



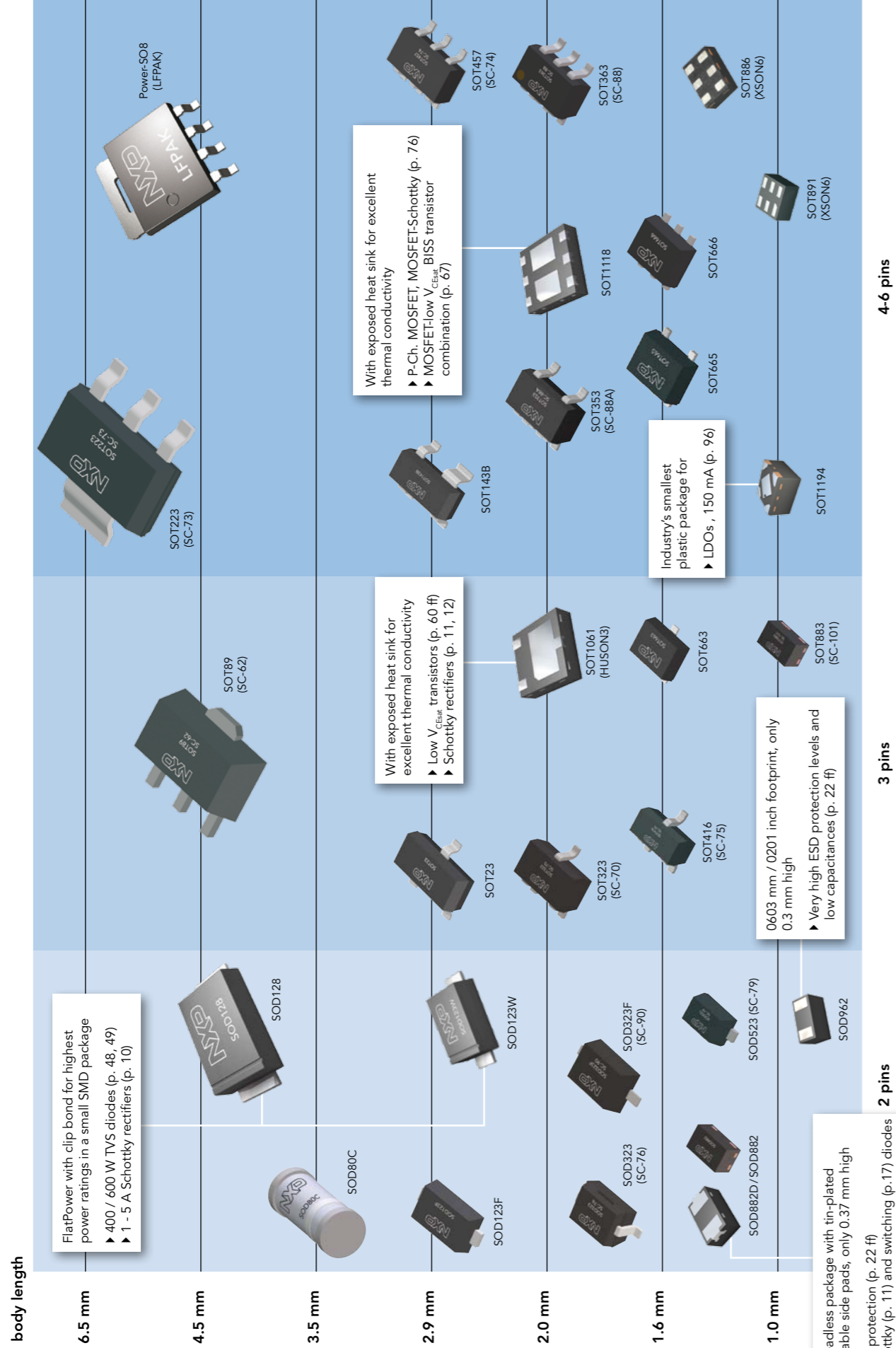
# Discrete Semiconductors Selection Guide 2011

Diodes, protection and signal conditioning devices,  
bipolar transistors, MOSFETs, thyristors

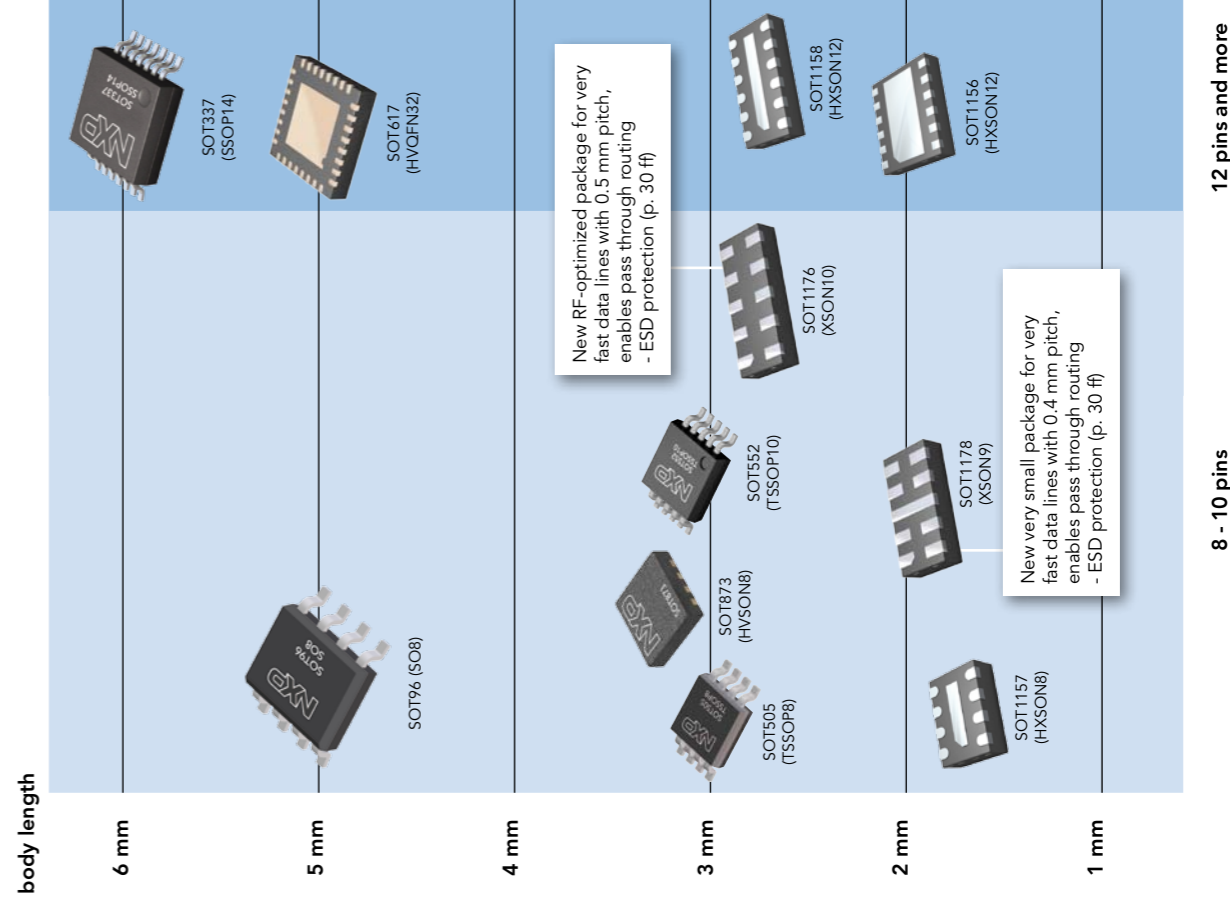


# Discrete Semiconductors packages – portfolio and highlights

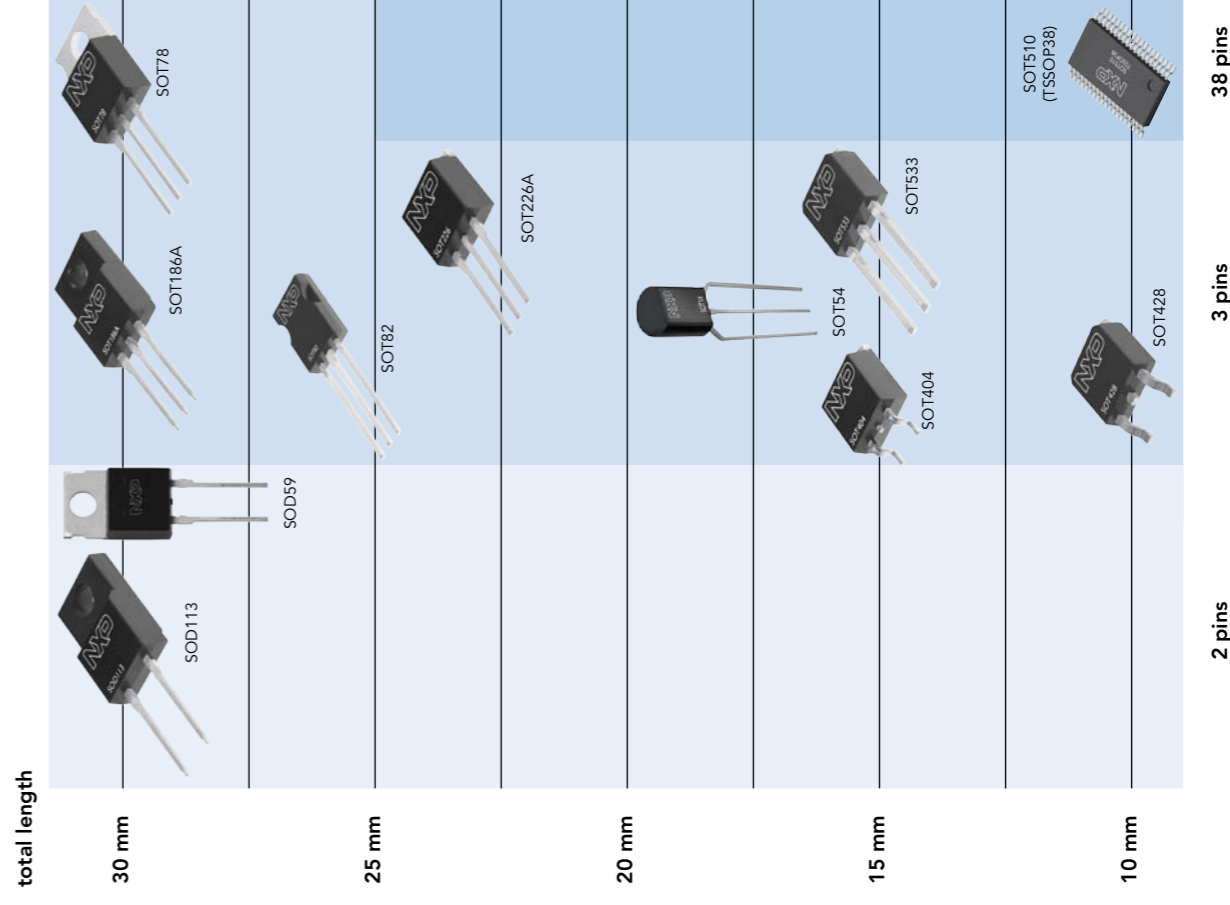
## Small SMD packages with 2 - 6 pins



## Small SMD packages with 8 pins and more



## Through-hole and SMD packages with total length of + 9 mm



# The first leadless package with solderable side pads

## Solderable (Tin-plated) exposed side pads

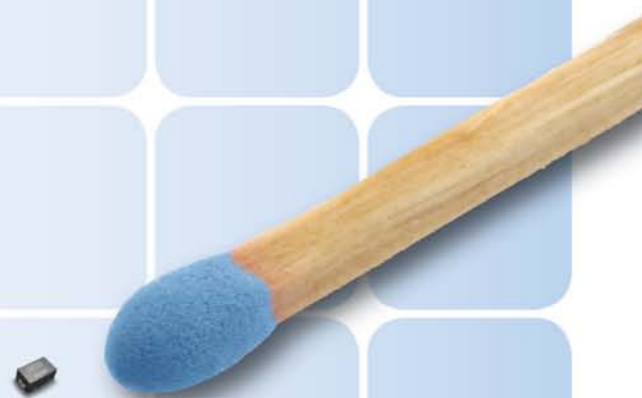
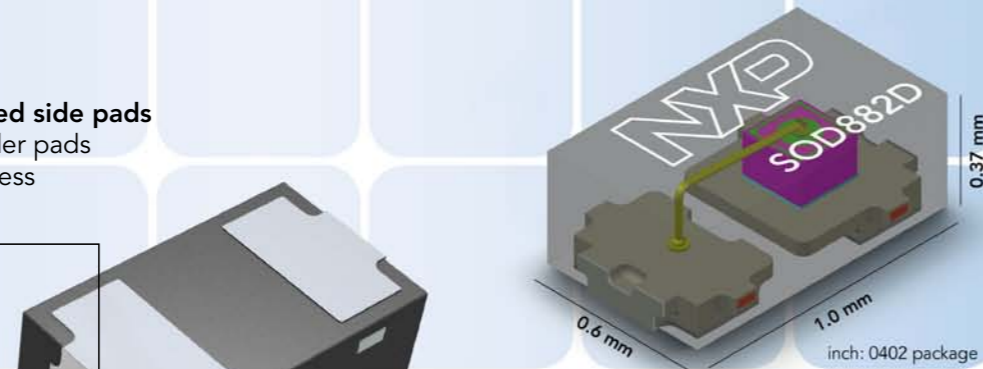
- ▶ Easy visible inspection of solder pads
- ▶ Very high mechanical robustness
- ▶ Post-soldering stability

Full thermal, electrical, mounting and footprint compatibility to leadless 1006 mm packages (inch: 0402)

- ▶ **Height only 0.37 mm**

## Built for a range of functions

- ▶ Protection, Switching and Schottky diodes
- ▶ **Ideal for small and thin devices**



Get ready to improve your ultra-flat PCB design with our SOD882D package.

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## Discrete Semiconductors Selection Guide 2011

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](http://www.nxp.com/discrete_selection_guide)

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# Support tools

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Your first stop for NXP's wide range of diodes, bipolar transistors, MOSFETs, thyristors and ESD protection products. The gateway focuses on:

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# Diodes

## Schottky barrier diodes and rectifiers

8

- General purpose Schottky diodes  $\leq 250$  mA
- Low capacitance Schottky diodes
- Medium power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA
- Medium power low  $V_F$  Schottky rectifiers dual  $\geq 200$  mA
- Improved forward characteristics of (MEGA) Schottky rectifiers in new packages

## Zener diodes

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- General purpose Zener diodes
- Zener diodes specification

## Switching diodes

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- General purpose switching diodes  $\leq 100$  V
- General purpose switching diodes  $> 100$  V
- Controlled avalanche switching diodes
- Low leakage current switching diodes

## Power diodes

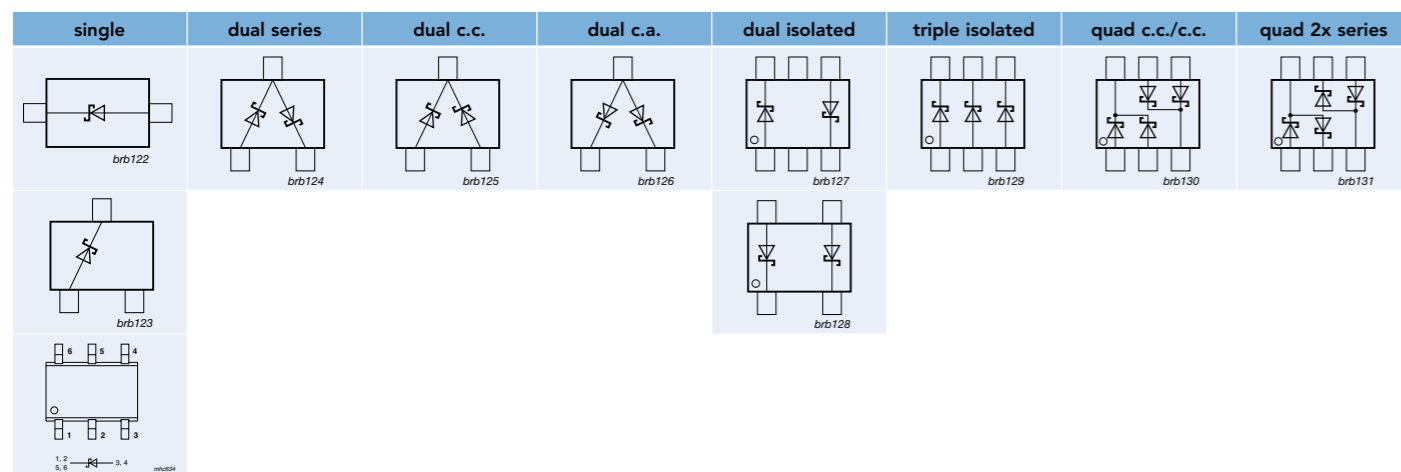
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- Ultrafast recovery power diodes
- Hyperfast power diodes

General purpose Schottky diodes ≤ 250 mA

types in **bold** represent new products

I <sub>F</sub> max (mA)	V <sub>R</sub> max (V)	V <sub>F</sub> max (mV)	@ I <sub>F</sub> (mA)	I <sub>R</sub> max (μA)	@ V <sub>R</sub> (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)	SOD882/ SOT883 (SC-101)							
							Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	
70	70	750	10	0.1	50	single			BAS70			BAS70H	BAS70W			1PS76SB70				1PS79SB70	BAS70L						
						dual series			BAS70-04			BAS70-04W															
						dual c.c.			BAS70-05			BAS70-05W															
						dual c.a.			BAS70-06			BAS70-06W															
						dual isolated							BAS70-07						BAS70-07S			BAS70-07V					
						triple isolated																BAS70VV					
						quad 2x series													BAS70XY								
120	40	370	1	0.5	30	single						BAS40H	BAS40W				RB751V40			RB751S40	RB751CS40						
						dual series			BAS40-04			BAS40-04W										1PS79SB40	BAS40L				
						dual c.c.			BAS40-05			BAS40-05W															
						dual c.a.			BAS40-06			BAS40-06W															
						dual isolated							BAS40-07									BAS40-07V					
						quad c.c./c.c.																BAS40-05V					
						quad 2x series																					
200	30	300	10	30	10	single														1PS79SB31							
						single			BAT754																		
						dual series			BAT754S																		
		340	10	2	25	25	dual c.c.			BAT754C																	
							dual c.a.			BAT754A																	
							triple isolated																				
		400	10	2	25	25	single	BAS85	BAT85	BAT54			BAT54H	BAT54W			BAT54J	1PS76SB10			BAT54T	1PS79SB10	BAT54L				
							dual series			BAT54S			BAT54SW														
							dual c.c.			BAT54C			BAT54CW														
							dual c.a.			BAT54A			BAT54AW														
							dual isolated							BAT74											BAT74V		
							triple isolated																		BAT54VV		
		500	200	30	10	10	quad c.c./c.c.																				
							quad 2x series																				
							single																				
600	200	1	10	10	single																						
					single			BAT721																			
					dual series			BAT721S																			
300	10	15	30	30	dual c.c.			BAT721C																			
					dual c.a.			BAT721A																			
					single																						
360	10	0.5	25	25	single																						
					single																						
					dual series																						
420	30	0.5	25	25	dual c.c.																						
					dual c.a.																						
					single																						
50	450	10	5	40	single	BAS86	BAT86																				
					single																						
100	850	250	4	75	single						BAT46WH																
					single																						
















Low capacitance Schottky diodes

I <sub>F</sub> max (mA)	V <sub>R</sub> max (V)	V <sub>F</sub> max (mV)	@ I <sub>F</sub> (mA)	C <sub>d</sub> max (pF)	@ V <sub>R</sub> = 0 V	Package	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	SOD882
							Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)	P <sub>tot</sub> (mW)	Size (mm)
30	4	450	1	1	single	BAT17				1PS76SB17		1PS79SB17	
					triple isolated						1PS66SB17		
					dual series	PMBD353 PMBD354 <sup>1)</sup>							
	15	340	1	1	single		1PS70SB82		1PS88SB82		1PS66SB82		1PS10SB82
					triple isolated								
					dual series		1PS70SB84		1PS70SB85		1PS70SB86		

<sup>1)</sup> Diodes have matched capacitance

Medium power low  $V_F$  Schottky rectifiers single  $\geq 200$  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	Package	SOD128	SOT457 (SC-74)	SOT23	SOD123W	SOD123F		SOT1061	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	SOD882	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 0.65	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	1.2 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 <sup>2</sup>	1050	540	420	950	830		1000	250	830	570	570	450	250	250		
				Optimization																
0.2	30	480	0.04	low $V_F$									PMEG3002EJ			PMEG3002AEB	PMEG3002AEL	<b>PMEG3002AELD</b>		
	40	600	0.01	low $I_R$									PMEG4002EJ			PMEG4002EB	PMEG4002EL	<b>PMEG4002ELD</b>		
	60	600	0.1	low $V_F$									PMEG6002EJ			PMEG6002EB				
0.5	20	390	0.2	low $V_F$			PMEG2005ET		PMEG2005EH				PMEG2005EJ	PMEG2005AEA	PMEG2005AEV					
		440	1.5	low $V_F$													PMEG2005AEL	<b>PMEG2005AELD</b>		
		480	0.01	low $I_R$													PMEG2005EB			
	30	500	0.03	low $I_R$													PMEG2005SEL	<b>PMEG2005ELD</b>		
		430	0.15	low $V_F$			PMEG3005ET		PMEG3005EH					PMEG3005EJ	PMEG3005AEA	PMEG3005AEV				
	500	0.5	low $V_F$														PMEG3005EB	PMEG3005EL	<b>PMEG3005ELD</b>	
40	470	0.1	low $V_F$			PMEG4005ET		PMEG4005EH					PMEG4005EJ	PMEG4005AEA	PMEG4005AEV					
	550	0.1	low $V_F$			BAT720					1PS70SB20									
1.0	20	340	1	low $V_F$				PMEG2010ER												
		375	1.9	low $V_F$							PMEG2010EPA									
		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	PMEG2010BEV				
		550	0.07	low $I_R$										PMEG2010AEJ	PMEG2010EA BAT760	PMEG2010EV BAT960				
	30	620	1.5	low $V_F$														PMEG2010AEB		
		450	1.0	low $V_F$			1PS74SB23													
		360	1.5	low $V_F$		PMEG3010EP			PMEG3010ER											
		450	0.05	low $I_R$		PMEG3010BEP			PMEG3010BER											
		520	0.05	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										
			640	0.1	low $V_F$				PMEG4010ET		PMEG4010EH				PMEG4010EJ	PMEG4010BEA	PMEG4010BEV			
570	0.05		low $I_R$						PMEG4010CEH				PMEG4010CEJ							
60	530	0.06	low $V_F$		PMEG6010EP			PMEG6010ER												
	650	0.35	low $V_F$			PMEG6010AED														
	660	0.05	low $I_R$						PMEG6010CEH				PMEG6010CEJ							
1.5	20	660	0.07	low $I_R$				PMEG2015EH				PMEG2015EJ	PMEG2015EA	PMEG2015EV						
	30	550	1.0	low $V_F$				PMEG3015EH				PMEG3015EJ		PMEG3015EV						
2.0	10	460	3.0	low $V_F$				PMEG1020EH				PMEG1020EJ	PMEG1020EA	PMEG1020EV						
		20	420	1.9	low $V_F$					PMEG2020EPA										
	30	525	0.2	low $V_F$					PMEG2020EH				PMEG2020EJ	PMEG2020AEA						
		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							PMEG3020EJ				
	40	620	1.0	low $V_F$					PMEG3020EH											
		490	0.1	low $V_F$		PMEG4020EP			PMEG4020ER											
		535	0.1	low $V_F$										PMEG4020EPA						
		60	530	0.15	low $V_F$		PMEG6020EP		PMEG6020ER											
60	575	0.25	low $V_F$										PMEG6020EPA							
	10	530	3.0	low $V_F$					PMEG1030EH					PMEG1030EJ						
3.0	30	360	5.0	low $V_F$																
		450	0.15	low $I_R$		PMEG3030EP														
	40	490	0.2	low $V_F$		PMEG3030BEP														
		540	0.1	low $I_R$		PMEG4030EP				PMEG4030ER										
5.0	30	530	0.2	low $V_F$		PMEG6030EP														
		360	8.0	low $V_F$		PMEG3050EP														
40	450	0.25	low $I_R$		PMEG3050BEP															
	490	0.3	low $V_F$		PMEG4050EP															

**In the Spotlight**

**Low  $V_F$  (MEGA) Schottky rectifiers in new leadless SOD882D**

- Ultra low package height of only 0.37 mm typ
- Tin-plated solderable side pads
- Ultra small dimensions 1.0 x 0.6 mm
- Portfolio of five low  $V_F$  (MEGA) Schottky diodes ( $I_F$  up to 0.5 A)
- AEC-Q101 qualified



### Medium power low $V_F$ Schottky rectifiers dual $\geq 200$ mA


types in **bold** represent new products

$I_F$ max (A)	$V_F$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_R$ max (mA) @ $V_R$ max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT1061	SOT666
						Size (mm)	Size (mm)	Size (mm)	Size (mm)
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.			<b>PMEG4010CPA</b>	
				low $V_F$	dual c.c.			<b>PMEG6010CPA</b>	
				low $V_F$	dual series	BAT160S			
60	650	0.35	low $V_F$	dual c.c.	BAT160C				
			low $V_F$	dual c.a.	BAT160A				
			low $V_F$	dual c.c.					
2.0	20	420	1.0	low $V_F$	dual c.c.				<b>PMEG2020CPA</b>
	30	440	2.0	low $V_F$	dual c.c.				<b>PMEG3020CPA</b>

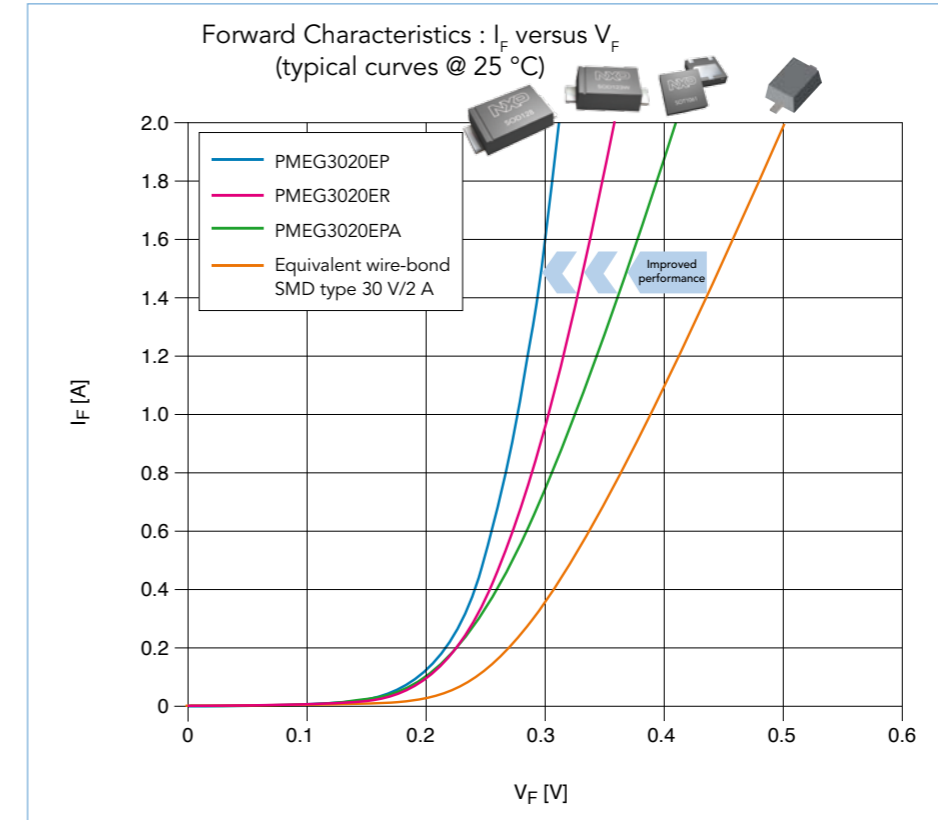
In the Spotlight

**Medium power single and dual Schottky rectifiers in SOT1061**

- Small (2 x 2 x 0.65 mm) leadless medium power package SOT1061
- Exposed heat sink for excellent thermal and electrical performance ( $P_{tot} > 1$  W)
- High forward-current capability ( $I_F$  up to 2 A) with low forward voltage drop
- High reverse voltage ( $V_F$  up to 60 V)
- AEC-Q101 qualified



### Improved forward characteristics of (MEGA)<sup>1</sup> Schottky rectifiers in new packages




<sup>1</sup> Maximum Efficiency General Application

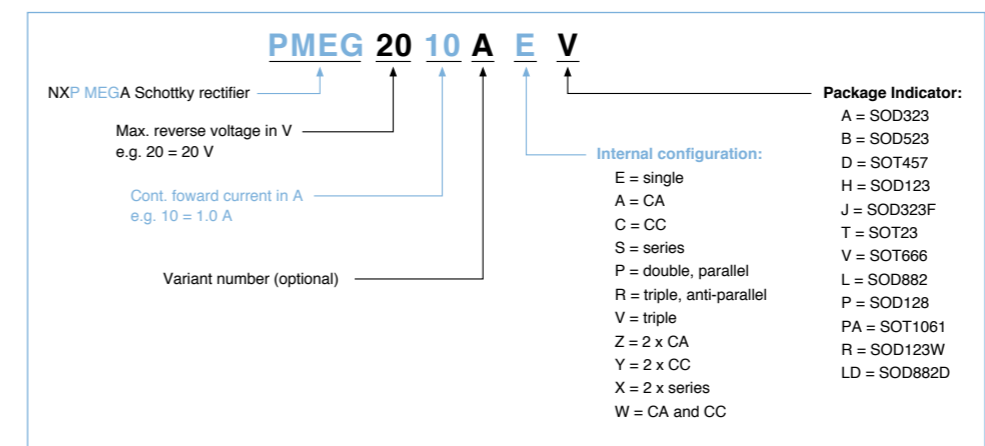
**In the Spotlight**

**3 and 5 A low  $V_F$  (MEGA) Schottky rectifiers in SOD123W and SOD128**

- Small FlatPower packages SOD123W/128, only 1 mm high
- Very low forward voltage drop  $V_F$  down to 340 mV
- Low reverse current  $I_R$  down to 0.05 mA
- High power capability due to clip-bonding technology and optimized die design
- AEC-Q101 qualified



### Nomenclature of low $V_F$ (MEGA) Schottky rectifiers





## General purpose Zener diodes

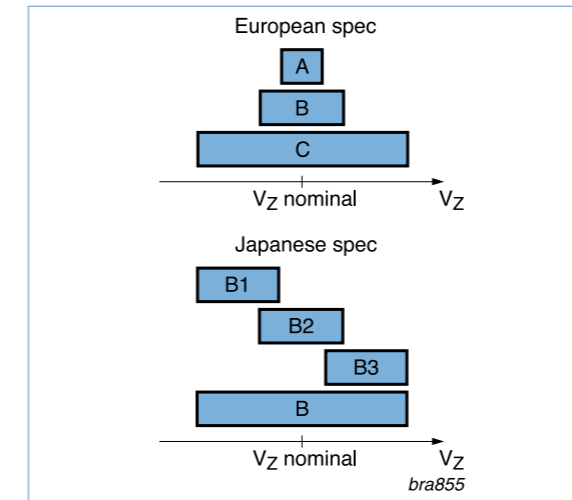
types in **bold** represent new products

$I_f$ max (mA)	$P_{ZSM}$ (W)	$V_z$ nom (V)	$V_z$ tolerance	Note	Configuration	Series	Package	Size (mm)	$P_{tot}$ (mW)
500	-	3.3~24	C	Eur	single	1N47xxA series	SOD66 (DO-41)	4.8 x 2.6 x 0.81	1000
	60	3.6~75				BZV85 series			
250	-	2.4~36	about 2%	special	single	NZX series	SOD27 (DO-35)	4.25 x 1.85 x 0.56	400
	40	2.4~75	B, C	Eur		BZX79 series			
400	40	2.4~75	C	Eur	single	BZV90 series	SOT223 (SC-73)	6.5 x 3.5 x 1.65	1500
250	40	2.4~75	C	Eur	single	BZV49 series	SOT89 (SC-62)	4.5 x 2.5 x 1.5	1000
250	40	2.4~75	B, C	Eur	single	BZV55 series	SOD80C (MiniMelf)	3.5 x 1.5 x 1.5	300
200	40	2.4~75	B, C	Eur	dual c.a.	BZB84 series	SOT23	2.9 x 1.3 x 1.0	250
			A, B, C		single	BZX84 series			
250	30	5~6.8	0.2 V	Ave	dual c.a.	PLVA600A series	SOT23	2.9 x 1.3 x 1.0	250
			0.2 V	Ave	dual c.a.	PLVA2600A series			
250	-	3.0~30	about 2.5%	special	single	NZH series	SOD123F	2.6 x 1.6 x 1.1	830
	40	2.4~75	B, C	Eur		BZT52H series			
200	40	2.7~24	B2	Jap	dual isolated	PZUxDB2 series	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	300
200	40	2.4~15	C	Eur	dual c.a.	BZB784 series	SOT323 (SC-70)	2.0 x 1.25 x 0.95	350
200	30	100	C	Eur	back-to-back	BZB100A	SOD323 (SC-76)	1.7 x 1.25 x 0.95	300
						PDZ-B series			
250	40	2.4~75	B, C	Eur	single	BZX384 series	SOD323 (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~36	B, B1, B2, B3	Jap	PZUxBA series				
200	60	100	C	Eur	single	BZX100A	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~36	B, B1, B2, B3	Jap	PZUxB series				
250	40	2.4~75	B, C	Eur	single	BZX84J series	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
200	40	2.4~15	C	Eur	dual c.a.	BZB984 series			
200	40	2.4~75	B, C	Eur	single	BZX585 series	SOD523 (SC-79)	1.2 x 0.8 x 0.6	300
200	40	2.4~75	B, C	Eur	single	BZX884 series	SOD882	1.0 x 0.6 x 0.5	250
		2.4~36	B, B2	Jap		PZUxBL series			
250	180	5.6	C	Eur	single	<b>TDZ5V6J</b>	SOD323F	1.7 x 1.25 x 0.7	500

