1.15	0.70	1.3	0.45	15.6	6.4	9.65		15.70	12.5	3.5	2.2	2.7

Note
1. Protruded dambar are included in the dimension.

0 5 10 mm
scale

SOD59



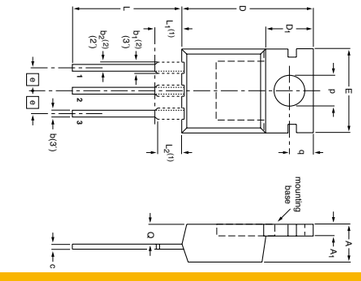
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	E	e	H_E max	j	k	L	L_1(1)	L_2 max	m	P	Q	q	T	w	z(2)
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	0.7 0.4	15.8 15.2	10.3 9.7	5.08	19.0	2.7 1.7	0.6 0.4	14.4 13.5	3.3 2.8	0.5	6.5 6.3	3.2 3.0	2.6 2.3	2.6	2.55	0.4	0.8

Notes
1. Terminals are uncontrolled within zone L_1.
2. z is depth of T.

0 10 20 mm
scale

SOD113



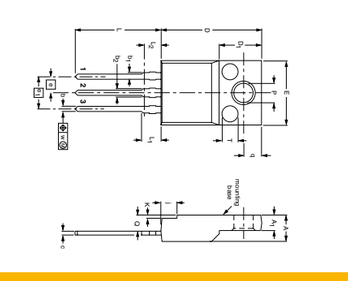
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

Notes
1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

0 5 10 mm
scale

SOT78



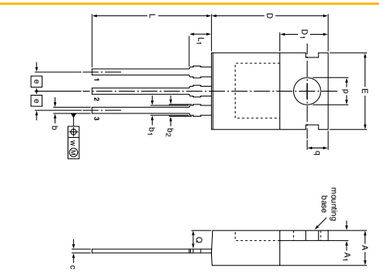
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1	E	e	e_1	j	K	L	L_1	L_2(1) max.	P	Q	q	T(2)	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	1.4 1.0	0.7 0.4	15.8 15.2	6.5 6.3	10.3 9.7	2.54	5.08	2.7 1.7	0.6 0.4	14.4 13.5	3.30 2.79	3	3.2 3.0	2.6 2.3	3.0 2.6	2.5	0.4

Notes
1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are Æ 2.5 ´ 0.8 max. depth

0 5 10 mm
scale

SOT186A

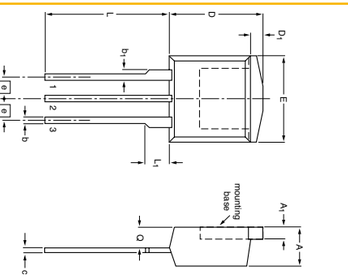


DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	D_1	E	e	L	L_1	Q
mm	4.5 4.1	1.40 1.27	0.85 0.60	1.3 1.0	0.7 0.4	11	1.6 1.2	10.3 9.7	2.54	15.0 13.5	3.30 2.79	2.6 2.2

0 5 10 mm
scale

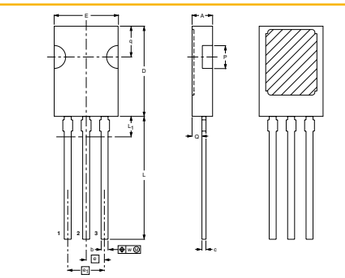
SOT78D



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1	E	e	e_1	L	L_1	L_2	L_3(1)	L_4(2) max.	m	∅ p	p_1	q	Q	Q_1	Q_2	R	w
mm	4.5 4.1	1.39 1.27	0.85 0.70	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	1.7	9.8 9.7	5.9 5.3	5.2 5.0	2.4 1.6	0.5	0.8 0.6	3.8 3.6	4.3 4.1	3.0 2.7	2.0	4.5	8.2	0.5	0.4

