

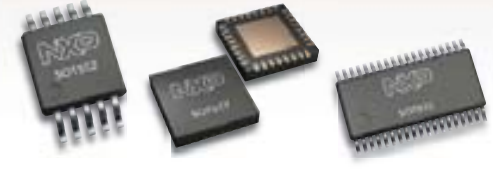


Discrete Semiconductors Selection Guide 2012

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



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

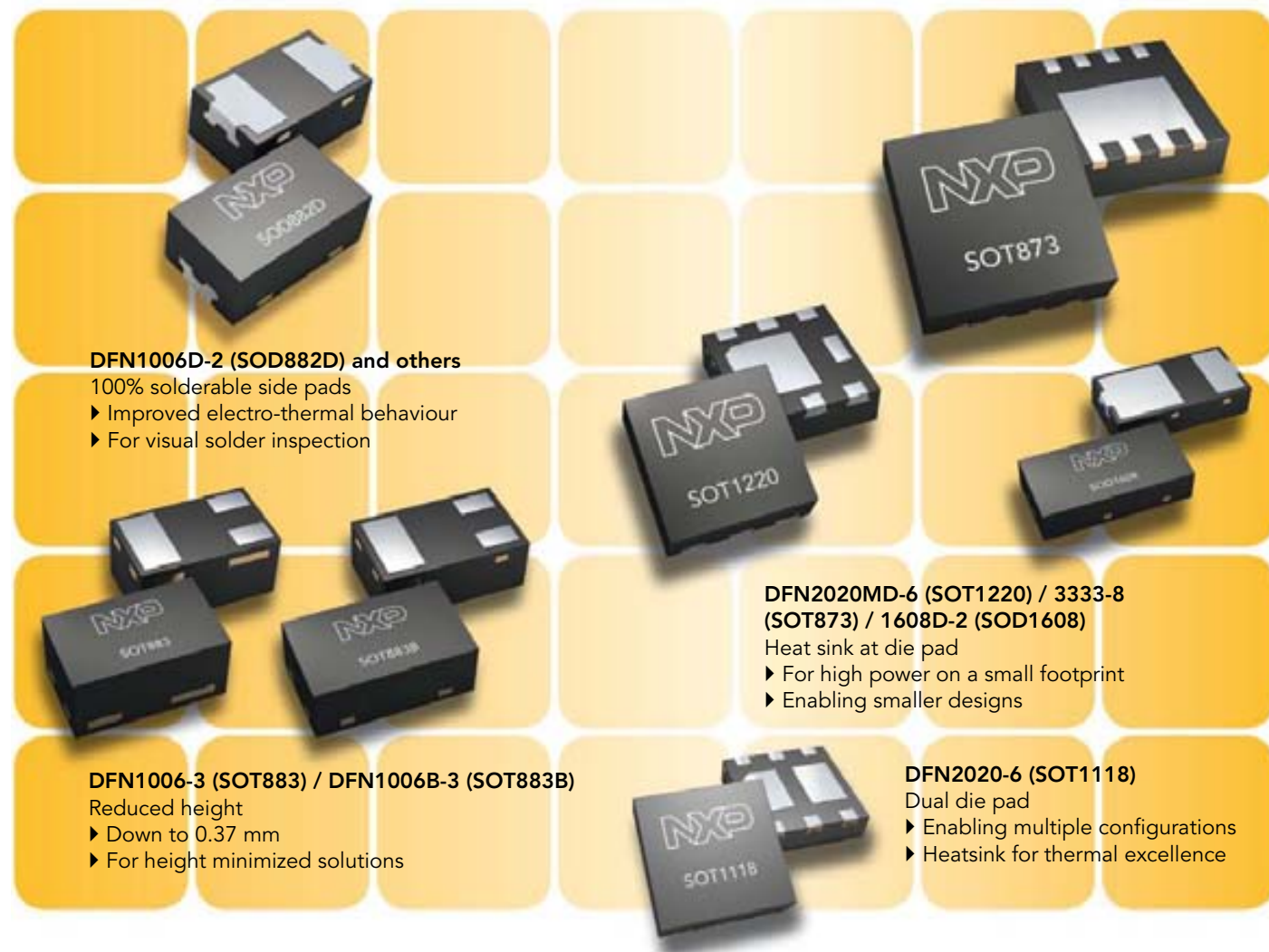
* This is only an example. The exact position of the balls varies.



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



Exceeding quality standards is our expectation



Diodes

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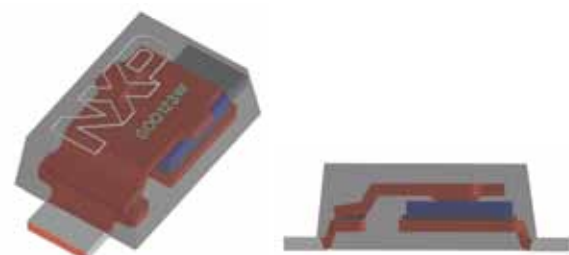
FlatPower packages: SOD123W and SOD128 NXP's medium power solution for shrinking designs



SOD123W and SOD128 package

Small SMD packages for shrinking designs

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

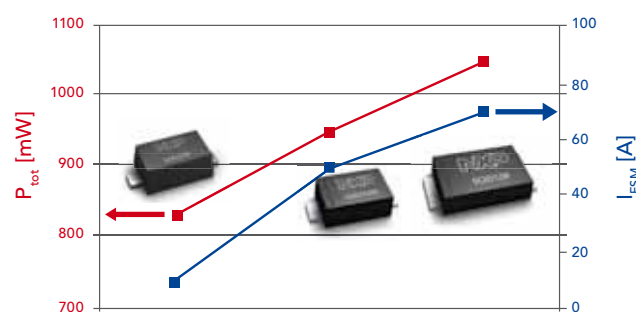


SOD123W and SOD128 design

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.



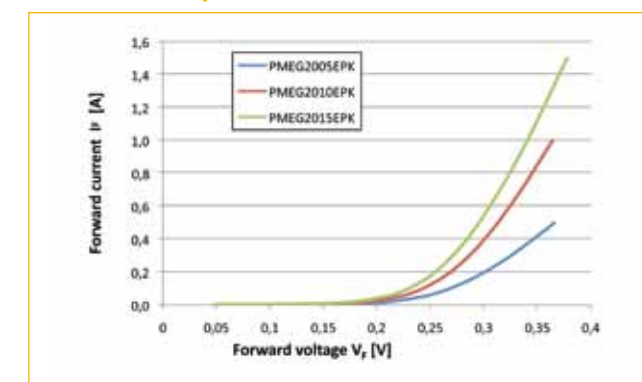
Features and benefits

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

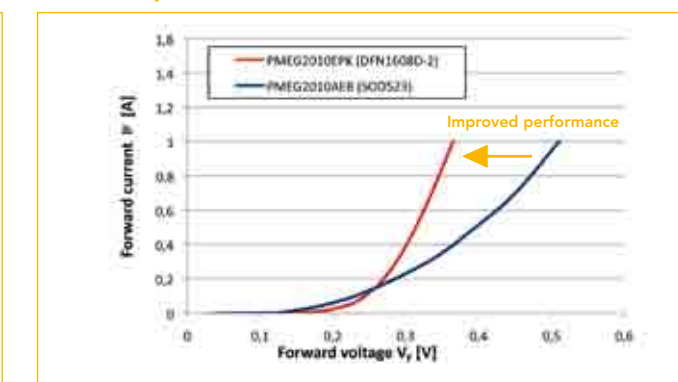
Applications

- ▶ Handheld equipment
- ▶ Backlighting for smart phone
- ▶ Battery charging
- ▶ Shrunk PCB design

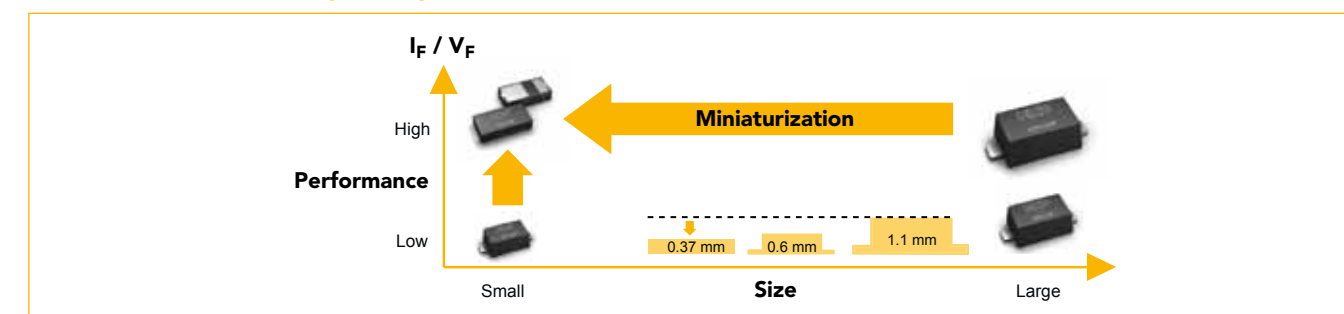
Differentiated portfolio ...



with best performance



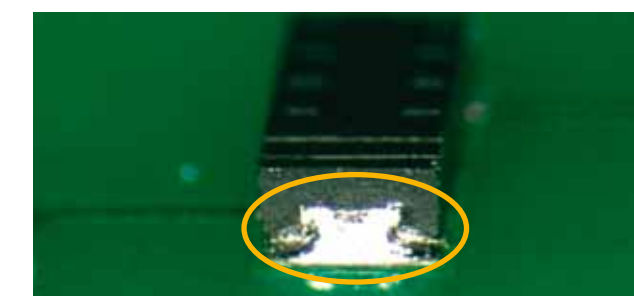
DFN1608D-2 combines improved performance with reduced size



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

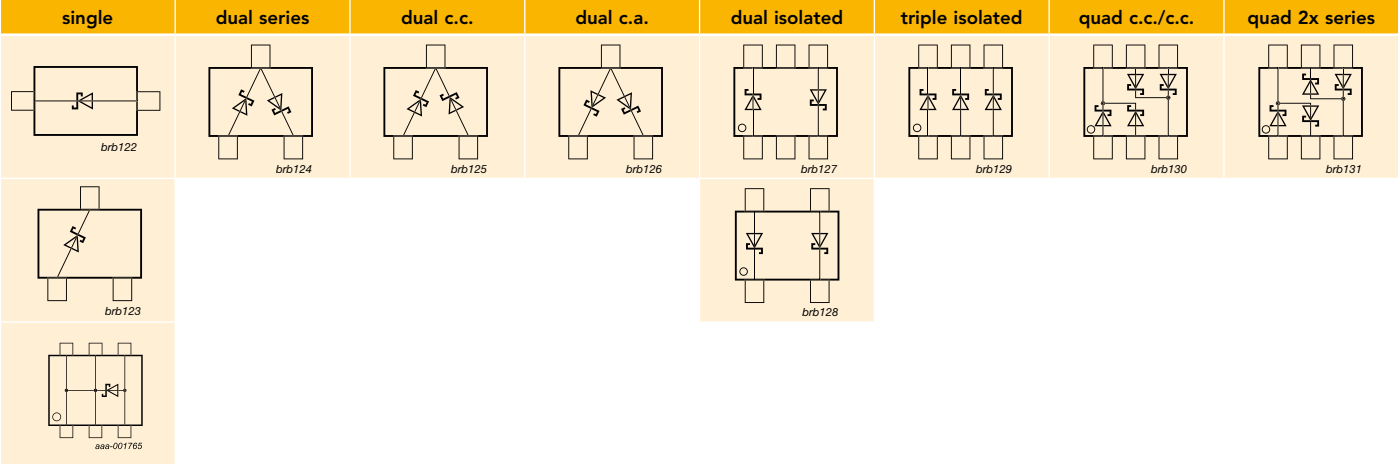
Soldered products onto pcb



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			
120	40	370	1	0.5	30	quad 2x series								BAS70XY						
		500	10	1	30	single						BAS40H	BAS40W			RB751V40			RB751S40	RB751CS40
						single			BAS40				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							
200	30	300	10	30	10	dual isolated														
			10	2	25	quad 2x series													1PS79SB31	
		340	10	2	25	single			BAT754											
						single series			BAT754S											
						dual c.c.			BAT754C											
						dual c.a.			BAT754A											
		400	10	2	25	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			
	40	500	200	30	10	triple isolated											BAT54VV			
			200	1	10	quad c.c./c.c.											BAT54CV			
		600	200	1	10	quad 2x series								BAT54XY						
						single													RB521S30	RB521CS30L
		300	10	15	30	single			BAT721							1PS76SB21			RB520S30	RB520CS30L
						dual series			BAT721S											
						dual c.c.			BAT721C											
						dual c.a.			BAT721A											
		360	10	0.5	25	single													1PS79SB30	
						single							BAT854W							
250	100	850	250	4	75	dual series							BAT854SW							
						dual c.c.							BAT854CW							
						dual c.a.							BAT854AW							
						single	BAS86	BAT86				BAT46WH			BAT46WJ					



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	single	BAT17			1PS76SB17		1PS79SB17			
				triple isolated				1PS66SB17					
				dual series	PMBD353 PMBD354 ¹⁾								
	15	340	1	single		1PS70SB82					1PS10SB82		
				triple isolated			1PS88SB82		1PS66SB82				
				dual series		1PS70SB84							
				dual c.c.		1PS70SB85							
				dual c.a.		1PS70SB86							

¹⁾ Diodes have matched capacitance

Medium power lowV_F Schottky rectifiers single ≥ 200 mA – Part I

types in **bold** represent new products - types in *italic* and **bold** represent new produts for high temperature application T_j ≤ 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 cm ²	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							

Medium power lowV_F Schottky rectifiers single ≥ 200 mA – Part 2

types in **bold** represent new products - types in *italic* and **bold** represent new products for high temperature application T_j ≤ 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 cm ²	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	PMEG4020EP			PMEG4020ER												
		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

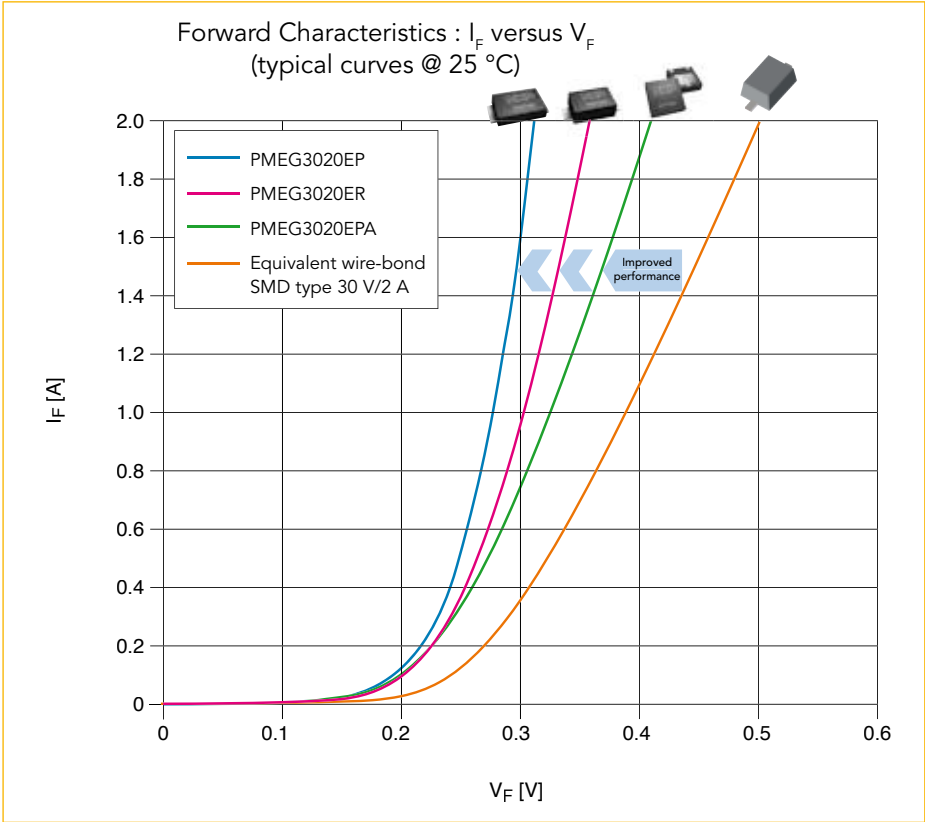


Medium power low V_F Schottky rectifiers dual ≥ 200 mA

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			
	20	420	1.0	low V_F	dual c.c.			PMEG2020CPA	
		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

$I_{R, typ} = 28$ μ A @ 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. forward current in A
e.g. 10 = 1.0 A

Variant number (optional)

Variant number (optional)
T = high temperature

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

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

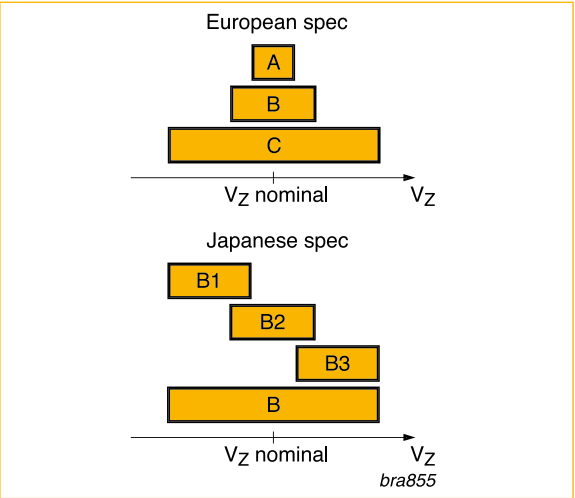
General purpose Zener diodes

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		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		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		6.5 x 3.5 x 1.65	1500
250	40	2.4~75	C	Eur	single 	BZV49 series		4.5 x 2.5 x 1.5	1000
250	40	2.4~75	B, C	Eur	single 	BZV55 series		3.5 x 1.5 x 1.5	300
200	40	2.4~75	B, C	Eur	dual c.a. 	BZB84 series		2.9 x 1.3 x 1.0	250
			A, B, C		single 	BZX84 series			
			0.2 V	Ave		PLVA600A series			
250	30	5~6.8	0.2 V	Ave	dual c.a. 	PLVA2600A series		2.9 x 1.3 x 1.0	250
250	-	3.0~30	about 2.5%	special	single 	NZH series		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		2.0 x 1.25 x 0.95	300
200	40	2.4~15	C	Eur	dual c.a. 	BZB784 series		2.0 x 1.25 x 0.95	350
200	30	100	C	Eur	back-to-back 	BZB100A		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	single 	PZUxBA series		1.7 x 1.25 x 0.7	550
200	60	100	C	Eur		BZX100A			
200	40	2.4~36	B, B1, B2, B3	Jap		PZUxB series			
250	40	2.4~75	B, C	Eur	single 	BZX84J series		1.7 x 1.25 x 0.7	500
200	40	2.4~15	C	Eur	dual c.a. 	BZB984 series			
		2.4~75	B, C	Eur	single 	BZX585 series		1.2 x 0.8 x 0.6	300
200	40	2.4~75	B, C	Eur	single 	BZX884 series		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		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



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

y =	C-series ± 5%	B-series ± 2%	A-series ± 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

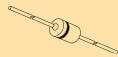
Japanese spec (PZU, PDZ)

y =	B-series ± 5%	B1-series ± 2%	B2-series ± 2%	B3-series ± 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	-	-	-

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		

General purpose switching diodes ≤ 100V

V _R max (V)	V _F max (V)	@ I _F (mA)	I _R max (nA)	@ V _R (V)	t _{tr} 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										

types in **bold** represent new products

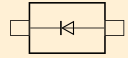
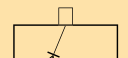
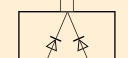
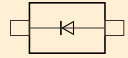
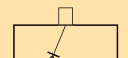
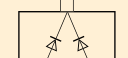
General purpose switching diodes > 100V

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)											
						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		
					50								BAS21		BAS21W		
					50						BAV23						
					50					BAV23A			BAS21AW				
					50					BAV23C							
					50					BAV23S			BAS21SW				
					50				BAS21AVD								
					50				BAS21AD								
					50										BAS21J	BAS521	
					50					BAS101							
					50					BAS101S							
					50						BAW101						
					50								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_{PRM} max (mA)	C_d max (pF)	t_{rr} max (ns)	Package	SOT23	SOT143B
								Size (mm)		
								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)								
					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_{FAV} (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_r (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOD141 (DO201AD)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT226 (I ² PAK)	SOT404 (D ² PAK)	SOT428 (DPAK)
													
100	8	0.8	8	20	BYW29E-100			BYV32E-100					
	2 x 10	0.72	8	20						BYV40E-150			
	2 x 0.75	0.5	0.5	10									
150	8	0.8	8	20	BYW29E-150								
	2 x 10	0.72	8	20				BYV32E-150					
	2 x 10	0.72	8	20				BYV42E-150					
	2 x 15	0.78	15	20									
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		
	2 x 5	0.95	5	50				BYT28-300					
	9	0.9	8	50	BYV29-400								
400	2 x 10	0.87	10	50				BYV34-400					
	9	0.9	8	50	BYV29-500	BYV29X-500						BYV29B-500	
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					
	4	0.88	4	33			NUR460						
600	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
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				
	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_{FAV} (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_r (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOT78 (TO220AB)	SOT404 (D ² PAK)
								
500	5	1.4	5	16	BYC5D-500	BYC5DX-500		
	5	1.4	5	19	BYC5-600	BYC5X-600		BYC5B-600
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_{FAV} (A)	V_F (typ) @ 150C (V)	@ I_F (A)	t_r (typ) @ 25C (ns)	SOD113 (2-pin SOT186A)
					
600	8	2	8	12.5	BYC58X-600
Casco diodes for Continuous Current Mode PFC					



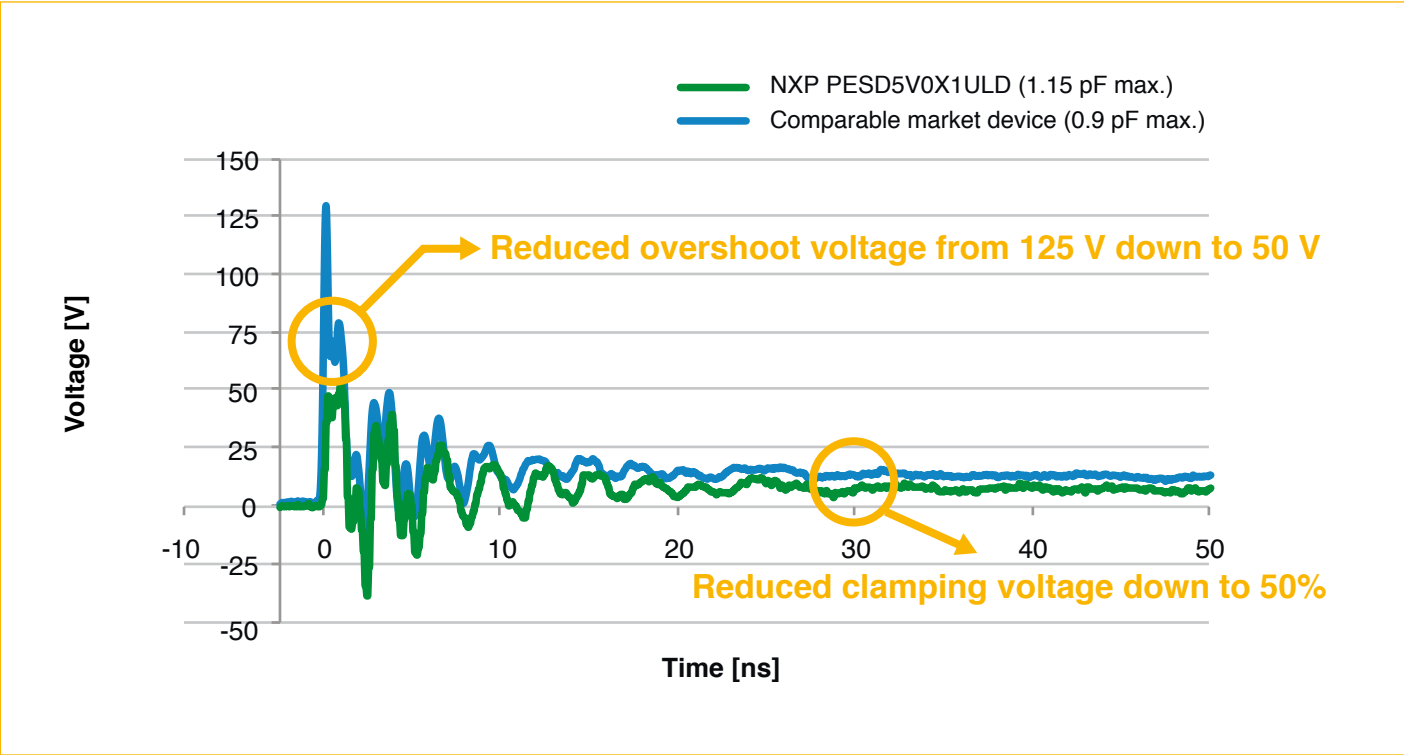
Protection and signal conditioning

Standard ESD protection devices	28
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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

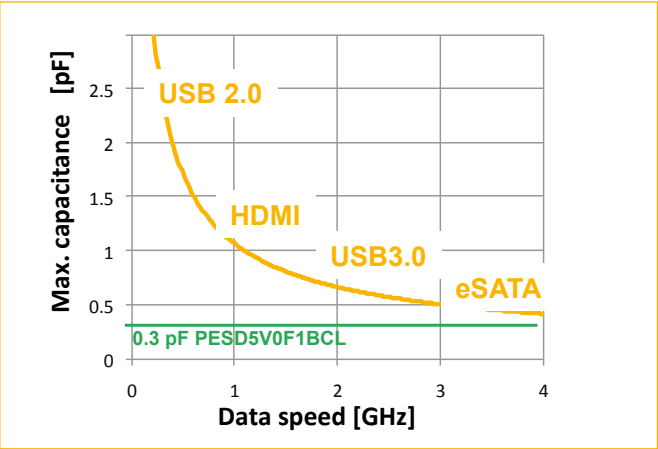
- ▶ Ultra high-speed interfaces allow only a minimum of additional line capacitance for ESD protection
- ▶ NXP new ultra low capacitance ESD protection diodes offer a line capacitance of only 0.3 pF, thereby increase PCB design flexibility

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

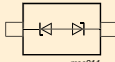
SOD882D

Tin-plated side pad

SOD882D (mounted on PCB)

Side pad after soldering; wetted with solder

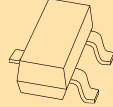
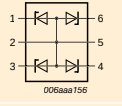
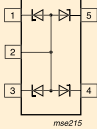
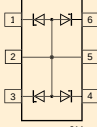
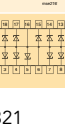
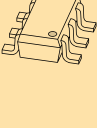
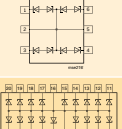
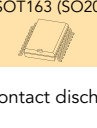
Standard ESD protection devices

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	DFN1006D-2 (SOD882D) 	1.0 x 0.6 x 0.37	
		5	152	200	150	30	1		PESD5V0S1ULD			
		12	38	75	150	30	0.05		PESD12VS1ULD			
		15	32	70	150	30	0.05		PESD15VS1ULD			
		24	23	50	150	23	0.05		PESD24VS1ULD	SOD523 (SC-79) 	1.2 x 0.8 x 0.6	
		3.3	207	300	330	30	2		PESD3V3S1UB			
		5	152	200	260	30	1		PESD5V0S1UB			
		12	38	75	180	30	0.05		PESD12VS1UB		1.7 x 1.25 x 0.95	
		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 0.7
		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)		1.0 x 0.6 x 0.5
		12	160	180	600	30	0.1		PESD12VS1UJ			
		5	68	75	150	30	1		PESD9X5.0L	DFN1006-2 (SOD882)		1.2 x 0.8 x 0.6
		7	62	70	150	30	1		PESD9X7.0L			
		2.5	229	300	260	30	6		PESD5Z2.5			
		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		1.2 x 0.8 x 0.6	
		12	35	75	200	30	0.01		PESD5Z12			
		5.5	35	45	100	30	0.1		PESD5V0S1BSF	DSN0603-2 (SOD962) 	0.6 x 0.3 x 0.3	
0	1	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	

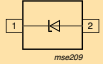
^[1] 8/20 μs exponential decay waveform according to IEC 61000-4-2 and IEC 61643-321

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

Standard ESD protection devices

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		2.9 x 1.3 x 1.0
		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		
		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		
4	3	15	37	50	-	8	0.1		BZA820A		2.0 x 1.25 x 0.95
		3	200	240	-	8	2		BZA456A		
		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		
		3.3	215	300	200	30	0.8		PESD3V3S5UD		2.9 x 1.5 x 1.0
		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		
5	4	5	45	75	-	15	0.1		BZA408B		12.8 x 7.5 x 2.65
		5	45	75	-	15	0.1		BZA408B		
		5	45	75	-	15	0.1		BZA408B		
		5	45	75	-	15	0.1		BZA408B		
0	4	5	45	75	-	15	0.1		BZA408B		12.8 x 7.5 x 2.65
		5	45	75	-	15	0.1		BZA408B		
		5	45	75	-	15	0.1		BZA408B		
		5	45	75	-	15	0.1		BZA408B		
18	17	5.2	100	120	-	8	2		BZA100		12.8 x 7.5 x 2.65
		5.2	100	120	-	8	2		BZA100		

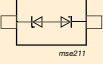
Low capacitance ESD protection devices – Part 1

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		1.2 x 0.8 x 0.6
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UB	SOD523 (SC-79)	
		5	2	2.6	-	9	0.1		PESD5V0U1UB		1.7 x 1.25 x 0.95
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76)	
		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	DSN0603B-2 (SOD962B)	0.6 x 0.3 x 0.25
		5	3.5	4	8	15	0.1		PESD5V0V1BSF-H250		
		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

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

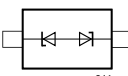
Bidirectional V_{RWM} = 16 V ESD protection device in DFN1006-2 (SOD882) package

Ultra low capacitance of C_d = 0.65 pF max.

ESD robustness V_{ESD} = 8 kV

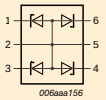
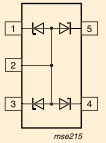
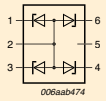
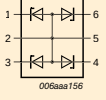
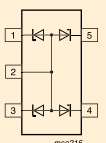
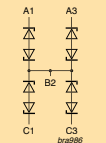
AEC-Q101 qualified

Applications: e.g. **NFC** antenna protection



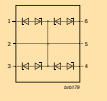
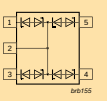
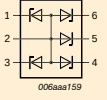
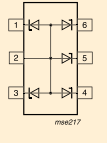
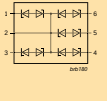
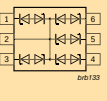
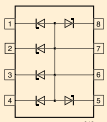
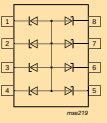
Low capacitance ESD protection devices – Part 3

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		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		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		2.0 x 1.25 x 0.95
		5	16	19	30	20	0.025		PESD5V0L4UG		
		3.3	13	17	25	10	1		PESD3V3V4UK		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		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		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		2.0 x 1.25 x 0.95
		5	12	15	16	12	0.025		PESD5V0V4UG		
		5.5	18	20	-	15	0.1		IP4343CX5/LF	WLCSP5	1.06 x 0.76 x 0.61
0	4	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		1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U4BW		1.6 x 1.2 x 0.55
5	4	3.3	20	24	28	15	2		PESD3V3L5UK		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		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		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		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		1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U5BV		1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6US		4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BS		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	SOD523 (SC-79) 	1.2 x 0.8 x 0.6
		5	0.95	1.15	8		PESD5V0X1UB		
		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	SOT323 	2.0 x 1.25 x 0.95
		80	0.6	0.75	30		NUP1301U		
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	
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 (SOT886) 	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

Ultra low clamping ESD Protection: PESD5V0X1BCAL

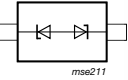
Bidirectional 5 V ESD protection device in DFN1006-2 (SOD882) package

Ultra low capacitance of C_d = 0.95 pF max.

