



# Discrete Semiconductors Selection Guide 2010

Diodes, transistors, ESD and signal conditioning devices  
Excellence in portfolio and performance



## Introducing new package technology

Portable and increasingly smaller end products fuel the race towards more sophisticated functionality in smaller form factors. To support system designers manage this challenge we as NXP develop products that fulfill requirements regarding space constraints, boosted performance and environmental aspects. Have a look at these five new SMD packages that take discretes to the next level:

### Leadless powerhouse – SOT1061 and SOT1118

#### Features

- ▶ Exposed heat sink for excellent thermal and electrical conductivity
- ▶ Power dissipation capability ( $P_{tot}$ ) of > 1 W
- ▶ Small footprint of 2 x 2 mm and height of 0.65 mm



#### Products in SOT1061

- 1 and 2 A low  $V_F$  Schottky rectifiers, pages 11 and 12
- Low  $V_{CEsat}$  (BISS) transistors, pages 57, 59, 64 and 65



#### Products in SOT1118

- Small-signal MOSFET P-channel and FET-KYs, page 77

### FlatPower – SOD123W and SOD128

#### Features

- ▶ High power ratings due to clip-bonding technology and optimized die design
- ▶ 1 mm low profile, footprint of 2.6 x 1.7 (SOD123W) and 3.8 x 2.5 mm (SOD128)
- ▶ Pad layout compatible with SMA for easy drop-in replacement
- ▶ AEC-Q101 qualified



#### Products in SOD123W and SOD128

- 400 W and 600 W TVS diodes, pages 44 and 45
- 1 to 5 A low  $V_F$  Schottky rectifiers, page 10

### Small, strong, perfectly visible – SOD882D

#### Features

- ▶ Exposed leads facilitate visual inspection of solder joints
- ▶ More rugged and reliable bond between device and PCB board
- ▶ Reduced height down to 0.37 mm and small footprint of 1 x 0.6 mm



#### Products in SOD882D

- Standard ESD protection devices, page 24

### Transfer to halogen-free products

Since 2009 all NXP small-signal discrete SMD packages on the market are “Dark Green”, meaning they are fully RoHS compliant (directive 2002/95/EC) and do not contain halogens or antimony exceeding allowed limits:

Substances	Limit
Antimony Oxides	< 900 ppm
Chlorinated + Brominated Compounds	$\Sigma$ < 900 ppm

# Discrete Semiconductors Selection Guide 2010

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

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## Support tools

To help you achieve the best, most efficient design-ins with our products, we offer a wide variety of support tools, available on the NXP Semiconductors website.

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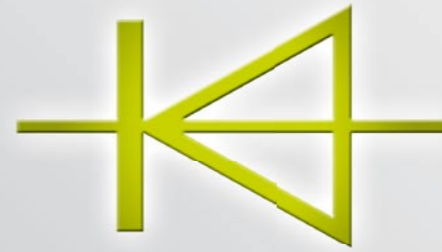
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## Diodes














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Medium power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA

types in **bold** represent new products

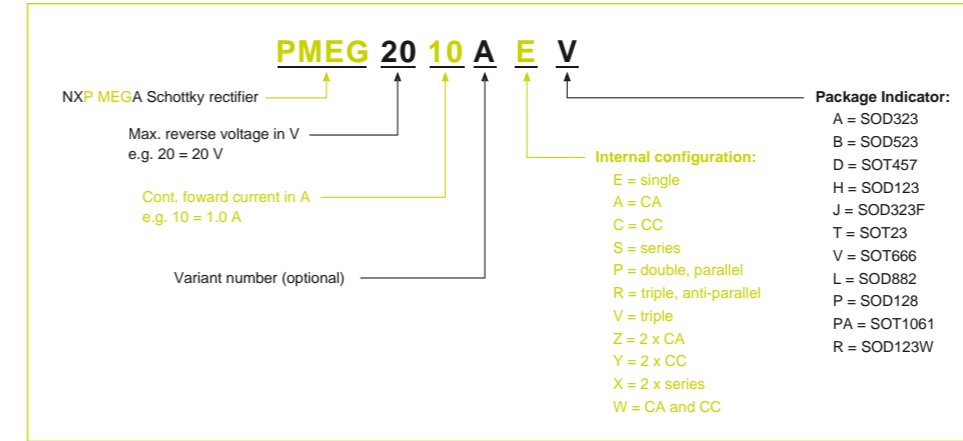
$I_F$ max (A)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_R$ max (mA) @ $V_R$ max	Package	SOD128	SOD87 (Meif)	SOT457 (SC-74)	SOT23	SOD123W		SOD123F	SOT1061	SOT323 (SC-70)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOD523 (SC-79)	SOD882	
																			