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

## Zener diodes specifications

### Differences in Zener specifications



### Japanese spec (PZU, PDZ)

y =	B-series ± 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	-	-	-

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

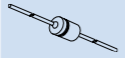
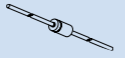































y =	C-series ± 5%	B-series ± 2%	A-series ± 1%
	$V_z$ (V)	$V_z$ (V)	$V_z$ (V)
BZX84-y2V4	2.2 - 2.6	2.35 - 2.45	2.37 - 2.43
BZX84-y2V7	2.5 - 2.9	2.65 - 2.75	2.67 - 2.73
BZX84-y3V0	2.8 - 3.2	2.94 - 3.06	2.97 - 3.03
BZX84-y3V3	3.1 - 3.5	3.23 - 3.37	3.26 - 3.34
BZX84-y3V6	3.4 - 3.8	3.53 - 3.67	3.56 - 3.64
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

### NZX-series in SOD27

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

General purpose switching diodes ≤ 100V

types in **bold** represent new products

V <sub>R</sub> max (V)	V <sub>F</sub> max (V)	I <sub>F</sub> (mA)	I <sub>R</sub> max (mA)	V <sub>R</sub> (V)	t <sub>tr</sub> 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)	SOD882	SOT883 (SC-101)	SOD882D						
																													
							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 <sub>tot</sub> (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																				
90	1	50	500	80	4					BAW56				BAW56W						BAW56T				BAW56M					
																			BAW56S										
																			BAW756S										
100	1	50	500	80	4		1N4148																						
														BAS16H				BAS316	BAS16J										
														BAS16				BAS16W					BAS16T						
																								BAS516	BAS16L		<b>BAS16LD</b>		
																							BAS16VY				BAS16VW		
														BAV70													BAV70T		BAV70M
																													
														BAV99															
																													

General purpose switching diodes > 100V

$V_R$ max (V)	$V_F$ max (V)	$I_F$ (mA)	$I_R$ max (nA)	$t_{tr}$ max (ns)	Package	SOD27 (DO-35)	SOD80C (MiniMelf)	SOT457 (SC-74)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOD523 (SC-79)		
						Size (mm)	4.25 x 1.85 x 0.56	3.5 x 1.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.2 x 0.8 x 0.6	
						$P_{tot}$ (mW)	500	300	500	250	250	830	350	300	400	550	500	
150	1	100	100	150	50		BAV20											
≥ 200	1	100	100	200	50		BAV21	BAV103			BAS21H			BAS321				
										BAS21		BAS21W						
											BAV23							
										BAV23A		BAS21AW						
										BAV23C								
										BAV23S		BAS21SW						
										BAS21VD								
															BAS21J	BAS521		
														BAS101				
														BAS101S				
300	1.1	100	150	250	50						BAW101							
																BAW101S		

Controlled avalanche switching diodes









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

Low leakage current switching diodes

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





### Ultrafast recovery power diodes

types in **bold** represent new products

$V_{RRM}$ (V)	$I_{FAV}$ (A)	$V_F$ (typ) @ 150C (V)	$I_F$ (A)	$t_r$ (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT226 (I <sup>2</sup> PAK)	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)
												
100	8	0.8	8	20	BYW29E-100							
	2 x 10	0.72	8	20			BYV32E-100					
150	2 x 0.75	0.5	0.5	10					BYV40E-150			
	8	0.8	8	20	BYW29E-150							
	2 x 10	0.72	8	20			BYV32E-150					
200	2 x 15	0.78	15	20			BYV42E-150					
	8	0.8	8	20	BYW29E-200	BYW29EX-200						BYW29ED-200
	2 x 5	0.8	5	15			BYQ28E-200	BYQ28X-200				BYQ28ED-200
	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			<b>BYV32G-200</b>	BYV32EB-200	
300	2 x 15	0.78	15	20			BYV42E-200			<b>BYV42G-200</b>	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					
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		<b>BYV25FX-600</b>	<b>BYV25F-600</b>				<b>BYV25FB-600</b>	<b>BYV25FD-600</b>
	9	1.25	8	17.5		BYV29FX-600	<b>BYV29F-600</b>				<b>BYV29FB-600</b>	<b>BYV29FD-600</b>
800	2 x 10	1.3	10	20			BYV410-600	BYV410X-600				
	8	1.07	8	60	BYR29-800	BYR29X-800						

### Hyperfast 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 <sup>2</sup> PAK)
								
600	5	1.4	5	19	BYC5-600	BYC5X-600		BYC5B-600
	8	1.4	8	19	BYC8-600	BYC8X-600		BYC8B-600
	8	1.4	8	19	<b>BYC8D-600</b>	<b>BYC8DX-600</b>		
	8	2	8	12.5		BYC58X-600		
	10	1.4	10	19	BYC10-600	BYC10X-600		BYC10B-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		






## Protection and signal conditioning

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### Standard ESD protection devices

types in **bold** represent new products








Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>r</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional											
1	0	3.3	207	300	150	30	2		PESD3V3S1UL	SOD882	1.0 x 0.6 x 0.5	
		5	152	200	150	30	1					
		12	38	75	150	30	0.05					
		15	32	70	150	30	0.05					
		24	23	50	150	23	0.05					
		24	23	50	150	23	0.05					
		5	152	200	150	30	1					
		12	38	75	150	30	0.05					
		15	32	70	150	30	0.05					
		24	23	50	150	23	0.05					
		3.3	207	300	330	30	2					
		5	152	200	260	30	1					
		12	38	75	180	30	0.05					
		15	32	70	160	30	0.05					
		24	23	50	160	23	0.05					
		5	480	530	890	30	4					
		12	160	180	600	30	0.1					
		24	23	50	160	23	0.05					
	0	1	5	480	530	890	30	4		PESD5V0S1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
			12	160	180	600	30	0.1				
			24	23	50	160	23	0.05				
			5	480	530	890	30	4				
			12	160	180	600	30	0.1				
			2.5	229	300	260	30	6				
			3.3	172	200	260	30	0.05				
			5	89	150	180	30	0.05				
			6	78	150	180	30	0.01				
			7	69	150	180	30	0.01				
			12	35	75	200	30	0.01				
			5	68	75	150	30	1				
7	62	70	150	30	1							
0	1	5	35	45	130	30	0.1		PESD5V0S1BL	SOD882	1.0 x 0.6 x 0.5	
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5	35	45	130	30	0.1					
		5.5	35	45	100	30	0.1					
		5.5	35	45	100	30	0.1					

<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

### Standard ESD protection devices

types in **bold** represent new products





















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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						
		12	38	100	150	30	0.03						
		15	32	70	150	30	0.05						
		24	23	50	150	23	0.05						
		24	23	50	150	23	0.05						
		3.3	207	300	330	30	2						
		5.2	152	200	260	30	1						
		12	38	75	180	30	1						
		15	32	70	160	30	1						
		24	23	50	160	23	1						
		36	17	35	160	30	1 (@ 30 V)						
	0	1	3.3	207	300	330	30	2		PESD3V3S2UAT	SOT23	2.9 x 1.3 x 1.0	
			5	152	200	260	30	1					
			12	38	75	180	30	0.05					
			15	32	70	160	30	0.05					
			24	23	50	160	23	0.05					
			24	23	50	160	23	0.05					
			5.5	45	60	-	15	0.1					
			5.5	30	40	-	15	0.1					
			3.3	110	300	110	30	1 (@ 3 V)					
			5	85	220	110	30	0.1 (@ 4.3 V)					
			3	107	125	-	8	1					
			4	90	105	-	8	0.5					
4	3	4.3	78	90	-	8	0.1		BZA956A	SOT665	1.6 x 1.2 x 0.55		
		3	200	240	-	8	2						
		3	107	125	-	8	1						
		4	165	200	-	8	0.7						
		4	90	105	-	8	0.5						
		4.3	145	180	-	8	0.2						
		4.3	78	90	-	8	0.1						
		15	37	50	-	8	0.1						
		3	200	240	-	8	2						
		4	165	200	-	15	0.7						
		14	37	48	-	8	0.075						
		15	37	48	-	8	0.1						
	0	3	3.3	215	300	200	30	0.8		BZA856A	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	
			5	165	220	200	30	0.2					
			12	73	100	200	30	0.015					
			15	60	90	200	30	0.015					
			24	40	70	200	23	0.015					
			24	40	70	200	23	0.015					
			3.3	215	300	200	30	0.8					
			5	165	220	200	30	0.2					
			12	73	100	200	30	0.015					
			15	60	90	200	30	0.015					
			24	45	70	200	23	0.015					
			24	45	70	200	23	0.015					
5	4	12	73	100	200	30	0.015		BZA820A	SOT457 (SC-74)	2.9 x 1.5 x 1.0		
		15	60	90	200	30	0.015						
		24	45	70	200	23	0.015						
		24	45	70	200	23	0.015						
0	4	5	45	75	-	15	0.1		BZA408B			SOT163 (SO20)	12.8 x 7.5 x 2.65
		5	45	75	-	15	0.1						
18	17	5.2	100	120	-	8	2		BZA100	SOT163 (SO20)	12.8 x 7.5 x 2.65		

<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

## Low capacitance ESD protection devices

types in **bold** represent new products











Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>r</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)			
Unidirectional	Bidirectional													
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL	SOD882	1.0 x 0.6 x 0.5			
		5	25	30	42	26	0.1		PESD5V0L1UL					
		5	25	30	42	26	0.1		<b>PESD5V0L1ULD</b>	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		1.7 x 1.25 x 0.95			
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-76)				
		5	25	30	42	26	0.1		PESD5V0L1UA					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UL	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					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95			
		5	2	2.6	-	9	0.1		PESD5V0U1UA					
		0	1	3.3	101	-	500		30	2		PESD3V3L1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
				5	75	-	500		30	1		PESD5V0L1BA		
				12	19	-	200		30	0.05		PESD12VL1BA		
15	16			-	200	30	0.05	PESD15VL1BA						
24	11			-	200	23	0.05	PESD24VL1BA						
5.5	12			15.4	35	30	0.1	<b>PESD5V0L1BSF</b>	SOD962			0.6 x 0.3 x 0.3		
5	11			13	45	30	0.01	PESD5V0V1BL	SOD882			1.0 x 0.6 x 0.5		
5	11			13	45	30	0.01	<b>PESD5V0V1BLD</b>	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	3.5			4.5	8	15	0.1	<b>PESD5V0V1BSF</b>	SOD962			0.6 x 0.3 x 0.3		
15	8			10	-	15	0.1	<b>IP4302CX2/A</b>	CSP2			0.7 x 0.52 x 0.40		

<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

## Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>r</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional											
0	1	5	2.9	3.5	-	10	0.1		PESD5V0U1BL	SOD882	1.0 x 0.6 x 0.5	
		5	2.9	3.5	-	10	0.1		<b>PESD5V0U1BLD</b>	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
		3.3	22	28	30	15	0.3		PESD3V3L2UM	SOT883 (SC-101)		1.0 x 0.6 x 0.5
2	1	5	16	19	30	15	0.025		PESD5V0L2UM	SOT323 (SC-70)	2.0 x 1.25 x 0.95	
		5	38	46	70	30	0.09 (@ 4 V)		PESD5V0L2UU			
		6	34	40	60	30	0.018 (@ 4.3 V)		PESD6V0L2UU			
		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						
0	2	5	35	45	130	30	0.1		PESD5V0S2BT	SOT883 (SC-101)	1.0 x 0.6 x 0.5	
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT			
		5	2.9	3.5	-	10	0.1		PESD5V0U2BM			
		15	13	15	-	15	0.1		IP4303CX4/P	CSP4		0.76 x 0.76 x 0.40

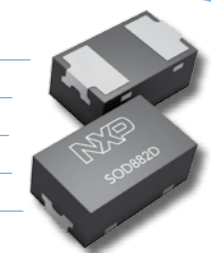
<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

### In the Spotlight

#### New innovative ultra-small package SOD882D

- Ultra-low package height of only 0.37 mm typ.
- Tin plated solderable side pads
- Fully compatible with standard 0402 inch / 1006 mm packages
- AEC-Q101 qualified
- Portfolio of 10 ESD diodes covering all applications and segments



### Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
3	0	5.5	3	4	-	15	0.1	-	<b>IP4059CX5/LF</b>	CSP5, staggered compressed	1.34 x 0.96 x 0.65		
4	3	3.3	22	28	30	20	0.3		PESD3V3L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		5	16	19	30	20	0.025		PESD5V0L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		3.3	22	28	30	20	0.3		PESD3V3L4UW	SOT665	1.6 x 1.2 x 0.55		
		5	16	19	30	20	0.025		PESD5V0L4UW	SOT665	1.6 x 1.2 x 0.55		
		3.3	22	28	30	20	0.3		PESD3V3L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5	16	19	30	20	0.025		PESD5V0L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		3.3	13	17	25	10	1		PESD3V3V4UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		5	12	15	25	15	0.3		PESD5V0V4UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		9	6.5	10	28	8	0.1		PESD9V0V4UK	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		3.3	15	18	16	12	0.3		PESD3V3V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		5	12	15	16	12	0.025		PESD5V0V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		3.3	15	18	16	12	0.3		PESD3V3V4UW	SOT665	1.6 x 1.2 x 0.55		
		5	12	15	16	12	0.025		PESD5V0V4UW	SOT665	1.6 x 1.2 x 0.55		
		3.3	15	18	16	12	0.3		PESD3V3V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5	12	15	16	12	0.025		PESD5V0V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5.5	18	20	-	15	0.1	-	<b>IP4142CX5/LF</b>	5 ball CSP, staggered compressed	1.28 x 0.91 x 0.65		
		0	4	5.5	18	20	-	15	0.1		<b>IP4343CX5/LF</b>	5 ball CSP	1.06 x 0.76 x 0.61
				5.5	18	20	-	15	0.1		IP4043CX5/LF	5 ball CSP	1.12 x 1.12 x 0.65

<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

### Low capacitance ESD protection devices

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	P <sub>pp</sub> <sup>[1]</sup> max (W)	ESD rating <sup>[2]</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
5	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BW	SOT665	1.6 x 1.2 x 0.55
		3.3	20	24	28	15	2		PESD3V3L5UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5	18.5	22	30	20	0.5		PESD5V0L5UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		3.3	22	28	25	20	0.3		PESD3V3L5UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	16	19	25	20	0.025		PESD5V0L5UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		3.3	22	28	25	20	0.3		PESD3V3L5UV	SOT666	1.6 x 1.2 x 0.55
		5	16	19	25	20	0.025		PESD5V0L5UV	SOT666	1.6 x 1.2 x 0.55
		3.3	22	28	25	20	0.3		PESD3V3L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5	16	19	25	20	0.025		PESD5V0L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF
5	2.9			3.5	-	10	0.1	PESD5V0U5BV	SOT666		1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6US	SOT96 (SO8)	4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8)	4.9 x 3.9 x 1.75

<sup>[1]</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>[2]</sup> acc. to IEC 61000-4-2 (contact discharge)

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

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	ESD rating <sup>(1)</sup> max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
1	0	5	1.55	1.75	15		PESD5V0X1ULD	SOD882D	1.0 x 0.6 x 0.37
		5	0.95	1.15	8		PESD5V0X1UALD	SOD523 (SC-79)	
		5	0.95	1.15	8		PESD5V0X1UB		
		5	1.55	1.75	15		PESD5V0X1UAB		
		16	0.83	0.98	8	PESD16VX1UL	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	0.4	0.55	10		PESD5V0F1BL	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	0.9	1.3	9		PESD5V0X1BL		
		5.5	0.25	0.3	28		PESD5V0F1BSF		
2	1	5	0.9	1.3	9		PESD5V0X1BQ	SOT663	1.6 x 1.2 x 0.55
		5	0.9	1.3	9		PESD5V0X1BT	SOT23	2.9 x 1.3 x 1.0
	0	5.5	1	1.5	8		PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0
			5.5	1.8	-		12	PRTR5V0U2AX	
		5.5	1	1.5	8	PRTR5V0U2K	SOT891 (XSON6)	1.0 x 1.0 x 0.5	
		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	SOT886 (XSON6)	1.45 x 1.0 x 0.5	


<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

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

**In the Spotlight**

**Ultra low clamping ESD protection diodes in SOD523**

- Ultra-low clamping voltage of V<sub>CL</sub> = 10 V
- Ultra-low capacitance of C<sub>d</sub> = 0.95 / 1.8 pF (high robustness version)
- Ultra-low dynamical resistance r<sub>dyn</sub> = 0.25 / 0.15 Ω
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified



Protection and signal conditioning

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	ESD rating <sup>(1)</sup> 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	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1.3	-	15		IP4359CX4/LF	CSP4 	0.76 x 0.76 x 0.61
3	2	5.5	1.4	1.5	15	-	<b>IP4356CX4</b>		
4	0	5.5	1.4	1.5	15	-	<b>IP4319CX10</b>	CSP10, staggered compressed	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	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1	-	8		IP4221CZ6-XS	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5.5	1	-	8		<b>IP4233CZ6</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)



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

types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	ESD rating <sup>(1)</sup> max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
4	0	5.5	1	-	8		PRTR5V0U4D	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		5.5	1	-	8		PRTR5V0U4Y	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		5.5	0.8	-	12		<b>IP4285CZ9-TBB</b>	SOT1178 (XSON9) 	1.0 x 2.1 x 0.5
		5.5	0.7	-	8		IP4280CZ10	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		5.5	0.6	-	8		<b>IP4283CZ10-TBA</b>	SOT1165 (XSON10) 	1.0 x 2.5 x 0.5
		5.5	0.6	-	8		<b>IP4283CZ10-TBR</b>	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		5.5	0.6	-	8		IP4283CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		5.5	0.5	-	8		<b>IP4284CZ10-TBR</b>	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		5.5	0.5	-	8		<b>IP4284CZ10-TT</b>	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		5.5	0.6	-	8		<b>IP4286CZ6-TBF</b>	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		5.5	0.6	-	8		<b>IP4286CZ6-TTY</b>	SOT363 (SC-88) 	2.0 x 1.25 x 0.95

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

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

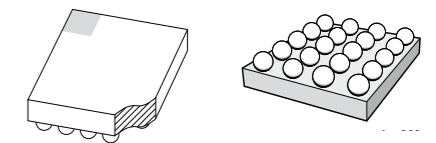
types in **bold** represent new products

Number of protected lines		V <sub>RWM</sub> (V)	C <sub>line typ</sub> (pF)	C <sub>line max</sub> (pF)	ESD rating <sup>(1)</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub>	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.5	-	8	-		<b>IP4292CZ10-TBR</b>	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
5	0	5.5	1.3	-	15	-		<b>IP4358CX6</b>	CSP 	0.76 x 1.16 x 0.61
8	0	5.5	1.3	-	15	-		<b>IP4309CX9</b>	CSP 	1.16 x 1.16 x 0.61
		5.5	1	-	8	-		PRTR5V0U8S	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
11	0	5.5	0.7	-	8	-		<b>IP4790CZ38</b>	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1

<sup>(1)</sup> acc. to IEC 61000-4-2 (contact discharge)

#### NXP Wafer-Level Chip Scale Package (WL-CSP)

- ▶ 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



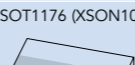
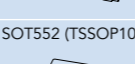

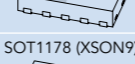
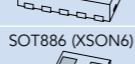

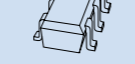
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R <sub>line</sub>	C <sub>line</sub> (pF)					
Audio	2	0.9 Ω	290	-	Low-ohmic speaker (< -8 Ω)	IP4047CX6/LF	6 ball CSP	1.56 x 1.01 x 0.65
		10 Ω	200	-	Low-ohmic speaker (> -8 Ω)	IP4048CX5/LF	5 ball CSP	0.91 x 1.28 x 0.65
		68 Ω	110	-	Single-ended or differential microphone	IP4049CX5/LF	6 ball CSP	1.56 x 1.03 x 0.65
		470 Ω	35	-	Single-ended or differential microphone	IP4055CX6/LF		1.16 x 0.76 x 0.65
		470 Ω	20	-	Single-ended or differential microphone	IP4355CX6/LF	8 ball CSP	1.67 x 1.67 x 0.65
		50 Ω / 2.2 kΩ	2000	-	Single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF		1.60 x 1.15 x 0.65
		0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	<b>IP3047CX6</b>	6 ball CSP	1.60 x 1.15 x 0.65
	0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	<b>IP3048CX5</b>	5 ball CSP	1.51 x 1.15 x 0.65	
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	20 ball CSP	1.91 x 2.52 x 0.65	

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

## Video interfaces


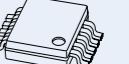
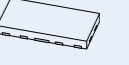
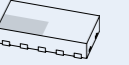
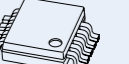


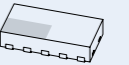

types in **bold** represent new products

Baseband interface	Number of protected lines	C <sub>line</sub> (pF)	Remark	Type	Package	Size (mm)
Display port	4	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR		1.0 x 2.5 x 0.5
		0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TT		3.0 x 3.0 x 1.1
		0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TBR		1.0 x 2.5 x 0.5
		0.5	ESD protection for ultra high-speed interfaces	<b>IP4284CZ10-TT</b>		3.0 x 3.0 x 1.1
		0.5	ESD protection for ultra high-speed interfaces	<b>IP4292CZ10-TBR</b>		1.0 x 2.5 x 0.5
		0.8	ESD protection for ultra high-speed interfaces	<b>IP4285CZ9-TBB</b>		1.0 x 2.1 x 0.5
		0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5
			ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY		2.0 x 1.25 x 0.95
	11	0.7	ESD protection for display port	IP4790CZ38		9.7 x 4.4 x 1.1

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

## Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	C <sub>line</sub> (pF)	Remark	Type	Package	Size (mm)			
HDMI	2	0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5			
									
	4	0.7	ESD protection for ultra high-speed interfaces	IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1			
									
					0.6	ESD protection for ultra high-speed interfaces	<b>IP4283CZ10-TBA</b>	SOT1165 (XSON10)	1.0 x 2.5 x 0.5
									
					0.6	ESD protection for ultra high-speed interfaces	<b>IP4283CZ10-TBR</b>	SOT1176 (XSON10)	1.0 x 2.5 x 0.5
									
					0.6	ESD protection for ultra high-speed interfaces	<b>IP4283CZ10-TT</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
									
					0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TBF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
									
0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88)	2.0 x 1.25 x 0.95					
									
0.5	ESD protection for ultra high-speed interfaces	<b>IP4284CZ10-TBR</b>	SOT1176 (XSON10)	1.0 x 2.5 x 0.5					
									
0.8	ESD protection for ultra high-speed interfaces	<b>IP4285CZ9-TBB</b>	SOT1178 (XSON10)	1.0 x 2.1 x 0.5					
									

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

In the Spotlight

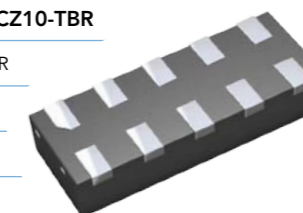
### HDMI: High-speed 4 channel ESD protection – IP4283CZ10-TBR

Low capacitance 4 channel ESD protection array: IP4283CZ10-TBR

Optimized for high level ESD protection of HDMI ports

Straight through routing → best signal integrity

10 pin QFN package with exposed leads (SOT1176)



Protection and signal conditioning

### Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C <sub>line</sub> (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
HDMI	4	-	-	0.5	-	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		-	-	0.5	-	ESD protection for ultra high-speed interfaces	<b>IP4292CZ10-TBR</b>	SOT1176 (XSON10)	1.0 x 2.5 x 0.5
	5	-	-	10	1.75 k, 100 k	HDMI, DDC, CEC, hot plug ESD protection and biasing	<b>IP4310CX8/P</b>	8 ball CSP	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	<b>IP4791CZ12</b>	SOT1156	2.5 x 2.1 x 0.5
	8	-	-	1.3	-	HDMI, TMDS line ESD protection	<b>IP4309CX9</b>	9 ball CSP	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		
		yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and hot plug application for a complete HDMI sink port	IP4778CZ38		
	13	yes	yes	100 Ω differential impedance	internal	Fully integrated HDMI solution with current limiter, buffer and level shifter for DDC, CEC, HP	<b>IP4786CZ32</b>	SOT617	5.0 x 5.0 x 1.0
	LVDS	2	-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	<b>IP3348CX5</b>	CSP5, staggered compressed
4		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	<b>IP3348CX10</b>	CSP10, staggered compressed	1.56 x 1.06 x 0.61
6		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	<b>IP3348CX15</b>	CSP15, staggered compressed	2.36 x 1.06 x 0.61
8		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	<b>IP3348CX20</b>	CSP20, staggered compressed	3.16 x 1.06 x 0.61

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

### Video interfaces

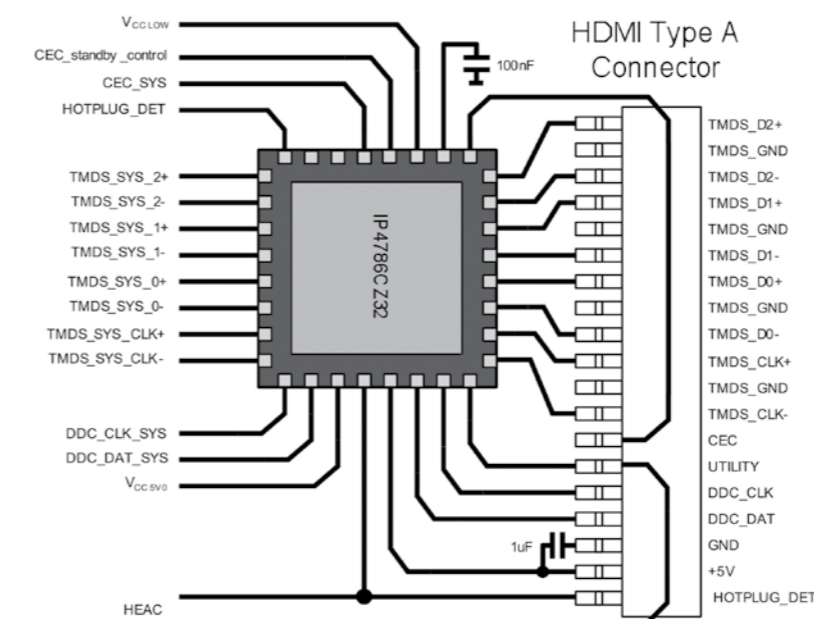
types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C <sub>line</sub> (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
VGA	7	yes	yes	5	55	H&V sync buffer, DDC level shifter	IP4770CZ16	SOT519 (SSOP16)	4.9 x 3.9 x 1.73
		yes	yes	5	65	H&V sync buffer, DDC level shifter	IP4771CZ16		
		yes	yes	5	10	H&V sync buffer, DDC level shifter	IP4772CZ16		
		yes	no	4	10	VGA receivers and transmitters, H&V sync buffer	IP4773CZ14	SOT337 (SSOP14)	6.2 x 5.3 x 2.0
		yes	no	4	10	VGA receivers and transmitters, H sync buffer	IP4774CZ14		
		no	yes	4	1.3 - 2.4	VGA receivers and transmitters, DDC level shifter	<b>IP4769CZ14</b>	SOT402-1 (TSSOP14)	5.0 x 4.4 x 1.1

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

Please find more ESD protection diodes for ultra high-speed interfaces on pages 28 - 31

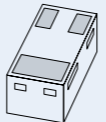
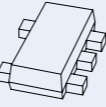
### Transmitter HDMI companion chip IP4786CZ32



Protection and signal conditioning

### Multichannel EMI filters, ESD protection for LCD and camera

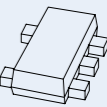
types in **bold** represent new products

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)					
LCD display, camera, keypad	1	75	36	-	~50	155	IP4307CX4/LF	4 ball CSP	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	5 ball CSP	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				
20	23	-	~90	264	PEMI2QFN/CK				

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

### Multichannel EMI filters, ESD protection for LCD and camera

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (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		
	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)

Protection and signal conditioning

### Multichannel EMI filters, ESD protection for LCD and camera

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)					
LCD display, camera, keypad	2	45	23	-	~80	249	PEMI2QFN/HK	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		45	19	-	~100	300	PEMI2QFN/HG		
		45	15	-	~125	376	PEMI2QFN/HE		
		65	40	-	~45	139	PEMI2QFN/LT		
		65	36	-	~50	155	PEMI2QFN/LR		
		65	32	-	~55	168	PEMI2QFN/LP		
		65	28	-	~65	197	PEMI2QFN/LM		
		65	23	-	~80	239	PEMI2QFN/LK		
		65	19	-	~95	288	PEMI2QFN/LG		
		65	15	-	~120	361	PEMI2QFN/LE		
		100	40	-	~45	131	PEMI2QFN/RT		
		100	36	-	~50	145	PEMI2QFN/RR		
		100	32	-	~55	159	PEMI2QFN/RP		
		100	30	-	~65	200	IP4256CZ6-F		
		100	28	-	~60	187	PEMI2QFN/RM		
		100	23	-	~75	227	PEMI2QFN/RK		
		100	19	-	~90	272	PEMI2QFN/RG		
		100	15	-	~115	343	PEMI2QFN/RE		
		200	40	-	~40	119	PEMI2QFN/WT		
		200	36	-	~45	132	PEMI2QFN/WR		
	200	32	-	~50	143	PEMI2QFN/WP			
	200	28	-	~55	169	PEMI2QFN/WM			
	200	23	-	~70	205	PEMI2QFN/WK			
	200	19	-	~80	247	PEMI2QFN/WG			
	200	15	-	~105	311	PEMI2QFN/WE			
	4	10	35	15	~115	350	IP3348CX10	10 ball CSP	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	SOT1157 (8 pin QFN)	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

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)					
LCD display, camera, keypad	4	45	15	-	~125	376	PEMI4QFN/HE	SOT1157 (8 pin QFN)	1.7 x 1.2 x 0.5
		65	40	-	~45	139	PEMI4QFN/LT		
		65	36	-	~50	155	PEMI4QFN/LR		
		65	32	-	~55	168	PEMI4QFN/LP		
		65	28	-	~65	197	PEMI4QFN/LM		
		65	23	-	~80	239	PEMI4QFN/LK		
		65	19	-	~95	288	PEMI4QFN/LG		
		65	15	-	~120	361	PEMI4QFN/LE		
		100	40	-	~45	131	PEMI4QFN/RT		
		100	36	-	~50	145	PEMI4QFN/RR		
		100	32	-	~55	159	PEMI4QFN/RP		
		100	28	-	~60	187	PEMI4QFN/RM		
		100	23	-	~75	227	PEMI4QFN/RK		
		100	19	-	~90	272	PEMI4QFN/RG		
		100	15	-	~115	343	PEMI4QFN/RE		
		200	40	-	~40	119	PEMI4QFN/WT		
		200	36	-	~45	132	PEMI4QFN/WR		
		200	32	-	~50	143	PEMI4QFN/WP		
		200	28	-	~55	169	PEMI4QFN/WM		
		200	23	-	~70	205	PEMI4QFN/WK		
	200	19	-	~80	247	PEMI4QFN/WG			
	200	15	-	~105	311	PEMI4QFN/WE			
	6	15	43	12	~60	175	IP3253CZ8-4-TTL	SOT1166 (8 pin QFN)	1.7 x 1.35 x 0.5
		15	50	18	~50	145	IP3254CZ8-4-TTL		
		40	18	-	~100	300	IP4252CZ8-4-TTL		
		100	45	-	~40	130	IP4254CZ8-4-TTL		
		100	15	-	~110	330	IP4251CZ8-4-TTL		
		200	45	-	~35	110	IP4253CZ8-4-TTL		
		10	35	15	~115	350	IP3348CX15	15 ball CSP	2.36 x 1.06 x 0.61
		18	65	40	~60	175	IP3088CX15		2.96 x 1.28 x 0.65
		100	60	-	~40	120	IP4053CX15/LF		2.96 x 1.32 x 0.65
100		60	-	~40	120	IP4353CX15/LF	2.38 x 1.05 x 0.61		
100		54	-	~30	98	PEMI6CSP/RW	2.36 x 1.06 x 0.61		
100	45	35	~20	150	IP3053CX15	2.96 x 1.28 x 0.65			
100	41	-	~40	125	PEMI6CSP/RT	2.36 x 1.06 x 0.61			
100	30	-	~70	210	IP4153CX15/LF	2.91 x 1.28 x 0.65			
20	40	-	~50	153	PEMI6QFN/CT	SOT1158 (12 pin QFN)	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