ESD robustness V_{ESD} = 15 kV

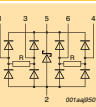
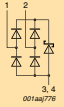
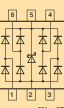
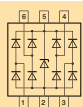
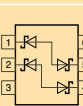
Ultra low clamping V_{CL} = 13.3 V @ 8 kV after 30 ns

AEC-Q101 qualified



Protection and signal conditioning

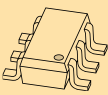
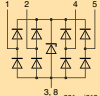
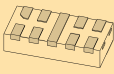
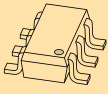
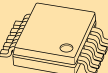
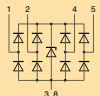
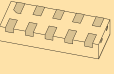
types in **bold** represent new products

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

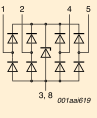
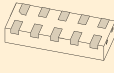
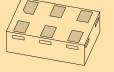
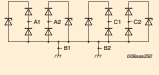
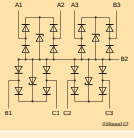
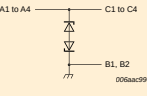
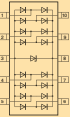
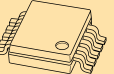
types in **bold** represent new products

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		2.9 x 1.5 x 1.0
		5.5	1	-	8		PRTR5V0U4Y		2.0 x 1.25 x 0.95
		5.5	0.8	-	12		IP4285CZ9-TBB		1.0 x 2.1 x 0.5
							IP4285CZ6-TD		2.9 x 1.5 x 1.0
							IP4285CZ6-TY		2.0 x 1.25 x 0.95
		5.5	0.7	-	8		IP4280CZ10		3.0 x 3.0 x 1.1
		5.5	0.6	-	8		IP4283CZ10-TBR		1.0 x 2.5 x 0.5
		5.5	0.6	-	8		IP4283CZ10-TT		3.0 x 3.0 x 1.1
		5.5	0.5	-	8		IP4284CZ10-TBR		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		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		1.45 x 1.0 x 0.5
		5	0.5	0.65	8	0.1		PESD5V0F5UW		1.6 x 1.2 x 0.55
5	0	5.5	1.3	-	15	-		IP4358CX6		0.76 x 1.16 x 0.61
8	0	5.5	1.3	-	15	-		IP4309CX9		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		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

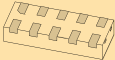
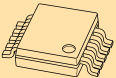
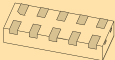
types in **bold** represent new products

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 differential channel LC filter	IP3047CX6	WLCSP6	1.60 x 1.15 x 0.65
		0.25 Ω, 3 nH	-	Inductive, low-ohmic differential 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 I

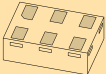
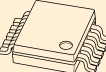
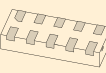
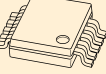
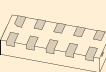
types in **bold** represent new products

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
		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
	4	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

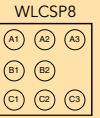
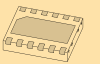
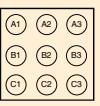
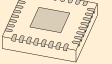
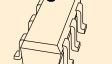
10 pin QFN package DFN2510A-10 (SOT1176)



Protection and signal conditioning

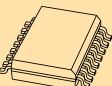
Video interfaces – Part 3

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

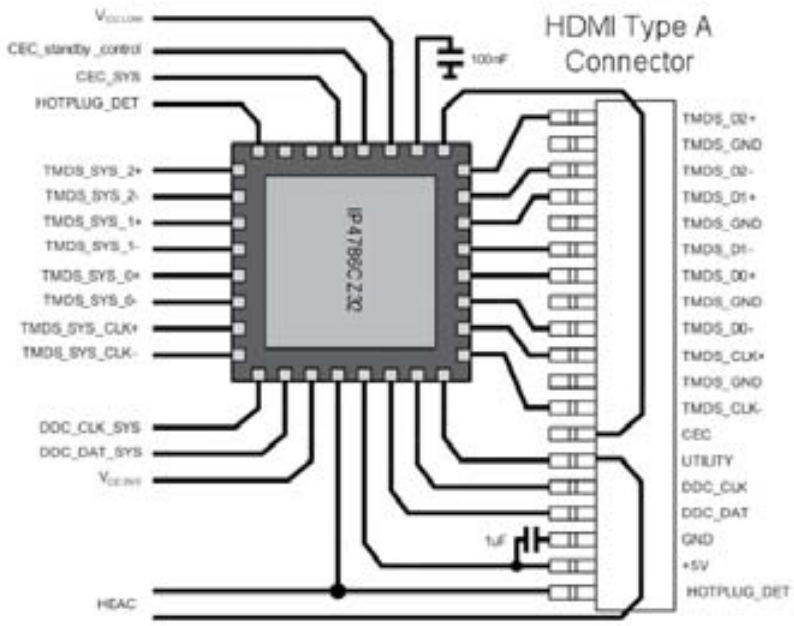
ESD protection acc. to IEC 61000-4-2 (level 4)

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

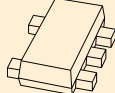
ESD protection acc. to IEC 61000-4-2 (level 4)
Please find more ESD protection diodes for very high-speed interfaces on pages 34 - 37

Transmitter HDMI companion chip IP4786CZ32



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

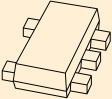
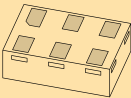
types in **bold** represent new products

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		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		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

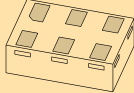
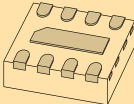
types in **bold** represent new products

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		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		
	2	20	40	-	~50	153	PEMI2QFN/CT		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

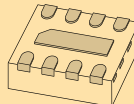
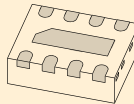
types in **bold** represent new products

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		
	4	200	32	-	~50	143	PEMI2QFN/WP	WLCSP10	1.56 x 1.06 x 0.61
		200	28	-	~55	169	PEMI2QFN/WM		1.96 x 1.28 x 0.65
		200	23	-	~70	205	PEMI2QFN/WK		1.56 x 1.06 x 0.61
		200	19	-	~80	247	PEMI2QFN/WG		1.96 x 1.28 x 0.65
		200	15	-	~105	311	PEMI2QFN/WE		1.56 x 1.06 x 0.61
		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)

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

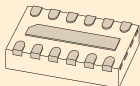
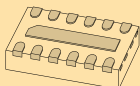
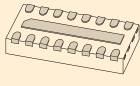
types in **bold** represent new products

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		
	6	200	19	-	~80	247	PEMI4QFN/WG	DFN1714-8 (SOT1166) 	1.7 x 1.35 x 0.5
		200	15	-	~105	311	PEMI4QFN/WE		
		15	43	18	~60	175	IP3253CZ8-4-TTL		
		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		
		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
	6	100	45	35	~20	150	IP3053CX15	WLCSP15	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		
	7	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		
	8	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
		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)

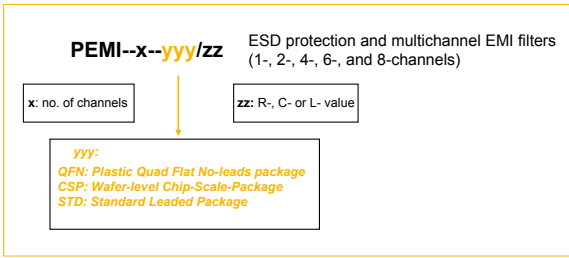
Multichannel EMI filters, ESD protection for LCD and camera – Part 6

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		
	10	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		
		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
	10	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



In the Spotlight

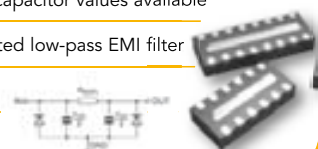
Ultra-small, highly flexible RC filters with superior ESD protection: PEMI-family

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



Protection and signal conditioning

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		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

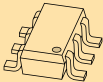
types in **bold** represent new products

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	SOD323F (SC-90) 	1.7 x 1.25 x 0.7
		160	V _{RWM} = 12 V	Power diode	PESD12VS1UJ		1.7 x 1.25 x 0.95
		160	V _{RWM} = 12 V	Power diode	PESD12VS1UA		1.7 x 1.25 x 0.95
		480	V _{RWM} = 5 V	Power diode	PESD5V0S1UJ		1.7 x 1.25 x 0.7
		480	V _{RWM} = 5 V	Power diode	PESD5V0S1UA		1.7 x 1.25 x 0.95

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

USB, SATA, LAN – Part I

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)

Protection and signal conditioning

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



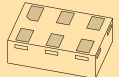
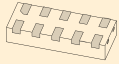
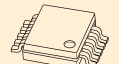
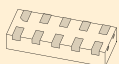
types in **bold** represent new products

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)

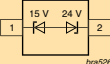
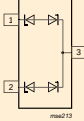
USB, SATA, LAN – Part 4

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		
	1	-	0.6	Ethernet ESD protection $V_{RWM} = 3.3\text{ V}$	PESD3V3U1UT	SOT23 	2.9 x 1.3 x 1.0
LAN	1	-	0.6	Ethernet ESD protection $V_{RWM} = 5.0\text{ V}$	PESD5V0U1UT		
		-	0.6	Ethernet ESD protection $V_{RWM} = 12\text{ V}$	PESD12VU1UT		
		-	0.6	Ethernet ESD protection $V_{RWM} = 15\text{ V}$	PESD15VU1UT		
		-	0.6	Ethernet ESD protection $V_{RWM} = 24\text{ V}$	PESD24VU1UT		
		-	0.6	Ethernet ESD protection $V_{RWM} = 24\text{ V}$	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

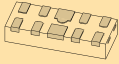
ESD protection acc. to IEC 61000-4-2 (level 4)
Please find more ESD protection diodes for very high-speed interfaces on pages 34 - 37

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_t 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

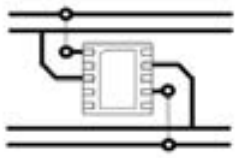
Ethernet surge protection: IP4238CZ10

8/20 surge protection > 25 A

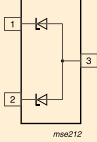
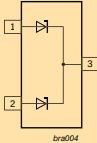
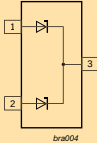
Very low capacitance of $C_d = 3\text{ pF}$

Extremely low clamping

Industry standard DFN2626-10 (SOT1197) package

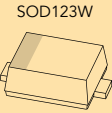


TVS diodes, 24 W / 40 W

	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 _{int} 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 MMBZ6V2AL MMBZ6V8AL MMBZ9V1AL MMBZ10VAL		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					
	4.5	6.48	6.8	7.14	1	30	150	9.6	2.5	0.3					
	6	8.65	9.1	9.56	1	30	155	14	1.7	0.1					
	6.5	9.5	10	10.5	1	30	130	14.2	1.7	0.02					
40	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VAL MMBZ15VAL MMBZ18VAL MMBZ20VAL MMBZ27VAL			
	12	14.25	15	15.75	1	30	85	21	1.9	0.005					
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005					
	17	19	20	21	1	30	65	28	1.4	0.005					
	22	25.65	27	28.35	1	30	48	40	1	0.005					
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VAL MMBZ12VDL MMBZ15VDL MMBZ18VCL MMBZ20VCL MMBZ27VCL MMBZ33VCL			
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005					
	12.8	14.3	15	15.8	1	30	85	21.2	1.9	0.005					
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005					
	17	19	20	21	1	30	65	28	1.4	0.005					
	22	25.65	27	28.35	1	30	48	38	1	0.005					
	26	31.35	33	34.65	1	30	45	46	0.87	0.005					

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

TVS diodes, 400 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)	V _{CL} max (V) @ I _{PP}	I _{PP} (A)	I _{PM} typ (µA) @ V _{RWM}	I _{PM} 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		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		

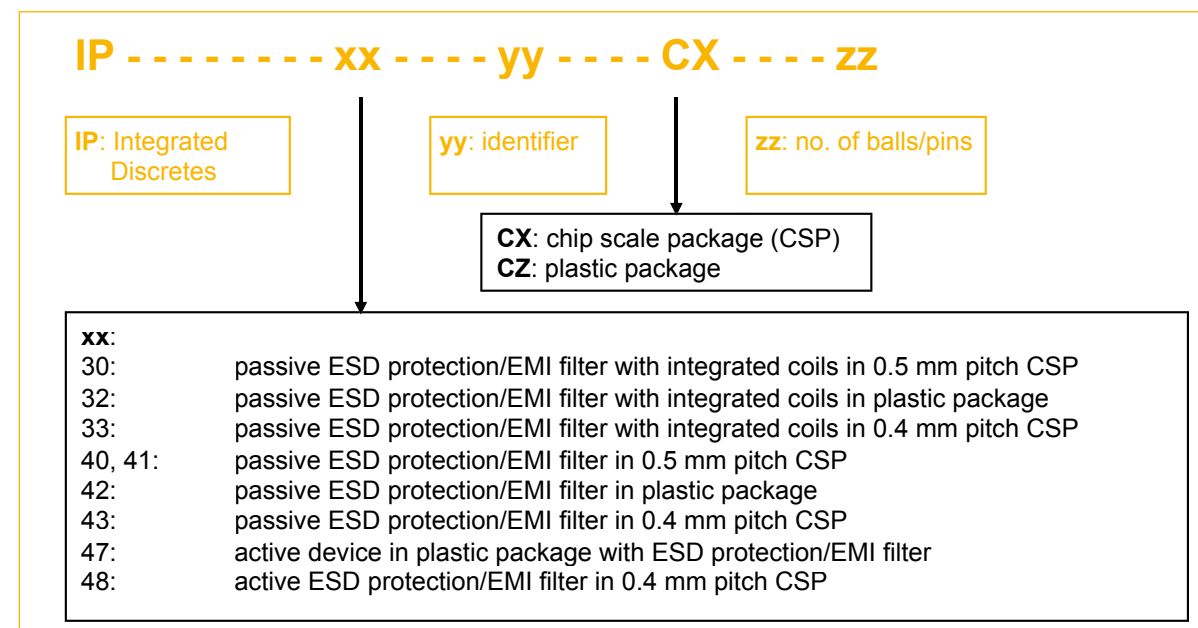
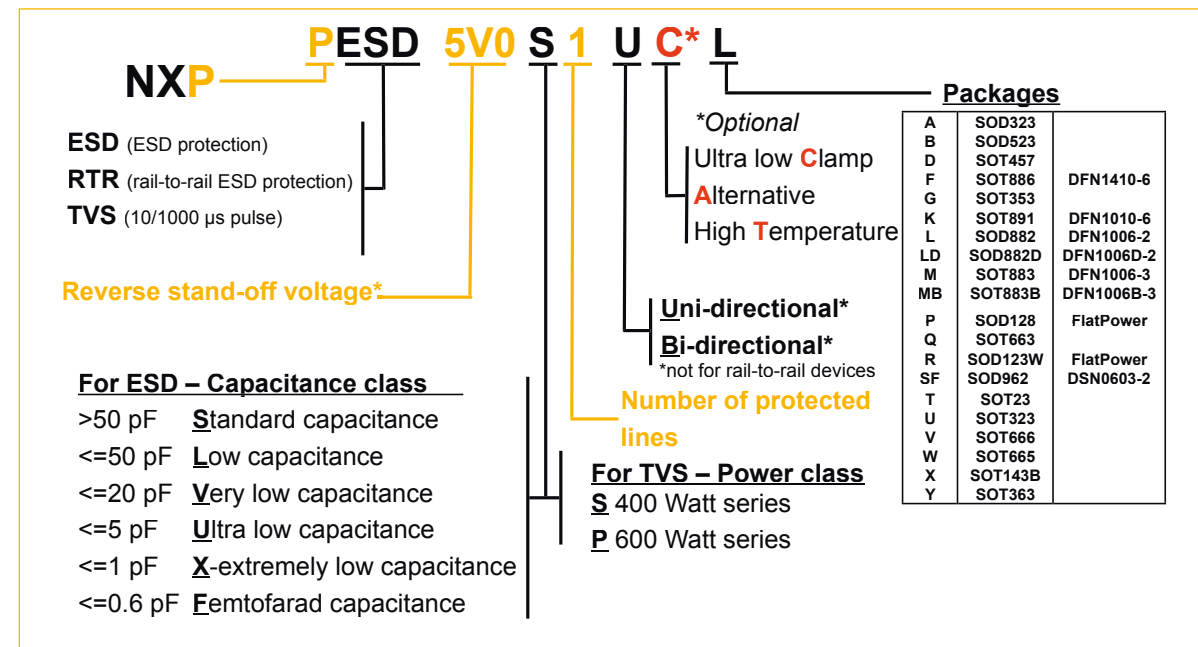
^[1] 10/1000 µs acc. to IEC 61643-321

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 _{PM} typ (µA) @ V _{RWM}	I _{PM} 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		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				

Protection and signal conditioning nomenclature



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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				
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				
45	500	290	460	100		2PD601BSL				
		100 - 250	250 - 600	100		BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W			
50	500	85 - 170	170 - 340	140 - 180		BCX19 2PD602AQL 2PD602ARL 2PD602ASL	2PD1820AR / S			
		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				
25	500	290	460	100		2PD601BSL				
		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	PMBT2222A	PMST2222A				PMBT2222AMB
						PZT2222A								
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
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			
PNP	400	300	50	200	20	PZTA44			PMBTA44	
	100	100	30	-	50				BSS63	
	250	100	50	-	60	BF723				
			50	-	60		BF623		BF823	
	300	100	50	-	60		BF621		BF821	
2 x NPN						PZTA92	PXTA92		PMBTA92	PMSTA92
						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													

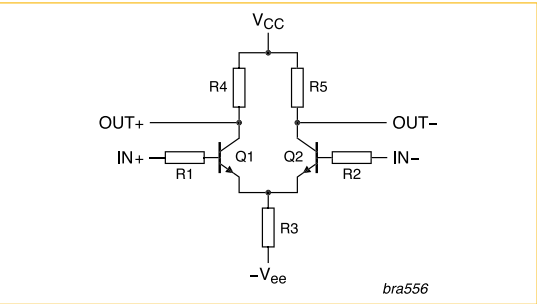
¹⁾ I_{C1}/I_{E2}

- 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

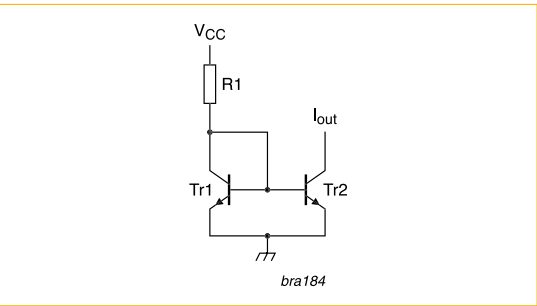
- Key benefits
- ▶ Improved performance of current mirror and differential amplifier circuits
 - ▶ Drop-in replacement for standard double transistors (BCM series)
 - ▶ Simplified board layout (PMP series)
 - ▶ Eliminates the need for costly additional trimming

- 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	
			10000	220		BCV49	BCV47
	60	1000	2000	200	BSP51	BST51	
			2000	200	BSP52	BST52	
	80	1000	2000	200			
PNP	30	500	20000	125			PMBTA64
				220		BCV28	BCV26
	45	1000	2000	200	BSP60	BST60	
			10000	220		BCV48	BCV46
	60	1000	2000	200	BSP61	BST61	
			2000	200	BSP62	BST62	

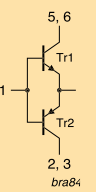
Schmitt trigger

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	
40	0.6	1	PMD2001D	SOT457	Switching transistors with reduced storage time	
	1	2	PMD3001D		Low V _{CEsat}	

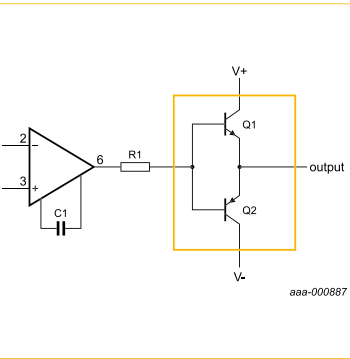
Key features and benefits

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

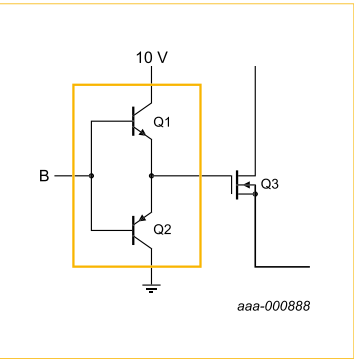
Key applications

- ▶ 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



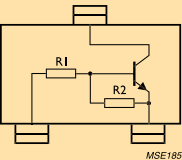
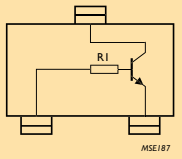
MOSFET driver Faster switching, lower losses

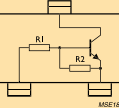
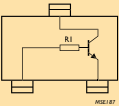


Medium frequency transistors

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
		Only R1	47/2.2	47/47				PUMD48			PEMD48	
			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 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	PBSS301NZ	PBSS301NX																																
	5.8	11.6	300/530	0.5	2	29 ¹⁾	18	235	5.8	0.29																																		
	6.0	7.0	280/440	0.5	2	33 ¹⁾	20	275	6	0.3																																		
15	0.5	1.0	200/325	0.01	2	360	-	250	0.5	0.05						PBSS4612PA																												
	200/425	0.01	2	300	200	250	0.5	0.05																																				
20	1.0	3.0	350/470	0.1	2	220	110 ²⁾	250	1	0.05					PBSS4120T				PBSS2515E																									
	2.0	4.0	220/410	0.5	2	140	70	350	2	0.2																																		
	2.0	5.0	220/330	0.1	2	80	45	310	3	0.3																																		
	3.0	5.0	220/390	0.5	2	85	40	310	3	0.3		PBSS4320X	PBSS301ND		PBSS4220V																													
	4.0	15.0	300/450	0.5	2	50	30	280	4	0.4																																		
	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																																		
	5.3	10.6	300/570	0.5	2	27 ¹⁾	20	200	5.3	0.265					PBSS4520X 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																																		
30	1.0	3.0	300/450	0.5	2	240	120 ²⁾	270	1	0.05	PBSS4021NZ				PBSS4130T PBSS4230T PBSS4032NT ³⁾																													
	2.0	3.0	300/450	0.5	2	120	70	320	2	0.2																																		
	2.6	5.0	300/500	0.5	2	76	80	320	3	0.3																																		
	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						PBSS4032ND ³⁾	PBSS4330PA																											
	3.5	6.0	300/500	0.5	2	50	70	300	4	0.4																																		
	4.7	10.0	300/500	0.5	2	45	57	250	4	0.4		PBSS4032NX ³⁾ PBSS303NX																																
	5.1	10.2	300/480	0.5	2	30 ¹⁾	20	220	5.1	0.255																																		
	5.4	10.0	300/500	0.5	2	45	57	340	4.9	0.27		PBSS4032NZ ³⁾ PBSS303NZ																																
	5.5	11.0	300/480	0.5	2	31 ¹⁾	20	240	5.5	0.275																																		
	6.0	7.0	280/450	0.5	2	35 ¹⁾	21	275	6	0.3		PBSS4630PA																																
	0.5	1.0	200/550	0.01	2	380	200 ²⁾	250	0.5	0.05		PBSS2540M					PBSS2540MB																											
40	1.0	3.0	300/-	0.5	5	150	70	440	2	0.2								PBSS2540E																										
		2.0	300/440	0.5	5	240	130	500	1	0.1								PBSS4140V																										
		2.0	300/510	0.5	5	230	120	500	1	0.1																																		
	2.0	3.0	300/420	0.5	5	150	130	500	1	0.1								PMMT491A PBSS4140T					PBSS4240V																					
			300/400	0.5	5	150	70	400	2	0.2																																		
			350/470	0.1	2	120	70	320	2	0.2																																		
	4.0	15.0	300/450	0.5	2	120	70	320	2	0.2								PBSS4240T			PBSS4240Y																							
			300/520	0.5	2	55	35	300	4	0.4			PBSS4540X														PBSS302ND																	
			300/500	0.5	2	40	21	355	5	0.5																																		
	5.0	10.0	300/500	0.5	2	42	25	355	5	0.5	PBSS4540Z																																	
	2.0	5.0	300/495	0.5	2	100	60	260	2	0.2	PBSS4350T																																	
50	3.0	5.0	300/-	0.5	2	160	90 ²⁾	320	2	0.2									PBSS4250X								PBSS4350X	PBSS4350D																
			200/280	0.5	2	110	65	290	2	0.2																																		
			300/460	0.5	2	75	50	370	3	0.3																																		
60	1.0	2.0	200/280	0.5	2	110	60 ¹⁾	290	2	0.2	PBSS4350Z																																	
			200/400	0.5	5	200	110	250	1	0.1																																		
			200/420	0.5	5	230	120	280	1	0.1																																		
			200/350	0.5	5	200	110	250	1	0.1																																		
	3.0	6.0	345/570	0.5	2	65	40	260	3	0.3						PBSS303ND		PBSS4160U																										
	3.8	8.0	300/500	0.5	2	46	29	200	3	0.3																																		
	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	PBSS304NX																																
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																																			
7.0	15.0	300/500	0.5	2	17.5	13	195	7	0.35	PBSS4041NZ																																		
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 PBSS305NX																				
4.6	9.2	300/470	0.5	2	37 ¹⁾	25	240	4.6	0.23	PBSS305NZ	PBSS305NX																																	
5.1	10.2	300/470	0.5	2	38 ¹⁾	25	270	5.1	0.255			PBSS4580PA																																
5.6	7.0	270/425	0.5	2	40 ¹⁾	25	320	5.6	0.28																																			
100	1.0	3.0	150/400	0.25	10	160	80	200	1			0.1																																
			150/300	0.25	10	165	70	200	1	0.1																																		
			150/290	0.25	10	160	75	200	1	0.1																																		
			150/290	0.25	10	165	73	200	1	0.1																																		
			150/290	0.25	10	160	73	200	1	0.1																																		
	3.0	4.0	170/275	0.5	2	72	45	360	4	0.4	PBSS8110Z																																	
	4.5	9.0	200/330	0.5	2	38 ¹⁾	27	245	4.5	0.225													PBSS306NX	PBSS305ND																				
	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																																			

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_{CE0} (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	PBSS301PZ	PBSS301PX										
	5.7	11.4	250/400	0.5	2	30 ¹⁾	20	245	5.7	0.285												
	6.0	7.0	220/335	0.5	2	33 ¹⁾	20	300	6	0.3						PBSSS612PA						
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					PBSSS120T							
		4.0	220/440	0.1	2	140	75	390	2	0.2										PBSSS220V		
	2.0	3.0	225/-	0.5	2	115	80 ²⁾	225	2	0.2					PBSSS220T							
		5.0	220/420	0.5	2	75	50	210	2	0.2				PBSSS320D								
	3.0	5.0	200/-	0.5	2	85	80 ²⁾	400	3	0.3			PBSSS320X									
			220/450	0.5	2	90	50	300	3	0.3					PBSS4021PT							
	3.5	8.0	250/400	0.5	2	55	35	375	4	0.2												
	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			PBSSS520X									
	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						PBSSS620PA						
	6.2	15.0	250/400	0.5	2	23	18	240	6	0.3			PBSS4021PX									
30	6.6	20.0	250/400	0.5	2	22	16	240	7	0.35	PBSS4021PZ											
	1.0	3.0	260/350	0.5	2	220	110	225	1	0.05					PBSSS130T							
	2.0	3.0	300/450	0.1	2	160	70	350	2	0.2					PBSSS230T							
	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			PBSSS330X									
	3.0	5.0	200/320	0.5	2	75	45	320	3	0.3						PBSSS330PA						
	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⁾			PBSS303PX								
	5.1	10.2	250/400	0.5	2	32 ¹⁾	25	230	5.1	0.255												
	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						PBSSS630PA						
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										PBSSS140V		
			300/520	0.1	5	230	130	500	1	0.1						PBSSS140U						
			300/800	0.1	5	250	130	500	1	0.1					PMMT591A							
	1.8	3.0	300/510	0.1	5	230	130	500	1	0.1					PBSSS140T							
			300/450	0.1	5	185	100	530	2	0.2										PBSSS240V		
	2.0	3.0	300/-	0.1	2	200	110 ²⁾	350	2	0.2									PBSSS240Y			
			300/450	0.1	2	150	70	350	2	0.2												
	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			PBSSS540X									
50	5.0	10.0	250/350	0.5	2	55	40 ¹⁾	160	2	0.2	PBSSS540Z											
	2.0	3.0	200/-	0.5	2	150	90 ²⁾	300	2	0.1					PBSSS250T							
		5.0	200/360	0.5	2	90	55	270	2	0.2					PBSSS350T							
			200/-	0.5	2	160	90 ²⁾	320	2	0.2			PBSSS250X									
	3.0	5.0	200/300	0.5	2	120	70	300	2	0.2				PBSSS350D								
			200/375	0.5	2	120	70	390	3	0.3	PBSSS350Z			PBSSS350X								
60			200/300	0.5	2	120	70	300	2	0.2												
	1.0	2.0	150/250	0.5	5	220	120	330	1	0.1										PBSSS160V		
			150/250	0.5	5	255	135	340	1	0.1						PBSSS160U						
			150/250	0.5	5	220	120	330	1	0.1												
			200/300	0.5	2	80	49	360	3	0.3					PBSSS160T							
	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											
80	5.0	6.0	170/260	0.5	2	35 ¹⁾	35	450	5	0.25						PBSSS560PA						
	15.0	15.0	200/300	0.5	2	40	30	300	5	0.5			PBSS4041PX									
			200/300	0.5	2	29	22	285	6	0.3	PBSS4041PZ											
			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						PBSSS580PA						
		10.0	200/300	0.5	2	50	35	380	5	0.5			PBSSS480X									
100			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											
	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

Low V_{CEsat} (BISS) 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)													
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 NPN	200	0.01	2	170 ¹⁾	250	0.5	0.05				PBSS2515VS
		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) transistors

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⁾
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
			4.7				PBLS1502Y
			10				PBLS1503Y
			22				PBLS1504Y
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
			4.7				PBLS4002Y
			10				PBLS4003Y
			22				PBLS4004Y
	1	170	47				PBLS4005Y
			2.2		PBLS4001D		
			4.7		PBLS4002D		
			10		PBLS4003D		
60	1	180	22			PBLS4004D	
			47			PBLS4005D	
	1.5	100	2.2			PBLS6001D	
			4.7			PBLS6002D	
			10			PBLS6003D	
			22			PBLS6004D	
			47			PBLS6005D	
			2.2		PBLS6021D		
			4.7		PBLS6022D		
			10		PBLS6023D		
			22		PBLS6024D		

¹⁾ Device mounted on a ceramic PCB, Al₂O₃, standard footprint
²⁾ Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint

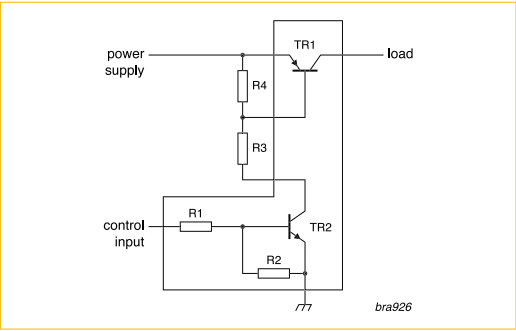
Key features and benefits

- ▶ 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 × 3.5 × 1.65	4.5 × 2.5 × 1.5	2.9 × 1.3 × 1.0
P _{tot} (mW)				1700	1300	250
Polarity	V _{CESM} ¹⁾	V _{CEO} (V)	I _C (A)			
NPN	-	150	1	PBHV8115Z		PBHV8115T
		180	2	PBHV8215Z		
			1			PBHV8118T
	500	400	0.5	PBHV8540Z		PBHV8540T
			1	PBHV8140Z		
		500	0.15			PMBTA45
PNP	-	150	1	PBHV9115Z	PBHV9115X	PBHV9115T
			2	PBHV9215Z		
			0.25	PBHV9040Z		PBHV9040T
	500	400	0.5	PBHV9540Z		
			0.15			PBHV9050T
		500	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

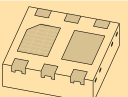
AEC-Q101 qualified

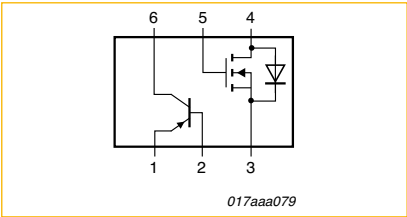


Low V_{CEsat} (BISS) RETs

Package					SOT23	
						
Size (mm)					2.9 × 1.3 × 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 × 2.0 × 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



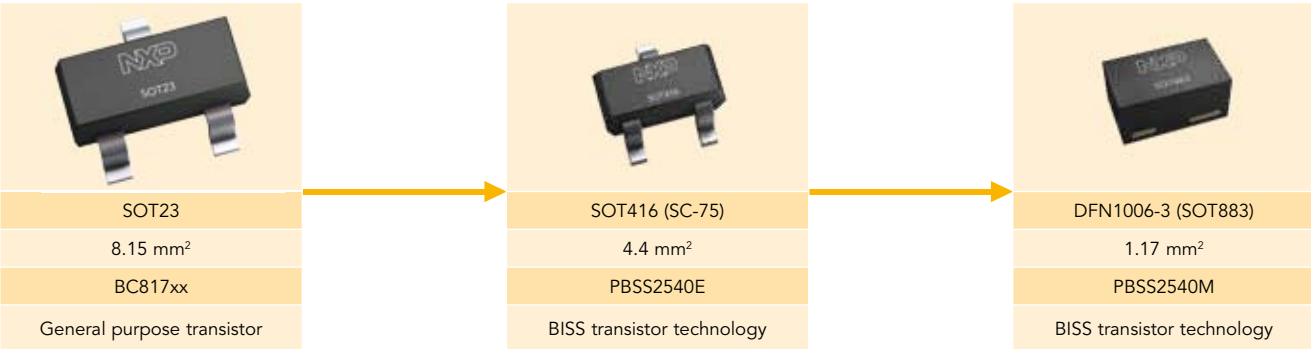
Combination of Low V_{CEsat} transistor with N-channel MOSFET in the very small and ultra thin leadless package DFN2020-6 (SOT1118)

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 :