SOT226



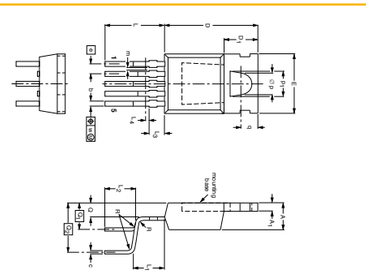
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D	E	e	H_E	L	L_1	L_2	L_3	p	q	Q	w
mm	2.8 2.3	0.88 0.65	0.58 0.47	11.1 10.5	7.8 7.2	2.29	4.58	16.5 15.3	2.54	3.1 2.5	1.5 0.9	3.9 3.5	0.254			

Note
1. Terminal dimensions within this zone are uncontrolled to allow for body and terminal irregularities.

0 2.5 5 mm
scale

SOT82



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D	D_1	E	e	L	L_1	L_2	L_3(1)	L_4(2) max.	m	∅ p	p_1	q	Q	Q_1	Q_2	R	w
mm	4.5 4.1	1.39 1.27	0.85 0.70	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	1.7	9.8 9.7	5.9 5.3	5.2 5.0	2.4 1.6	0.5	0.8 0.6	3.8 3.6	4.3 4.1	3.0 2.7	2.0	4.5	8.2	0.5	0.4

SOT263B-1

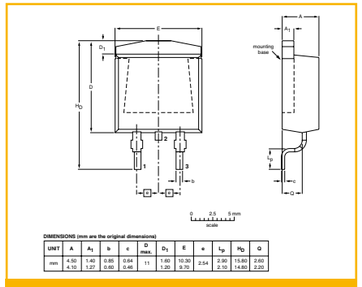
Dimensions in mm

Minimized outline drawings and reflow soldering footprint

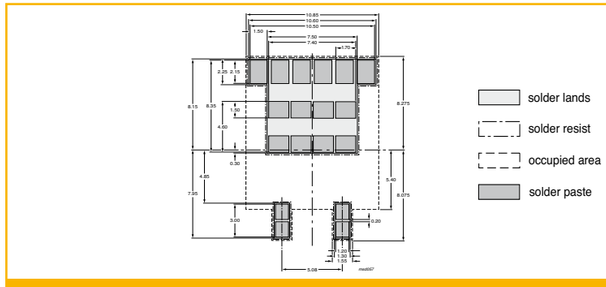
Single Ended and Through Hole Packages

Dimensions in mm

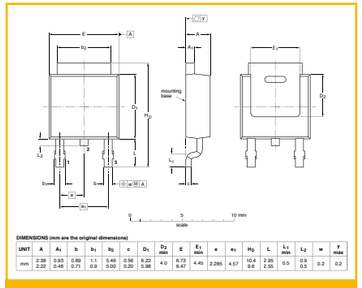
Single Ended and Through Hole Packages



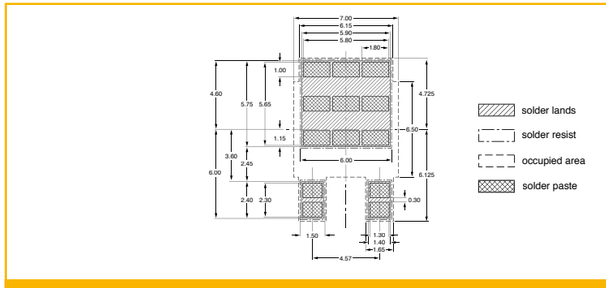
SOT404



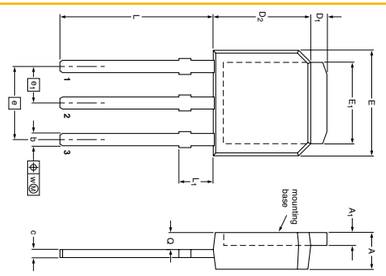
SOT404



SOT428



SOT428



SOT533

Dimensions in mm

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