

# General Applications Selection Guide 2009

Diodes, transistors and integrated discretes  
Excellence in portfolio and performance

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## Dark Green – NXP’s transfer to halogen-free products



### Why Dark Green?

We as NXP are deeply committed to developing eco-friendly products and integrating environmental safety aspects in all manufacturing processes. For our packaging technology this meant a shift to lead-free and halogen-free “Dark Green”, years ahead of upcoming legislation. 2008 we have taken concerted action to transfer all remaining packages to “Dark Green”.

### What is Dark Green?

- ▶ Dark Green products are **fully RoHS compliant** with the European Union directive 2002/95/EC.
- ▶ Dark Green products **ban the use of halogens and antimony** in the material, which is used as flame retardant in the mold compound.
- ▶ Dark Green products conform to following requirements:

Substances	Limit
a) Antimony oxides (Sb <sub>2</sub> O <sub>3</sub> , Sb <sub>2</sub> O <sub>5</sub> )	< 900 ppm
b) Brominated flame retardants	< 900 ppm
Total amount of a) and b)	< 1500 ppm

### Which packages are Dark Green now?

**All NXP small-signal discrete SMD plastic packages on the market and in development are Dark Green.**

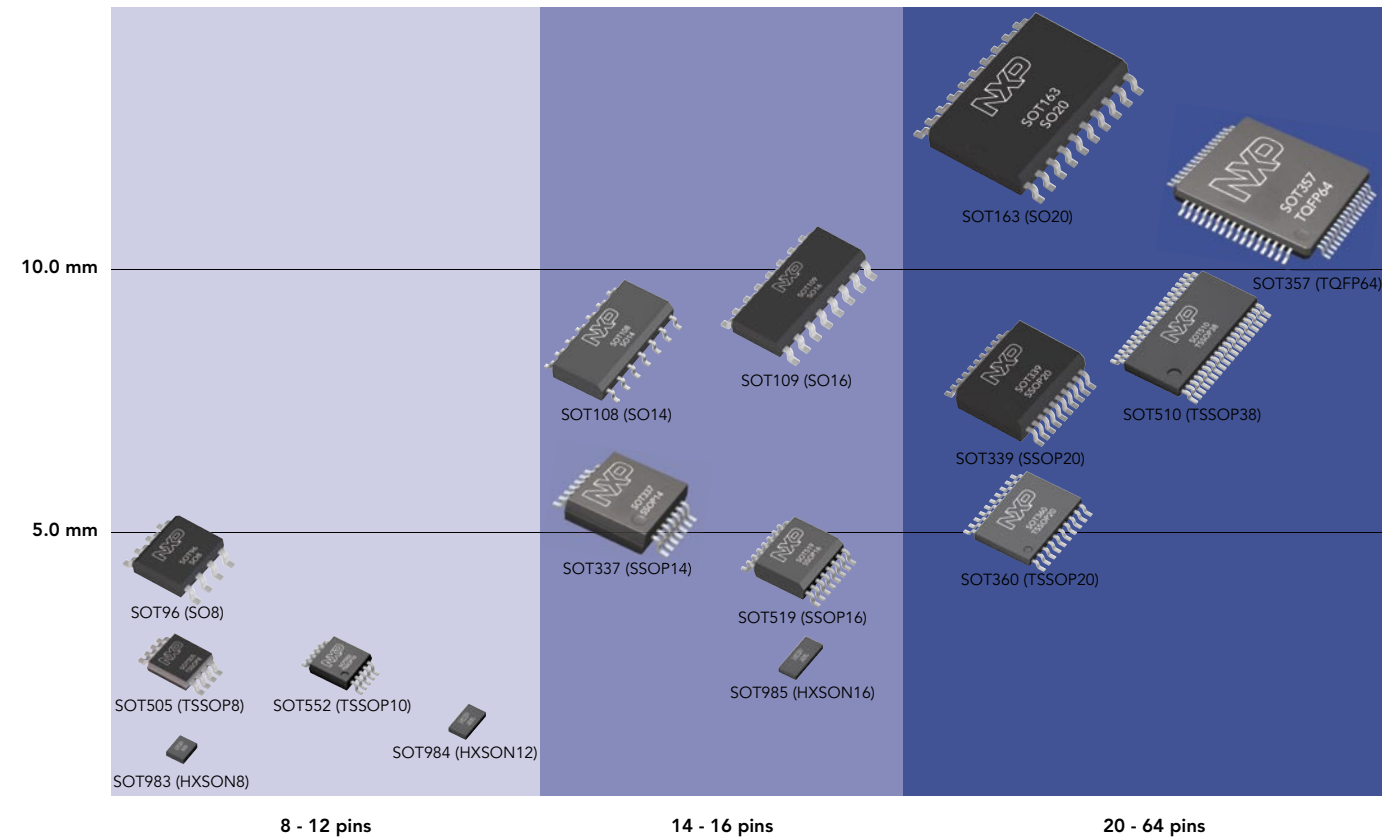
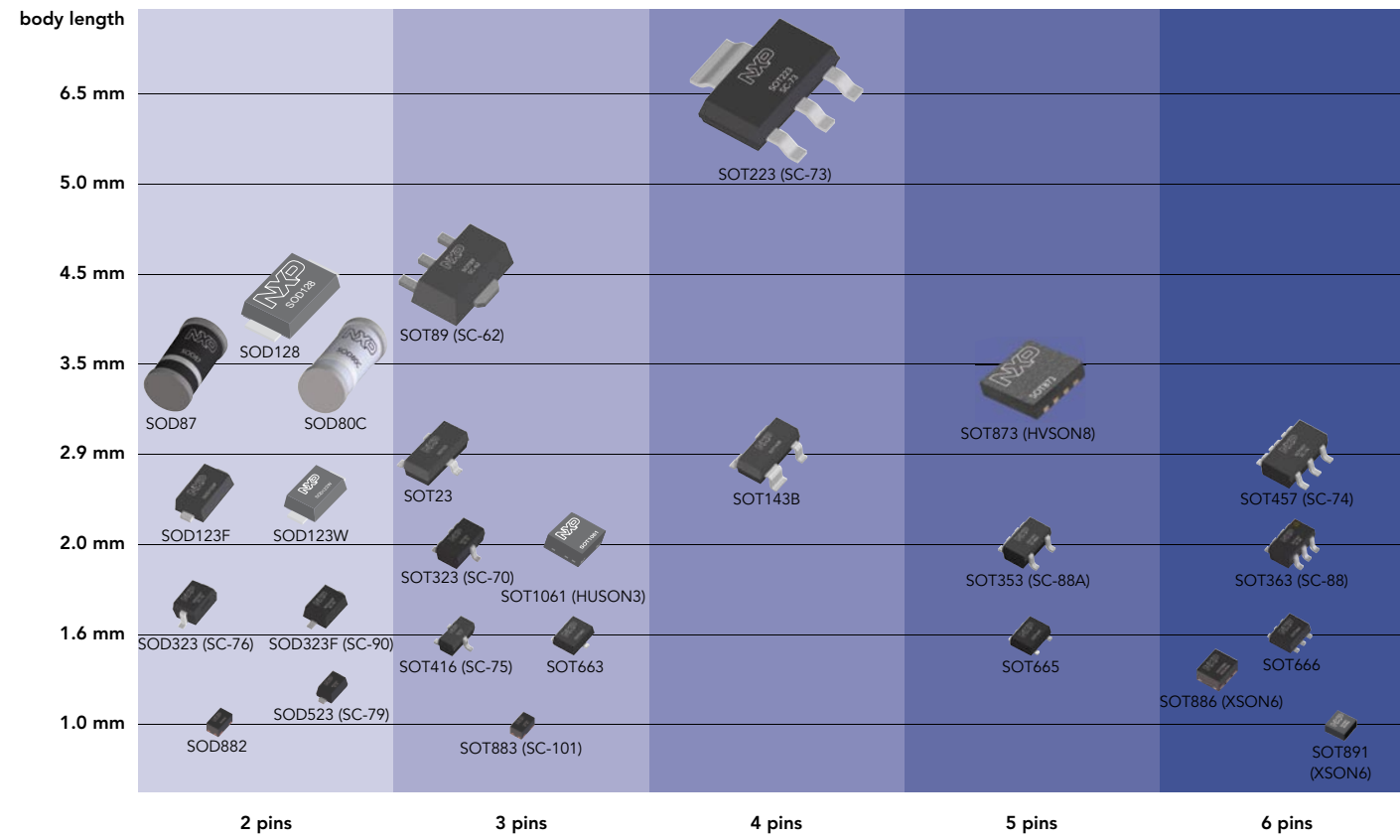
Exception is SOT89 that will be transferred to Dark Green as last plastic package of NXP GA.

### What does Dark Green mean for you?

You receive a product that has been produced according to strict environmental protection targets and does not contain hazardous substances. At the same time, there will be **no changes on any product parameter** and the products will be qualified to tight automotive standard AEC-Q101.

Please see reverse side for package overview

## General application products – packages



## General application products – support tools

To help you achieve the best, most efficient design-ins with our products, we offer a wide variety of support tools. Available for both internal and external customers, all the tools can be found on the NXP Semiconductors website, or via the marketing group.



### Application notes

Comprehensive application information:  
[http://www.nxp.com/all\\_appnotes](http://www.nxp.com/all_appnotes)

### Datasheets

Details on all released products and product families, available for download as pdf files:  
[http://www.nxp.com/all\\_datasheets](http://www.nxp.com/all_datasheets)

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### Selection Guide – offline version

The pdf file of this selection guide can be downloaded here:  
[http://www.nxp.com/all\\_literature](http://www.nxp.com/all_literature) (Discretes/General)

### Spice models

A selection of our spice models can be found on the internet:  
<http://www.nxp.com/models/>

### X-reference tool

Looking for the most up-to-date information on small-signal discrete, power management, RF and standard logic products? Then download our x-reference offline tool from the NXP website.  
<http://www.nxp.com/search/advanced>

For further design-in support (e. g. demo boards) please contact your local sales office.



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








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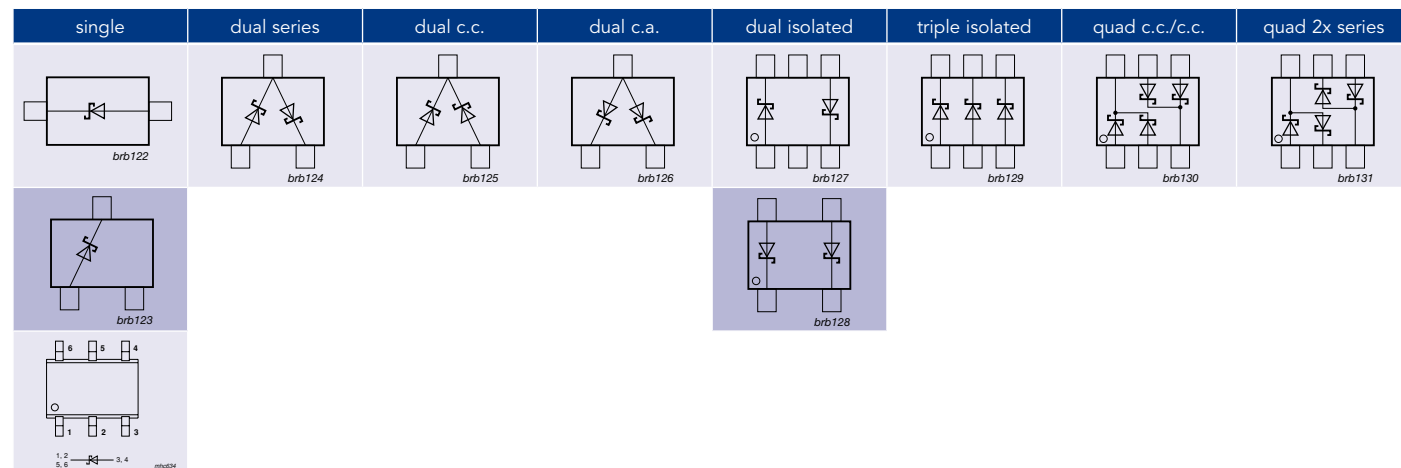
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







General purpose Schottky diodes ≤ 200 mA

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)						
																									
							3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5						
							300	500	250	250	830	250	300	550	400	300	150	500	250						
70	70	750	10	0.1	50	single			BAS70				BAS70H	BAS70W		1PS76SB70			1PS79SB70	BAS70L					
						dual series			BAS70-04			BAS70-04W													
						dual c.c.			BAS70-05			BAS70-05W													
						dual c.a.			BAS70-06			BAS70-06W													
						dual isolated							BAS70-07					BAS70-07S				BAS70-07V			
120	40	500	10	1	30	triple isolated																			
						quad 2x series									BAS70XY										
						single																			
						single						BAS40			BAS40H	BAS40W								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						
200	30	340	10	2	25	quad c.c./c.c.																			
						quad 2x series																			
						single							BAT754												
						dual series						BAT754S													
						dual c.c.					BAT754C														
		400	10	2	25	dual c.a.			BAT754A																
						triple isolated																			
						single	BAS85	BAT85	BAT54			BAT54H	BAT54W		BAT54J	1PS76SB10							1PS79SB10	BAT54L	
						dual series			BAT54S				BAT54SW												
						dual c.c.			BAT54C				BAT54CW												BAT54CM
						dual c.a.			BAT54A				BAT54AW												
dual isolated							BAT74					BAT74S							BAT74V						
200	40	300	10	30	30	triple isolated																			
						quad c.c./c.c.																			
						quad 2x series																			
						single																			
						single																			
						dual series																			
						dual c.c.																			
200	50	450	10	5	40	quad c.c./c.c.																			
						quad 2x series																			
						single																			
200	40	300	10	15	30	single			BAT721																
						dual series			BAT721S																
						dual c.c.			BAT721C																
						dual c.a.			BAT721A																
200	40	360	10	0.5	25	single																			
						single																			
						dual series																			
						dual c.c.																			
200	40	420	30	0.5	25	dual c.c.																			
						dual c.a.																			
200	50	450	10	5	40	single	BAS86	BAT86																	



















Medium power Schottky diodes single  $\geq 200$  mA

types in **bold blue** 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	SOD87 (Melf)	SOT457 (SC-74)	SOT23	SOD123W		SOD123F	SOT1061	SOT323 (SC-70)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOD523 (SC-79)	SOD882	
																			
				Size (mm)	3.8 x 2.5 x 1.0	3.5 x 2.05 x 2.05	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 x 2 x 0.65	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	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	
				$P_{tot}$ (mW) @ 1 cm <sup>2</sup>	1050	1000	540	420	950		830	1000	250	570	830	570	450	250	
				Optimization															
0.2	30	480	0.04	low $V_F$											<b>PMEG3002EJ</b>		PMEG3002AEB	PMEG3002AEL	
	40	600	0.04	low $I_R$											<b>PMEG4002EJ</b>		PMEG4002EB	PMEG4002EL	
	60	600	0.1	low $V_F$											<b>PMEG6002EJ</b>		PMEG6002EB		
0.5	20	390	0.2	low $V_F$				PMEG2005ET			PMEG2005EH			PMEG2005AEA	PMEG2005EJ	PMEG2005AEV			
		440	1.5	low $V_F$															PMEG2005AEL
		480	0.03	low $I_R$														PMEG2005EB	
	30	500	0.03	low $I_R$															PMEG2005EL
		430	0.15	low $V_F$				PMEG3005ET				PMEG3005EH			PMEG3005AEA	PMEG3005EJ	PMEG3005AEV		
		500	0.5	low $V_F$														PMEG3005EB	PMEG3005EL
40	470	0.1	low $V_F$				PMEG4005ET				PMEG4005EH			PMEG4005AEA	PMEG4005EJ	PMEG4005AEV			
	550	0.1	low $V_F$				BAT720						1P5705B20						
1.0	20	340	1	low $V_F$					<b>PMEG2010ER</b>										
		375	1.9	low $V_F$								<b>PMEG2010EPA</b>							
		430	0.2	low $V_F$				PMEG2010AET			PMEG2010AEH								
		450	0.05	low $I_R$															
		450	1.0	low $V_F$															
		500	0.2	low $V_F$					PMEG2010ET			PMEG2010EH			PMEG2010BEA	PMEG2010EJ	PMEG2010BEV		
	30	550	0.05	low $I_R$										PMEG2010EA BAT760	PMEG2010AEJ	PMEG2010EV BAT960			
		620	1.5	low $V_F$														PMEG2010AEB	
		450	1.0	low $V_F$															
		360	1.5	low $V_F$															
		450	0.05	low $I_R$															
		450	0.05	low $I_R$															
		520	0.05	low $I_R$								PMEG3010CEH				PMEG3010CEJ			
		550	1	low $V_F$															
		550	1	low $V_F$															
		560	0.15	low $V_F$					PMEG3010ET			PMEG3010EH			PMEG3010BEA	PMEG3010EJ	PMEG3010BEV		
		680	0.5	low $V_F$															PMEG3010EB
		40	490	0.05	low $V_F$														
490	0.05		low $V_F$																
600	1.0		low $V_F$																
640	0.1		low $V_F$																
570	0.05		low $I_R$																
570	0.05		low $I_R$																
60	530	0.05	low $V_F$																
	530	0.05	low $V_F$																
	650	0.35	low $V_F$																
1.5	20	660	0.2	low $I_R$															
	30	550	1.0	low $V_F$															
2.0	10	460	3.0	low $V_F$															
	20	525	0.2	low $V_F$															
	30	370	7.0	low $V_F$															
		420	1.5	low $V_F$															
		450	0.1	low $I_R$															
		470	2.5	low $V_F$															
		520	0.05	low $I_R$															
	40	620	1.0	low $V_F$															
		490	0.1	low $V_F$															
		490	0.1	low $V_F$															
		535	0.1	low $V_F$															
		530	0.2	low $V_F$															
60	575	0.25	low $V_F$																
	575	0.25	low $V_F$																
3.0	10	530	3.0	low $V_F$															
	30	370	10.5	low $V_F$															
	30	450	0.15	low $I_R$															
	40	490	0.2	low $V_F$															
	40	540	0.1	low $I_R$															
5.0	60	530	0.3	low $V_F$															
	30	370	17	low $V_F$															
	30	450	0.5	low $I_R$															
40	490	0.3	low $V_F$																

### Medium power Schottky diodes dual $\geq 200$ mA

types in **bold blue** represent new products

$I_F$ max (A)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_F$ max (mA) @ $V_R$ max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT666
								
					Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	1.6 x 1.2 x 0.55
$P_{TOT}$ (mW)	1500	250	300					
0.2	30	480	0.05	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. 		<b>PMEG2005CT</b>	
	30	430	0.15	low $V_F$			<b>PMEG3005CT</b>	
	40	470	0.1	low $V_F$			<b>PMEG4005CT</b>	
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		
	60	650	0.35	low $V_F$	dual series 	BAT160S		
				low $V_F$	dual c.c. 	BAT160C		
				low $V_F$	dual c.a. 	BAT160A		
				low $V_F$	dual series 			
				low $V_F$	dual c.c. 			

### Low capacitance Schottky diodes

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

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

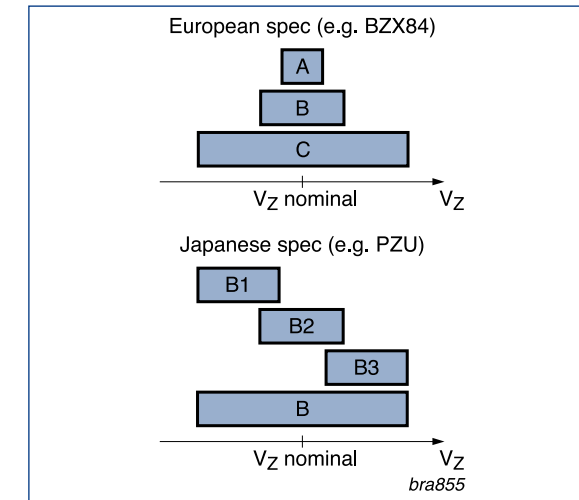
## General purpose Zener diodes

types in **bold blue** 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	<b>NZX series</b>	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
						<b>BZB84 series</b>	SOT23		
200	40	2.4~75	B, C	Eur	dual c.a.	BZX84 series		2.9 x 1.3 x 1.0	250
			A, B, C		single				
250	30	5~6.8	0.2 V	Ave	dual c.a.	PLVA600A series		2.9 x 1.3 x 1.0	250
			0.2 V	Ave		PLVA2600A series			
250	40	2.4~75	C	Eur	single	BZT52H series	SOD123F	2.6 x 1.6 x 1.1	830
200	40	2.7~24	B2	Jap	dual isolated	<b>PZUxDB2 series</b>	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	300
						BZB784 series	SOT323 (SC-70)		
200	30	100	C	Eur	back-to-back	<b>BZB100A</b>	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		1.7 x 1.25 x 0.7	550
			2.4~36			B, B1, B2, B3			
200	60	100	C	Eur	single	BZX100A	SOD323F (SC-90)	1.7 x 1.25 x 0.7	550
						2.4~36	B, B1, B2, B3		
250	40	2.4~75	B, C	Eur	single	BZX84J series		1.7 x 1.25 x 0.7	550
			2.4~36			B, B1, B2, B3	Jap		
200	40	2.4~15	C	Eur	dual c.a.	BZB984 series	SOT663	1.6 x 1.2 x 0.55	350
200	40	2.4~75	B, C	Eur	single	BZX585 series	SOD523 (SC-79)	1.2 x 0.8 x 0.6	300
						BZX884 series	SOD882		
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		

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

## Differences in Zener specification



## BZX-series, European spec

$y =$	C-series $\pm 5\%$ $V_Z$ (V)	B-series $\pm 2\%$ $V_Z$ (V)	A-series $\pm 1\%$ $V_Z$ (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	-
BZX84-y18	16.8 - 19.1	17.6 - 18.4	-
BZX84-y20	18.8 - 21.2	19.6 - 20.4	19.8 - 20.2
BZX84-y22	20.8 - 23.3	21.6 - 22.4	-
BZX84-y24	22.8 - 25.6	23.5 - 24.5	-
BZX84-y27	25.1 - 28.9	26.5 - 27.5	26.73 - 27.27
BZX84-y30	28 - 32	29.4 - 30.6	-
BZX84-y33	31 - 35	32.3 - 33.7	-
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

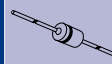
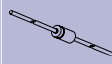































## PZU-series in SOD323F, Japanese spec

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

## NZX-series in SOD27

	$V_Z$ (V)		$V_Z$ (V)		$V_Z$ (V)
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 - 11.3	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

V <sub>R</sub> max (V)	V <sub>F</sub> max (V)	I <sub>F</sub> (mA)	I <sub>R</sub> max (nA)	t <sub>rr</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)						
																										
						Size (mm)	4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.5					
P <sub>tot</sub> (mW)	500	500	500	250	250	830	200	300	400	550	180	170	500	250	250											
50	1	50	100	50					BAL74																	
70	1	50	1000	70					BAL99																	
75	1	10	25	20	4		1N4531																			
	1	50	1000	75	4					BAS28																
	1	100	5000	75	4			BAS32L																		
90	1	50	500	80	4				BAW56			BAW56W							BAW56T		BAW56M					
														BAW56S												
															BAV756S											
100	1	10	25	20	4		1N4148																			
													BAS16H			BAS316	BAS16J									
	1	50	500	80	4					BAS16			BAS16W							BAS16T						
																							BAS516	BAS16L		
																	BAS16VY									
																										BAS16VW
														BAV70			BAV70W							BAV70T		BAV70M
																		BAV70S								
								BAV99			BAV99W															
													BAV99S													





### ESD protection diodes for high-speed data rates

types in **bold blue** represent new products

Number of protected lines	C <sub>typ</sub> (pF)	V <sub>RWM</sub> (V)	ESD rating <sup>1)</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub> (V)	Configuration	Type	Package	Size (mm)	
1	0.4	5	8	0.1	5		<b>PESD5V0F1BL</b>	SOD882	1.0 x 0.6 x 0.5
							PESD5V0X1BL	SOD882	
	0.9	5	9	0.1	5		<b>PESD5V0X1BA</b>	SOD323 (SC-76)	1.7 x 1.25 x 0.95
							PESD5V0X1BQ	SOT663	
							<b>PESD5V0X1BT</b>	SOT23	
							<b>PESD3V3X1BL</b>	SOD882	
	1.3	3.3	9	0.1	3		<b>PESD3V3X1BA</b>	SOD323 (SC-76)	1.7 x 1.25 x 0.95
							PESD5V0U1UL	SOD882	
	2	5	9	0.1	5		<b>PESD5V0U1UB</b>	SOD523	1.2 x 0.8 x 0.6
							<b>PESD5V0U1UA</b>	SOD323 (SC-76)	
							<b>PESD3V3U1UA</b>	SOD523 (SC-79)	
							<b>PESD3V3U1UB</b>	SOD882	
	2.6	3.3	9	0.1	3		<b>PESD3V3U1UL</b>	SOD882	1.0 x 0.6 x 0.5
							PESD5V0U1BA	SOD323 (SC-76)	
							PESD5V0U1BB	SOD523 (SC-79)	
	2.9	5	10	0.1	5		<b>PESD5V0U1BL</b>	SOD882	1.0 x 0.6 x 0.5
							PESD5V0U1BA	SOD323 (SC-76)	
							PESD5V0U1BB	SOD523 (SC-79)	
	1	5.5	8	0.1	3 <sup>2)</sup>		<b>PRTR5V0U1T</b>	SOT23	2.9 x 1.3 x 1.0
	2	0.9	5	9	0.1	5		<b>PESD5V0X2BT</b>	SOT883
							<b>PESD5V0U2BT</b>		
2.9		5	10	0.1	5		PESD5V0U2BM	SOT883	1.0 x 0.6 x 0.5
1		5.5	8	0.1	3 <sup>2)</sup>		<b>PRTR5V0U2X</b>	SOT143B	2.9 x 1.3 x 1.0
1.8	12	0.1	3 <sup>2)</sup>		<b>PRTR5V0U2AX</b>	SOT143B			

### ESD protection diodes for high-speed data rates

types in **bold blue** represent new products

Number of protected lines	C <sub>typ</sub> (pF)	V <sub>RWM</sub> (V)	ESD rating <sup>1)</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RWM</sub> (V)	Configuration	Type	Package	Size (mm)	
2	1	5.5	8	0.1	5 <sup>2)</sup>		<b>PRTR5V0U2D</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
							<b>PRTR5V0U2F</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
							<b>PRTR5V0U2K</b>	SOT891	1.0 x 1.0 x 0.5
4	1	5.5	8	0.1	3		<b>PRTR5V0U4Y</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
							<b>PRTR5V0U4D</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
	2.9	5	10	0.1	5		<b>PESD5V0U4BF</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
							<b>PESD5V0U4BW</b>	SOT665	1.6 x 1.2 x 0.55
5	2.9	5	10	0.1	5		<b>PESD5V0U5BF</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
							<b>PESD5V0U5BV</b>	SOT666	1.6 x 1.2 x 0.55
6	1	5.5	8	0.1	3 <sup>2)</sup>		<b>PRTR5V0U6S</b>	SOT96 (SO8)	4.9 x 3.9 x 1.75
							<b>PRTR5V0U6AS</b>	SOT96 (SO8)	
8	1	5.5	8	0.1	3 <sup>2)</sup>		<b>PRTR5V0U8S</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1

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

<sup>2)</sup> Value is specified at V<sub>R</sub> (V)

### ESD protection diodes for automotive applications

Number of protected lines bidirectional	C <sub>typ</sub> (pF)	V <sub>RWM</sub> (V)	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> (V)	Configuration	Type	Package	Size (mm)
1	13	15 (diode 1)	160	23	0.05		PESD1LIN	SOD323 (SC-76)	1.7 x 1.25 x 0.95
		24 (diode 2)							
2	11	24	200	23	0.05		PESD1CAN	SOT23	2.9 x 1.3 x 1.0
		25	230	30	0.01				
		11 <sup>3)</sup>	200	23	0.05				

<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)