				Size (mm)	3.8 x 2.5 x 1.0	3.5 x 2.05 x 2.05	2.9 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	2.0 x 2.0 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 $V_F$															
	40	600	0.01	low $I_R$															
	60	600	0.1	low $V_F$															
0.5	20	390	0.2	low $V_F$															
		440	1.5	low $V_F$															
		480	0.01	low $I_R$															
	30	500	0.03	low $I_R$															
		430	0.15	low $V_F$															
		500	0.5	low $V_F$															
40	470	0.1	low $V_F$																
	550	0.1	low $V_F$																
1.0	20	340	1	low $V_F$															
		375	1.9	low $V_F$															
		430	0.2	low $V_F$															
		450	0.05	low $I_R$															
		500	1.0	low $V_F$															
		550	0.2	low $V_F$															
	30	620	1.5	low $V_F$															
		450	1.0	low $V_F$															
		360	1.5	low $V_F$															
		450	0.05	low $I_R$															
		520	0.05	low $I_R$															
		550	1	low $V_F$															
	40	560	0.15	low $V_F$															
		680	0.5	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 $I_R$															
60	530	0.06	low $V_F$																
	650	0.35	low $V_F$																
	660	0.05	low $I_R$																
1.5	20	660	0.07	low $I_R$															
	30	550	1.0	low $V_F$															
2.0	10	460	3.0	low $V_F$															
		420	1.9	low $V_F$															
	20	525	0.2	low $V_F$															
		360	3.0	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 $I_R$															
	30	620	1.0	low $V_F$															
		490	0.1	low $V_F$															
		535	0.1	low $V_F$															
		530	0.15	low $V_F$															
60	575	0.25	low $V_F$																
3.0	10	530	3.0	low $V_F$															
	30	360	5.0	low $V_F$															
		450	0.15	low $I_R$															
	40	490	0.2	low $V_F$															
		540	0.1	low $I_R$															
60	530	0.2	low $V_F$																
5.0	30	360	8.0	low $V_F$															
	40	490	0.3	low $V_F$															