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)					
LCD display, camera, keypad	6	45	36	-	~55	161	PEMI6QFN/HR	SOT1158 (12 pin QFN)	2.5 x 1.2 x 0.5
		45	32	-	~60	175	PEMI6QFN/HP		
		45	28	-	~70	206	PEMI6QFN/HM		
		45	23	-	~80	249	PEMI6QFN/HK		
		45	19	-	~100	300	PEMI6QFN/HG		
		45	15	-	~125	376	PEMI6QFN/HE		
		65	40	-	~45	139	PEMI6QFN/LT		
		65	36	-	~50	155	PEMI6QFN/LR		
		65	32	-	~55	168	PEMI6QFN/LP		
		65	28	-	~65	197	PEMI6QFN/LM		
		65	23	-	~80	239	PEMI6QFN/LK		
		65	19	-	~95	288	PEMI6QFN/LG		
		65	15	-	~120	361	PEMI6QFN/LE		
		100	40	-	~45	131	PEMI6QFN/RT		
		100	36	-	~50	145	PEMI6QFN/RR		
		100	32	-	~55	159	PEMI6QFN/RP		
		100	28	-	~60	187	PEMI6QFN/RM		
		100	23	-	~75	227	PEMI6QFN/RK		
		100	19	-	~90	272	PEMI6QFN/RG		
		100	15	-	~115	343	PEMI6QFN/RE		
		200	40	-	~40	119	PEMI6QFN/WT		
		200	36	-	~45	132	PEMI6QFN/WR		
		200	32	-	~50	143	PEMI6QFN/WP		
		200	28	-	~55	169	PEMI6QFN/WM		
		200	23	-	~70	205	PEMI6QFN/WK		
		200	19	-	~80	247	PEMI6QFN/WG		
		200	15	-	~105	311	PEMI6QFN/WE		
		15	50	18	~50	145	<b>IP3254CZ12-6-TTL</b>		
	15	43	12	~60	175	<b>IP3253CZ12-6-TTL</b>			
	40	18	-	~100	300	<b>IP4252CZ12-6-TTL</b>			
	100	45	-	~40	130	<b>IP4254CZ12-6-TTL</b>			
	100	15	-	~110	330	<b>IP4251CZ12-6-TTL</b>			
	200	45	-	~35	110	<b>IP4253CZ12-6-TTL</b>			
	7	70	25	-	~75	220	IP4337CX18/LF	18 ball CSP	1.96 x 1.61 x 0.61
	125	25	60	~60	180	IP3337CX18/LF	2.06 x 1.66 x 0.61		
	8	10	35	15	~115	350	<b>IP3348CX20</b>	20 ball CSP	3.16 x 1.06 x 0.61
		18	65	40	~60	175	<b>IP3088CX20</b>		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	SOT1159 (16 pin QFN)	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)

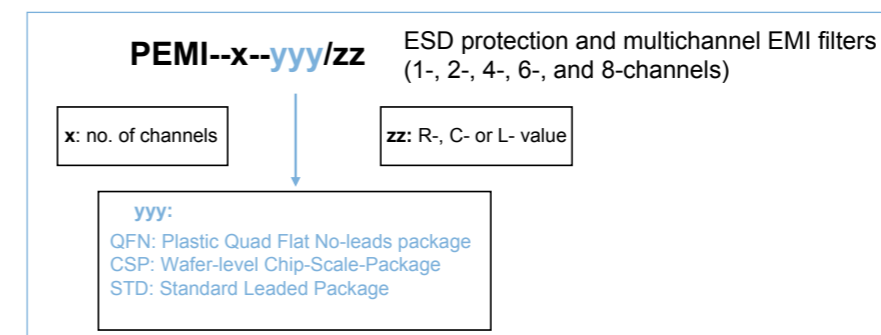
### Multichannel EMI filters, ESD protection for LCD and camera

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 <sub>line</sub> (Ω)	C <sub>line</sub> (pF)	L <sub>line</sub> (nH)							
LCD display, camera, keypad	8	45	40	-	~50	145	PEMI8QFN/HT	SOT1159 (16 pin QFN)	3.3 x 1.2 x 0.5		
		45	36	-	~55	161	PEMI8QFN/HR				
		45	32	-	~60	175	PEMI8QFN/HP				
		45	28	-	~70	206	PEMI8QFN/HM				
		45	23	-	~80	249	PEMI8QFN/HK				
		45	19	-	~100	300	PEMI8QFN/HG				
		45	15	-	~125	376	PEMI8QFN/HE				
		65	40	-	~45	139	PEMI8QFN/LT				
		65	36	-	~50	155	PEMI8QFN/LR				
		65	32	-	~55	168	PEMI8QFN/LP				
		65	28	-	~65	197	PEMI8QFN/LM				
		65	23	-	~80	239	PEMI8QFN/LK				
		65	19	-	~95	288	PEMI8QFN/LG				
		65	15	-	~120	361	PEMI8QFN/LE				
		100	40	-	~45	131	PEMI8QFN/RT				
		100	36	-	~50	145	PEMI8QFN/RR				
		100	32	-	~55	159	PEMI8QFN/RP				
		100	28	-	~60	187	PEMI8QFN/RM				
		100	23	-	~75	227	PEMI8QFN/RK				
		100	19	-	~90	272	PEMI8QFN/RG				
		100	15	-	~115	343	PEMI8QFN/RE				
		200	40	-	~40	119	PEMI8QFN/WT				
		200	36	-	~45	132	PEMI8QFN/WR				
		200	32	-	~50	143	PEMI8QFN/WP				
		200	28	-	~55	169	PEMI8QFN/WM				
		200	23	-	~70	205	PEMI8QFN/WK				
		200	19	-	~80	247	PEMI8QFN/WG				
		200	15	-	~105	311	PEMI8QFN/WE				
		15	43	12	~60	175	<b>IP3253CZ16-8-TTL</b>			SOT1168 (16 pin QFN)	3.3 x 1.35 x 0.5
		15	50	18	~50	145	<b>IP3254CZ16-8-TTL</b>				
		40	18	-	~100	300	<b>IP4252CZ16-8-TTL</b>				
		100	45	-	~40	130	<b>IP4254CZ16-8-TTL</b>				
	100	15	-	~110	330	<b>IP4251CZ16-8-TTL</b>					
	200	45	-	~35	110	<b>IP4253CZ16-8-TTL</b>					
	10	70	25	-	~75	220	IP4338CX24/LF	24 ball CSP	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	25 ball CSP	2.41 x 2.41 x 0.65		
		80	40	-	~30	100	IP4032CX25/LF		2.41 x 2.41 x 0.65		
		200	50	-	~35	105	IP4041CX25/LF		2.41 x 2.41 x 0.65		

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




### PEMI-series nomenclature



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 <sub>line</sub>	C <sub>line</sub> (pF)							
SIM card	3 + 2	47 Ω / 100 Ω		10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	<b>IP4365CX11</b>	11 ball CSP	1.16 x 1.56 x 0.61	
		47 Ω / 100 Ω		40	~12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	8 ball CSP	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				
	3	47 Ω / 100 Ω		40	~12	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-40-TTL	SOT1166 (8 pin QFN)	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	<b>IP4264CZ8-10-TTL</b>			
-		1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S	SOT886 (XSON6)	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	11 ball CSP	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	16 ball CSP	1.96 x 1.97 x 0.65	
	6	40 Ω		12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	<b>IP4252CZ12-6-TTL</b>	SOT1167 (12 pin QFN) 	2.5 x 1.35 x 0.5	
	6 + 2	40 Ω		12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	<b>IP4252CZ16-8-TTL</b>	SOT1168 (16 pin QFN) 	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	20 ball CSP	2.54 x 1.96 x 0.65	
		-		5	~24	Memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP	1.46 x 1.52 x 0.65	
	6 (+3)	15 Ω / 50 kΩ / 15 kΩ		8	>52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61	
		40 Ω / 50 kΩ / 15 kΩ		20	>52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF		2.02 x 2.01 x 0.61	
		-		-	-	>52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		40 Ω / 50 kΩ / 15 kΩ		-	-	>52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter	IP4853CX24/P	24 ball CSP	

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

Please find more ESD protection diodes for ultra high-speed interfaces on pages 28 - 31

## Battery and charger protection




types in **bold** represent new products

Baseband interface	Number of protected lines	C <sub>line</sub> (pF)	Diode voltage	Remark	Type	Package	Size (mm)	
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4	4 ball CSP 	0.91 x 0.91 x 0.65	
		450	Breakdown 7 V	Power diode	IP4385CX4			
		160	Breakdown 16 V	Power diode	<b>IP4386CX4</b>			
		290	Breakdown 10 V	Power diode	<b>IP4387CX4</b>			
		160	V <sub>RWM</sub> = 12 V	Power diode with 2 A integrated fuse	<b>IP4389CX4</b>	SOD323F (SC-90) 	1.7 x 1.25 x 0.7	
		160	V <sub>RWM</sub> = 12 V	Power diode	PESD12VS1UJ		SOD323 (SC-76) 	1.7 x 1.25 x 0.95
		480	V <sub>RWM</sub> = 5 V	Power diode	PESD5V0S1UJ		SOD323F (SC-90) 	1.7 x 1.25 x 0.7
		480	V <sub>RWM</sub> = 5 V	Power diode	PESD5V0S1UA		SOD323 (SC-76) 	1.7 x 1.25 x 0.95

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

## USB, SATA, LAN

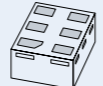
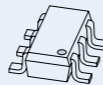
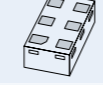

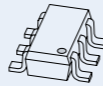
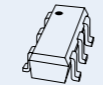
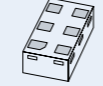

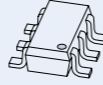
types in **bold** represent new products

Baseband interface	Number of protected lines	R <sub>line</sub>	C <sub>line</sub> (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	8 ball CSP	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	10 ball CSP	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	11 ball CSP	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	8 ball CSP	0.91 x 1.91 x 0.65
		17 Ω / 1.5 kΩ	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4158CX8/LF		
		33 Ω	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection and impedance matching	IP4078CX6/LF	6 ball CSP	0.91 x 1.41 x 0.65
	3	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4359CX4/LF</b>	4 ball CSP	0.76 x 0.76 x 0.61
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4356CX4</b>	4 ball CSP	0.76 x 0.76 x 0.61
		47 Ω / 100 Ω	10	~20/6	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11/P	11 ball CSP	1.16 x 1.56 x 0.61
		33 Ω / 1.5 kΩ / 20 kΩ	17	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4368CX9/P	5 ball CSP	1.16 x 1.16 x 0.61
4	-	3	>240	USB2.0 high-speed ESD protection	IP4059CX5/LF	5 ball CSP	0.96 x 1.34 x 0.65	
	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4358CX6</b>	6 ball CSP	0.76 x 1.16 x 0.41	
	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4319CX10</b>	10 ball CSP	1.56 x 1.05 x 0.61	
	0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0	
USB2.0 (Plastic package)	2	-	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	SOT886 (XSON6) 	1.45 x 1.0 x 0.5

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

## USB, SATA, LAN

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		1.0 x 1.0 x 0.5
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2D		2.9 x 1.5 x 1.0
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2F		1.45 x 1.0 x 0.5
	3 + 1	-	0.8	USB protection for USB OTG with 5.5 V Vbat protection	<b>PUSBM5V5X4-TL</b>		1.6 x 1.6 x 0.5
		-	0.8	USB protection for USB OTG with 12 V Vbat protection	<b>PUSBM12VX4-TL</b>		
		-	0.8	USB protection for USB OTG with 15 V Vbat protection	<b>PUSBM15VX4-TL</b>		
		-	0.8	USB protection for USB OTG with 27 V Vbat protection	<b>PUSBM27VX4-TL</b>		
	4	-	1	Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4220CZ6		2.9 x 1.5 x 1.0
		-	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		2.0 x 1.25 x 0.95
		-	1	ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-S		1.45 x 1.0 x 0.5
		-	1	ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-XS		1.0 x 1.0 x 0.5
		1	3	>15 kV IEC contact ESD protection with pi-filter	IP4225CZ10		2.9 x 1.5 x 1.0

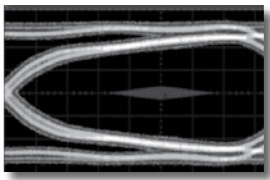
ESD protection acc. to IEC 61000-4-2 (level 4)

## USB, SATA, LAN

**In the Spotlight**

**USB3.0: Ultra high-speed 4 channel ESD protection – IP4292CZ10-TBR**

- Low clamping voltage ensures best protection of the System Chip
- Low Cline and high ESD protection level
- Straight through routing → best signal integrity
- Clean eye diagrams
- 10 pin QFN package with exposed leads (SOT1176)



Protection and signal conditioning

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	<b>IP4284CZ10-TBR</b>		1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
		-	0.5	ESD protection for ultra high-speed interfaces	<b>IP4292CZ10-TBR</b>		1.0 x 2.5 x 0.5

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



## USB, SATA, LAN





types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)
Display port	4	-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	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	<b>IP4282CZ6</b>	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	4	-	0.6	ESD protection for ultra high-speed interfaces	<b>IP4283CZ10-TBR</b>	SOT1176 (XSON10) 	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	<b>IP4284CZ10-TBR</b>	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		-	0.8	ESD protection for ultra high-speed interfaces	<b>IP4285CZ9-TBB</b>	SOT1178 (XSON9) 	1.0 x 2.5 x 0.1
		-	0.5	ESD protection for ultra high-speed interfaces	<b>IP4292CZ10-TBR</b>	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4292CZ10-TT	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5

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

## USB, SATA, LAN

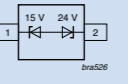

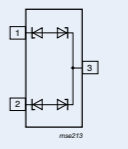

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Remark	Type	Package	Size (mm)		
LAN	1	-	0.6	Ethernet ESD protection $V_{RWM} = 3.3$ V	PESD3V3U1UT		2.9 x 1.3 x 1.0		
		-	0.6	Ethernet ESD protection $V_{RWM} = 5.0$ V	PESD5V0U1UT				
		-	0.6	Ethernet ESD protection $V_{RWM} = 12$ V	PESD12VU1UT				
		-	0.6	Ethernet ESD protection $V_{RWM} = 15$ V	PESD15VU1UT				
	4	-	0.6	Ethernet ESD protection $V_{RWM} = 24$ V	PESD24VU1UT				
		-	1	Ethernet ESD protection	IP4220CZ6			SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		-	1	Ethernet line surge ESD protection	<b>IP4233CZ6</b>			SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		-	1	Ethernet line surge ESD protection	<b>IP4233CZ6</b>			SOT363 (SC-88) 	2.0 x 1.25 x 0.95

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

Please find more ESD protection diodes for ultra high-speed interfaces on pages 28 - 31

## 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 <sup>(2)</sup> max (kV)	$I_s$ 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		2.9 x 1.3 x 1.0
		25	30	230	30	0.01		PESD2CAN		
		11	17	200	23	0.05		PESD1FLEX		

<sup>(1)</sup> 8/20 μs surge pulse acc. to IEC 61000-4-5

<sup>(2)</sup> acc. to IEC 61000-4-2 (contact discharge)

TVS diodes, 24 W / 40 W

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

<sup>(1)</sup> acc. to IEC 61643-321 <sup>(2)</sup> acc. to IEC 61000-4-2 (contact discharge)

TVS diodes, 400 W

Power (W) (10/1000 μs waveform) <sup>(1)</sup>	V <sub>RWM</sub> (V)	V <sub>BR min</sub> (V) @ I <sub>R</sub>	V <sub>BR typ</sub> (V) @ I <sub>R</sub>	V <sub>BR max</sub> (V) @ I <sub>R</sub>	I <sub>R</sub> (mA)	V <sub>CL max</sub> (V) @ I <sub>PP</sub>	I <sub>PP</sub> (A)	I <sub>RV typ</sub> (μA) @ V <sub>RWM</sub>	I <sub>RV max</sub> (μA) @ V <sub>RWM</sub>	Type	Package	Size (mm)
350	3.5	5.20	5.60	6.00	10	8.0	43.8	5	600	PTVS3V3S1UR		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		
	6.0	6.67	7.02	7.37	10	10.3	38.8	5	400	PTVS6V0S1UR		
	6.5	7.22	7.60	7.98	10	11.2	35.7	5	250	PTVS6V5S1UR		
	7.0	7.78	8.20	8.60	10	12.0	33.3	3	100	PTVS7V0S1UR		
	7.5	8.33	8.77	9.21	1	12.9	31.0	0.2	50	PTVS7V5S1UR		
	8.0	8.89	9.36	9.83	1	13.6	29.4	0.03	25	PTVS8V0S1UR		
	8.5	9.44	9.92	10.40	1	14.4	27.8	0.01	10	PTVS8V5S1UR		
	9.0	10.00	10.55	11.10	1	15.4	26.0	0.005	5	PTVS9V0S1UR		
	10	11.10	11.70	12.30	1	17.0	23.5	0.005	2.5	PTVS10VS1UR		
	11	12.20	12.85	13.50	1	18.2	22.0	0.005	2.5	PTVS11VS1UR		
	12	13.30	14.00	14.70	1	19.9	20.1	0.005	2.5	PTVS12VS1UR		
	13	14.40	15.15	15.90	1	21.5	18.6	0.001	0.1	PTVS13VS1UR		
	14	15.60	16.40	17.20	1	23.2	17.2	0.001	0.1	PTVS14VS1UR		
	15	16.70	17.60	18.50	1	24.4	16.4	0.001	0.1	PTVS15VS1UR		
	16	17.80	18.75	19.70	1	26.0	15.4	0.001	0.1	PTVS16VS1UR		
	17	18.90	19.90	20.90	1	27.6	14.5	0.001	0.1	PTVS17VS1UR		
	18	20.00	21.00	22.10	1	29.2	13.7	0.001	0.1	PTVS18VS1UR		
	20	22.20	23.35	24.50	1	32.4	12.3	0.001	0.1	PTVS20VS1UR		
	22	24.40	25.60	26.90	1	35.5	11.3	0.001	0.1	PTVS22VS1UR		
	24	26.70	28.10	29.50	1	38.9	10.3	0.001	0.1	PTVS24VS1UR		
	26	28.90	30.40	31.90	1	42.1	9.5	0.001	0.1	PTVS26VS1UR		
	28	31.10	32.80	34.40	1	45.4	8.8	0.001	0.1	PTVS28VS1UR		
	30	33.30	35.10	36.80	1	48.4	8.3	0.001	0.1	PTVS30VS1UR		
	33	36.70	38.70	40.60	1	53.3	7.5	0.001	0.1	PTVS33VS1UR		
36	40.00	42.10	44.20	1	58.1	6.9	0.001	0.1	PTVS36VS1UR			
40	44.40	46.80	49.10	1	64.5	6.2	0.001	0.1	PTVS40VS1UR			
43	47.80	50.30	52.80	1	69.4	5.8	0.001	0.1	PTVS43VS1UR			
45	50.00	52.65	55.30	1	72.7	5.5	0.001	0.1	PTVS45VS1UR			
48	53.30	56.10	58.90	1	77.4	5.2	0.001	0.1	PTVS48VS1UR			
51	56.70	59.70	62.70	1	82.4	4.9	0.001	0.1	PTVS51VS1UR			
54	60.00	63.15	66.30	1	87.1	4.6	0.001	0.1	PTVS54VS1UR			
58	64.40	67.80	71.20	1	93.6	4.3	0.001	0.1	PTVS58VS1UR			
60	66.70	70.20	73.70	1	96.8	4.1	0.001	0.1	PTVS60VS1UR			
64	71.10	74.85	78.60	1	103.0	3.9	0.001	0.1	PTVS64VS1UR			

<sup>(1)</sup> 10/1000 μs acc. to IEC 61643-321

TVS diodes, 600 W

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

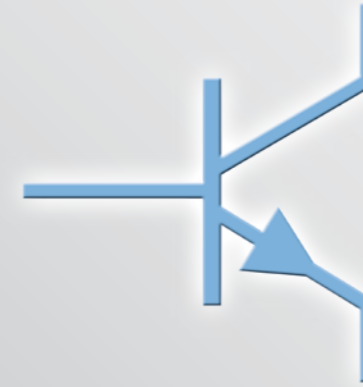
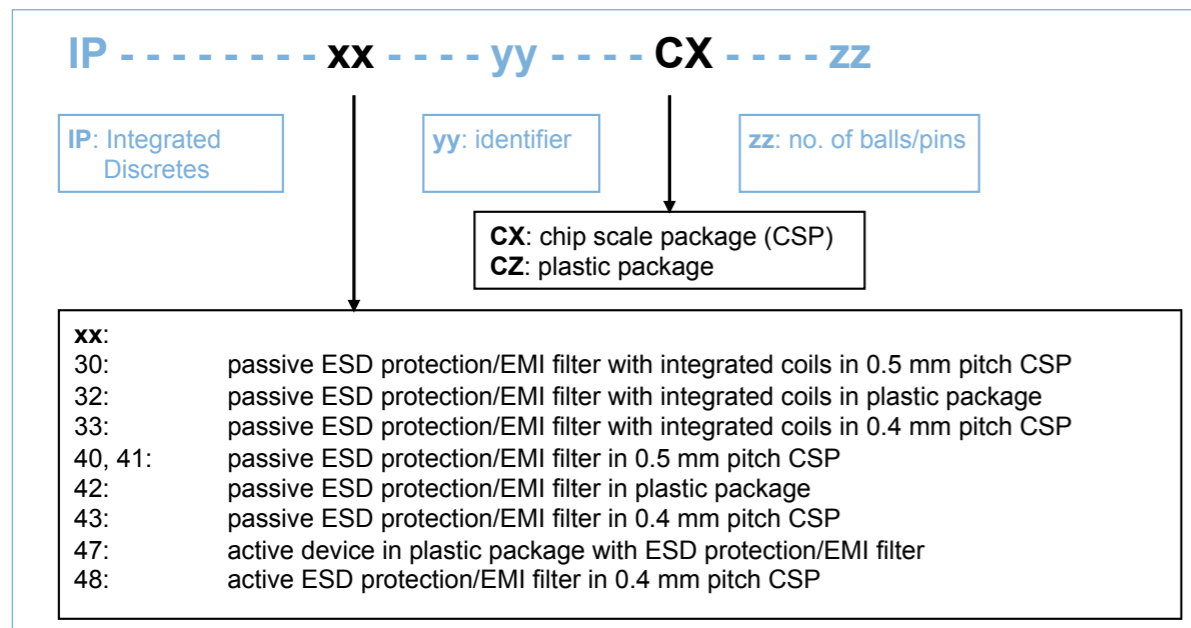
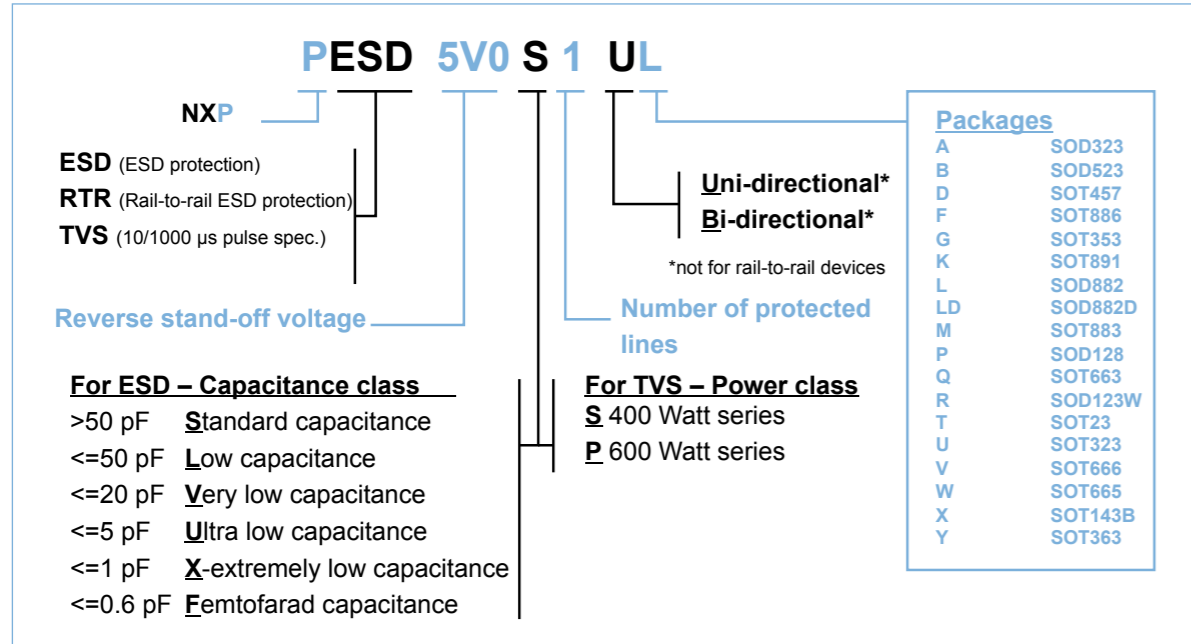
<sup>(1)</sup> 10/1000 μs acc. to IEC 61643-321

**In the Spotlight**

**600 / 400 W TVS series – PTVSxP1UP & PTVSxS1UR**

- Industry's smallest packages in the 600 / 400 W surge protection class
- Small FlatPower packages SOD123W/128, only 1 mm high
- AEC-Q101 qualified
- Low reverse leakage current (down to 1 nA typical)

## Protection and signal conditioning nomenclature



## Bipolar transistors

### General purpose bipolar transistors

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### Low $V_{CEsat}$ (BISS) transistors

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### High voltage power bipolar transistors

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High voltage bipolar transistors for lighting, SMPS and industrial applications	68
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### Single transistors NPN

types in **bold** represent new products

Package						SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
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
P <sub>tot</sub> (mW)						250	200	150	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> 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	
45	100	110 - 420	220 - 800	100		BC847 / A / B / C	BC847W / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM
		120 - 380	220 - 630	100		BCX70G / H / J / K			
		110 - 200	220 - 450	100		BCW71 / 72			
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	
80	100	20	80	60		BSS64			
50	150	120 - 270	270 - 560	100			2PC4081Q / R / S	2PC4617Q / R	
	200	210	340	100		<b>2PD601BRL</b> <b>2PD601BSL</b>			
45	500	100 - 250	250 - 600	100		BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W		
		100	600	100		BCX19 2PD602AQL 2PD602ARL 2PD602ASL	2PD1820AR / S		
50	500	85 - 170	170 - 340	140 - 180					
60	500	50	-	100			PMSTA05		

### Single transistors PNP

types in **bold** represent new products

Package						SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
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
P <sub>tot</sub> (mW)						250	200	150	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)					
80	500	100	-	100		PMBTA06	PMSTA06		
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	
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
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		<b>2PD601BRL</b> <b>2PD601BSL</b>			
25	500	100	600	80		BCX18			
45	500	100 - 250	250 - 600	80		BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W		
		100	600	80		BCX17			
50	500	85 - 170	170 - 340	100 - 140		2PB710ARL 2PB710ASL	2PB1219AQ / R / S		
60	500	100	-	50			PMSTA55		
80	500	100	-	50			PMBTA56		

### 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 <sub>tot</sub> (mW)						600	300	300	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)				
NPN	40	100	120	450	100		PUMX1	PEMX1	
	45	100	200	450	100		BC847DS	BC847BS	
	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		PUMT1	PEMT1	
	45	100	200	450	100			BC857BS	
	65	100	110	-	100			BC856S	
			200	450	100			BC856BS	
45	500	160	400	80		BC807DS			
NPN/PNP	40	100	120	450	100			PUMZ1	
	45	100	200	450	100			BC847BPN	
	50	100	120	560	100			PUMZ2	
	65	100	200	450	100			BC846BPN	
	12	500	200	-	250/100				
	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	SOT883 (SC-101)
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
P <sub>tot</sub> (mW)							1700	1300	250	200	300	300	250
Configuration							single	single	single	single	double	double	single
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)	t <sub>off</sub> (ns)							
NPN	12	100	40	120	400	20			BSV52				
	40	100	100	300	180	1200			PMB53904	PMSS3904			
					300	250		PXT2222A					
	15	200	40	120	500	20			PMBT2369	PMST2369			
	40	200	100	300	300	250			MMBT3904				
									PMBT3904	PMST3904	PMBT3904YS	PMBT3904VS	PMBT3904M
	30	600	100	300	250	250			PMBT2222	PMST2222			
	40	600	100	300	300	250			PZT4401	PXT4401	PMBT4401	PMST4401	
									MMBT2222A				
							PZT2222A		PMBT2222A	PMST2222A			
40	800	100	300	300	250			BSR14					
PNP	40	100	100	300	150	700			PMB53906	PMSS3906			
	40	200	100	300	250	300			MMBT3906				
									PMBT3906	PMST3906	PMBT3906YS	PMBT3906VS	PMBT3906M
	40	600	100	300	200	350	365		PZT4403	PXT4403	PMBT4403	PMST4403	
						300						PMST2907A	
	60	600	100	300	200	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)
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5
P <sub>tot</sub> (mW)						1700	1300
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)		
NPN	20	1000	85 - 160	375	40	BCP68 / -25	BC868 / -25
	45	1000	63 - 100	160 - 250	100	BCP54 / -10 / -16	BCX54 / -10 / -16
	60	1000	63 - 100	160 - 250	100	BCP55 / -10 / -16	BCX55 / -10 / -16
			100	300	100	BSP41	BSR41
80	1000	63 - 100	160 - 250	100	BCP56 / -10 / -16	BCX56 / -10 / -16	
		40 - 100	120 - 300	100	BSP43	BSR42 / 43	
PNP	20	1000	85 - 160	250 - 375	40	BCP69 / -16 / -25	BC869 / -16 / -25
	45	1000	63 - 100	160 - 250	115 <sup>1)</sup> - 145 <sup>1)</sup>	BCP51 / -10 / -16	BCX51 / -10 / -16
	60	1000	63 - 100	160 - 250	100	BCP52 / -10 / -16	BCX52 / -10 / -16
			40 - 100	120 - 300	100	BSP31	BSR30 / 31
80	1000	63 - 100	160 - 250	115 <sup>1)</sup> - 145 <sup>1)</sup>	100	BCP53 / -10 / -16	BCX53 / -10 / -16
		40 - 100	120 - 300	100	BSP32 / 33	BSR33	

<sup>1)</sup> typical value

### 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 <sub>tot</sub> (mW)						1700	1300	600	250	200	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)						
NPN	80	100	20	-	60				BSS64		
	140	100	60	250	100				PMBT5550	PMST5550	
	160	300	80	250	100				PMBT5551/BSR19A	PMST5551	
	250	100	50	-	60	BF722	BF622		BF822		
			50	-	60	BF720	BF620		BF820	BF820W	
	300	100	40	-	50	PZTA42	PXTA42		PMBTA42	PMSTA42	
350	100	40	-	70	BSP19	BST39					
400	300	50	200	20	PZTA44			PMBTA44			
PNP	100	100	30	-	50				BSS63		
	250	100	50	-	60	BF723					
			50	-	60		BF623		BF823		
	300	100	50	-	60		BF621		BF821		
400	100	40	-	50	PZTA92	PXTA92		PMBTA92	PMSTA92		
		40	-	50							
2 x NPN	300	100	40	-	50			PMBTA42DS			

For high voltage transistors with increased performance please refer to our high voltage low V<sub>CEsat</sub> (BISS) transistor portfolio on page 66.