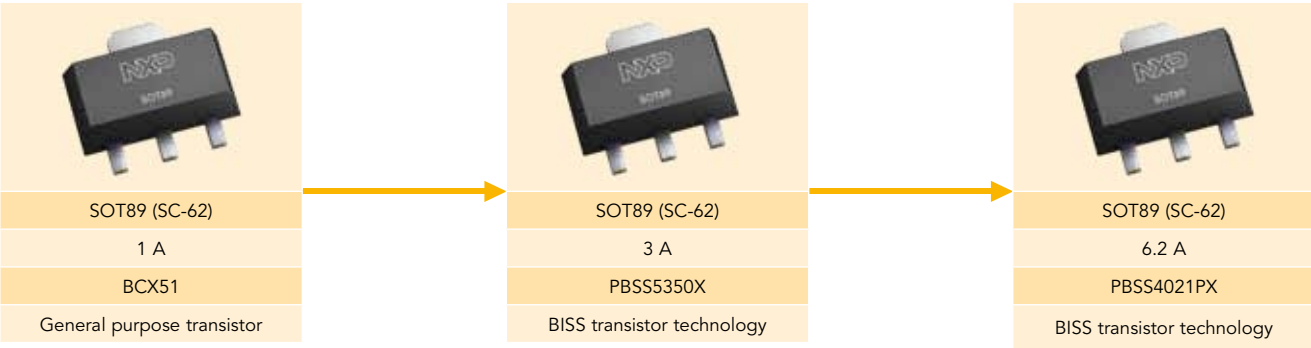
Reduction in board space

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



Improved collector current capabilities

- ▶ 17.87 mm² footprint



High voltage power bipolar transistors

types in **bold** represent new products

V _{CESM} (V)	I _{CDCl} (max) (A)	25 °C ind. t _i (typ) (ns)	@ I _C (A)	h _{FE} (typ)	@ I _C (A)	SOT54 (TO92)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D ² PAK)	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

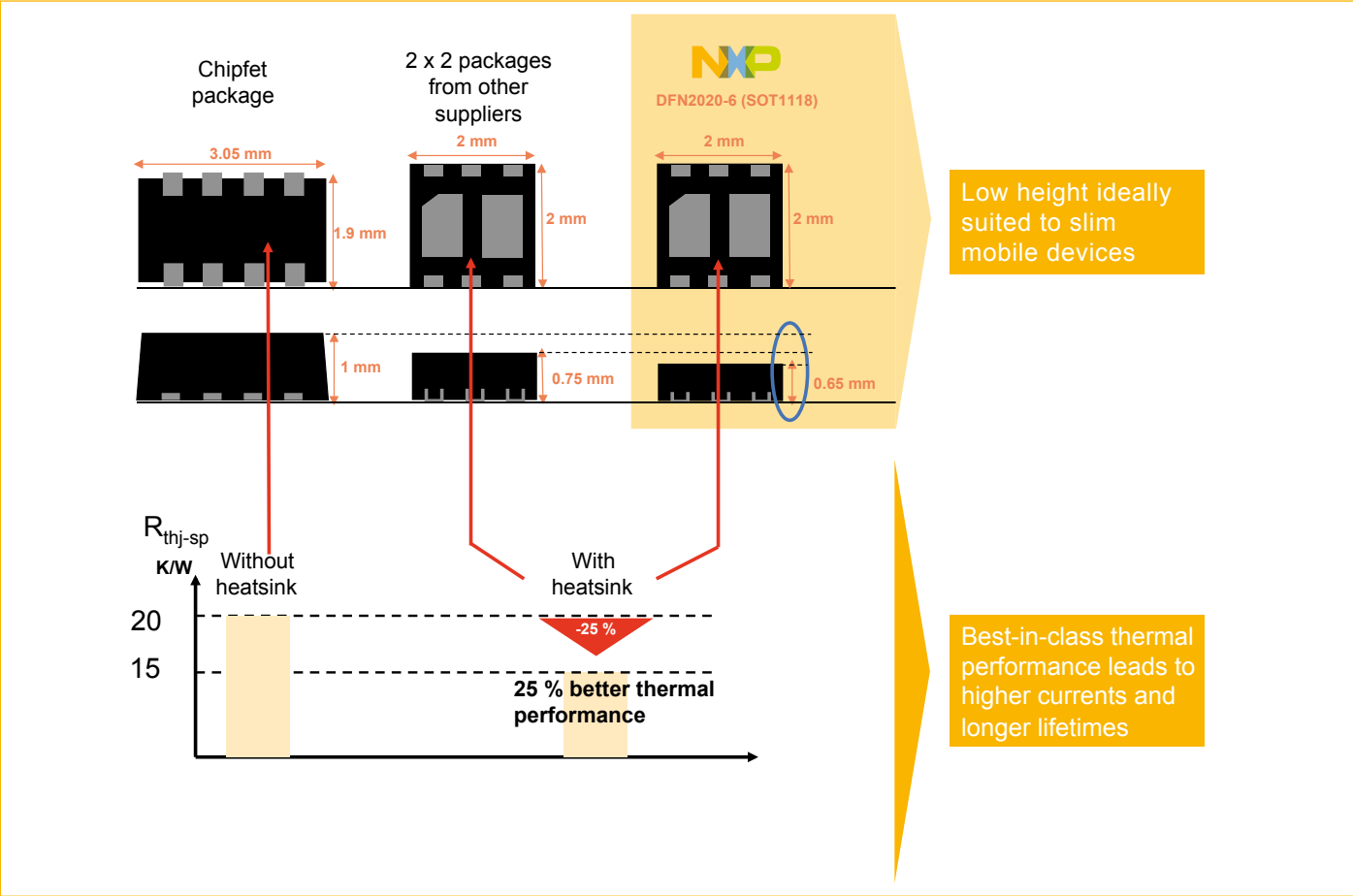
Small-signal MOSFETs	78
Small-signal MOSFETs single (N-channel) < 50 V	78
Small-signal MOSFETs single (N-channel) ≥ 50 V	80
Small-signal MOSFETs dual	82
Small-signal MOSFETs single (P-Channel)	82
Small-signal MOSFET – Schottky combination	84
Small-signal MOSFETs in new DFN2020-6 (SOT1118) dual package	84
Small-signal MOSFETs in new DFN2020MD-6 (SOT1220) single package	85
Power MOSFETs	86
Automotive MOSFETs	92

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



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

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)	$R_{DS(on)}$ typ (mOhm) @ $V_{GS} =$				DFN2020-6 (SOT1118)
											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			PMDPB80UP*
dual	N	20	12							-		30			PMDPB30XN*
MOS + RET	P	30	12		0.7	1.3				-		85			PMC85XP*
complementary	N	20	12							-		30			PMCPB530X*
complementary	P	20	12							-		60			

* Products to be released in 2012

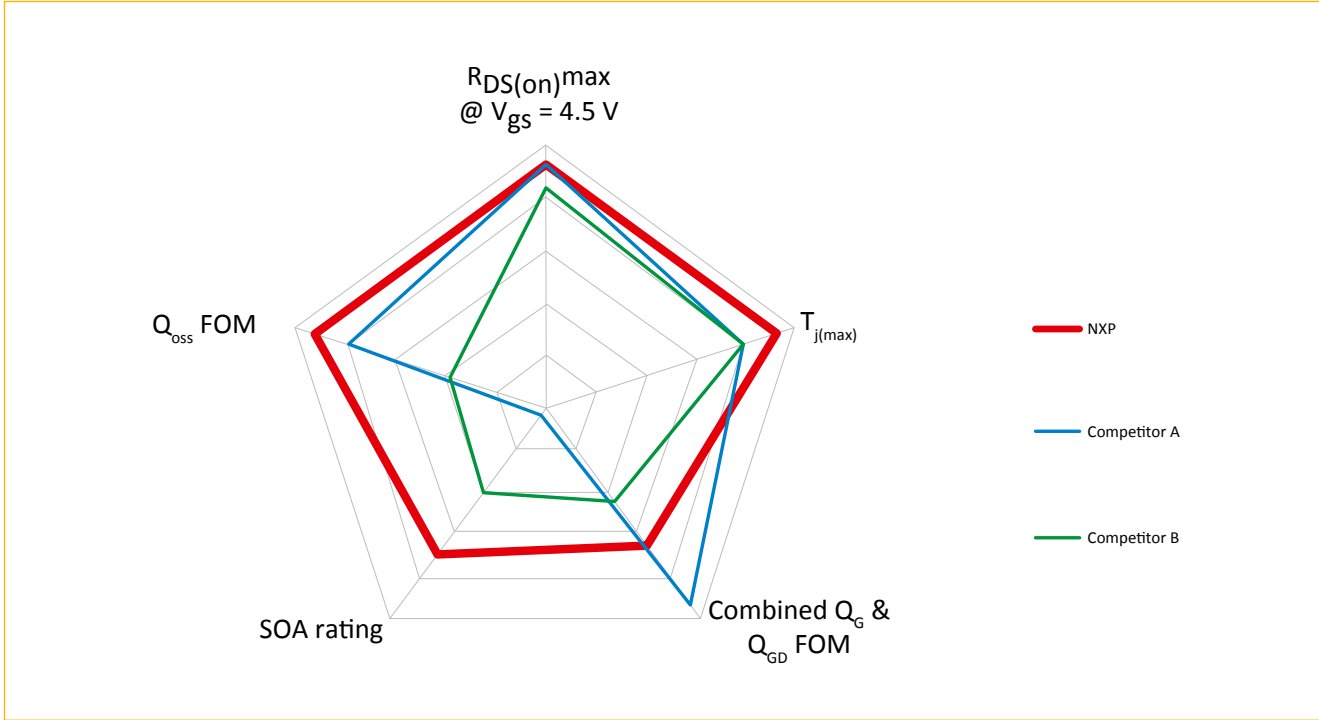
NXP introduces a range of high performance
N-channel, logic-level MOSFETs in LPAK

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...

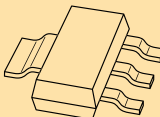
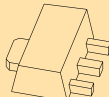
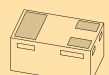
Many competitors focus only on optimising $R_{DS(on)}$ and Q_g . As Q_g gets lower then losses due to Q_{oss} and Q_{gd} become more significant. NextPower uses Superjunction technology to provide the optimum balance between low $R_{DS(on)}$, low Q_{oss} , low $Q_{g(tot)}$ and Q_{gd} to give optimum 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 m Ω types at both 25 V and 30 V.

Comparison of NextPower technology with key competitor types



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							

otlight

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

ESD protection up to 2 kV in several SMD packages

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

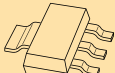


Small-signal MOSFETs dual

Package															SOT363 (SC-88)	SOT666
Size (mm)																
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)	R _{DSon} typ (mΩ) @ V _{GS} =							
									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	
	30	12	0.86	0.5	1.5	16	17	0.72	-	290	460	-		PMGD290XN		
			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	
		15	1	0.5	1.5			-	-	175		-		PMGD175XN*		
			0.74	0.5	1.5	17	19.5	0.65	-	370	550	-		PMGD370XN		
			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

Small-signal MOSFETs single (P-channel)

Package														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)																						
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)	R _{DSon} typ (mΩ) @ V _{GS} =													
									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										
		2	0.5	1.1	7	50	6	-	-	100	-	-										
	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	-				PMN80XP*	PMV65XP ¹⁾					
								-	-	80							PMV80XP*					
30	8	2	0.65	1.15	48	64	4.8	-	-	90	125	-						PMG85XP				
		1	0.65	1.15	26	44	2.6	-	-	175	240	-										
		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	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

types in **bold** represent new products

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

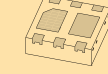
TrenchMOS technology

AEC-Q101 qualified

1.8 V R_{DSon} rated for Low Voltage Gate Drive



Small-signal 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 _O (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*

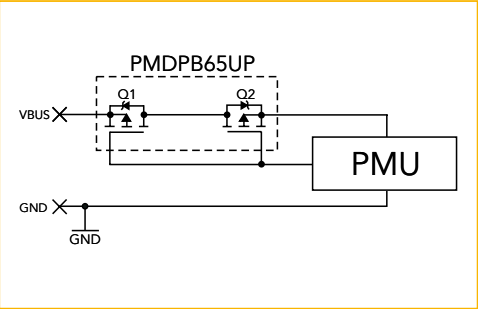
* Products to be released in 2012

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

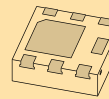
Very low R_{DSon} of <70 mΩ at V_{GS} = 4.5 V

1.8 V R_{DSon} rating for operation at low voltage gate drive levels

Best-in-class thermal performance due to extra heatsink

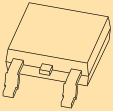
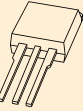
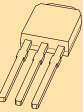
Smallest 2 x 2 mm leadless package dual P-channel; 0.65 mm package height

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

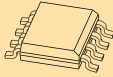
Package														DFN2020MD-6 (SOT1220)
														
Size (mm)														2.0 x 2.0 x 0.65
P _{tot} (mW)														>1500
Polarity	V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS} (th) min (V)	V _{GS} (th) max (V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection (kV)	R _{DSon} typ (mΩ) @ 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

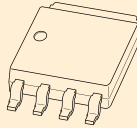
Power MOSFETs (N-channel) – Part 1

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

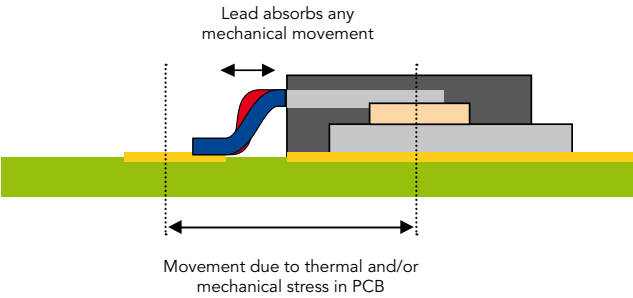
Package	Typenumber	V _{DS} [max] (V)	R _{DSon} [max] @ V _{GS} = 10 V (mΩ)	R _{DSon} [max] @ V _{GS} = 4.5 V (mΩ)	I _D [max] (A)
DFN3333-8 (SOT873-1) 	PSMN3R5-30LL	30	3.6	5.6	40
	PSMN3R8-30LL	30	3.7	5.8	40
	PSMN5R8-30LL	30	5.8	8	40
	PSMN9R0-30LL	30	9	13	21
	PSMN013-30LL	30	13	19	21
	PSMN017-30LL	30	17	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 _O [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

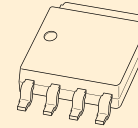
LFPAK for mechanical & thermal ruggedness

NXP LFPAK



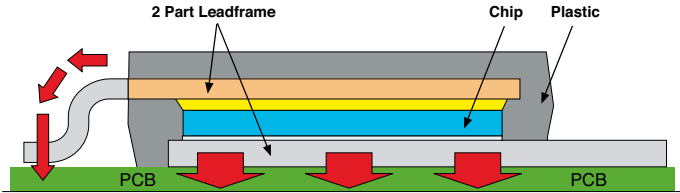
LFPAK pins provide compliance and allow for thermal expansion due to temperature difference between the MOSFET & PCB and also mechanical strain due to PCB bending & flexing

Power MOSFETs (N-channel) – Part 4

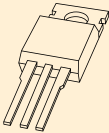
Package	Typenumber	V _{DS} [max] (V)	R _{DSon} [max] @ V _{GS} = 10 V (mΩ)	R _{DSon} [max] @ V _{GS} = 4.5 V (mΩ)	I _O [max] (A)
 Power-SO8 (LFPAK)	PSMN6R0-30YL	30	6	7.87	79
	PSMN5R9-30YL	30	6.1	9	78
	PSMN6R0-30YLB	30	6.5	8.1	71
	PSMN7R0-30YL	30	7	9.1	76
	PSMN7R0-30YLC	30	7.1	8.9	61
	PSMN8R0-30YLC	30	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

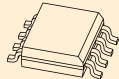
- ▶ Low Thermal resistance
- ▶ Low Electrical resistance
- ▶ Low Inductance



Power MOSFETs (N-channel) – Part 5

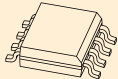
Package	Typenumber	V _{DS} [max] (V)	R _{DSon} [max] @ V _{GS} = 10 V (mΩ)	R _{DSon} [max] @ V _{GS} = 4.5 V (mΩ)	I _D [max] (A)
 TO-220AB (SOT78)	PSMN1R1-30PL	30	1.3	1.4	120
	PSMN1R6-30PL	30	1.7	2.1	100
	PSMN1R8-30PL	30	1.8	2.3	100
	PSMN2R0-30PL	30	2.1	2.8	100
	PSMN2R7-30PL	30	2.7	3.6	100
	PSMN3R4-30PL	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

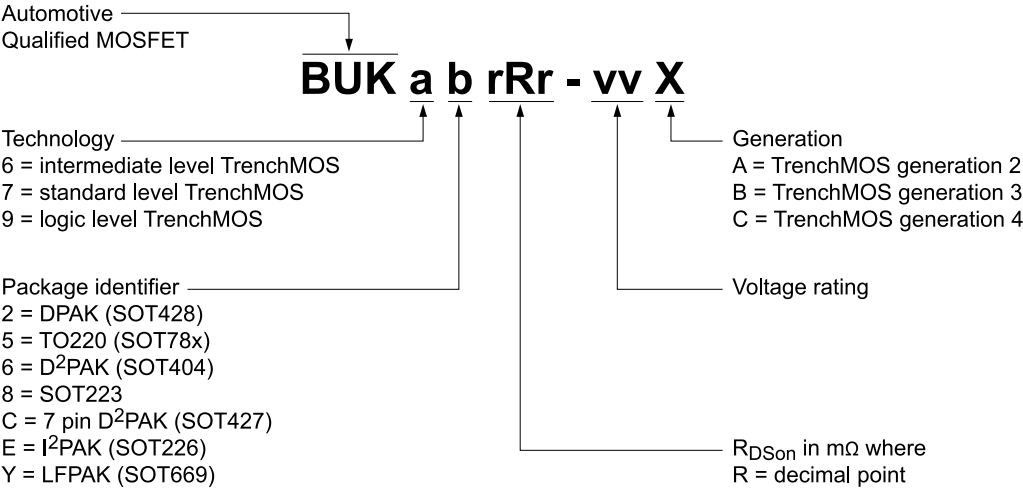
<u>P</u>	<u>H</u>	<u>P</u>	<u>4</u>	<u>4</u>	<u>N</u>	<u>Q</u>	<u>0</u>	<u>3</u>	<u>L</u>	<u>T</u>
MOSFET Brand name	Package type	Current rating I _D (A)	MOSFET type N-ch or P-ch		Q-Trench	MOSFET voltage V _{DSS}	Gate threshold voltage		Trench MOS	
PH	B = D ² PAK	44 = 44 A	N = N-ch		Q = low gate charge 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)	I ² PAK (SOT226)	D ² PAK-7 (SOT427)	D ² PAK (SOT404)	DPAK (SOT428)	LFAK (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



brb582

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)	I ² PAK (SOT226)	D ² PAK-7 (SOT427)	D ² PAK (SOT404)	DPAK (SOT428)	LFAK (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			<i>BUK6C1R5-40C</i>			
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)} [K/W]	3-lead TO-220AB (SOT78A)	I ² PAK (SOT226)	D ² PAK-7 (SOT427)	D ² PAK (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)} [K/W]	3-lead TO-220AB (SOT78A)	I ² PAK (SOT226)	D ² PAK-7 (SOT427)	D ² PAK (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)	I ² PAK (SOT226)	D ² PAK-7 (SOT427)	D ² PAK (SOT404)	DPAK (SOT428)	LFAK (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

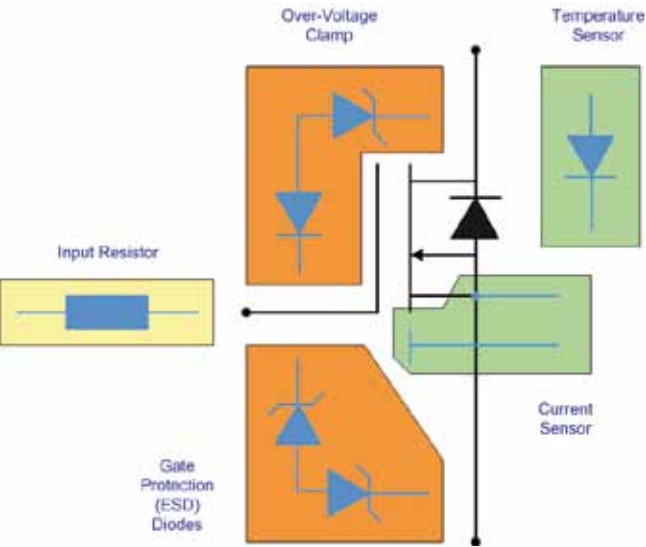
R _{DSon} [max] @ 10 V [mΩ]	R _{DSon} [max] @ 5 V [mΩ]	I _D [max] @ 25 °C [A]	R _{th(j-mb)} [max] [K/W]	3-lead TO-220AB (SOT78A)	I ² PAK (SOT226)	D ² PAK (SOT404)	DPAK (SOT428)	LFAK (SOT669)	SC-73 (SOT223)
									
				15.5 x 10.0 x 4.3	11.0 x 10.0 x 4.3	11.0 x 10.0 x 4.3	6.0 x 6.6 x 2.3	3.95 x 4.9 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.

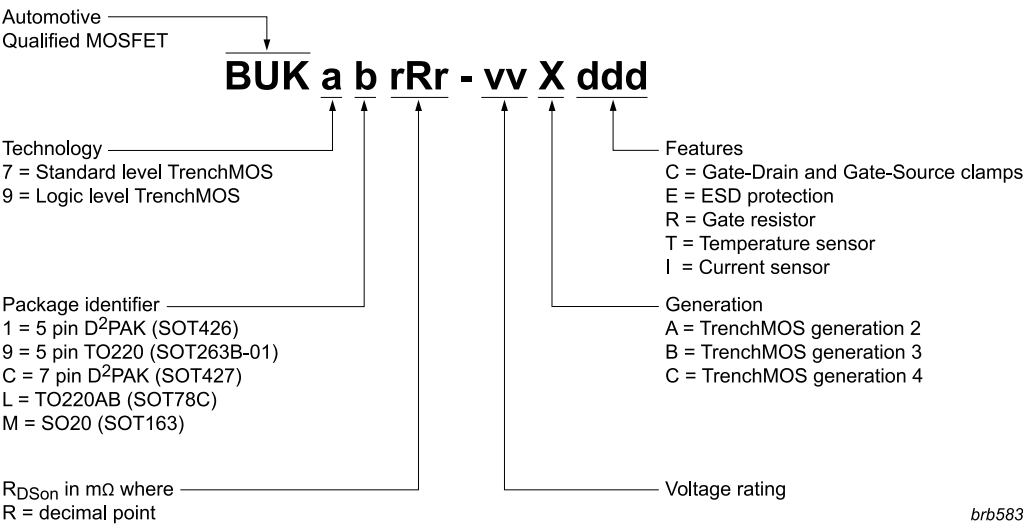
V _{DS} (V)	R _{DS(on)} (max) @ 10 V (mΩ)	R _{DS(on)} (max) @ 5 V (mΩ)	I _D (max) @ 25 °C (A)	Temp Sense	Gate Source Clamps	Gate Drain Clamps	Current Sensing	Gate Resistor	Surface Mount Package			Leaded Package	
									7-pin D ² PAK (SOT427)	5-pin D ² PAK (SOT426)	SO20 (SOT163)	TO220AB (SOT78C)	5-pin 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 _{DS(on)} (max) @ 10 V (mΩ)	R _{DS(on)} (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 D ² PAK (SOT427)	5-pin D ² PAK (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



brb583



Thyristors

AC Thyristor Triacs	102
AC Thyristors	102
3-quadrant triacs	103
4-quadrant triacs	104
Silicon Controlled Rectifiers	105

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 ² PAK)	SOT404 (D ² PAK)	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_{GTmax}
E = 10, 10, 10 mA

Package identifier
- = TO220AB (SOT78)
X = SOT186A (isolated TO220AB)
G = I²PAK (SOT226)
B = D²PAK (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

Gate sensitivity I_{GTmax}
E = 10, 10 mA

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

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 ² PAK)	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			
	600	B/D/E/F		BTA208		BTA208X			BTA208S
	800	B/E/F		BTA208		BTA208X			BTA208S
8	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_{jmax} 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

Gate sensitivity I_{GTmax}
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

Package identifier
- = TO220AB (SOT78)
B = D²PAK (SOT404)
S = DPAK (SOT428)
W = SOT223
X = SOT186A (isolated TO220AB)
Y = SOT78D (internally insulated TO220)
BTA2008, BTA201 use TO92 (SOT54) package

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 ² PAK)	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*			
	600	D/E/-/G				BT134				
4	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
	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		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

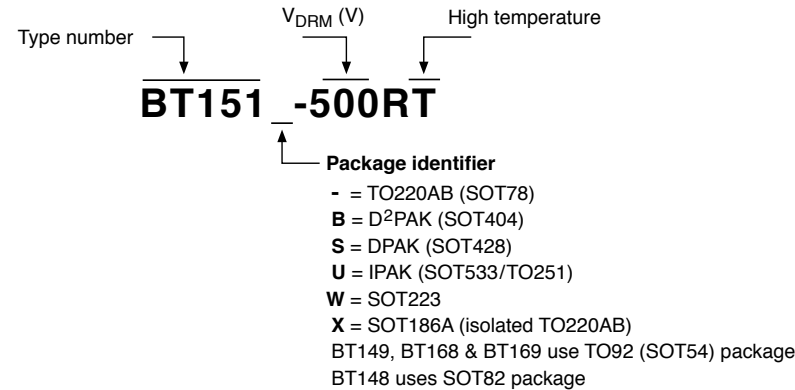
I_{GT} key:
D 5 mA (10 mA in 3+)
E 10 mA (25 mA in 3+)
F 25 mA (70 mA in 3+)
- 35 mA (70 mA in 3+)
G 50 mA (100 mA in 3+)

Silicon Controlled Rectifiers

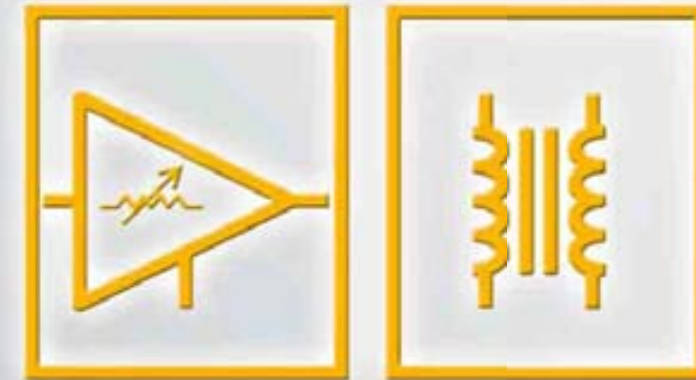
types in bold represent new products										
I _{T(RMS)} (A)	V _{DRM} & V _{RRM} (V)	I _{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D ² PAK)	SOT428 (DPAK)	SOT533 (IPAK)
0.8	600	0.5 µA min - 7 µA max	N0118GA							
	400	0.012	EC103D1							
	200 / 400 / 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							
1	200	0.2					MCR08BT1			
	600	0.02 min - 0.2 max					BT168GW			
	600	0.07 min - 0.45 max					BT168GWF**			
4	600	0.2					BT148W-R*			
	400 / 500 / 600	0.2			BT148-R					
	600	0.2							BT150S-R	
8	500	0.2		BT150-R						
	800	0.05							BT258S-LT	
	500 / 600 / 800	0.2		BT258-R		BT258X-R				
	600	0.2								BT258U-R
	800	0.2							BT258S-R	
12	600	5							BT300S-R	
	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
20	500 / 1000	15		BT151-RT*						
	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_Jmax 150 °C

SCRs part numbering



MSD848



Standard linear products

Low-dropout regulator / low-voltage	110
Ultra low-dropout voltage regulator	110
High PSRR low-dropout voltage regulator	113
Low-dropout regulator / mid-voltage	114
DC/DC converter	115
Adjustable shunt voltage regulator	117
Discrete voltage regulator / Constant current source	119

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.

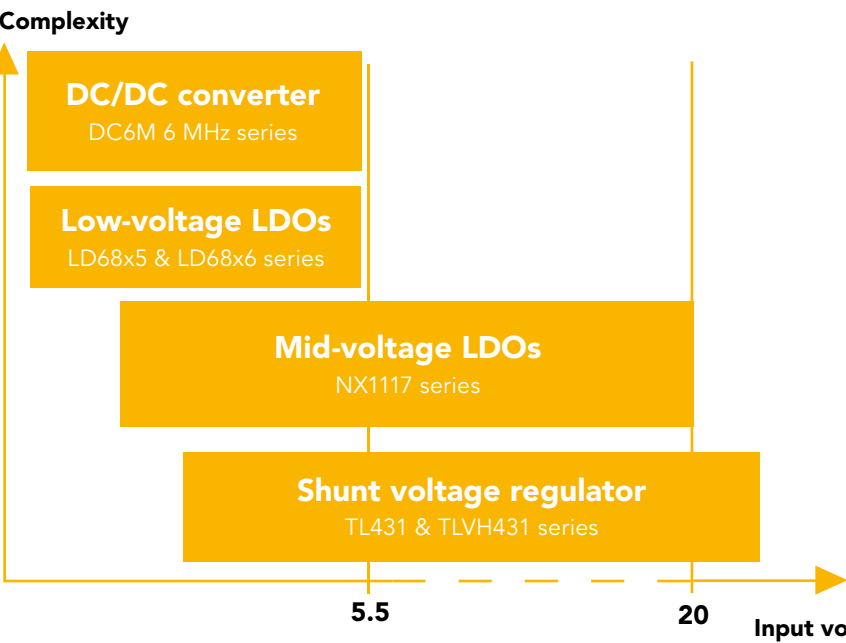
Mid-voltage

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

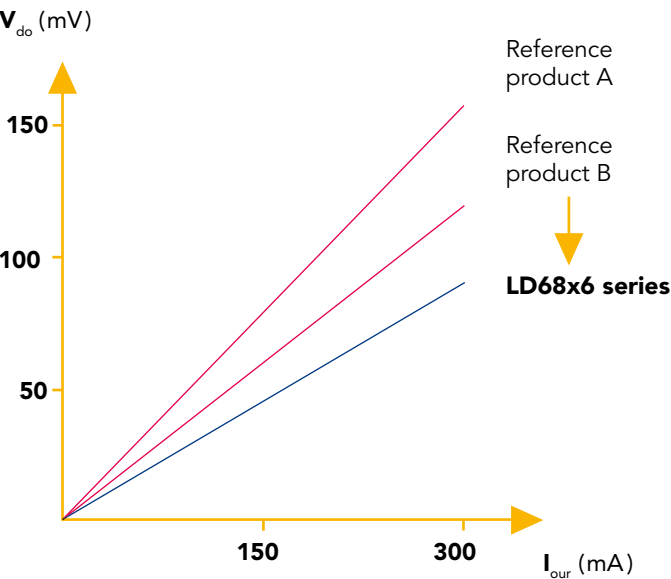
Low-voltage LDO

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.