<sup>3)</sup> f = 5 MHz; V<sub>R</sub> = 0 V

### ESD protection diodes for general purpose interfaces

types in **bold blue** represent new products

Number of protected lines uni-directional	Number of protected lines bi-directional	C <sub>typ</sub> (pF)	V <sub>RWM</sub> (V)	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> (V)	Configuration	Type	Package	Size (mm)					
1	1	200	3.3	150	30	2	3.3		PESD3V3S1UL	SOD882		1.0 x 0.6 x 0.5					
		150	5	150	30	1	5		PESD5V0S1UL								
		38	12	150	30	0.05	12		PESD12VS1UL								
		34	3.3	45	30	0.3	3.3		<b>PESD3V3L1UL</b>								
		32	15	150	30	0.05	15		PESD15VS1UL								
		25	5	42	30	0.1	5		<b>PESD5V0L1UL</b>								
		23	24	150	23	0.05	24		PESD24VS1UL								
		207	3.3	330	30	2	3.3		PESD3V3S1UB					SOD523 (SC-79)		1.2 x 0.8 x 0.6	
		152	5	260	30	1	5		PESD5V0S1UB								
		38	12	180	30	0.05	12		PESD12VS1UB								
		32	15	160	30	0.05	15		PESD15VS1UB								
		23	24	160	23	0.05	24		PESD24VS1UB								
		229	2.5	260	30	6	2.5		PESD5Z2.5								
		172	3.3	260	30	0.05	3.3		PESD5Z3.3								
		89	5	180	30	0.05	5	PESD5Z5.0									
		78	6	180	30	0.01	6	PESD5Z6.0									
		69	7	180	30	0.01	7	PESD5Z7.0									
		35	12	200	30	0.01	12	PESD5Z12									
		34	3.3	45	30	0.3	3.3	<b>PESD3V3L1UB</b>									
		25	5	42	30	0.1	5	<b>PESD5V0L1UB</b>									
		480	5	890	30	4	5	<b>PESD5V0S1UA</b>	SOD323 (SC-76)		1.7 x 1.25 x 0.95						
		160	12	600	30	0.1	12	<b>PESD12VS1UA</b>									
		34	3.3	45	30	0.3	3.3	<b>PESD3V3L1UA</b>									
		25	5	42	30	0.1	5	<b>PESD5V0L1UA</b>									
		480	5	890	30	4	5	<b>PESD5V0S1UJ</b>				SOD323F (SC-90)		1.7 x 1.25 x 0.7			
		160	12	600	30	0.1	12	<b>PESD12VS1UJ</b>									
		1	1	35	5	120	30	0.1				5		PESD5V0S1BA	SOD323 (SC-76)		1.7 x 1.25 x 0.95
														PESD5V0S1BB	SOD523 (SC-79)		1.2 x 0.8 x 0.6
PESD5V0S1BL	SOD882														1.0 x 0.6 x 0.5		
PESD3V3L1BA	SOD323 (SC-76)														1.7 x 1.25 x 0.95		
PESD5V0L1BA																	
PESD12VL1BA																	
PESD15VL1BA																	
PESD24VL1BA																	
PESD3V3L1BA																	

<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 diodes for general purpose interfaces

types in **bold blue** represent new products

Number of protected lines uni-directional	Number of protected lines bi-directional	C <sub>typ</sub> (pF)	V <sub>RWM</sub> (V)	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> (V)	Configuration	Type	Package	Size (mm)									
1	1	12	5	50	25	0.1	5		PESD5V0V1BA	SOD323 (SC-76)		1.7 x 1.25 x 0.95									
									PESD5V0V1BL	SOD523 (SC-79)		1.2 x 0.8 x 0.6									
									PESD5V0V1BB	SOD882		1.0 x 0.6 x 0.5									
									2	1	207	3.3	330	30	2	3.3		PESD3V3S2UAT	SOT23		2.9 x 1.3 x 1.0
																		PESD5V0S2UAT			
2	1	12	5	50	25	0.1	5		PESD12VS2UAT	SOT663		1.6 x 1.2 x 0.55									
									PESD15VS2UAT												
									PESD24VS2UAT												
									PESD3V3S2UT												
									PESD5V2S2UT												
									PESD12VS2UT												
									PESD15VS2UT												
									PESD24VS2UT												
									PESD3V3S2UQ												
									PESD5V0S2UQ												
									PESD12VS2UQ												
									PESD15VS2UQ												
									PESD24VS2UQ												
									PESD3V3S2UJ												
									PESD5V0S2UJ												
									PESD12VS2UJ												
									PESD15VS2UJ												
									PESD24VS2UJ												
									PESD3V3L2UU				SOT323 (SC-70)		2 x 1.25 x 0.95						
									PESD6V0L2UU				SOT883 (SC-101)		1.0 x 0.6 x 0.5						
2	2	35	5	120	30	0.1	5		PESD5V0S2BT	SOT23		2.9 x 1.3 x 1.0									
									PESD3V3L2BT												
									PESD5V0L2BT												
									PESD12VL2BT												
									PESD15VL2BT												
PESD24VL2BT																					
4	3	13	3.3	14	10	2	3.3		<b>PESD3V3V4UK</b>	SOT886 (XSON6)		1.45 x 1.0 x 0.5									
									<b>PESD5V0V4UK</b>												
									<b>PESD9V3V4UK</b>												
									PESD3V3L4UF												
									PESD5V0L4UF												
									PESD3V3V4UF												
									PESD5V0V4UF												
									PESD3V3S4UF												
									PESD5V0S4UF												
									12				5	20	10	1	5		PESD3V3L2UM	SOT883 (SC-101)	
101	3.3	350	30	2	3.3	PESD5V0L2UM															
75	5	350	30	1	5	PESD12VL2UM															
19	12	200	30	0.05	12	PESD15VL2UM															
16	15	200	30	0.05	15	PESD24VL2UM															
11	24	200	23	0.05	24	PESD3V3L2UM															
16	15	200	30	0.05	15	PESD5V0L2UM															
13	3.3	14	10	2	3.3	PESD3V3L2UM															
12	5	20	10	1	5	PESD5V0L2UM															
6.5	9	25	10	0.5	9	PESD12VL2UM															

<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 diodes for general purpose interfaces

types in **bold blue** represent new products

Number of protected lines uni-directional	Number of protected lines bi-directional	$C_{line}$ typ (pF)	$V_{RWM}$ (V)	$P_{PP}^{(1)}$ max (W)	ESD rating <sup>(2)</sup> max (kV)	$I_p$ max (μA) @ $V_{RWM}$ (V)	Configuration	Type	Package	Size (mm)		
4	3	200	3	-	8	2	3		SOT457 (SC-74)	2.9 x 1.5 x 1.0	BZA456A	
		165	4	-	8	0.7	4				BZA462A	
		37	14	-	8	0.075	14				BZA418A	
		37	15	-	8	0.1	15				BZA420A	
		215	3.3	200	30	0.8	3.3				PESD3V3S4UD	
		165	5	200	30	0.2	5				PESD5V0S4UD	
		73	12	200	30	0.01	12				PESD12V54UD	
		60	15	200	30	0.01	15				PESD15V54UD	
		45	24	200	23	0.01	24				PESD24V54UD	
		200	3	-	8	2	3				BZA856A	
		165	4	-	8	0.7	4				BZA862A	
		145	4.3	-	8	0.2	4.3				BZA868A	
	4	3	37	15	-	8	0.01	15	BZA820A	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	BZA856AL
			107	3	-	8	1	3	BZA862AL			
			90	4	-	8	0.5	4	BZA868AL			
			78	4.3	-	8	0.01	4.3	PESD3V3L4UG			
			22	3.3	30	20	0.3	3.3	PESD5V0L4UG			
			16	5	30	20	0.025	5	PESD3V3V4UG			
			15	3.3	16	10	0.3	3.3	PESD5V0V4UG			
			12	5	16	10	0.025	5	BZA956A			
			107	3	-	8	1	3	BZA962A			
			90	4	-	8	0.5	4	BZA968A			
			78	4.3	-	8	0.01	4.3	PESD3V3L4UW			
			22	3.3	30	20	0.3	3.3	PESD5V0L4UW			
16	5	30	20	0.025	5	PESD3V3V4UW						
15	3.3	16	10	0.3	3.3	PESD5V0V4UW						
12	5	16	10	0.025	5							
4	4	48	5	-	15	0.01	5	SOT457 (SC-74)	2.9 x 1.5 x 1.0	BZA408B		
5	4	215	3.3	200	30	0.8	3.3		SOT457 (SC-74)	2.9 x 1.5 x 1.0	PESD3V3S5UD	
		165	5	200	30	0.2	5				PESD5V0S5UD	
		73	12	200	30	0.01	12				PESD12V5S5UD	
		60	15	200	30	0.01	15				PESD15V5S5UD	
		45	24	200	23	0.01	24				PESD24V5S5UD	
		22	3.3	25	20	0.2	3.3				PESD3V3L5UK	
		16	5	25	20	0.1	5				PESD5V0L5UK	
		22	3.3	30	20	0.2	3.3				PESD3V3L5UF	
		16	5	30	20	0.1	5				PESD5V0L5UF	
		22	3.3	25	20	0.3	3.3				PESD3V3L5UY	
		16	5	25	20	0.025	5				PESD5V0L5UY	
		22	3.3	25	20	0.3	3.3				PESD3V3L5UV	
16	5	25	20	0.025	5	PESD5V0L5UV						
6	5	16	5	35	20	0.025	5		SOT96 (SO8)	4.9 x 3.9 x 1.75	PESD5V0L6US	
									SOT505 (TSSOP8)	3.0 x 3.0 x 1.1	PESD5V0L6UAS	
6	7	7	5	35	20	0.025	5		SOT96 (SO8)	4.9 x 3.9 x 1.75	PESD5V0L7BS	
									SOT505 (TSSOP8)	3.0 x 3.0 x 1.1	PESD5V0L7BAS	
18	17	100	5.2	100	8	1	5.2		SOT163 (SO20)	12.8 x 7.5 x 2.65	BZA100	
									SOT339 (SSOP20)	7.2 x 5.3 x 2.0	PESD5V2S18U	

<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, 400 W

types in **bold blue** represent new products

Power (W) (10/1000 μs waveform)	$V_{RWM}$ (V)	$I_{RM}$ typ. (μA) @ $V_{RWM}$	$I_{RM}$ max (μA) @ $V_{RWM}$	$V_{BR}$ min (V) @ $I_R$	$V_{BR}$ typ (V) @ $I_R$	$V_{BR}$ max (V) @ $I_R$	$I_R$ (mA)	$V_C$ max (V) @ $I_{PP}$	$I_{PP}$ (A)	Type	Package	Size (mm)	$P_{TP}$ (mW)
350	3.3	5	600	5.2	5.6	6	10	8	43.8	PTVS3V3S1UR	SOD123W	2.6 x 1.7 x 1.0	900
	5	5	400	6.4	6.7	7	10	9.2	43.5	PTVS5V0S1UR			
	6	5	400	6.67	7.02	7.37	10	10.3	38.8	PTVS6V0S1UR			
	6.5	5	250	7.22	7.6	7.98	10	11.2	35.7	PTVS6V5S1UR			
	7	3	100	7.78	8.2	8.6	10	12	33.3	PTVS7V0S1UR			
	7.5	0.2	50	8.33	8.77	9.21	1	12.9	31.0	PTVS7V5S1UR			
	8	0.03	25	8.89	9.36	9.83	1	13.6	29.4	PTVS8V0S1UR			
	8.5	0.01	10	9.44	9.92	10.4	1	14.4	27.8	PTVS8V5S1UR			
	9	0.005	5	10	10.55	11.1	1	15.4	26.0	PTVS9V0S1UR			
	10	0.005	2.5	11.1	11.7	12.3	1	17	23.5	PTVS10V51UR			
	11	0.005	2.5	12.2	12.85	13.5	1	18.2	22.0	PTVS11V51UR			
	12	0.005	2.5	13.3	14	14.7	1	19.9	20.1	PTVS12V51UR			
400	13	0.001	0.1	14.4	15.15	15.9	1	21.5	18.6	PTVS13V51UR			
	14	0.001	0.1	15.6	16.4	17.2	1	23.2	17.2	PTVS14V51UR			
	15	0.001	0.1	16.7	17.6	18.5	1	24.4	16.4	PTVS15V51UR			
	16	0.001	0.1	17.8	18.75	19.7	1	26	15.4	PTVS16V51UR			
	17	0.001	0.1	18.9	19.9	20.9	1	27.6	14.5	PTVS17V51UR			
	18	0.001	0.1	20	21	22.1	1	29.2	13.7	PTVS18V51UR			
	20	0.001	0.1	22.2	23.35	24.5	1	32.4	12.3	PTVS20V51UR			
	22	0.001	0.1	24.4	25.6	26.9	1	35.5	11.3	PTVS22V51UR			
	24	0.001	0.1	26.7	28.1	29.5	1	38.9	10.3	PTVS24V51UR			
	26	0.001	0.1	28.9	30.4	31.9	1	42.1	9.5	PTVS26V51UR			
	28	0.001	0.1	31.1	32.8	34.4	1	45.4	8.8	PTVS28V51UR			
	30	0.001	0.1	33.3	35.1	36.8	1	48.4	8.3	PTVS30V51UR			
	33	0.001	0.1	36.7	38.7	40.6	1	53.3	7.5	PTVS33V51UR			
	36	0.001	0.1	40	42.1	44.2	1	58.1	6.9	PTVS36V51UR			
	40	0.001	0.1	44.4	46.8	49.1	1	64.5	6.2	PTVS40V51UR			
	43	0.001	0.1	47.8	50.3	52.8	1	69.4	5.8	PTVS43V51UR			
	45	0.001	0.1	50	52.65	55.3	1	72.7	5.5	PTVS45V51UR			
	48	0.001	0.1	53.3	56.1	58.9	1	77.4	5.2	PTVS48V51UR			
	51	0.001	0.1	56.7	59.7	62.7	1	82.4	4.9	PTVS51V51UR			
	54	0.001	0.1	60	63.15	66.3	1	87.1	4.6	PTVS54V51UR			
	58	0.001	0.1	64.4	67.8	71.2	1	93.6	4.3	PTVS58V51UR			
	60	0.001	0.1	66.7	70.2	73.7	1	96.8	4.1	PTVS60V51UR			
	64	0.001	0.1	71.1	74.85	78.6	1	103	3.9	PTVS64V51UR			

TVS diodes, 24 W / 40 W

types in **bold blue** represent new products

Number of protected lines uni-directional	Number of protected lines bi-directional	$C_{line}$ typ (pF)	$P_{PP}^{(1)}$ max (W)	ESD rating <sup>(2)</sup> max (kV)	ESD rating <sup>(3)</sup> max (kV)	$I_{RM}$ max (μA) @ $V_{RWM}$ (V)	Configuration	Type	Package	Size (mm)	
2	1	210	24	16	30	5	3		SOT23	2.9 x 1.3 x 1.0	MMBZ5V6AL
		170	24	16	30	0.5	3				MMBZ6V2AL
		150	24	16	30	0.5	4.5				MMBZ6V8AL
		160	24	16	30	0.3	6				MMBZ9V1AL
		135	24	16	30	0.3	6.5				MMBZ10VAL
		110	40	16	30	0.2	8.5				MMBZ12VAL
		85	40	16	30	0.05	12				MMBZ15VAL
		70	40	16	30	0.05	14.5				MMBZ18VAL
		62	40	16	30	0.05	17				MMBZ20VAL
		48	40	16	30	0.05	22				MMBZ27VAL
		42	40	16	30	0.05	26				MMBZ33VAL
		2	1	110	40	16	30				0.2
85	40			16	30	0.1	12	MMBZ15VDL			
70	40			16	30	0.05	14.5	MMBZ18VCL			
62	40			16	30	0.05	17	MMBZ20VCL			
48	40			16	30	0.05	22	MMBZ27VCL			
42	40			16	30	0.05	26	MMBZ33VCL			

<sup>1)</sup> 10/1000 μs acc. to IEC 61643-321  
<sup>2)</sup> MIL-STD-883 (Human Body Model)  
<sup>3)</sup> IEC61000-4-2



Small-signal MOSFETs single (N-channel) < 100V

Package												SOT223 (SC-73)	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	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25x 0.95	2.0 x 1.25x 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)	V <sub>GS</sub> (th) min (V)	V <sub>GS</sub> (th) max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>g</sub> typ (nC)	ESD protection	R <sub>DSon</sub> typ (mΩ) @V <sub>GS</sub> =										
								10 V	4.5 V	2.5 V	1.8 V							
12	8	0.4	-	23	67	10.1	-	-	28	-	39							
		2	4	23	71	10.6	-	-	23	-	37							
		0.4	-	23	71	10.6	-	-	27	-	39							
		0.45	-	20	66	7.4	-	-	30	-	44							
		0.65	-	35	84	5.4	-	-	56	77	-							
		0.65	-	35	84	5.4	-	-	56	77	-							
		0.4	-	6.5	65	-	-	-	140	-	240							
		0.45	0.95	14.5	23.5	0.89	-	-	250	-	420							
	0.45	1	14.5	23.5	-	-	-	280	-	460								
	0.45	1	14.5	23.5	0.89	-	-	280	-	460								
	0.5	1.5	25	37	5.8	-	-	31	44	-								
	0.5	1.5	16	17	0.72	-	-	270	440	-								
	0.5	1.5	16	17	-	-	-	290	460	-								
	0.5	1.5	16	17	0.72	-	-	290	460	-								
0.5	1.5	16	17	0.72	-	-	290	460	-									
1	2	24	35	13.1	-	-	28	34	-	-								
1	2	24	35	13.1	-	-	55	70	-	-								
20	8	0.45	-	22	60	9.9	-	-	38	-	54							
		0.45	-	18	50	9.3	-	-	40	-	55							
		0.45	0.95	11.5	22.5	0.89	-	-	390	-	550							
		0.45	1	11.5	22.5	-	-	-	400	-	580							
		0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>							
		0.45	1	11.5	22.5	0.89	-	-	400	-	580							
		0.5	1.5	16	19.5	0.65	-	-	350	520	-							
		0.5	1.5	16	19.5	-	-	-	370	550	-							
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	0.65	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	1	2	12	27	13.8	-	-	32	40	-	-							
	1	2	33	44	6.1	-	-	31	38	-	-							
1	2	33	44	6.1	-	-	32	42	-	-								
1	2	12	21.5	9.4	-	-	35	45	-	-								
1	2	8.4	17.8	8.8	-	-	40	49	-	-								
1	2	12	23.5	9.4	-	-	47	60	-	-								
1.5	-	12	23.5	4.6	-	-	74	117	-	-								
1	2.8	14	36	-	-	-	80	120	-	-								
1.5	-	11.5	31	4.6	-	-	117 <sup>2)</sup>	190 <sup>2)</sup>	-	-								
1	2.8	18	44	24	-	-	20	30	-	-								
1	2	11	41	6.4	-	-	77	102	-	-								
30	8	0.4	1.8	2	5	-	-	8000	-	18000	-							
		0.45	-	22	60	9.9	-	-	38	-	54							
		0.45	-	18	50	9.3	-	-	40	-	55							
		0.45	0.95	11.5	22.5	0.89	-	-	390	-	550							
		0.45	1	11.5	22.5	-	-	-	400	-	580							
		0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>							
		0.45	1	11.5	22.5	0.89	-	-	400	-	580							
		0.5	1.5	16	19.5	0.65	-	-	350	520	-							
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	0.65	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	1	2	12	27	13.8	-	-	32	40	-	-							
1	2	33	44	6.1	-	-	31	38	-	-								
1	2	33	44	6.1	-	-	32	42	-	-								
1	2	12	21.5	9.4	-	-	35	45	-	-								
1	2	8.4	17.8	8.8	-	-	40	49	-	-								
1	2	12	23.5	9.4	-	-	47	60	-	-								
1.5	-	12	23.5	4.6	-	-	74	117	-	-								
1	2.8	14	36	-	-	-	80	120	-	-								
1.5	-	11.5	31	4.6	-	-	117 <sup>2)</sup>	190 <sup>2)</sup>	-	-								
1	2.8	18	44	24	-	-	20	30	-	-								
1	2	11	41	6.4	-	-	77	102	-	-								
50	13	0.4	1.8	2	5	-	-	8000	-	18000	-							
		0.45	-	22	60	9.9	-	-	38	-	54							
		0.45	-	18	50	9.3	-	-	40	-	55							
		0.45	0.95	11.5	22.5	0.89	-	-	390	-	550							
		0.45	1	11.5	22.5	-	-	-	400	-	580							
		0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>							
		0.45	1	11.5	22.5	0.89	-	-	400	-	580							
		0.5	1.5	16	19.5	0.65	-	-	350	520	-							
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	0.65	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	0.5	1.5	16	19.5	-	-	-	370	550	-								
	1	2	12	27	13.8	-	-	32	40	-	-							
1	2	33	44	6.1	-	-	31	38	-	-								
1	2	33	44	6.1	-	-	32	42	-	-								
1	2	12	21.5	9.4	-	-	35	45	-	-								
1	2	8.4	17.8	8.8	-	-	40	49	-	-								
1	2	12	23.5	9.4	-	-	47	60	-	-								
1.5	-	12	23.5	4.6	-	-	74	117	-	-								
1	2.8	14	36	-	-	-	80	120	-	-								
1.5	-	11.5	31	4.6	-	-	117 <sup>2)</sup>	190 <sup>2)</sup>	-	-								
1	2.8	18	44	24	-	-	20	30	-	-								
1	2	11	41	6.4	-	-	77	102	-	-								
55	15	0.4	1.8	2	5	-	-	8000	-	18000	-							
		0.45	-	22	60	9.9	-	-	38	-	54							
		0.45	-	18	50	9.3	-	-	40	-	55							
		0.45	0.95	11.5	22.5	0.89	-	-	390	-	550							
		0.45	1	11.5	22.5	-	-	-	400	-	580							
		0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>							
		0.45	1	11.5	22.5	0.89	-	-	400	-	580							
		0.5	1.5	16	19.5	0.65	-	-	350	520	-							
	0.5	1.5	16	19.5	-	-	-	370	550									

Small-signal MOSFETs single (N-channel) ≥ 100V

Package													SOT223 (SC-73)	SOT89 (SC-62)	SOT873	SOT23
Size (mm)													6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	3.3 x 3.3 x 0.85	2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)													1700	1300	1500	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	V <sub>GS</sub> (th) min (V)	V <sub>GS</sub> (th) max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	R <sub>DSon</sub> typ (mΩ) @V <sub>GS</sub> =								
								10 V	4.5 V	2.5 V	1.8 V					
100	16	1	2	14	73	-	-	-	200	-	-	-	PHT4NQ10LT			
	20	1	-	3	12	-	-	-	5000	-	-	-				BST82
	20	1	2.8	3	12	-	-	3500	-	-	-	-				BSS123
	20	2	4	21	31	-	-	200	-	-	-	-	PHT4NQ10T			
	20	2	4	-	-	-	-	57	-	-	-	-	PHT6NQ10T			
200	30	2	4	10.5	12.5	7	-	213	-	-	-	-				PMV213SN <sup>1)</sup>
	20	0.4	2	10	45	-	-	1700	-	3000	-	-	BSP122			
	20	0.8	2.8	6	49	-	-	1600	-	-	-	-		BSS87		
220	20	2	4	18	26	13.3	-	250	-	-	-	-			PML260SN	
	20	2	4	20.8	24.3	13.2	-	320	-	-	-	-			PML340SN	
240	20	0.8	2	6	47	-	-	2800	-	7500 <sup>2)</sup>	-	-	BSP89			
250	20	0.8	2	6	47	-	-	2800	-	-	-	-	BSP126			
300	20	0.8	2	6	46	-	-	3700	-	4800	-	-	BSP130			

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

<sup>2)</sup> max values

Small-signal MOSFETs single (P-channel)

Package													SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23
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
P <sub>tot</sub> (mW)													1700	1300	600	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	V <sub>GS</sub> (th) min (V)	V <sub>GS</sub> (th) max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	R <sub>DSon</sub> typ (mΩ) @V <sub>GS</sub> =								
								10 V	4.5 V	2.5 V	1.8 V					
12	8	0.4	-	6.5	65	-	-	-	80	-	140	-				BSH207
	8	0.4	-	6.5	65	-	-	-	180	-	420	-				BSH205 <sup>1)</sup>
20	12	0.55	0.95	16	117	10	-	-	48	65	-	-				PMN50XP
	12	0.55	0.95	28	101	7.6	-	-	65	90	-	-				PMV65XP <sup>1)</sup>
30	8	0.4	-	6.5	65	-	-	-	660	-	1100	-				BSH203
	20	1	2.8	20	50	-	-	220	330	-	-	-	BSP250			
	20	1	-	6.5	65	-	-	630	890	-	-	-				BSH202
50	20	0.8	2	3	7	-	-	6000	-	-	-	-				BSS84
60	20	1	-	6.5	65	-	-	2100	2700	-	-	-				BSH201
200	20	0.8	2.8	5	20	-	-	10000	-	-	-	-	BSP220			
240	20	0.8	2.8	5	20	-	-	10000	-	-	-	-		BSS192		
250	20	0.8	2.8	5	10	-	-	10000	-	-	-	-	BSP225			
300	20	1.95	2.8	5	15	-	-	17000 <sup>2)</sup>	-	-	-	-	BSP230			

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

<sup>2)</sup> max values

### Small-signal MOSFETs double

Package											SOT363 (SC-88)
Size (mm)											2.0 x 1.25 x 0.95
P <sub>tot</sub> (mW)											300
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	V <sub>GS</sub> (th) min (V)	V <sub>GS</sub> (th) max (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>g</sub> typ (nC)	R <sub>DSon</sub> typ (mΩ) @V <sub>GS</sub> =				
							10 V	4.5 V	2.5 V	1.8 V	
20	8	0.45	1	14.5	23.5	0	-	280	-	460	PMGD280UN
	12	0.5	1.5	16	17	0.72	-	290	460	-	PMGD290XN
30	8	0.45	1	11.5	22.5	0.89	-	400	-	580	PMGD400UN
	12	0.5	1.5	17	19.5	0.65	-	370	550	-	PMGD370XN
	15	0.8	1.5	17	22	0.35	-	1800	2900	-	PMGD8000LN
60	20	1	-	6	7.2	1.05	780	1100	-	-	PMGD780SN

### MOSFET driver

Package			SOT457 (SC-74)		
Size (mm)			2.9 x 1.5 x 1.0		
P <sub>tot</sub> (mW)			400		
Configuration					
Contains	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	R1 = R2 (kΩ)		
General purpose transistors	0.1	0.2	PMD9050D		BCV65 (SOT143B)
					2.2
					4.7
					10
Switching transistors - reduced storage time	0.6	1.0			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

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

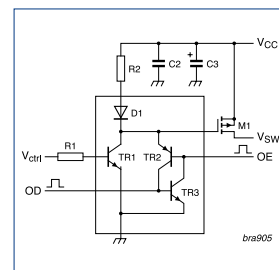
#### Key benefits

- ▶ Reduced component count
- ▶ Smaller end products

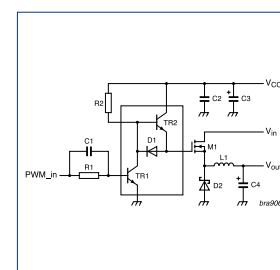
#### Key applications

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

#### MOSFET driver with hardware output disable function



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



### Single transistors

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		

### 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>CE0</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		BC847BS	BC847BV	
	65	100	110	450	100		BC846S		
	50	150	120	560	100		PUMX2		
	45	500	160	400	80		BC817DS		
PNP	40	100	120	450	100		PIMT1	PUMT1	PEMT1
	45	100	200	450	100		BC857BS	BC857BV	
	65	100	110	450	100		BC856S		
	45	500	160	400	80		BC807DS		
NPN/PNP	40	100	120	450	100		PUMZ1	PEMZ1	
	45	100	200	450	100		BC847BPN	BC847BVN	
	50	100	120	560	100		PIMZ2	PUMZ2	
	12	500	200	-	250/100			PEMZ7	
45	500	160	400	100/80		BC817DPN			