### 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 <sub>tot</sub> (mW)						250	200	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	NF max (dB)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> 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

### 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 <sub>tot</sub> (mW)							250	380	300	300	300	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	h <sub>FE1</sub> /h <sub>FE2</sub>	V <sub>BE1</sub> - V <sub>BE2</sub> (mV)						
NPN	30	100	110	800	0.7 <sup>1)</sup>	n.a.	BCV61/A/B/C <sup>1)</sup>					
	45	100	200	450	0.9 <sup>1)</sup>	n.a.	BCM61B <sup>1)</sup>					
						2		BCM847DS		BCM847BS		BCM847BV
						0.95	2		PMP4501G		PMP4501Y	
0.98	2		PMP4201G		PMP4201Y		PMP4201V					
Configuration												
PNP	30	100	100	800	0.7 <sup>1)</sup>	n.a.	BCV62/A/B/C <sup>1)</sup>					
	45	100	200	450	0.9 <sup>1)</sup>	n.a.	BCM62B <sup>1)</sup>					
						2		BCM857DS		BCM857BS		BCM857BV
						0.95	2		PMP5501G		PMP5501Y	
0.98	2		PMP5201G		PMP5201Y		PMP5201V					
65	100	200	450	0.9	2		BCM856DS		BCM856BS			
Configuration												

<sup>1)</sup> I<sub>C1</sub>/I<sub>E2</sub>

#### 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

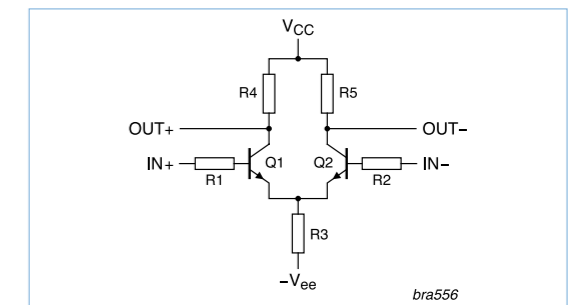
#### Key benefits

- ▶ 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

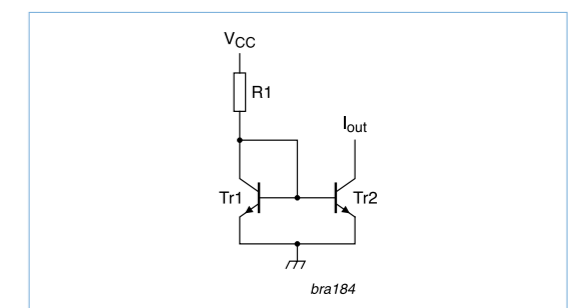
#### Key applications

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

#### Differential amplifier



#### Current mirror



### Darlington transistors

						SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Package								
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 <sub>tot</sub> (mW)						1700	1300	250
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	f <sub>T</sub> min (MHz)				
NPN	30	500	10000	125			PMBTA13	
			20000	125	PZTA14	PXTA14	PMBTA14	
	45	1000	2000	220			BCV27	
			2000	200	BSP50	BCV29	BCV27	
			10000	200	BSP51	BCV49	BCV47	
80	1000	2000	200	BSP52	BST52			
PNP	30	500	20000	125			PMBTA64	
			20000	220			BCV28	BCV26
	45	1000	2000	200		BSP60	BST60	
			10000	220			BCV48	BCV46
			2000	200	BSP61	BST61		
80	1000	2000	200	BSP62	BST62			

### Schmitt trigger

							SOT143B
Package							
Size (mm)							2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)							250
Polarity	V <sub>CEO</sub> (V) TR1	V <sub>CEO</sub> (V) TR2	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	V <sub>CEsat</sub> typ (mV)	
NPN	30	6	100	110	800	250	BCV63 / B
PNP	30	6	100	220	475	250	BCV64B

#### Key features

- ▶ Low current (max. 100 mA)
- ▶ Low voltage (max. 30 and 6 V)

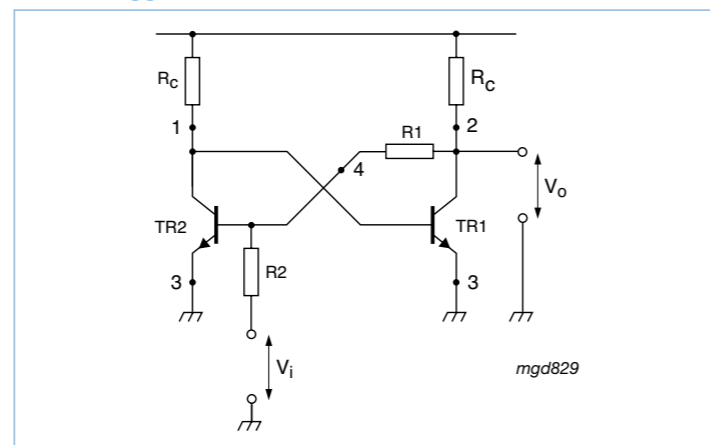
#### Key benefits

- ▶ Reduced component count and pick-and-place costs
- ▶ Smaller designs

#### Key applications

- ▶ General purpose switching and amplification
- ▶ Schmitt trigger applications

#### Schmitt trigger



### MOSFET driver

				SOT457 (SC-74)		
Package						
Size (mm)				2.9 x 1.5 x 1.0		
P <sub>tot</sub> (mW)				400	400	580
Configuration						
Contains	I <sub>C</sub> (A)	I <sub>CM</sub> (A)		R1 = R2 (kΩ)		
General purpose transistors	0.1	0.2	PMD9050D	-	PMD9010D	BCV65 (SOT143B)
				2.2	PMD9001D	
				4.7	PMD9002D	
Switching transistors - reduced storage time	0.6	1.0		10	PMD9003D	
				-		PMD2001D
Low V <sub>CEsat</sub> (BISS) transistors - Low V <sub>CEsat</sub> , high h <sub>FE</sub> and I <sub>C</sub>	1.0	2.0		-		PMD3001D

#### Key features

- ▶ Three different configurations
- ▶ Types available with standard, switching and low V<sub>CEsat</sub> (BISS) transistors
- ▶ Small footprint packages

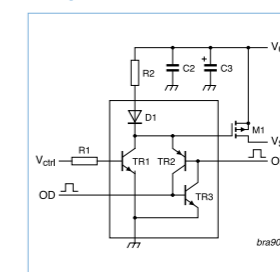
#### Key benefits

- ▶ Reduced component count
- ▶ Smaller end products

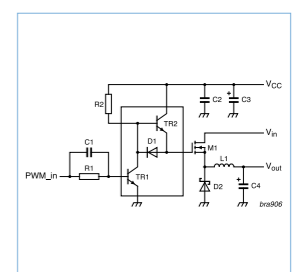
#### Key applications

- ▶ MOSFET driver
- ▶ Bipolar power transistor driver
- ▶ Push-pull driver

#### MOSFET driver with hardware output disable function





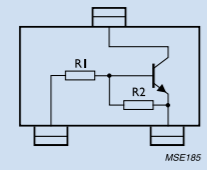
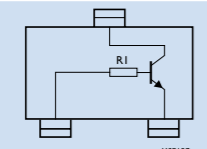
#### High-side MOSFET driver with level shifter function



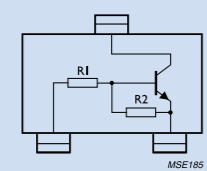
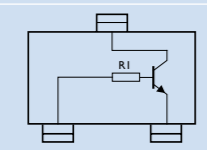


### Medium frequency transistors




						SOT23	SOT323 (SC-70)
Package							
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P <sub>tot</sub> (mW)						250	200
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> typ (MHz)		
NPN	15	100	40	-	500	BF570	
	20	25	40	85	>275	BFS20	BFS20W
		30	65	225	260	BFS19	
PNP	40	25	67	220	380	BF840	
	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 <sub>tot</sub> (mW)					250		200			
V <sub>CEO</sub> (V)	I <sub>c</sub> (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)		SOT883 (SC-101)			
										
Size (mm)					1.6 x 0.8 x 0.77		1.0 x 0.6 x 0.5			
P <sub>tot</sub> (mW)					150		250			
V <sub>CEO</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP		
50	100		1	1		PDTA113EE		PDTA113EM		
			2.2	2.2	PDTC123EE	PDTA123EE	PDTC123EM	PDTA123EM		
			4.7	4.7	PDTC143EE	PDTA143EE	PDTC143EM	PDTA143EM		
			10	10	PDTC114EE	PDTA114EE	PDTC114EM	PDTA114EM		
			22	22	PDTC124EE	PDTA124EE	PDTC124EM	PDTA124EM		
			47	47	PDTC144EE	PDTA144EE	PDTC144EM	PDTA144EM		
			100	100	PDTC115EE	PDTA115EE	PDTC115EM	PDTA115EM		
			1	10		PDTA113ZE		PDTA113ZM		
			2.2	10	PDTC123YE	PDTA123YE	PDTC123YM	PDTA123YM		
			2.2	47	PDTC123JE	PDTA123JE	PDTC123JM	PDTA123JM		
			4.7	10	PDTC143XE	PDTA143XE	PDTC143XM	PDTA143XM		
			4.7	47	PDTC143ZE	PDTA143ZE	PDTC143ZM	PDTA143ZM		
			10	47	PDTC114YE	PDTA114YE	PDTC114YM	PDTA114YM		
			22	47	PDTC124XE	PDTA124XE	PDTC124XM	PDTA124XM		
		47	10	PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM			
		47	22	PDTC144WE	PDTA144WE	PDTC144WM	PDTA144WM			
		2.2	-	PDTC123TE	PDTA123TE	PDTC123TM	PDTA123TM			
		4.7	-	PDTC143TE	PDTA143TE	PDTC143TM	PDTA143TM			
		10	-	PDTC114TE	PDTA114TE	PDTC114TM	PDTA114TM			
		22	-	PDTC124TE	PDTA124TE	PDTC124TM	PDTA124TM			
		47	-	PDTC144TE	PDTA144TE	PDTC144TM	PDTA144TM			
		100	-	PDTC115TE	PDTA115TE	PDTC115TM	PDTA115TM			
										


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 <sub>tot</sub> (mW)					600		300			300			
V <sub>CEO</sub> (V)	I <sub>c</sub> (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
			2.2	47				PUMH10	PUMD10	PUMB10	PEMH10	PEMD10	PEMB10
			4.7	10				PUMH18	PUMD18	PUMB18	PEMH18	PEMD18	PEMB18
			4.7	47				PUMH13	PUMD13	PUMB13	PEMH13	PEMD13	PEMB13
			10	47	PIMH9			PUMH9	PUMD9	PUMB9	PEMH9	PEMD9	PEMB9
			22	47				PUMH16	PUMD16	PUMB16	PEMH16	PEMD16	PEMB16
			47	22				PUMH17	PUMD17	PUMB17	PEMH17	PEMD17	PEMB17
			47/2.2	47/47					PUMD48			PEMD48	
			2.2	-					PUMH30	PUMD30	PUMB30	PEMH30	PEMD30
		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 <sub>tot</sub> (mW)					600		250	
V <sub>CEO</sub> (V)	I <sub>c</sub> (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<sub>CEsat</sub> (BISS) RETs

Package						SOT23
						
Size (mm)						2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)						250
Polarity	V <sub>CEO</sub> (V)	I <sub>c</sub> (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	SOT1061	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	SOT883 (SC-101)
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
P <sub>tot</sub> (mW)											1700	1650	750		480	1400	350	430	250	500	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	h <sub>FE</sub> min/typ	@ I <sub>C</sub> (A)	@ V <sub>CE</sub> (V)	R <sub>CEsat</sub> typ (mΩ); I <sub>C</sub> /I <sub>B</sub> = 10	V <sub>CEsat</sub> typ (mV); I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)											
12	5.3	10.6	300/530	0.5	2	27 <sup>1)</sup>	18	200	5.3	0.265											
	5.8	11.6	300/530	0.5	2	29 <sup>1)</sup>	18	235	5.8	0.29	PBSS301NZ										
	6.0	7.0	280/440	0.5	2	33 <sup>1)</sup>	20	275	6	0.3				PBSS4612PA							
15	0.5	1.0	200/325	0.01	2	360	-	250	0.5	0.05										PBSS2515M	
			200/425	0.01	2	300	200	250	0.5	0.05											
20	1.0	3.0	350/470	0.1	2	220	110 <sup>2)</sup>	250	1	0.05											
		2.0	220/410	0.5	2	140	70	350	2	0.2											
		5.0	220/330	0.1	2	80	45	310	3	0.3											
		3.0	220/390	0.5	2	85	40	310	3	0.3											
		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										
		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 <sup>1)</sup>	20	200	5.3	0.265										
		5.8	10.2	300/570	0.5	2	30 <sup>1)</sup>	20	250	5.8	0.29										
		6.0	7.0	280/440	0.5	2	33 <sup>1)</sup>	20	275	6	0.3										
30	1.0	3.0	300/450	0.5	2	240	120 <sup>2)</sup>	270	1	0.05											
		2.0	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										
		3.0	5.0	300/465	0.5	2	75	40	300	3	0.3										
		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										
		5.1	10.2	300/480	0.5	2	30 <sup>1)</sup>	20	220	5.1	0.255										
		5.4	10.0	300/500	0.5	2	45	57	340	4.9	0.27										
		5.5	11.0	300/480	0.5	2	31 <sup>1)</sup>	20	240	5.5	0.275										
40	0.5	1.0	200/550	0.01	2	380	200 <sup>2)</sup>	250	0.5	0.05											
			200/350	0.01	2	380	190	250	0.5	0.05											
		3.0	300/-	0.5	5	150	70	440	2	0.2											
		1.0	300/440	0.5	5	240	130	500	1	0.1											
		2.0	300/510	0.5	5	230	120	500	1	0.1											
			300/420	0.5	5	150	130	500	1	0.1											
		3.0	300/400	0.5	5	150	70	400	2	0.2											
		4.0	350/470	0.1	2	120	70	320	2	0.2											
		4.0	15.0	300/520	0.5	2	55	35	300	4	0.4										
		5.0	10.0	300/500	0.5	2	40	21	355	5	0.5										
50	2.0	5.0	300/495	0.5	2	100	60	260	2	0.2											
			300/-	0.5	2	160	90 <sup>2)</sup>	320	2	0.2											
		3.0	200/280	0.5	2	110	65	290	2	0.2											
			300/460	0.5	2	75	50	370	3	0.3											
			200/280	0.5	2	110	60 <sup>1)</sup>	290	2	0.2											
60	1.0	2.0	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	345/570	0.5	2	65	40	260	3	0.3											
		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 <sup>1)</sup>	25	245	4.7	0.235										
		5.2	10.4	300/520	0.5	2	39 <sup>1)</sup>	25	280	5.2	0.26										
		6.0	7.0	280/440	0.5	2	34 <sup>1)</sup>	22	290	6	0.3										
80	3.0	6.0	240/360	0.5	2	67	40	255	3	0.3											
		4.0	10.0	250/400	0.5	2	43 <sup>1)</sup>	25	230	4	0.2										
		4.6	9.2	300/470	0.5	2	37 <sup>1)</sup>	25	240	4.6	0.23										
		5.1	10.2	300/470	0.5	2	38 <sup>1)</sup>	25	270	5.1	0.255										
		5.6	7.0	270/425	0.5	2	40 <sup>1)</sup>	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										
		4.5	9.0	200/330	0.5	2	38 <sup>1)</sup>	27	245	4.5	0.225										
	5.1	10.2	200/330	0.5	2	43 <sup>1)</sup>	27	300	5.1	0.255											
	5.2	6.0	180/285	0.5	2	48 <sup>1)</sup>	30	340	5.2	0.26											

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub> = 20  
<sup>2)</sup> V<sub>CEsat</sub> (max)  
<sup>3)</sup> optimized for high speed switching



Low  $V_{CEsat}$  (BISS) transistors single PNP

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)		SOT23	SOT1061	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	SOT883 (SC-101)
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
P <sub>tot</sub> (mW)											1700	1650	750		480	1400	350	430	250	500	250
V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	h <sub>FE</sub> min/typ	@ I <sub>C</sub> (V)	@ V <sub>CE</sub> (V)	R <sub>CEsat</sub> typ (mΩ); I <sub>C</sub> /I <sub>B</sub> = 10	V <sub>CEsat</sub> typ (mV); I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)											
12	5.3	10.6	250/400	0.5	2	28 <sup>1)</sup>	20	210	5.3	0.265											
	5.7	11.4	250/400	0.5	2	30 <sup>1)</sup>	20	245	5.7	0.285	PBSS301PZ										
	6.0	7.0	220/335	0.5	2	33 <sup>1)</sup>	20	300	6	0.3				PBSS5612PA							
15	0.5	1.0	200/260	0.01	2	300	150	250	0.5	0.05											
			200/325	0.01	2	300	150	250	0.5	0.05											
20	1.0	2.0	300/450	0.1	2	250	125 <sup>2)</sup>	250	1	0.05											
	2.0	4.0	220/440	0.1	2	140	75	390	2	0.2											
		3.0	225/-	0.5	2	115	80 <sup>2)</sup>	225	2	0.2											
		5.0	220/420	0.5	2	75	50	210	2	0.2											
	3.0	5.0	200/-	0.5	2	85	80 <sup>2)</sup>	400	3	0.3											
				220/450	0.5	2	90	50	300	3	0.3										
	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											
	5.0	10.0	300/430	0.5	2	34	45	270	5	0.5											
	5.1	10.2	250/370	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255											
30	5.5	11.0	250/370	0.5	2	34 <sup>1)</sup>	25	265	5.5	0.275											
	6.0	7.0	230/345	0.5	2	39 <sup>1)</sup>	25	350	6	0.3											
	6.2	15.0	250/400	0.5	2	23	18	240	6	0.3											
	6.6	20.0	250/400	0.5	2	22	16	240	7	0.35											
	1.0	3.0	260/350	0.5	2	220	110	225	1	0.05											
	2.0	3.0	300/450	0.1	2	160	70	350	2	0.2											
	2.4	5.0	200/320	0.5	2	110	95	330	2	0.2											
	2.7	5.0	200/350	0.5	2	88	87	395	3	0.3											
	3.0	5.0	200/380	0.5	2	80	50	320	3	0.3											
	3.0	5.0	200/320	0.5	2	75	45	320	3	0.3											
40	4.2	10.0	200/350	0.5	2	58	70	345	4	0.4											
	4.4	10.0	200/350	0.5	2	58	70	400	4	0.2											
	5.1	10.2	250/400	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255											
	5.3	10.6	250/400	0.5	2	35 <sup>1)</sup>	25	265	5.3	0.265											
	6.0	7.0	200/335	0.5	2	39 <sup>1)</sup>	25	350	6	0.3											
	0.5	1.0	200/380	0.01	2	440	220	350	0.5	0.05											
			200/380	0.01	2	440	230	350	0.5	0.05											
	1.0	2.0	300/-	0.1	5	200	120	310	1	0.1											
			300/520	0.1	5	230	130	500	1	0.1											
	1.8	3.0	300/800	0.1	5	250	130	500	1	0.1											
300/510			0.1	5	230	130	500	1	0.1												
2.0	3.0	300/450	0.1	5	185	100	530	2	0.2												
2.0	3.0	300/-	0.1	2	200	110 <sup>2)</sup>	350	2	0.2												
		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												
		250/370	0.5	2	45	33	375	5	0.5												
5.0	10.0	250/350	0.5	2	55	40 <sup>1)</sup>	160	2	0.2												
		200/310	0.5	2	55	46	300	4	0.4												
5.0	3.0	200/-	0.5	2	150	90 <sup>2)</sup>	300	2	0.1												
		200/360	0.5	2	90	55	270	2	0.2												
2.0	5.0	200/-	0.5	2	160	90 <sup>2)</sup>	320	2	0.2												
		200/300	0.5	2	120	70	300	2	0.2												
3.0	5.0	200/375	0.5	2	120	70	390	3	0.3												
		200/300	0.5	2	120	70	300	2	0.2												
60	1.0	150/250	0.5	5	220	120	330	1	0.1												
		150/250	0.5	5	255	135	340	1	0.1												
		150/250	0.5	5	220	120	330	1	0.1												
	2.7	8.0	200/300	0.5	2	80	49	360	3	0.3											
	3.0	6.0	180/265	0.5	2	70	55	290	3	0.3											
	4.2	8.4	200/295	0.5	2	53 <sup>1)</sup>	35	310	4.2	0.21											
	4.5	9.0	200/295	0.5	2	59 <sup>1)</sup>	35	375	4.5	0.225											
	5.0	15.0	170/260	0.5	2	35 <sup>1)</sup>	35	450	5	0.25											
			200/300	0.5	2	40	30	300	5	0.5											
	5.7	15.0	200/300	0.5	2	29	22	285	6	0.3											
3.0	5.0	155/225	0.5	2	71	55	290	3	0.3												
		180/265	0.5	2	65 <sup>1)</sup>	40	420	4	0.2												
4.0	10.0	200/300	0.5	2	50	35	380	5	0.5												
		200/280	0.5	2	43	36	240	4	0.4												
4.5	9.0	200/280	0.5	2	69 <sup>1)</sup>	36	450	4.5	0.225												
100	1.0	150/-	0.25	5	170	93	320	1	0.1												
		150/350	0.5	5	170	95	320	1	0.1												
		150/350	0.5	5	170	100	320	1	0.1												
		150/350	0.5	5	170	90	320	1	0.1												
		150/-	0.5	5	170	90	320	1	0.1												
2.0	3.0	175/275	0.5	2	88	65	250	2	0.2												
2.7	4.0	180/295	0.5	2	110 <sup>1)</sup>	45	450	2.7	0.135												
3.7	7.4	200/300	0.5	2	52	45	300	4	0.4												
4.1	8.2	200/300	0.5	5	57	45	325	4.1	0.41												

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub> = 20  
<sup>2)</sup> V<sub>CEsat</sub> (max)  
<sup>3)</sup> optimized for high speed switching

In the Spotlight

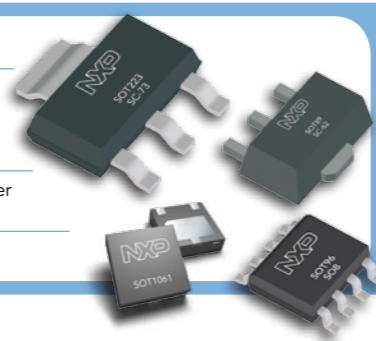
**New low  $V_{CEsat}$  (BISS) transistors**

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 SOT1061 (2 x 2 x 0.65 mm)

Benchmark for reduced on-state-resistance



**Low  $V_{CEsat}$  (BISS) double transistors**

Package		SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666					
Size (mm)		4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55					
P <sub>tot</sub> (mW)		2000 <sup>2)</sup>	750	430	500					
V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	Polarity	h <sub>FE</sub> min	@ I <sub>C</sub> (A)	@ V <sub>CE</sub> (V)	V <sub>CEsat</sub> typ (mV); I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)	
15	0.5	2 x NPN	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515VS
		2 x PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS3515VS
		NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515VPN
		NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05	PBSS2515YPN
20	7.5	NPN/NPN	300	0.5	2	15	150	4	0.2	PBSS4021SN
		PNP/PNP	250	0.5	2	24	225	4	0.2	PBSS4021SP
		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 <sup>3)</sup>
		PNP/PNP	200	0.5	2	70	390	4	0.4	PBSS4032SP <sup>3)</sup>
		NPN/PNP	300/200	0.5	2	57/70	250/390	4	0.4	PBSS4032SPN <sup>3)</sup>
40	1.0	NPN/PNP	300/250	0.5	5	130/150	500	1	0.1	PBSS4140DPN
		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	

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub>=20

<sup>2)</sup> Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

<sup>3)</sup> Optimized for high speed switching

**Low  $V_{CEsat}$  (BISS) load switches**

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

<sup>1)</sup> Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

<sup>2)</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint

**Key features**

- ▶ Low  $V_{CEsat}$  (BISS) transistor and resistor-equipped transistor (RET) in one package
- ▶ Low saturation voltage
- ▶ Low 'threshold' voltage (<1 V) compared to MOSFET
- ▶ Low drive power required
- ▶ Range of small, very small and ultra small packages

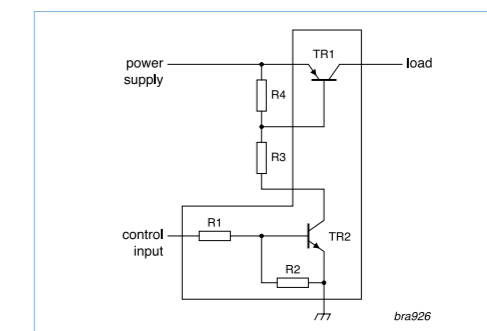
**Key benefits**

- ▶ Smaller end products
- ▶ Reduced component count
- ▶ Less sourcing effort
- ▶ Fewer solder points increase reliability
- ▶ Cost reduction
- ▶ More efficient, cooler running systems

**Key applications**

- ▶ Supply line switch
- ▶ Battery charger
- ▶ High-side switch for LEDs, drivers and backlights
- ▶ Portable equipment

**BISS load switch**



## High voltage low $V_{CEsat}$ (BISS) transistors

types in **bold** represent new products

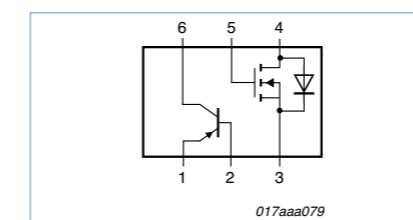
				SOT223 (SC-73)	SOT89 (SC-62)	SOT23
<b>Package</b>						
<b>Size (mm)</b>				6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
<b>P<sub>tot</sub> (mW)</b>				1700	1300	250
Polarity	$V_{CESM}^{1)}$	$V_{CEO}$ (V)	$I_C$ (A)			
NPN	-	150	1	PBHV8115Z		PBHV8115T
			2	PBHV8215Z		
		180	1			<b>PBHV8118T</b>
	500	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		

<sup>1)</sup> Collector-emitter peak voltage

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

types in **bold** represent new products

											SOT1118
<b>Package</b>											
<b>Size (mm)</b>											2.0 x 2.0 x 0.65
<b>P<sub>tot</sub> (mW)</b>											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	<b>PBSM5240PF</b>



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

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

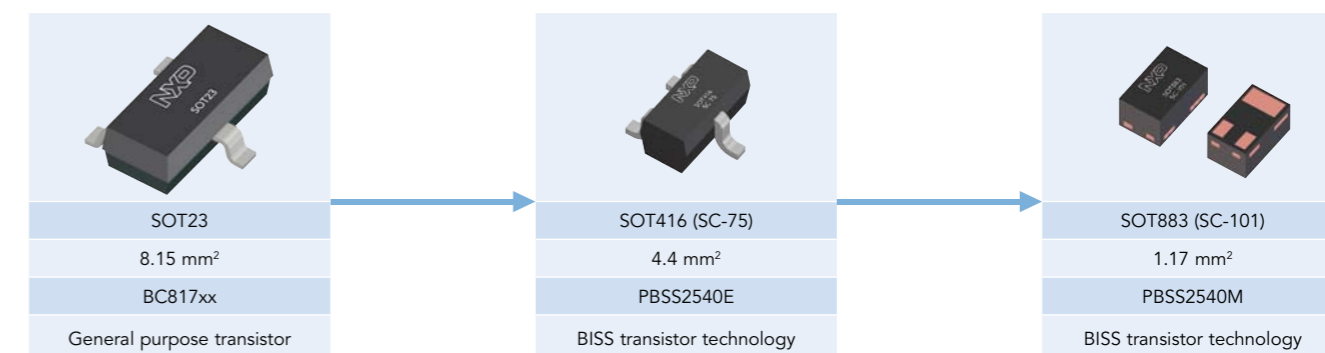
					SOT23	
<b>Package</b>						
<b>Size (mm)</b>					2.9 x 1.3 x 1.0	
<b>P<sub>tot</sub> (mW)</b>					250	
$V_{CEO}$ (V)	$I_C$ (mA)		R1 (kΩ)	R2 (kΩ)	NPN	PNP
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET
			2.2	2.2	PBRN123ET	PBRP123ET
		R1 ≠ R2	1	10	PBRN113ZT	PBRP113ZT
			2.2	10	PBRN123YT	PBRP123YT

## 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:

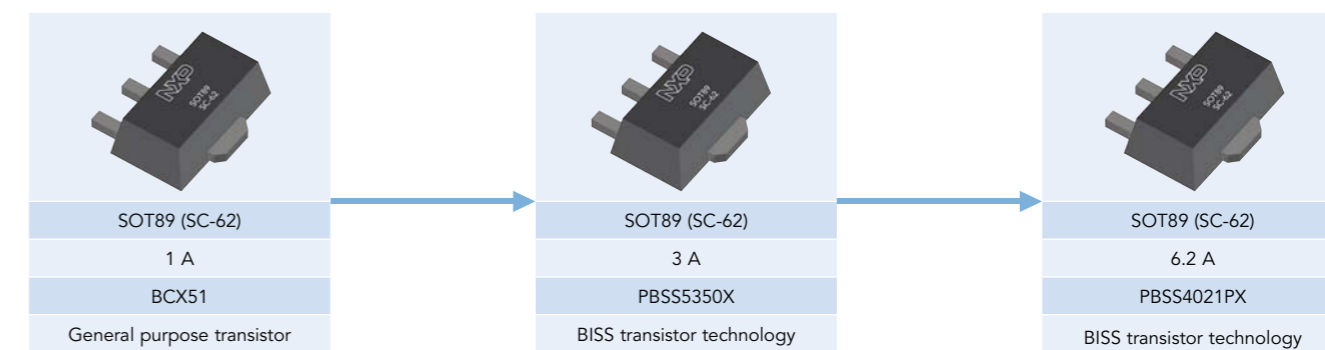
### Reduction in board space

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





### Improved collector current capabilities

- 17.87 mm² footprint

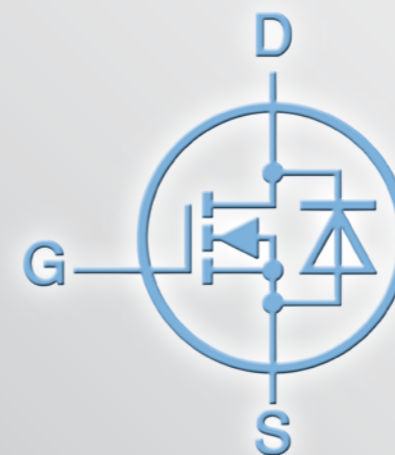


## High voltage bipolar transistors for lighting, SMPS and industrial applications

types in **bold** represent new products

$V_{CESM}$ (V)	$I_{C(DC)}$ (max) (A)	25 °C ind. $t_f$ (typ) (ns)	@ $I_C$ (A)	$h_{FE}$ (typ)	@ $I_C$ (A)	SOT54 (TO92)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)
										
700	1	80	1	7.5	0.8	BUJ100LR				
	1	80	1	7.5	0.8	PHE13003A				
	1	50	1	14	0.75	BUJ100				
	1.5	100	0.5	9	1	PHE13003C				
	1.5	100	0.5	9	1	PHD13003C <sup>1)</sup>				
	4	30	2	12.5	3		BUJ103A	BUJ103AX		BUJ103AD
	4	30	2	12.5	3					BUJD103AD <sup>1)</sup>
	4	100	2	17	2		PHE13005	PHE13005X		
	4	100	2	17	2		PHD13005 <sup>1)</sup>			
	8	20	5	11	4		BUJ105A		BUJ105AB	BUJ105AD
	8	20	5	11	4					BUJD105AD <sup>1)</sup>
	8	40	5	9	5		PHE13007			
	10	20	5	11	6		BUJ106A			
12	100	5	6 min - 30 max	8		PHE13009				
850	4	30	2	12.5	3		<b>BUJD203A<sup>1)</sup></b>	<b>BUJD203AX<sup>1)</sup></b>		<b>BUJD203AD<sup>1)</sup></b>
1000	5	145	2.5	12	3		BUJ303A	<b>BUJ303AX</b>		<b>BUJ303AD</b>
1050	4	520	2	41	0.8		<b>BUJ302A</b>	<b>BUJ302AX</b>		<b>BUJ302AD</b>
	5	200	2.5	10.5	3		BUJ303B			
1200	6	170	2.5	15.5	3		BUJ403A			

<sup>1)</sup> Integrated freewheeling diode



## MOSFETs

### Small-signal MOSFETs

70

- Small-signal MOSFETs single (N-channel) < 50 V
- Small-signal MOSFETs single (N-channel) ≥ 50 V
- Small-signal MOSFETs dual (N-channel)
- Small-signal MOSFETs single (P-Channel)
- Small-signal MOSFET – Schottky combination
- Small-signal MOSFETs dual (P-channel)

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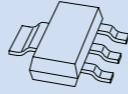
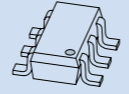





### Power MOSFETs

77

- 12 V - 25 V N-channel MOSFETs
- 30 V N-channel MOSFETs
- 40 V - 55 V N-channel MOSFETs
- 60 V - 80 V N-channel MOSFETs
- 100 V - 110 V N-channel MOSFETs
- 150 V - 300 V N-channel MOSFETs
- P-channel MOSFETs
- Multi-chip MOSFETs

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

													SOT223 (SC-73)		TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Package																				
Size (mm)													6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P <sub>tot</sub> (mW)													1700		600	250	300	200	150	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min (V)	V <sub>GS(th)</sub> max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection (kV)	R <sub>Dson</sub> typ (mΩ) @ V <sub>GS</sub> =											
									10 V	4.5 V	2.5 V	1.8 V								
12	8	5.7	0.4	-	23	67	10.1	-	-	28	-	39					PMN28UN			
20	8	tbd	tbd	tbd	tbd	tbd	tbd	-	-	16	tbd	tbd					PMN23UN			
		6.3	2	4	23	71	10.6	-	-	23	-	37					PMN27UN			
		5.7	0.4	-	23	71	10.6	-	-	27	-	39								
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	-	28	tbd	tbd							
		5.7	0.45	-	20	66	7.4	-	-	30	-	44								
		3.76	0.65	-	35	84	5.4	-	-	56	77	-								
		2.5	0.65	-	35	84	5.4	-	-	56	77	-								
		1.05	0.4	-	6.5	65	-	-	-	140	-	240								
		2.28	0.45	0.95	14.5	23.5	0.89	-	-	250	-	420								
	1	0.45	1	14.5	23.5	0.89	-	-	280	-	460									
	12	tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	-	30	tbd	-							
		5.9	0.5	1.5	25	37	5.8	-	-	31	44	-								
		2.15	0.5	1.5	16	17	0.72	-	-	270	440	-								PMZ250UN
		1	0.5	1.5	16	17	0.72	-	-	290	460	-								
	15	5.7	1	2	24	35	13.1	-	28	34	-	-								
4.1		1	2	24	35	13.1	-	55	70	-	-									
30	8	4.9	0.45	-	22	60	9.9	-	-	38	-	54								
		4.9	0.45	-	18	50	9.3	-	-	40	-	55								
		1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550								PMZ390UN
		0.85	0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>								
		0.8	0.45	1	11.5	22.5	0.89	-	-	400	-	580								
	12	tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	-	20	tbd	-							
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	-	250	tbd	-							
		1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-								PMZ350XN
		0.87	0.35	-	16	19.5	-	-	-	370	550	-								
	20	0.9	0.5	-	16	19.5	0.65	-	-	370	550	-								
		5.4	1	2	12	27	13.8	-	32	40	-	-								
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	15	tbd	-							
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	18	tbd	-							
		10	1	2.8	18	44	24	-	20	30	-	-								
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	31	tbd	-							
tbd		tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	35	tbd	-								
5.4		1	2	33	44	6.1	-	31	38	-	-									
5.2		1	2	33	44	6.1	-	32	42	-	-									
5.4		1	2	12	21.5	9.4	-	35	45	-	-									
15	4.6	1	2	8.4	17.8	8.8	-	40	49	-	-									
	4.7	1	2	12	23.5	9.4	-	47	60	-	-									
	1.9	1	2	11	41	6.4	-	77	102	-	-									
	2.5	1.5	-	12	23.5	4.6	-	74	117	-	-									
	6	1	2.8	14	36	-	-	80	120	-	-									
1.7	1.5	-	11.5	31	4.6	-	117 <sup>2)</sup>	190 <sup>2)</sup>	-	-										