Standard linear products

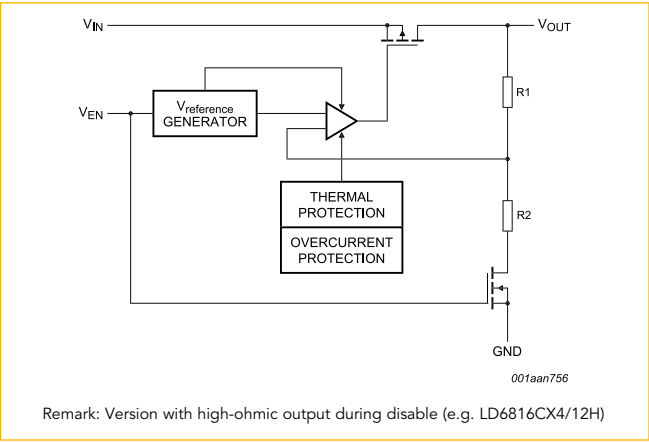
LD6816 ultra low-dropout voltage regulators – 150 mA

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



Key features

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

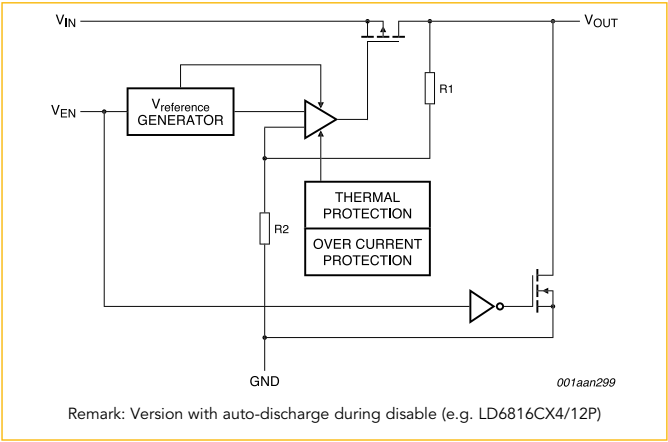
Key benefits

- ▶ 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

Functional diagram: Auto-discharge (pull-down)



In the Spotlight

LDOs in ultra-small WLCSP package

State of the art wafer-level chip scale technology

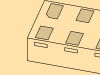
Dimensions of only 0.76 x 0.76 x 0.47 mm

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 × 1.0 × 0.5		2.9 × 1.5 × 1.0	
P _{Tot} @°C (mW)							770		450		800	
V _{IN} (V)	I _{OUT} typ (mA)	Quiescent current (µA)	V _{ds} 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

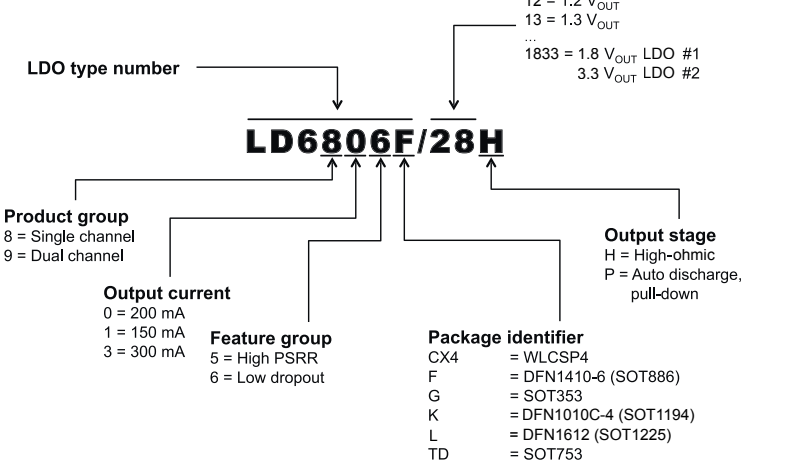
Key benefits

- ▶ 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



Standard linear products

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



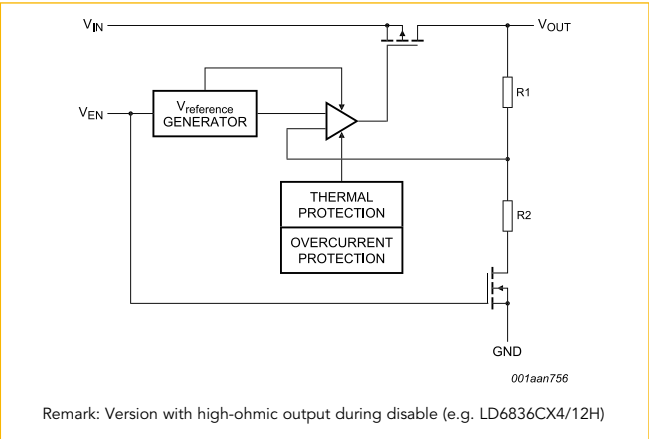
LD6836 ultra low-dropout voltage regulators – 300 mA

types in **bold** represent new products

Package							WLCSP4		SOT753	
										
Size (mm)							0.76 × 0.76 × 0.47		2.9 × 1.5 × 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



Key features

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

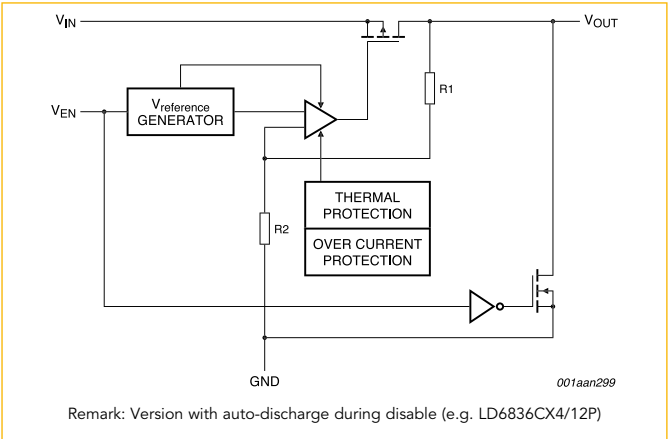
Key benefits

- ▶ 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

Functional diagram: Auto-discharge (pull-down)



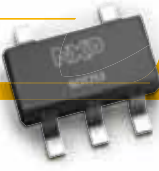
In the Spotlight

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



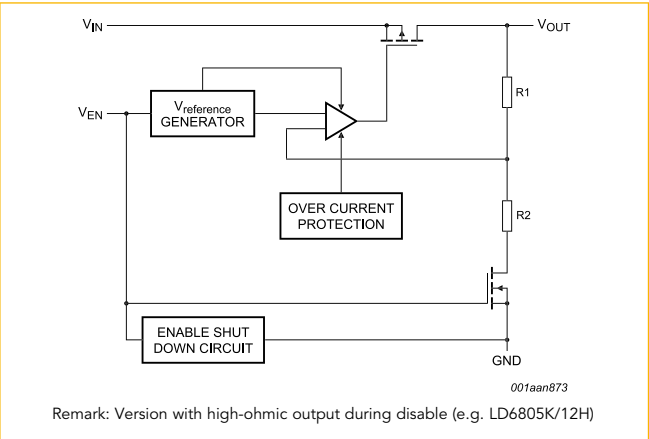
LD6805 high PSRR low-dropout voltage regulators – 150 mA

types in **bold** represent new products

Package							DFN1010C-4 (SOT1194)	
								
Size (mm)							1.0 × 1.0 × 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



Key features

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

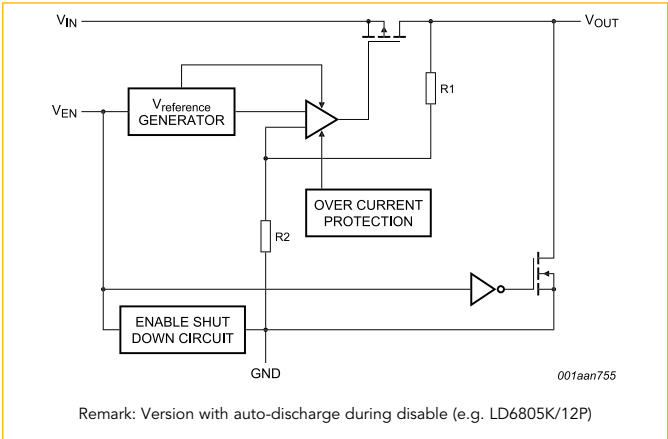
Key benefits

- ▶ 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

Functional diagram: Auto-discharge (pull-down)



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

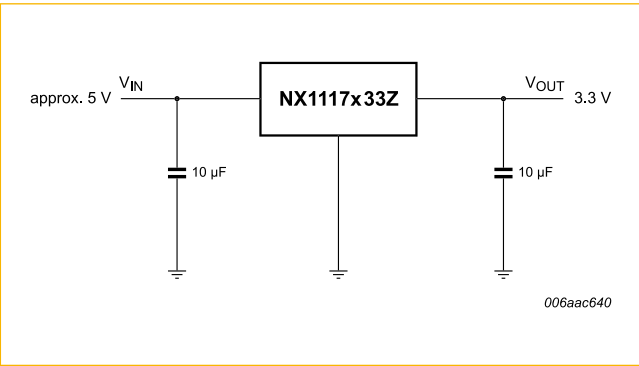


Standard linear products

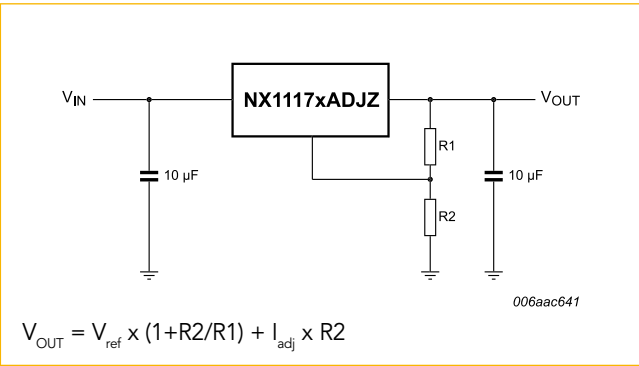
Low-dropout adjustable and fixed linear voltage regulator NX1117

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



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

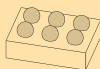
In the Spotlight

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)

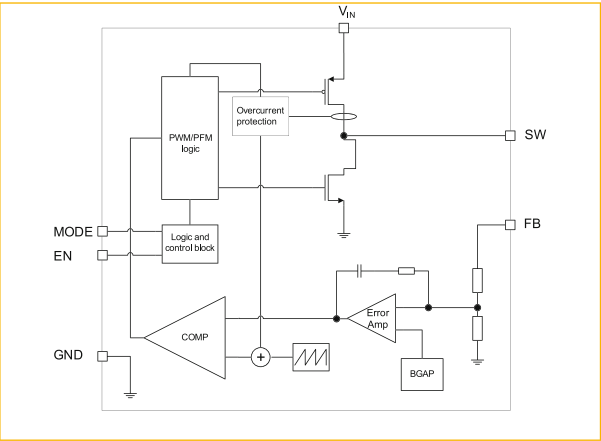


DC6M401, DC6M402 small size 6 MHz DC/DC buck converter – 425 mA

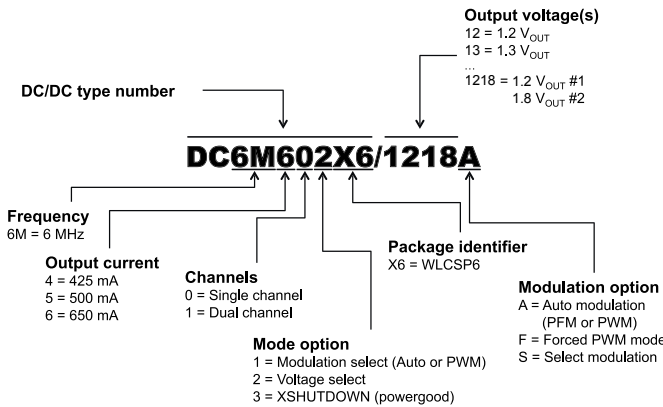
Package							WLCSP6	
								
Size (mm)							1.36 x 0.96 x 0.47	
P _{tot} @ °C							800	
V _{IN} (V)	I _{OUT} (mA)	Operation frequency (MHz)	Quiescent current typ (µA)	Output voltage ripple (mV)	Efficiency typ (%)	Output voltage V*	DC6M401/xxxxS Modulation select	DC6M402/xxxxxA Voltage select auto 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



Standard linear products

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/xxxAXSHUTDOWN 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/xxxAXSHUTDOWN 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

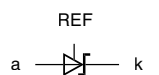
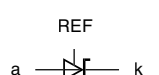
- ▶ Mobile phones, PC tablets, DSCs (digital still cameras), video cameras, game pads, notebooks, netbooks, ultrabooks
- ▶ Any battery operated applications requiring a lower than battery voltage supply with high currents and high efficiency down conversion

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		

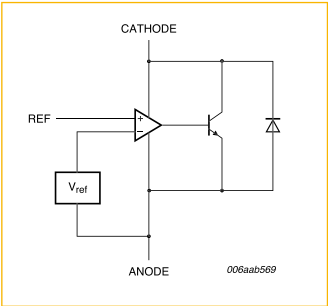
Key benefits

- ▶ 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

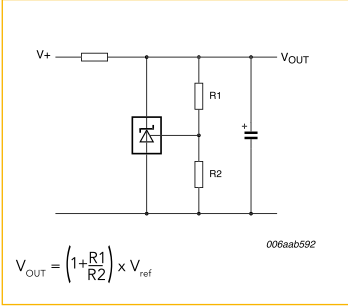
Key applications

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

Functional diagram



Shunt voltage regulator



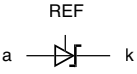
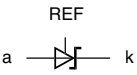
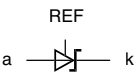
Any voltage in the given range can be set by only 2 external resistors

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

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	
				-40 to 85	TLVH431IDBZR	
				-40 to 125	TLVH431QDBZR	TLVH431MQDBZR
			1%	0 to 70	TLVH431ACDBZR	
				-40 to 85	TLVH431AIDBZR	
				-40 to 125	TLVH431AQDBZR	TLVH431AMQDBZR
			0.75%	-40 to 125	TLVH431DQDBZR	TLVH431DMQDBZR
						TLVH431QDBVR
						TLVH431AQDBVR

*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		

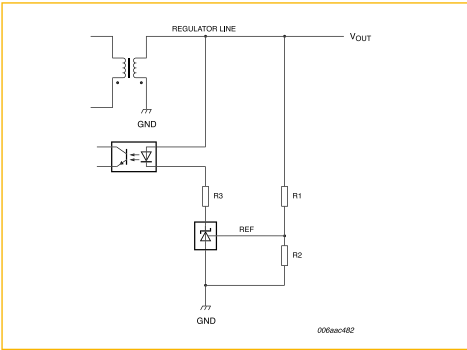
Key benefits

- ▶ 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 I_k(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

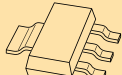
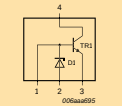
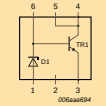
Key applications

- ▶ 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

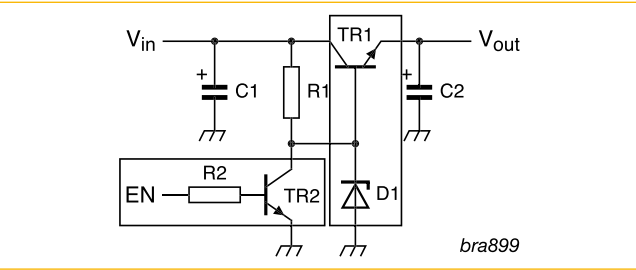
Key benefits

- ▶ 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

SOT353 (SC-88A)							
Package							
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)	ΔI _{out} /I _{out} typ (%)	ΔI _{out} /I _{out} typ (°C)
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

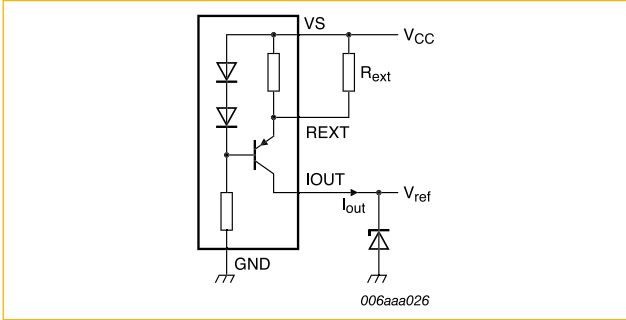
Key features and benefits

- ▶ 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



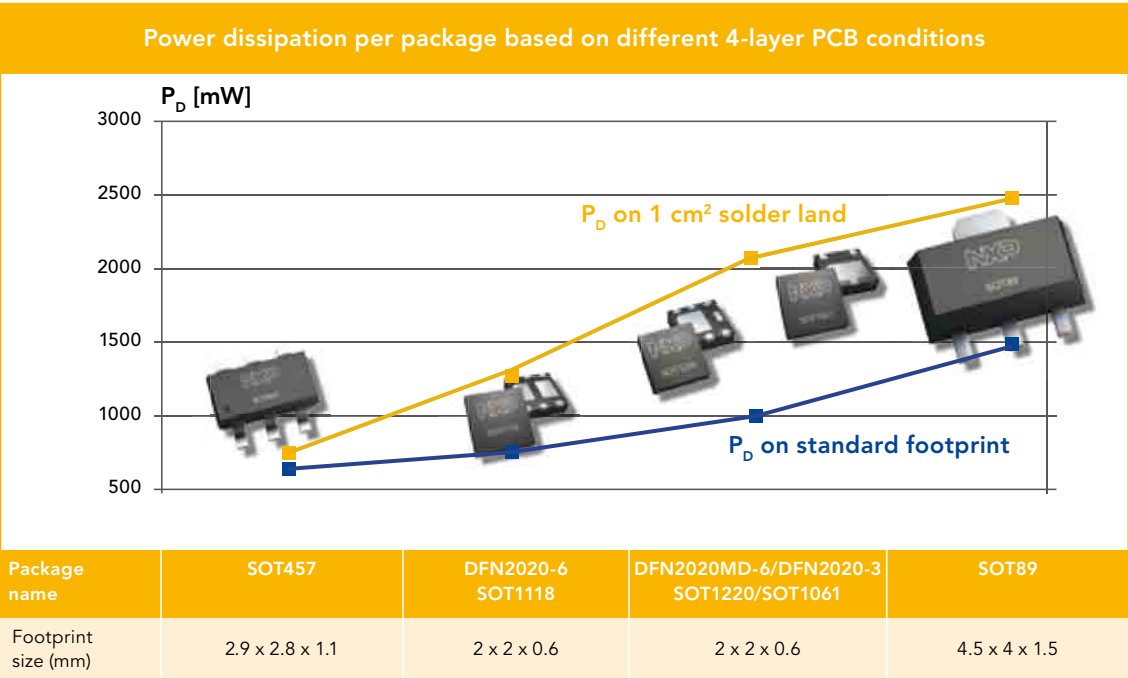


Packages

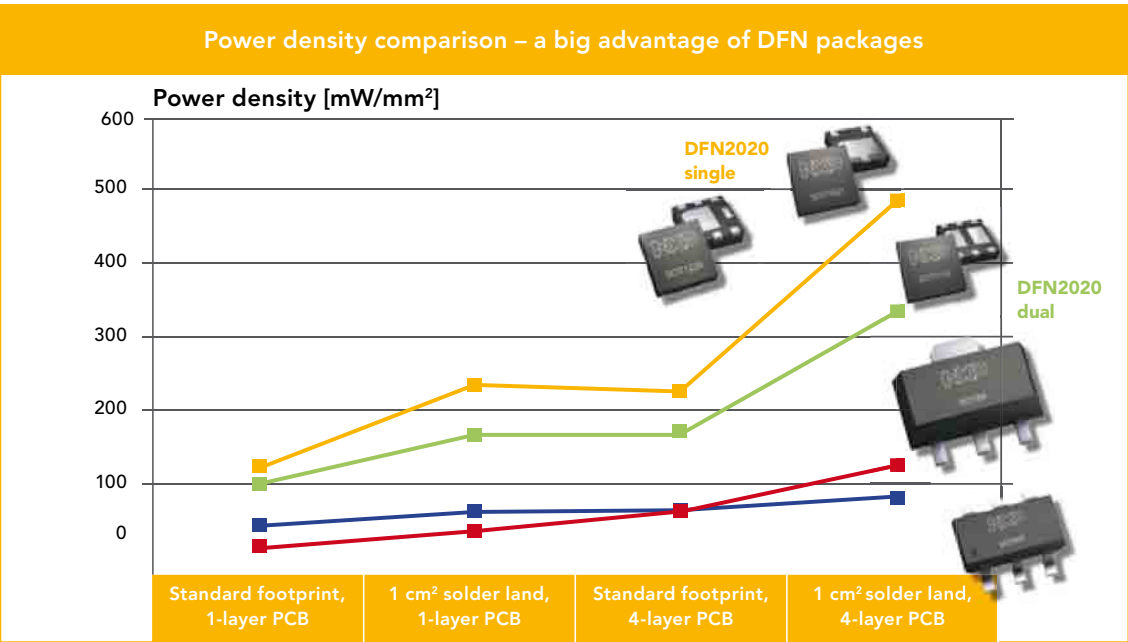
Package details and packing methods	124
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Minimized outline drawings and reflow soldering footprint	134

New DFN packages with best-in-class thermal capabilities

Thermal capability comparison



DFN packages have the best heat dissipation capabilities



Small SMD packages

Ultra small	Very small	Small	Medium power	
2 Pins DSN0603-2 WLCSP2 0.6x0.3x0.3 DFN1006D-2 DFN1006-2 SOD1006-2 1.0x0.6x0.37 DFN1608D-2 1.6x0.8x0.57	2 Pins SOD323 1.7x1.25x0.95 SOD323F 1.7x1.25x0.7	2 Pins SOD123F 2.8x1.6x1.1 SOD123W 2.8x1.7x1.0 3 Pins SOT23 2.9x1.3x1.0 SOT143B 2.9x1.3x1.0 4/5 Pins SOT353 2.0x1.25x0.95 DFN2020MD-6 2.0x2.0x0.65 SOT353 2.0x1.25x0.95 6/8 Pins DFN1010B-6 1.0x1.0x0.35 DFN1010-6 1.0x1.0x0.5 DFN1410-6 1.45x1.0x0.5 WLCSP4* 0.76x0.76x0.61 DFN1010C 1.0x1.0x0.55 WLCSP5* 1.51x1.14x0.65 SOT665 1.6x1.2x0.55 DFN1010-6 1.0x1.0x0.5 SOT666 1.6x1.2x0.55 WLCSP6* 1.6x1.15x0.65	2 Pins SOD80C 3.5x1.5x1.5 SOD128 3.8x2.6x1.0 3 Pins SOT89 4.5x3.95x1.0 4/5 Pins SOT223 6.5x3.5x1.65 Power-SO8 4.9x3.95x1.0 6/8 Pins DFN3333-8 3.3x3.3x1.0 SOT96 4.9x3.9x1.75	2 Pins SOT552 3.0x3.0x1.1 DFN5050-32 5.0x5.0x1.0 SOT510 9.7x4.4x1.1 3 Pins DFN2510A-10 2.5x1.0x0.5 DFN2512-12 2.5x1.2x0.5 DFN2521-12 2.5x2.1x0.5 4 Pins SOT457 2.9x1.5x1.0 SOT505 3.0x3.0x1.1 5 Pins WLCSP16* 1.9x1.97x0.65 DFN2110-9 2.1x1.0x0.5 WLCSP24* 2.45x2.4x0.65

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

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						
6	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						
					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						
SOT363 (SC-88)	2.0 x 1.25 x 0.95	0.65		4 mm pitch, 8 mm tape and reel	286 x 8	T2																-165	
				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							
SOT457 (SC-74)	2.9 x 1.5 x 1.0	0.95		4 mm pitch, 8 mm tape and reel	286 x 8	T2																-165	
				4 mm pitch, 8 mm tape and reel	180 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
3	SOD141	52 mm tape ammo pack, axial		-133	12000 pcs
		Bulk pack, 500 pcs. per carrier		-112	20 carriers x 500 pcs
	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
		Rail packing, 50 pcs/tube, tube length = 520 mm		-127	20 tubes x 50 pcs
	SOT226	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	LFPK (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

2 Pins

SOD59
15.7 x 9.98 x 4.5

SOD113
15.5 x 10.0 x 4.3

3 Pins

SOT54
4.6 x 3.9 x 5.1

LFPK Power-SO8
4.9 x 3.95 x 1.0

DPAK SOT428
6.1 x 6.6 x 2.3

SOT533
6.1 x 6.6 x 2.3

SOT82
10.8 x 7.5 x 2.55

D²PAK SOT404
11.0 x 10.0 x 4.3

SOT226
11.0 x 10.0 x 4.3

SOT186A
15.5 x 10.0 x 4.3

SOT78
15.6 x 10.0 x 4.4

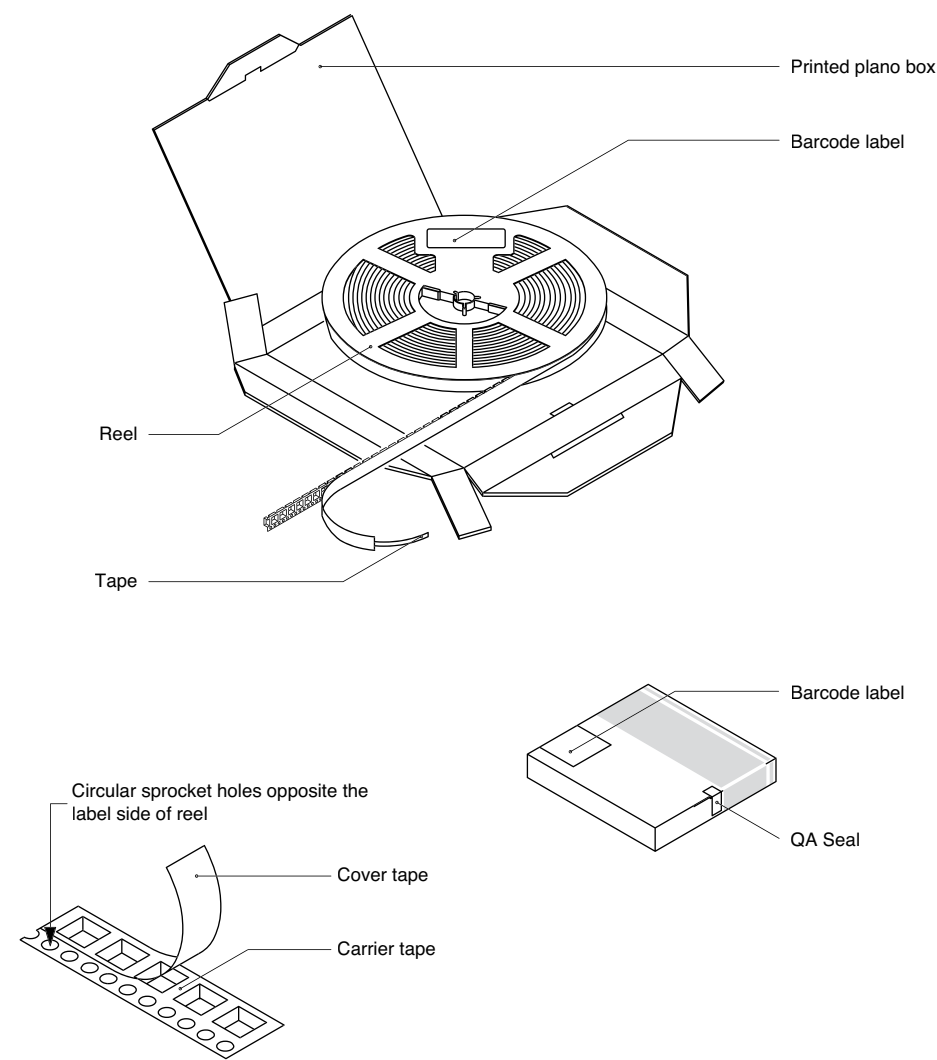
Package cross reference

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 ² PAK)	-	11.0 x 11.0 x 4.3	-		LPDS/ LPTS	TO-220SM	D ² PAK D ² PAK 3	TO-220S / SMD TO-263 LDKPAK(S)-(1)	TO263-3	TO263 (D ² PAK)	D ² PAK	TO-263 3-lead TO-263AB / D ² PAK	
	SOT416	SC-75	1.6 x 0.8 x 0.77	150		EMD3/ EMT3	SSM	SC-75	SMPAK	SC75			SC-75A	
4	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	
	SOT143B	-	2.9 x 1.3 x 1.0	250			CP4		MPAK-4R	SOT143	SOT-143			
5	SOT223	SC-73	6.5 x 3.5 x 1.65	1700				SOT-223		SOT223	SOT-223	SOT-223	SOT223	
	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		

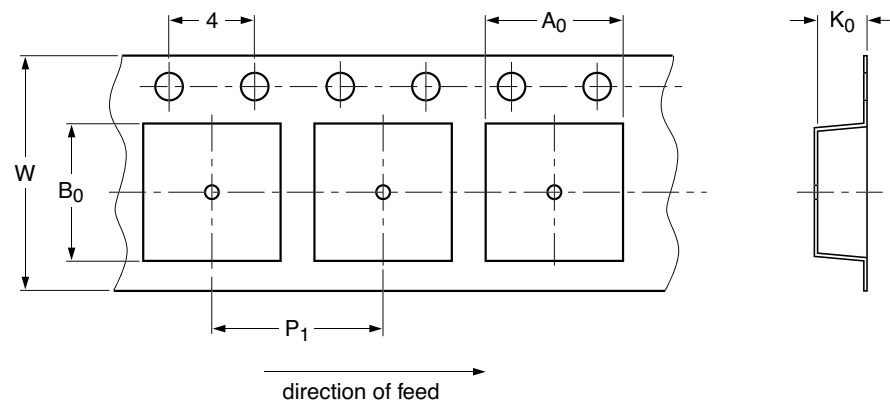
Package cross reference

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	
	SOT96	SO8	4.9 x 3.9 x 1.75	1500		SOP8	FM8	SOIC-8 NB	SOP-8			FLP-8	SO8	
8	SOT505	TSSOP8	3.0 x 3.0 x 1.1	-				TSSOP-8				TSSOP8		
	DFN1712-8 (SOT1157)	HXSON8	1.2 x 1.7 x 0.5	-				UDFN8, 1.8 x 1.2, 0.4P						
8 + 1	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



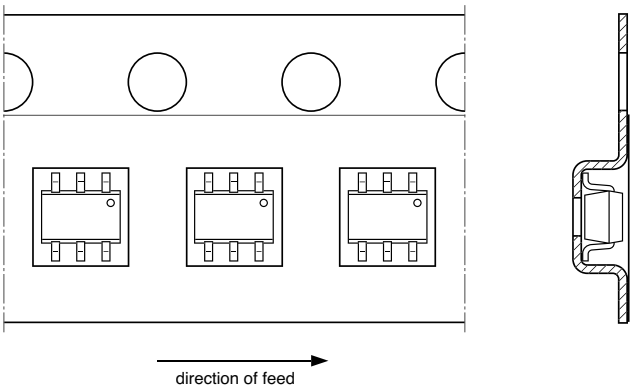
Carrier tape - tape and reel



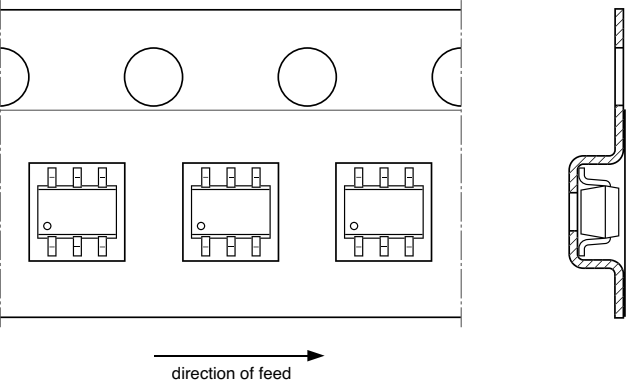
P_1 = pitch (see table packing methods)
 W = tape width (see table packing methods)
Compartment width (A_0), length (B_0) and depth (K_0) depending on package

Product orientation (tape and reel pack) T1-T4

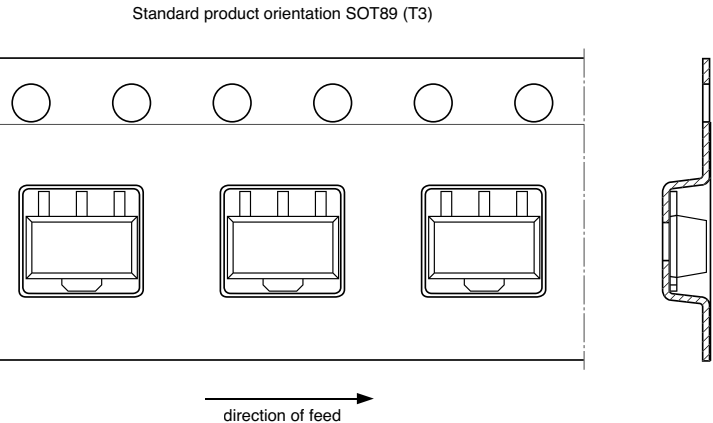
T1 taping



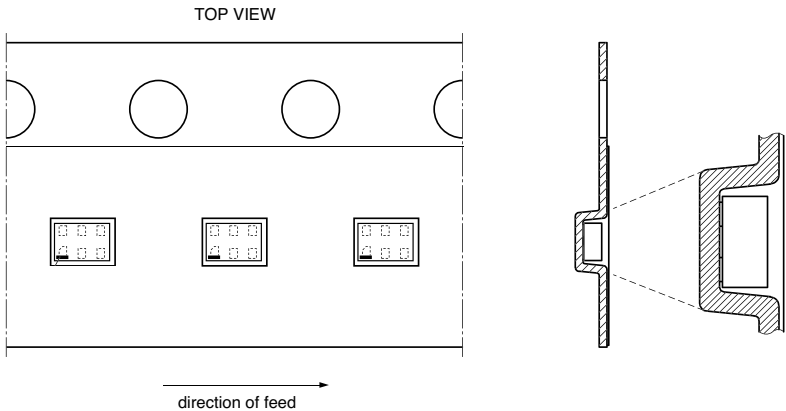
T2 taping



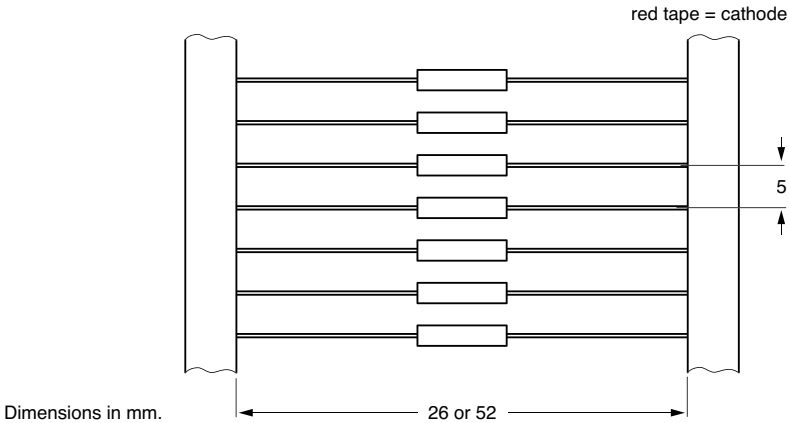
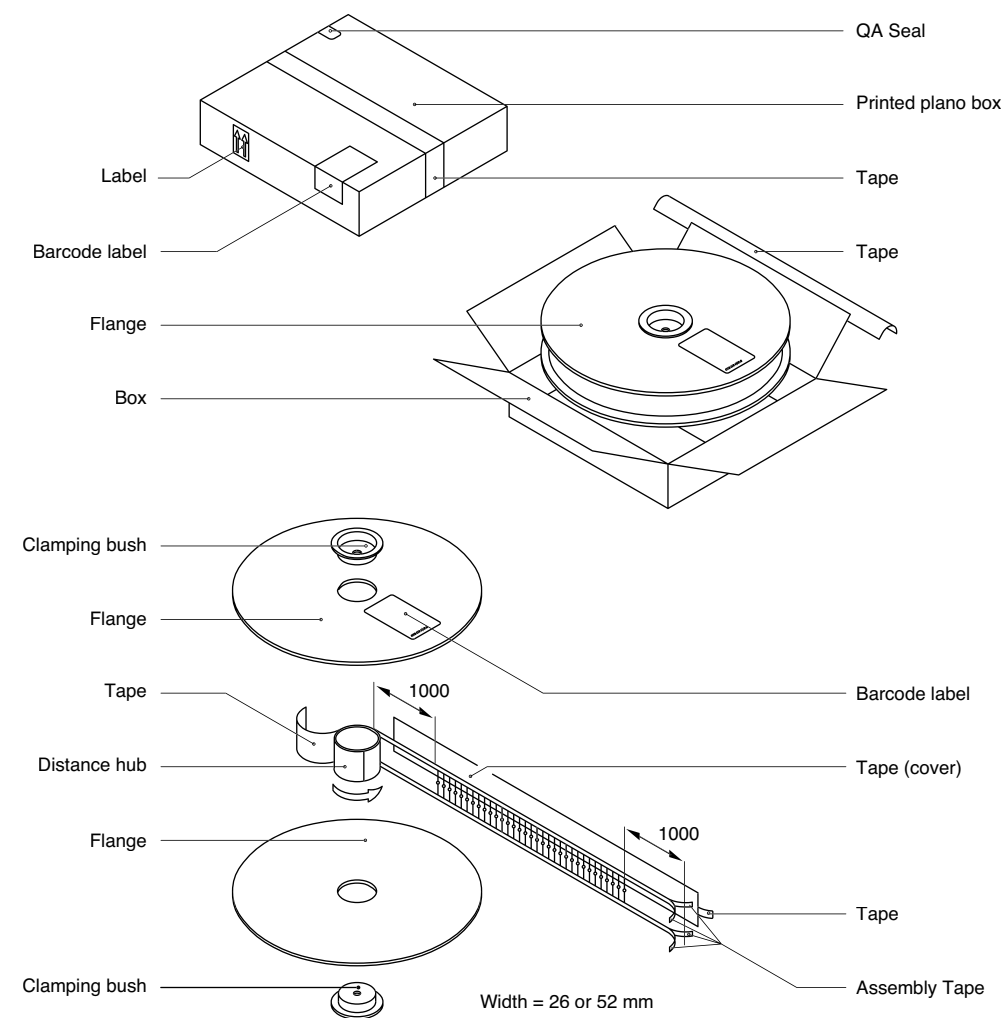
T3 taping