### Single and double switching transistors

types in **bold blue** represent new products

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
Polarity	V <sub>CE0</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				
					500	20			PMBT2369	PMST2369			
	40	200	100	300	300	250			MMBT3904		<b>PMBT3904YS</b>	<b>PMBT3904VS</b>	<b>PMBT3904M</b>
PNP	30	600	100	300	250	250			PMBT2222	PMST2222			
					250	250	PZT4401	PXT4401	PMBT4401	PMST4401			
	40	600	100	300	300	250			MMBT2222A				
					300	250	PZT2222A		PMBT2222A	PMST2222A			
PNP	40	100	100	300	150	700			PMB53906	PMSS3906			
									MMBT3906		<b>PMBT3906YS</b>	<b>PMBT3906VS</b>	<b>PMBT3906M</b>
									PMBT3906	PMST3906			
	40	600	100	300	350	365			PZT4403	PXT4403	PMBT4403	PMST4403	
					300	365			PMBT2907			PMST2907A	
60	600	100	300	200	365			BSR16					
NPN/PNP	40	200	100	300	300/250	250/300						<b>PMBT3946YPN</b>	<b>PMBT3946VPN</b>

### 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>CE0</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			
										PMBT5551/BSR19A	PMST5551			
	160	300	80	250	100									
										BF722	BF622		BF822	
	250	100	50	-	60							BF820	BF820W	
										BF720	BF620		PMBTA42	PMSTA42
										PZTA42	PXTA42			
									350	100	40	-	70	BSP19
PNP	400	300	50	200	20						PMBTA44			
										PZTA44				
	100	100	30	-	50						BSS63			
										BF723				
250	100	50	-	60							BF623	BF823		
300	100	50	-	60							BF621	BF821		
2 x NPN	300	100	40	-	50						PZTA92	PXTA92	PMBTA92	PMSTA92
													PMBTA42DS	

### 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>CE0</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

### Darlington transistors

Package							SOT223 (SC-73)	SOT89 (SC-62)	SOT23	
Size (mm)							6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	
P <sub>tot</sub> (mW)							1700	1300	250	
Polarity	V <sub>CE0</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	f <sub>T</sub> typ (MHz)						
NPN	30	500	10000	125				PMBTA13		
			20000	125			PZTA14	PXTA14	PMBTA14	
	45	1000	2000	200				BCV29	BCV27	
			500	10000	220			BSP50	BST50	
	60	500	1000	200					BCV49	BCV47
			1000	2000	200			BSP51	BST51	
80	1000	2000	200				BSP52	BST52		
PNP	30	500	20000	125					PMBTA64	
			20000	220					BCV28	BCV26
	45	1000	2000	200					BSP60	BST60
			500	10000	220					BCV48
60	500	1000	200							
		1000	2000	200				BSP61	BST61	
80	1000	2000	200					BSP62	BST62	



### Matched pair transistors

types in **bold blue** represent new products

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>CE0</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.
	45	100	200	450	0.9 <sup>1)</sup>	2
					0.95	2
					0.98	2
Configuration						
PNP	30	100	100	800	0.7 <sup>1)</sup>	n.a.
	45	100	200	450	0.9 <sup>1)</sup>	2
					0.95	2
					0.98	2
	65	100	200	450	0.9	2
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

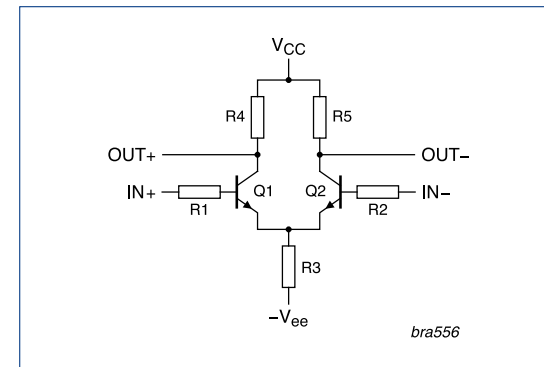
#### Key benefits

- ▶ 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

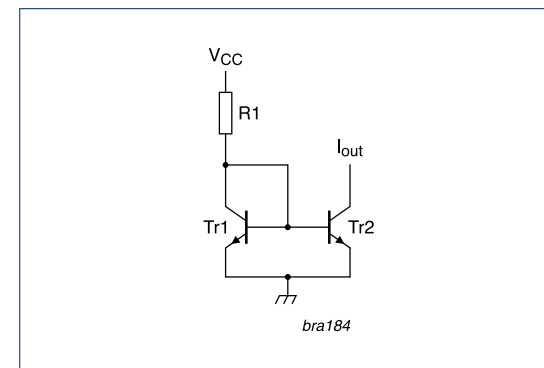
#### Key applications

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

#### Differential amplifier



#### Current mirror



### Medium frequency transistors

Package		SOT23	SOT323 (SC-70)		
Size (mm)		2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95		
P <sub>tot</sub> (mW)		250	200		
Polarity	V <sub>CE0</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
	20	30	25	40	> 275
			65	225	260
	40	25	67	220	380
PNP	30	25	25	50	250
	40	25	50	-	> 325

### Schmitt trigger

Package		SOT143B					
Size (mm)		2.9 x 1.3 x 1.0					
P <sub>tot</sub> (mW)		250					
Polarity	V <sub>CE0</sub> (V)	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	250		
PNP	30	6	100	220	250		

#### Key features

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

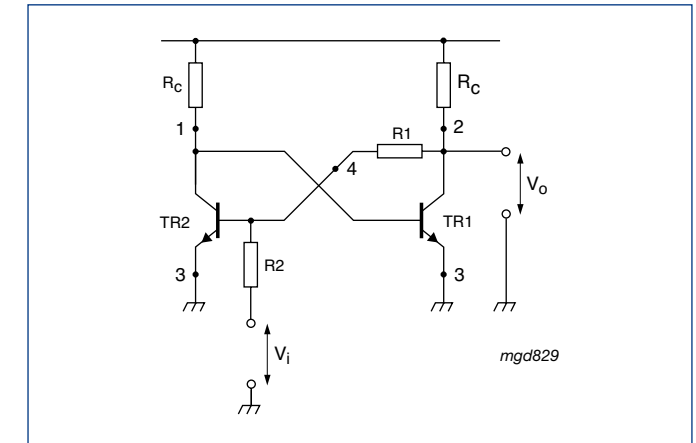
#### Key benefits

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

#### Key applications

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

#### Schmitt trigger



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>CE0</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>CE0</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>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	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	PEMB30	
		4.7	-				PUMH7	PUMD6	PUMB3	PEMH7	PEMD6	PEMB3		
		10	-				PUMH4	PUMD4	PUMB4	PEMH4	PEMD4	PEMB4		
		22	-				PUMH19	PUMD19	PUMB19	PEMH19	PEMD19	PEMB19		
		47	-				PUMH14	PUMD14	PUMB14	PEMH14	PEMD14	PEMB14		

RETs 500 mA

Package		SOT457 (SC-74)	SOT23				
Size (mm)		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0				
P <sub>tot</sub> (mW)		600	250				
V <sub>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	2 x NPN	NPN	PNP
50	500	R1 = R2	1.0	1.0		PDTD113ET	PDTB113ET
			2.2	2.2		PDTD123ET	PDTB123ET
		R1 ≠ R2	1.0	10	PIMN31	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>CE0</sub> (V)	I <sub>c</sub> (mA)	Configuration	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 PNP

types in **bold blue** represent new products

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-62)		SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	SOT883 (SC-101)	SOT1061
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	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	2.0 x 2.0 x 0.65
P <sub>tot</sub> (mW)											1700	1650	750		480	350	430	250	500	250	1650
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> = 0.5A; I <sub>B</sub> = 0.05A	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	200/320	1	2	32	20	280	6	0.3										PBSS5612PA	
15	0.5	1.0	200/260	0.01	2	300	150	250	0.5	0.05										PBSS3515M	
	0.5	1.0	200/325	0.01	2	300	150	250	0.5	0.05										PBSS3515E	
20	1.0	2.0	300/450	0.1	2	250	125 <sup>2)</sup>	250	1	0.05											
	2.0	4.0	220/440	0.1	2	140	75	390	2	0.2		PBSS5120T									
	2.0	3.0	225/-	0.5	2	115	80 <sup>2)</sup>	225	2	0.2											
	2.0	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											
	3.0	5.0	220/450	0.5	2	90	50	300	3	0.3											
	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	PBSS302PZ										
	6.0	7.0	200/335	1	2	35	23	300	6	0.3											
	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											
	3.0	5.0	200/380	0.5	2	80	50	320	3	0.3											
40	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	PBSS303PZ										
	6.0	7.0	200/335	1	2	37	24	315	6	0.3											
	0.5	1.0	200/380	0.01	2	440	220	350	0.5	0.05											
	0.5	1.0	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											
	1.0	2.0	300/520	0.1	5	230	130	500	1	0.1											
	1.0	2.0	300/800	0.1	5	250	130	500	1	0.1											
	1.0	2.0	300/510	0.1	5	230	130	500	1	0.1											
	1.8	3.0	300/450	0.1	5	185	100	530	2	0.2											
50	2.0	3.0	300/-	0.1	2	200	110 <sup>2)</sup>	350	2	0.2											
	2.0	3.0	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											
	4.0	10.0	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											
	2.0	3.0	200/-	0.5	2	150	90 <sup>2)</sup>	300	2	0.1											
	2.0	5.0	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											
60	3.0	5.0	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											
	3.0	5.0	200/300	0.5	2	120	70	300	2	0.2											
	1.0	2.0	150/250	0.5	5	220	120	330	1	0.1											
	1.0	2.0	150/250	0.5	5	255	135	340	1	0.1											
	1.0	2.0	150/250	0.5	5	220	120	330	1	0.1											
	3.0	6.0	180/265	0.5	2	70	55	290	3	0.3											
80	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	6.0	170/260	1	2	52	31	375	5	0.25											
	3.0	5.0	155/225	0.5	2	71	55	290	3	0.3											
	4.0	10.0	200/300	0.5	2	50	35	380	5	0.5											
100	4.0	8.0	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											
	4.5	5.0	170/265	1	2	63	35	420	4.5	0.225											
100	1.0	3.0	150/-	0.25	5	170	93	320	1	0.1											
	1.0	3.0	150/350	0.5	5	170	95	320	1	0.1											
	1.0	3.0	150/350	0.5	5	170	100	320	1	0.1											
	1.0	3.0	150/350	0.5	5	170	90	320	1	0.1											
	1.0	3.0	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											
	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											
3.0	4.0	170/275	1	2	95	43	400	3.0	0.15												

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub> = 20  
<sup>2)</sup> V<sub>CEsat</sub> (max)

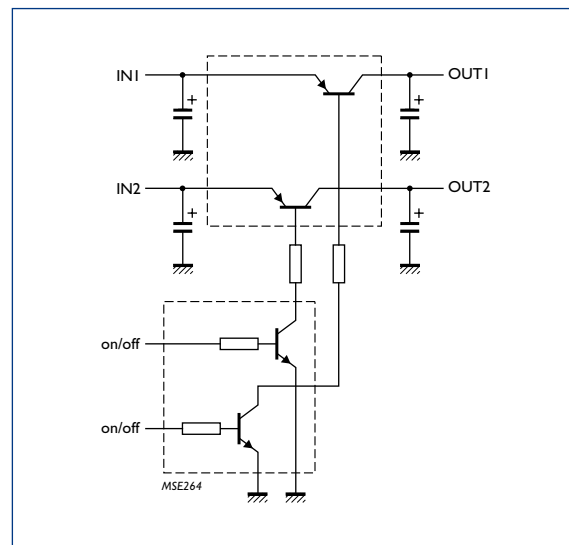


## Low $V_{CEsat}$ (BISS) transistors double

Package										SOT96 (SO8)	SOT457 (SC-62)	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>4)</sup>	750	430	500
V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	Polarity	h <sub>FE min</sub>	@ I <sub>C</sub> (A)	@ V <sub>CE</sub> (V)	V <sub>CEsat typ</sub> (mV); I <sub>C</sub> = 0.5A; I <sub>B</sub> = 0.05A	V <sub>CEsat max</sub> (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
	0.5	2 x PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05				PBSS3515VS
	0.5	NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05				PBSS2515VPN
	0.5	NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05			PBSS2515YPN	
40	1.0	NPN/PNP	300/250	0.5	5	130/150	500	1	0.1				PBSS4140DPN
	2.0	NPN/PNP	300/250	0.5	5	80/100	400/530	2	0.2				PBSS4240DPN
50	2.7	2 x NPN	300	0.5	2	50	340	2.7	0.27				PBSS4350SS
	2.7	2 x PNP	200	0.5	2	60	370	2.7	0.27				PBSS5350SS
	2.7	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
	1.0	2 x PNP	150	0.5	5	120	330	1	0.1				PBSS5160DS
	1.0	NPN/PNP	200/150	0.5	5	115/120	250/330	1	0.1				PBSS4160DPN

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

### Dual load switch using double RETs and double BISS transistors



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

types in **bold blue** represent new products

Package					SOT96 (SO8)	SOT457 (SC-62)	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>	600 <sup>1)</sup>	300 <sup>2)</sup>	300 <sup>2)</sup>
V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	V <sub>CEsat typ</sub> (mV); I <sub>C</sub> = 0.5A; I <sub>B</sub> = 0.05A	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	
20	1.6	70	2.2				<b>PBLS2021D</b>	
			4.7				<b>PBLS2022D</b>	
			10				<b>PBLS2023D</b>	
			22				<b>PBLS2024D</b>	
20	3	75	2.2				PBLS2001S	
			4.7				PBLS2002S	
			10				PBLS2003S	
40	1	170	2.2				PBLS4001D	
			4.7				PBLS4002D	
			10				PBLS4003D	
			22				PBLS4004D	
			47				PBLS4005D	
60	1	180	2.2				PBLS6001D	
			4.7				PBLS6002D	
			10				PBLS6003D	
			22				PBLS6004D	
			47				PBLS6005D	
60	1.3	100	2.2				<b>PBLS6021D</b>	
			4.7				<b>PBLS6022D</b>	
			10				<b>PBLS6023D</b>	
			22				<b>PBLS6024D</b>	

<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

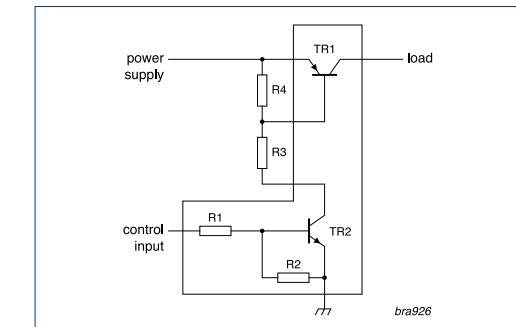
### Key benefits

- ▶ 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 loadswitch



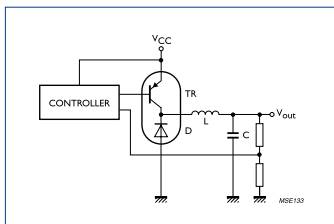
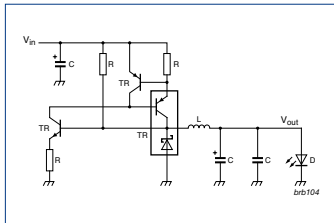
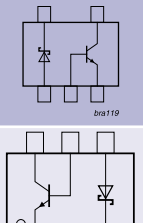
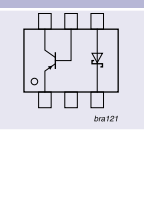
### High voltage low $V_{CEsat}$ (BISS) transistors

types in **bold blue** represent new products

Package				SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Size (mm)				6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)				1700	1300	250
Polarity	V <sub>CESM</sub> <sup>1)</sup> (V)	V <sub>CEO</sub> (V)	I <sub>C</sub> (A)			
NPN	-	150	1	PBHV8115Z	<b>PBHV8115X</b>	PBHV8115T
	500	400	0.5	PBHV8540Z	<b>PBHV8540X</b>	PBHV8540T
PNP	-	150	1	PBHV9115Z	<b>PBHV9115X</b>	PBHV9115T
	500	400	0.25	PBHV9040Z	<b>PBHV9040X</b>	PBHV9040T

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

### Low $V_{CEsat}$ modules – Schottky diode / (BISS) transistor module

Package		Configuration		SOT457 (SC-74)	SOT353 (SC-88A)		
Size (mm)				2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95		
P <sub>tot</sub> (mW)				500	250		
Transistor		Schottky rectifier					
V <sub>CEO</sub> max (V)	I <sub>C</sub> max (A)	V <sub>CEsat</sub> max (mV)	I <sub>F</sub> max (A)	V <sub>F</sub> max (V)	V <sub>F</sub> max (V)		
15	0.5	250	0.5	20	390	 bra119	PMEM1505NG
40	1.0	210	1	20	550		
	2.0	400	1	40	640	 bra121	PMEM4010ND PMEM4020ND PMEM4020AND
15	0.5	250	0.5	20	390	 bra122	PMEM1505PG
40	1.0	410	1	20	550		
	2.0	530	1	640		 bra121	PMEM4010PD PMEM4020PD PMEM4020APD

#### Key features

- ▶ Combination of low V<sub>F</sub> (MEGA) Schottky rectifier and low V<sub>CEsat</sub> (BISS) transistor in one package
- ▶ High forward current capability
- ▶ Low power dissipation

#### Key applications

- ▶ DC/DC conversion
- ▶ Inductive load driver
- ▶ Push-pull driver

#### Key benefits

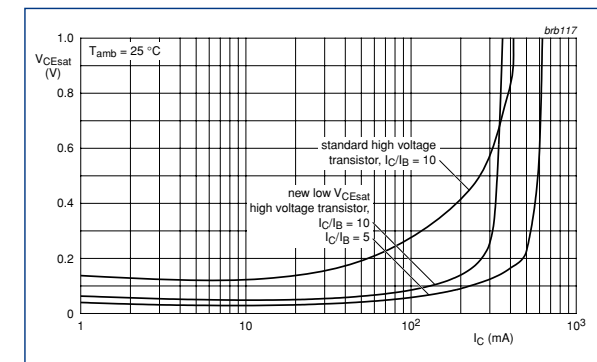
- ▶ Reduced component count
- ▶ Space savings of up to 32 %
- ▶ Higher efficiency
- ▶ Higher power density
- ▶ Cost reduction potential
- ▶ Simplified circuit design

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

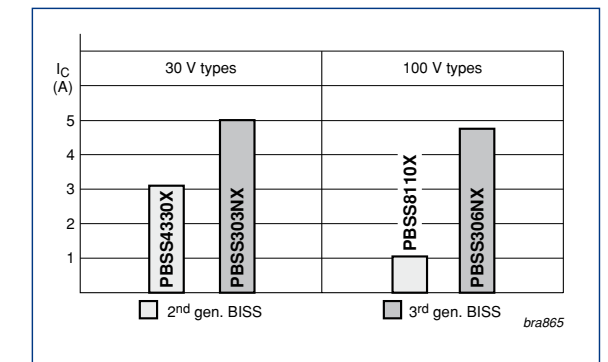
Package						SOT23
Size (mm)						2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)						250
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	R1 (kΩ)	R2 (kΩ)		
NPN	40	600	R1 = R2	1	1	PBRN113ET
				2.2	2.2	PBRN123ET
			R1 ≠ R2	1	10	PBRN113ZT
				2.2	10	PBRN123YT
PNP	40	600	R1 = R2	1	1	PBRP113ET
				2.2	2.2	PBRP123ET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

### Advantages of low $V_{CEsat}$ (BISS) technology

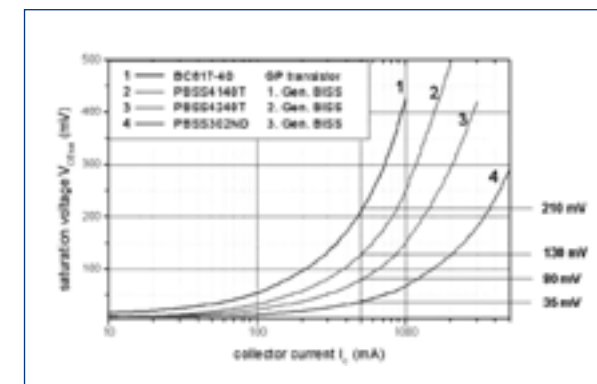
High voltage low  $V_{CEsat}$  (BISS)  $V_{CEsat}$  improvement leads to higher I<sub>C</sub> capability



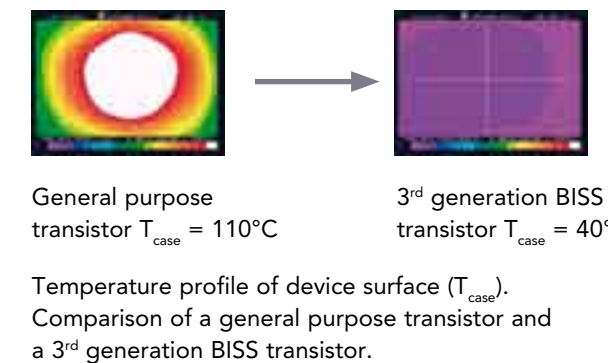
#### Improved collector current capabilities



Saturation voltage: General purpose versus low  $V_{CEsat}$  (BISS) transistors (NPN in SOT23/SOT457)



#### 65 % heat reduction by BISS transistors



Medium power low  $V_{CEsat}$  (BISS) transistors NPN

Package													SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-62)
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
P <sub>tot</sub> (mW)													1700	1650	750
Polarity	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> = 0.5A; I <sub>B</sub> = 0.05A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)				
NPN	12	5.3	10.6	300/530	0.5	2	27 <sup>1)</sup>	18	200	5.3	0.265		PBSS301NX		
		5.8	11.6	300/530	0.5	2	29 <sup>1)</sup>	18	235	5.8	0.29		PBSS301NZ		
	20	3.0	5.0	220/390	0.5	2	85	40	310	3	0.3		PBSS4320X		
		4.0	15.0	300/450	0.5	2	50	30	280	4	0.4			PBSS301ND	
		5.0	10.0	300/450	0.5	2	32	35	220	5	0.5		PBSS4520X		
		5.3	10.6	300/570	0.5	2	27 <sup>1)</sup>	20	200	5.3	0.265		PBSS302NX		
		5.8	10.2	300/570	0.5	2	30 <sup>1)</sup>	20	250	5.8	0.29		PBSS302NZ		
	30	3.0	5.0	300/490	0.5	2	80	45 <sup>1)</sup>	300	3	0.3		PBSS4330X		
		5.1	10.2	300/480	0.5	2	30 <sup>1)</sup>	20	220	5.1	0.255		PBSS303NX		
		5.5	11.0	300/480	0.5	2	31 <sup>1)</sup>	20	240	5.5	0.275		PBSS303NZ		
	40	4.0	15.0	300/520	0.5	2	55	35	300	4	0.4			PBSS302ND	
		4.0	10.0	300/500	0.5	2	40	21	355	5	0.5		PBSS4540X		
		5.0	10.0	300/500	0.5	2	42	25	355	5	0.5		PBSS4540Z		
	50	2.0	5.0	300/495	0.5	2	100	60	260	2	0.2				
		2.0	5.0	300/-	0.5	2	160	90 <sup>2)</sup>	320	2	0.2		PBSS4250X		
		3.0	5.0	200/280	0.5	2	110	65	290	2	0.2			PBSS4350D	
		3.0	5.0	300/460	0.5	2	75	50	370	3	0.3			PBSS4350X	
		3.0	5.0	200/280	0.5	2	110	60 <sup>1)</sup>	290	2	0.2		PBSS4350Z		
		3.0	6.0	345/570	0.5	2	65	40	260	3	0.3			PBSS303ND	
	60	4.7	9.4	300/520	0.5	2	37 <sup>1)</sup>	25	245	4.7	0.235			PBSS304NX	
		5.2	10.4	300/520	0.5	2	39 <sup>1)</sup>	25	280	5.2	0.26		PBSS304NZ		
	80	3.0	6.0	240/360	0.5	2	67	40	255	3	0.3			PBSS304ND	
		4.0	10.0	250/400	0.5	2	43 <sup>1)</sup>	25	230	4	0.2			PBSS4480X	
		4.6	9.2	300/470	0.5	2	37 <sup>1)</sup>	25	240	4.6	0.23			PBSS305NX	
		5.1	10.2	300/470	0.5	2	38 <sup>1)</sup>	25	270	5.1	0.255		PBSS305NZ		
	100	1.0	3.0	150/290	0.25	10	160	75	200	1	0.1			PBSS8110D	
		1.0	3.0	150/290	0.25	10	165	73	200	1	0.1			PBSS8110X	
		1.0	3.0	150/290	0.25	10	160	73	200	1	0.1			PBSS8110Z	
3.0		4.0	170/275	0.5	2	72	45	360	4	0.4			PBSS305ND		
4.5		9.0	200/330	0.5	2	38 <sup>1)</sup>	27	245	4.5	0.225			PBSS306NX		
5.1	10.2	200/330	0.5	2	43 <sup>1)</sup>	27	300	5.1	0.255			PBSS306NZ			

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub> = 20  
<sup>2)</sup> V<sub>CEsat</sub> (max)

Medium power low  $V_{CEsat}$  (BISS) transistors PNP

Package													SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-62)
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
P <sub>tot</sub> (mW)													1700	1650	750
Polarity	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> = 0.5A; I <sub>B</sub> = 0.05A	V <sub>CEsat</sub> max (mV)	@ I <sub>C</sub> (A)	@ I <sub>B</sub> (A)				
PNP	12	5.3	10.6	250/400	0.5	2	28 <sup>1)</sup>	20	210	5.3	0.265		PBSS301PX		
		5.7	11.4	250/400	0.5	2	30 <sup>1)</sup>	20	245	5.7	0.285		PBSS301PZ		
	20	3.0	5.0	200/-	0.5	2	85	80 <sup>2)</sup>	400	3	0.3			PBSS5320D	
		3.0	5.0	220/450	0.5	2	90	50	300	3	0.3			PBSS5320X	
		4.0	15.0	250/400	0.5	2	50	35	280	4	0.4			PBSS301PD	
		5.0	10.0	300/430	0.5	2	34	45	270	5	0.5			PBSS5520X	
		5.1	10.2	250/370	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255			PBSS302PX	
	30	3.0	5.0	200/380	0.5	2	80	50	320	3	0.3			PBSS5330X	
		5.1	10.2	250/400	0.5	2	32 <sup>1)</sup>	25	230	5.1	0.255			PBSS303PX	
		5.3	10.6	250/400	0.5	2	35 <sup>1)</sup>	25	265	5.3	0.265			PBSS303PZ	
	40	4.0	15.0	200/310	0.5	2	55	46	300	4	0.4			PBSS302PD	
		4.0	10.0	250/370	0.5	2	45	33	375	5	0.5			PBSS5540X	
	50	2.0	5.0	200/-	0.5	2	160	90 <sup>2)</sup>	320	2	0.2			PBSS5250X	
		3.0	5.0	200/300	0.5	2	120	70	300	2	0.2			PBSS5350D	
		3.0	5.0	200/375	0.5	2	120	70	390	3	0.3			PBSS5350X	
		3.0	5.0	200/300	0.5	2	120	70	300	2	0.2			PBSS5350Z	
	60	3.0	6.0	180/265	0.5	2	70	55	290	3	0.3			PBSS303PD	
		4.2	8.4	200/295	0.5	2	53 <sup>1)</sup>	35	310	4.2	0.21			PBSS304PX	
		4.5	9.0	200/295	0.5	2	59 <sup>1)</sup>	35	375	4.5	0.225			PBSS304PZ	
	80	3.0	5.0	155/225	0.5	2	71	55	290	3	0.3			PBSS304PD	
		4.0	10.0	200/300	0.5	2	50	35	380	5	0.5			PBSS5480X	
		4.0	8.0	200/280	0.5	2	43	36	240	4	0.4			PBSS305PX	
		4.5	9.0	200/280	0.5	2	69 <sup>1)</sup>	36	450	4.5	0.225			PBSS305PZ	
	100	1.0	3.0	150/350	0.5	5	170	100	320	1	0.1			PBSS9110D	
		1.0	3.0	150/350	0.5	5	170	90	320	1	0.1			PBSS9110X	
		1.0	3.0	150/-	0.5	5	170	90	320	1	0.1			PBSS9110Z	
		2.0	3.0	175/275	0.5	2	88	65	250	2	0.2			PBSS305PD	
		3.7	7.4	200/300	0.5	2	52	45	300	4	0.4			PBSS306PX	
4.1	8.2	200/300	0.5	5	57	45	325	4.1	0.41			PBSS306PZ			