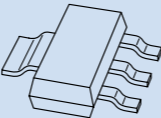
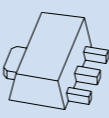




<sup>1)</sup> Enhanced thermal capability

<sup>2)</sup> Max values

\* Products to be released in 2011. For new product information, please check <http://standardproducts.nxp.com/mosfets>

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

types in **bold** represent new products


													SOT223 (SC-73)		SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Package																			
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
P <sub>tot</sub> (mW)													1700		1300	250	200	150	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on typ</sub> (ns)	t <sub>off typ</sub> (ns)	Q <sub>G typ</sub> (nC)	ESD protection (kV)	R <sub>DSon typ</sub> (mΩ) @ V <sub>GS</sub> =										
									10 V	4.5 V	2.5 V	1.8 V							
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 <sup>3)</sup>	-	-							
55	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100							
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100							
	13	2.5	2	4	-	-	-	-	2	120	-	-	-						
3.5		1	2	-	-	-	-	2	-	65	-	-							
2.5		1	2	-	-	-	-	2	-	120	-	-							
60	15	0.26	1	3.3	3	9	-	1	2800	3800	-	-							
	20	0.25	0.8	3	-	-	-	-	-	2500	-	-	-						
		0.36	0.9	1.5	5	13	0.72	-	-	900	1000	-	-						
		1.22	1	3	6	7.2	1.05	-	-	760	1100	-	-						
		0.57	1	-	6	7.2	-	-	-	780	1100	-	-						
		0.55	1	3	6	7.2	1.05	-	-	780	1100	-	-						
	30	0.3	1	2.5	7	15	0.6	-	-	1000	1300	-	-						
		0.3	1	2.5	11	19	0.5	2	-	1000	1300	-	-						
		0.3	1	2.5	16	60	1.09	3	-	1100	1300	-	-						
		0.34	1	-	3	9	-	1	-	2800	3800	-	-						
		0.385	1	2.5	2.5	11	0.69	-	-	780	1200	-	-						
	100	16	0.475	1	2.5	2.5	11	0.69	-	780	1200	-	-						
0.3			1	2.5	2.5	11	-	-	2800	3800	-	-							
0.3			1	2.5	2.5	11	-	-	2800	3800	-	-							
20		3.5	1	2	14	73	-	-	-	200	-	-	-						
		3	2	4	-	-	-	-	-	57	-	-	-						
		3.5	2	4	21	31	7.4	-	-	200	-	-	-						
		0.85	2	4	19	13	4.6	-	-	400	-	-	-						
30	0.15	1	2.8	3	12	-	-	-	3500	-	-	-							
	0.19	1	-	3	12	-	-	-	-	5000	-	-							
	0.52	1	-	3	12	-	-	-	-	5000	-	-							
200	20	1.9	2	4	10.5	12.5	7	-	213	-	-	-							
240	20	0.4	0.8	2.8	6	49	-	-	1600	-	-	-							
		0.55	0.4	2	10	45	-	-	1700	-	3000	-							
240	20	0.375	0.8	2	6	47	-	-	2800	7500 <sup>2)</sup>	-	-							
250	20	0.35	0.8	2	6	47	-	-	2800	-	-	-							
300	20	0.35	0.8	2	6	46	-	-	3700	-	4800	-							

<sup>1)</sup> Enhanced thermal capability  
<sup>2)</sup> Max values  
<sup>3)</sup> @ V<sub>GS</sub> = 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 (N-channel)

types in **bold** represent new products

Package										SOT363 (SC-88)	SOT666 (SC-88)		
Size (mm)										2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55		
P <sub>tot</sub> (mW)										300	300		
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>b</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>g</sub> typ (nC)	ESD protection (kV)	R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =				
									10 V	4.5 V	2.5 V	1.8 V	
20	8	0.87	0.45	1	14.5	23.5	-	-	-	280	-	460	PMGD280UN
	12	0.86	0.5	1.5	16	17	0.72	-	-	290	460	-	PMGD290XN
30	8	0.71	0.45	1	11.5	22.5	0.89	-	-	400	-	580	PMGD400UN
	12	0.74	0.5	1.5	17	19.5	0.65	-	-	370	550	-	PMGD370XN
	15	0.125	0.8	1.5	17	22	0.35	-	-	1800	2900	-	PMGD8000LN
60	20	0.49	1	-	6	7.2	1.05	-	-	780	1100	-	PMGD780SN
		0.36	0.9	1.5	5	13	0.72	-	-	900	1000	-	<b>BSS138PS</b>
		0.3	1	2.5	7	15	0.6	-	-	1000	1300	-	<b>2N7002PS</b>
		0.3	1	2.5	11	19	0.5	2	-	1000	1300	-	<b>2N7002BKS</b>

**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<sub>DS(on)</sub> rated for Low Voltage Gate Drive



Small-signal MOSFETs single (P-channel)

types in **bold** represent new products

Package										SOT223 (SC-73)	SOT89 (SC-62)	TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Size (mm)										6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P <sub>tot</sub> (mW)										1700	1300	600	250	300	200	150	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>b</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>g</sub> typ (nC)	ESD protection (kV)	R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =								
									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 <sup>1)</sup>				
20	8	tbd	tbd	tbd	tbd	tbd	tbd	-	-	21	tbd	tbd	PMN21UP*				
		tbd	tbd	tbd	tbd	tbd	tbd	-	-	27	tbd	tbd	PMN27UP*				
		2	0.5	1.1	7	50	6	-	-	100	-	-	<b>NX2301P</b>				
	12	4.8	0.55	0.95	16	117	10	-	-	48	65	-	PMN50XP				
		3.5	0.75	1.25	24	84	8.5	-	-	48	71	-	PMN48XP*				
		3.9	0.55	0.95	28	101	7.6	-	-	65	90	-	PMV65XP <sup>1)</sup>				
3.5	0.75	1.25	tbd	tbd	tbd	-	-	85	tbd	tbd	-	PMG85XP*					
3.5	0.75	1.25	tbd	tbd	tbd	-	-	170	tbd	tbd	-	PMF170XP*					
30	8	0.47	0.4	-	6.5	65	-	-	-	660	-	1100	BSH203				
		3	1	2.8	20	50	-	-	220	330	-	-	BSP250				
		0.52	1	-	6.5	65	-	-	630	890	-	-	BSH202				
50	20	0.2	tbd	tbd	tbd	tbd	tbd	1	5300	6000	-	-	BSS84AK*				
		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 <sup>2)</sup>	-	-	-	BSP230				

<sup>1)</sup> Enhanced thermal capability

<sup>2)</sup> Max values

\* Products to be released in 2011. For new product information, please check <http://standardproducts.nxp.com/mosfets>

### Small-signal MOSFET – Schottky combination

types in **bold** represent new products

Package														SOT1118		
Size (mm)														2.0 x 2.0 x 0.65		
P <sub>tot</sub> (mW)														1250		
Configuration	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on typ</sub> (ns)	t <sub>off typ</sub> (ns)	Q <sub>G typ</sub> (nC)	ESD protection (kV)	I <sub>F</sub> (A)	V <sub>R</sub> (V)	V <sub>F typ.</sub> (mA)	R <sub>DSon typ</sub> (mΩ) @ V <sub>GS</sub> =			
													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	<b>PMFPB6545UP</b>
			3.3	0.5	1.5	15	92	4.5	1	2.2	30	325	58	72	100	<b>PMFPB6532UP</b>

### Small-signal MOSFETs dual (P-channel)

types in **bold** represent new products


Package														SOT363 (SC-88)	SOT666 (SC-88)	SOT1118
Size (mm)														2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	2.0 x 2.0 x 0.65
P <sub>tot</sub> (mW)														300	300	1250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on typ</sub> (ns)	t <sub>off typ</sub> (ns)	Q <sub>G typ</sub> (nC)	ESD protection (kV)	R <sub>DSon typ</sub> (mΩ) @ V <sub>GS</sub> =							
									10 V	4.5 V	2.5 V	1.8 V				
20	8	3.3	0.5	1.5	15	92	4.5	1	-	58	72	100				<b>PMDPB65UP</b>
50	20	0.2	tbd	tbd	tbd	tbd	tbd	1	5300	6000	-	-	BSS84AKS*	BSS84AKV*		

\* Products to be released in 2011. For new product information, please check <http://standardproducts.nxp.com/mosfets>

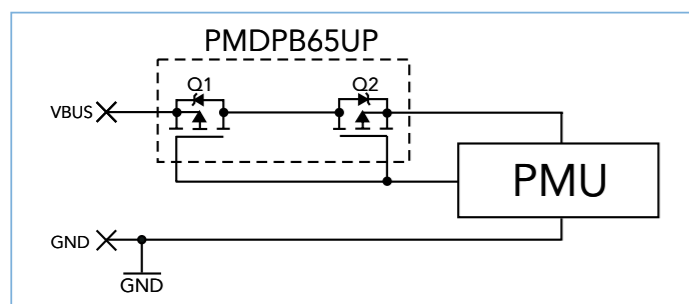
**In the Spotlight**

**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<sub>DSon</sub> of <70 mΩ at V<sub>GS</sub> = 4.5 V
- 1.8 V R<sub>DSon</sub> 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



### USB OTG Vbus protection



### 12 V - 25 V N-channel MOSFETs

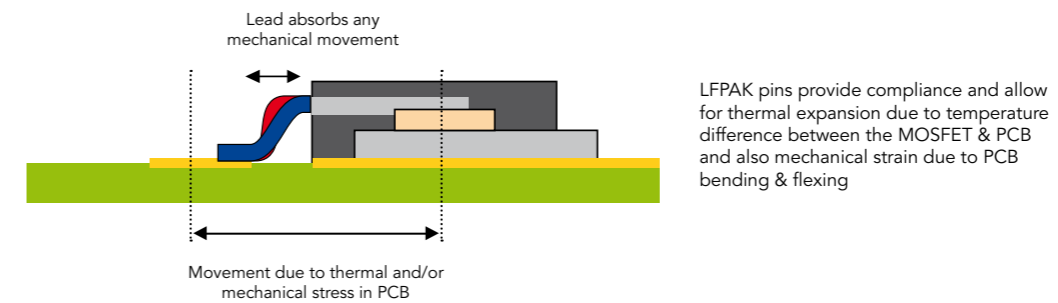
types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g[total]</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PHB66NQ03LT	25	10.5	-	66	12
DPAK (SOT428)	PHD38N02LT	20	-	-	44.7	15.1
	PHD97NQ03LT	25	6.3	10.6	75	11.7
IPAK (SOT533)	PHU97NQ03LT	25	6.6	-	75	-
	PH2520U	20	-	2.7	100	78
Power-SO8 (LFAK)	PH3120L	20	2.65	3.7	100	48.5
	PH2925U	25	-	3	100	92
	<b>PSMN1R2-25YL</b>	25	1.2	1.85	100	50.6
	<b>PSMN1R5-25YL</b>	25	1.5	2.2	100	36
SO8 (SOT96-1)	PHKD6N02LT	20	-	-	10.9	15.3
	PSMN006-20K	20	-	5	32	32

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

### LFAK for mechanical & thermal ruggedness

#### NXP LFAK





### 30 V N-channel MOSFETs

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
DPAK (SOT428)	PHD71NQ03LT	30	10	-	75	13.2
	PHD36N03LT	30	17	22	43.4	18.5
Power-SO8 (LFPACK)	<b>PSMN1R0-30YLC</b>	30	1.15	1.4	100	50
	<b>PSMN1R3-30YL</b>	30	1.3	1.95	100	46.6
	<b>PSMN1R5-30YL</b>	30	1.5	1.9	100	36.2
	<b>PSMN1R7-30YL</b>	30	1.7	2.1	100	36.2
	<b>PSMN2R0-30YL</b>	30	2	2.63	100	30
	<b>PSMN2R5-30YL</b>	30	2.4	3.16	100	27
	<b>PSMN3R0-30YL</b>	30	3	4.04	100	21
	<b>PSMN3R5-30YL</b>	30	3.5	4.61	100	19
	<b>PSMN4R0-30YL</b>	30	4	5.25	100	17.6
	<b>PSMN4R5-30YLC</b>	30	4.8	6.1	84	9.6
	<b>PSMN5R0-30YL</b>	30	5	6.7	91	14.1
	<b>PSMN6R0-30YL</b>	30	6	7.87	79	11
	<b>PSMN7R0-30YL</b>	30	7	9.1	76	10
<b>PSMN9R0-30YL</b>	30	8	11.03	61	8.7	
QFN3333 (SOT873-1)	<b>PSMN3R5-30LL</b>	30	3.6	5.6	40	18
	<b>PSMN3R8-30LL</b>	30	3.7	5.8	40	38
	<b>PSMN5R8-30LL</b>	30	5.8	8	40	24
	<b>PSMN9R0-30LL</b>	30	9	13	21	20.6
	<b>PSMN013-30LL</b>	30	13	19	21	12.2
SO8 (SOT96-1)	PHK12NQ03LT	30	-	14	11.8	-
	<b>PSMN3R2-30KL</b>	30	3.5	3.8	30	70.3
	PHK31NQ03LT	30	4.4	-	30.4	-
	<b>PSMN005-30K</b>	30	5.5	8	-	34
	PHK28NQ03LT	30	6.5	7.7	23.7	30.3
	PHK18NQ03LT	30	8.9	-	20.3	-
	SI4410DY	30	13.5	20	10	21.5
	PHK13N03LT	30	20	26	13.8	10.7
	PHKD13N03LT	30	20	26	10.4	10.7
	PHN203	30	30	55	6.3	14.6
TO-220AB (SOT78)	PHN210T	30	100	200	3.4	-
	<b>PSMN1R6-30PL</b>	30	1.7	2.1	100	101
	<b>PSMN1R8-30PL</b>	30	1.8	2.3	100	83
	<b>PSMN2R0-30PL</b>	30	2.1	2.8	100	55
	<b>PSMN2R7-30PL</b>	30	2.7	3.6	100	32
	<b>PSMN3R4-30PL</b>	30	3.4	4.1	100	31
	<b>PSMN4R3-30PL</b>	30	4.3	6.2	100	19
PHP36N03LT	30	17	22	43.4	18.5	
<b>PSMN022-30PL</b>	30	22	34	30	4.4	

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

### 40 V - 55 V N-channel MOSFETs

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PHB191NQ06LT	55	3.7	4.4	75	95.6
	PHB21N06LT	55	70	-	19	-
	PHB20N06T	55	75	-	20.3	11
DPAK (SOT428)	PHD20N06T	55	77	-	18	11
Power-SO8 (LFPACK)	<b>PSMN2R6-40YS</b>	40	2.8	-	100	63
	<b>PSMN3R3-40YS</b>	40	3.3	-	100	49
	<b>PSMN4R0-40YS</b>	40	4.2	-	100	38
	<b>PSMN5R8-40YS</b>	40	5.7	-	90	28.8
	<b>PSMN8R3-40YS</b>	40	8.6	-	70	20
	<b>PSMN014-40YS</b>	40	14	-	46	12
QFN3333 (SOT873-1)	<b>PSMN7R0-40LS</b>	40	7	-	40	21.4
TO-220AB (SOT78)	<b>PSMN2R2-40PS</b>	40	2.1	-	100	110
	<b>PSMN2R8-40PS</b>	40	2.8	-	100	71
	<b>PSMN4R5-40PS</b>	40	4.6	-	100	35
	<b>PSMN8R0-40PS</b>	40	7.6	-	77	17
	PHP191NQ06LT	55	3.7	4.4	75	95.6
	PHP20N06T	55	75	-	20.3	11

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

#### Part numbering for PSMN types

P	S	M	N	1	R	7	-	3	0	Y	S
MOSFET Brand name		MOSFET type N -ch or P -ch		MOSFET on - resistance R <sub>DSon</sub>			-	MOSFET voltage BV <sub>DSS</sub>		Package type	Gate threshold voltage
Power Silicon Max		N = N -ch		R95 = 0.95 mΩ			-	25 = 25 V		B = D <sup>2</sup> PAK SOT404	X = Extremely low
		P = P -ch		1R7 = 1.7 mΩ			-	30 = 30 V		D = DPAK SOT428	L = logic level
		X = Dual N -ch		014 = 14 mΩ			-	40 = 40 V		E = I <sup>2</sup> PAK SOT226	S = standard level
		X = Dual P -ch		125 = 125 mΩ			-	60 = 60 V		K = SO8 SOT96	
		Z = N -ch + P -ch					-	80 = 80 V		L = QFN3333 SOT873	
							-	100 = 100 V		P = TO220 SOT78	
							-	110 = 110 V		Y = LFPACK SOT669 & SOT1023	

### 60V - 80V N-channel MOSFETs

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN004-60B	60	3.6	75	168
	PHB32N06LT	60	37	34	17
	PHB29N08T	75	-	27	19
	PSMN005-75B	75	5	75	165
	PSMN008-75B	75	8.5	75	122.8
	PHB110NQ08T	75	9	75	113.1
Power-SO8 (LFPAK)	<b>PSMN5R5-60YS</b>	60	5.2	100	56
	<b>PSMN7R0-60YS</b>	60	6.4	89	45
	<b>PSMN8R5-60YS</b>	60	8	76	39
	<b>PSMN012-60YS</b>	60	11.1	59	28.4
	<b>PSMN017-60YS</b>	60	15.7	44	20
	<b>PSMN030-60YS</b>	60	24.7	29	13
	<b>PSMN8R2-80YS</b>	80	8.5	82	55
	<b>PSMN011-80YS</b>	80	11	67	45
	<b>PSMN013-80YS</b>	80	12.9	60	37
	<b>PSMN018-80YS</b>	80	18	45	26
	<b>PSMN026-80YS</b>	80	27.5	34	20
QFN3333 (SOT873-1)	<b>PSMN014-60LS</b>	60	14	40	19.6
	<b>PSMN023-80LS</b>	80	23	34	21
TO-220AB (SOT78)	<b>PSMN3R0-60PS</b>	60	3	100	130
	<b>PSMN4R6-60PS</b>	60	4.6	100	70.8
	<b>PSMN7R6-60PS</b>	60	7.8	92	38.7
	<b>PSMN015-60PS</b>	60	14.8	50	20.9
	PHP29N08T	75	-	27	19
	PSMN008-75P	75	8.5	75	122.8
	PHP79NQ08LT	75	16	73	30
	<b>PSMN4R4-80PS</b>	80	4.1	100	112
	<b>PSMN5R0-80PS</b>	80	4.7	100	87
	<b>PSMN6R5-80PS</b>	80	6.9	100	71
	<b>PSMN8R7-80PS</b>	80	8.7	90	52
	<b>PSMN012-80PS</b>	80	11	74	36
	<b>PSMN017-80PS</b>	80	17	50	26
	<b>PSMN050-80PS</b>	80	46	22	9

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

### 100V - 110V N-channel MOSFETs

types in **bold** represent new products

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN009-100B	100	8.8	75	156
	PSMN015-100B	100	15	75	90
	PHB45NQ10T	100	25	47	61
	PHB47NQ10T	100	28	47	66
	PHB27NQ10T	100	50	28	-
	PHB18NQ10T	100	90	18	-
DPAK (SOT428)	PSMN025-100D	100	25	47	61
I <sup>2</sup> PAK (SOT226)	<b>PSMN7R0-100ES</b>	100	6.8	100	125
	<b>PSMN013-100ES</b>	100	13.9	68	59
Power-SO8 (LFPAK)	<b>PSMN012-100YS</b>	100	12	60	64
	<b>PSMN016-100YS</b>	100	16.3	51	54
	<b>PSMN020-100YS</b>	100	20.5	43	41
	<b>PSMN028-100YS</b>	100	27.5	42	33
	<b>PSMN039-100YS</b>	100	39.5	28.1	23
	<b>PSMN069-100YS</b>	100	72.4	17	14
QFN3333 (SOT873-1)	<b>PSMN035-100LS</b>	100	32	27	23
SO8 (SOT96-1)	PHK12NQ10T	100	28	11.6	35
	PSMN038-100K	100	38	-	43
	PHKD3NQ10T	100	90	3	-
TO-220AB (SOT78)	<b>PSMN5R6-100PS</b>	100	5.6	100	141
	<b>PSMN7R0-100PS</b>	100	6.8	100	125
	PSMN009-100P	100	8.8	75	156
	<b>PSMN9R5-100PS</b>	100	9.6	89	82
	<b>PSMN013-100PS</b>	100	13.9	68	59
	PSMN015-100P	100	15	75	90
	PSMN015-110P	110	15	75	90
	<b>PSMN016-100PS</b>	100	16	96	49
	PHP45NQ10T	100	25	47	61
	PHP45NQ11T	105	25	47	60
	<b>PSMN027-100PS</b>	100	26.8	37	30
	<b>PSMN034-100PS</b>	100	34.5	32	23.8
	PHP27NQ11T	110	50	27.6	30
	PHP23NQ11T	110	70	23	22
	PHP18NQ10T	100	90	18	-
	PHP18NQ11T	110	90	18	21

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

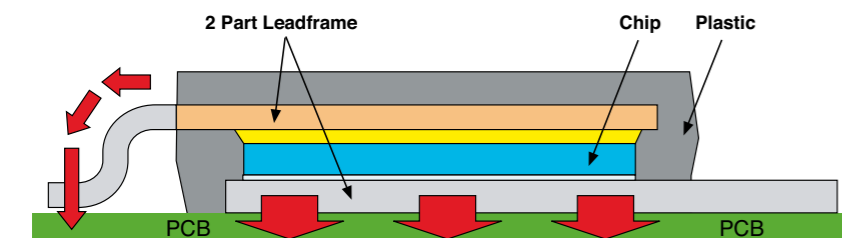
### 150V - 300V N-channel MOSFETs

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
D <sup>2</sup> PAK (SOT404)	PSMN030-150B	150	30	55.5	-
	PSMN035-150B	150	35	50	79
	PHB45NQ15T	150	42	45.1	32
	PSMN057-200B	200	57	39	-
	PSMN070-200B	200	70	35	-
	PHB33NQ20T	200	77	32.7	32.2
	PHB20NQ20T	200	130	20	-
DPAK (SOT428)	PSMN063-150D	150	63	29	55
	PSMN130-200D	200	130	20	-
	PHD9NQ20T	200	400	8.7	-
Power-SO8 (LFAK)	PSMN059-150Y	150	59	43	-
	PSMN102-200Y	200	102	21.5	-
QFN3333 (SOT873-1)	PML260SN	200	294	8.8	13.3
	PML340SN	220	386	7.3	13.2
SO8 (SOT96-1)	PHK5NQ15T	150	75	5	29
	PSMN085-150K	150	85	-	40
	PSMN165-200K	200	165	-	40
TO-220AB (SOT78)	PSMN030-150P	150	30	55.5	-
	PSMN035-150P	150	35	50	79
	PHP30NQ15T	150	63	29	55
	PHP28NQ15T	150	65	28.5	24
	PSMN057-200P	200	57	39	-
	PSMN070-200P	200	70	35	-
	PHP33NQ20T	200	77	32.7	32.2
	PHP20NQ20T	200	130	20	-
	PHP9NQ20T	200	400	8.7	-

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

### Power-SO8 (LFAK) Design

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



### P-channel MOSFETs

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
SO8 (SOT96-1)	PHK04P02T	-16	-	120	-4.66	-
	PMK50XP	-20	-	50	-7.9	10
	PMK30EP	-30	19	30	-14.9	50
	PMK35EP	-30	19	35	-14.9	42
	PHP225	-30	250	-	-	-

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

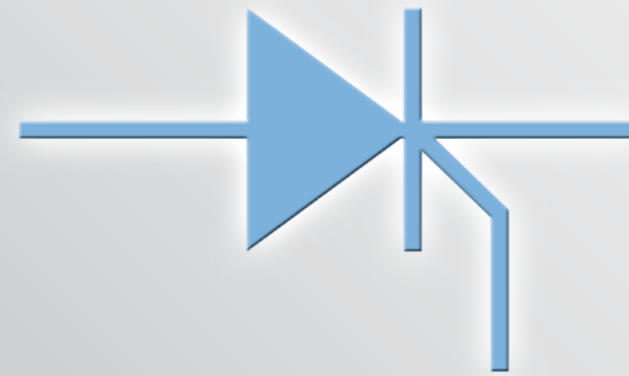
### Multi-chip MOSFETs

Package	Typenumber	V <sub>DS</sub> [max] (V)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ)	R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ)	I <sub>D</sub> [max] (A)	Q <sub>g(tot)</sub> [typ] (nC)
SO8 (SOT96-1)	PHKD6N02LT	20	-	20 @ 5 V	10.9	dual N-channel
	PHKD13N03LT	30	20	26	10.4	dual N-channel
	PHN203	30	30	-	6.3	dual N-channel
	PHC21025	30, -30	100, 250	-	3.5, -2.3 @ 80 °C	complementary pair
	PHP225	-30	250	-	-2.3 @ 80 °C	dual P-channel
	PHKD3NQ10T	100	90	-	3	dual N-channel

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

### Part numbering for PH types

P	H	P	4	4	N	Q	0	3	L	T
MOSFET Brand name	Package type	Current rating I <sub>D</sub> (A)	MOSFET type N-ch or P-ch	Q-Trench	MOSFET voltage V <sub>DSS</sub>	Gate threshold voltage	Trench MOS			
PH	B = D <sup>2</sup> PAK	44 = 44 A	N = N-ch	Q = low gate charge Q <sub>GD</sub>	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					











## Thyristors

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


### 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 <sup>2</sup> PAK)	SOT428 (DPAK)
										
0.6	400	5/5/5/7	MAC97A6							
	600	5/5/5/7	MAC97A8							
	400 / 600	5/5/5/7	BT1306-D							
0.8	400 / 600	5/5/5/7	BT1308-D					BT1308W-D		
	600	5/5/5/7	Z00607MA							
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	<b>Z0103MA0/NA0**</b>					<b>Z0103MN0/NN0**</b>		
	600 / 800	5/5/5/7	<b>Z0107MA0/NA0**</b>					<b>Z0107MN0/NN0**</b>		
	600 / 800	10/10/10/10	<b>Z0109MA0/NA0**</b>					<b>Z0109MN0/NN0**</b>		
4	600	D/E/-/G								
	800	E/-						BT134		
	600	D/-		BT136				BT136X		BT136S
	600	F						BT136X		BT136S
	600 / 800	E		BT136				BT136X	BT136B	BT136S
	800	F						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						BT137X	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							

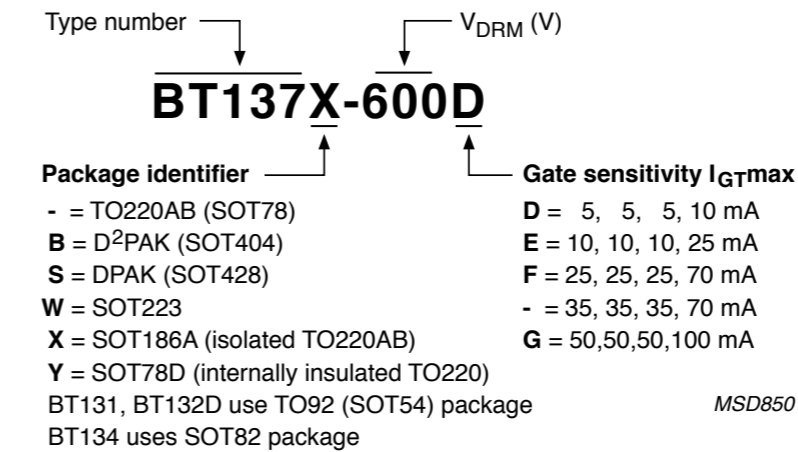
\* Large chip / high  $I_{TSM}$   
 \*\* Enhanced immunity to false triggering

### 4-Quadrant Triacs

$I_{T(RMS)}$ (A)	$V_{DRM}$ (V)	$I_{GT}$ (max) (mA)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D <sup>2</sup> PAK)
					
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
20	600	50/50/50/75		MAC223A8X	
	600 / 800	-	BTA140		








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

#### 4-Quadrant Triacs part numbering



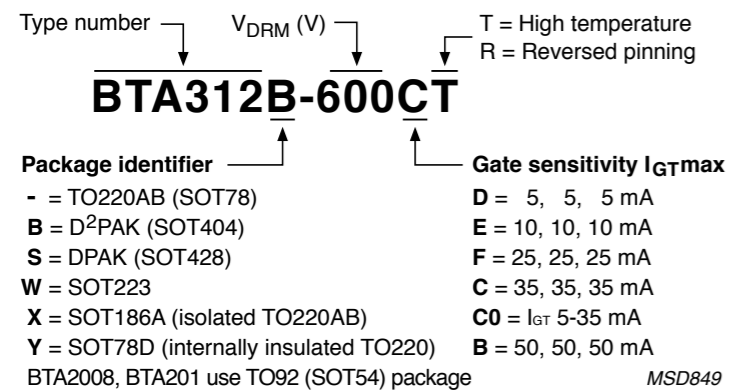
### 3-Quadrant Triacs

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 <sup>2</sup> PAK)	SOT428 (DPAK)
									
0.8	600 / 800	D/E	BTA2008						
1	600 / 800	B/E/ER	BTA201						
	600 / 800	E					BTA201W		
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				<b>BTA204X</b>			<b>BTA204S</b>
8	600	B/D/E/F		BTA208		BTA208X			BTA208S
	800	B/E		BTA208		BTA208X			BTA208S
	800	F		<b>BTA208</b>		BTA208X			<b>BTA208S</b>
	1000	B				BTA208X			
	1000	C				BTA208X		BTA208B	
	1000	5 min - 35 max				BTA208X-1000C0			
12	600	D		BTA312		BTA312X			BTA312B
	600	CT		BTA312					BTA312B
	600 / 800	B/C/E		BTA312		BTA312X			BTA312B
	600 / 800	C			BTA312Y				
	800	ET		BTA312					BTA312B
16	600 / 800	B/C			BTA412Y				
	600	BT/D		BTA316					
	600 / 800	B/C/E		BTA316		BTA316X			BTA316B
	600 / 800	ET		<b>BTA316</b>					
25	800	10 min - 50 max				<b>BTA316X-800B0</b>			
	600 / 800	B/C			BTA416Y				
	600	BT		BTA225					
600 / 800	B		BTA225					BTA225B	




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

#### 3-Quadrant Triacs part numbering

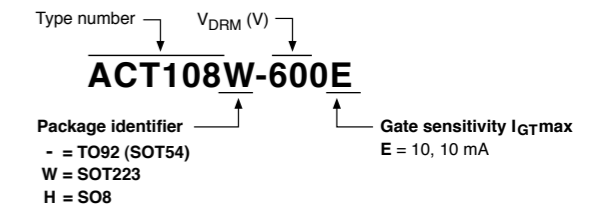


### AC Thyristors

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	<b>ACT108</b>	<b>ACT108W</b>	
	600	E	ACT108	ACT108W	

#### AC Thyristors part numbering



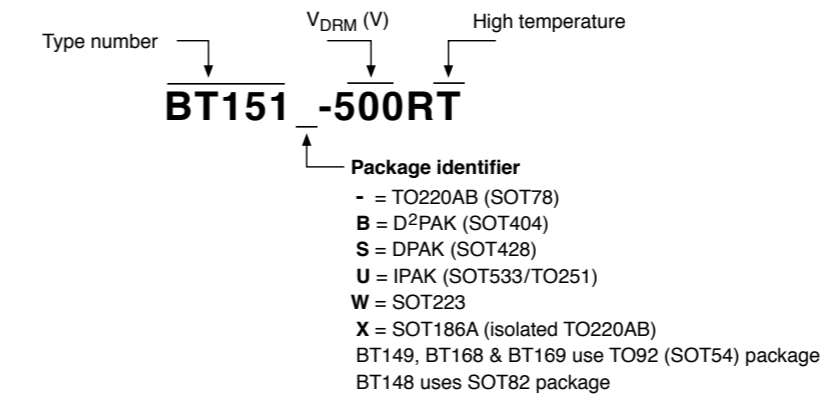
### Silicon Controlled Rectifiers

types in **bold** represent new products

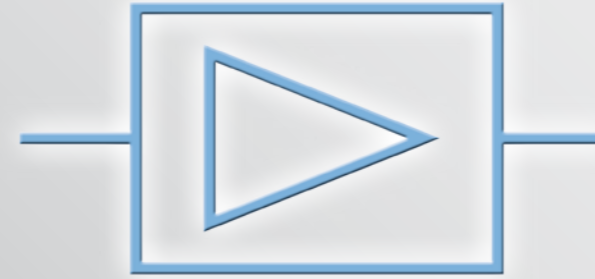
$I_{T(RMS)}$ (A)	$V_{DRM}$ & $V_{RRM}$ (V)	$I_{GT}$ (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D <sup>2</sup> PAK)	SOT428 (DPAK)	SOT533 (IPAK)
										