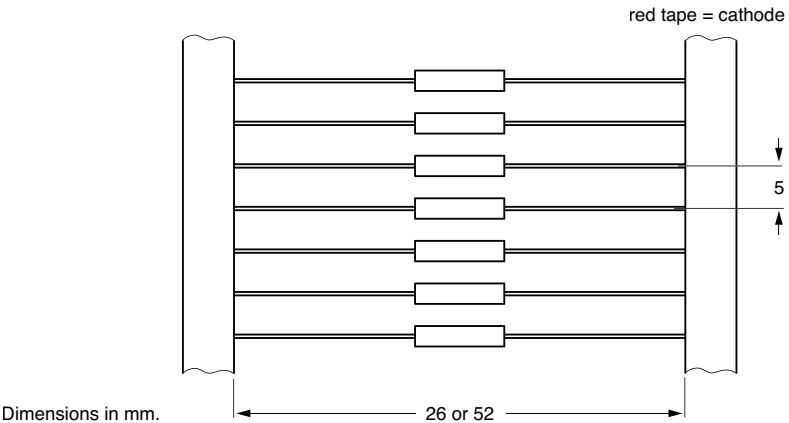
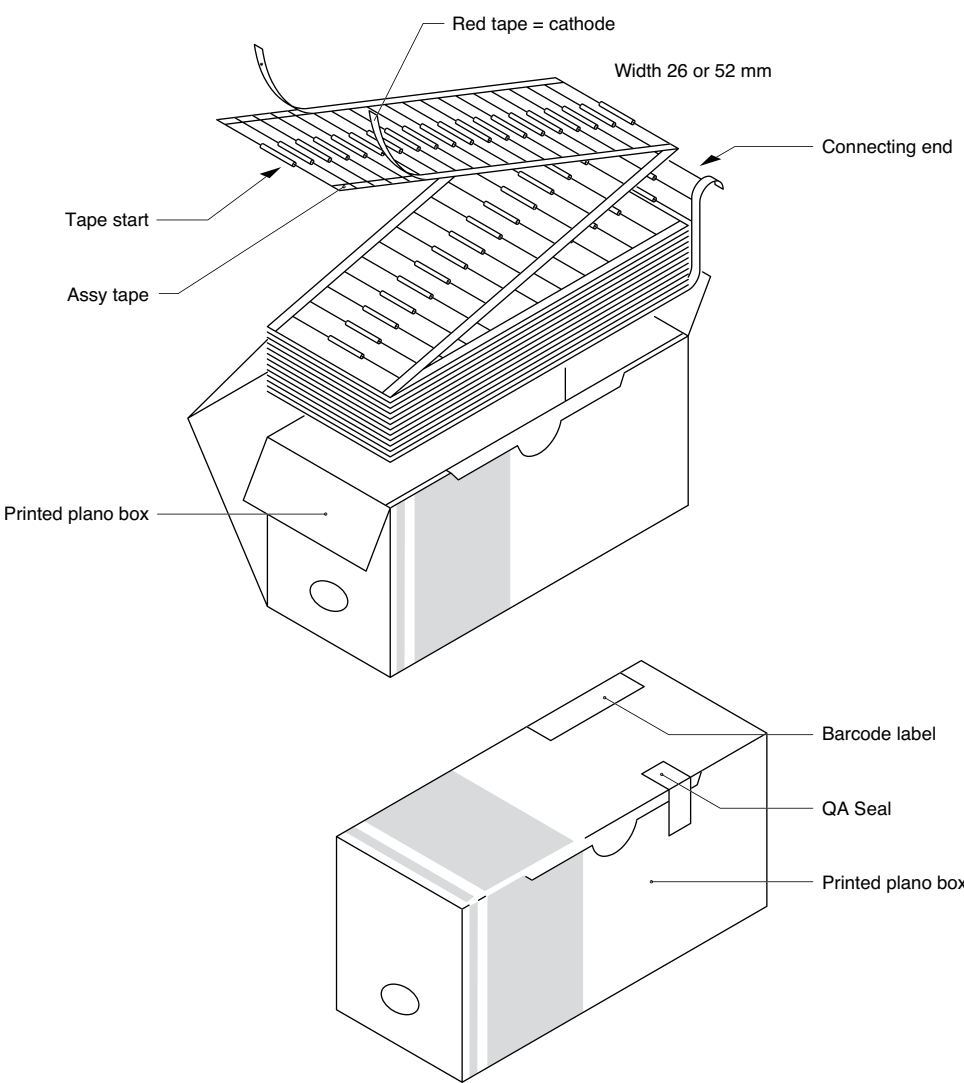
T4 taping



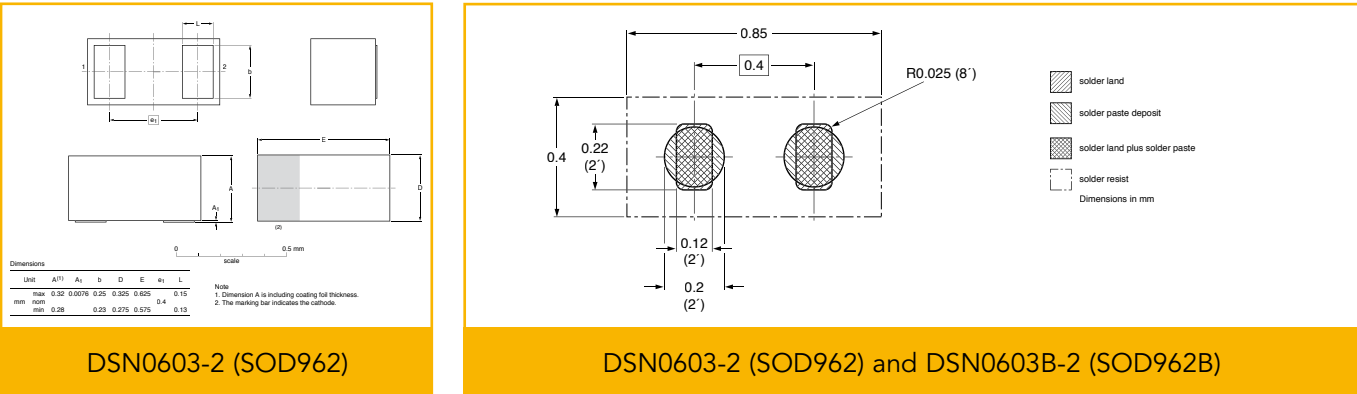
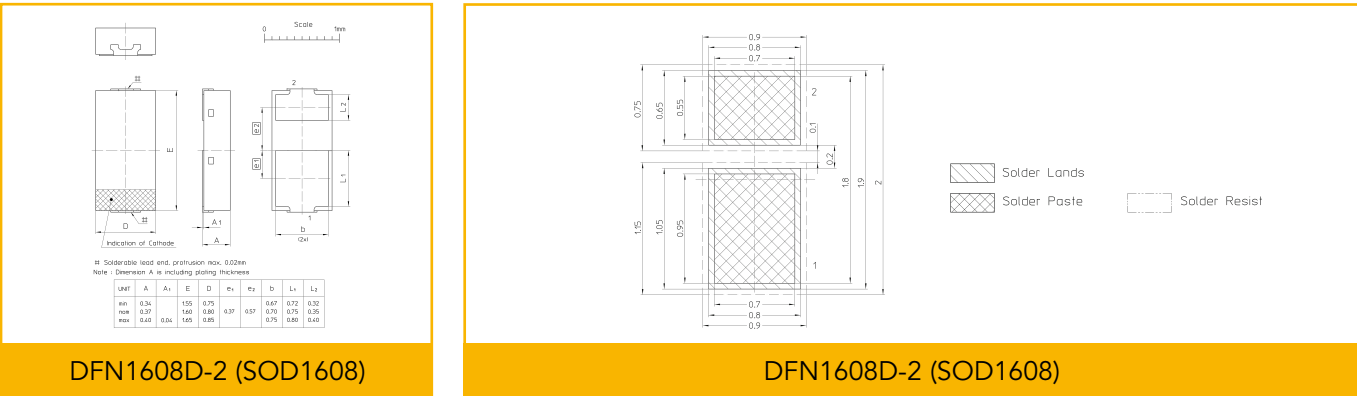
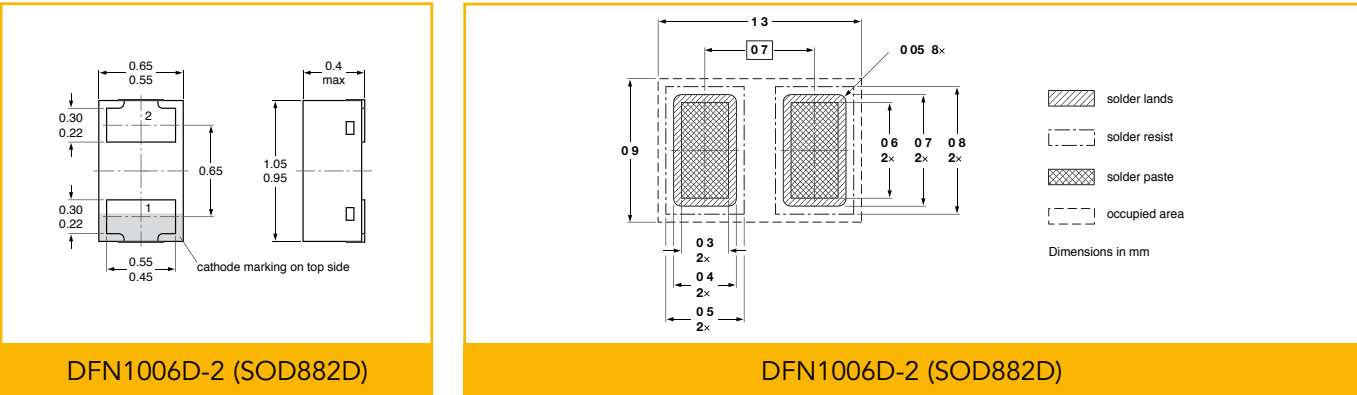
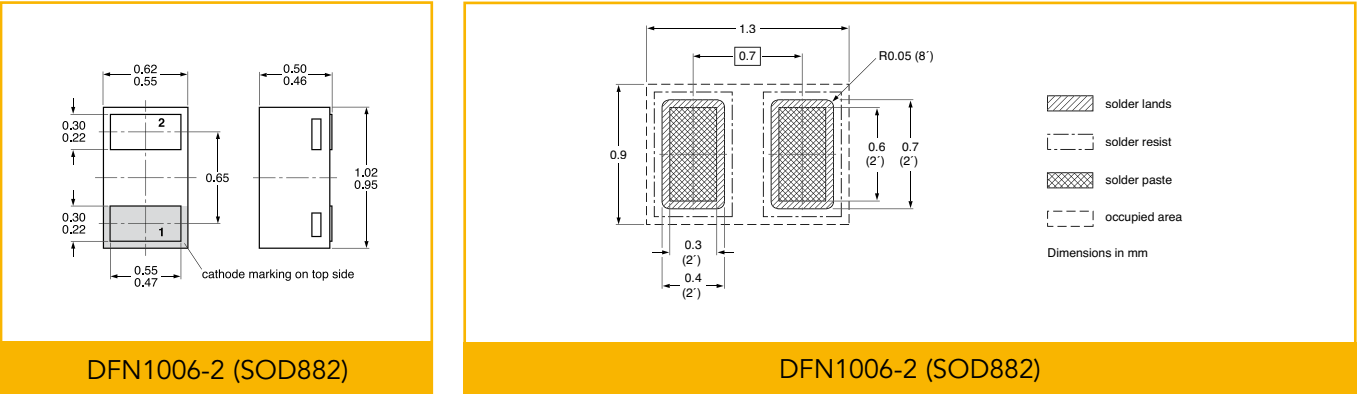
Reel pack axial tape for glass diodes



Ammo pack axial tape for glass diodes

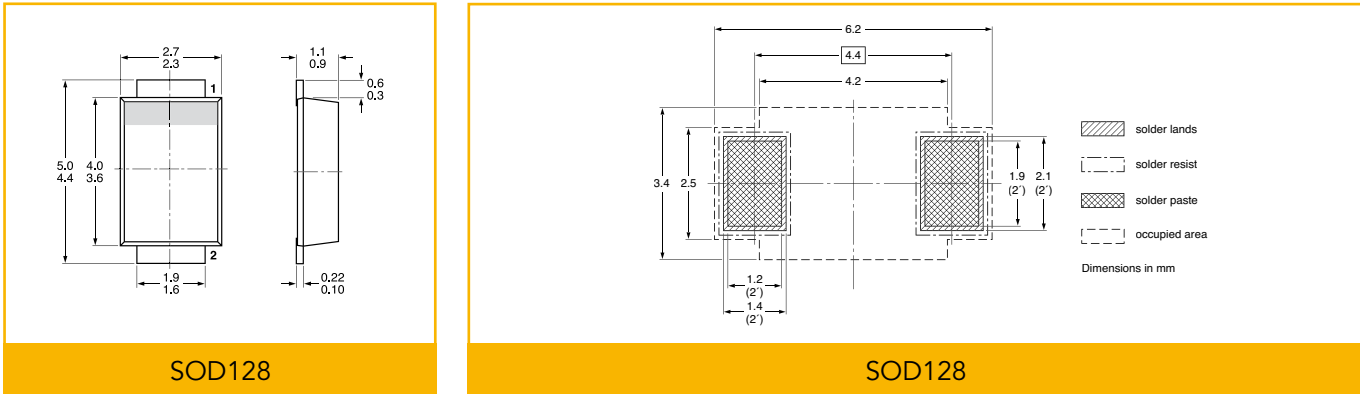
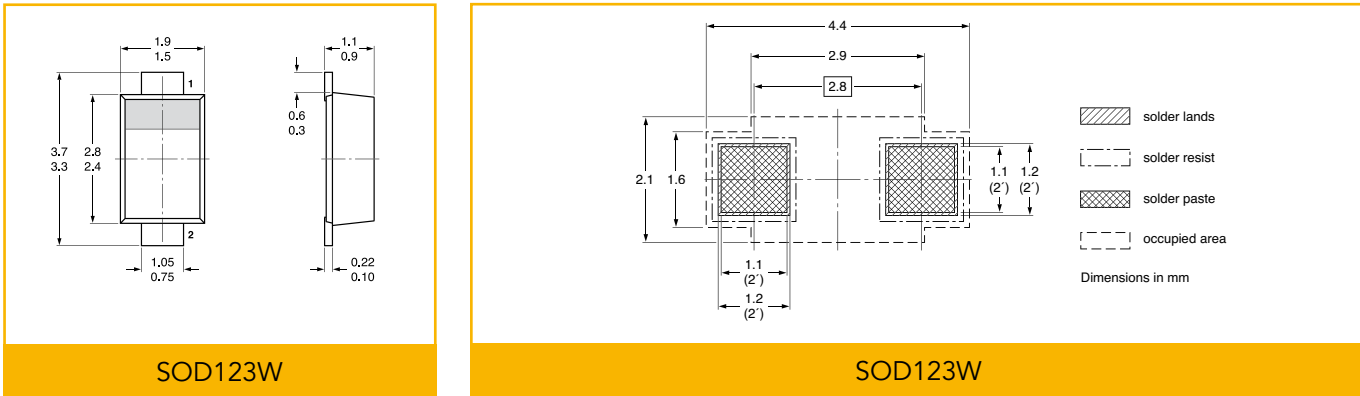
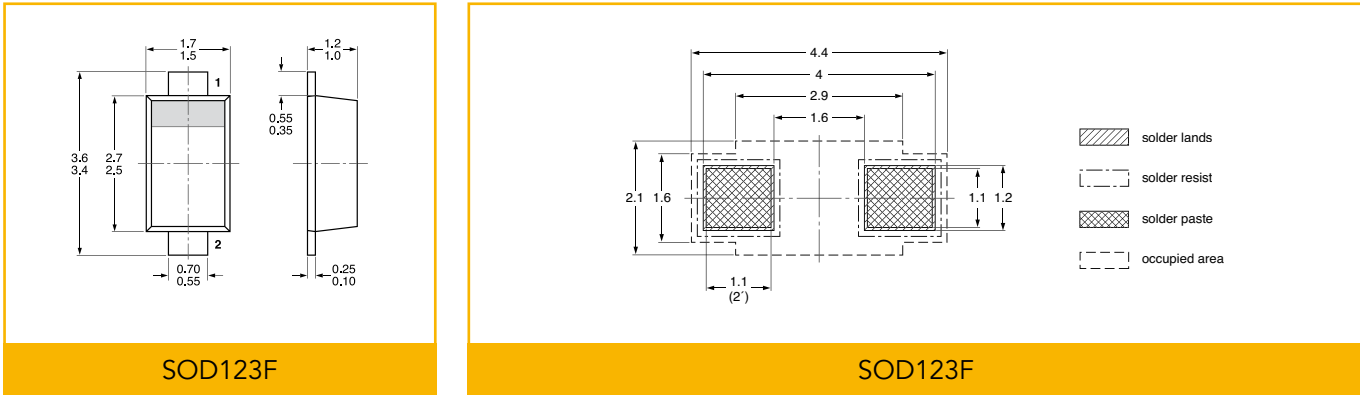
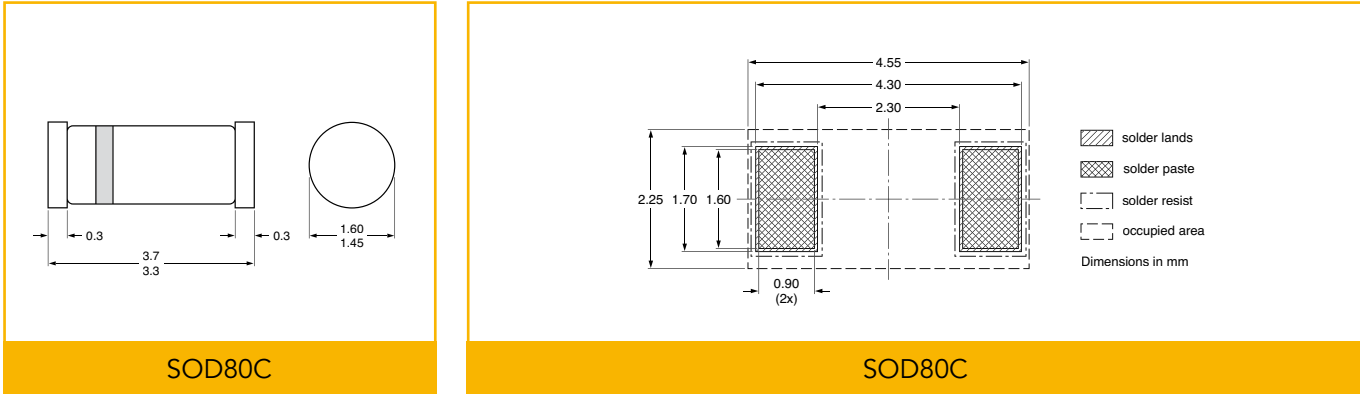


2-Pin SMD Packages



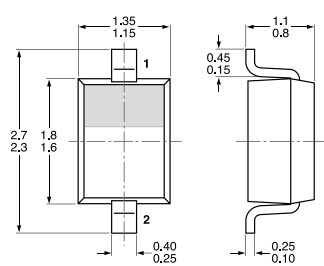
Dimensions in mm

2-Pin SMD Packages

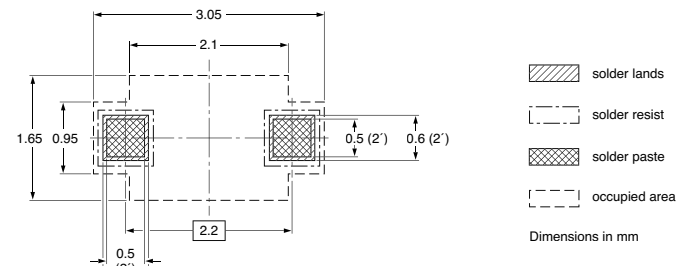


Dimensions in mm

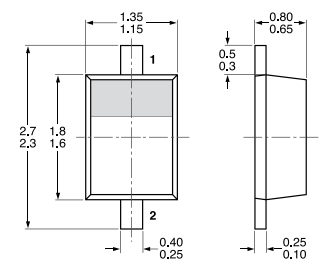
2-Pin SMD Packages



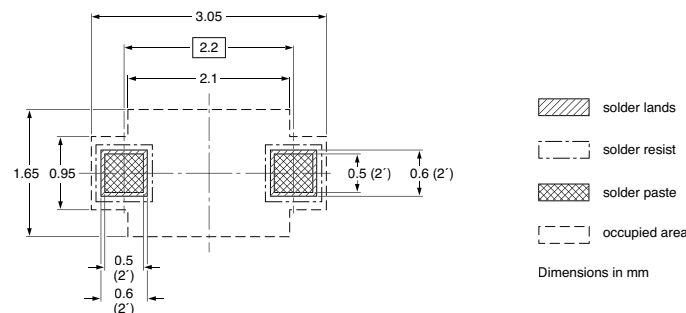
SOD323 (SC-76)



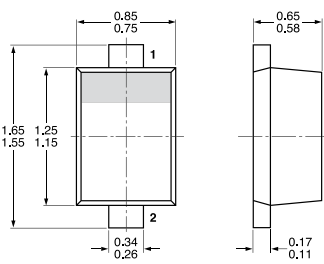
SOD323 (SC-76)



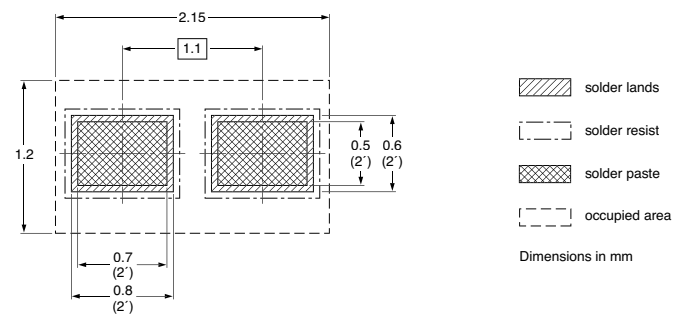
SOD323F (SC-90)



SOD323F (SC-90)

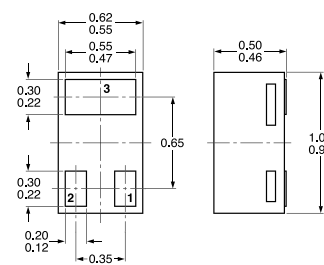


SOD523 (SC-79)



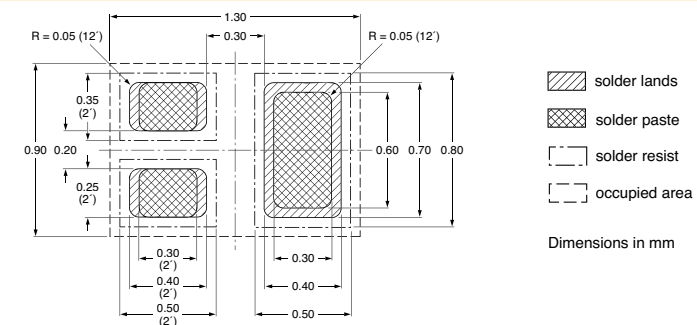
SOD523 (SC-79)

3-Pin SMD Packages



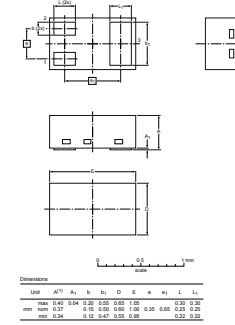
DFN1006-3 (SOT883)

Dimensions in mm

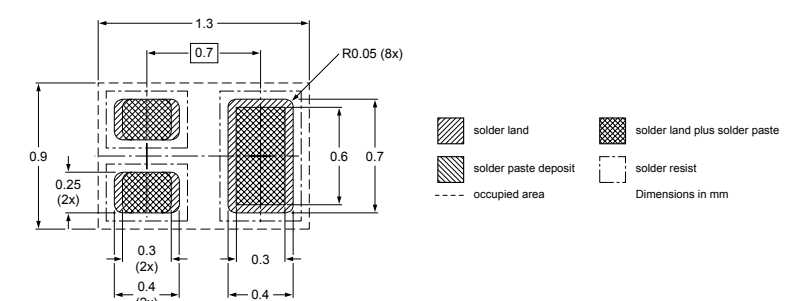


DFN1006-3 (SOT883)

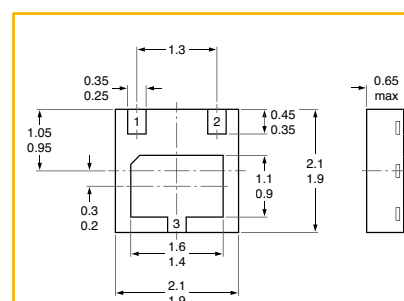
3-Pin SMD Packages



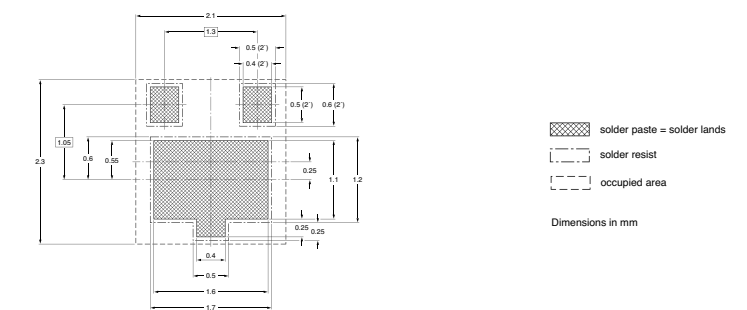
DFN1006B-3 (SOT883B)



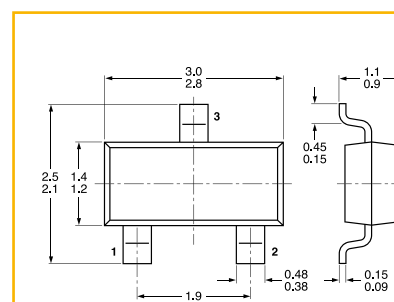
DFN1006B-3 (SOT883B)



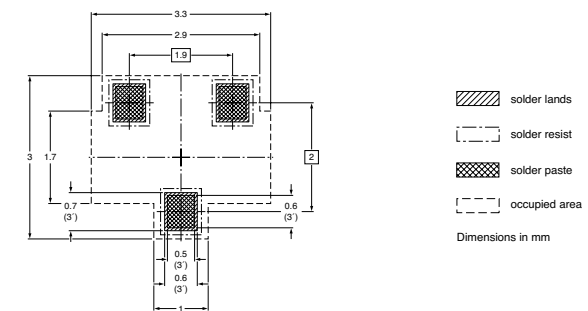
DFN2020-3 (SOT1061)



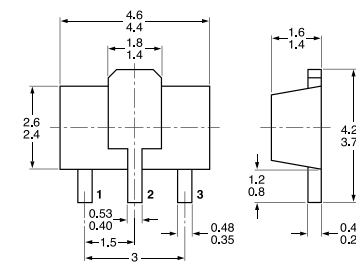
DFN2020-3 (SOT1061)



SOT23

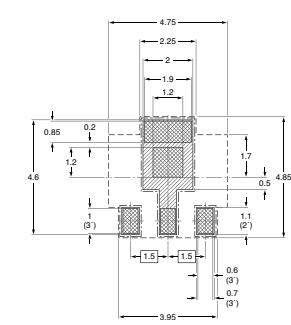


SOT23



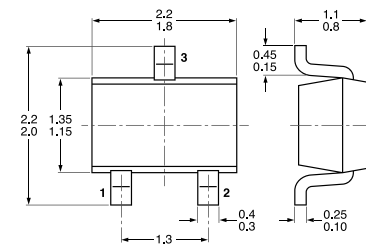
SOT89 (SC-62)

Dimensions in mm

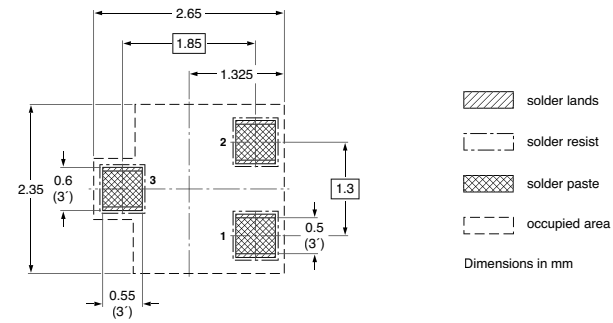


SOT89 (SC-62)

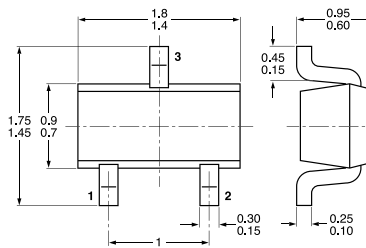
3-Pin SMD Packages



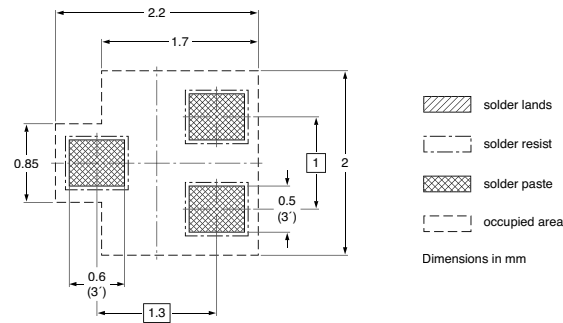
SOT323 (SC-70)



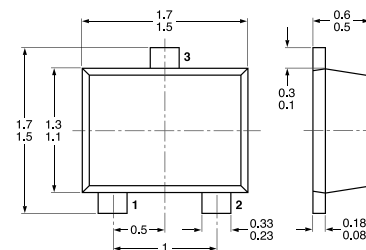
SOT323 (SC-70)



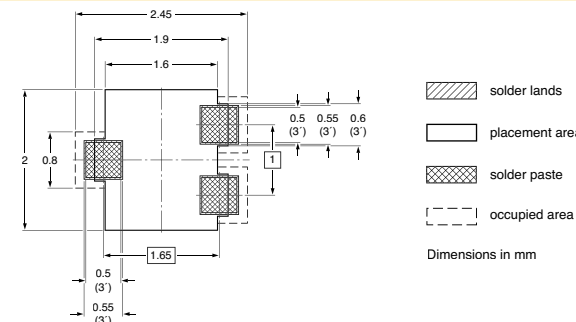
SOT416 (SC-75)



SOT416 (SC-75)