<sup>1)</sup> I<sub>C</sub>/I<sub>B</sub> = 20  
<sup>2)</sup> V<sub>CEsat</sub> (max)

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
PNP	20	1000	63 - 100	160 - 250	100	BCP56 / -10 / -16	BCX56 / -10 / -16
	45	1000	40 - 100	120 - 300	100	BSP43	BSR42 / 43
			63 - 100	160 - 250	100	BCP69 / -16 / -25	BC869 / -16 / -25
	80	1000	63 - 100	160 - 250	115 <sup>1)</sup> - 145 <sup>1)</sup>	100	BCP51 / -10 / -16
63 - 100			160 - 250	100	BCP52 / -10 / -16	BCX52 / -10 / -16	
40 - 100			120 - 300	100	BSP31	BSR30 / 31	
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

## Voltage regulator IC

types in **bold blue** represent new products

Package				SOT23
Size (mm)				2.9 x 1.3 x 1.0
P <sub>tot</sub> (mW)				480
V <sub>KA</sub> (V)	I <sub>k</sub> (A)	V <sub>ref</sub>	T <sub>amb</sub>	
36	150	2%	0 to 70°C	<b>TL431CDBZR</b>
			-40 to 85°C	<b>TL431IDBZR</b>
			-40 to 125°C	<b>TL431QDBZR</b> <b>TL431SDT<sup>1)</sup></b>
		1%	0 to 70°C	<b>TL431ACDBZR</b>
			-40 to 85°C	<b>TL431AIDBZR</b>
			-40 to 125°C	<b>TL431AQDBZR</b> <b>TL431ASDT<sup>1)</sup></b>

<sup>1)</sup> optimized for use with dedicated capacitive load

## Discrete voltage regulators

Package					SOT223 (SC-73)	SOT457 (SC-74)
Size (mm)					6.5 x 3.5 x 1.65	2.9 x 1.5 x 1.0
P <sub>tot</sub> (mW)					1300	380
Zener diode		Transistor				
V <sub>out</sub> (V)	V <sub>z</sub> min - V <sub>z</sub> max (V)	V <sub>CEO</sub> (V)	I <sub>c</sub> (A)	h <sub>FE</sub> min		
	@ I <sub>z</sub> = 5 mA			@ 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
- ▶ Output power dissipation capability: 1300 mW in SOT223 and 380 mW in SOT457
- ▶ SMD plastic packages

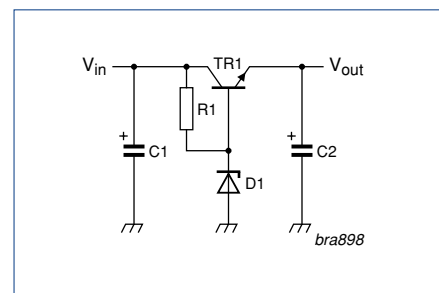
### Key benefits

- ▶ Component count reduction
- ▶ Board space reduction
- ▶ Improved reliability

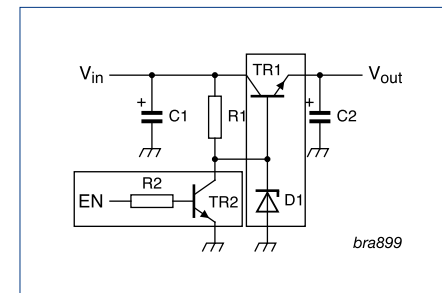
### Key applications

- ▶ Linear voltage regulation

Standard voltage regulator. PVR-series already include TR1 and D1, internally connected



A resistor-equipped transistor (RET) adds an output enable function



## Constant current source

Package								SOT353 (SC-88A)
Size (mm)								2.0 x 1.25 x 0.95
P <sub>tot</sub> (mW)								335
Type								PSSI2021SAY
Description	maximum supply voltage	maximum supply current	typical stabilized output current	minimum stabilized output current	maximum stabilized output current	typical load stability of stabilized output current	typical output current change over ambient temperature	
Parameter	V <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 (ΔT <sub>amb</sub> )	
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

- ▶ Single-chip constant current source
- ▶ Output current set by an external resistor
- ▶ Very small footprint package

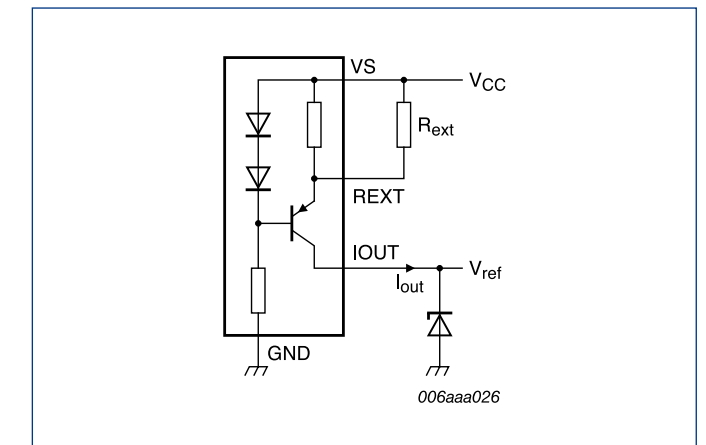
### Key benefits

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

### Key applications

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

### Voltage reference








## Audio solutions

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		$R_{line}$	$C_{line}$ (pF)					
Audio	2	0.9 $\Omega$	290	-	low-ohmic speaker (< ~8 $\Omega$ )	IP4047CX6/LF	6 ball CSP	1.56 x 1.01 x 0.65
		10 $\Omega$	200	-	high-ohmic speaker (> ~8 $\Omega$ )	IP4048CX5/LF	5 ball CSP	0.91 x 1.28 x 0.65
		15 $\Omega$	5000	-	high-ohmic speaker (> ~8 $\Omega$ )	IP5311CX5/LF	5 ball CSP	0.80 x 1.16 x 0.61
		68 $\Omega$	110	-	single-ended or differential microphone	IP4049CX5/LF	5 ball CSP	0.91 x 1.28 x 0.65
		470 $\Omega$	35	-	single-ended or differential microphone	IP4055CX6/LF	6 ball CSP	1.56 x 1.03 x 0.65
		470 $\Omega$	35	-	single-ended or differential microphone	IP4355CX6/LF	6 ball CSP	1.16 x 0.76 x 0.65
		50 $\Omega$ / 2200 $\Omega$	2000	-	single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF	8 ball CSP	1.67 x 1.67 x 0.65
		50 $\Omega$	4000	-	differential microphone filter with integrated biasing network for $\Sigma\Delta$ ADC converters	IP5006CX11/LF	11 ball CSP	1.41 x 1.91 x 0.65
		5 $\Omega$ / 20 $\Omega$ / 1.5 k $\Omega$	9450	-	differential microphone filter with integrated biasing network for $\Sigma\Delta$ including coupling capacitors	IP5020CX16/LF	16 ball CSP	2.01 x 1.91 x 0.65
	4	10 k $\Omega$	5000	-	dual differential speaker	IP5040CX11/LF	11 ball CSP	1.41 x 2.01 x 0.65
	5	15 $\Omega$ / 95 $\Omega$	65 / 33	-	single-ended microphone and high-ohmic speaker (> ~8 $\Omega$ ) with integrated 2 kohm pull-up resistor	IP4363CX10/LF	10 ball CSP	0.76 x 1.96 x 0.61
	6	40 $\Omega$ / 1450 $\Omega$ / 10 $\Omega$	50 / 20 / 200	-	fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4025CX20/LF	20 ball CSP	1.98 x 2.53 x 0.65
					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
					fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4125CX20/LF	20 ball CSP	2.00 x 2.66 x 0.65
8	0.8 $\Omega$ / 30 $\Omega$ / 200 $\Omega$	20 / 50 / 150	~20	fully integrated audio interface protection including EMI filtering for microphone and speaker, and additional 4-channel EMI filter	IP4110CX20/LF	20 ball CSP	1.91 x 2.47 x 0.65	

## MMC, SD &amp; SIM cards solutions

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		$R_{line}$	$C_{line}$ (pF)					
SIM card	3	47 $\Omega$ / 100 $\Omega$	10	~20	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	<b>IP4365CX11</b>	11 ball CSP	1.16 x 1.56 x 0.61
		47 $\Omega$ / 100 $\Omega$	40	~12	EMI filter, ESD protection	IP4044CX8/LF	8 ball CSP	1.46 x 1.49 x 0.65
		47 $\Omega$ / 100 $\Omega$	20	~20	EMI filter, ESD protection	IP4064CX8/LF/S	8 ball CSP	1.41 x 1.41 x 0.65
		47 $\Omega$ / 100 $\Omega$	20	~20	EMI filter, ESD protection, extremely small size	IP4364CX8/LF	8 ball CSP	1.16 x 1.16 x 0.61
		47 $\Omega$ / 100 $\Omega$	10	~20	Integrated low capacitance SIM-Card passive filter array with ESD protection	<b>IP4366CX8/LF</b>	8 ball CSP	1.21 x 1.21 x 0.66
		47 $\Omega$ / 100 $\Omega$	40	~12	EMI filter, ESD protection	IP4264CZ8-40	8 pin QFN 	1.7 x 1.35 x 0.5
		47 $\Omega$ / 100 $\Omega$	20	~20	EMI filter, ESD protection	IP4264CZ8-20	8 pin QFN 	1.7 x 1.35 x 0.5
		-	1	~240	ESD protection	IP4221CZ6-S	SOT886 (XSON6) 	1.45 x 1.0 x 0.5

types in **bold blue** represent new products

## MMC, SD &amp; SIM cards solutions

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		$R_{line}$	$C_{line}$ (pF)					
Memory cards	4	47 $\Omega$ / 13 k $\Omega$ / 56 k $\Omega$	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP	1.44 x 1.96 x 0.65
		50 $\Omega$ / 75 k $\Omega$ / 7 k $\Omega$	18	~50	high-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	16 ball CSP	1.96 x 1.97 x 0.65
	7	40 $\Omega$ / 50 k $\Omega$ / 25 k $\Omega$	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
	9	15 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	8	> 52	(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 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	20	> 52	(mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF	24 ball CSP	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 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	-	> 52	(mini) SD/SDIO memory card level shifter and voltage regulator, incl. ESD and EMI filter	IP4853CX24/LF	24 ball CSP	2.01 x 2.01 x 0.61









## USB 2.0 &amp; USB I.I solutions

types in **bold blue** represent new products



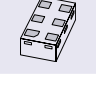
Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)	
		$R_{line}$	$C_{line}$ (pF)						
USB (CSP Package)	2	47 $\Omega$ / 100 $\Omega$	10	~20	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	<b>IP4365CX11</b>	11 ball CSP	1.16 x 1.56 x 0.61	
		33 $\Omega$ / 1.3 k $\Omega$	30	~5.5	fully integrated USB2.0 low / full-speed 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 $\Omega$ / 1.3 k $\Omega$ / 10 k $\Omega$	30	~5.5	fully integrated USB2.0 low / full-speed 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 $\Omega$ / 1.3 k $\Omega$ / 17 k $\Omega$ / 15 k $\Omega$	27	~5.5	fully integrated USB2.0 low / full-speed 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 $\Omega$ / 1.5 k $\Omega$	35	~5.5	fully integrated USB2.0 low / full-speed interface with EMI filter, ESD protection, pull-up resistors and impedance matching on NXP ISP110x, ISP130x, ISP136x	IP4058CX8/LF	8 ball CSP	0.91 x 1.91 x 0.65	
		17 $\Omega$ / 1.5 k $\Omega$	35	~5.5	fully integrated USB2.0 low / full-speed interface with EMI filter, ESD protection, pull-up resistors and impedance matching on NXP ISP110x, ISP130x, ISP136x	IP4158CX8/LF	8 ball CSP	0.91 x 1.91 x 0.65	
		33 $\Omega$	35	~5.5	fully integrated USB2.0 low / full-speed interface with EMI filter, ESD protection and impedance matching on NXP ISP1110	IP4078CX6/LF	6 ball CSP	0.91 x 1.41 x 0.65	
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection on NXP ISP1504/01 HS transceiver	IP4359CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61	
		-	3	~240	USB2.0 high-speed ESD protection on NXP ISP176x and ISP1504	IP4059CX5/LF	5 ball CSP	0.96 x 1.34 x 0.65	
		-	1.3	5.5	USB2.0 high-speed ESD protection on NXP ISP176x and ISP1504	<b>IP4358CX6/LF</b>	6 ball CSP	0.76 x 1.16 x 0.41	
	USB (Plastic Package)	3	-	1.0	~240	USB2.0 high-speed ESD protection on NXP ISP1504/01 HS transceiver	IP4221CZ6-S	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
			-	-	1	-	ESD protection	IP4220CZ6	SOT457 (SC-74) 

### USB 2.0 & USB I.I solutions

types in **bold blue** represent new products













Interface	Number of protected lines	Buffer	Level shifter	Line small-signal equivalents		Remark	Type	Package	Size (mm)
				R <sub>line</sub> (Ω)	C <sub>line</sub> (pF)				
USB (Plastic Package)	4	-	-	1	-	Dual USB 2.0, ESD protection	IP4220CZ6		2.9 x 1.5 x 1.0
		-	-	1	-	ESD protection, as IP4220CZ6 but different bonding	PRTR5V0U4AD		2.9 x 1.5 x 1.1
		-	-	1	-	ESD protection, as IP4220CZ6 but different package	PRTR5V0U4Y		2.0 x 1.25 x 0.95
		-	-	1	-	USB 2.0 high-speed, SD-Card, SIM card	IP4221CZ6-S		1.0 x 1.0 x 0.5
		-	-	1	-	USB 2.0 high-speed, SD-Card, SIM card	IP4221CZ6-XS		2.9 x 1.5 x 1.0
		-	-	1.5	0.9	2-channel common mode filter with integrated ESD protection	<b>IP3219CZ6</b>		2.3 x 3.5 x 0.85
		-	-	3	1	>15kv contact ESD protection with pi-filter	IP4225CZ10		2.9 x 1.5 x 1.0
		2	-	0.9	-	ESD protection	<b>IP4242CZ6</b>		1.45 x 1.0 x 0.5

### Multichannel, battery, generic ESD & special diode solutions

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R <sub>line</sub> (Ω)	C <sub>line</sub> (pF)					
Reverse battery	1	-	240	-	overvoltage and reverse battery protection	IP4085CX4/LF	4 ball CSP	0.91 x 0.91 x 0.65
		-	450	-	overvoltage and reverse battery protection	IP4385CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
		-	220	-	overvoltage and reverse battery protection	IP4386CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
		-	290	-	overvoltage and reverse battery protection	IP4387CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
Multi-channel filters e.g.: Bottom connector LCD display Camera interface Keypad connector	1	75 Ω	36	~40	EMI filter, ESD protection with common ground	IP4307CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
		100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ3-M		1 x 0.6 x 0.5
	2	100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ5-W		1.6 x 1.2 x 0.5
		100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ6-F		1.0 x 1.0 x 0.5

### Multichannel, battery, generic ESD & special diode solutions

types in **bold blue** 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> (Ω)	C <sub>line</sub> (pF)						
Multi-channel filters e.g.: Bottom connector LCD display Camera interface Keypad connector	4	100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ8-4		1.7 x 1.35 x 0.5	
		40 Ω	18	~70	EMI filter, ESD protection	IP4252CZ8-4		1.7 x 1.35 x 0.5	
		100 Ω	45	~30	EMI filter, ESD protection	IP4254CZ8-4		1.7 x 1.35 x 0.5	
		200 Ω	45	~30	EMI filter, ESD protection	IP4253CZ8-4		1.7 x 1.35 x 0.5	
		100 Ω	60	~20	EMI filter, ESD protection plus 4x ESD	IP4054CX15/LF	15 ball CSP	2.96 x 1.32 x 0.65	
		100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ12-6		2.5 x 1.35 x 0.5	
	6	40 Ω	18	~70	EMI filter, ESD protection	IP4252CZ12-6		2.5 x 1.35 x 0.5	
		100 Ω	45	~30	EMI filter, ESD protection	IP4254CZ12-6		2.5 x 1.35 x 0.5	
		200 Ω	45	~30	EMI filter, ESD protection	IP4253CZ12-6		2.5 x 1.35 x 0.5	
		100 Ω	60	~20	EMI filter, ESD protection	IP4053CX15/LF	15 ball CSP	2.96 x 1.32 x 0.65	
		100 Ω	30	~40	EMI filter, ESD protection	IP4153CX15/LF	15 ball CSP	2.91 x 1.28 x 0.65	
		100 Ω	60	~20	EMI filter, ESD protection	<b>IP4353CX15/LF</b>	15 ball CSP	2.38 x 1.05 x 0.61	
		7	70 Ω	25	~40	EMI filter, ESD protection, extremely small size	IP4337CX18/LF/E	18 ball CSP	1.96 x 1.61 x 0.61
			125 Ω	25	~60	60 nH coils RLC filter	IP3337CX18/LF	18 ball CSP	2.11 x 1.81 x 0.61
		8	100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ16-8		3.3 x 1.35 x 0.5
			40 Ω	18	~70	EMI filter, ESD protection	IP4252CZ16-8		3.3 x 1.35 x 0.5
			100 Ω	45	~30	EMI filter, ESD protection	IP4254CZ16-8		3.3 x 1.35 x 0.5
			200 Ω	45	~30	EMI filter, ESD protection	IP4253CZ16-8		3.3 x 1.35 x 0.5
	100 Ω		50	~25	EMI filter, ESD protection	IP4088CX20/LF	20 ball CSP	3.91 x 1.28 x 0.65	

### Multichannel, battery, generic ESD & special diode solutions

types in **bold blue** represent new products

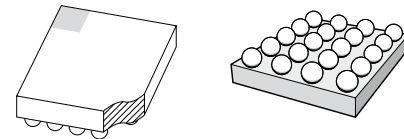
Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R <sub>line</sub>	C <sub>line</sub> (pF)					
Multi-channel filters e.g.: Bottom connector LCD display Camera interface Keypad connector	7	125 Ω	25/60 <sup>1)</sup>	200	EMI filter, ESD protection	<b>IP3337CX18/LF</b>	18 ball CSP	2.06 x 1.66 x 0.61
		80 Ω	40	-30	EMI filter, ESD protection	IP4032CX25/LF	25 ball CSP	2.41 x 2.41 x 0.65
	10	80 Ω	40	-30	EMI filter, ESD protection (higher tolerances as IP4032CX25/LF)	IP4033CX25/LF	25 ball CSP	2.41 x 2.41 x 0.65
		84 Ω	14	-40	EMI filter, ESD protection	IP4040CX25/LF	25 ball CSP	2.41 x 2.46 x 0.65
		200 Ω	50	-20	EMI filter, ESD protection	IP4041CX25/LF/S	25 ball CSP	2.41 x 2.41 x 0.65
		1 kΩ	50	< 1	EMI filter, ESD protection	IP4035CX24/LF	24 ball CSP	2.46 x 2.44 x 0.65
		200 Ω	50	-20	EMI filter, ESD protection, extremely small size	IP4341CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		70 Ω	25	-40	EMI filter, ESD protection, extremely small size	IP4338CX24/LF	24 ball CSP	1.96 x 2.01 x 0.61
		125 Ω	25	-60	60 nH coils RLC filter	IP3338CX24/LF	24 ball CSP	2.11 x 2.21 x 0.61
125 Ω	25/60 <sup>1)</sup>	200	EMI filter, ESD protection	IP3338CX24/LF	24 ball CSP	2.11 x 2.11 x 0.61		
Generic ESD protection	1	-	10	-40	1x back-to-back diode with one common ground, extremely small size	IP4302CX2/LF	2 ball CSP	0.52 x 0.7 x 0.61
	2	-	10	-40	2x back-to-back diode with one common ground, extremely small size	IP4303CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
		-	0.6	-	16V Ultra low capacitance ESD protection in 4 mm pitch	<b>IP4361CX4/LF</b>	4 ball CSP	0.76 x 0.76 x 0.61
	4	-	30	-30	4x single diode with one common ground	IP4042CX5/LF	5 ball CSP	0.91 x 1.28 x 0.65
		-	14	-40	4x single diode with one common ground	IP4142CX5/LF	5 ball CSP	0.91 x 1.28 x 0.65
		-	15	Breakdown: min. 5.5V	Quad diode array with ESD protection	<b>IP4332CX5/LF</b>	5 ball CSP	0.76 x 1.06 x 0.61
		-	30	Breakdown: min. 5.5V	Quad diode array with ESD protection	<b>IP4342CX5/LF</b>	5 ball CSP	0.76 x 1.06 x 0.61
		-	16	-40	4x back-to-back diode with one common ground	IP4043CX5/LF	5 ball CSP	1.12 x 1.12 x 0.65
-	16	-40	4x back-to-back diode with one common ground, extremely small size	IP4343CX5/LF	5 ball CSP	0.93 x 0.93 x 0.61		

<sup>1)</sup> second value is L<sub>line</sub> (nH)

			C <sub>line</sub> (pF)	Diode Voltage	Remark	Type	Package	Size (mm)
Special Diode	1	-	65	Breakdown: min. 20V Forward: 0.25 - 0.5V	Schottky Power Diode in WLCSP	IP4306CX2/LF	2 ball CSP	0.49 x 0.67 x 0.38
	2	-	19	Breakdown: min. 15V Forward: 0.25 - 0.45V	1x back-to-back diode with integrated dual Schottky diode array incl. ESD protection	IP4305CX4/LF	4 ball CSP	0.96 x 0.96 x 0.61

#### 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



### HDMI, DVI, DP, VGA, IEEE1394, LAN & LVDS solutions

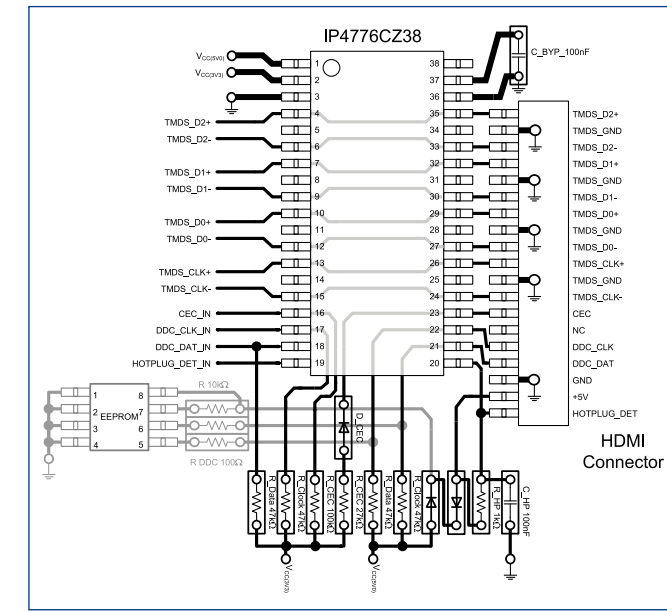
types in **bold blue** represent new products

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	IP4770 CZ16	SOT519 (SSOP16)	4.9 x 3.9 x 1.73							
		yes	yes	5	65	H&V sync buffer, DDC level shifter	IP4771 CZ16									
		yes	yes	5	10	H&V sync buffer, DDC level shifter	IP4772 CZ16									
		yes	no	4	10	VGA receivers, H&V sync buffer	IP4773CZ14	SOT337 (SSOP14)	6.2 x 5.3 x 2							
		yes	no	4	10	VGA receivers, H sync buffer	<b>IP4774CZ14</b>									
		no	yes	4	1.3 - 2.4	VGA receivers, DDC level shifter	<b>IP4769CZ14</b>	SOT402-1 (TSSOP14)	5.0 x 4.4 x 1.1							
		Display Port	2	-	-	0.5	1.3 - 2.4	ESD protection for High Speed Interfaces	<b>IP4285CZ6</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5					
SOT457 (SC-74)	2.9 x 1.5 x 1.0															
SOT363 (SC-88)	2.0 x 1.25 x 1.0															
4	-		-	0.6	-	ESD protection for Ultra High Speed Interfaces	IP4283CZ10-TB	SOT1059 (XSON10U)	1 x 2.5 x 0.5							
								SOT552 (TSSOP10)	3.0 x 3.0 x 1.1							
								SOT886 (XSON6)	1.45 x 1.0 x 0.5							
								SOT457 (SC-74)	2.9 x 1.5 x 1.0							
								SOT363 (SC-88)	2.0 x 1.25 x 1.0							
								11	-	-	0.7	-	ESD protection	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
								IEEE1394	4	-	-	5	55	ESD protection and termination for IEEE1394	IP4224CZ6	SOT457(SC-74)
LAN	4	-	-	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 1.0	
LVDS	10	-	-	5	100	100Ω termination	IP4263CZ14	SOT108(SO14)	8.65 x 3.9 x 1.75							

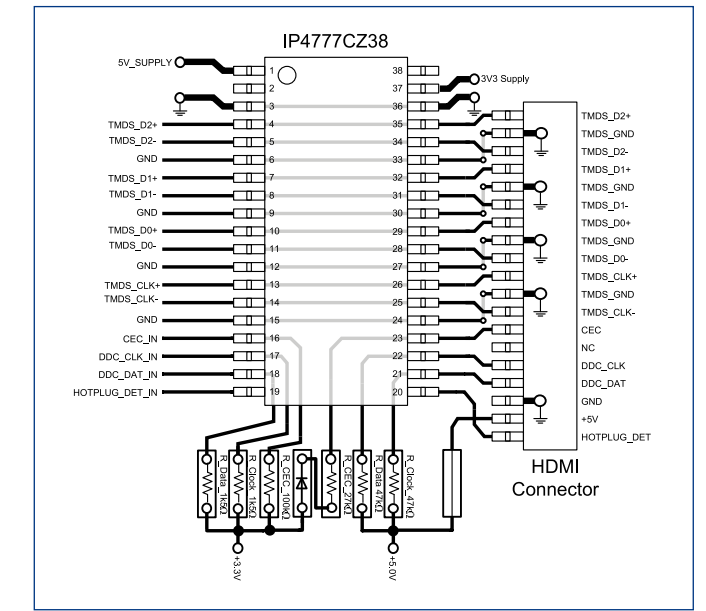
HDMI, DVI, DP, VGA, IEEE1394, LAN & LVDS solutions

Interface	Number of protected lines	Buffer	Level shifter	C <sub>line</sub> (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)		
HDMI	2	-	-	0.5	1.3 - 2.4	ESD protection for High Speed Interfaces	IP4285CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
								SOT457 (SC-74)	2.9 x 1.5 x 1.0		
								SOT363 (SC-88)	2.0 x 1.25 x 1.0		
	4	-	-	0.6	1.3 - 2.4	ESD protection for High Speed Interfaces	IP4286CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
								SOT457 (SC-74)	2.9 x 1.5 x 1.0		
								SOT363 (SC-88)	2.0 x 1.25 x 1.0		
		-	-	-	1	-	ESD protection	PRTR5V0U4D	2.0 x 1.25 x 0.95		
		-	-	-	1	-	ESD protection	PRTR5V0U4Y	3.0 x 3.0 x 1.1		
		-	-	-	0.7	-	ESD protection	IP4280CZ10			
		-	-	-	0.7	-	ESD protection for Ultra High Speed Interfaces	IP4281CZ10	SOT1059 (XSON10U)	1 x 2.5 x 0.5	
		-	-	-	0.6	-	ESD protection for Ultra High Speed Interfaces	IP4283CZ10-TB	SOT1059 (XSON10U)	1 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	
		12	2	-	-	0.7	-	ESD protection for Ultra High Speed Interfaces	IP4282CZ6	SOT886(XSON6)	1.45 x 1.0 x 0.5
			-	-	-	1	-	ESD protection	PRTR5V0U8S	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
			yes	yes	-	0.7	-	level shifter, ESD protection	IP4776CZ38		
yes	yes		-	0.7	-	for HDMI sinks- I <sup>2</sup> C buffer, level shifter, ESD protection, back drive protection, CEC buffer	IP4778CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1		
-	yes		-	0.7	-	for HDMI sources- I <sup>2</sup> C buffer, level shifter, ESD protection, CEC buffer	IP4777CZ38				
yes	yes	-	0.7	-	HDMI and DVI 3-to-1 switch which includes ESD protection, TMDS, equalizer, TMDS driver, DDC slew rate accelerator and level shifting	IP4779CZ64	SOT357	10 x 10 x 1			