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

types in **bold** represent new products

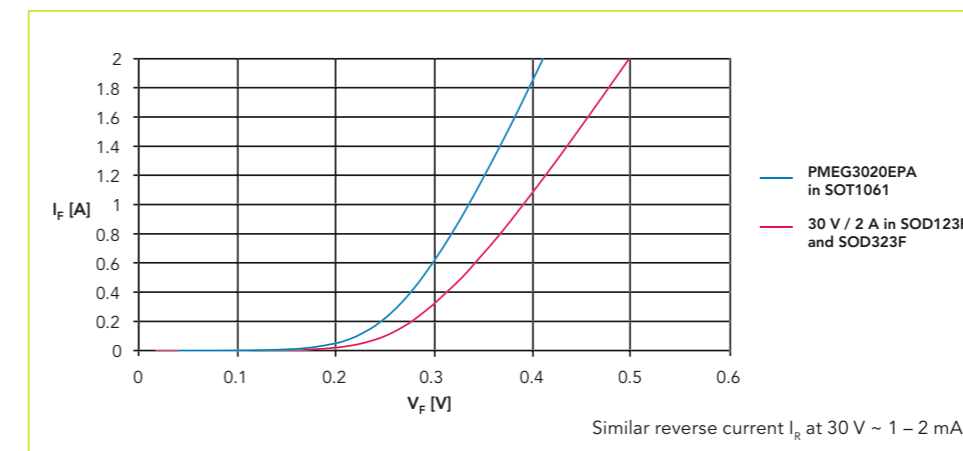
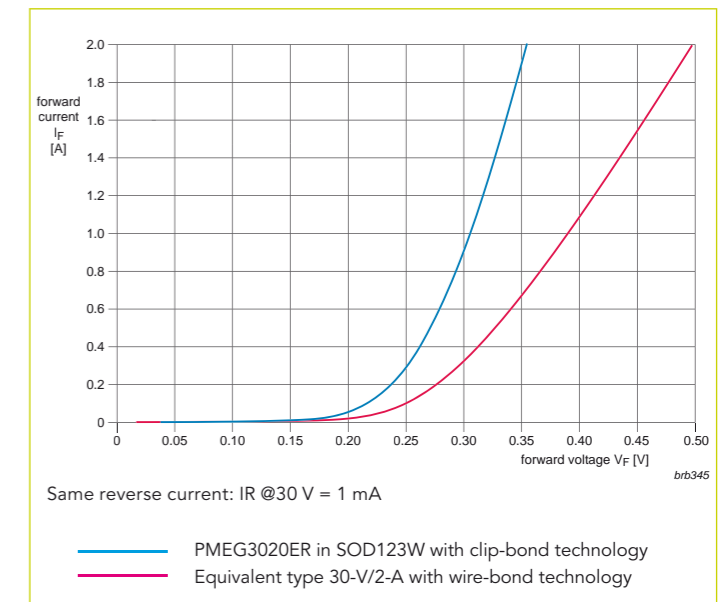
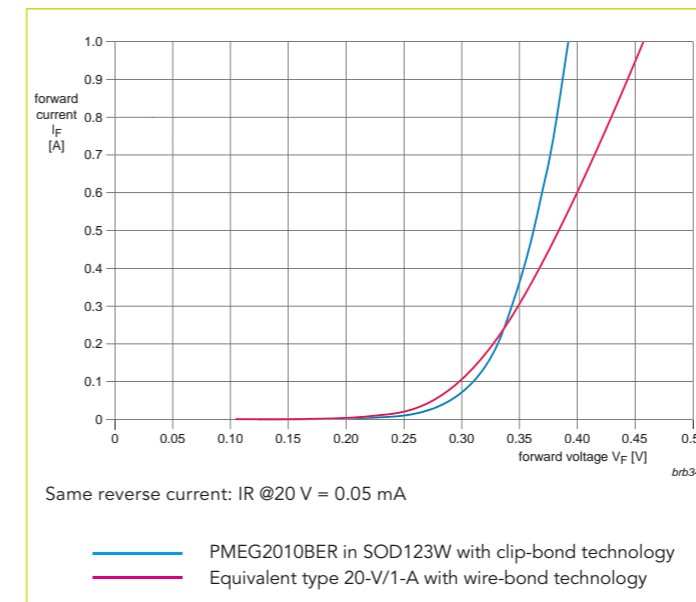
$I_F$ max (A)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ max	$I_F$ max (mA) @ $V_R$ max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT1061	SOT666	
						Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	1.6 x 1.2 x 0.55
						$P_{tot}$ (mW)	1500	250	1000	300
0.2	30	480	0.03	low $V_F$	dual isolated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

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



### Improved forward characteristics of (MEGA) Schottky rectifiers in new packages

NXP low  $V_F$  maximum efficiency general applications (MEGA) Schottky rectifiers in new FlatPower SOD123W and medium power leadless SOT1061 package