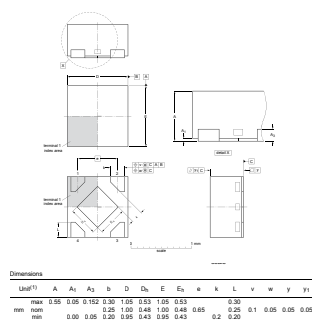


SOT663

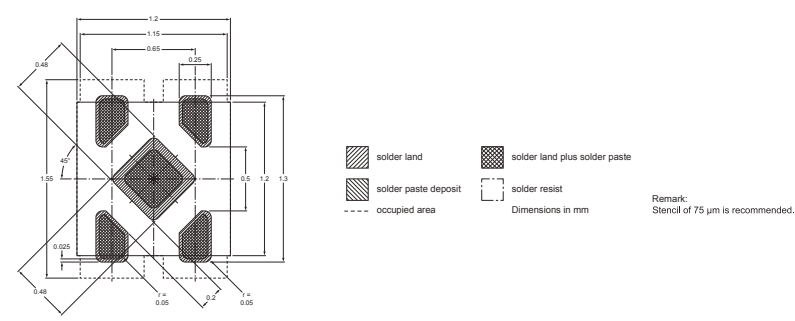


SOT663

4-/5-Pin SMD Packages



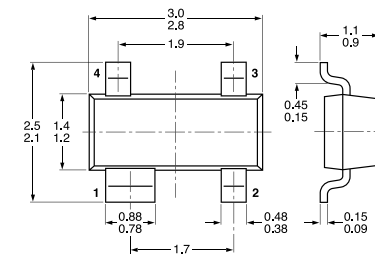
DFN1010C-4 (SOT1194)



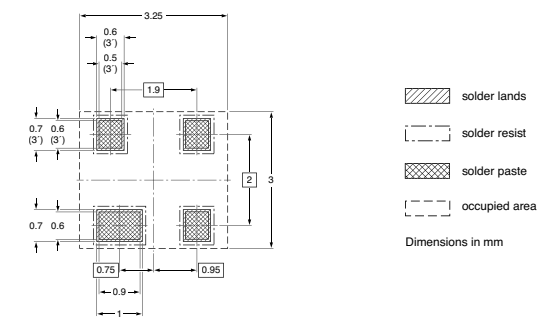
DFN1010C-4 (SOT1194)

Dimensions in mm

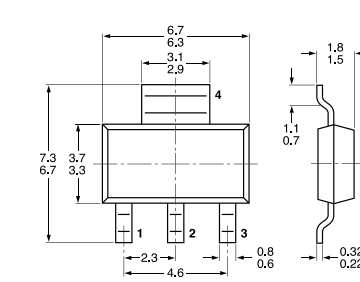
4-/5-Pin SMD Packages



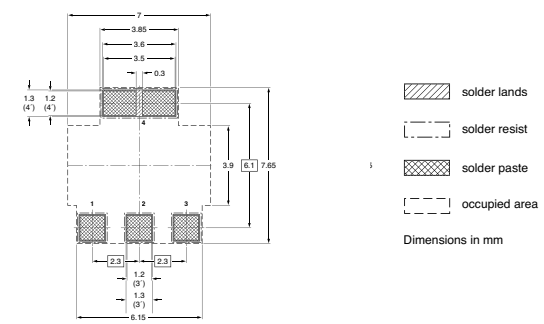
SOT143B



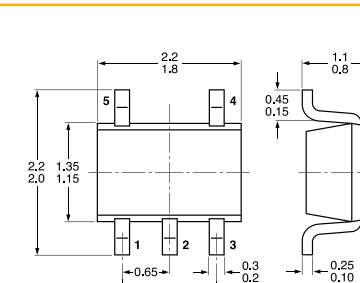
SOT143B



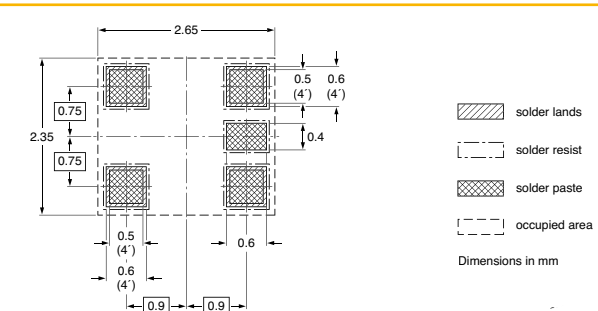
SOT223 (SC-73)



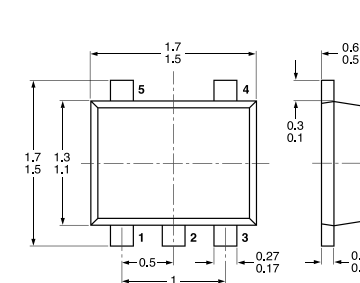
SOT223 (SC-73)



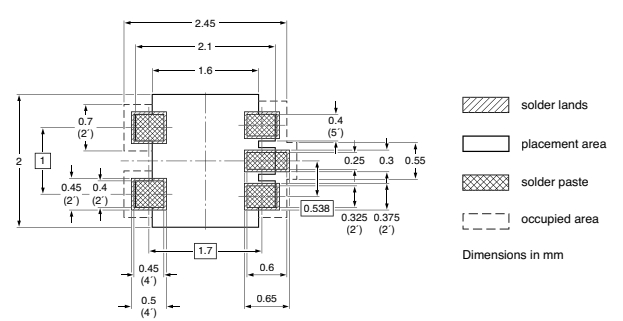
SOT353 (SC-88A)



SOT353 (SC-88A)



SOT665

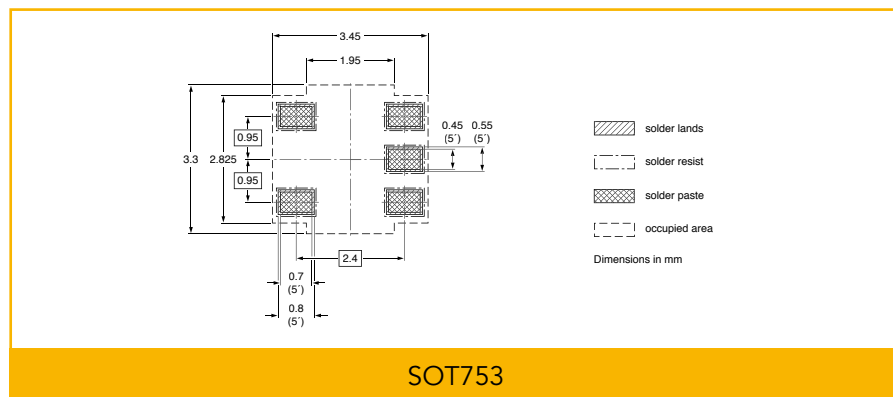
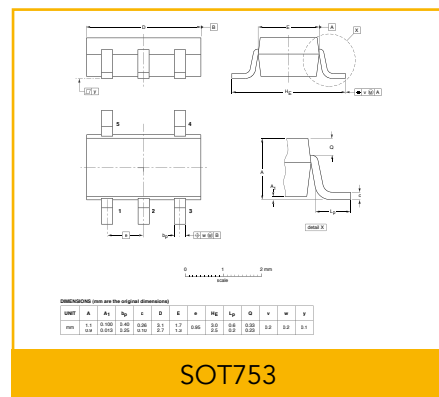


SOT665

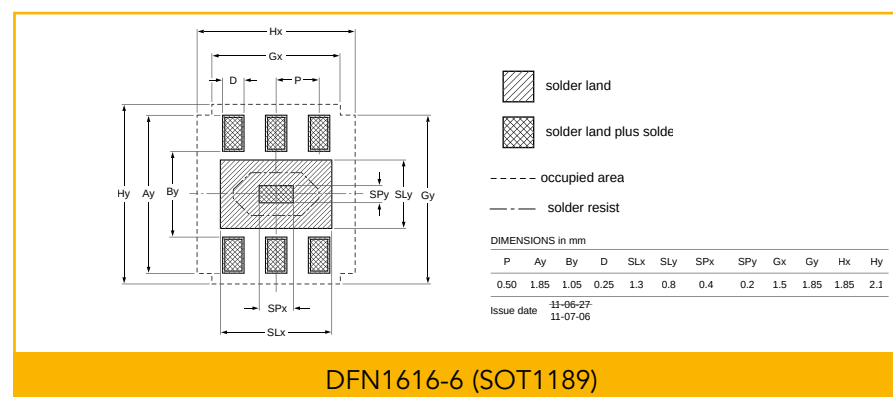
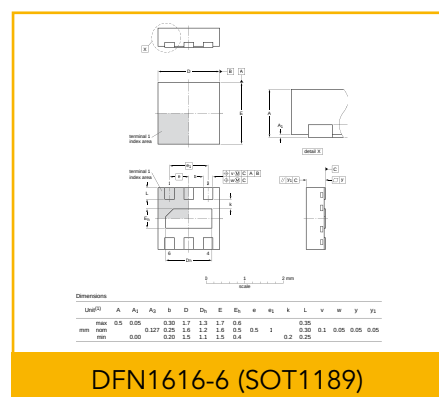
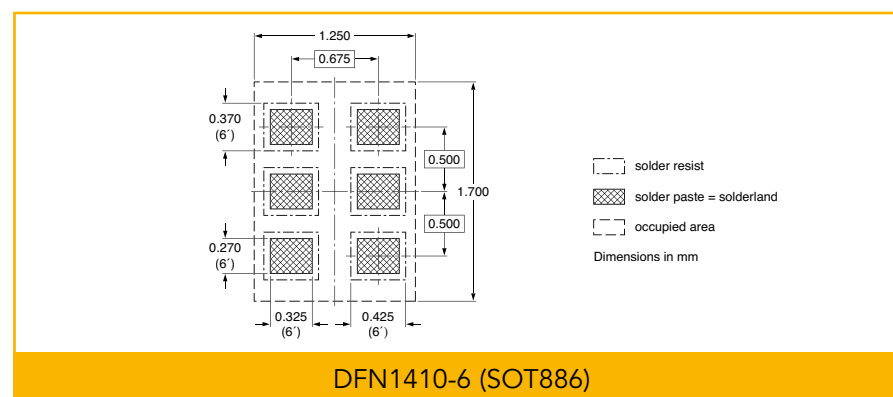
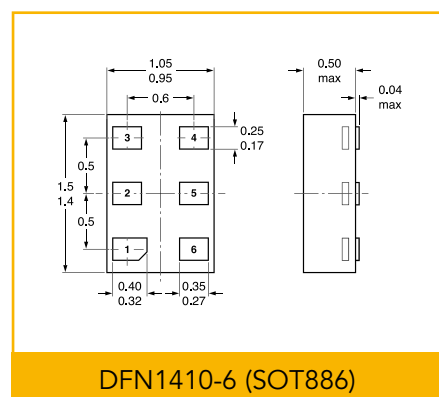
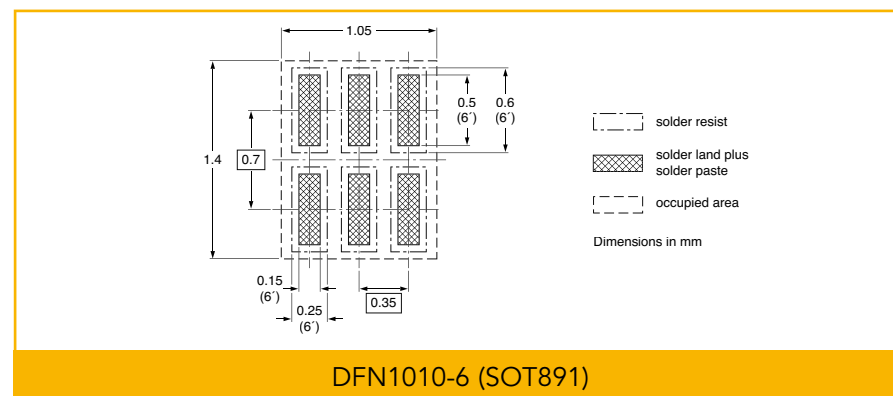
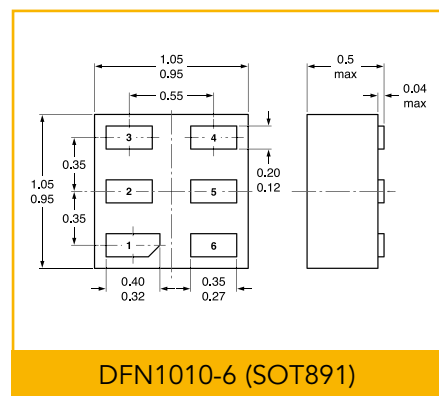
Dimensions in mm

Minimized outline drawings and reflow soldering footprint

4-/5-Pin SMD Packages



6- to 8-Pin SMD Packages

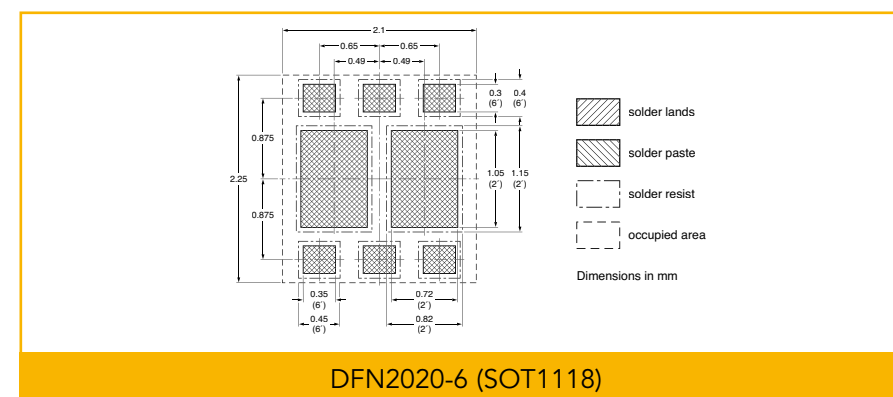
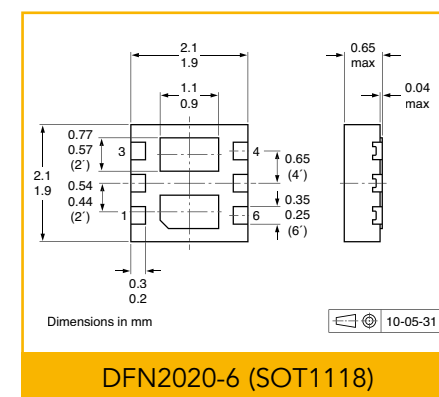
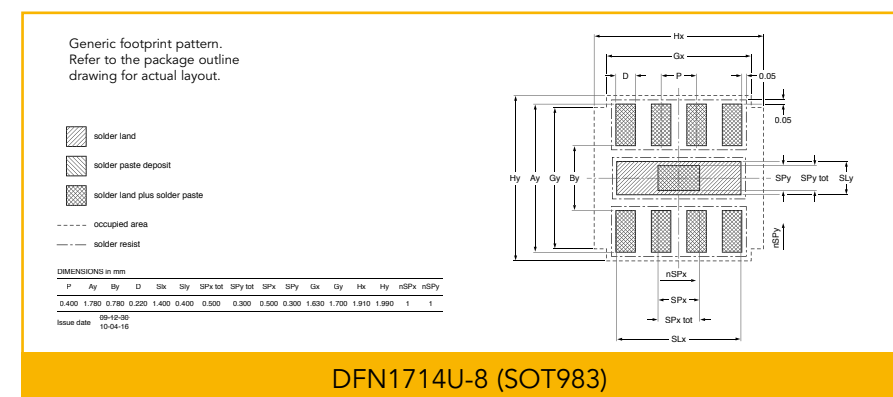
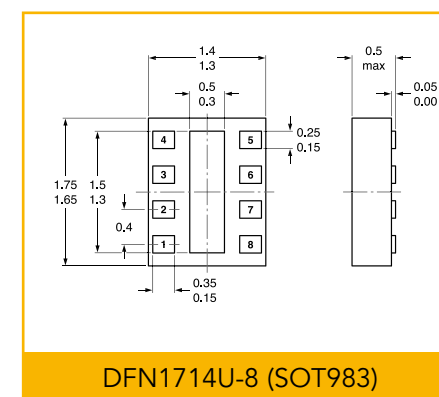
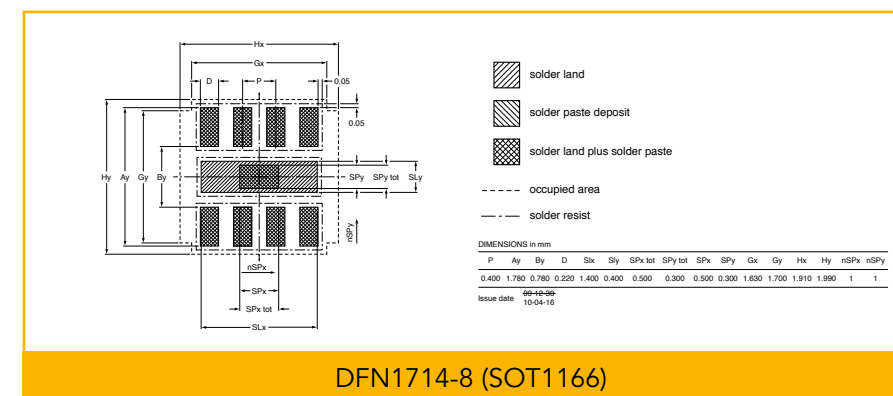
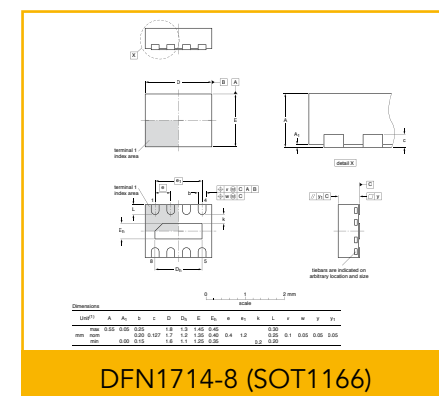
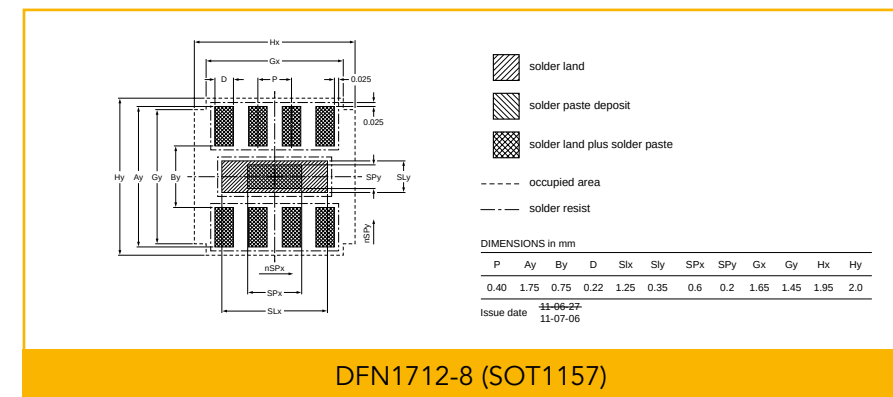
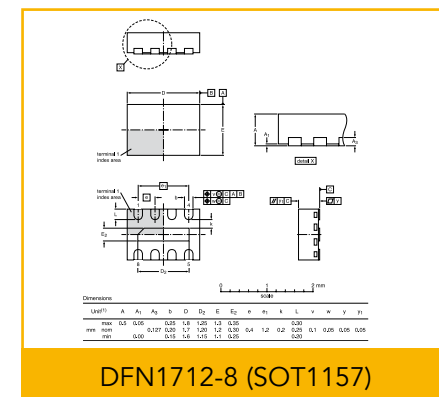


Dimensions in mm

140

Minimized outline drawings and reflow soldering footprint

6- to 8-Pin SMD Packages

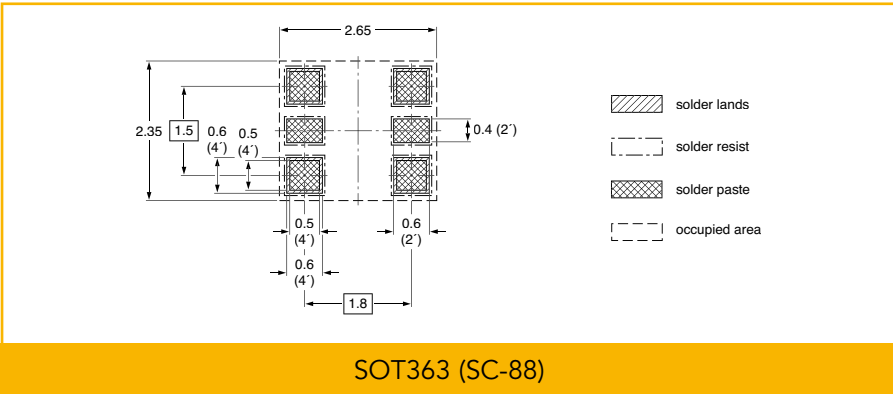
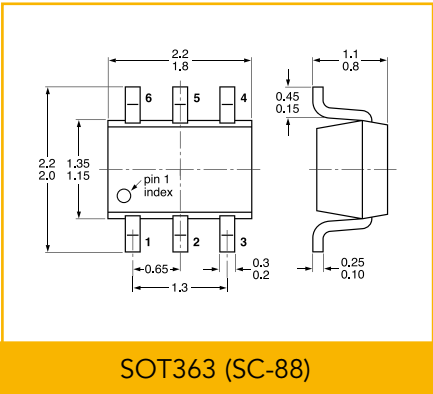
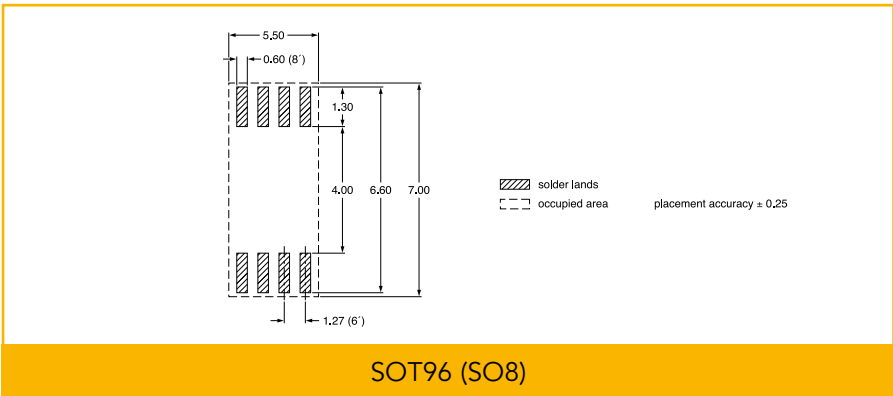
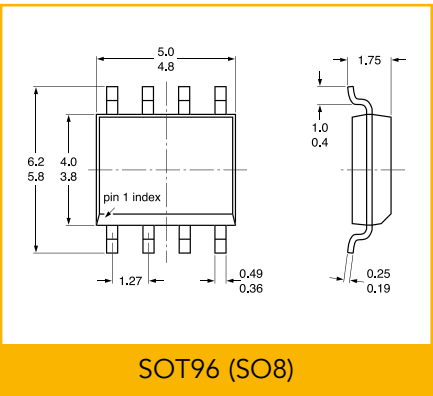
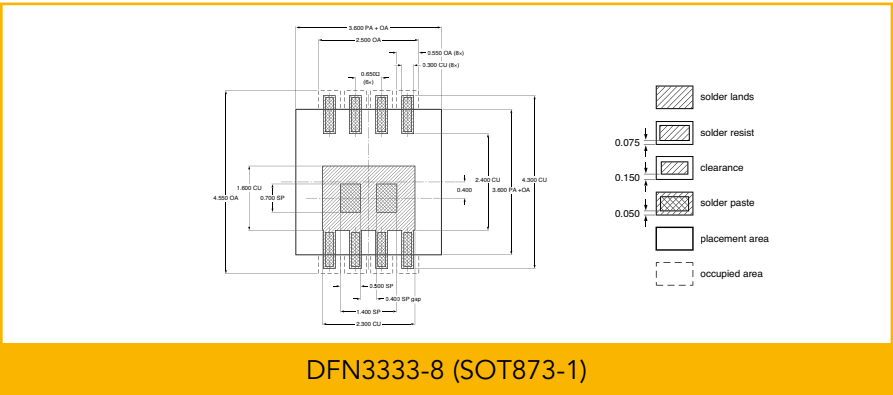
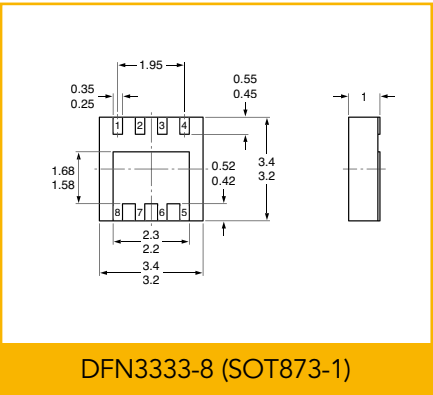
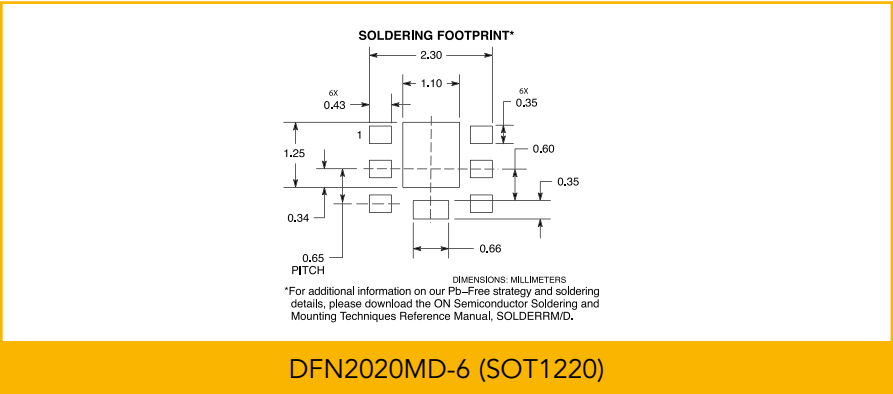
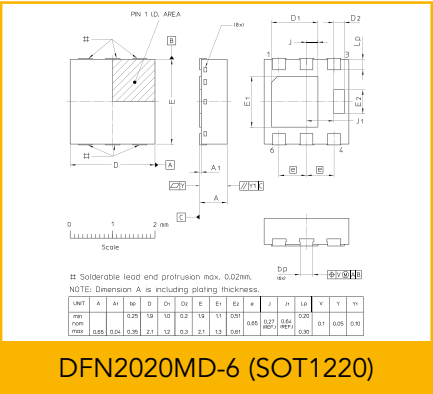


Dimensions in mm

Packages

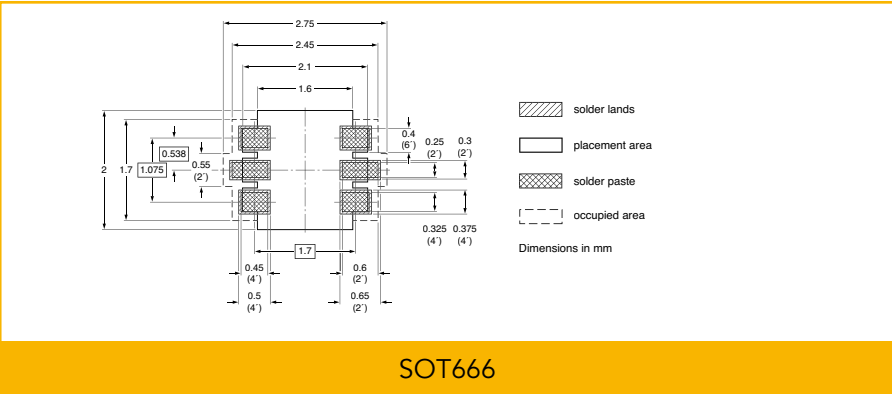
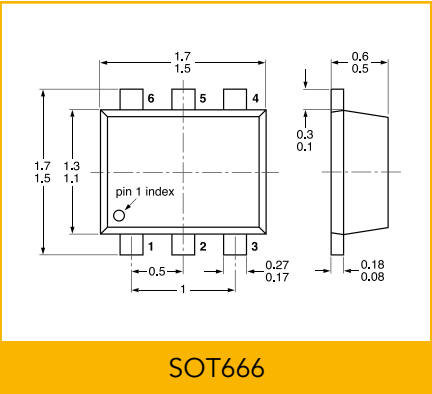
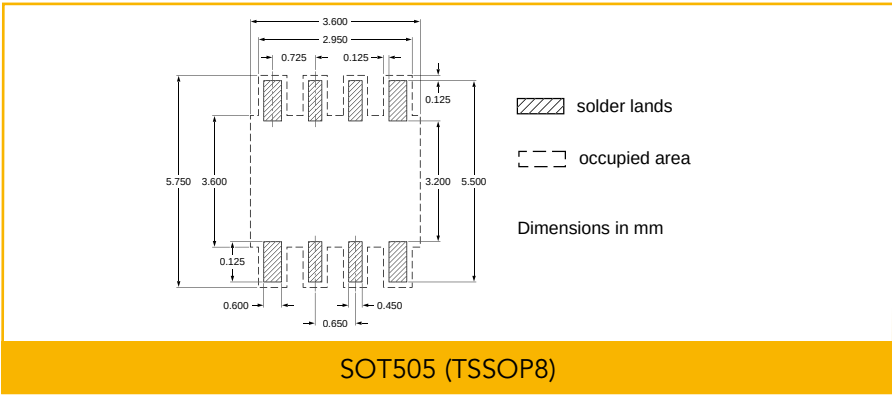
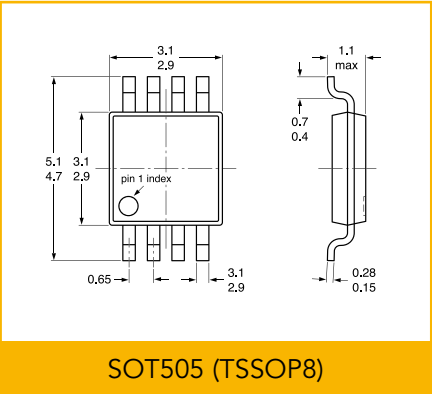
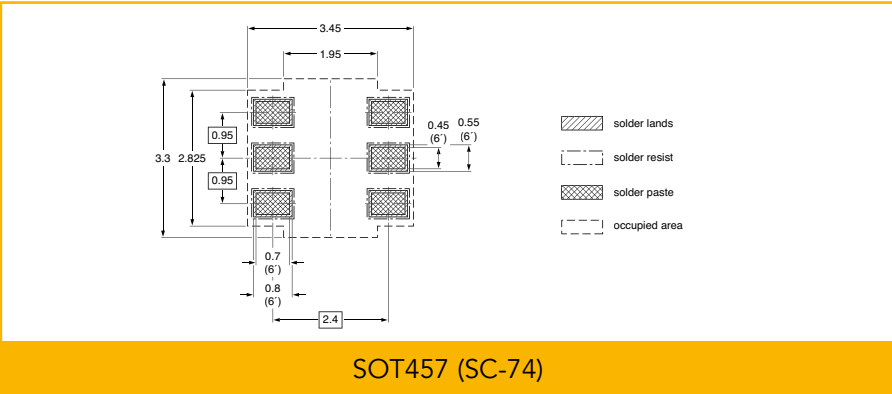
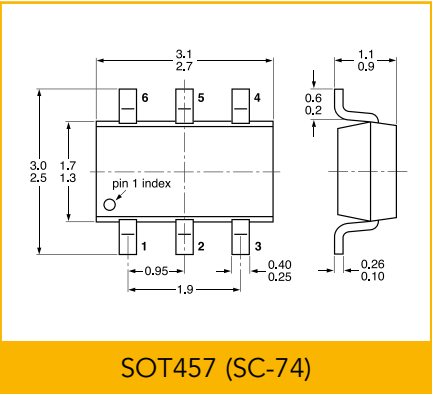
141

6- to 8-Pin SMD Packages

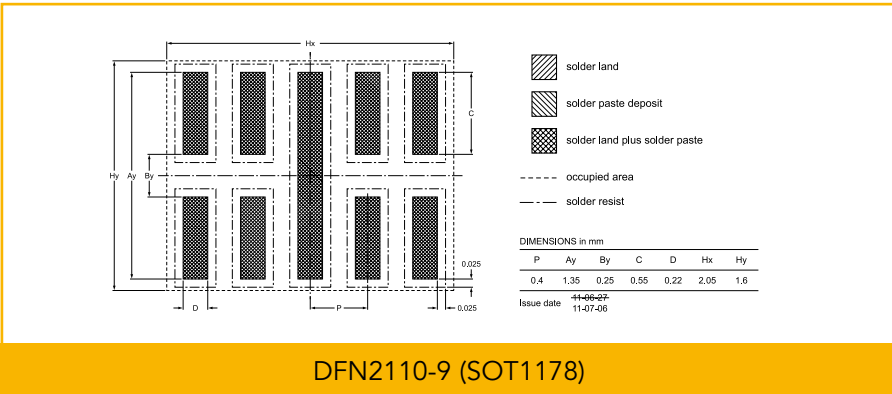
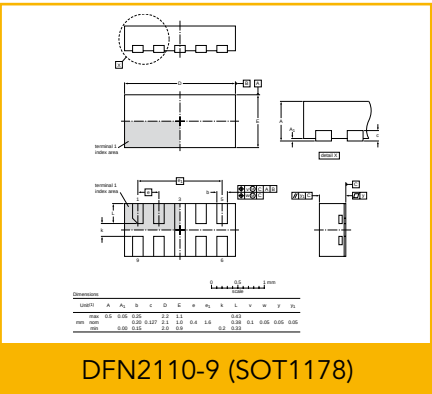