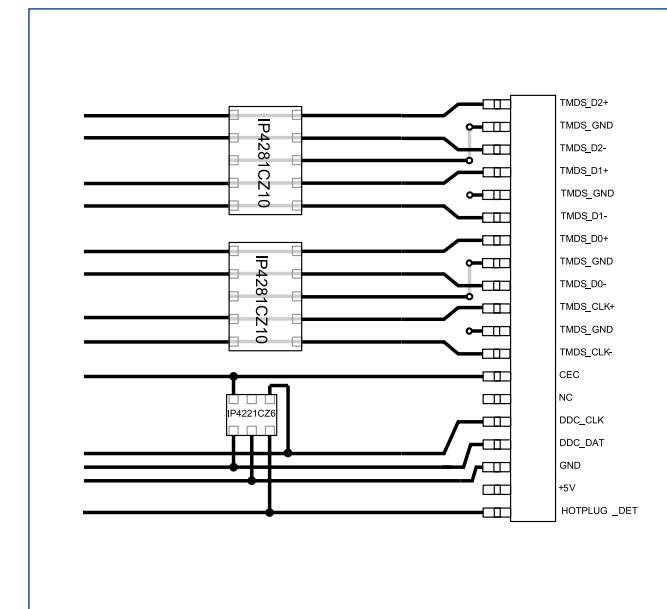
IP4776CZ38 HDMI Receiver



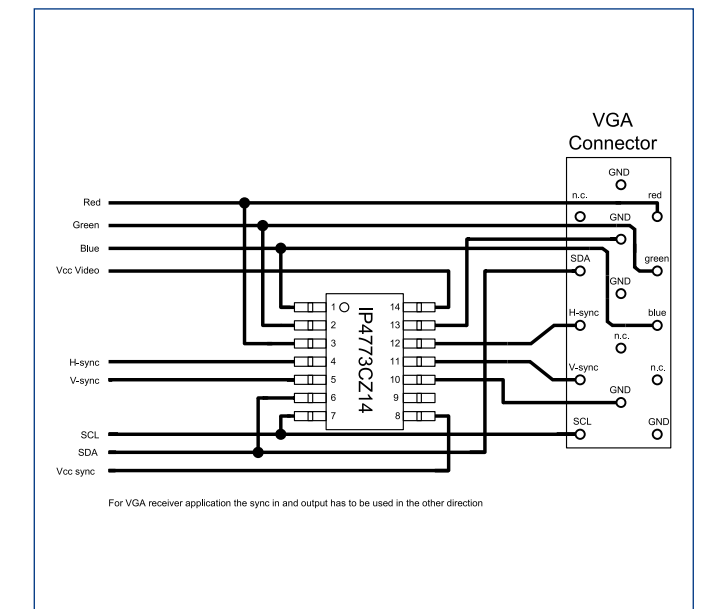
IP4777CZ38 HDMI Transmitter



IP4281CZ10 HDMI Transmitter/Receiver

























IP4773CZ14 VGA Solution



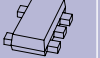



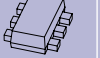
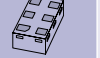

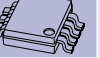

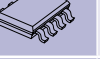








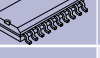
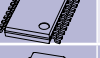


Package cross reference

types in **bold blue** represent new products

NXP	Industry standard names	Size (l x w x h)	Pins/leads	P <sub>tot</sub> (mW)	Package	Competitor synonyms						
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC
SOD27	DO-35	4.25 x 1.85 x 0.56	2	500		GSD			DO-35		DO-35	
SOD66	DO-41	4.8 x 2.6 x 0.81	2	1300		GSR	DO-41				DO-41	
SOD68	DO-34	3.04 x 1.6 x 0.55	2	500		MSD						
SOD80C	MiniMelf	3.5 x 1.5 x 1.5	2	300		LLDS			LLD			
SOD87	Melf	3.5 x 2.05 x 2.05	2	1000								
SOD123F	-	2.6 x 1.6 x 1.1	2	830		PMDU	S-Flat	SOD-123-FL			PowerDI123	SMF
<b>SOD123W</b>	-	2.6 x 1.7 x 1.0	2	900			S-Flat	SOD-123-FL			PowerDI123	
<b>SOD128</b>	-	3.8 x 2.6 x 1.0	2	1000		PMDT	M-Flat					
SOD323	SC-76	1.7 x 1.25 x 0.95	2	400			USC	SOD-323	URP	SOD323	SOD-323	USC
SOD323F	SC-90	1.7 x 1.25 x 0.7	2	830		UMD2	US-Flat				PowerDI323	
SOD523	SC-79	1.2 x 0.8 x 0.6	2	500		EMD2	ESC/TESC	SOD-523	UFP	SC79		ESC
SOD882	-	1.0 x 0.6 x 0.5	2	250						TSLP-2	DFN1006-2	
<b>SOT1061</b>	HUSON3	2.0 x 2.0 x 0.65	3	1300				WDFN3				
SOT23	-	2.9 x 1.3 x 1.0	3	250		SSD3/SST3		SOT-23		SOT23	SOT-23	SOT-23
SOT323	SC-70	2.0 x 1.25 x 0.95	3	200		UMD3/UMT3	USM	SC-70	CMAK/CM-PAK	SOT323	SOT-323	USM
SOT416	SC-75	1.6 x 0.8 x 0.77	3	150		EMD3/EMT3	SSM	SC-75	SMPAK	SC75		
SOT663	-	1.6 x 1.2 x 0.55	3	300								
SOT883	SC-101	1.0 x 0.6 x 0.5	3	250			SS CSP2			TSLP-3-1	DFN1006-3	
SOT89	SC-62	4.5 x 2.5 x 1.5	3	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89		SOT-89
SOT143B	-	2.9 x 1.3 x 1.0	4	250			CP4		M-PAK-4R	SOT143	SOT-143	
SOT223	SC-73	6.5 x 3.5 x 1.65	4	1700				SOT-223		SOT223	SOT-223	SOT-223
SOT353	SC-88A	2.0 x 1.25 x 0.95	5	300		UMD5/UMT5	USV	SC-88A	CMPAK-5(T)			USV

Package cross reference

types in **bold blue** represent new products

NXP	Industry standard names	Size (l x w x h)	Pins/leads	P <sub>tot</sub> (mW)	Package	Competitor synonyms						
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC
SOT665	-	1.6 x 1.2 x 0.55	5	300		EMD5/EMT5	ESV	SOT-553	VSON-5			TESV
<b>SOT1082</b>	VSON6U	2.3 x 3.5 x 0.85	6	-								
SOT363	SC-88	2.0 x 1.25 x 0.95	6	300		UMD6/UMT6	US6	SC-88	CMPAK-6	SOT363	SOT-363	US6
SOT457	SC-74	2.9 x 1.5 x 1.0	6	750		SMD6/SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6
SOT666	-	1.6 x 1.2 x 0.55	6	300		EMD6/EMT6	ES6	SOT-563	SMFPAK-6	SOT666		TES6
SOT886	XSON6	1.45 x 1.0 x 0.5	6	250								
SOT891	XSON6	1.0 x 1.0 x 0.5	6	-				CS6				
SOT505	TSSOP8	3.0 x 3.0 x 1.1	8	-					TSSOP-8			TSSOP8
SOT873	HVSON8	3.3 x 3.3 x 0.85	8	1500								
SOT96	SO8	4.9 x 3.9 x 1.75	8	1500		SOP8	FM8	SOIC-8 NB	SOP-8			FLP-8
SOT983	HXSON8	1.7 x 1.35 x 0.5	8	-							TSSOP38	
SOT552	TSSOP10	3.0 x 3.0 x 1.1	10	-					Micro10		TSSOP10	
SOT984	HXSON12	2.5 x 1.35 x 0.5	12	-								
SOT108	SO14	8.65 x 3.9 x 1.75	14	-		SOP14					DSO14	
SOT402	TSSOP14	5.0 x 4.4 x 1.1	14	-								
SOT109	SO16	9.9 x 3.9 x 1.75	16	-		SOP16		SOIC-16			DSO16	FLP-16
SOT519	SSOP16	4.9 x 3.9 x 1.73	16	-								
SOT985	HXSON16	3.3 x 1.35 x 0.5	16	-					Micro10		TSSOP10	
SOT163	SO20	12.8 x 7.5 x 2.65	20	1250								
SOT360	TSSOP20	6.5 x 4.4 x 1.1	20	-					TSSOP20		TSSOP20	
SOT510	TSSOP38	9.7 x 4.4 x 1.1	38	-							TSSOP38	
SOT357	TQFP64	10 x 10 x 1	64	-								



# Packing methods

types in **bold blue** represent new products

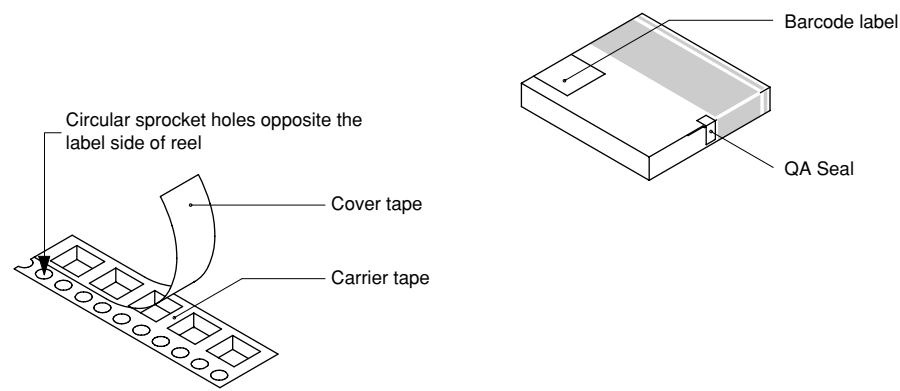
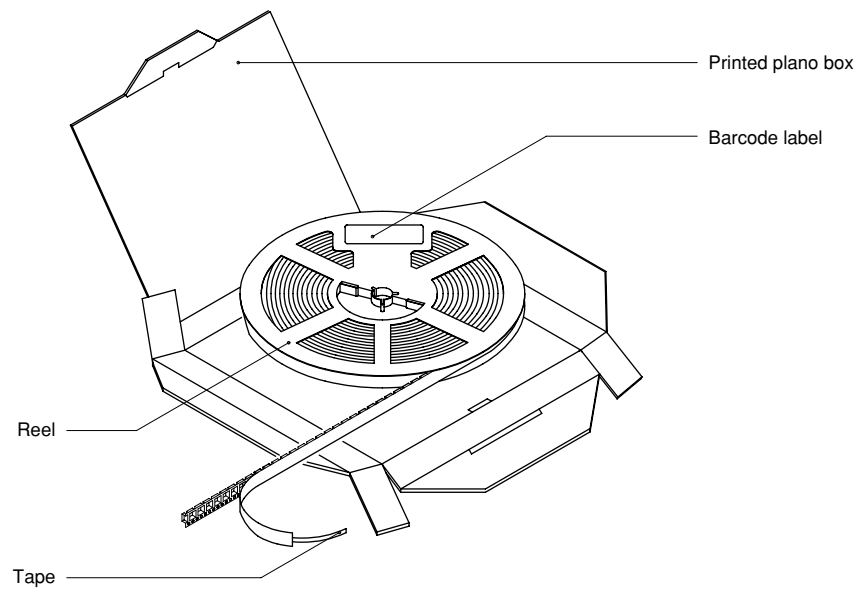
Package	Packing method and tape dimension	Reel dimension (d x w)	Package	Packing quantity						
				2000	2500	3000	4000	5000	8000	10000
SOD27	26 mm tape ammo pack, axial			-	-	-	-	-143	-	-
	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
	52 mm reel pack, axial			-	-	-	-	-	-	-113
SOD66	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
	52 mm reel pack, axial			-	-	-	-	-	-	-113
SOD68	26 mm tape ammo pack, axial			-	-	-	-	-143	-	-
	52 mm reel pack, axial			-	-	-	-	-	-	-113
	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
SOD80C	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-115	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	330 x 8 mm		-	-	-	-	-	-	-135
SOD87	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-115	-	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	330 x 8 mm		-	-	-	-	-	-135	-
SOD123F	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
<b>SOD123W</b>	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
<b>SOD128</b>	4 mm pitch, 12 mm tape and reel	180 x 12 mm		-	-	-115	-	-	-	-
SOD323	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOD323F	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOD523	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-315	-
	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOD882	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315
<b>SOT1061</b>	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOT23	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-215	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-235
SOT323	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOT416	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOT663	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-115	-	-	-
SOT883	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315

# Packing methods

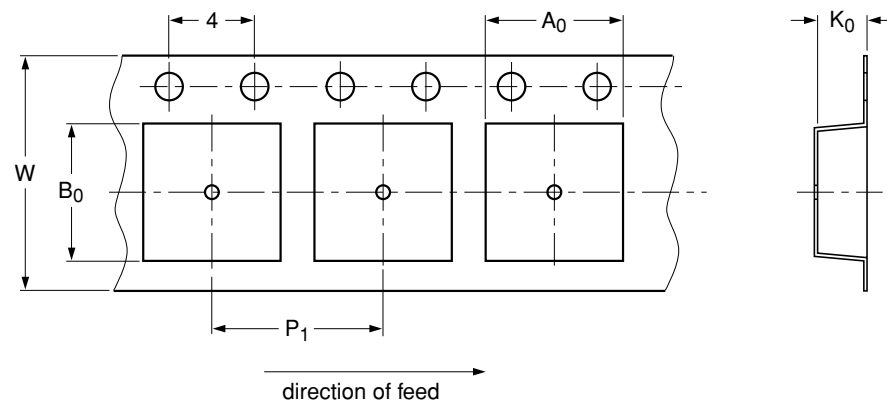
types in **bold blue** represent new products

Package	Packing method and tape dimension	Reel dimension (d x w)	Taping	Package	Packing quantity								
					1000	1400	2500	3000	4000	5000	8000	10000	
SOT89	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T1		-115	-	-	-	-	-	-	-	-
	8 mm pitch, 12 mm tape and reel	330 x 12 mm	T1		-	-	-	-	-135	-	-	-	-
	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T3		-146	-	-	-	-	-	-	-	-
	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T4		-147	-	-	-	-	-	-	-	-
SOT143B	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-215	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm			-	-	-	-	-	-	-	-	-235
SOT223	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-115	-	-	-	-	-	-	-	-
	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-	-	-135	-	-	-	-
SOT353	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T1		-	-	-	-	-	-	-	-	-135
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T2		-	-	-	-	-	-	-	-	-165
SOT665	2 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-	-	-	-315	-
	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-115	-	-	-	-
SOT363	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T1		-	-	-	-	-	-	-	-	-135
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T2		-	-	-	-	-	-	-	-	-165
SOT457	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T1		-	-	-	-	-	-	-	-	-135
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T2		-	-	-	-	-	-	-	-	-165
SOT666	2 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-	-	-	-315	-
	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-115	-	-	-	-
SOT886	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-	-	-115	-	-	-
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T4		-	-	-	-	-	-	-132	-	-
SOT891	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T4		-	-	-	-	-	-	-132	-	-
SOT505	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-118	-	-	-	-	-	-
SOT873	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-	-118	-	-	-	-	-	-	-
SOT96	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-115	-	-	-	-	-	-	-	-
	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-118	-	-	-	-	-	-

### Tape and reel pack for SMD packages



### Carrier tape - tape and reel

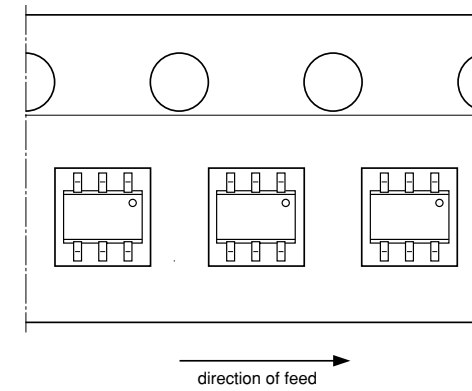


P1 = pitch (see table packing methods)  
W = tape width (see table packing methods)

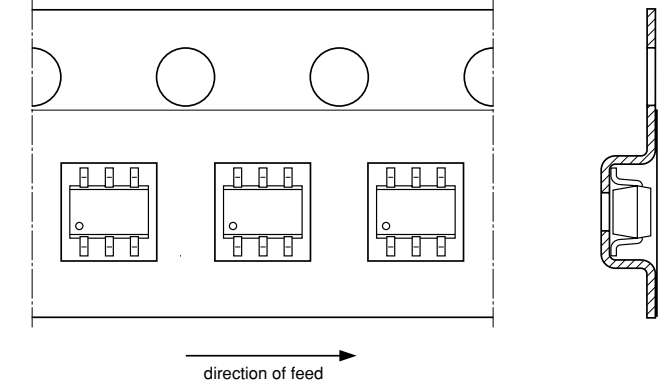
Compartment width ( $A_0$ ), length ( $B_0$ ) and depth ( $K_0$ ) depending on package

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

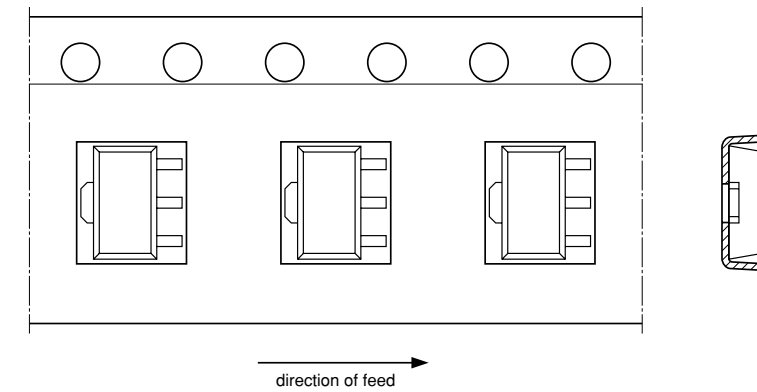
#### T1 taping



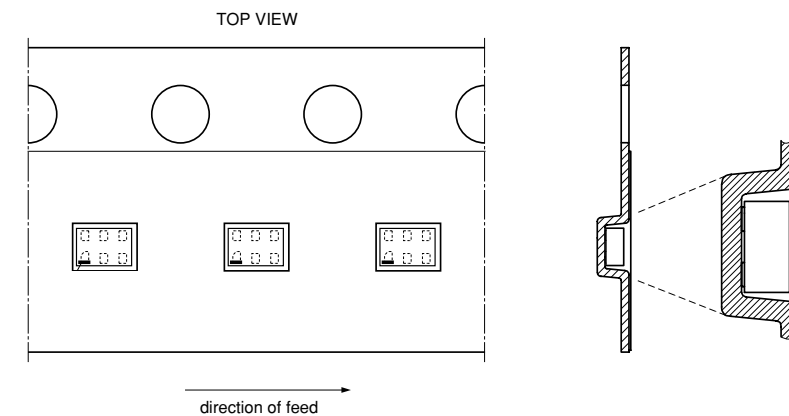
#### T2 taping



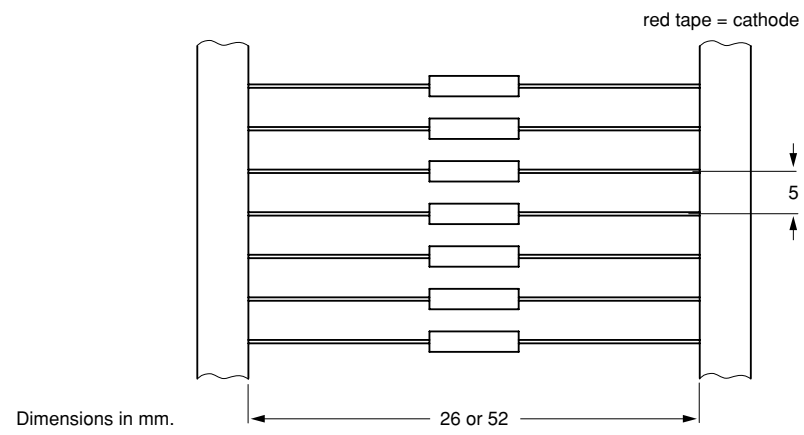
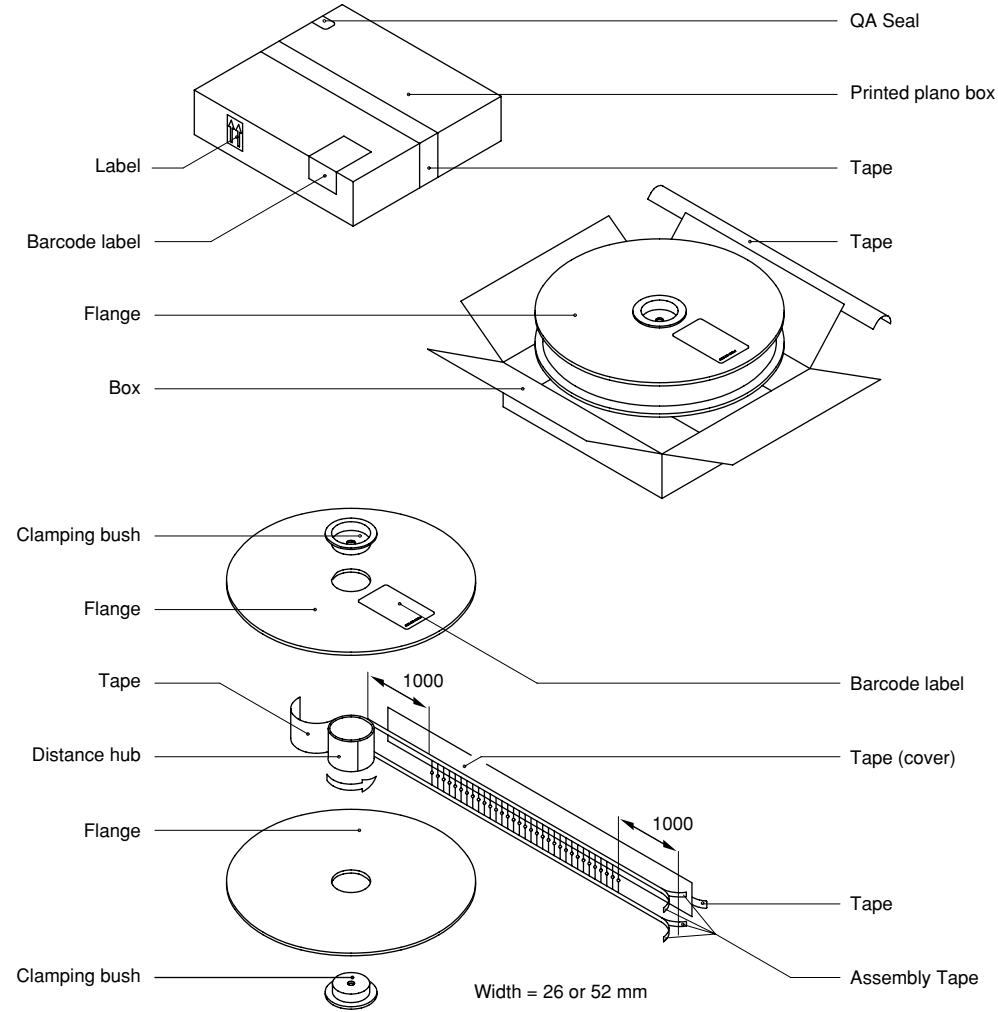
#### T3 taping



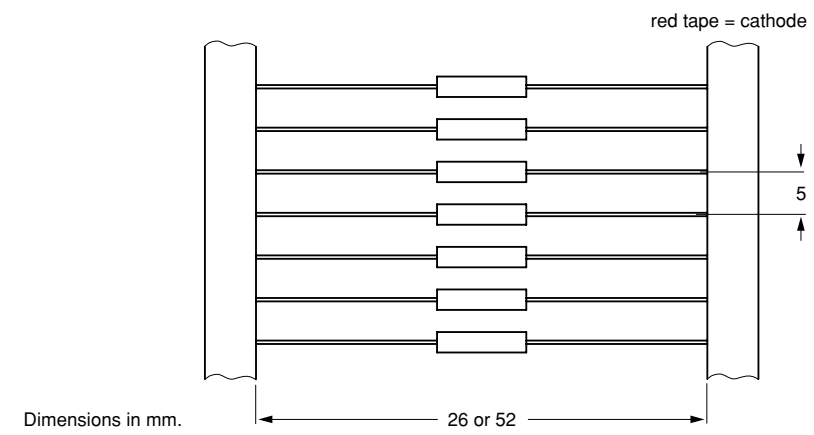
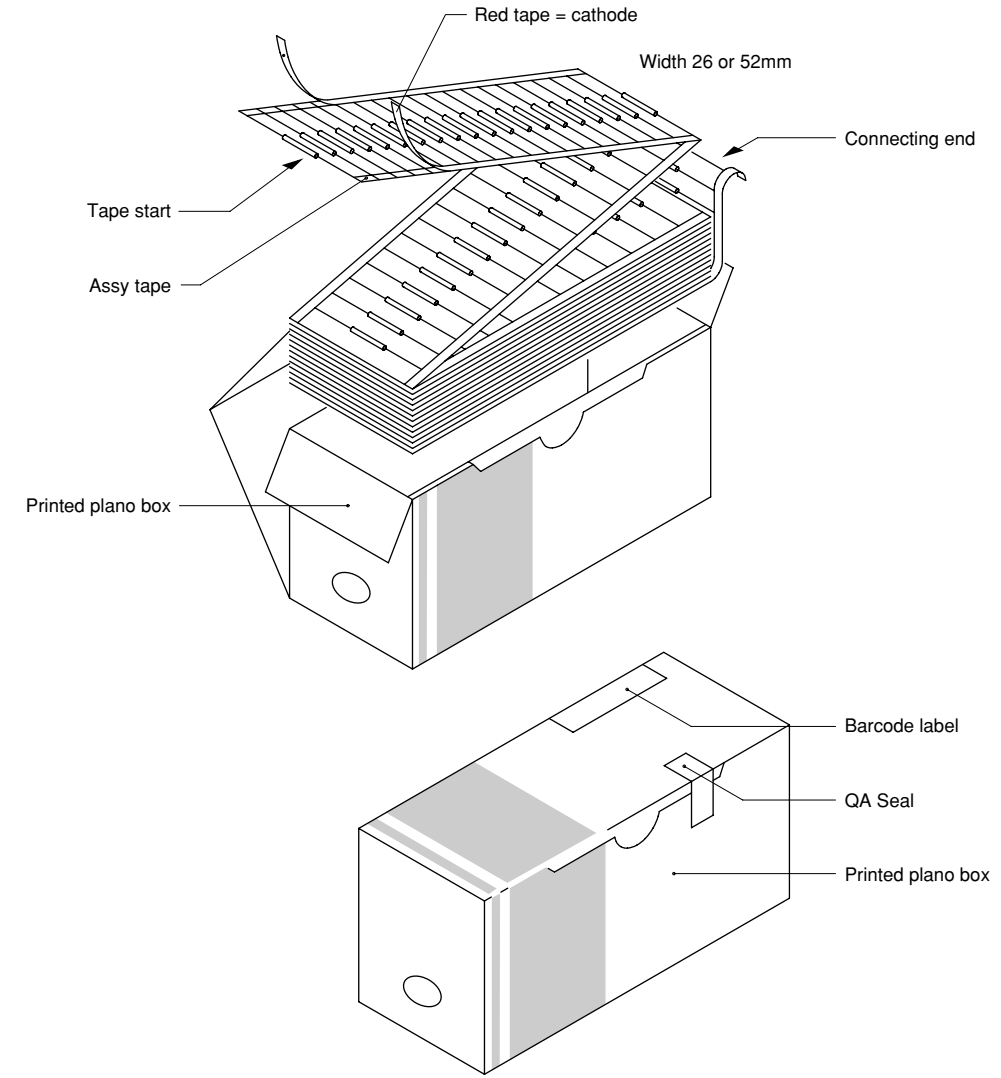
#### T4 taping