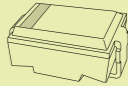
### Low capacitance Schottky diodes

$I_F$ max (mA)	$V_R$ max (V)	$V_F$ max (mV) @ $I_F$ (mA)	$C_d$ max (pF) @ $V_R = 0$ V	Package	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	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							
				single				1PS76SB17		1PS79SB17		
				triple isolated					1PS66SB17			
				dual series	PMBD353 PMBD354 <sup>1)</sup>							
	15	340	1	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

### PN rectifiers in SMA, SMB, SMC

types in **bold** represent new products

Package	SOD131 (SMA)				SOD132 (SMB)			SOD133 (SMC)			
											
Size (mm)	4.25 x 2.67 x 2.14				4.32 x 3.62 x 2.29			6.86 x 5.91 x 2.34			
$t_r$ (ns)	30	60	300	2000	30	300	2000	30	60	300	2000
$V_R$ max (V)	$I_F$ max (A)										
50	1	<b>ES1A</b>	<b>US1A</b>	<b>RS1A</b>	<b>S1A</b>						
	1.5			<b>RS2AA</b>		<b>RS2A</b>	<b>S2A</b>				
	2					<b>ES2A</b>					
	3							<b>ES3A</b>	<b>US3A</b>	<b>RS3A</b>	<b>S3A</b>
100	1	<b>ES1B</b>	<b>US1B</b>	<b>RS1B</b>	<b>S1B</b>						
	1.5			<b>RS2BA</b>		<b>RS2B</b>	<b>S2B</b>				
	2					<b>ES2B</b>					
	3							<b>ES3B</b>	<b>US3B</b>	<b>RS3B</b>	<b>S3B</b>
200	1	<b>ES1D</b>	<b>US1D</b>	<b>RS1D</b>	<b>S1D</b>						
	1.5		<b>US2DA</b>	<b>RS2DA</b>	<b>S2DA</b>		<b>RS2D</b>	<b>S2D</b>			
	2					<b>ES2D</b>					
	3							<b>ES3D</b>	<b>US3D</b>	<b>RS3D</b>	<b>S3D</b>
400	1	<b>ES1G</b>	<b>US1G</b>	<b>RS1G</b>	<b>S1G</b>						
	1.5		<b>US2GA</b>	<b>RS2GA</b>	<b>S2GA</b>		<b>RS2G</b>	<b>S2G</b>			
	2					<b>ES2G</b>					
	3							<b>ES3G</b>	<b>US3G</b>	<b>RS3G</b>	<b>S3G</b>
600	1		<b>US1J</b>	<b>RS1J</b>	<b>S1J</b>		<b>RS2J</b>	<b>S2J</b>			
	1.5		<b>US2JA</b>	<b>RS2JA</b>	<b>S2JA</b>						
	3								<b>US3J</b>	<b>RS3J</b>	<b>S3J</b>
800	1		<b>US1K</b>	<b>RS1K</b>	<b>S1K</b>		<b>RS2K</b>	<b>S2K</b>			
	1.5			<b>RS2KA</b>	<b>S2KA</b>						
	3								<b>US3K</b>	<b>RS3K</b>	<b>S3K</b>
1000	1		<b>US1M</b>	<b>RS1M</b>	<b>S1M</b>		<b>RS2M</b>	<b>S2M</b>			
	1.5			<b>RS2MA</b>	<b>S2MA</b>						
	3								<b>US3M</b>	<b>RS3M</b>	<b>S3M</b>

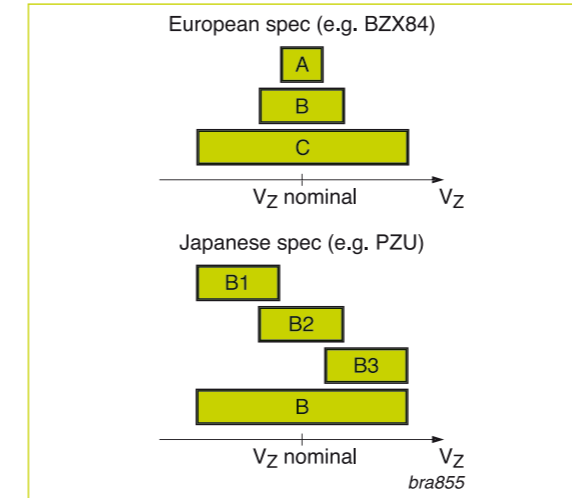
## General purpose Zener diodes

types in **bold** represent new products

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

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 ± 5 % $V_z$ (V)	B-series ± 2 % $V_z$ (V)	A-series ± 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