0.8	400	0.012	EC103D1							
	400 ( $V_{DRM}$ only)	0.2	NXL0840							
	200 / 400 / 600	0.2	BT149B/D/G							
	200 / 400 / 600	0.2	BT169B/D/G							
	400	0.05	BT169D-L							
	800	0.1	BT169H							
	500 / 600	0.02 min - 0.2 max	BT168E/G							
	200	0.2						MCR08BT1		
	600	0.02 min - 0.2 max						BT168GW		
	600	0.07 min - 0.45 max						<b>BT168GWF**</b>		
4	400 / 500 / 600	0.2			BT148-R					
	600	0.2							BT150S-R	
	500	0.2			BT150-R					
8	800	0.05							BT258S-LT	
	500 / 600 / 800	0.2			BT258-R		BT258X-R			
	600	0.2							BT258U-R	
	800	0.2							BT258S-R	
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	400 / 600 / 800	32			BT152-R		BT152X-R		BT152B-R	
	500	32			BT152-RT					
	800	35			BT145-R					

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

#### SCRs part numbering



MSD848



## Standard & advanced linear products

Adjustable shunt voltage regulator TL431 92

Adjustable shunt voltage regulator TLVH431 93

Discrete voltage regulator / Constant current source 94

Low-dropout regulator 95

Advanced linear ultra low-dropout voltage regulators 96

## Adjustable shunt voltage regulator TL431

types in **bold** represent new products

Package				SOT23		
Size (mm)				2.9 x 1.3 x 1.0		
P <sub>tot</sub> (mW)				580		
Pinning configuration				Normal pinning*	Mirrored pinning*	
V <sub>KA</sub> (V)	I <sub>k</sub> (mA)	V <sub>ref</sub>	T <sub>amb</sub> (°C)			
36	100	2.495	2%	0 to 70	TL431CDBZR <sup>1)</sup>	
				-40 to 85	TL431IDBZR <sup>1)</sup>	
				-40 to 125	TL431QDBZR <sup>1)</sup>	
			-40 to 125	<b>TL431FDT</b> <sup>2)</sup>	<b>TL431MFD</b> <sup>2)</sup>	
				TL431SDT <sup>3)</sup>	TL431MSDT <sup>3)</sup>	
				TL431ACDBZR <sup>1)</sup>		
		1%	0 to 70	TL431ACDBZR <sup>1)</sup>		
			-40 to 85	TL431AIDBZR <sup>1)</sup>		
			-40 to 125	TL431AQDBZR <sup>1)</sup>		
		0.5%	-40 to 125	<b>TL431AFDT</b> <sup>2)</sup>	<b>TL431AMFD</b> <sup>2)</sup>	
				TL431ASDT <sup>3)</sup>	TL431AMSDT <sup>3)</sup>	
				TL431BCDBZR <sup>1)</sup>		
	-40 to 85	TL431BIDBZR <sup>1)</sup>				
	-40 to 125	TL431BQDBZR <sup>1)</sup>				
	-40 to 125	<b>TL431BFD</b> <sup>2)</sup>	<b>TL431BMFD</b> <sup>2)</sup>			
		TL431BSDT <sup>3)</sup>	TL431BMSDT <sup>3)</sup>			

<sup>1)</sup> Offers enhanced stability area and very low load capacity requirement

<sup>2)</sup> Offers higher ElectroMagnetic Interference (EMI) ruggedness, e.g. for Switch Mode Power Supply

<sup>3)</sup> 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		

## Adjustable shunt voltage regulator TLVH431

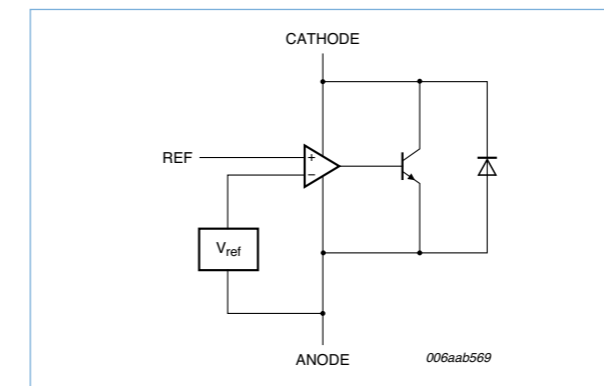
types in **bold** represent new products

Package				SOT23		
Size (mm)				2.9 x 1.3 x 1.0		
P <sub>tot</sub> (mW)				580		
Pinning configuration				Normal pinning*	Mirrored pinning*	
V <sub>KA</sub> (V)	I <sub>k</sub> (mA)	V <sub>ref</sub>	T <sub>amb</sub> (°C)			
20	80	1.5%	0 to 70	TLVH431CDBZR		
				-40 to 85	TLVH431IDBZR	
				-40 to 125	TLVH431QDBZR	<b>TLVH431MQDBZR</b>
			1%	0 to 70	TLVH431ACDBZR	
				-40 to 85	TLVH431AIDBZR	
				-40 to 125	TLVH431AQDBZR	<b>TLVH431AMQDBZR</b>
		0.5%	0 to 70	TLVH431BCDBZR		
			-40 to 85	TLVH431BIDBZR		
			-40 to 125	TLVH431BQDBZR	<b>TLVH431BMQDBZR</b>	

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

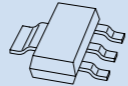
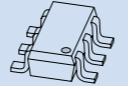
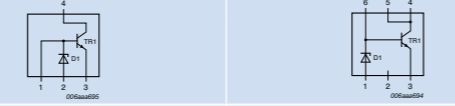
	Pin	Symbol	Description	Simplified outline	Grafic symbol
Normal pinning	1	REF	reference		
	2	k	cathode		
	3	a	anode		
Mirrored pinning	1	k	cathode		
	2	REF	reference		
	3	a	anode		

### Functional diagram





## Discrete voltage regulator

					SOT223 (SC-73)	SOT457 (SC-74)
<b>Package</b>						
<b>Size (mm)</b>					6.5 x 3.5 x 1.65	2.9 x 1.5 x 1.0
<b>P<sub>tot</sub> (mW)</b>					1300	380
Zener diode		Transistor				
V <sub>out</sub> (V)	V <sub>z</sub> min - V <sub>z</sub> max (V) @ I <sub>z</sub> = 5 mA	V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	h <sub>FE</sub> min @ I <sub>C</sub> = 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<sub>out</sub>: 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

## Constant current source

SOT353 (SC-88A)							
							
<b>Size (mm)</b> 2.0 x 1.25 x 0.95							
<b>P<sub>tot</sub> (mW)</b> 335							
<b>Type</b> 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 <sub>S</sub> max (V)	I <sub>S</sub> max (mA)	I <sub>out</sub> typ (μA)	I <sub>out</sub> min (mA)	I <sub>out</sub> max (mA)	ΔI <sub>out</sub> /I <sub>out</sub> typ (%)	ΔI <sub>out</sub> /I <sub>out</sub> typ (°C)
Condition		@ V <sub>S</sub> = 12 V; I <sub>out</sub> = 15 μA; V <sub>out</sub> = 1 V to 10 V	@ V <sub>S</sub> = 12 V; V <sub>out</sub> = 1 V to 10 V; R <sub>ext</sub> = open			@ V <sub>S</sub> = 12 V; V <sub>out</sub> = 1 V to 10 V	@ V <sub>S</sub> = 12 V; V <sub>out</sub> = 1 V; T <sub>amb</sub> = -55 °C to 150 °C
Value	75	2.2	15	0.015	50	0.5	0.15

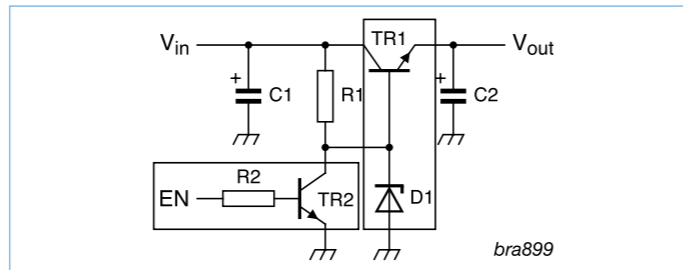
### Key features and benefits

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

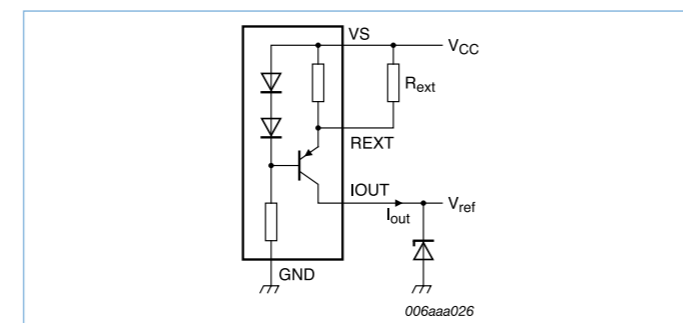
### Key applications

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

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

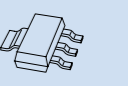


### Voltage reference

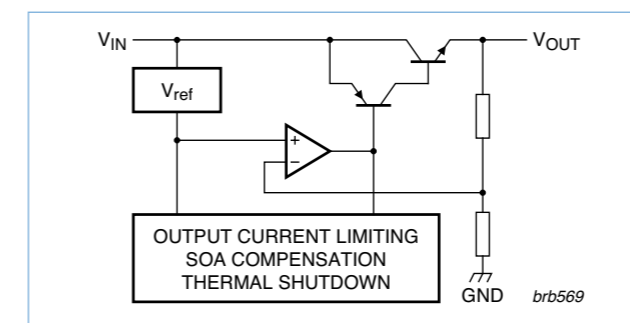


## Low-dropout adjustable and fixed linear voltage regulator NX1117

types in **bold** represent new products

					SOT223 (SC-73)
<b>Package</b>					
<b>Size (mm)</b>					6.5 x 3.5 x 1.65
<b>P<sub>tot</sub> (mW)</b>					1700
V <sub>max</sub> (V)	I <sub>max</sub> (A)	V <sub>out</sub> drop (V) @ 800 mA	V <sub>out</sub> (V)	V <sub>out</sub> tolerance	T <sub>amb</sub> (°C)
20	1	1.1	1.25 adj	1%	-40 to 125
			1.2		<b>NX1117CADJZ</b>
			1.5		<b>NX1117C12Z</b>
			1.8		<b>NX1117C15Z</b>
			1.9		<b>NX1117C18Z</b>
			2.0		<b>NX1117C19Z</b>
			2.5		<b>NX1117C20Z</b>
			2.85		<b>NX1117C25Z</b>
			3.3		<b>NX1117C33Z</b>
			5.0		<b>NX1117C50Z</b>
12.0	<b>NX1117C120Z</b>				

### Functional diagram: fixed output voltage version



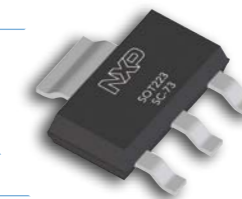
### Key applications

- ▶ Post regulator for switching DC/DC converter
- ▶ High efficiency linear regulators
- ▶ Battery charger
- ▶ Battery powered instrumentation
- ▶ Low voltage micro-controller
- ▶ PC motherboard
- ▶ LCD TV, set top box
- ▶ DVD player

### In the Spotlight


#### Low-dropout linear voltage regulator NX1117

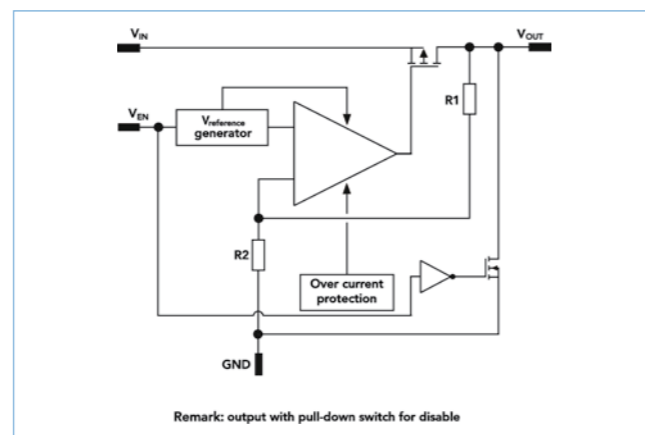
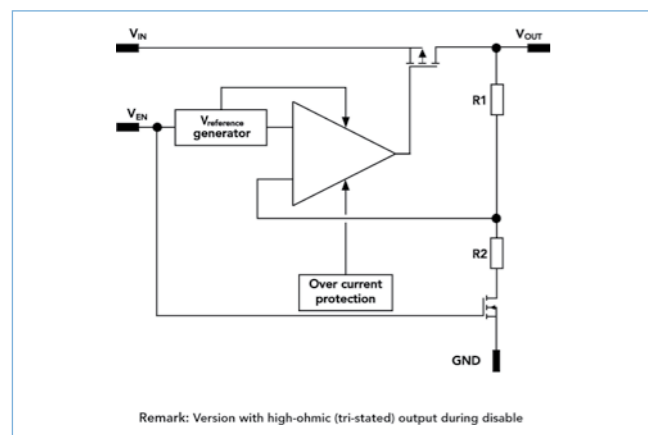
- Adjustable or fixed output voltage version in SOT223 package
- Output voltage accuracy of 1%
- Wide input voltage range up to 20 V
- Maximum output current of 1 A
- Output current limiting and thermal shutdown
- Temperature range -40 °C to 125 °C



## LD6805 Ultra low-dropout voltage regulators – 150 mA

types in **bold** represent new products

Package							SOT1194	
								
Size (mm)							1.0 x 1.0 x 0.55	
P <sub>tot</sub> @ °C							400	
V <sub>in</sub> (V)	I <sub>out</sub> typ (mA)	Quiescent current (uA)	V <sub>out</sub> drop @ 150 mA (mV)	output noise μVrms (typ)	PSRR @ 1 kHz dB	Output voltage (V)	V <sub>OUT, nom</sub>	
							LD6805K/vvH High ohmic output stage	LD6805K/vvP Pull down output stage
2.3 - 5.5	150	35	250	50	75	1.2	<b>LD6805K/12H</b>	<b>LD6805K/12P</b>
						1.4	<b>LD6805K/14H</b>	<b>LD6805K/14P</b>
						1.6	<b>LD6805K/16H</b>	<b>LD6805K/16P</b>
						1.7	<b>LD6805K/17H</b>	<b>LD6805K/17P</b>
						1.8	<b>LD6805K/18H</b>	<b>LD6805K/18P</b>
						2.2	<b>LD6805K/22H</b>	<b>LD6805K/22P</b>
						2.3	<b>LD6805K/23H</b>	<b>LD6805K/23P</b>
						2.5	<b>LD6805K/25H</b>	<b>LD6805K/25P</b>
						2.8	<b>LD6805K/28H</b>	<b>LD6805K/28P</b>
						2.9	<b>LD6805K/29H</b>	<b>LD6805K/29P</b>
						3.0	<b>LD6805K/30H</b>	<b>LD6805K/30P</b>
						3.3	<b>LD6805K/33H</b>	<b>LD6805K/33P</b>
						3.6	<b>LD6805K/36H</b>	<b>LD6805K/36P</b>



### Key features

- ▶ High power supply ripple rejection (PSRR)
- ▶ Ultra low-dropout voltage and low noise
- ▶ Very small package size

### Key benefits



- ▶ No additional noise bypass capacitor needed
- ▶ Very low-dropout voltage for extended battery usage
- ▶ Lower power dissipation

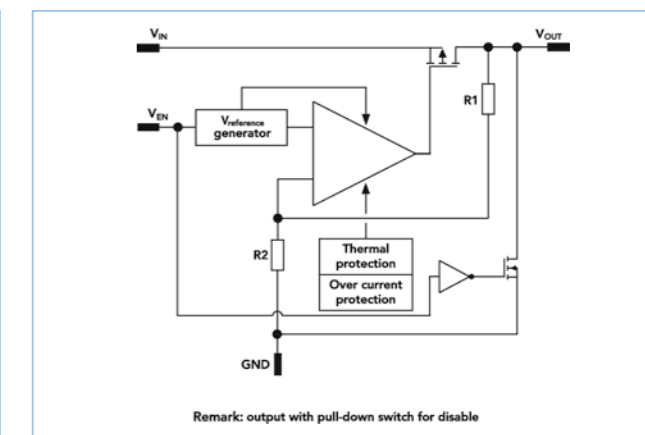
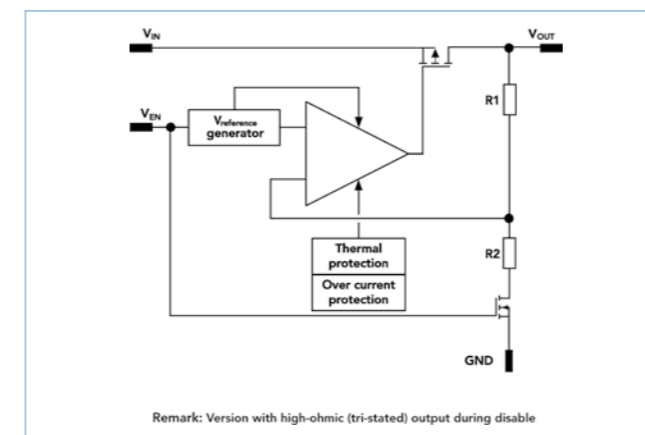
### Key applications

- ▶ Mobile phone handsets, cordless telephones, personal digital devices (applications requiring component miniaturization)

## LD6806 Ultra low-dropout voltage regulators – 200 mA

types in **bold** represent new products

Package							SOT886		CSP 4	
										
Size (mm)							1.45 x 1.0 x 0.5		0.76 x 0.76 x 0.47	
P <sub>tot</sub> @ °C							450		600	
V <sub>in</sub> (V)	I <sub>out</sub> typ (mA)	Quiescent current (uA)	V <sub>out</sub> drop @ 200 mA (mV)	output noise μVrms (typ)	PSRR @ 1 kHz dB	Output voltage (V)	LD6806F/vvH	LD6806F/vvP	LD6806CX4/vvH	LD6806CX4/vvP
2.3 - 5.5	200	70	60	30	55	1.2	<b>LD6806F/12H</b>	<b>LD6806F/12P</b>	<b>LD6806CX4/12H</b>	<b>LD6806CX4/12P</b>
						1.4	<b>LD6806F/14H</b>	<b>LD6806F/14P</b>	<b>LD6806CX4/14H</b>	<b>LD6806CX4/14P</b>
						1.6	<b>LD6806F/16H</b>	<b>LD6806F/16P</b>	<b>LD6806CX4/16H</b>	<b>LD6806CX4/16P</b>
						1.7	<b>LD6806F/17H</b>	<b>LD6806F/17P</b>	<b>LD6806CX4/17H</b>	<b>LD6806CX4/17P</b>
						1.8	<b>LD6806F/18H</b>	<b>LD6806F/18P</b>	<b>LD6806CX4/18H</b>	<b>LD6806CX4/18P</b>
						2.2	<b>LD6806F/22H</b>	<b>LD6806F/22P</b>	<b>LD6806CX4/22H</b>	<b>LD6806CX4/22P</b>
						2.3	<b>LD6806F/23H</b>	<b>LD6806F/23P</b>	<b>LD6806CX4/23H</b>	<b>LD6806CX4/23P</b>
						2.5	<b>LD6806F/25H</b>	<b>LD6806F/25P</b>	<b>LD6806CX4/25H</b>	<b>LD6806CX4/25P</b>
						2.8	<b>LD6806F/28H</b>	<b>LD6806F/28P</b>	<b>LD6806CX4/28H</b>	<b>LD6806CX4/28P</b>
						2.9	<b>LD6806F/29H</b>	<b>LD6806F/29P</b>	<b>LD6806CX4/29H</b>	<b>LD6806CX4/29P</b>
						3.0	<b>LD6806F/30H</b>	<b>LD6806F/30P</b>	<b>LD6806CX4/30H</b>	<b>LD6806CX4/30P</b>
						3.3	<b>LD6806F/33H</b>	<b>LD6806F/33P</b>	<b>LD6806CX4/33H</b>	<b>LD6806CX4/33P</b>
						3.6	<b>LD6806F/36H</b>	<b>LD6806F/36P</b>	<b>LD6806CX4/36H</b>	<b>LD6806CX4/36P</b>



### Key benefits

- ▶ Ultra low-dropout voltage (60mV@200mA) for extended battery usage
- ▶ No additional noise bypass capacitor needed
- ▶ Smallest CSP package
- ▶ Lower power dissipation

### Key applications

- ▶ Mobile phone handsets, cordless telephones, personal digital devices (applications requiring component miniaturization)

### In the Spotlight

#### Ultra low-dropout voltage regulators – LD680x

Typical output current 150 mA (LD6805) and 200 mA LDOs (LD6806)

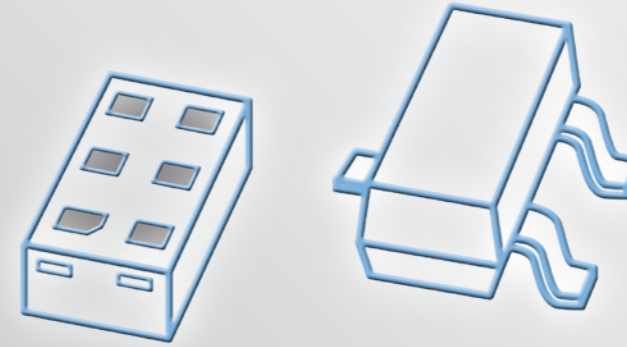
Ultra low-dropout voltage → 60 mV @ 200 mA (LD6806)

Ultra high power supply ripple rejection (PSRR): 75 dB (LD6805)

Low noise → 30 μVrms for LD6806 and 50μVrms for LD6805

Smallest packages (WLCSP and Plastic SMD)

































## Packages

Package cross reference 100

Packing methods 102

Minimized outline drawings and reflow soldering footprint 108

### Package cross reference

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P <sub>tot</sub> (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay	Semtech
2	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		PMDU	S-Flat	SOD-123-FL			PowerDI123	SMF		
	SOD123W	-	2.6 x 1.7 x 1.0	900			S-Flat	SOD-123-FL			PowerDI123			
	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	
	SOD882	-	1.0 x 0.6 x 0.5	250			CTS2			TSLP-2	DFN1006-2			
	SOD882D	-	1.0 x 0.6 x 0.37	250						TSLP-2-7	DFN1006H4-2			
3	SOT1061	HUSON3	2.0 x 2.0 x 0.65	1300				WDFN3			DFN2020-3		PowerPAK SC706L	
	SOT23	-	2.9 x 1.3 x 1.0	250		SSD3/SST3		SOT-23		SOT23	SOT-23	SOT-23	SOT23	
	SOT323	SC-70	2.0 x 1.25 x 0.95	200		UMD3/UMT3	USM	SC-70	CMAK/CM-PAK	SOT323	SOT-323	USM	SC-70 3 leads	
	SOT416	SC-75	1.6 x 0.8 x 0.77	150		EMD3/EMT3	SSM	SC-75	SMPAK	SC75			SC-75A	
	SOT883	SC-101	1.0 x 0.6 x 0.5	250			SS CSP2			TSLP-3-1	DFN1006-3			
4	SOT89	SC-62	4.5 x 2.5 x 1.5	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89		SOT-89		
	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		
6	SOT363	SC-88	2.0 x 1.25 x 0.95	300		UMD6/UMT6	US6	SC-88	CMPAK-6	SOT363	SOT-363	US6	SOT363	
	SOT457	SC-74	2.9 x 1.5 x 1.0	750		SMD6/SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6	TSOP-6	
	SOT666	-	1.6 x 1.2 x 0.55	300		EMD6/EMT6	ES6	SOT-563	SMFPAK-6	SOT666	SOT563	TES6	SC89-6lead	
	SOT1118	-	2.0 x 2.0 x 0.65	1300				6 Lead DFN			DFN2020B-6			
	SOT886	XSON6	1.45 x 1.0 x 0.5	250										SLP1510N6
SOT891	XSON6	1.0 x 1.0 x 0.5	-											

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P <sub>tot</sub> (mW)	Package	Competitor synonyms									
						Rohm	Toshiba	ON Semi	Renesas	Infineon	KEC	Vishay	Semtech		
8	SOT505	TSSOP8	3.0 x 3.0 x 1.1	-								TSSOP-8		TSSOP8	
	SOT96	SO8	4.9 x 3.9 x 1.75	1500		SOP8	FM8	SOIC-8 NB	SOP-8			FLP-8	SO8		
8 + 1	SOT983	HXSON8	1.7 x 1.35 x 0.5	-								UDFN 1.7 x 1.35, 0.4P		SLP1713P8	
	SOT1157	HXSON8	1.2 x 1.7 x 0.5	-								UDFN8, 1.8 x 1.2, 0.4P			
	SOT1166	HUSON8	1.35 x 1.7 x 0.55	-										SLP1713P8	
9	SOT1178	XSON9	1.0 x 2.1 x 0.5	-										SLP2010P8T	
10	SOT1165	XSON10	1.0 x 2.5 x 0.5	-								UDFN10 2.5 x 1, 0.5P	TSLP-9-1	SLP1610P4	
	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	SOT984	HXSON12	2.5 x 1.35 x 0.5	-										SLP2513P12	
	SOT1158	HXSON12	1.2 x 2.5 x 0.5	-								UDFN12, 2.5 x 1.2, 0.4P			
14	SOT1167	HUSON12	1.35 x 2.5 x 0.55	-								UDFN12, 2.5 x 1.35, 0.4P		SLP2513P12	
	SOT108	SO14	8.65 x 3.9 x 1.75	-		SOP14							DSO14		
16 + 1	SOT985	HXSON16	3.3 x 1.35 x 0.5	-								UDFN16, 3.3 x 1.35, 0.4P		SLP3313P16	
	SOT1159	HXSON16	1.2 x 3.3 x 0.5	-								UDFN16, 3.5 x 1.2, 0.4P			
	SOT1168	HUSON16	1.35 x 3.3 x 0.55	-										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		

### Packing methods SMD

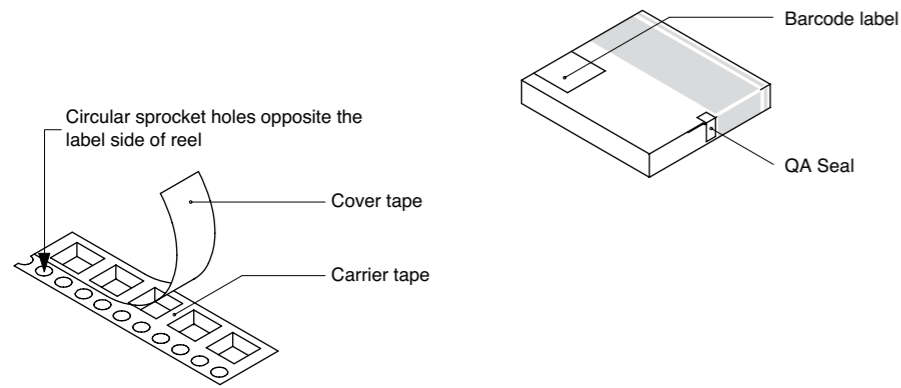
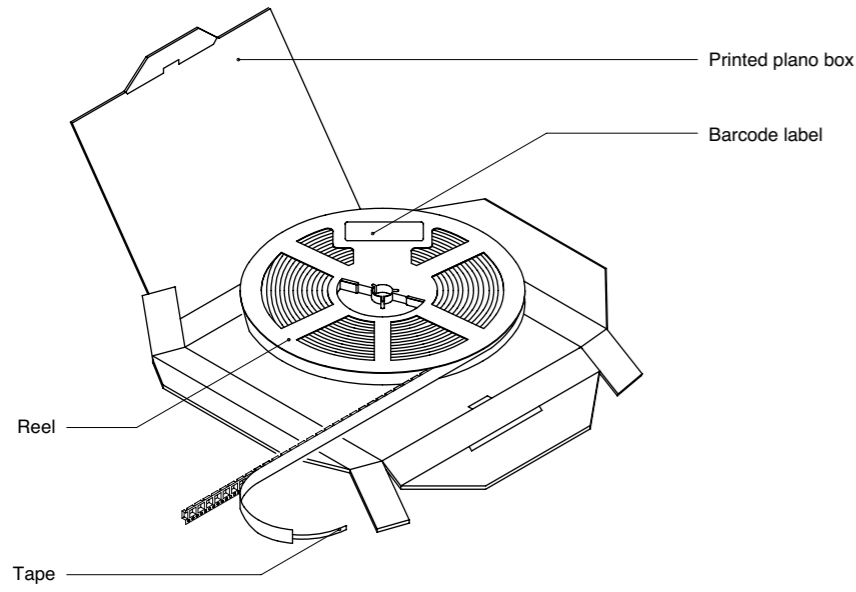
Pins / leads	Package	Packing method and tape dimension	Reel dimension (d x w) (mm)	Taping	Package	Packing quantity and ordering code (12 NC ending)							
						800	1000	2500	3000	4000	8000	9000	10000
2	SOD80C	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-115	-	-	-	-	-
		4 mm pitch, 8 mm tape and reel	330 x 8	-		-	-	-	-	-	-	-	-135
	SOD123F	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-
	SOD123W	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-
	SOD128	4 mm pitch, 12 mm tape and reel	180 x 12	-		-	-	-	-115	-	-	-	-
	SOD323	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	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-
	SOD523	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
	SOD882	2 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-	-	-	-315
	SOD882D	2 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-	-	-	-315
	SOD962	2 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-	-	-	-315
3	SOT23	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	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	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-
		4 mm pitch, 8 mm tape and reel	286 x 8	-		-	-	-	-	-	-	-	-135
	SOT404	16 mm pitch, 24 mm tape and reel	330 x 24	-		-118	-	-	-	-	-	-	-
	SOT416	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-
		4 mm pitch, 8 mm tape and reel	286 x 8	-		-	-	-	-	-	-	-	-135
	SOT428	8 mm pitch, 16 mm tape and reel	330 x 16	-		-	-	-118	-	-	-	-	-
	SOT663	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-115	-	-	-
	SOT883	2 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-	-	-	-315
SOT1061	4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-115	-	-	-	-	
4	SOT143B	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	8 mm pitch, 12 mm tape and reel	180 x 12	-		-	-115	-	-	-	-	-	-
		8 mm pitch, 12 mm tape and reel	330 x 12	-		-	-	-	-	-135	-	-	-

Pins / leads	Package	Packing method and tape dimension	Reel dimension (d x w) (mm)	Taping	Package	Packing quantity and ordering code (12 NC ending)								
						1000	1400	2500	3000	4000	5000	8000	10000	
5	SOT353	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	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	SOT363	4 mm pitch, 8 mm tape and reel	180 x 8	T1		-	-	-	-115	-	-	-	-	
		4 mm pitch, 8 mm tape and reel	286 x 8	T1		-	-	-	-	-	-	-	-135	
		4 mm pitch, 8 mm tape and reel	180 x 8	T2		-	-	-	-125	-	-	-	-	
		4 mm pitch, 8 mm tape and reel	286 x 8	T2		-	-	-	-	-	-	-	-165	
	SOT457	4 mm pitch, 8 mm tape and reel	180 x 8	T1		-	-	-	-115	-	-	-	-	
		4 mm pitch, 8 mm tape and reel	286 x 8	T1		-	-	-	-	-	-	-	-135	
		4 mm pitch, 8 mm tape and reel	180 x 8	T2		-	-	-	-125	-	-	-	-	
		4 mm pitch, 8 mm tape and reel	286 x 8	T2		-	-	-	-	-	-	-	-165	
	SOT666	2 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-	-	-	-315	
		4 mm pitch, 8 mm tape and reel	180 x 8	-		-	-	-	-	-115	-	-	-	
		SOT1118	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	-	-
SOT886	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	-	-		
SOT891	4 mm pitch, 8 mm tape and reel	180 x 8	T4		-	-	-	-	-	-132	-	-		
8	SOT505	8 mm pitch, 12 mm tape and reel	330 x 12	-		-	-	-118	-	-	-	-	-	
		8 mm pitch, 12 mm tape and reel	180 x 12	-		-	-118	-	-	-	-	-	-	
	SOT96	8 mm pitch, 12 mm tape and reel	180 x 12	-		-115	-	-	-	-	-	-	-	
		8 mm pitch, 12 mm tape and reel	330 x 12	-		-	-	-118	-	-	-	-	-	