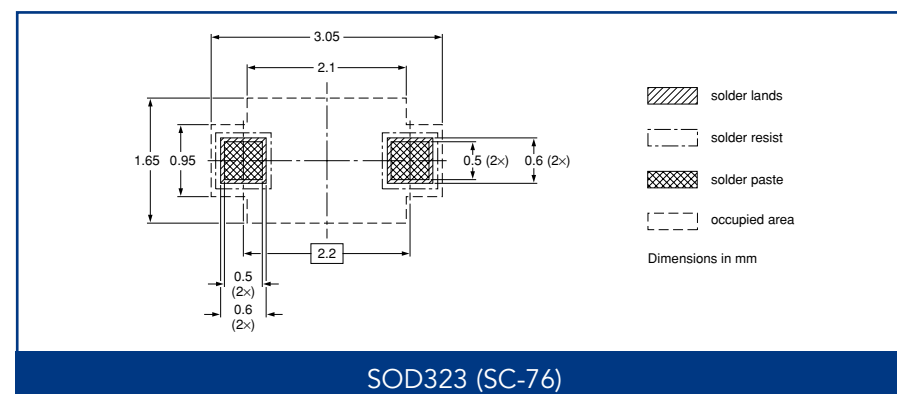
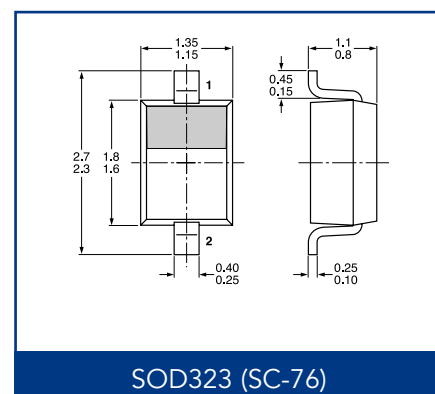
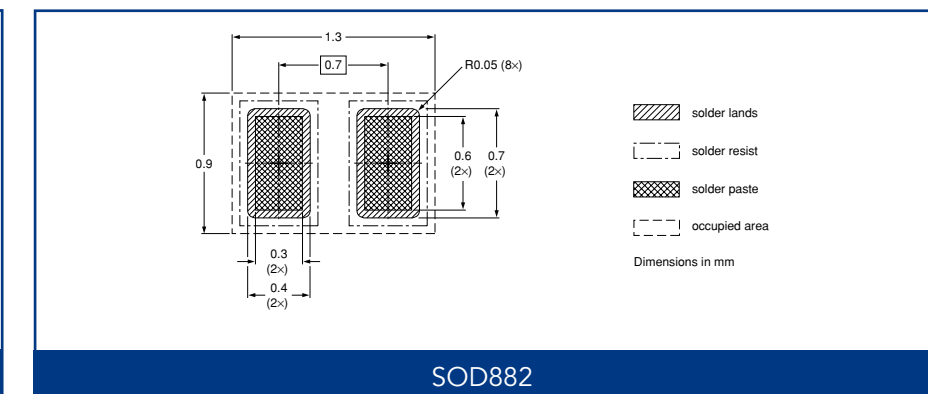
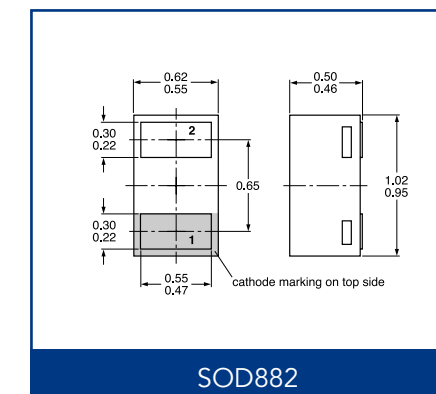
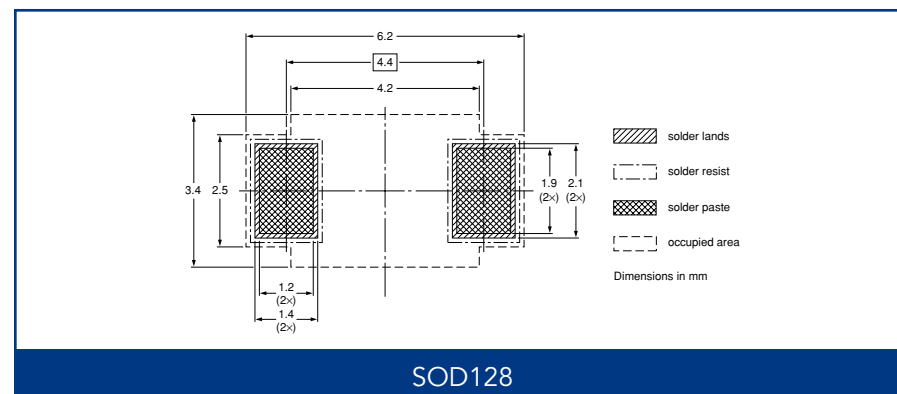
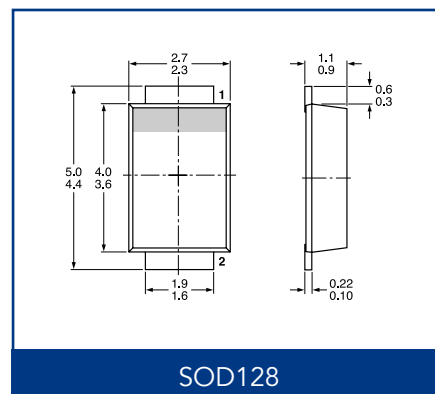
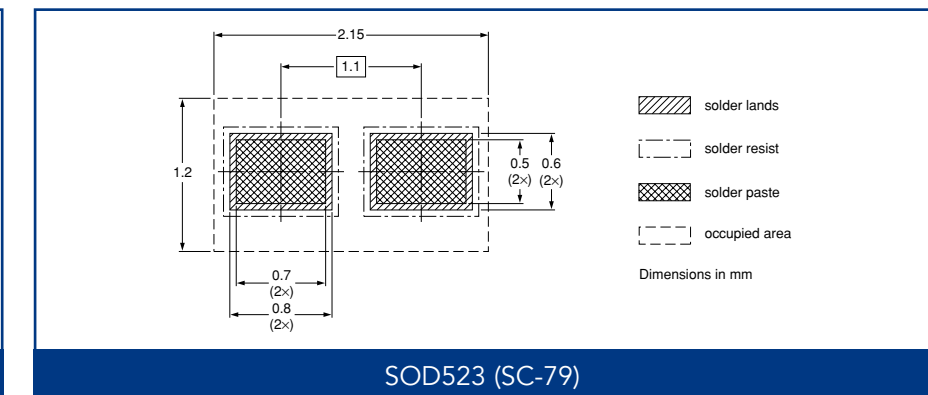
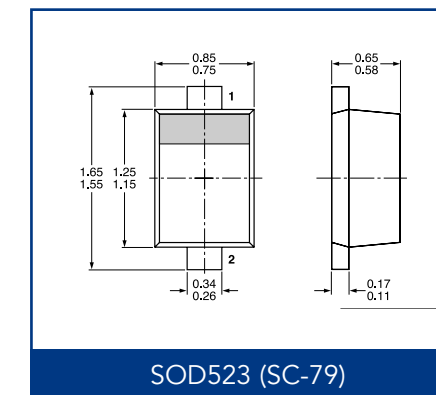
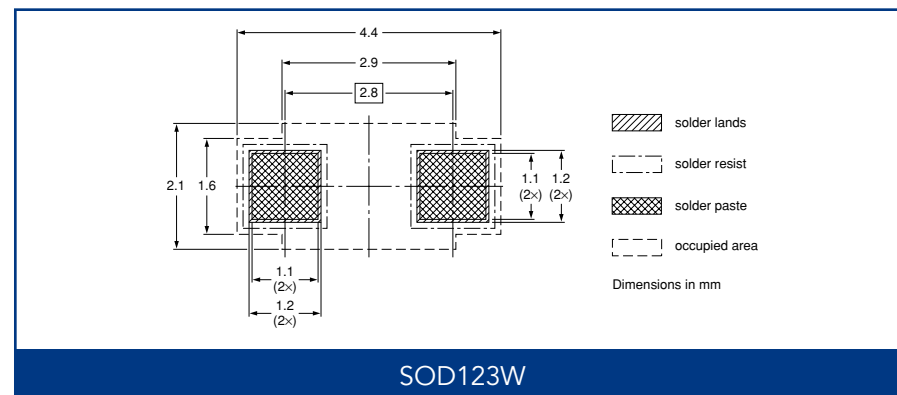
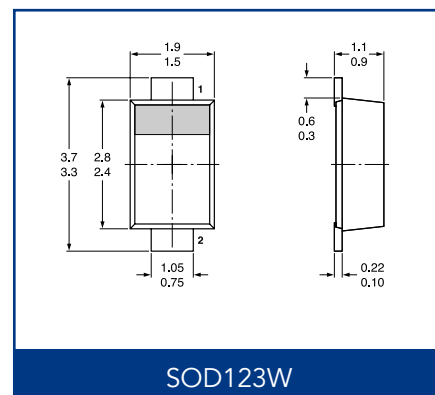
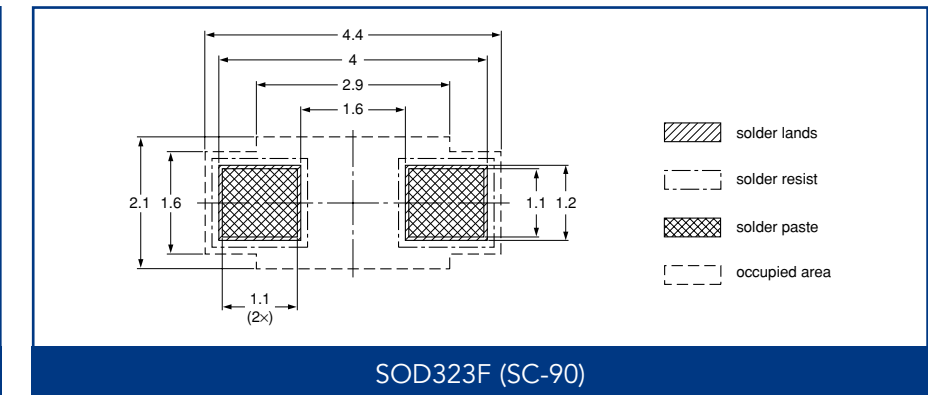
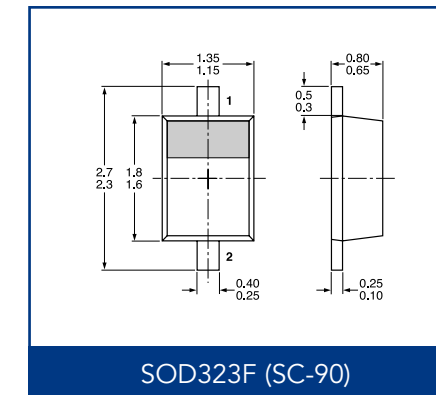
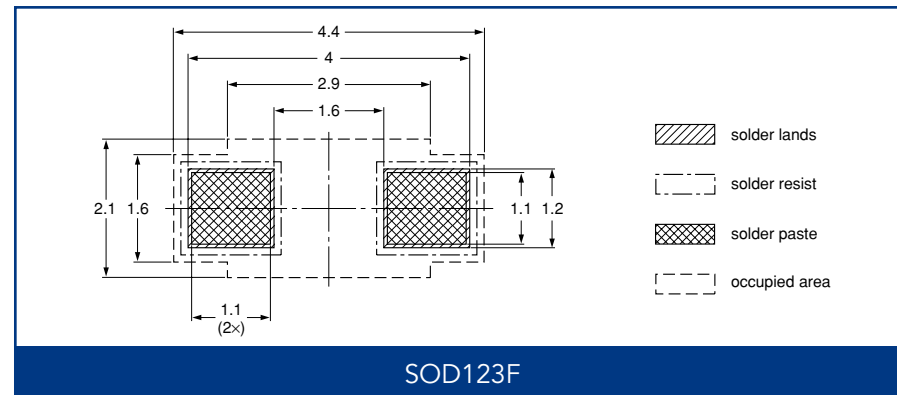
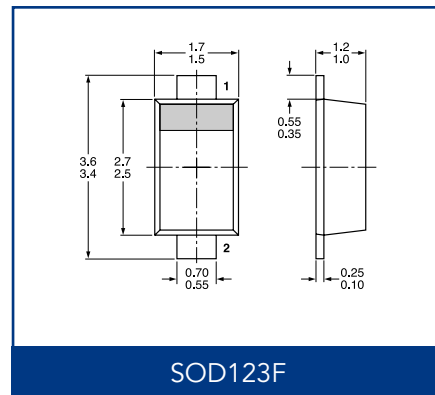
### Reel pack axial tape for glass diodes



### Ammo pack axial tape for glass diodes

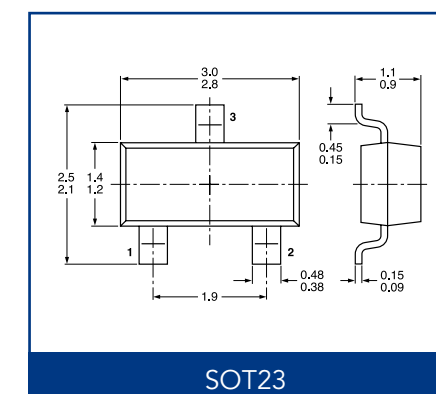


### 2-Pin SMD Packages

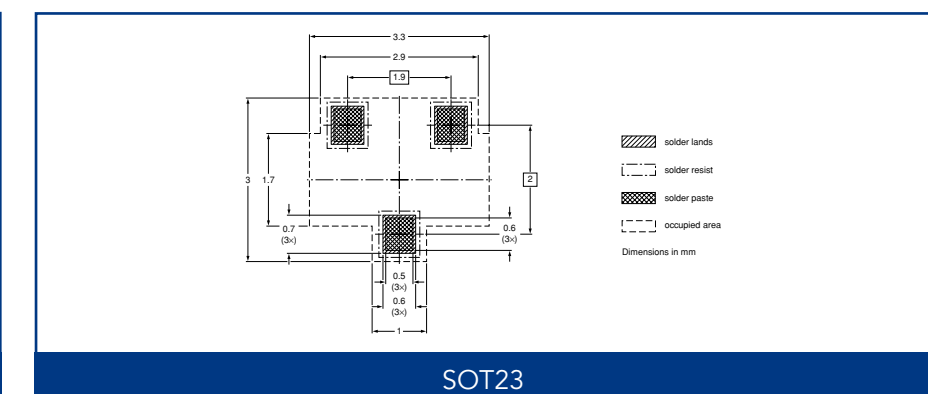


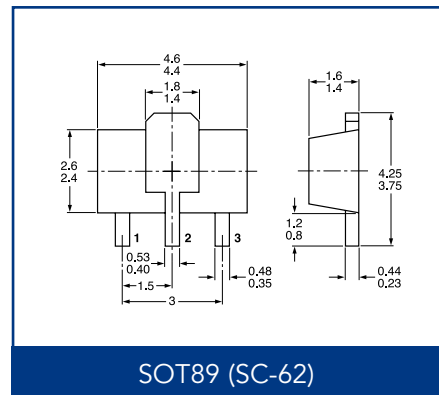
Dimensions in mm

### 3-Pin SMD Packages

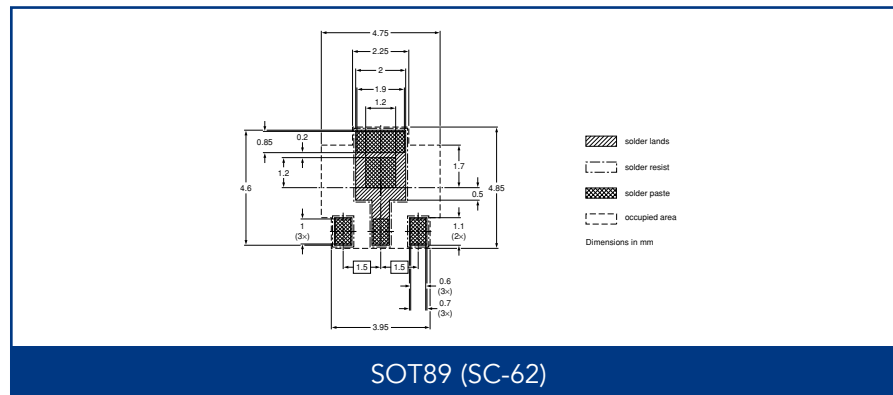


Dimensions in mm

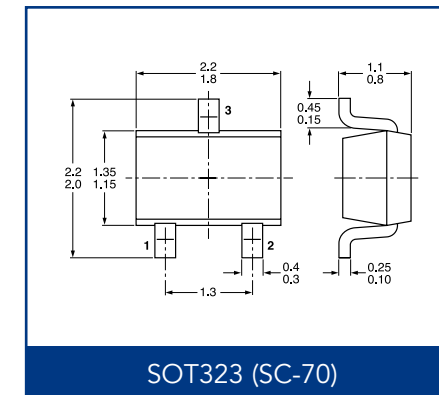




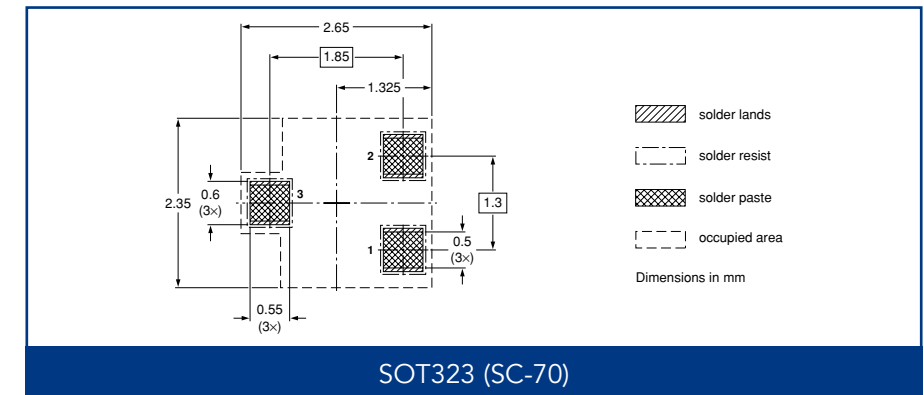
SOT89 (SC-62)



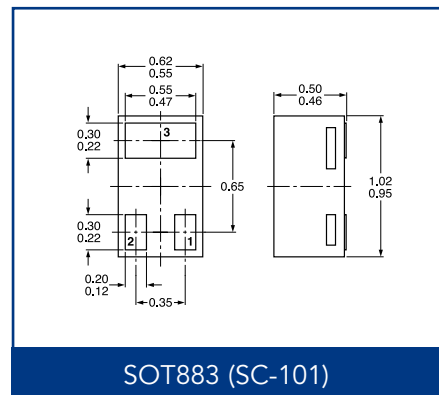
SOT89 (SC-62)



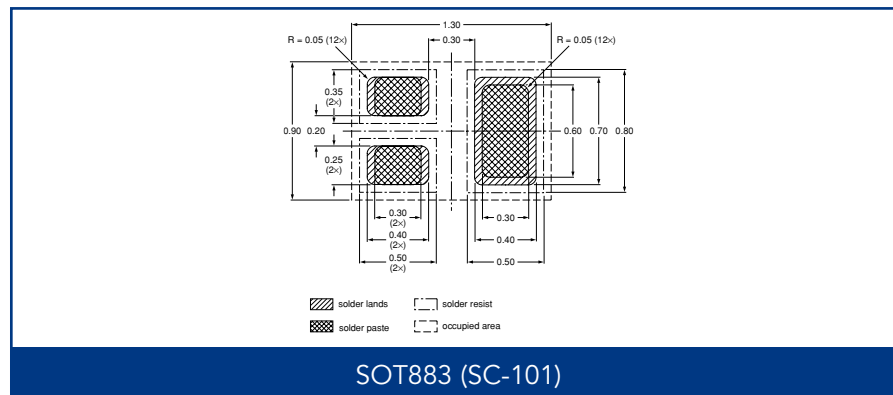
SOT323 (SC-70)



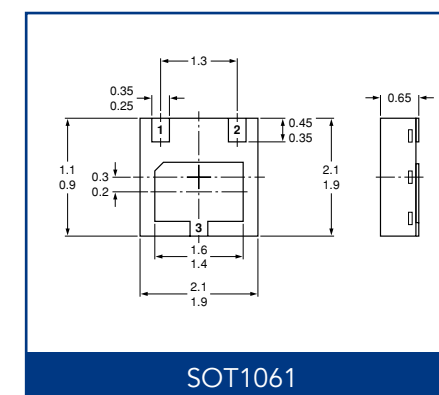
SOT323 (SC-70)



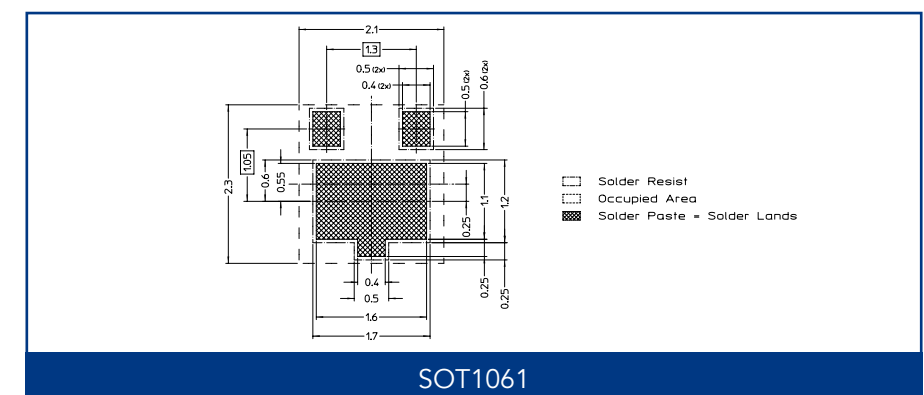
SOT883 (SC-101)



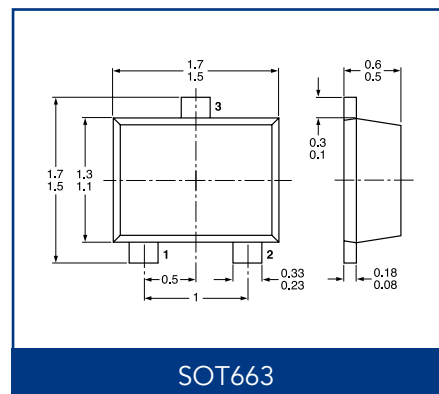
SOT883 (SC-101)



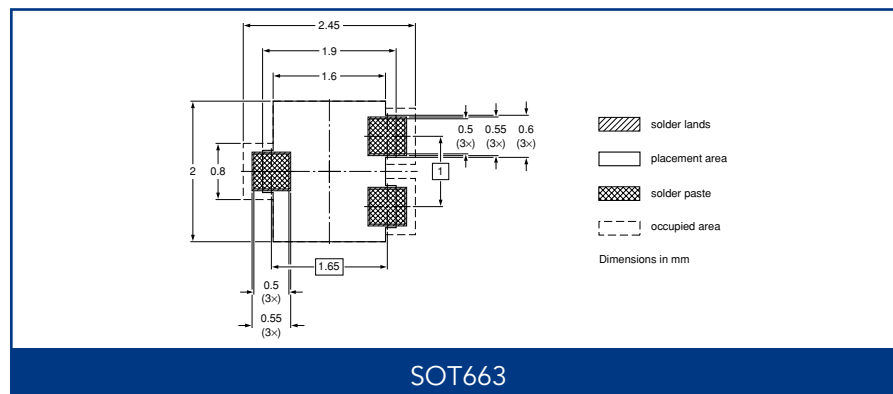
SOT1061



SOT1061

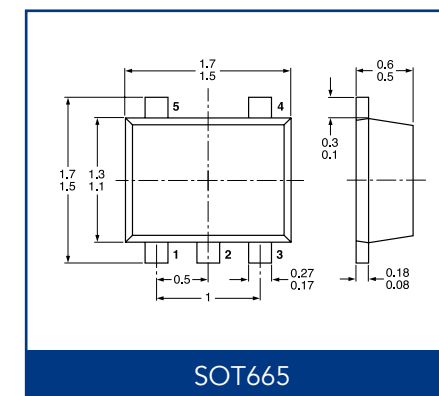


SOT663

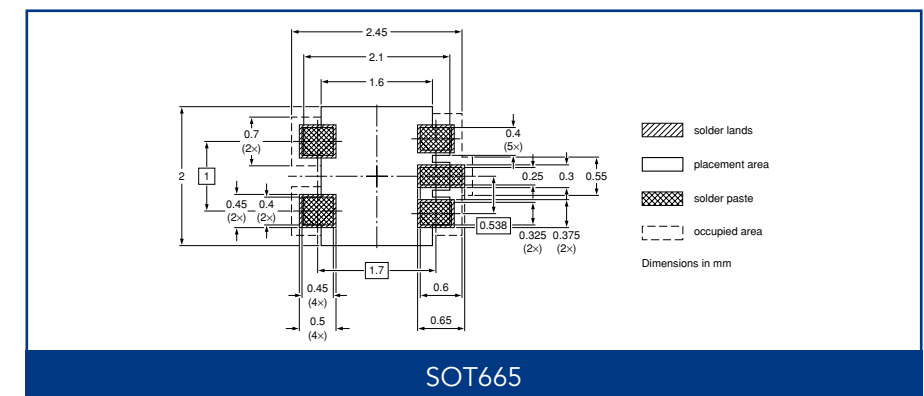


SOT663

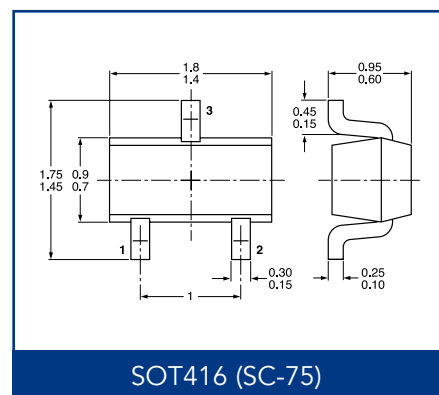
4-/5-Pin SMD Packages



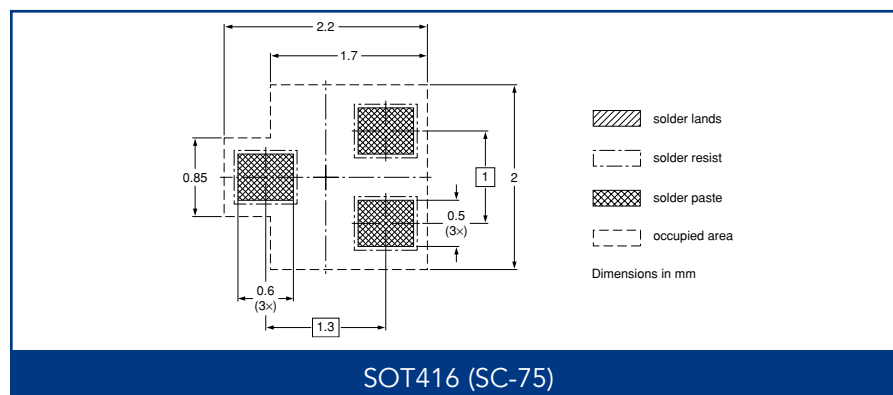
SOT665



SOT665

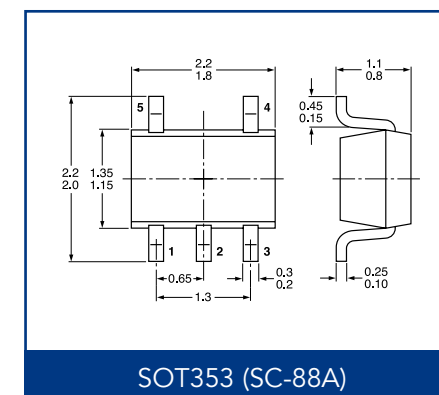


SOT416 (SC-75)