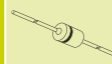
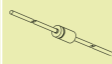






























y =	B-series ± 5 % $V_z$ (V)	B1-series ± 2 % $V_z$ (V)	B2-series ± 2 % $V_z$ (V)	B3-series ± 2 % $V_z$ (V)
PZU2.4y	2.3 - 2.6	-	-	-
PZU2.7y	2.5 - 2.9	2.5 - 2.75	2.65 - 2.9	-
PZU3.0y	2.8 - 3.2	2.8 - 3.05	2.95 - 3.2	-
PZU3.3y	3.1 - 3.5	3.1 - 3.35	3.25 - 3.5	-
PZU3.6y	3.4 - 3.8	3.4 - 3.65	3.55 - 3.8	-
PZU3.9y	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	11.14 - 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 - 11.1	NZX27X	26.99 - 28.39
NZX5V1B	4.9 - 5.1	NZX11C	10.9 - 11.3	NZX30A	28.2 - 29.6
NZX5V1C	5 - 5.2	NZX11D	11.1 - 11.6	NZX30B	29.2 - 30.6
NZX5V1D	5.1 - 5.3	NZX12A	11.4 - 11.9	NZX30C	30.2 - 31.6
NZX5V6A	5.2 - 5.5	NZX12B	11.6 - 12.1	NZX30X	29.02 - 30.51
NZX5V6B	5.3 - 5.6	NZX12C	11.9 - 12.4	NZX33A	31.2 - 32.6
NZX5V6C	5.4 - 5.7	NZX12D	12.2 - 12.7	NZX33B	32.2 - 33.6
NZX5V6D	5.5 - 5.8	NZX12X	11.44 - 12.03	NZX33C	33.2 - 34.5
NZX5V6E	5.6 - 5.9	NZX13A	12.4 - 12.9	NZX36A	34.2 - 35.7
NZX6V2A	5.7 - 6	NZX13B	12.6 - 13.1	NZX36B	35.3 - 36.8
NZX6V2B	5.8 - 6.1	NZX13C	12.9 - 13.4	NZX36C	36.4 - 38
NZX6V2C	6 - 6.3	NZX14A	13.2 - 13.7	NZX36X	35.36 - 37.19



General purpose switching diodes ≤ 100V

V <sub>r</sub> max (V)	V <sub>f</sub> max (V)	I <sub>f</sub> (mA)	I <sub>r</sub> max (mA)	@ V <sub>r</sub> (V)	t <sub>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)			
																								
							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			
						500	500	500	250	250	830	200	300	400	550	180	170	500	250	250				
50	1	50	100	50	4					BAL74														
70	1	50	1000	70	4					BAL99														
75	1	10	25	20	4			1N4531																
		50	1000	75	4					BAS28														
		100	5000	75	4				BAS32L															
90	1	50	500	80	4					BAW56			BAW56W						BAW56T			BAW56M		
																	BAW56S							
																		BAW756S						
100	1	10	25	20	4		1N4148																	
														BAS16H			BAS316	BAS16J						
										BAS16			BAS16W						BAS16T					
																				BAS516	BAS16L			
														BAS16VY					BAS16VV					
										BAV70				BAV70W						BAV70T			BAV70M	
															BAV70S									
										BAV99				BAV99W										
													BAV99S											