Dimensions in mm

6- to 8-Pin SMD Packages

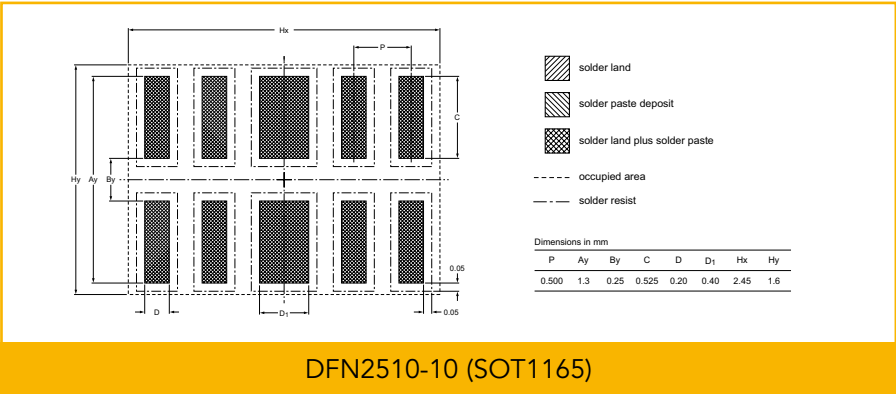
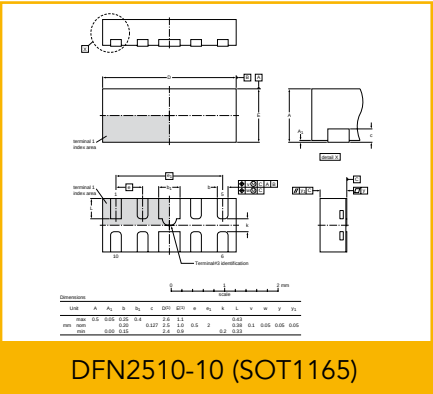


More than 8-Pin Packages

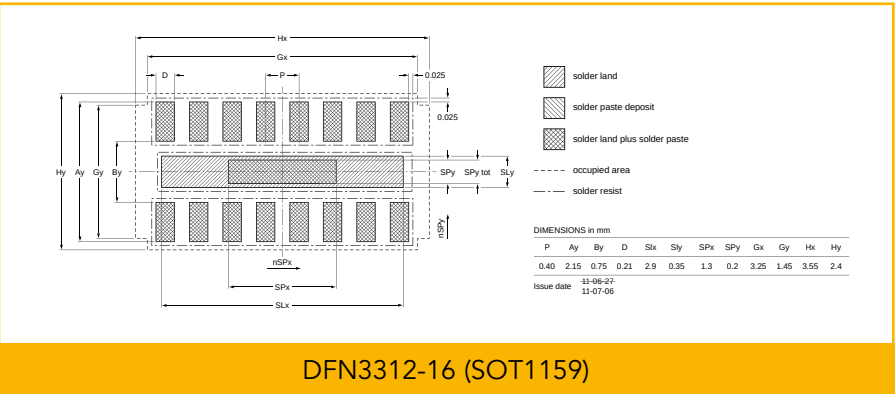
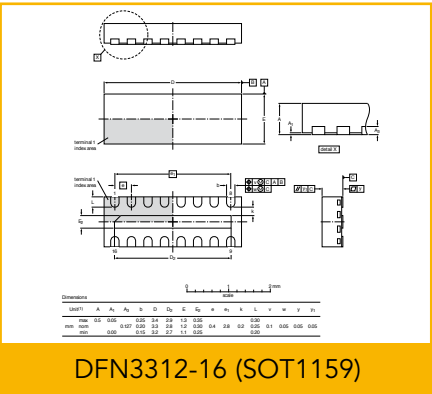
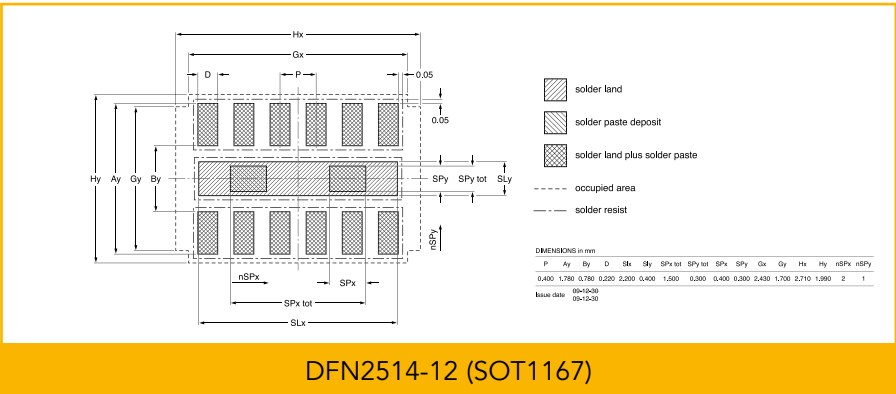
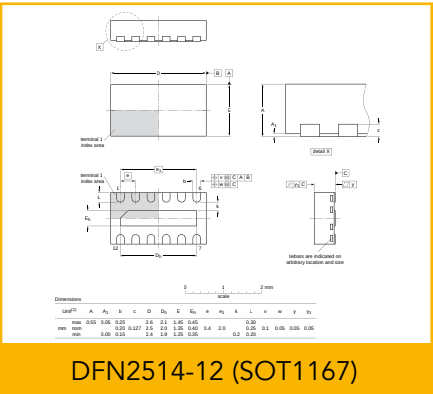
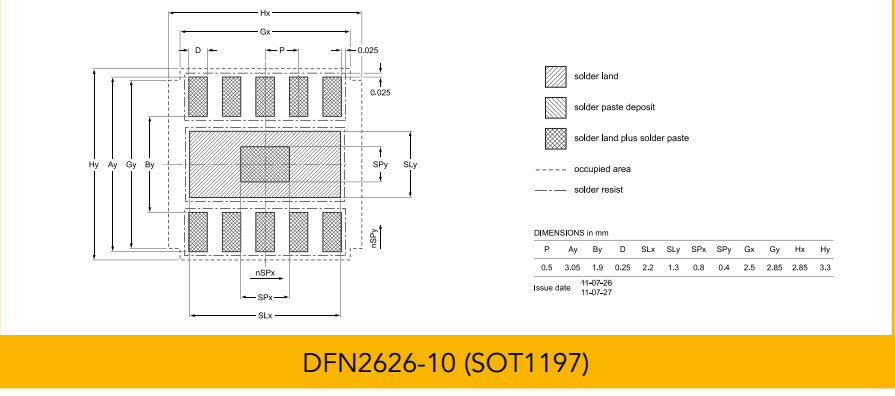
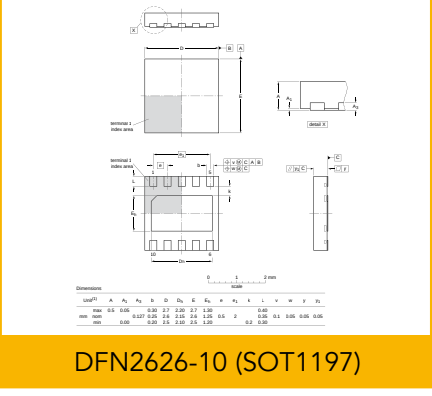
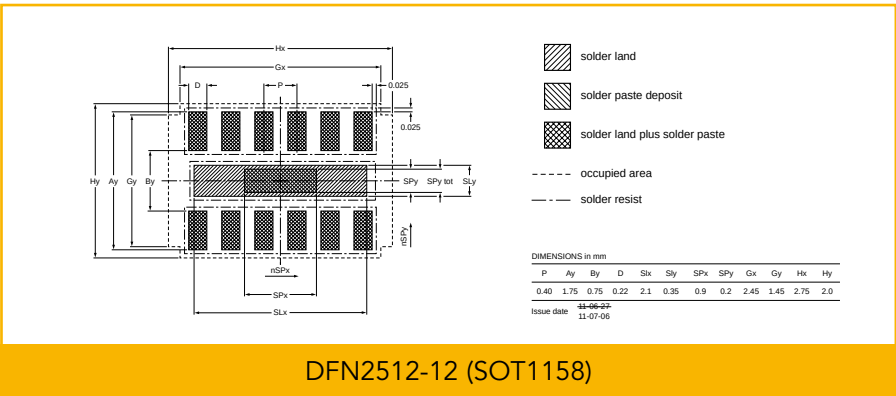
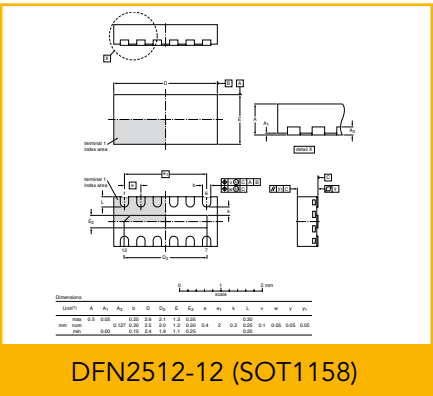
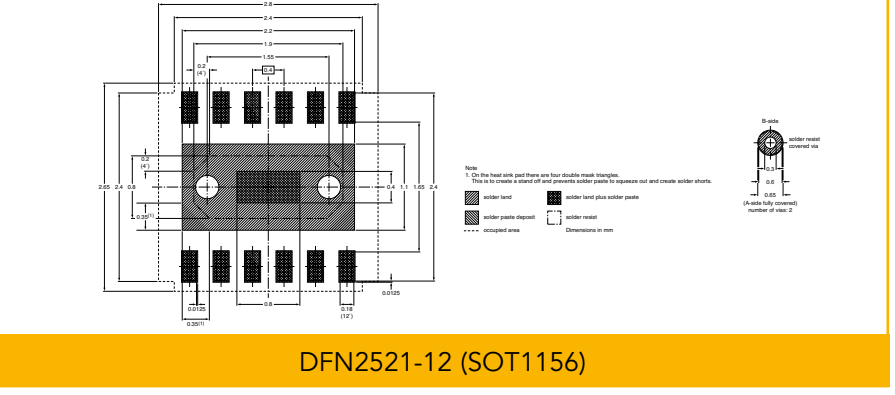
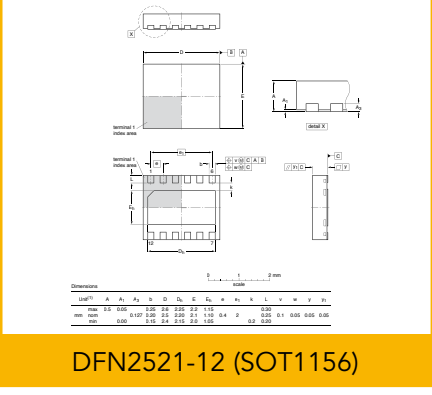
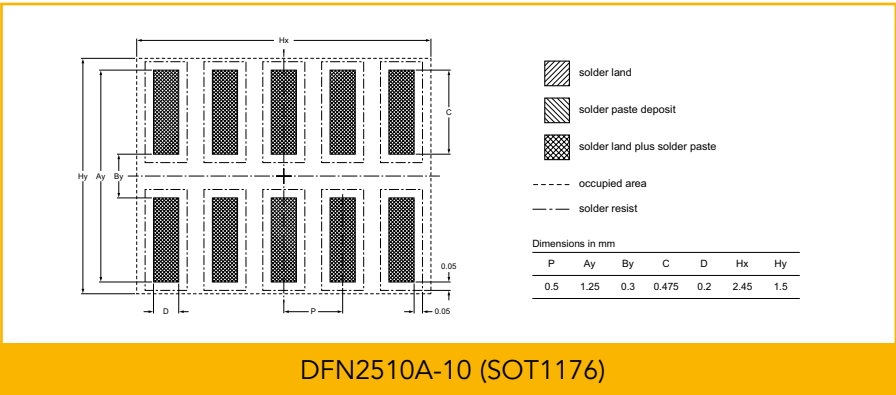
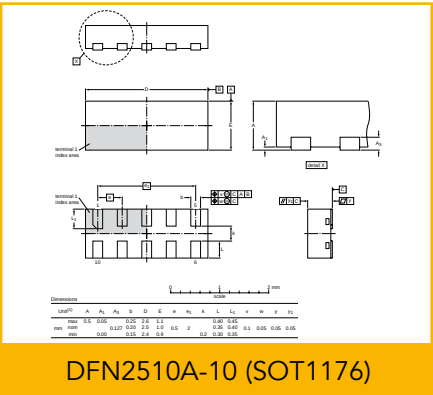
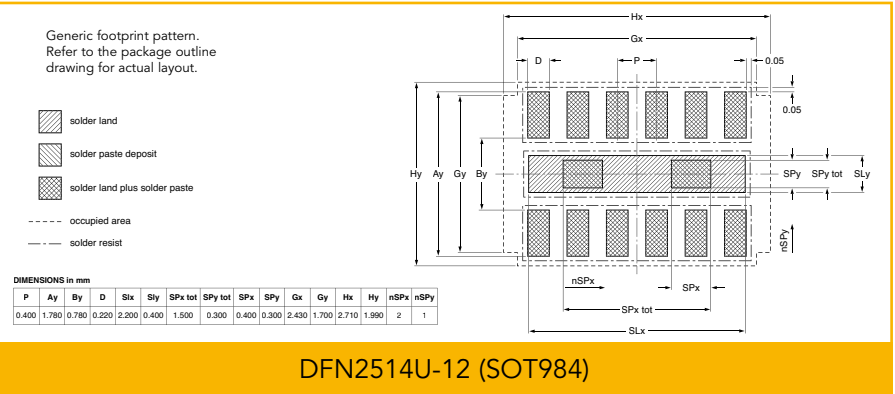
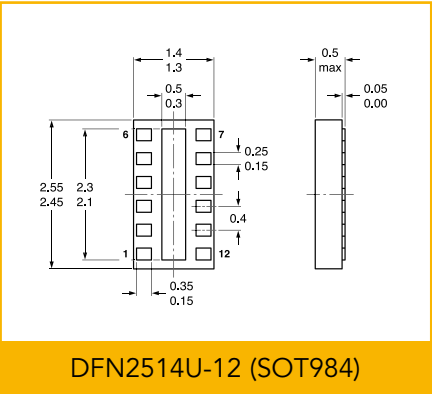


Dimensions in mm

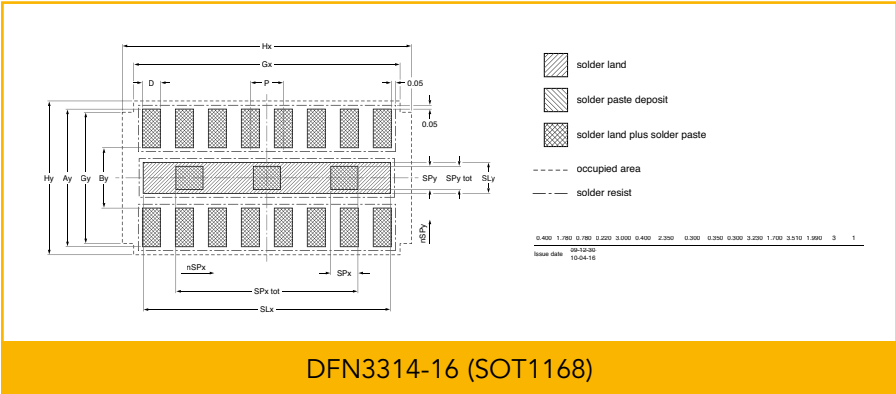
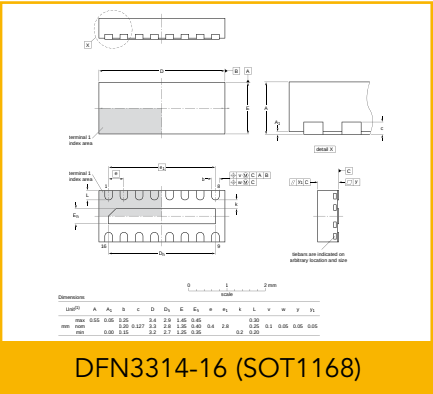
More than 8-Pin Packages



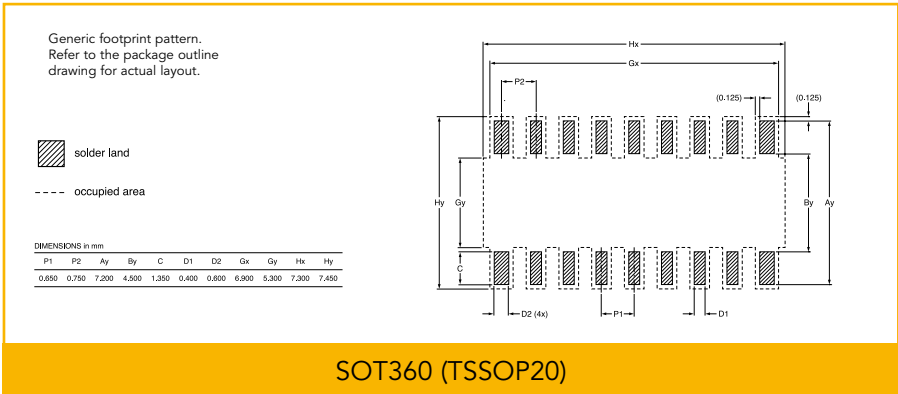
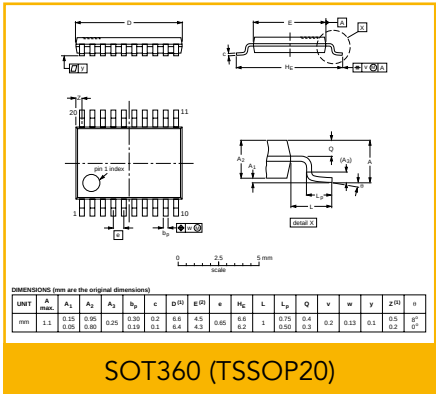
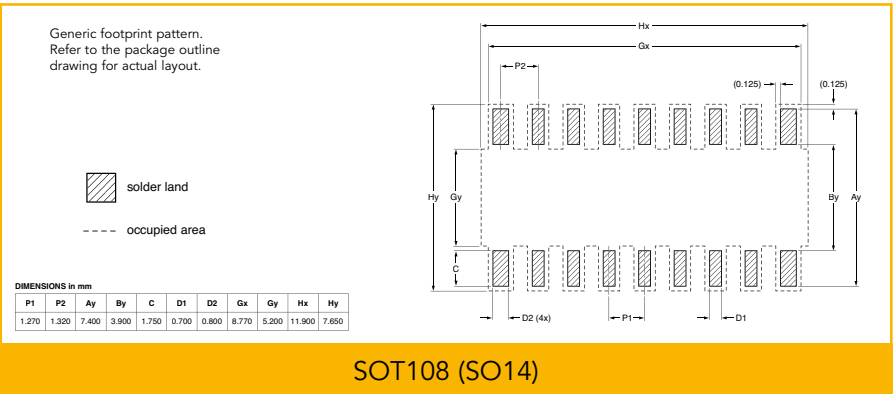
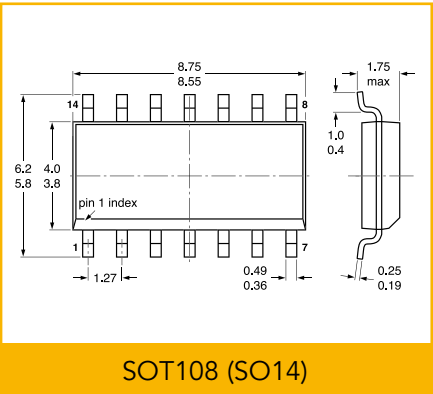
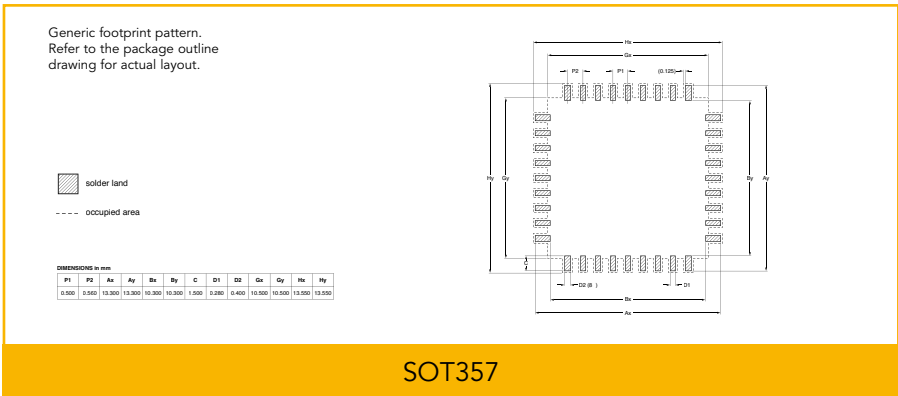
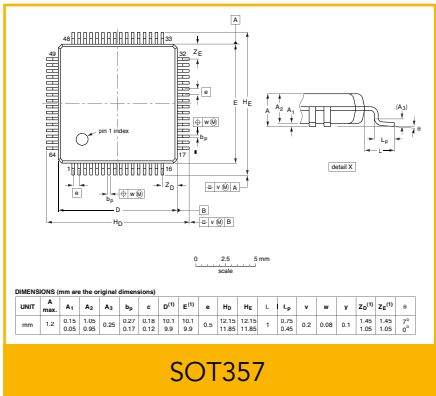
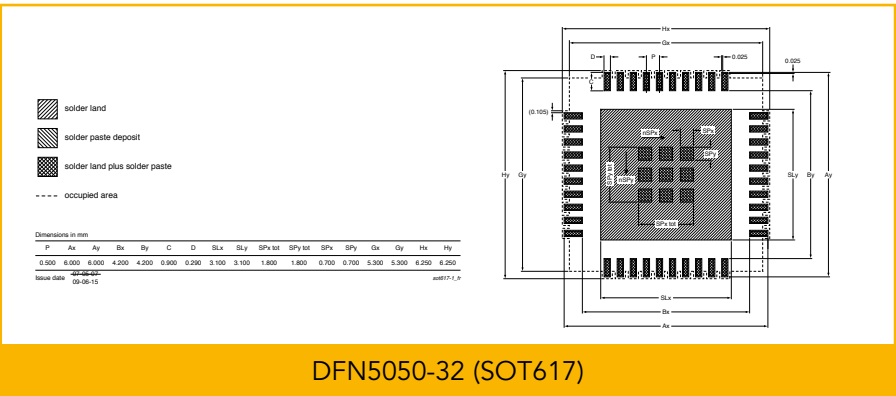
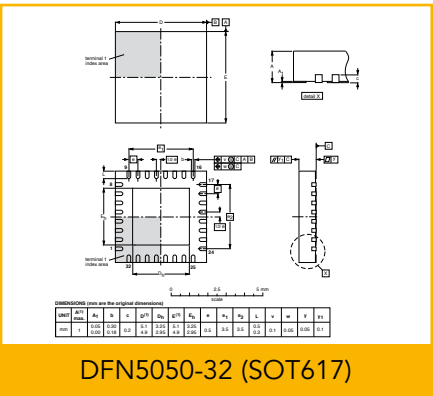
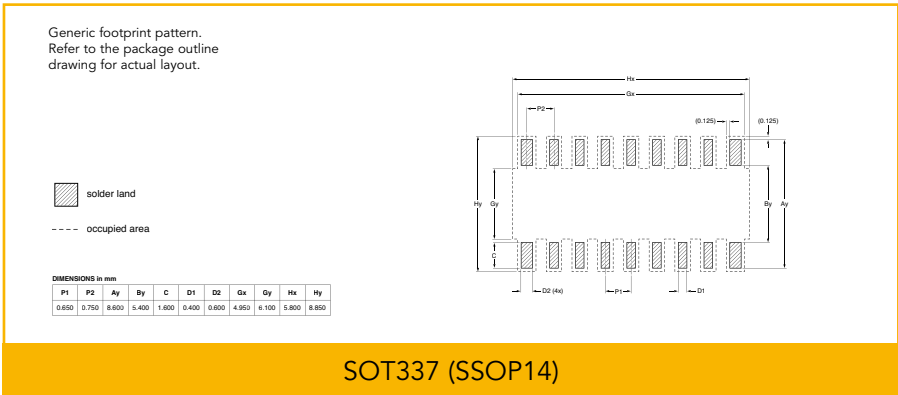
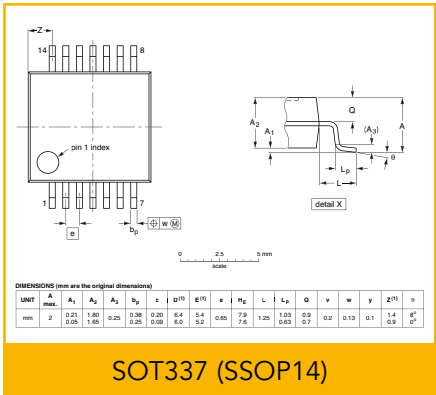
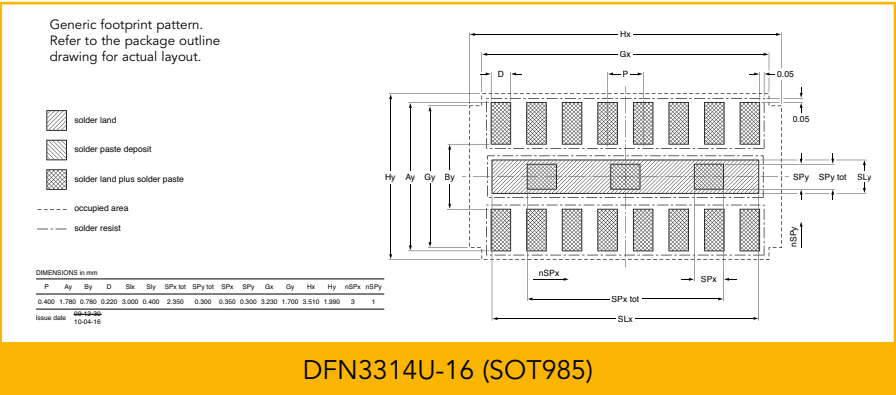
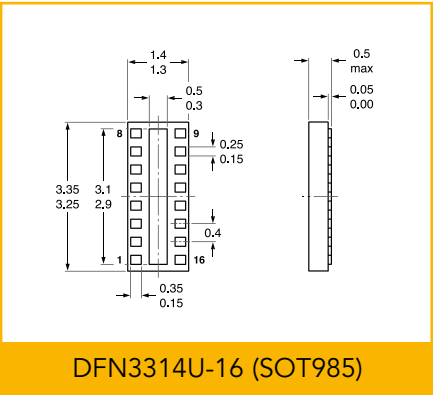
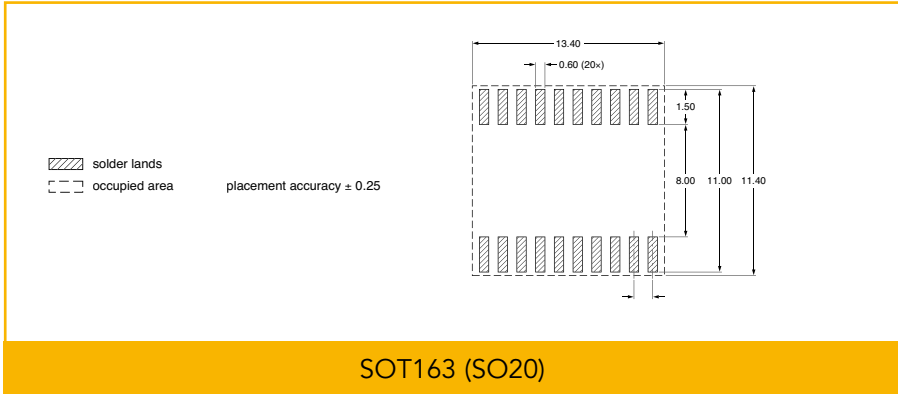
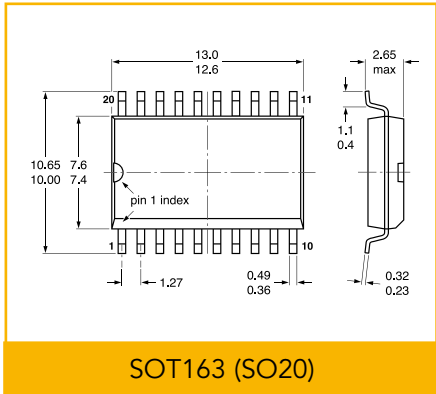
More than 8-Pin Packages



More than 8-Pin Packages

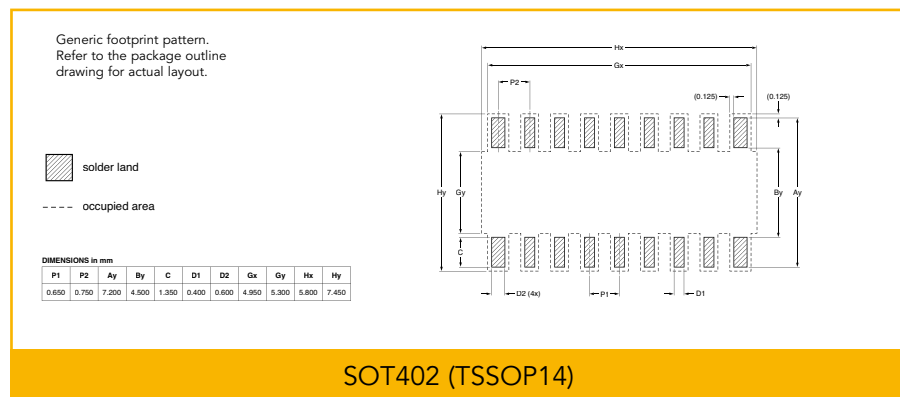
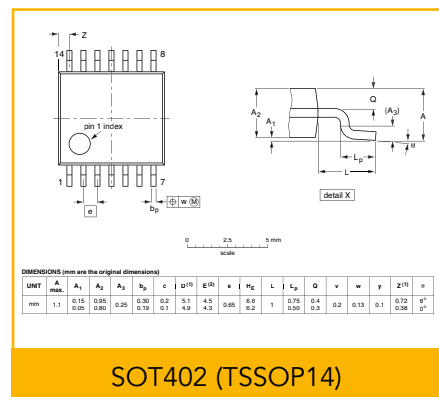


More than 8-Pin Packages



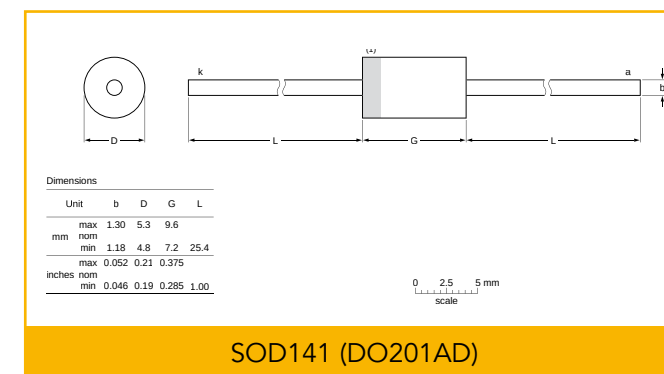
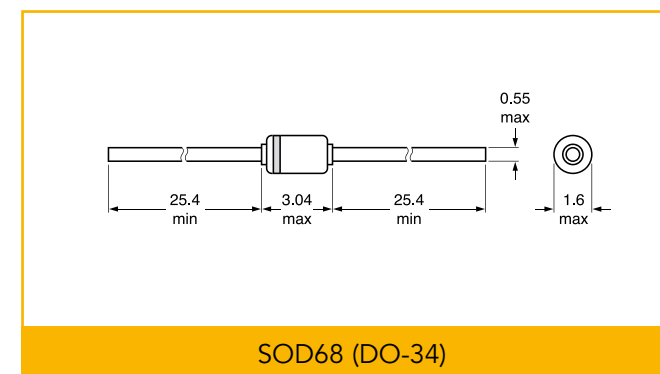
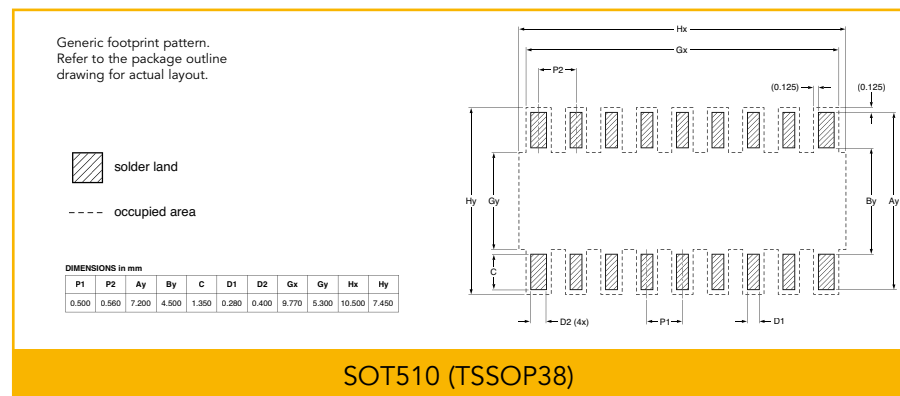
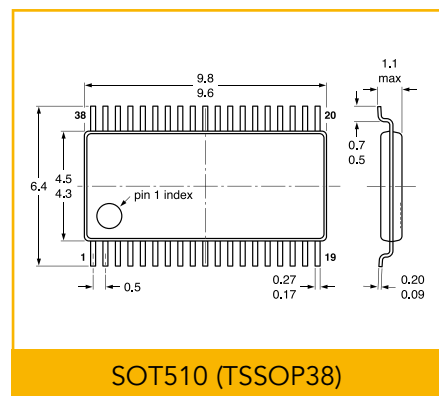
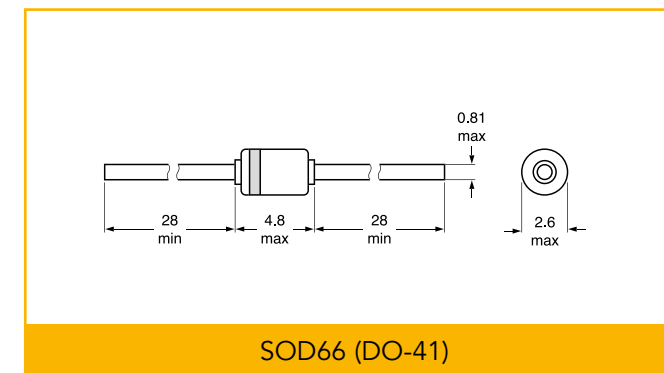
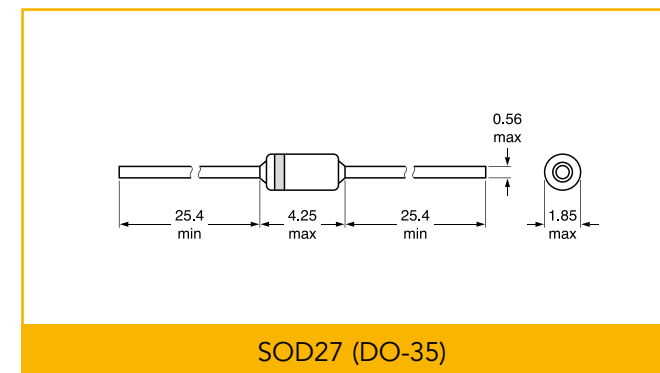
Minimized outline drawings and reflow soldering footprint