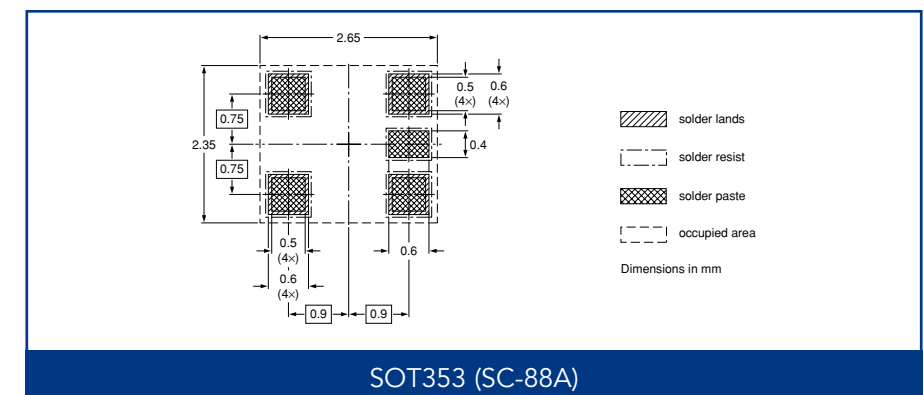


SOT416 (SC-75)

Dimensions in mm



SOT353 (SC-88A)



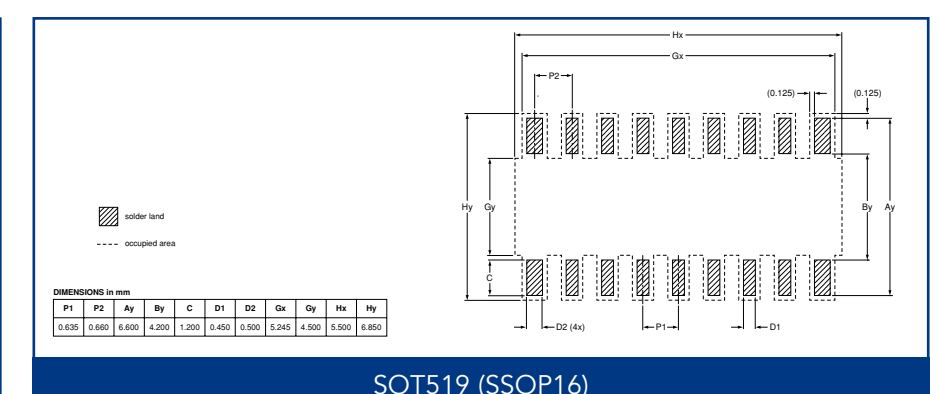
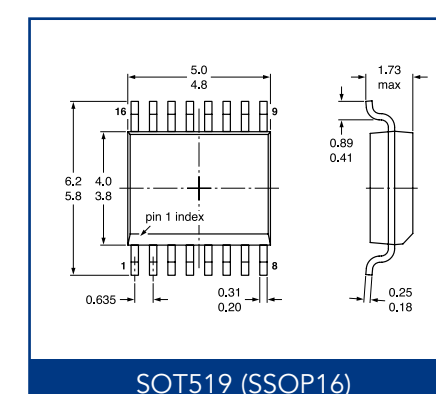
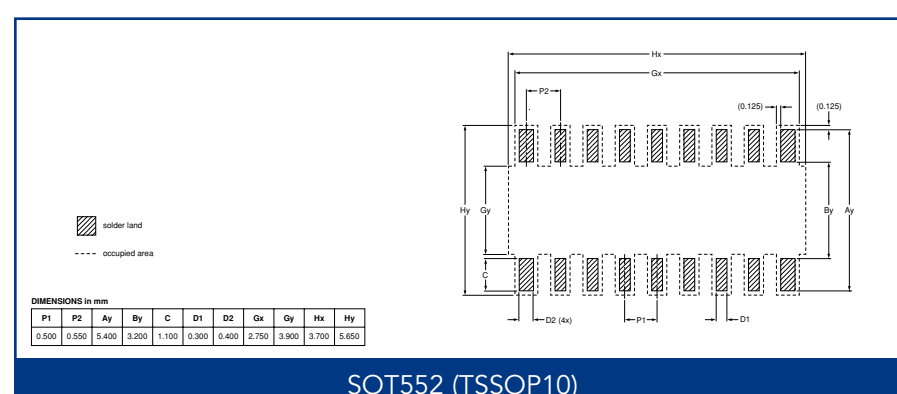
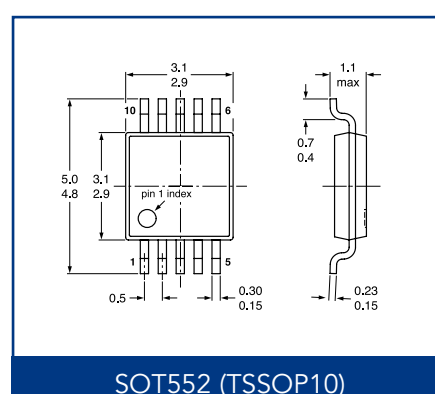
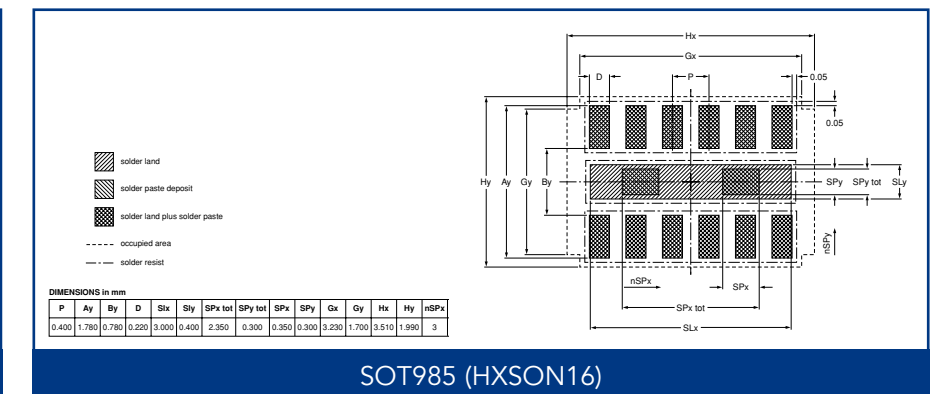
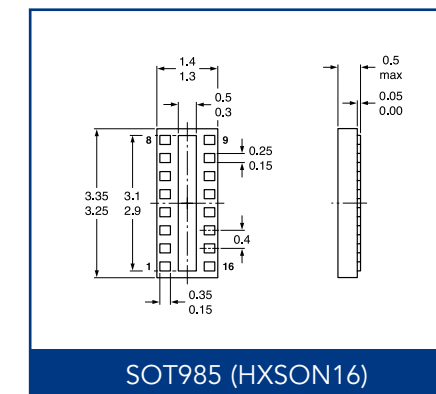
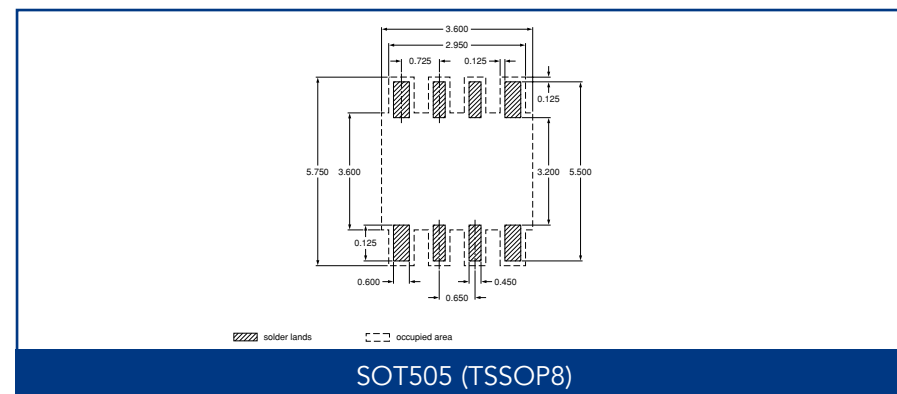
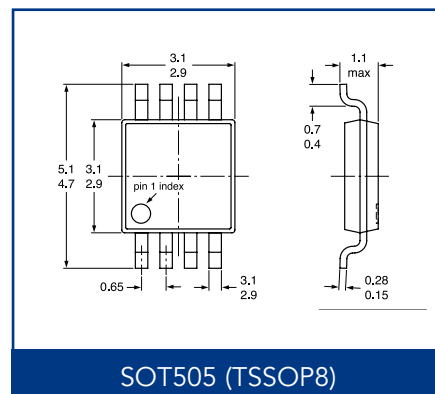
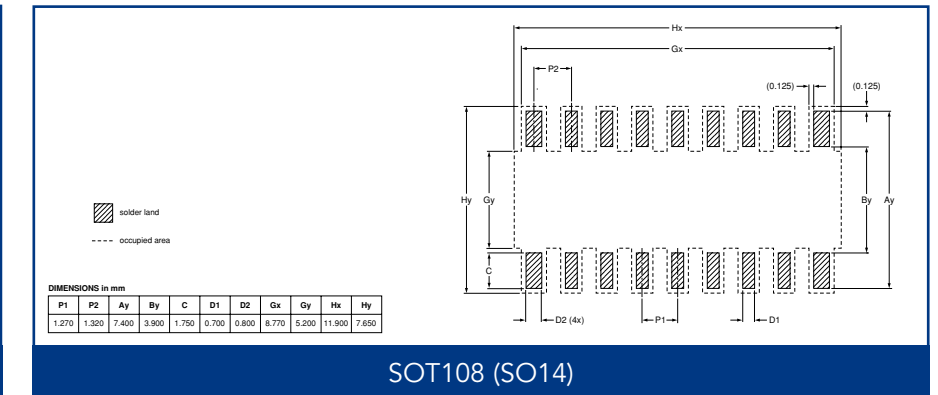
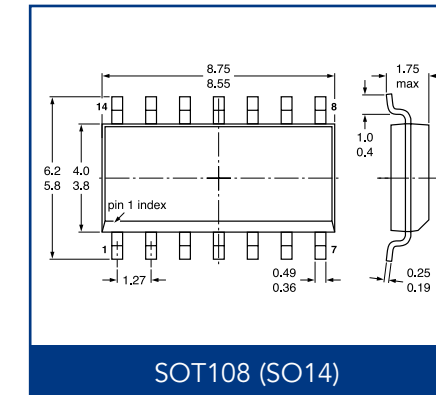
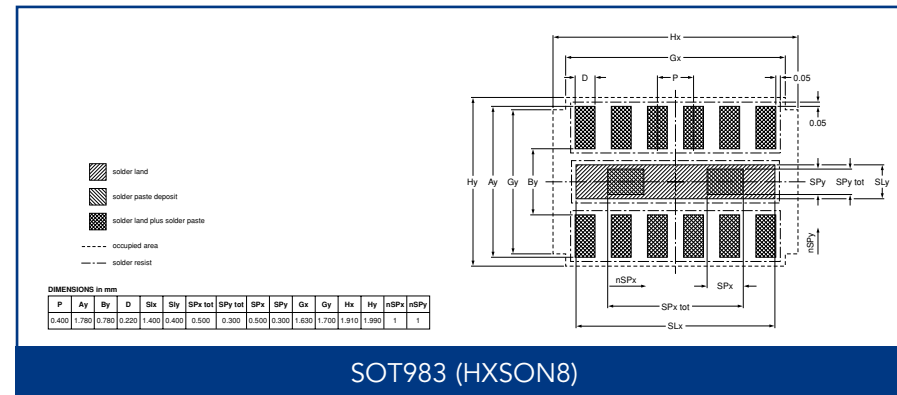
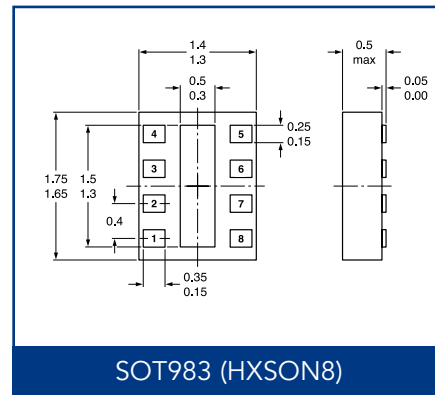
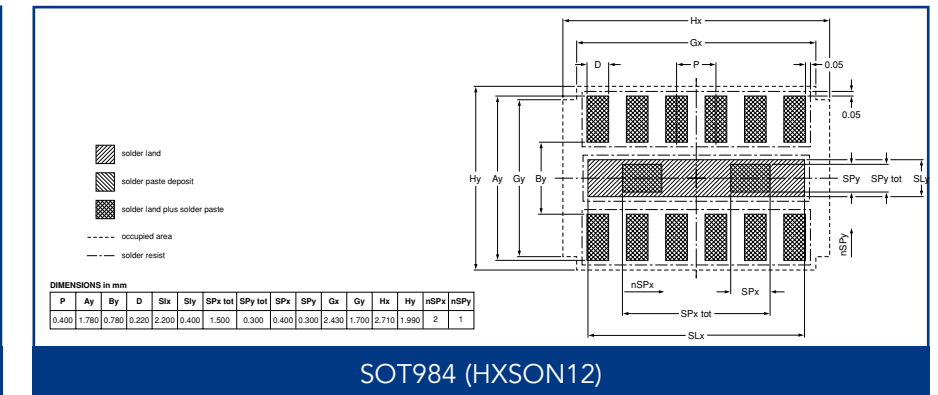
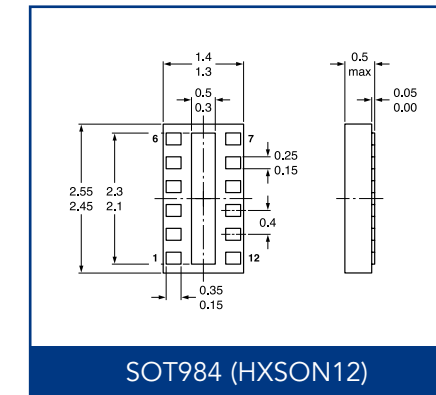
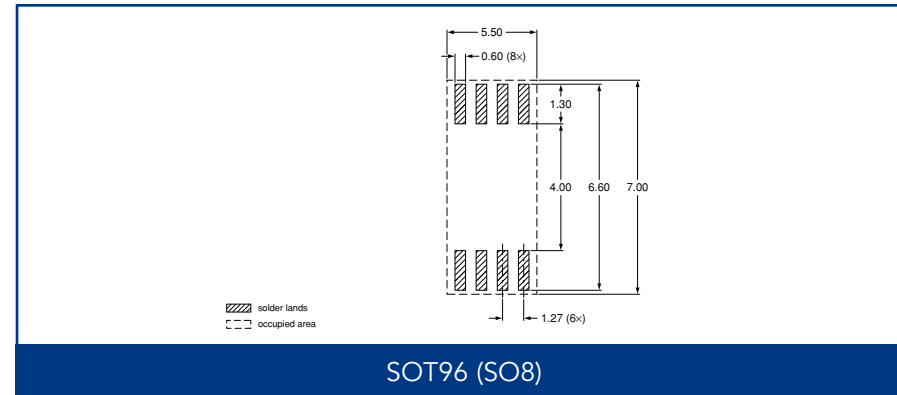
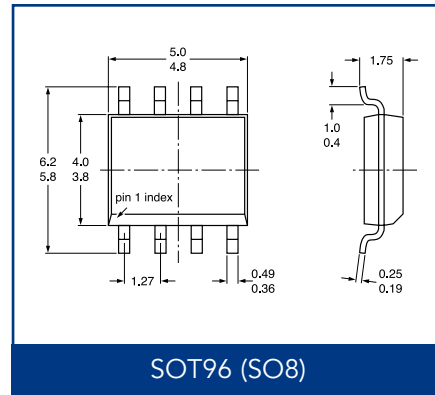
SOT353 (SC-88A)

Dimensions in mm



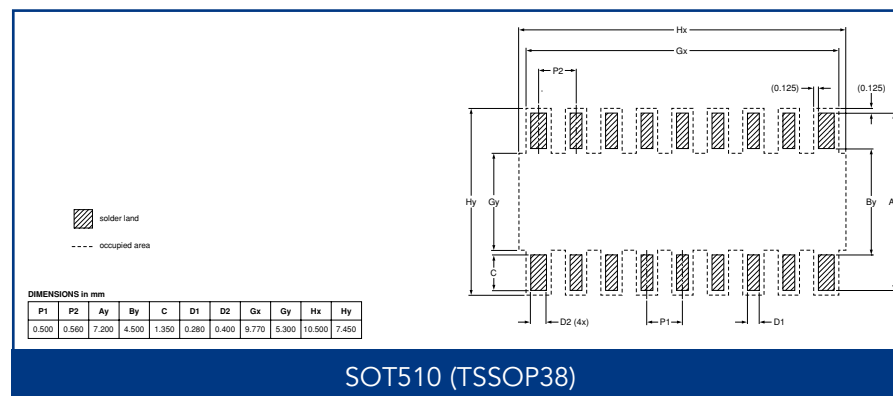
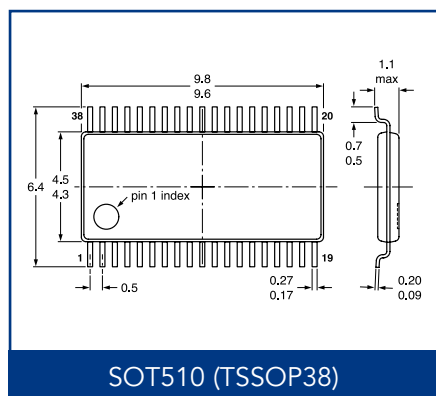
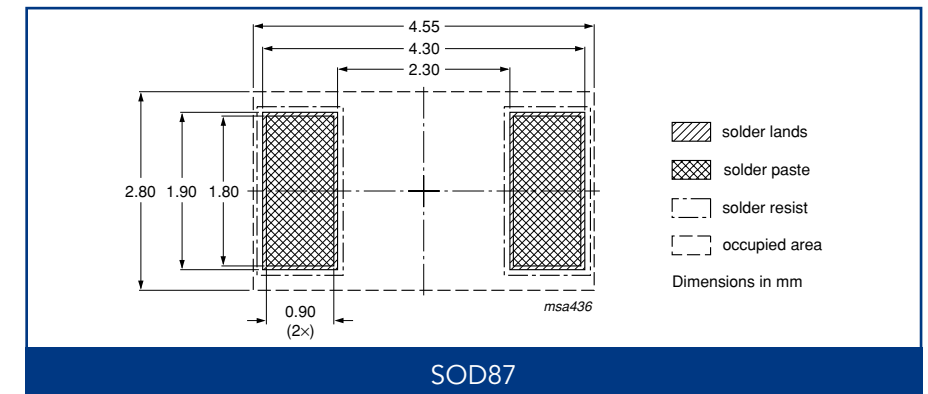
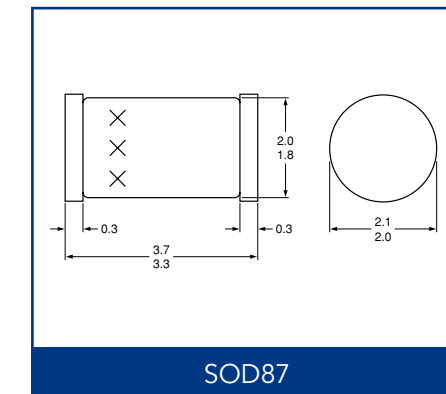
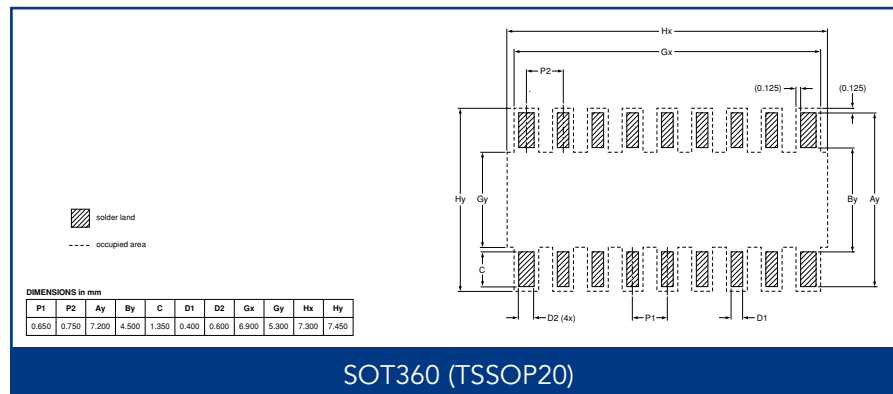
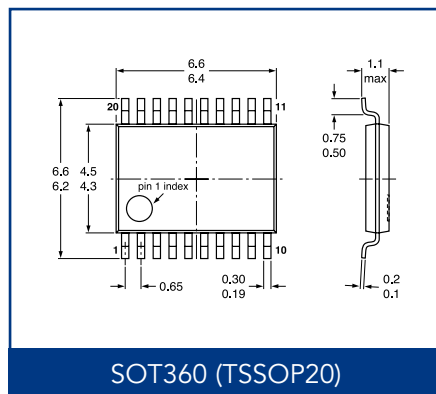
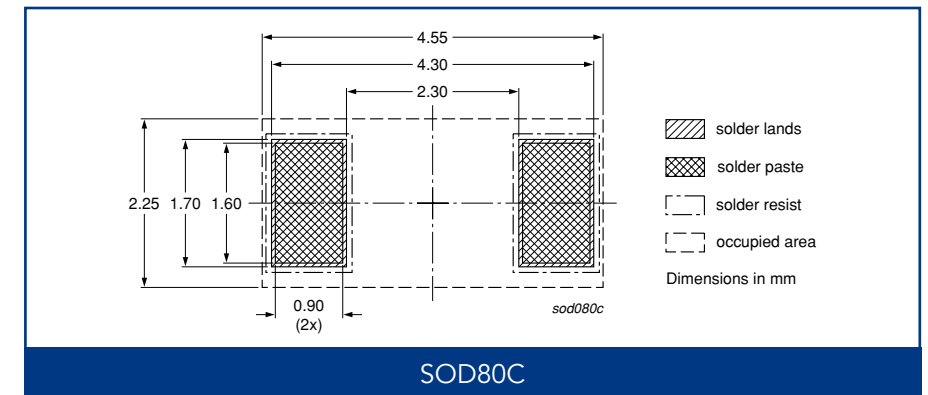
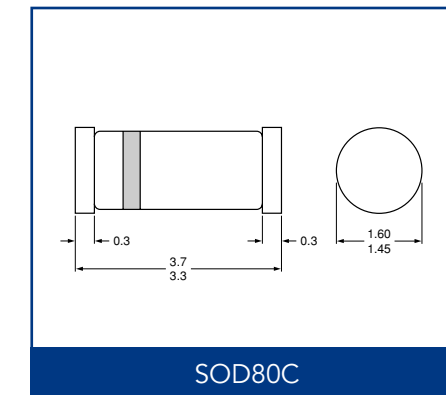
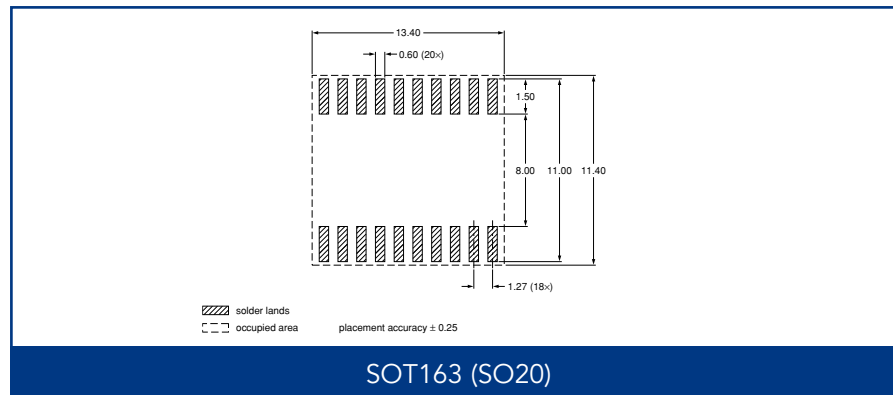
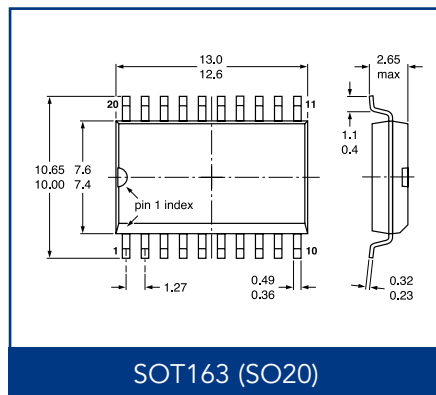
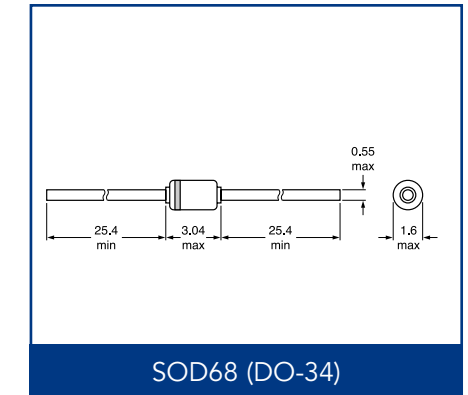
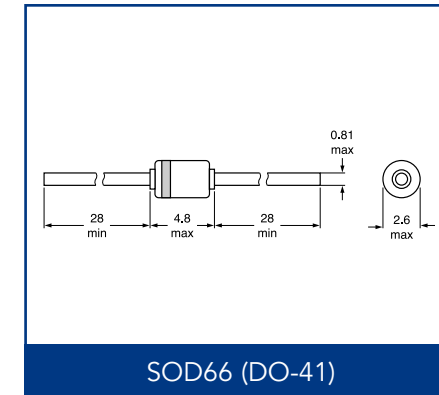
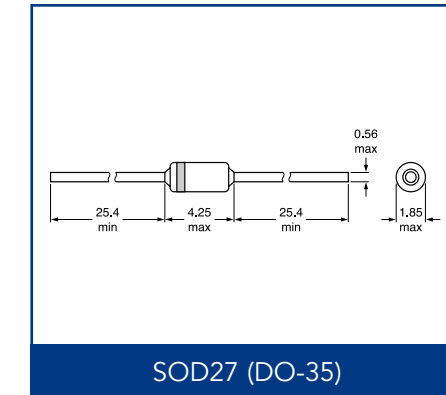
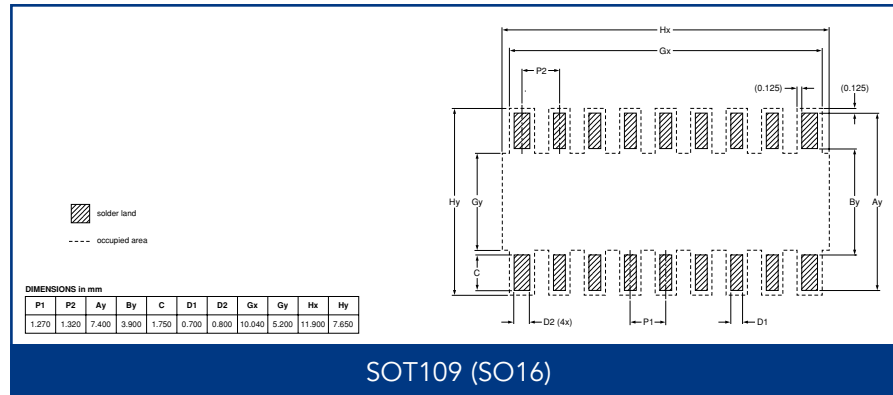
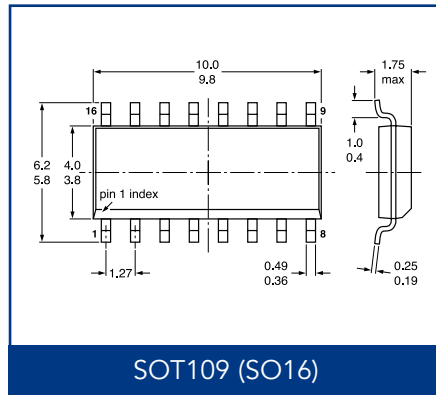