### General purpose switching diodes > 100V

types in **bold** represent new products

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

### Controlled avalanche switching diodes

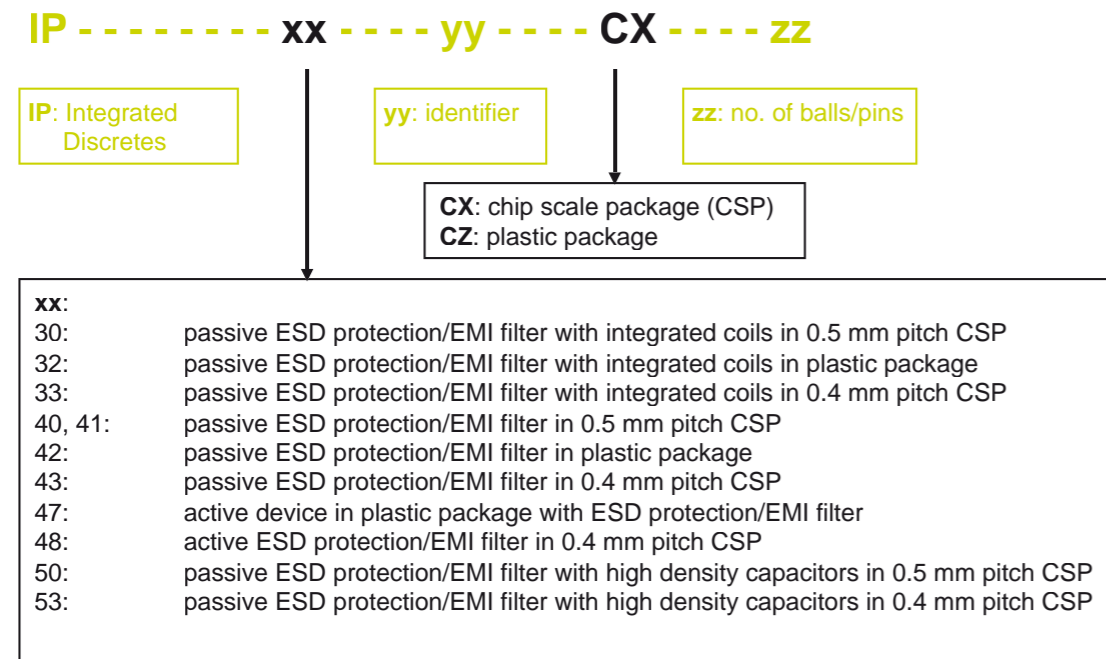
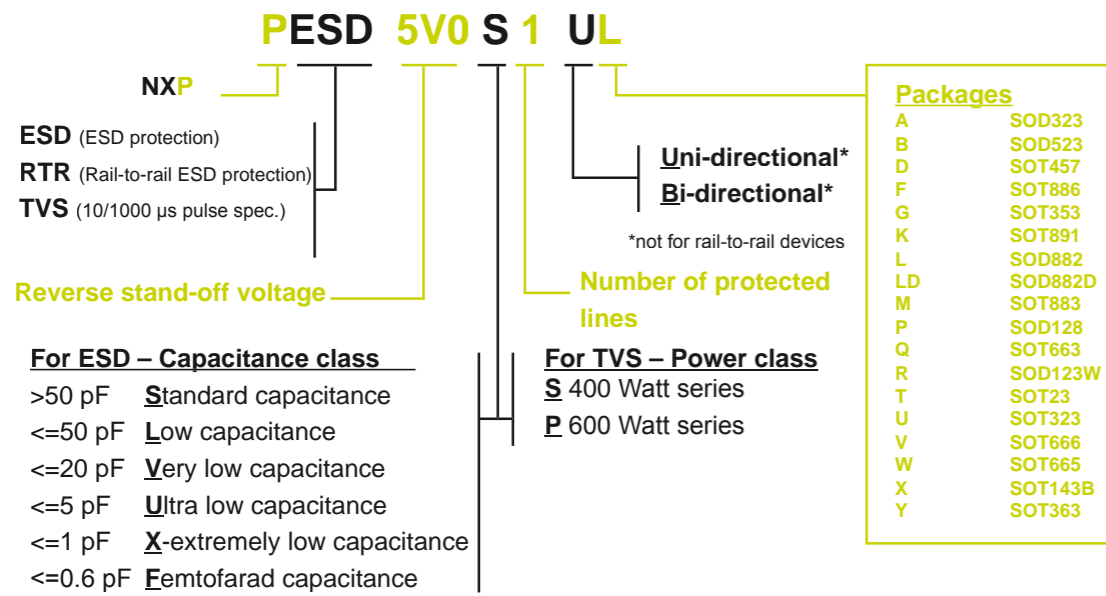
$V_R$ max (V)	$V_F$ max (V)	@ $I_F$ (mA)	$I_{RM}$ max (mA)	$I_{FSM}$ max (A)	$I_{FM}$ max (mA)	$C_j$ max (pF)	$t_{rr}$ max (ns)	Package	SOT23	SOT143B	
									Size (mm)	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0
									$P_{tot}$ (mW)	250	250
60	1	200	100	9	600	2.5	6			BAS56	
90	1	200	100	10	600	35	50		BAS29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