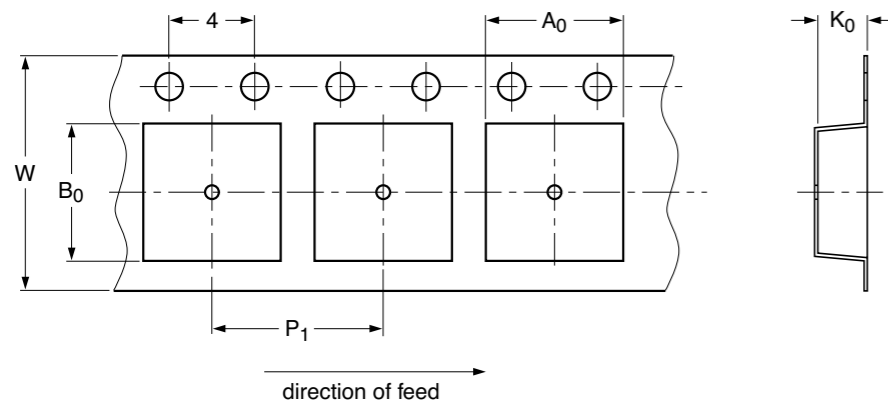
### Packing methods glass diodes and through hole packages

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
3	SOT54	Bulk pack, 1000 pcs/carrier		-112	5 carriers x 1000 pcs	
		55 mm reel packing, 2000 pcs/reel, reel dimensions = 380 x 55 mm		-116	5 reels x 2000 pcs	
		Ammo packing, 18 mm tape, 2000 pcs/carrier, reel dimensions = 350 x 55 mm		-126	5 carriers x 2000 pcs	
		Bulk pack, 1000 pcs/carrier		-412	5 carriers x 1000 pcs	
	SOT78	Rail packing, 50 pcs/tube, tube length = 520 mm			-127	20 tubes x 50 pcs
SOT78D	Rail packing, 50 pcs/tube, tube length = 520 mm			-127	20 tubes x 50 pcs	
SOT82	Rail packing, 50 pcs/tube, tube length = 390 mm			-127	20 tubes x 50 pcs	
SOT186A	Rail packing, 50 pcs/tube, tube length = 520 mm			-127	20 tubes x 50 pcs	
SOT226	Rail packing, 50 pcs/tube, tube length = 520 mm			-127	20 tubes x 50 pcs	
SOT533	Rail packing			-127	75 tubes x 50 pcs	

### Tape and reel pack for SMD packages



### Carrier tape - tape and reel

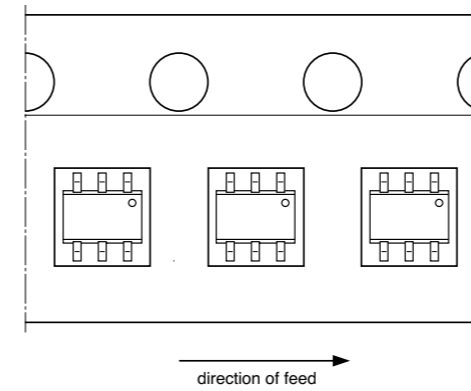


P1 = pitch (see table packing methods)  
W = tape width (see table packing methods)

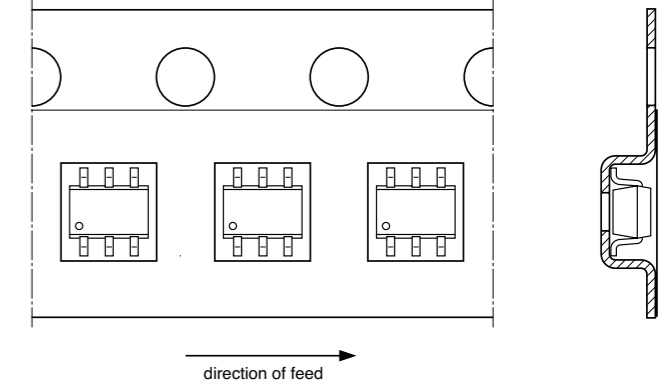
Compartment width ( $A_0$ ), length ( $B_0$ ) and depth ( $K_0$ ) depending on package

### Product orientation (tape and reel pack) T1-T4

#### T1 taping

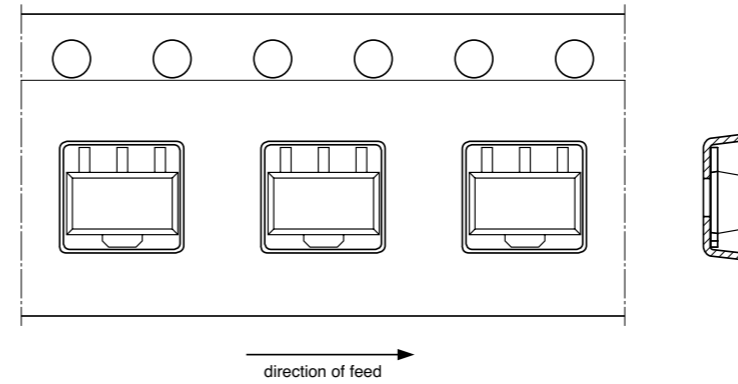


#### T2 taping

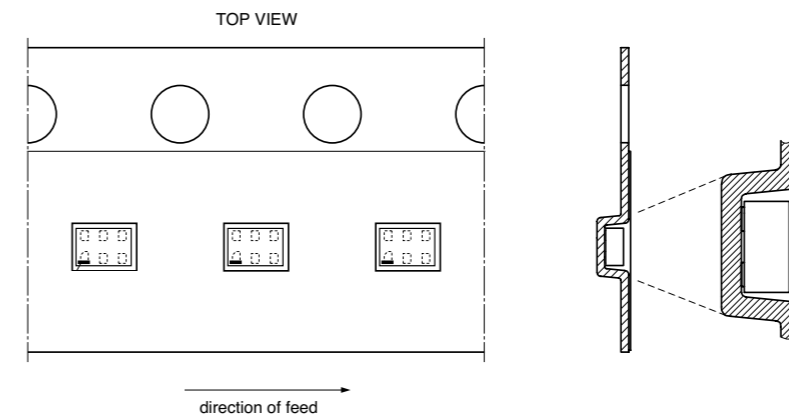


#### T3 taping

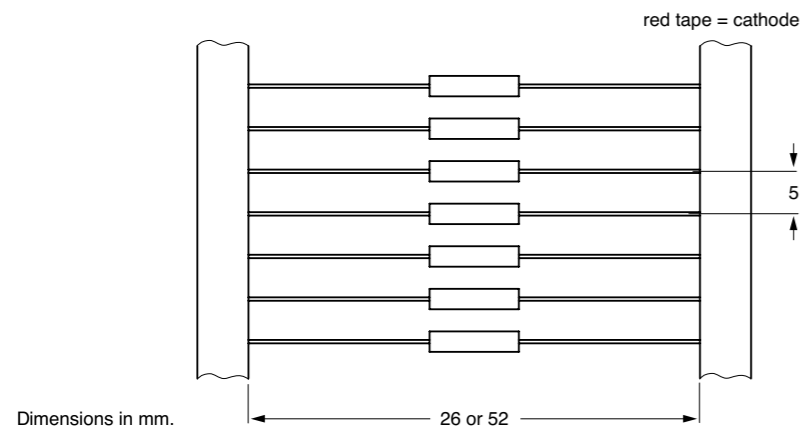
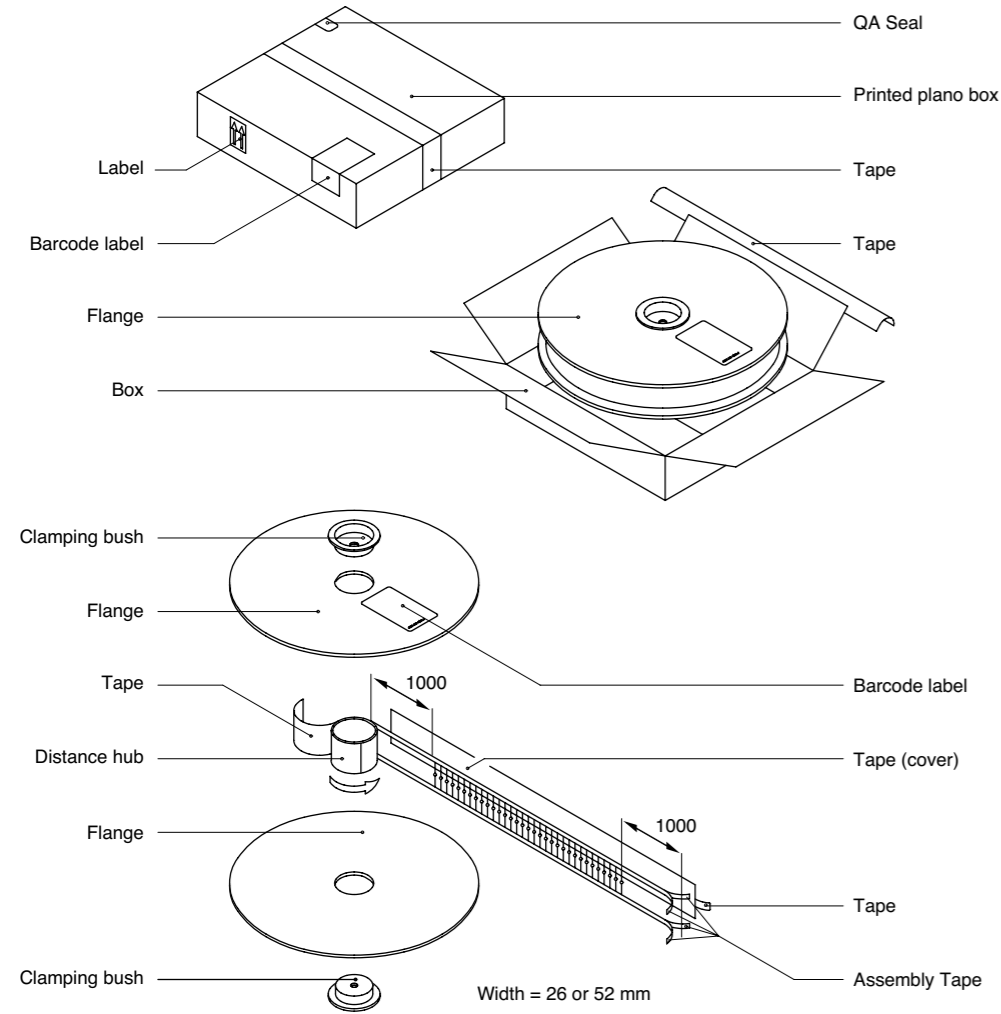
Standard product orientation SOT89 (T3)



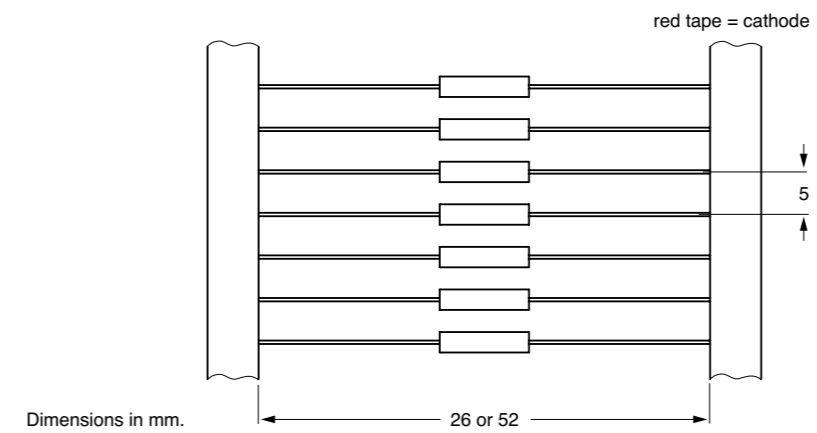
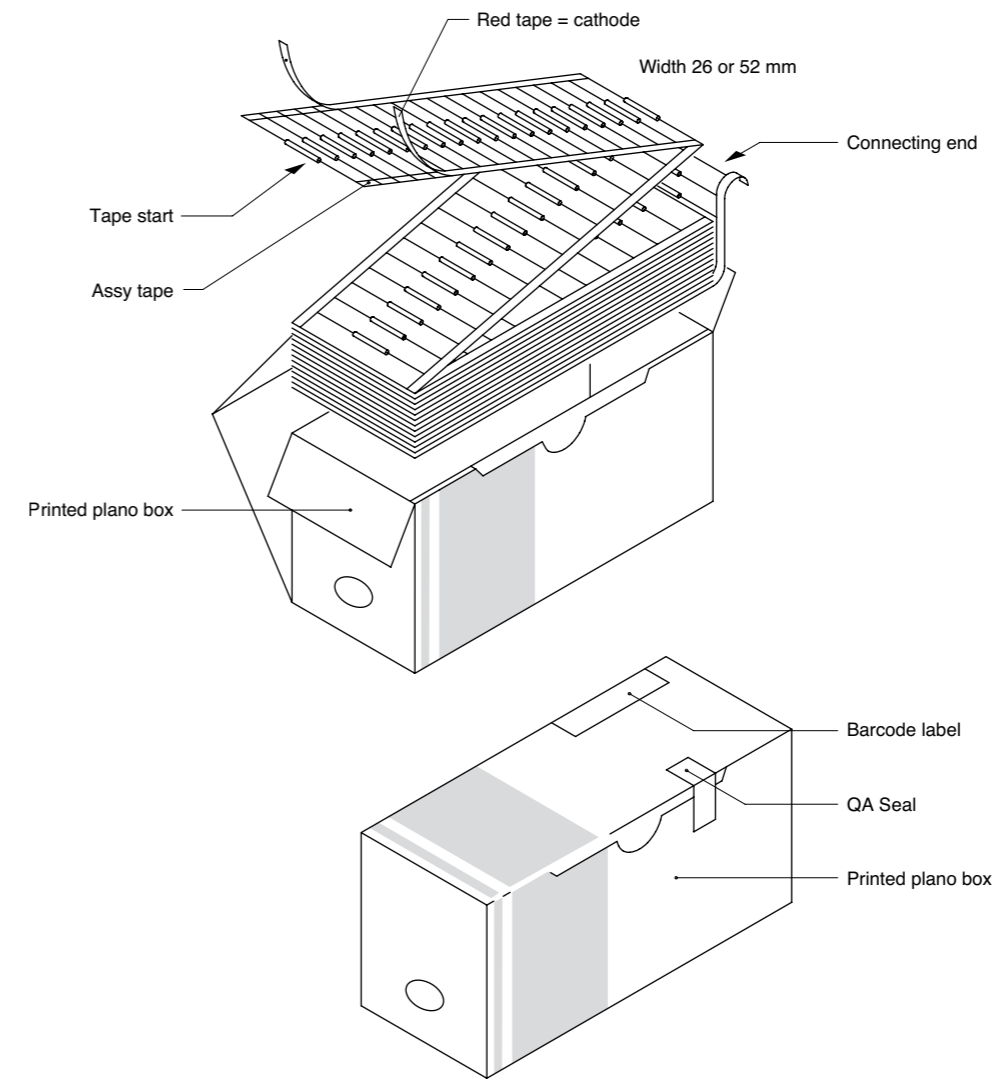
#### T4 taping



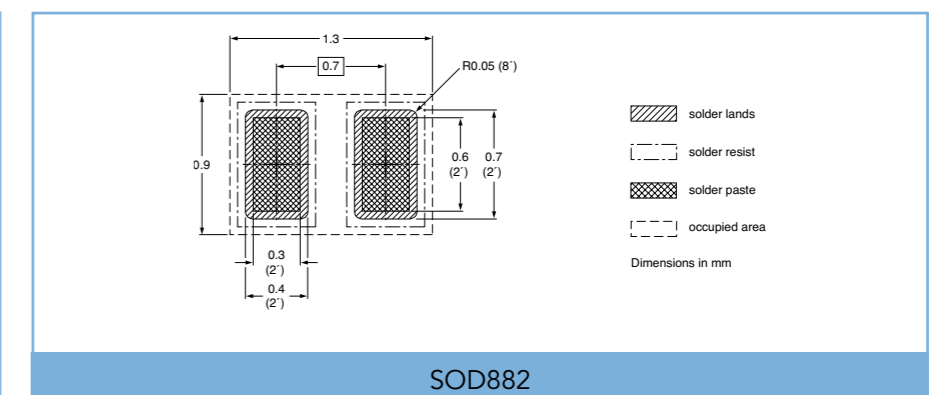
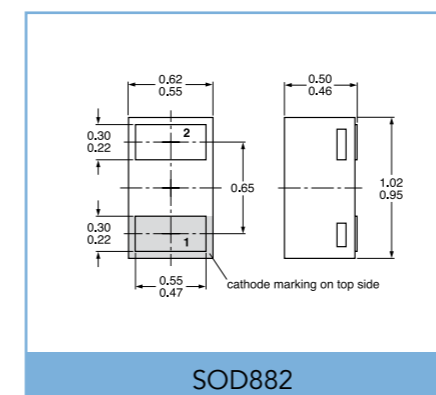
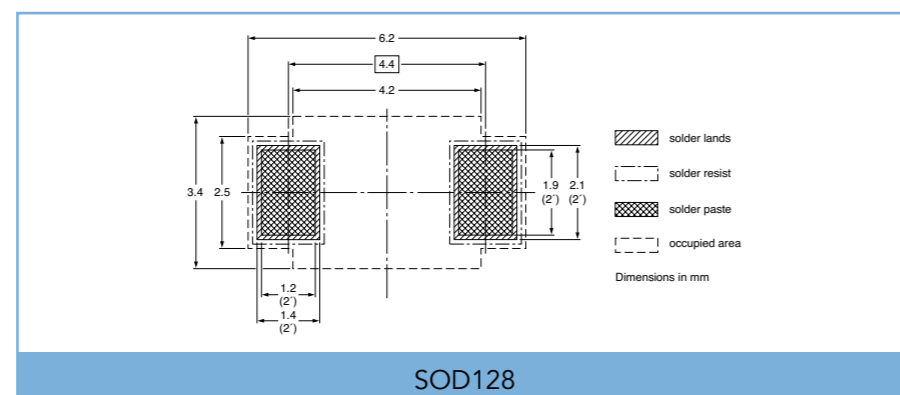
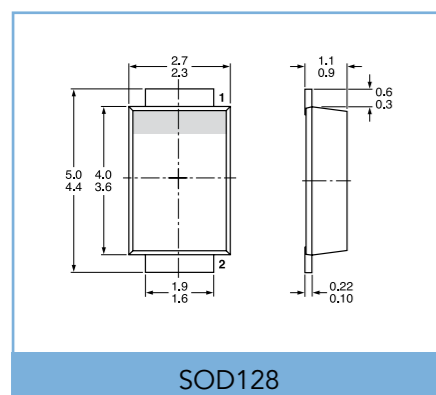
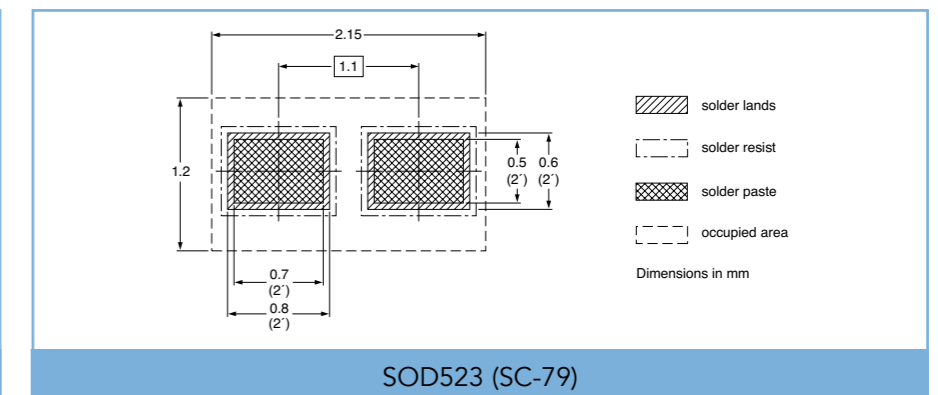
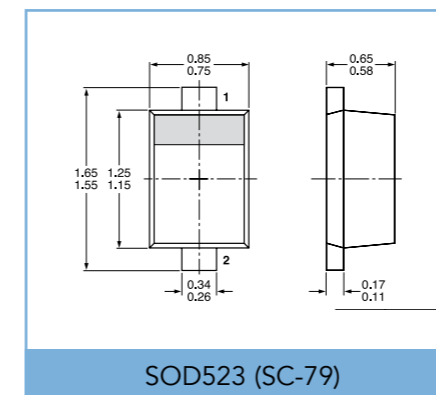
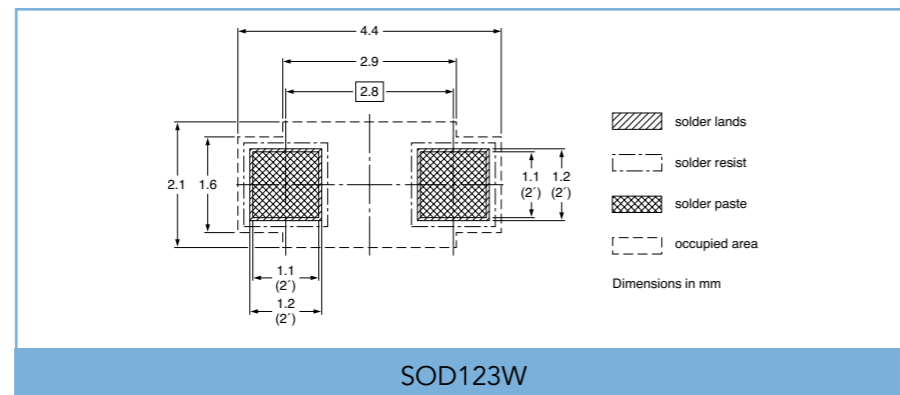
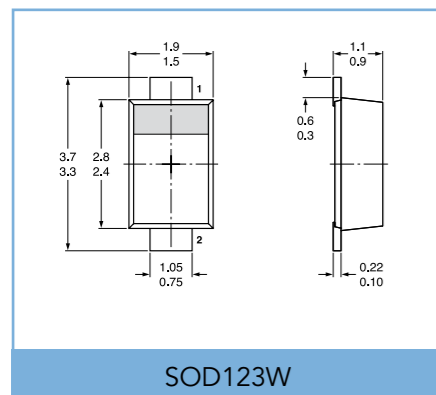
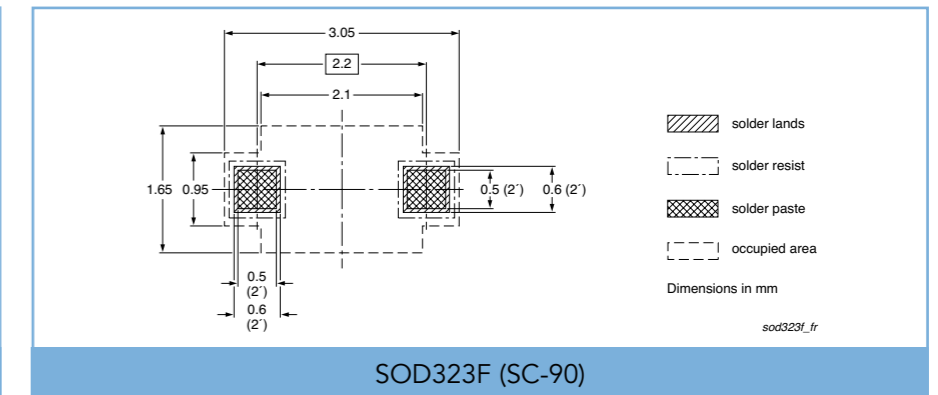
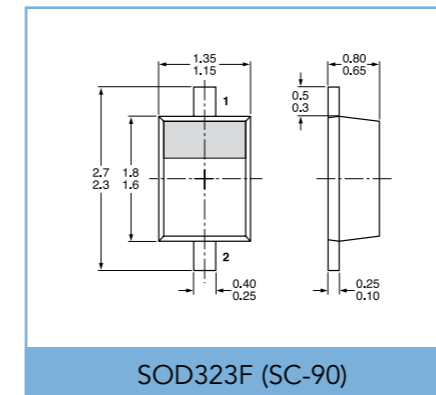
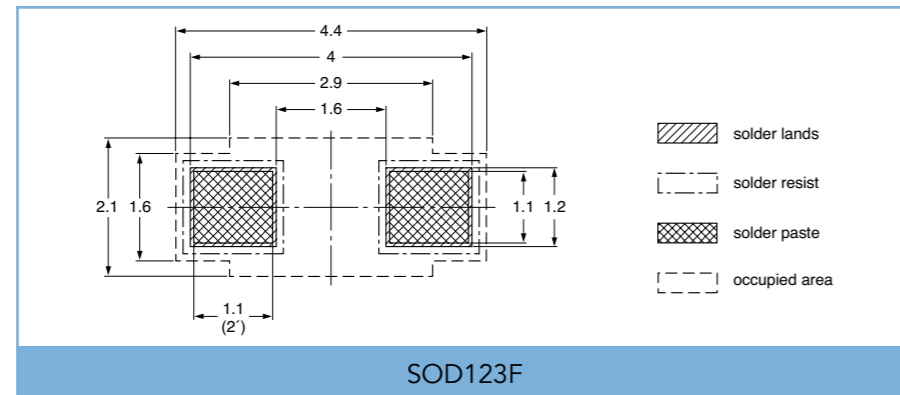
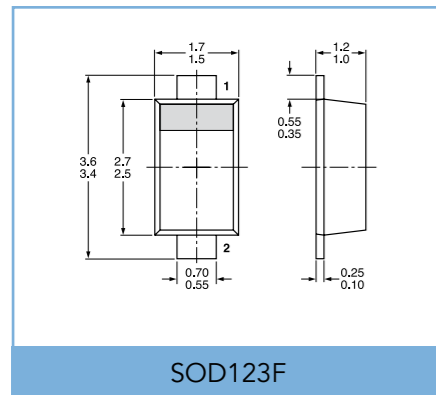
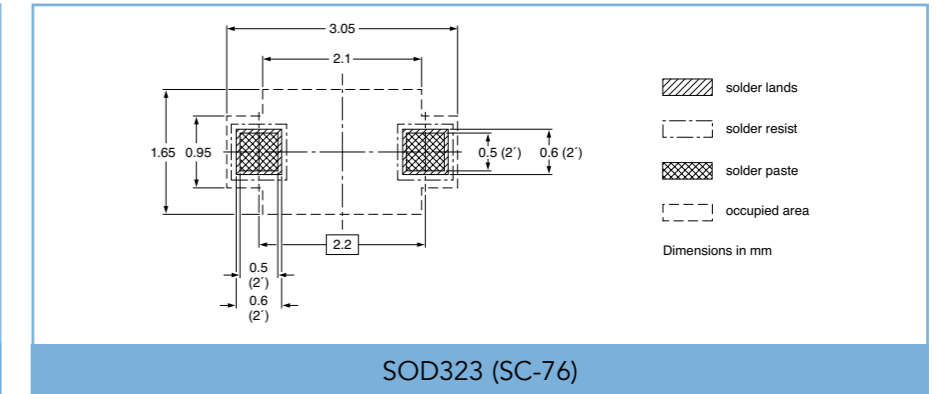
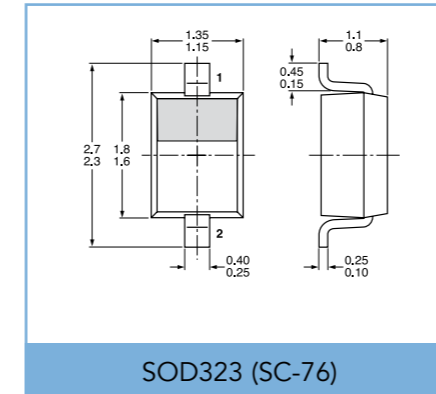
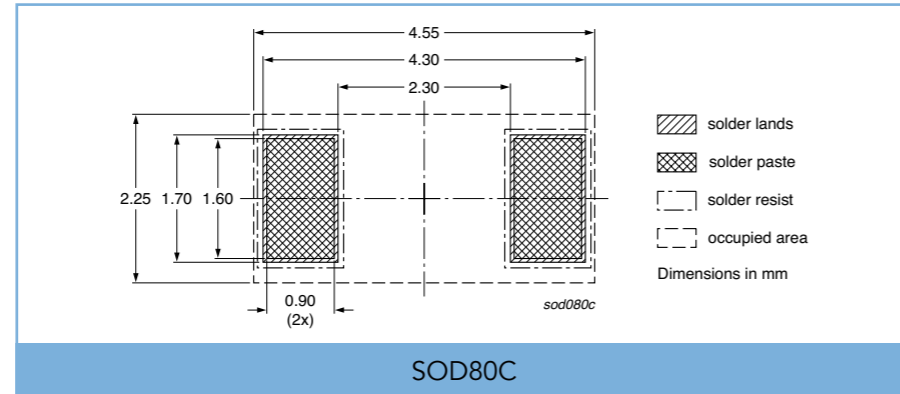
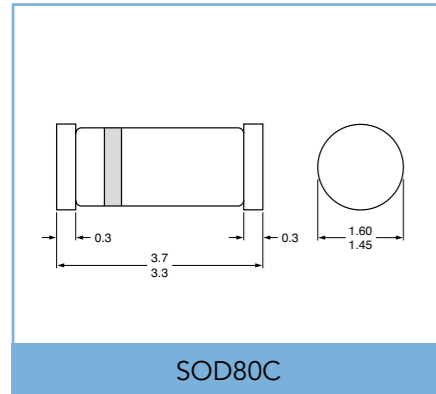
### Reel pack axial tape for glass diodes



### Ammo pack axial tape for glass diodes



## 2-Pin SMD Packages

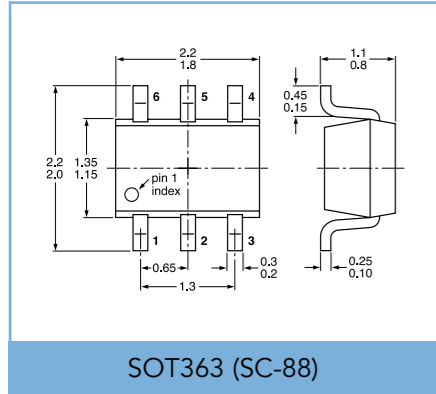




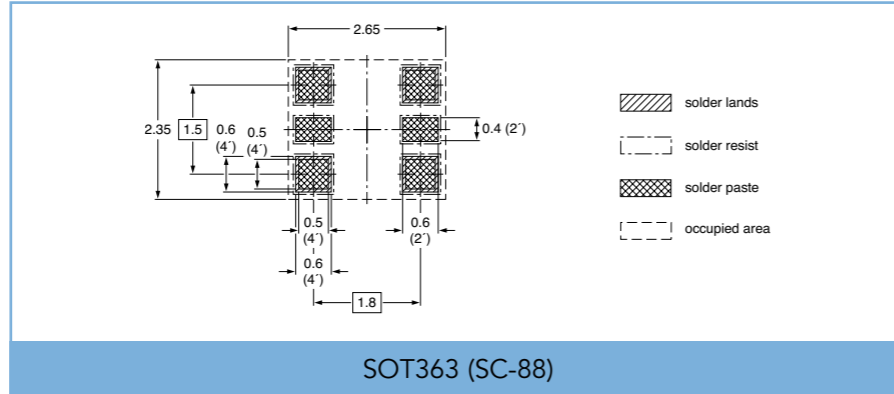




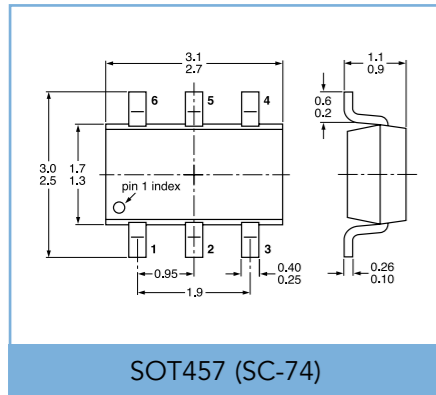
### 6-Pin SMD Packages



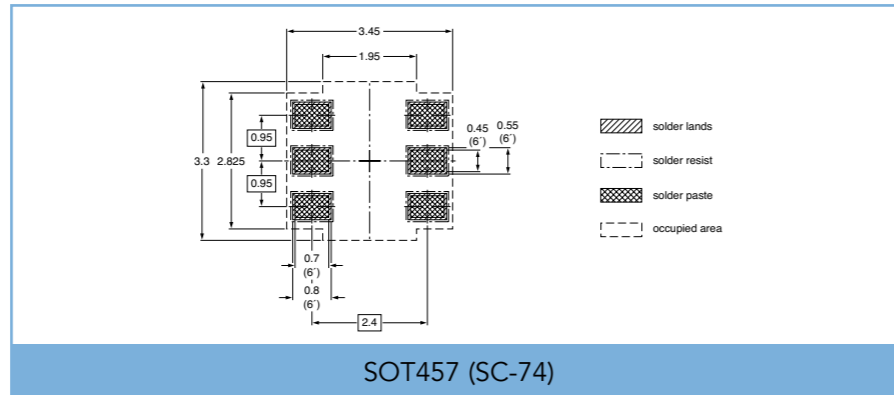
SOT363 (SC-88)