More than 8-Pin Packages

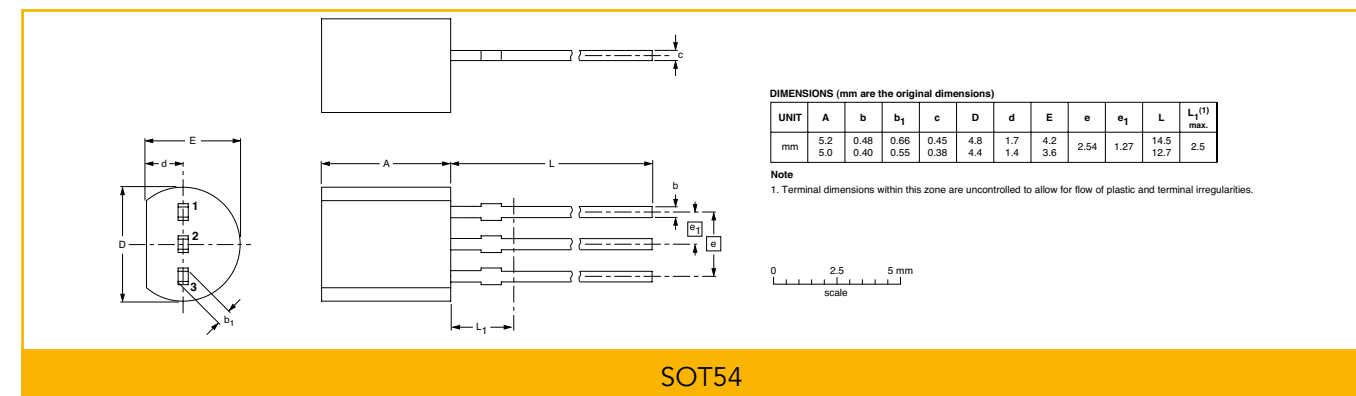
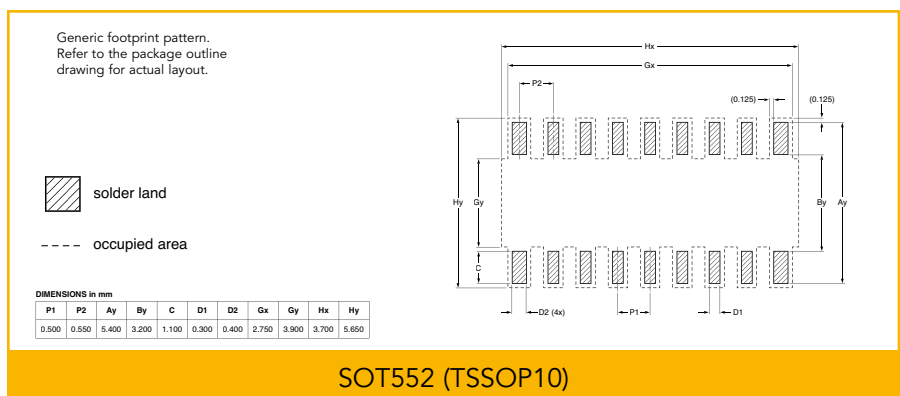
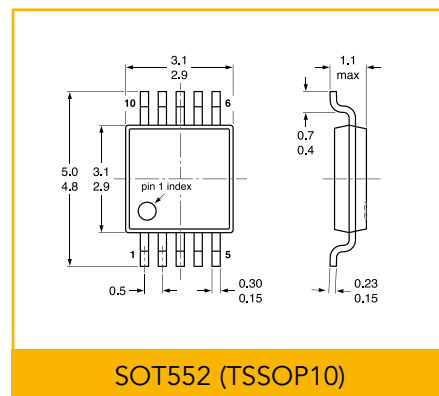
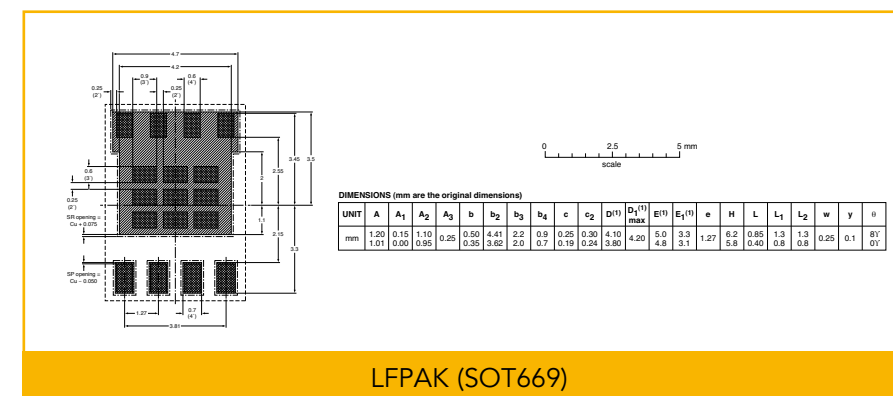
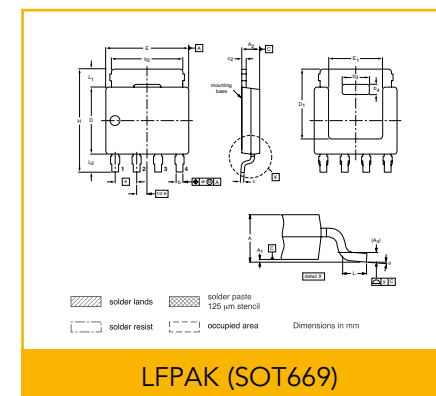
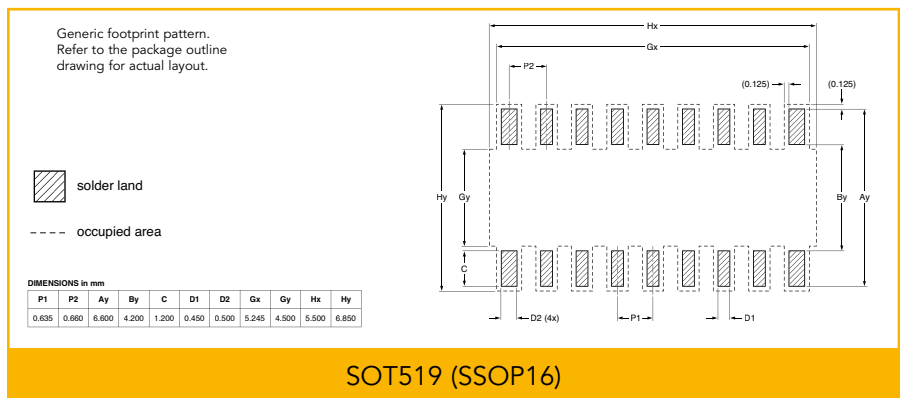
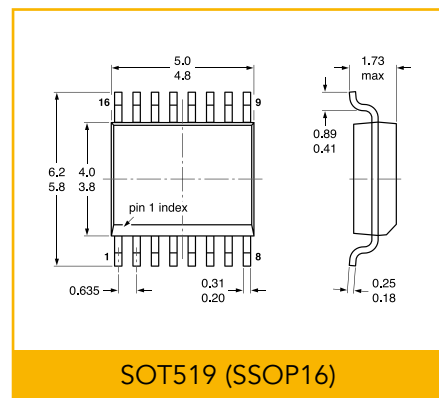


Minimized outline drawings and reflow soldering footprint

Glass diodes



Single Ended and Through Hole Packages



Dimensions in mm

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	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	(REF)	15.70	12.5	3.5	2.2	2.7

Note
1. Protuded dambar are included in the dimension.

SOD59

Single Ended and Through Hole Packages

DIMENSIONS (mm are the original dimensions)																				
UNIT	A	A ₁	b	b ₁	c	D	E	e	H _g max	j	k	L	L ₁ ⁽¹⁾	L ₂ max	m	P	Q	q	T	w
mm	4.6	2.9	0.9	1.1	0.7	15.8	10.3	5.08	18.0	2.7	0.6	14.4	3.3	0.5	6.5	3.2	2.6	2.6	2.55	0.4
	4.0	2.5	0.7	0.9	0.4	15.2	9.7		1.7	0.4	13.5	2.8			6.3	3.0	2.5			

Notes
1. Terminals are uncontrolled within zone L₁.
2. z is depth of T.

SOD113

DIMENSIONS (mm are the original dimensions)																
UNIT	A	A ₁	b	b ₁ ⁽²⁾	b ₂ ⁽²⁾	c	D	D ₁	E	e	L	L ₁ ⁽¹⁾	L ₂ ⁽¹⁾ max	p	q	Q
mm	4.7	1.40	0.9	1.6	1.3	0.7	16.0	6.6	10.3	2.54	15.0	3.30	3.0	3.8	3.0	2.6
	4.1	1.25	0.6	1.0	1.0	0.4	15.2	5.9	9.7		12.8	2.79		3.5	2.7	2.2

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

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	y ⁽²⁾	w
mm	4.6	2.9	0.9	1.1	1.4	0.7	15.8	6.5	10.3	2.54	5.08	2.7	0.6	14.4	3.30	3	3.2	2.6	3.0	2.5	0.4
	4.0	2.5	0.7	0.9	1.0	0.4	15.2	6.3	9.7		1.7	0.4	13.5	2.79		3	3.0	2.3	2.6		

Notes
1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are ∇ E 2.5° 0.8 max. depth

SOT186A

DIMENSIONS (mm are the original dimensions)																
UNIT	A	A ₁	b	b ₁	b ₂	c	D	D ₁ ref	E	e	L	L ₁ ref	p	Q	q	w
mm	4.7	1.40	0.9	1.4	1.72	0.6	16.0	6.5	10.3	2.54	14.0	3.0	3.7	2.6	3.0	0.2
	4.3	1.25	0.6	1.1	1.32	0.4	15.2		9.7		12.8		3.5	2.2	2.7	

SOT78D

DIMENSIONS (mm are the original dimensions)											
UNIT	A	A ₁	b	b ₁	c	D max	D ₁	E	e	L	Q
mm	4.5	1.40	0.85	1.3	0.7	11	1.6	10.3	2.54	15.0	2.6
	4.1	1.27	0.60	1.0	0.4		1.2	9.7		13.5	2.2

SOT226

DIMENSIONS (mm are the original dimensions)													
UNIT	A	b	c	D	E	e	e ₁	L	L ₁ ⁽¹⁾ max	P	Q	q	w
mm	2.8	0.88	0.59	11.1	7.8	2.29	4.58	16.5	2.54	3.1	1.5	3.9	
	2.3	0.65	0.47	10.5	7.2			15.3		2.5	0.9	3.5	0.254

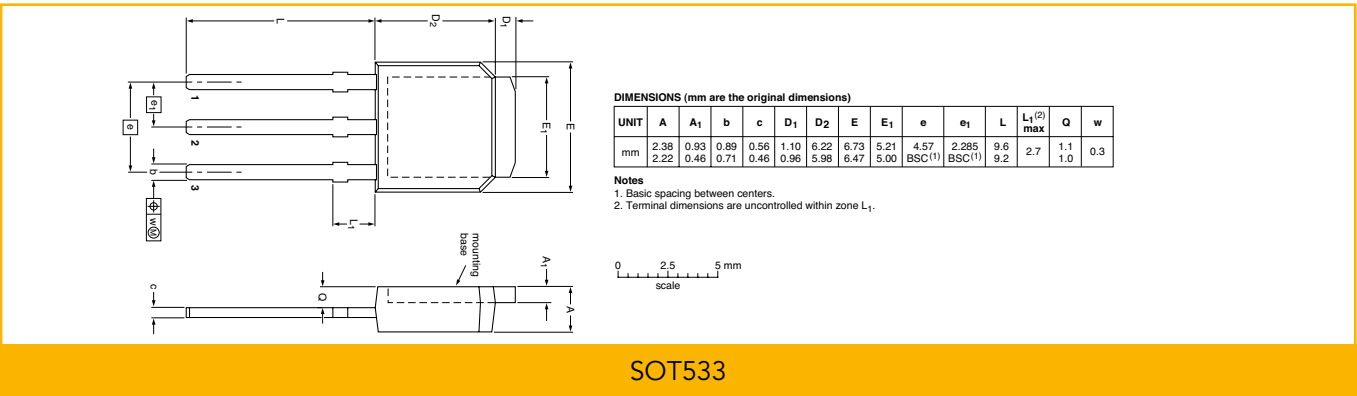
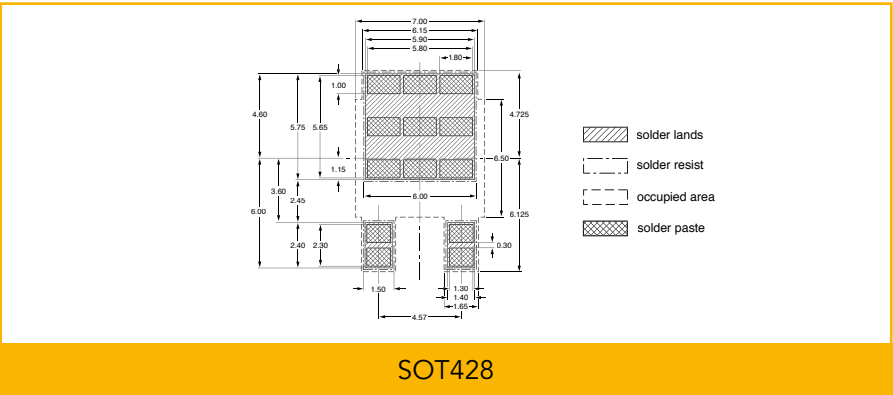
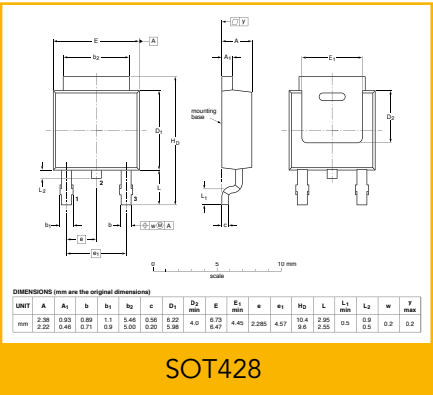
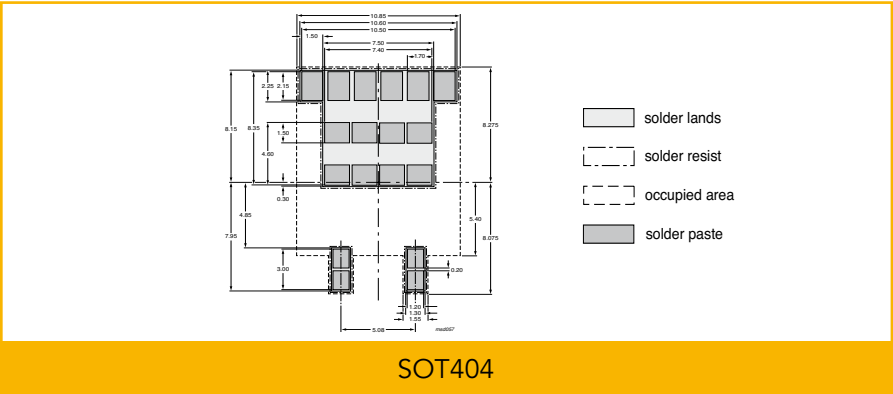
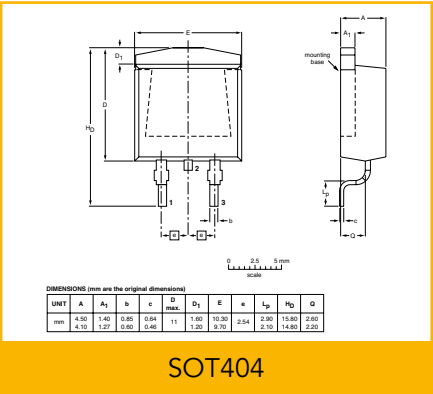
Note
1. Terminal dimensions within this zone are uncontrolled to allow for body and terminal irregularities.

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	1.39	0.85	0.7	15.8	6.4	10.3	1.7	9.8	5.9	5.2	2.4	0.5	0.8	3.8	4.3	3.0	2.0	4.5	8.2	0.5	0.4
	4.1	1.27	0.70	0.4	15.2	5.9	9.7		9.7	5.3	5.0	1.6		0.6	3.6	4.1	2.7					

SOT263B-1

Single Ended and Through Hole Packages



Dimensions in mm

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
1N4148	20	2PB709ASL	58	BAS35	23	BAT54CW	11	BAW56	20
1N4531	20	2PB710ARL	58	BAS40	10	BAT54H	11	BAW56M	21
1N47xxA series	18	2PB710ASL	58	BAS40-04	10	BAT54J	11	BAW56S	21
1PS10SB82	11	2PC4081Q / R / S	58	BAS40-04W	11	BAT54L	11	BAW56T	21
1PS300	20	2PC4617Q / R	58	BAS40-05	10	BAT54S	10	BAW56W	20
1PS301	20	2PC4617QM / RM	58	BAS40-05V	11	BAT54SW	11	BC51PA / BC51-10PA / BC51-16PA	60
1PS302	20	2PC4617QMB / RMB	58	BAS40-05W	11	BAT54T	11	BC52PA / BC52-10PA / BC52-16PA	60
1PS66SB17	11	2PD1820AR / S	58	BAS40-06	10	BAT54VV	11	BC53PA / BC53-10PA / BC53-16PA	60
1PS66SB82	11	2PD601ARL	58	BAS40-06W	11	BAT54W	11	BC54PA / BC54-10PA / BC54-16PA	60
1PS70SB20	13	2PD601ART	58	BAS40-07	10	BAT54XY	11	BC55PA / BC55-10PA / BC55-16PA	60
1PS70SB82	11	2PD601ARW / SW	58	BAS40-07V	11	BAT720	12	BC56PA / BC56-10PA / BC56-16PA	60
1PS70SB84	11	2PD601ASL	58	BAS40H	11	BAT721	10	BC68PA / BC68-25PA	60
1PS70SB85	11	2PD601BRL	58	BAS40L	11	BAT721A	10	BC69PA / BC69-16PA / BC69-25PA	60
1PS70SB86	11	2PD601BSL	58	BAS40W	11	BAT721C	10	BC807 / -16 / -25 / -40	58
1PS74SB23	12	2PD602AQL	58	BAS40XY	11	BAT721S	10	BC807DS	59
1PS75SB45	11	2PD602ARL	58	BAS416	23	BAT74	10	BC807W / -16W / -25W / -40W	58
1PS76SB10	11	2PD602ASL	58	BAS45A	23	BAT74S	11	BC817 / -16 / -25 / -40	58
1PS76SB17	11	ACT108	102	BAS45AL	23	BAT74V	11	BC817DPN	59
1PS76SB21	11	ACT108W	102	BAS516	21	BAT754	10	BC817DS	59
1PS76SB40	11	ACTT2S	102	BAS521	22	BAT754A	10	BC817W / -16W / -25W / -40W	58
1PS76SB70	11	ACTT2X	102	BAS56	23	BAT754C	10	BC846 / A / B	58
1PS79SB10	11	ACTT6	102	BAS70	10	BAT754L	11	BC846BMB	58
1PS79SB17	11	ACTT6B	102	BAS70-04	10	BAT754S	10	BC846BPN	59
1PS79SB30	11	ACTT6G	102	BAS70-04W	11	BAT760	13	BC846BS	59
1PS79SB31	11	ACTT6X	102	BAS70-05	10	BAT85	10	BC846DS	59
1PS79SB40	11	BAL74	20	BAS70-05W	11	BAT854AW	11	BC846S	59
1PS79SB70	11	BAL99	20	BAS70-06	10	BAT854CW	11	BC846T / AT / BT	58
1PS88SB48	11	BAS101	22	BAS70-06W	11	BAT854SW	11	BC846W / AW / BW	58
1PS88SB82	11	BAS101S	22	BAS70-07	10	BAT854W	11	BC847 / A / B / C	58
2N7002	81	BAS116	23	BAS70-07S	11	BAT86	10	BC847AM / BM / CM	58
2N7002BK	81	BAS116H	23	BAS70-07V	11	BAT960	13	BC847AMB / BMB / CMB	58
2N7002BKM	81	BAS116T	23	BAS70H	11	BAV103	22	BC847BPN	59
2N7002BKMB	81	BAS16	20	BAS70L	11	BAV170	23	BC847BS	59
2N7002BKS	83	BAS16H	20	BAS70VV	11	BAV199	23	BC847BV	59
2N7002BKT	81	BAS16J	21	BAS70W	11	BAV199W	23	BC847BVN	59
2N7002BKV	83	BAS16L	21	BAS70XY	11	BAV20	22	BC847DS	59
2N7002BKW	81	BAS16LD	21	BAS716	23	BAV21	22	BC847T / AT / BT / CT	58
2N7002CK	81	BAS16T	21	BAS85	10	BAV23	22	BC847W / AW / BW / CW	58
2N7002E	81	BAS16VV	21	BAS86	10	BAV23A	22	BC848B	58
2N7002F	81	BAS16VY	21	BAT120A	16	BAV23C	22	BC848W	58
2N7002K	81	BAS16W	20	BAT120C	16	BAV23S	22	BC849B	62
2N7002P	81	BAS21	22	BAT120S	16	BAV70	20	BC849BW	62
2N7002PS	83	BAS21AD	22	BAT160A	16	BAV70M	21	BC849C	62
2N7002PT	81	BAS21AVD	22	BAT160C	16	BAV70S	21	BC849CW	62
2N7002PV	83	BAS21AW	22	BAT160S	16	BAV70T	21	BC850B	62
2N7002PW	81	BAS21J	22	BAT17	11	BAV70W	20	BC850BW	62
2PA1576Q / R / S	58	BAS21SW	22	BAT46WH	11	BAV74	20	BC850C	62
2PA1774Q / R / S	58	BAS21W	22	BAT46WJ	11	BAV756S	21	BC850CW	62
2PA1774QM / RM / SM	58	BAS28	20	BAT54	10	BAV99	20	BC856 / A / B	58
2PA1774QMB / RMB / SMB	58	BAS29	23	BAT54A	10	BAV99S	21	BC856BS	59
2PB1219AQ / R / S	58	BAS31	23	BAT54AW	11	BAV99W	20	BC856S	59
2PB709ARL	58	BAS316	21	BAT54C	10	BAW101	22	BC856T / AT / BT	58
2PB709ART	58	BAS321	22	BAT54CM	11	BAW101S	22	BC856W / AW / BW	58
2PB709ARW / SW	58	BAS32L	20	BAT54CV	11	BAW156	23	BC857 / A / B / C	58

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
BC857AM / BM / CM	58	BCW69 / 70	58	BSP225	83	BT136B	104	BTA202X	103
BC857AMB / BMB / CMB	58	BCW71 / 72	58	BSP230	83	BT136S	104	BTA204	103
BC857BS	59	BCW89	58	BSP250	83	BT136X	104	BTA204S	103
BC857BV	59	BCX17	58	BSP31	60	BT137	104	BTA204W	103
BC857T / AT / BT / CT	58	BCX18	58	BSP32 / 33	60	BT137B	104	BTA204X	103
BC857W / AW / BW / CW	58	BCX19	58	BSP41	60	BT137S	104	BTA206	103
BC858B	58	BCX51 / -10 / -16	60	BSP43	60	BT137X	104	BTA206X	103
BC858W	58	BCX52 / -10 / -16	60	BSP50	62	BT138	104	BTA208	103
BC859B	62	BCX53 / -10 / -16	60	BSP51	62	BT138B	104	BTA208B	103
BC859BW	62	BCX54 / -10 / -16	60	BSP52	62	BT138X	104	BTA208S	103
BC859C	62	BCX55 / -10 / -16	60	BSP60	62	BT138Y	104	BTA208X	103
BC859CW	62	BCX56 / -10 / -16	60	BSP61	62	BT139	104	BTA225	103
BC860B	62	BCX70G / H / J / K	58	BSP62	62	BT139B	104	BTA225B	103
BC860BW	62	BCX71H / J / K	58	BSP89	80	BT139X	104	BTA312	103
BC860C	62	BF550	63	BSR14	59	BT145-R	105	BTA312B	103
BC860CW	62	BF570	63	BSR16	59	BT148-R	105	BTA312X	103
BC868 / -25	60	BF620	60	BSR30 / 31	60	BT148W-R	105	BTA312Y	103
BC869 / -16 / -25	60	BF621	60	BSR33	60	BT149B/D/G	105	BTA316	103
BCM61B	61	BF622	60	BSR41	60	BT150-R	105	BTA316B	103
BCM62B	61	BF623	60	BSR42 / 43	60	BT150S-R	105	BTA316X	103
BCM847BS	61	BF720	60	BSS123	81	BT151-C	105	BTA412Y	103
BCM847BV	61	BF722	60	BSS138BK	81	BT151-L	105	BTA416Y	103
BCM847DS	61	BF723	60	BSS138BKS	83	BT151-R	105	BTH151S-R	105
BCM856BS	61	BF820	60	BSS138BKW	81	BT151-RT	105	BUJ100	74
BCM856DS	61	BF820W	60	BSS138P	81	BT151S-L	105	BUJ100LR	74
BCM857BS	61	BF821	60	BSS138PS	83	BT151S-R	105	BUJ103A	74
BCM857BV	61	BF822	60	BSS138PW	81	BT151U-C	105	BUJ103AD	74
BCM857DS	61	BF823	60	BSS192	83	BT151X-C	105	BUJ103AX	74
BCP51 / -10 / -16	60	BF824	63	BSS63	58, 60	BT151X-R	105	BUJ105A	74
BCP52 / -10 / -16	60	BF824W	63	BSS64	58, 60	BT152-R	105	BUJ105AB	74
BCP53 / -10 / -16	60	BF840	63	BSS84	83	BT152-RT	105	BUJ105AD	74
BCP54 / -10 / -16	60	BFS19	63	BSS84AK	83	BT152B-R	105	BUJ106A	74
BCP55 / -10 / -16	60	BFS20	63	BSS84AKM	83	BT152X-R	105	BUJ302A	74
BCP56 / -10 / -16	60	BFS20W	63	BSS84AKMB	83	BT168E/G	105	BUJ302AD	74
BCP68 / -25	60	BSH103	79	BSS84AKT	83	BT168GW	105	BUJ302AX	74
BCP69 / -16 / -25	60	BSH105	79	BSS84AKW	83	BT168GWF	105	BUJ303A	74
BCV26	62	BSH108	79	BSS87	81	BT169B/D/G	105	BUJ303AD	74
BCV27	62	BSH111	81	BST39	60	BT169D-L	105	BUJ303AX	74
BCV28	62	BSH114	81	BST50	62	BT169G-L	105	BUJ303B	74
BCV29	62	BSH121	81	BST51	62	BT169H	105	BUJ403A	74
BCV46	62	BSH201	83	BST52	62	BT234	104	BUJD103AD	74
BCV47	62	BSH202	83	BST60	62	BT234X	104	BUJD105AD	74
BCV48	62	BSH203	83	BST61	62	BT236X	104	BUJD203A	74
BCV49	62	BSH205	83	BST62	62	BT258-R	105	BUJD203AD	74
BCV61/A/B/C	61	BSH207	83	BST82	81	BT258S-LT	105	BUJD203AX	74
BCV62/A/B/C	61	BSN20	81	BSV52	59	BT258S-R	105	BUK6207-55C	94
BCV63 / B	62	BSP030	78	BT131	104	BT258U-R	105	BUK6209-30C	92
BCV64B	62	BSP100	78	BT131-D	104	BT258X-R	105	BUK6210-55C	94
BCV65	63	BSP110	80	BT131-E	104	BT300S-R	105	BUK6211-75C	96
BCV71 / 72	58	BSP122	80	BT131W	104	BTA140	104	BUK6212-40C	93
BCW29 / 30	58	BSP126	80	BT132-D	104	BTA2008	103	BUK6213-30A	92
BCW31 / 32 / 33	58	BSP130	80	BT134	104	BTA2008W	103	BUK6213-30C	92
BCW60B / C / D	58	BSP19	60	BT134W	104	BTA201	103	BUK6215-75C	96
BCW61B / C / D	58	BSP220	83	BT136	104	BTA201W	103	BUK6217-55C	95

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
BUK6218-40C	93	BUK7109-75AIE	99	BUK754R0-55B	94	BUK794R1-40BT	98	BUK9509-40B	93
BUK6226-75C	96	BUK7109-75ATE	99	BUK754R3-40B	93	BUK7C06-40AITE	98	BUK9509-75A	96
BUK6228-55C	95	BUK714R1-40BT	98	BUK754R3-75C	96	BUK7C08-55AITE	98	BUK9510-100B	97
BUK6246-75C	96	BUK7207-30B	92	BUK755R2-40B	93	BUK7C10-75AITE	99	BUK9510-55A	94
BUK624R5-30C	92	BUK7208-40B	93	BUK7575-100A	97	BUK7E04-40A	93	BUK9511-55A	94
BUK625R0-40C	93	BUK7210-55B	94	BUK7575-55A	95	BUK7E07-55B	94	BUK9512-55B	94
BUK625R2-30C	92	BUK7212-55B	94	BUK7604-40A	93	BUK7E11-55B	94	BUK9514-55A	94
BUK626R2-40C	93	BUK7214-75B	96	BUK7606-55A	94	BUK7E2R3-40C	93	BUK9515-100A	97
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PTVS48VS1UR	54	PUMB1	65	PUMX1	59	TL431ASDT	117		
PTVS51VP1UP	55	PUMB10	65	PUMX2	59	TL431BCDBZR	117		
PTVS51VP1UTP	55	PUMB11	65	PUMZ1	59	TL431BFDT	117		
PTVS51VS1UR	54	PUMB13	65	PUMZ2	59	TL431BIDBZR	117		
PTVS51VS1UTR	54	PUMB14	65	PUSBM12VX4-TL	50	TL431BMFDT	117		
PTVS54VP1UP	55	PUMB15	65	PUSBM15VX4-TL	50	TL431BMSDT	117		
PTVS54VP1UTP	55	PUMB16	65	PUSBM30VX4-TL	50	TL431BQDBZR	117		
PTVS54VS1UR	54	PUMB17	65	PUSBM5VSX4-TL	50	TL431BSDT	117		
PTVS54VS1UTR	54	PUMB18	65	PVR100AD-B12V	119	TL431CDBZR	117		
PTVS58VP1UP	55	PUMB19	65	PVR100AD-B2V5	119	TL431FDT	117		
PTVS58VP1UTP	55	PUMB2	65	PVR100AD-B3V0	119	TL431IDBZR	117		
PTVS58VS1UR	54	PUMB20	65	PVR100AD-B3V3	119	TL431MFDT	117		
PTVS58VS1UTR	54	PUMB24	65	PVR100AD-B5V0	119	TL431MSDT	117		
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PTVS5V0P1UTP	55	PUMB30	65	PVR100AZ-B2V5	119	TL431SDT	117		
PTVS5V0S1UR	54	PUMB4	65	PVR100AZ-B3V0	119	TLVH431ACDBZR	118		
PTVS5V0S1UTR	54	PUMB9	65	PVR100AZ-B3V3	119	TLVH431AIDBZR	118		
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				PZTA14	62	Z0107MA/NA	104		

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