Multi-Pin SMD Packages



Dimensions in mm

Dimensions in mm



Dimensions in mm

Dimensions in mm

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
1N4148	12	BAS16H	13	BAT17	9	BAW56	12	BCM847BV	30
1N4531	12	BAS16J	13	BAT54	4	BAW56M	13	BCM847DS	30
1N47xxA series	10	BAS16L	13	BAT54A	4	BAW56S	13	BCM856BS	30
1PS10SB82	9	BAS16T	13	BAT54AW	5	BAW56T	13	BCM856DS	30
1PS66SB17	9	BAS16VV	13	BAT54C	4	BAW56W	13	BCM857BS	30
1PS66SB82	9	BAS16VY	13	BAT54CM	5	BC807 / -16 / -25 / -40	27	BCM857BV	30
1PS70SB20	7	BAS16W	13	BAT54CV	5	BC807DS	28	BCM857DS	30
1PS70SB82	9	BAS21	14	BAT54CW	5	BC807W/-16W/-25W/-40W	27	BCP51 / -10 / -16	43
1PS70SB84	9	BAS21AW	14	BAT54H	5	BC817 / -16 / -25 / -40	27	BCP52 / -10 / -16	43
1PS70SB85	9	BAS21H	14	BAT54J	5	BC817DPN	28	BCP53 / -10 / -16	43
1PS70SB86	9	BAS21J	14	BAT54L	5	BC817DS	28	BCP54 / -10 / -16	43
1PS74SB23	6	BAS21SW	14	BAT54S	4	BC817W/-16W/-25W/-40W	27	BCP55 / -10 / -16	43
1PS75SB45	5	BAS21VD	14	BAT54SW	5	BC846 / A / B	27	BCP56 / -10 / -16	43
1PS76SB1	5	BAS21W	14	BAT54VV	5	BC846S	28	BCP68 / -25	43
1PS76SB17	9	BAS28	13	BAT54W	5	BC846T / AT / BT	27	BCP69 / -16 / -25	43
1PS76SB21	5	BAS29	15	BAT54XY	5	BC846W / AW / BW	27	BCV26	29
1PS76SB4	5	BAS31	15	BAT720	6	BC847 / A / B / C	27	BCV27	29
1PS76SB7	5	BAS31	13	BAT721	4	BC847AM / BM / CM	27	BCV28	29
1PS79SB10	5	BAS321	14	BAT721A	4	BC847BPN	28	BCV29	29
1PS79SB17	9	BAS32L	12	BAT721C	4	BC847BS	28	BCV46	29
1PS79SB30	5	BAS35	15	BAT721S	4	BC847BV	28	BCV47	29
1PS79SB31	5	BAS40	4	BAT74	5	BC847BVN	28	BCV48	29
1PS79SB40	5	BAS40-04	4	BAT74S	5	BC847T / AT / BT / CT	27	BCV49	29
1PS79SB70	5	BAS40-04W	5	BAT74V	5	BC847W/AW/BW/CW	27	BCV61/A/B/C	30
1PS88SB48	5	BAS40-05	4	BAT754	4	BC848B	27	BCV62/A/B/C	30
1PS88SB82	9	BAS40-05V	5	BAT754A	4	BC848W	27	BCV63 / B	31
2N7002	23	BAS40-05W	5	BAT754C	4	BC849B	29	BCV64B	31
2N7002E	23	BAS40-06	4	BAT754L	5	BC849BW	29	BCV65 (SOT143B)	26
2N7002F	23	BAS40-06W	5	BAT754S	4	BC849C	29	BCV71 / 72	27
2N7002K	23	BAS40-07	5	BAT760	7	BC849CW	29	BCW29 / 30	27
2PA1576Q / R / S	27	BAS40-07V	5	BAT85	4	BC850B	29	BCW31	27
2PA1774Q / R / S	27	BAS40H	5	BAT854AW	5	BC850BW	29	BCW32	27
2PA1774QM / RM / SM	27	BAS40L	5	BAT854CW	5	BC850C	29	BCW33	27
2PB1219AQ / R / S	27	BAS40W	5	BAT854SW	5	BC850CW	29	BCW60B / C / D	27
2PB709ARL	27	BAS40XY	5	BAT854W	5	BC856 / A / B	27	BCW61B / C / D	27
2PB709ART	27	BAS416	15	BAT86	4	BC856S	28	BCW69 / 70	27
2PB709ARW / SW	27	BAS45A	15	BAT960	7	BC856T / AT / BT	27	BCW71	27
2PB709ASL	27	BAS45AL	15	BAV103	14	BC856W / AW / BW	27	BCW72	27
2PB710ARL	27	BAS516	13	BAV170	15	BC857 / A / B / C	27	BCW89	27
2PB710ASL	27	BAS521	14	BAV199	15	BC857AM / BM / CM	27	BCX17	27
2PC4081Q / R / S	27	BAS56	15	BAV199W	15	BC857BS	28	BCX18	27
2PC4617Q / R	27	BAS70	4	BAV20	14	BC857BV	28	BCX19	27
2PC4617QM / RM	27	BAS70-04	4	BAV21	14	BC857T / AT / BT / CT	27	BCX51 / -10 / -16	43
2PD1820A / R / S	27	BAS70-04W	5	BAV23	14	BC857W/AW/BW/CW	27	BCX52 / -10 / -16	43
2PD601ARL	27	BAS70-05	4	BAV23A	14	BC858B	27	BCX53 / -10 / -16	43
2PD601ART	27	BAS70-05W	5	BAV23C	14	BC858W	27	BCX54 / -10 / -16	43
2PD601ARW / SW	27	BAS70-06	4	BAV23S	14	BC859B	29	BCX55 / -10 / -16	43
2PD601ASL	27	BAS70-06W	5	BAV70	12	BC859BW	29	BCX56 / -10 / -16	43
2PD602AQL	27	BAS70-07	5	BAV70M	13	BC859C	29	BCX70G / H / J / K	27
2PD602ARL	27	BAS70-07S	5	BAV70S	13	BC859CW	29	BCX71H / J / K	27
2PD602ASL	27	BAS70-07V	5	BAV70T	13	BC860B	29	BF550	31
4283CZ10-TB	52	BAS70H	5	BAV70W	13	BC860BW	29	BF570	31
BAL74	12	BAS70L	5	BAV756S	13	BC860C	29	BF620	29
BAL99	12	BAS70VV	5	BAV99	12	BC860CW	29	BF621	29
BAS101	14	BAS70W	5	BAV99S	13	BC868 / -25	43	BF622	29
BAS101S	14	BAS70XY	5	BAV99W	13	BC869 / -16 / -25	43	BF623	29
BAS116	15	BAS716	15	BAW101	14	BCM61B	30	BF720	29
BAS116H	15	BAS85	4	BAW101S	14	BCM62B	30	BF722	29
BAS16	12	BAS86	4	BAW156	15	BCM847BS	30	BF723	29

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
BF820	29	BST60	29	BZX84-y4V3	11	IP4221CZ6-S	48	IP4772 CZ16	51
BF820W	29	BST61	29	BZX84-y4V7	11	IP4221CZ6-XS	48	IP4773CZ14	51
BF821	29	BST62	29	BZX84-y51	11	IP4224CZ6	51	IP4774CZ14	51
BF822	29	BST82	25	BZX84-y56	11	IP4225CZ10	48	IP4776CZ38	52
BF823	29	BSV52	28	BZX84-y5V1	11	IP4233CZ6	51	IP4777CZ38	52
BF824	31	BZA100	20	BZX84-y5V6	11	IP4242CZ6	48	IP4778CZ38	52
BF824W	31	BZA408B	20	BZX84-y62	11	IP4251CZ12-6	49	IP4779CZ64	52
BF840	31	BZA418A	20	BZX84-y68	11	IP4251CZ16-8	49	IP4790CZ38	51
BFS19	31	BZA420A	20	BZX84-y6V2	11	IP4251CZ8-4	49	IP4852CX25/LF	47
BFS20	31	BZA456A	20	BZX84-y6V8	11	IP4252CZ12-6	49	IP4853CX24/LF	47
BFS20W	31	BZA462A	20	BZX84-y75	11	IP4252CZ16-8	49	IP5002CX8/LF	46
BSH103	23	BZA820A	20	BZX84-y7V5	11	IP4252CZ8-4	49	IP5006CX11/LF	46
BSH105	23	BZA856A	20	BZX84-y8V2	11	IP4253CZ12-6	49	IP5020CX16/LF	46
BSH108	23	BZA856AL	20	BZX84-y9V1	11	IP4253CZ16-8	49	IP5040CX11/LF	46
BSH201	25	BZA862A	20	BZX884 series	10	IP4253CZ8-4	49	IP5311CX5/LF	46
BSH202	25	BZA862AL	20	IP3219CZ6	48	IP4254CZ12-6	49	MEG3020CEP	6
BSH203	25	BZA868A	20	IP3337CX18/LF	49	IP4254CZ16-8	49	MEG3020DEP	6
BSH205	25	BZA868AL	20	IP3337CX18/LF	50	IP4254CZ8-4	49	MMBT2222A	28
BSH207	25	BZA956A	20	IP3338CX24/LF	50	IP4256CZ3-M	48	MMBT3904	28
BSN20	23	BZA962A	20	IP3338CX24/LF	50	IP4256CZ5-W	48	MMBT3906	28
BSP030	23	BZA968A	20	IP4025CX20/LF	46	IP4256CZ6-F	48	MMBZ10VAL	21
BSP100	23	BZB100A	10	IP4027CX20/LF	46	IP4263CZ14	51	MMBZ12VAL	21
BSP122	25	BZB784 series	10	IP4032CX25/LF	50	IP4264CZ8-20	46	MMBZ12VDL	21
BSP126	25	BZB84 series	10	IP4033CX25/LF	50	IP4264CZ8-40	46	MMBZ15VAL	21
BSP130	25	BZB984 series	10	IP4035CX24/LF	50	IP4280CZ10	52	MMBZ15VDL	21
BSP19	29	BZT52H series	10	IP4040CX25/LF	50	IP4281CZ10	52	MMBZ18VAL	21
BSP220	25	BZV49 series	10	IP4041CX25/LF/S	50	IP4282CZ6	52	MMBZ18VCL	21
BSP225	25	BZV55 series	10	IP4042CX5/LF	50	IP4283CZ10-TT	51	MMBZ20VAL	21
BSP230	25	BZV85 series	10	IP4043CX5/LF	50	IP4285CZ6	51	MMBZ20VCL	21
BSP250	25	BZV90 series	10	IP4044CX8/LF	46	IP4285CZ6	52	MMBZ27VAL	21
BSP31	43	BZX100A	10	IP4047CX6/LF	46	IP4286CZ6	51	MMBZ27VCL	21
BSP32 / 33	43	BZX384 series	10	IP4048CX5/LF	46	IP4286CZ6	52	MMBZ33VAL	21
BSP41	43	BZX585 series	10	IP4049CX5/LF	46	IP4302CX2/LF	50	MMBZ33VCL	21
BSP43	43	BZX79 series	10	IP4051CX11/LF	47	IP4303CX4/LF	50	MMBZ56AL	21
BSP50	29	BZX84 series	10	IP4052CX20/LF	47	IP4305CX4/LF	50	MMBZ62AL	21
BSP51	29	BZX84J series	10	IP4053CX15/LF	49	IP4306CX2/LF	50	MMBZ6V8AL	21
BSP52	29	BZX84-y10	11	IP4054CX15/LF	49	IP4307CX4/LF	48	MMBZ9V1AL	21
BSP60	29	BZX84-y11	11	IP4055CX6/LF	46	IP4332CX5/LF	50	NZX series	10
BSP61	29	BZX84-y12	11	IP4056CX8/LF	47	IP4338CX24/LF	50	NZX10A	11
BSP62	29	BZX84-y13	11	IP4057CX10/LF	47	IP4341CX25/LF	50	NZX10B	11
BSP89	25	BZX84-y15	11	IP4058CX8/LF	47	IP4342CX5/LF	50	NZX10C	11
BSR14	28	BZX84-y16	11	IP4059CX5/LF	47	IP4343CX5/LF	50	NZX10D	11
BSR16	28	BZX84-y18	11	IP4060CX16/LF	47	IP4350CX24/LF	47	NZX11A	11
BSR30 / 31	43	BZX84-y20	11	IP4064CX8/LF/S	46	IP4352CX24/LF	47	NZX11B	11
BSR33	43	BZX84-y22	11	IP4065CX11/LF	47	IP4355CX6/LF	46	NZX11C	11
BSR41	43	BZX84-y24	11	IP4067CX9/LF	47	IP4358CX6/LF	47	NZX11D	11
BSR42 / 43	43	BZX84-y27	11	IP4078CX6/LF	47	IP4359CX4/LF	47	NZX12A	11
BSS123	25	BZX84-y2V4	11	IP4085CX4/LF	48	IP4361CX4/LF	50	NZX12B	11
BSS192	25	BZX84-y2V7	11	IP4088CX20/LF	49	IP4363CX10/LF	46	NZX12C	11
BSS63	27	BZX84-y30	11	IP4110CX20/LF	46	IP4364CX8/LF	46	NZX12D	11
BSS63	29	BZX84-y33	11	IP4125CX20/LF	46	IP4365CX11	46	NZX12X	11
BSS64	27	BZX84-y36	11	IP4142CX5/LF	50	IP4365CX11	47	NZX13A	11
BSS64	29	BZX84-y39	11	IP4153CX15/LF	49	IP4366CX8/LF	46	NZX13B	11
BSS84	25	BZX84-y3V0	11	IP4158CX8/LF	47	IP4385CX4/LF	48	NZX13C	11
BSS87	25	BZX84-y3V3	11	IP4220CZ6	47	IP4386CX4/LF	48	NZX14A	11
BST39	29	BZX84-y3V6	11	IP4220CZ6	48	IP4387CX4/LF	48	NZX14B	11
BST50	29	BZX84-y3V9	11	IP4220CZ6	51	IP4769CZ14	51	NZX14C	11
BST51	29	BZX84-y43	11	IP4221CZ6-S	46	IP4770 CZ16	51	NZX15A	11
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NZX20C	11	NZX6V2C	11	PBLS4003D	39	PBSS303ND	34	PBSS4160V	35
NZX22A	11	NZX6V2D	11	PBLS4004D	39	PBSS303ND	42	PBSS4220V	35
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NZX22C	11	NZX6V8A	11	PBLS6001D	39	PBSS303NX	42	PBSS4240DPN	38
NZX24A	11	NZX6V8B	11	PBLS6002D	39	PBSS303NZ	34	PBSS4240T	35
NZX24B	11	NZX6V8C	11	PBLS6003D	39	PBSS303NZ	42	PBSS4240V	35
NZX24C	11	NZX6V8D	11	PBLS6004D	39	PBSS303PD	36	PBSS4240Y	35
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NZX27A	11	NZX7V5B	11	PBLS6021D	39	PBSS303PX	36	PBSS4250X	42
NZX27B	11	NZX7V5C	11	PBLS6022D	39	PBSS303PX	43	PBSS4320T	35
NZX27C	11	NZX7V5D	11	PBLS6023D	39	PBSS303PZ	36	PBSS4320X	34
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NZX3V6B	11	PBHV9115T	40	PBSS301ND	34	PBSS305PZ	43	PBSS4630PA	35
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NZX4V3C	11	PBLS1503V	39	PBSS301PD	43	PBSS306PZ	36	PBSS5140V	37
NZX4V3D	11	PBLS1503Y	39	PBSS301PX	36	PBSS306PZ	43	PBSS5160DS	38
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PBSS5230T	37	PDTA113EM	32	PDTA143TE	32	PDTC123JT	32	PDZ-B series	10
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PBSS5240T	37	PDTA113EU	32	PDTA143TT	32	PDTC123TE	32	PEMB10	33
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PBSS5250T	37	PDTA113ZU	32	PDTA143XT	32	PDTC123YE	32	PEMB15	33
PBSS5250X	36	PDTA114EE	32	PDTA143XU	32	PDTC123YM	32	PEMB16	33
PBSS5250X	43	PDTA114EM	32	PDTA143ZE	32	PDTC123YT	32	PEMB17	33
PBSS5320D	36	PDTA114ET	32	PDTA143ZM	32	PDTC123YU	32	PEMB18	33
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PBSS5620PA	37	PDTA123TT	32	PDTC114TE	32	PDTC143ZU	32	PEMH10	33
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PBSS9110Z	36	PDTA143EE	32	PDTC123ET	32	PDTD113ZT	33	PEMZ1	28
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PESD24VS4UD	20	PESD5V0S2BT	19	PMB53906	28	PMEG2010EA	7	PMEG4005CT	8
PESD24VS5UD	20	PESD5V0S2UAT	19	PMBT2222	28	PMEG2010EH	7	PMEG4005EH	7
PESD2CAN	17	PESD5V0S2UQ	19	PMBT2222A	28	PMEG2010EJ	7	PMEG4005EJ	7
PESD3V3L1BA	18	PESD5V0S4UD	20	PMBT2369	28	PMEG2010EPA	7	PMEG4005ET	6
PESD3V3L1UA	18	PESD5V0S4UF	19	PMBT2907	28	PMEG2010ER	6	PMEG4010BEA	7
PESD3V3L1UB	18	PESD5V0S5UD	20	PMBT2907A	28	PMEG2010ET	6	PMEG4010BEV	7
PESD3V3L1UL	18	PESD5V0U1BA	16	PMBT3904	28	PMEG2010EV	7	PMEG4010CEH	7
PESD3V3L2BT	19	PESD5V0U1BB	16	PMBT3904M	28	PMEG2015EA	7	PMEG4010CEJ	7
PESD3V3L2UM	19	PESD5V0U1BL	16	PMBT3904VS	28	PMEG2015EH	7	PMEG4010EH	7
PESD3V3L4UF	19	PESD5V0U1UA	16	PMBT3904YS	28	PMEG2015EJ	7	PMEG4010EJ	7
PESD3V3L4UG	20	PESD5V0U1UB	16	PMBT3906	28	PMEG2015EV	7	PMEG4010EP	6
PESD3V3L4UW	20	PESD5V0U1UL	16	PMBT3906M	28	PMEG2020AEA	7	PMEG4010ER	6
PESD3V3L5UF	20	PESD5V0U2BM	16	PMBT3906VS	28	PMEG2020EH	7	PMEG4010ET	6
PESD3V3L5UK	20	PESD5V0U2BT	16	PMBT3906YS	28	PMEG2020EJ	7	PMEG4020EP	6
PESD3V3L5UV	20	PESD5V0U4BF	17	PMBT3946VFN	28	PMEG3002AEB	7	PMEG4020EPA	7
PESD3V3L5UY	20	PESD5V0U4BW	17	PMBT3946YFN	28	PMEG3002AEL	5	PMEG4020ER	6
PESD3V3S1UB	18	PESD5V0U5BF	17	PMBT4401	28	PMEG3002AEL	7	PMEG4030EP	6
PESD3V3S1UL	18	PESD5V0U5BV	17	PMBT4403	28	PMEG3002EJ	7	PMEG4030ER	6
PESD3V3S2UAT	19	PESD5V0V1BA	19	PMBT5550	29	PMEG3002TV	8	PMEG4050EP	6
PESD3V3S2UQ	19	PESD5V0V1BB	19	PMBT5551/BSR19	29	PMEG3005AEA	7	PMEG6002EB	7
PESD3V3S2UT	19	PESD5V0V1BL	19	PMBT6428	27	PMEG3005AEV	7	PMEG6002EJ	7
PESD3V3S4UD	20	PESD5V0V4UF	19	PMBT6429	27	PMEG3005CT	8	PMEG6002TV	8
PESD3V3S4UF	19	PESD5V0V4UG	20	PMBTA06	27	PMEG3005EB	7	PMEG6010AED	6
PESD3V3S5UD	20	PESD5V0V4UK	19	PMBTA13	29	PMEG3005EH	7	PMEG6010CEH	7
PESD3V3U1UA	16	PESD5V0V4UW	20	PMBTA14	29	PMEG3005EJ	7	PMEG6010CEJ	7
PESD3V3U1UB	16	PESD5V0X1BA	16	PMBTA42	29	PMEG3005EL	7	PMEG6010EP	6
PESD3V3U1UL	16	PESD5V0X1BL	16	PMBTA42DS	29	PMEG3005ET	6	PMEG6010ER	6
PESD3V3V4UF	19	PESD5V0X1BQ	16	PMBTA44	29	PMEG3010BEA	7	PMEG6020EP	6
PESD3V3V4UG	20	PESD5V0X1BT	16	PMBTA56	27	PMEG3010BEP	6	PMEG6020EPA	7

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PMEG6030EP	6	PMST2369	28	PTVS17VS1UR	21	PUMD4	33	PZU2.4y	11
PMEM1505NG	40	PMST2907A	28	PTVS18VS1UR	21	PUMD48	33	PZU2.7y	11
PMEM1505PG	40	PMST3904	28	PTVS20VS1UR	21	PUMD6	33	PZU20y	11
PMEM4010ND	40	PMST3906	28	PTVS22VS1UR	21	PUMD9	33	PZU22y	11
PMEM4010PD	40	PMST4401	28	PTVS24VS1UR	21	PUMH1	33	PZU24y	11
PMEM4020AND	40	PMST4403	28	PTVS26VS1UR	21	PUMH10	33	PZU27y	11
PMEM4020APD	40	PMST5088	27	PTVS28VS1UR	21	PUMH11	33	PZU3.0y	11
PMEM4020ND	40	PMST5089	27	PTVS30VS1UR	21	PUMH13	33	PZU3.3y	11
PMEM4020PD	40	PMST5550	29	PTVS33VS1UR	21	PUMH14	33	PZU3.6y	11
PMF280UN	23	PMST5551	29	PTVS36VS1UR	21	PUMH15	33	PZU3.9y	11
PMF290XN	23	PMST6428	27	PTVS3V3S1UR	21	PUMH16	33	PZU30y	11
PMF370XN	23	PMST6429	27	PTVS40VS1UR	21	PUMH17	33	PZU33y	11
PMF3800SN	23	PMSTA05	27	PTVS43VS1UR	21	PUMH18	33	PZU36y	11
PMF400UN	23	PMSTA06	27	PTVS45VS1UR	21	PUMH19	33	PZU4.3y	11
PMF780SN	23	PMSTA42	29	PTVS48VS1UR	21	PUMH2	33	PZU4.7y	11
PMG370XN	23	PMSTA55	27	PTVS51VS1UR	21	PUMH20	33	PZU5.1y	11
PMGD280UN	26	PMSTA56	27	PTVS54VS1UR	21	PUMH24	33	PZU5.6y	11
PMGD290XN	26	PMSTA92	29	PTVS58VS1UR	21	PUMH30	33	PZU6.2y	11
PMGD370XN	26	PMV117EN	23	PTVS5V0S1UR	21	PUMH4	33	PZU6.8y	11
PMGD400UN	26	PMV213SN	25	PTVS60VS1UR	21	PUMH7	33	PZU7.5y	11
PMGD780SN	26	PMV30UN	23	PTVS64VS1UR	21	PUMH9	33	PZU8.2y	11
PMGD800LN	26	PMV31XN	23	PTVS6V0S1UR	21	PUMT1	28	PZU9.1y	11
PML260SN	25	PMV40UN	23	PTVS6V5S1UR	21	PUMX1	28	PZUxB series	10
PML340SN	25	PMV45EN	23	PTVS7V0S1UR	21	PUMX2	28	PZUxBA series	10
PMMT491A	35	PMV56XN	23	PTVS7V5S1UR	21	PUMZ1	28	PZUxBL series	10
PMMT591A	37	PMV60EN	23	PTVS8V0S1UR	21	PUMZ2	28	PZUxDB2 series	10
PMMT591A	37	PMV65XP	25	PTVS8V5S1UR	21	PVR100AD-B12V	44	RB751CS40	5
PMN23UN	23	PMZ250UN	23	PTVS9V0S1UR	21	PVR100AD-B2V5	44	RB751S40	5
PMN27UN	23	PMZ270XN	23	PUMB1	33	PVR100AD-B3V0	44	RB751V4	5
PMN28UN	23	PMZ350XN	23	PUMB10	33	PVR100AD-B3V3	44	SI2302DS	23
PMN34LN	23	PMZ390UN	23	PUMB11	33	PVR100AD-B5V0	44	SI2304DS	23
PMN34UN	23	PMZ760SN	23	PUMB13	33	PVR100AZ-B12V	44	TL431ACDBZR	44
PMN38EN	23	PRLL5817	6	PUMB14	33	PVR100AZ-B2V5	44	TL431AIDBZR	44
PMN40LN	23	PRLL5818	6	PUMB15	33	PVR100AZ-B3V0	44	TL431AQDBZR	44
PMN45EN	23	PRLL5819	6	PUMB16	33	PVR100AZ-B3V3	44	TL431ASDT	44
PMN49EN	23	PRTR5V0U1T	16	PUMB17	33	PVR100AZ-B5V0	44	TL431CDBZR	44
PMN50XP	25	PRTR5V0U2AX	16	PUMB18	33	PXT2222A	28	TL431IDBZR	44
PMN55LN	23	PRTR5V0U2D	17	PUMB19	33	PXT2907A	28	TL431QDBZR	44
PMP4201G	30	PRTR5V0U2F	17	PUMB2	33	PXT4401	28	TL431SDT	44
PMP4201V	30	PRTR5V0U2K	17	PUMB20	33	PXT4403	28		
PMP4201Y	30	PRTR5V0U2X	16	PUMB24	33	PXTA14	29		
PMP4501G	30	PRTR5V0U4AD	48	PUMB3	33	PXTA42	29		
PMP4501V	30	PRTR5V0U4D	17	PUMB30	33	PXTA92	29		
PMP4501Y	30	PRTR5V0U4D	52	PUMB4	33	PZT2222A	28		
PMP5201G	30	PRTR5V0U4Y	17	PUMB9	33	PZT2907A	28		
PMP5201V	30	PRTR5V0U4Y	48	PUMD10	33	PZT4401	28		
PMP5201Y	30	PRTR5V0U4Y	52	PUMD12	33	PZT4403	28		
PMP5501G	30	PRTR5V0U6AS	17	PUMD13	33	PZTA14	29		
PMP5501V	30	PRTR5V0U6S	17	PUMD14	33	PZTA42	29		
PMP5501Y	30	PRTR5V0U8S	17	PUMD15	33	PZTA44	29		
PMR280UN	23	PRTR5V0U8S	52	PUMD16	33	PZTA92	29		
PMR290XN	23	PSSI2021SAY	45	PUMD17	33	PZU10y	11		
PMR370XN	23	PTVS10VS1UR	21	PUMD18	33	PZU11y	11		
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PMR780SN	23	PTVS12VS1UR	21	PUMD2	33	PZU13y	11		
PMSS3904	28	PTVS13VS1UR	21	PUMD20	33	PZU14y	11		
PMSS3906	28	PTVS14VS1UR	21	PUMD24	33	PZU15y	11		
PMST2222	28	PTVS15VS1UR	21	PUMD3	33	PZU16y	11		