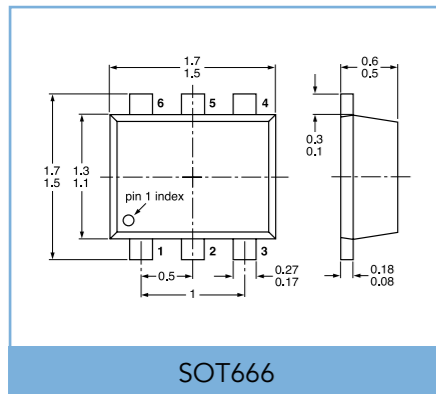
SOT363 (SC-88)



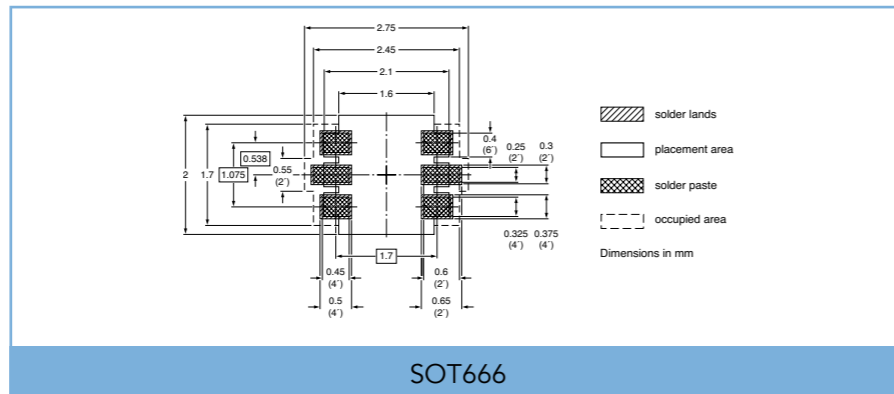
SOT457 (SC-74)



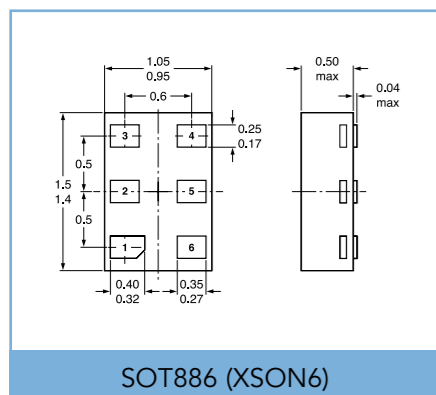
SOT457 (SC-74)



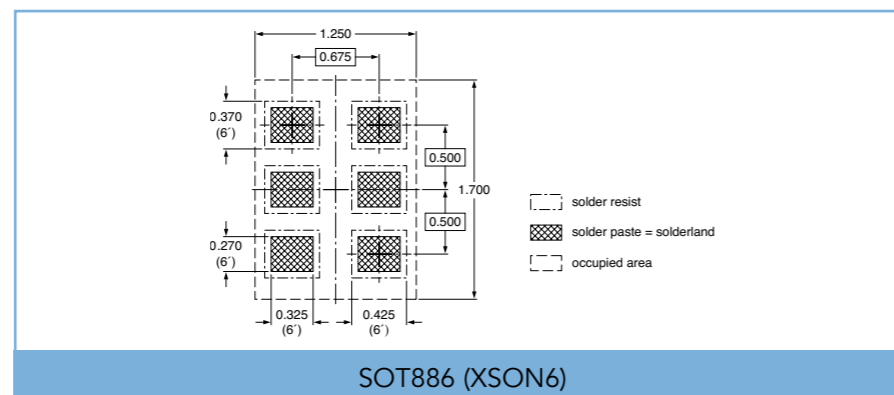
SOT666



SOT666

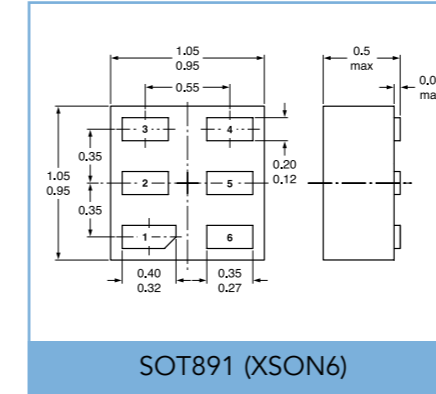


SOT886 (XSON6)

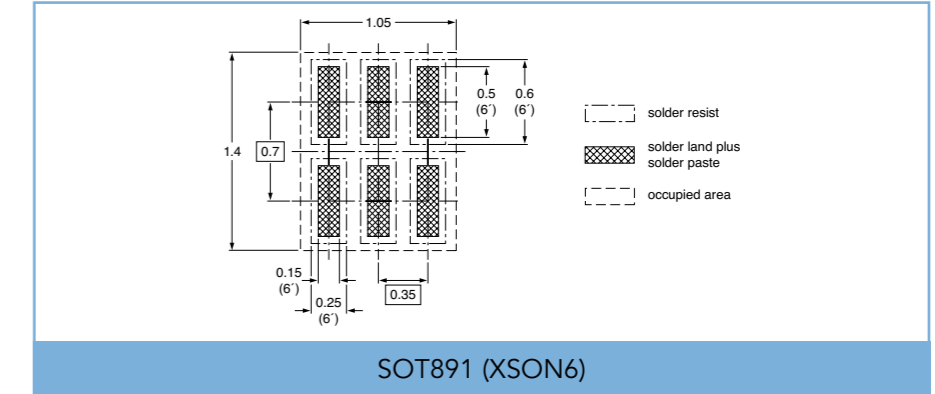


SOT886 (XSON6)

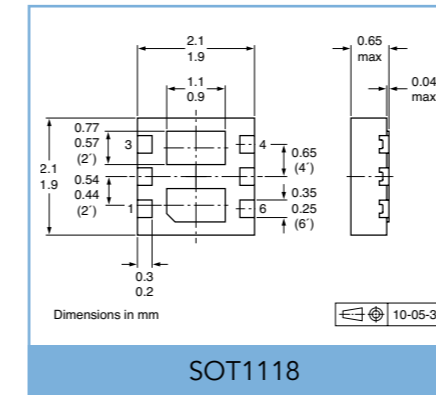
Dimensions in mm



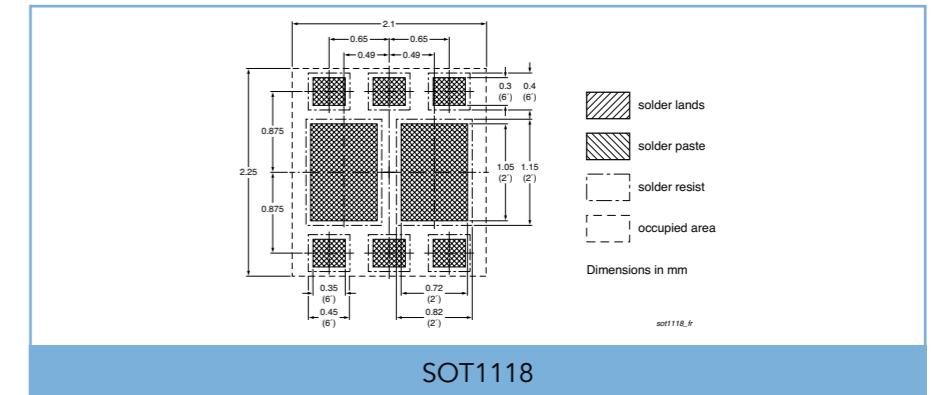
SOT891 (XSON6)



SOT891 (XSON6)

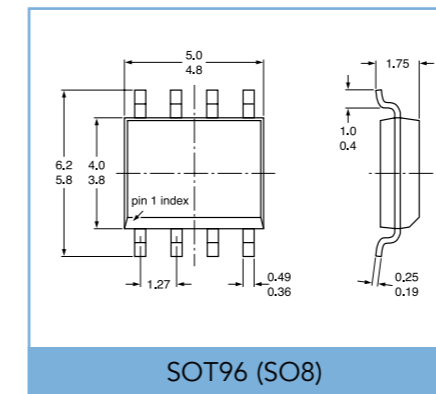


SOT1118

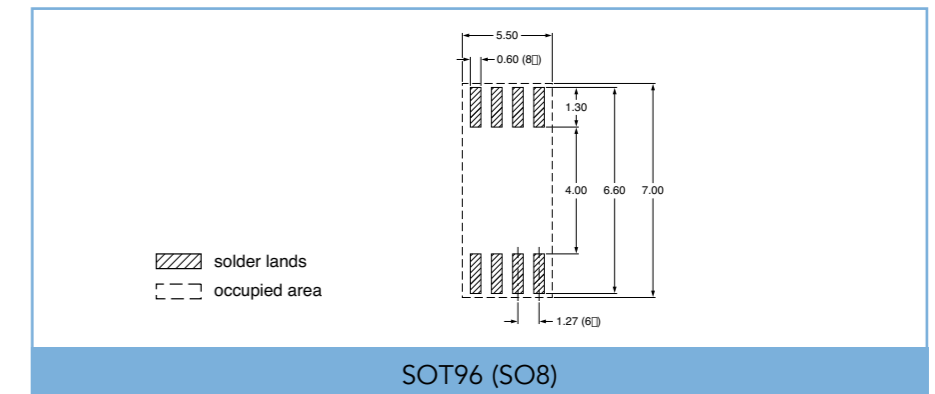


SOT1118

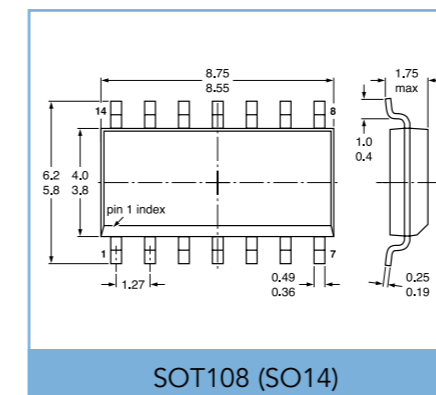
### Multi-Pin SMD Packages



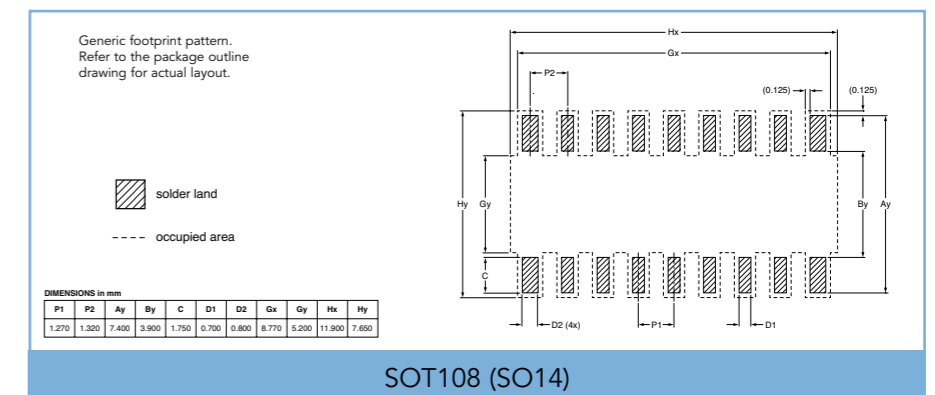
SOT96 (SO8)



SOT96 (SO8)



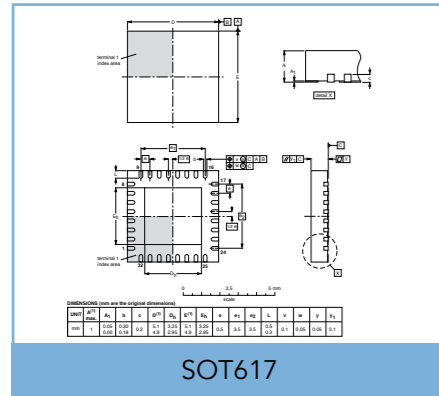
SOT108 (SO14)



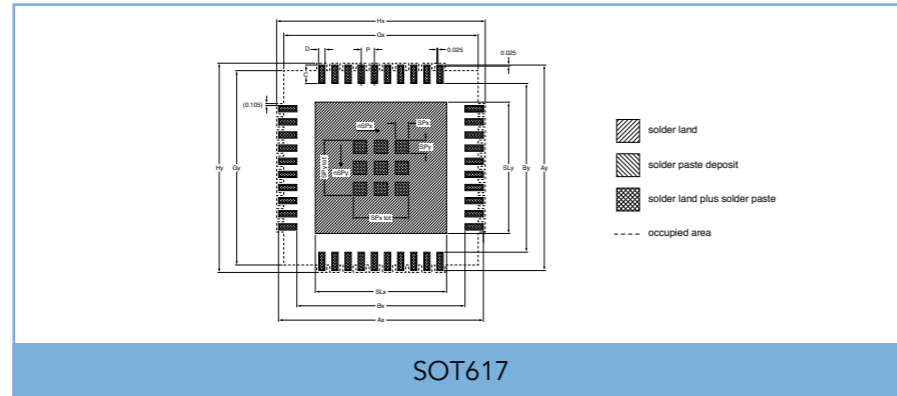
SOT108 (SO14)

Dimensions in mm

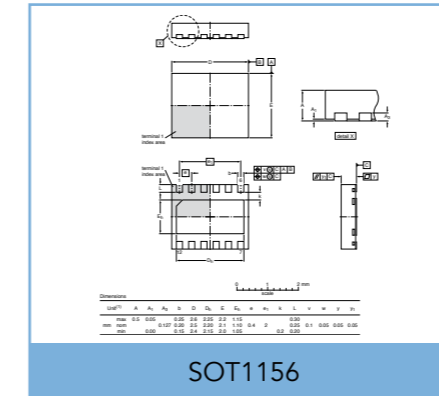




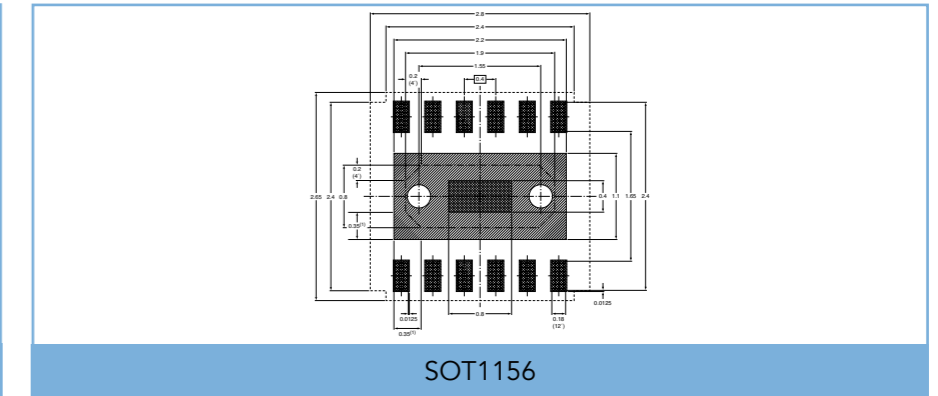
SOT617



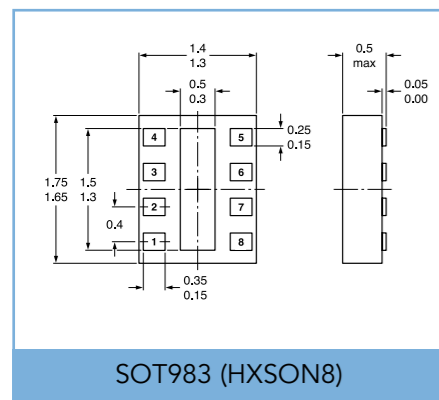
SOT617



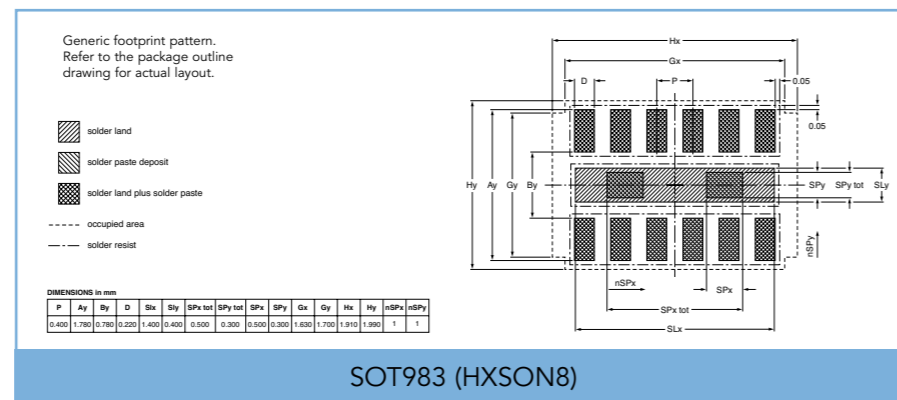
SOT1156



SOT1156

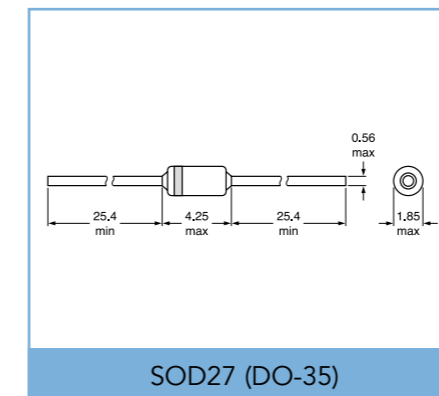


SOT983 (HXSON8)

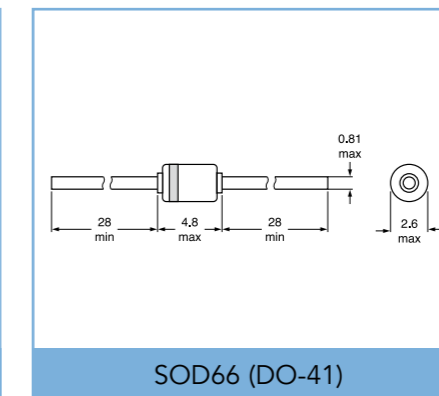


SOT983 (HXSON8)

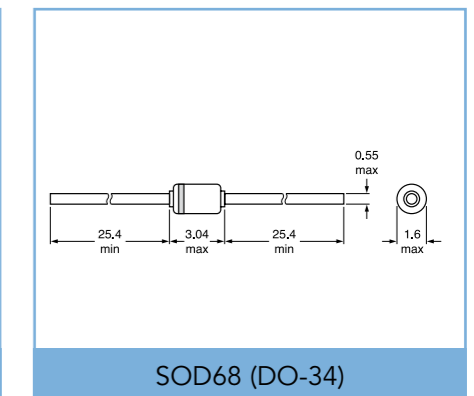
Glass diodes



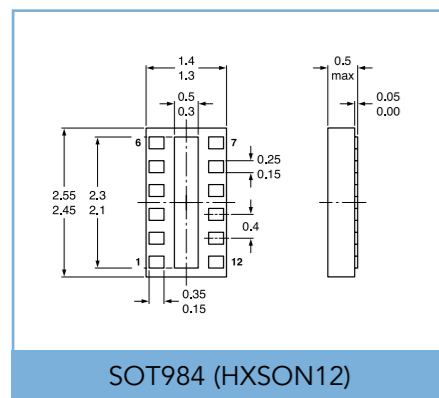
SOD27 (DO-35)



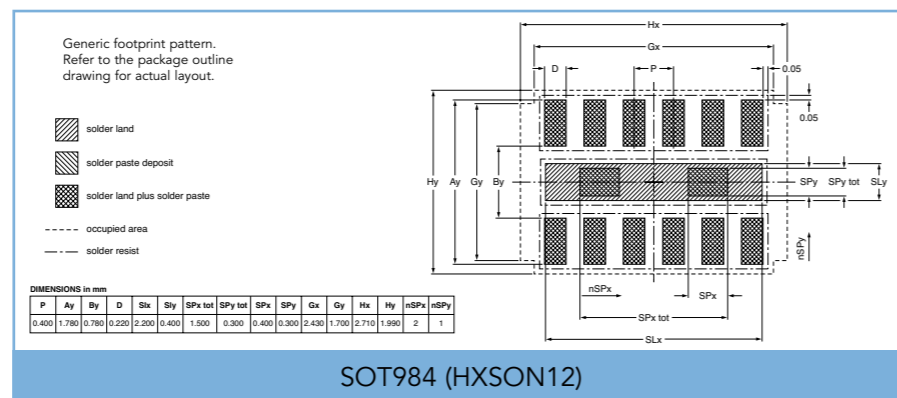
SOD66 (DO-41)



SOD68 (DO-34)

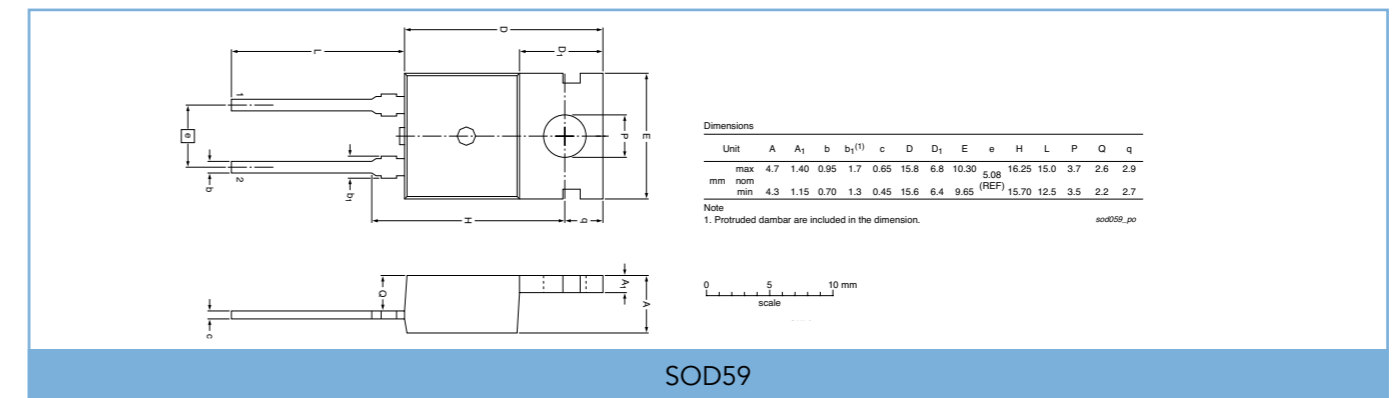


SOT984 (HXSON12)

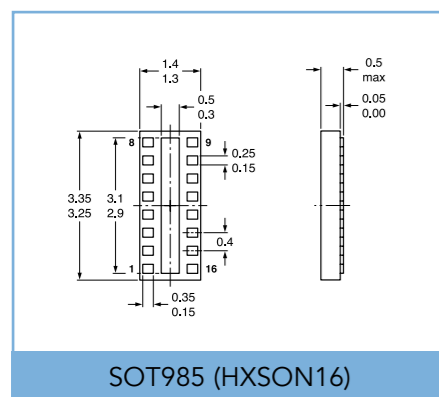


SOT984 (HXSON12)

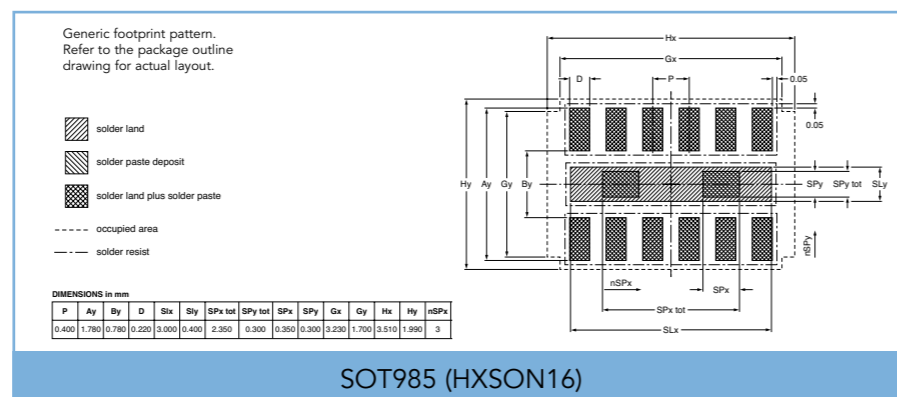
Through Hole Packages



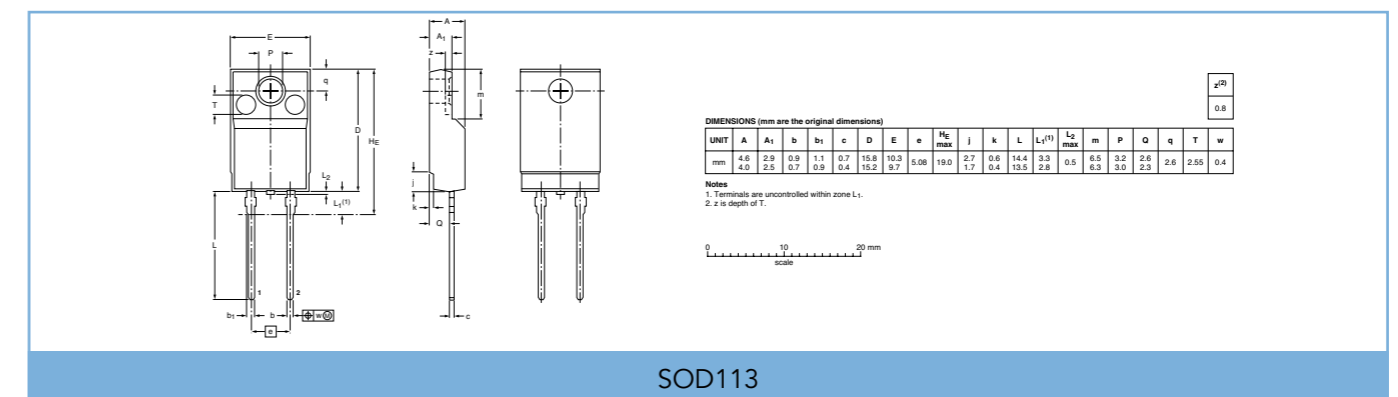
SOD59



SOT985 (HXSON16)



SOT985 (HXSON16)



SOD113

**DIMENSIONS (mm are the original dimensions)**

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

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

0 2.5 5 mm  
scale

**SOT54**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D	D <sub>1</sub>	E	e	e <sub>1</sub>	j	K	L	L <sub>1</sub>	L <sub>2</sub> <sup>(1)</sup> max.	P	Q	q	y <sup>(2)</sup>	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		3.0	2.3	2.6	2.5		

**Notes**  
1. Terminal dimensions within this zone are uncontrolled.  
2. Both recesses are  $\pm 2.5^\circ$  0.8 max. depth.

0 5 10 mm  
scale

**SOT186A**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub> <sup>(2)</sup>	b <sub>2</sub> <sup>(2)</sup>	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> <sup>(1)</sup>	L <sub>2</sub> <sup>(1)</sup> 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.

0 5 10 mm  
scale

**SOT78**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D max.	D <sub>1</sub>	E	e	L	L <sub>1</sub>	Q
mm	4.5	1.40	0.85	1.3	0.7	11	1.6	10.3	2.54	15.0	3.30	2.6
	4.1	1.27	0.60	1.0	0.4		1.2	9.7		13.5	2.79	2.2

0 5 10 mm  
scale

**SOT226**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D	D <sub>1</sub> ref.	E	e	L	L <sub>1</sub> 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	

0 5 10 mm  
scale

**SOT78D**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub>	b	c	D <sub>1</sub>	D <sub>2</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(2)</sup> max.	Q	w
mm	2.38	0.93	0.89	0.56	1.10	6.22	6.73	5.21	4.57	2.285	9.6	2.7	1.1	0.3
	2.22	0.46	0.71	0.46	0.96	5.98	6.47	5.00		BSC <sup>(1)</sup>	BSC <sup>(1)</sup>		1.0	

**Notes**  
1. Basic spacing between centers.  
2. Terminal dimensions are uncontrolled within zone L<sub>1</sub>.

0 2.5 5 mm  
scale

**SOT533**

**DIMENSIONS (mm are the original dimensions)**

UNIT	A	b	c	D	E	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(1)</sup> max.	P	Q	q	w
mm	2.8	0.88	0.58	11.1	7.8	2.29	4.58	16.5	2.54	3.1	1.5	3.9	0.254
	2.3	0.65	0.47	10.5	7.2			15.3		2.5	0.9	3.5	

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

0 2.5 5 mm  
scale

**SOT82**

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1N47xxA series	14	2PD602ARL	52	BAS70-06	8	BAV170	19	BC856 / A / B	52
1PS66SB17	9	2PD602ASL	52	BAS70-06W	9	BAV199	19	BC856BS	53
1PS66SB82	9	ACT102H	89	BAS70-07	8	BAV199W	19	BC856S	53
1PS70SB20	11	ACT108	89	BAS70-07S	9	BAV20	18	BC856T / AT / BT	52
1PS70SB82	9	ACT108W	89	BAS70-07V	9	BAV21	18	BC856W / AW / BW	52
1PS70SB84	9	BAL74	16	BAS70H	9	BAV23	18	BC857 / A / B / C	52
1PS70SB85	9	BAL99	16	BAS70L	9	BAV23A	18	BC857AM / BM / CM	52
1PS70SB86	9	BAS101	18	BAS70LV	9	BAV23C	18	BC857BS	53
1PS74SB23	10	BAS101S	18	BAS70W	9	BAV23S	18	BC857BV	53
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1PS76SB40	9	BAS16H	16	BAT120A	12	BAV70W	17	BC859B	54
1PS76SB70	9	BAS16J	17	BAT120C	12	BAV74	16	BC859BW	54
1PS79SB10	9	BAS16L	17	BAT120S	12	BAV756S	17	BC859C	54
1PS79SB17	9	BAS16LD	17	BAT160A	12	BAV99	16	BC859CW	54
1PS79SB30	9	BAS16T	17	BAT160C	12	BAV99S	17	BC860B	54
1PS79SB31	9	BAS16VV	17	BAT160S	12	BAV99W	17	BC860BW	54
1PS79SB40	9	BAS16VY	17	BAT17	9	BAW101	18	BC860C	54
1PS79SB70	9	BAS16W	17	BAT46WH	9	BAW101S	18	BC860CW	54
1PS88SB48	9	BAS21	18	BAT46WJ	9	BAW156	19	BC868 / -25	54
1PS88SB82	9	BAS21AW	18	BAT54	8	BAW56	16	BC869 / -16 / -25	54
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2N7002BK	73	BAS21J	18	BAT54AW	9	BAW56S	17	BCM62B	55
2N7002BKM	73	BAS21SW	18	BAT54C	8	BAW56T	17	BCM847BS	55
2N7002BKS	75	BAS21VD	18	BAT54CM	9	BAW56W	17	BCM847BV	55
2N7002BKT	73	BAS21W	18	BAT54CV	9	BC807 / -16 / -25 / -40	52	BCM847DS	55
2N7002BKV	75	BAS28	16	BAT54CW	9	BC807DS	53	BCM856BS	55
2N7002BKW	73	BAS29	19	BAT54H	9	BC807W / -16W / -25W / -40W	52	BCM856DS	55
2N7002CK	73	BAS31	19	BAT54J	9	BC817 / -16 / -25 / -40	52	BCM857BS	55
2N7002E	73	BAS316	17	BAT54L	9	BC817DPN	53	BCM857BV	55
2N7002F	73	BAS321	18	BAT54S	8	BC817DS	53	BCM857DS	55
2N7002K	73	BAS32L	16	BAT54SW	9	BC817W / -16W / -25W / -40W	52	BCP51 / -10 / -16	54
2N7002P	73	BAS35	19	BAT54T	9	BC846 / A / B	52	BCP52 / -10 / -16	54
2N7002PS	75	BAS40	8	BAT54VV	9	BC846BPN	53	BCP53 / -10 / -16	54
2N7002PT	73	BAS40-04	8	BAT54W	9	BC846BS	53	BCP54 / -10 / -16	54
2N7002PV	75	BAS40-04W	9	BAT54XY	9	BC846DS	53	BCP55 / -10 / -16	54
2N7002PW	73	BAS40-05	8	BAT720	10	BC846S	53	BCP56 / -10 / -16	54
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2PA1774Q / R / S	52	BAS40-05W	9	BAT721A	8	BC846W / AW / BW	52	BCP69 / -16 / -25	54
2PA1774QM / RM / SM	52	BAS40-06	8	BAT721C	8	BC847 / A / B / C	52	BCV26	56
2PB1219AQ / R / S	52	BAS40-06W	9	BAT721S	8	BC847AM / BM / CM	52	BCV27	56
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2PB709ART	52	BAS40-07V	9	BAT74S	9	BC847BS	53	BCV29	56
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2PB709ASL	52	BAS40L	9	BAT754	8	BC847BVN	53	BCV47	56
2PB710ARL	52	BAS40W	9	BAT754A	8	BC847DS	53	BCV48	56
2PB710ASL	52	BAS40XY	9	BAT754C	8	BC847T / AT / BT / CT	52	BCV49	56
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2PD601ART	52	BAS56	19	BAT854CW	9	BC849C	54	BCV71 / 72	52
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BF621	54	BSS138PS	75	BT151X-R	89	BUJD103AD	68	BYV34-500	20
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BF623	54	BSS192	75	BT152-RT	89	BUJD203A	68	BYV34G-600	20
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