### Low leakage current switching diodes

types in **bold** represent new products

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

# Protection and signal conditioning nomenclature



# Protection and signal conditioning

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### Standard ESD protection devices

types in **bold** represent new products

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

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

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

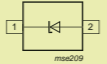








### Standard ESD protection devices

Number of protected lines		$V_{RWM}$ (V)	$C_{line}$ typ (pF)	$C_{line}$ max (pF)	$P_{PP}^{(1)}$ max (W)	ESD rating <sup>[2]</sup> max (kV)	$I_R$ max (μA) @ $V_{RWM}$	Configuration	Type	Package	Size (mm)				
Unidirectional	Bidirectional														
2	1	3.3	200	275	150	23	3		PESD3V3S2UQ	SOT663	1.6 x 1.2 x 0.55				
		5	150	215	150	30	0.3		PESD5V0S2UQ						
		12	38	100	150	30	0.03		PESD12VS2UQ						
		15	32	70	150	30	0.05		PESD15VS2UQ						
		24	23	50	150	23	0.05		PESD24VS2UQ						
		3.3	207	300	330	30	2		PESD3V3S2UT			SOT23	2.9 x 1.3 x 1.0		
		5.2	152	200	260	30	1		PESD5V2S2UT						
		12	38	75	180	30	1		PESD12VS2UT						
		15	32	70	160	30	1		PESD15VS2UT						
		24	23	50	160	23	1		PESD24VS2UT						
		36	17	35	160	30	1 (@ 30 V)		PESD36VS2UT						
		3.3	207	300	330	30	2			PESD3V3S2UAT	SOT886 (XSON6)	1.45 x 1.0 x 0.5			
		5	152	200	260	30	1	PESD5V0S2UAT							
		12	38	75	180	30	0.05	PESD12VS2UAT							
		15	32	70	160	30	0.05	PESD15VS2UAT							
		24	23	50	160	23	0.05	PESD24VS2UAT							
		3.3	110	300	110	30	1 (@ 3 V)	PESD3V3S4UF		SOT886 (XSON6)			1.45 x 1.0 x 0.5		
		5	85	220	110	30	0.1 (@ 4.3 V)	PESD5V0S4UF							
		4	3	3	107	125	-	8		1				BZA956A	SOT665
				4	90	105	-	8	0.5	BZA962A					
				4.3	78	90	-	8	0.1	BZA968A					
				3	200	240	-	8	2	BZA856A	SOT353 (SC-88A)	2.0 x 1.25 x 0.95			
				3	107	125	-	8	1	BZA856AL					
				4	165	200	-	8	0.7	BZA862A					
4	90			105	-	8	0.5	BZA862AL							
4.3	145			180	-	8	0.2	BZA868A							
4.3	78			90	-	8	0.1	BZA868AL							
15	37			50	-	8	0.1	BZA820A	SOT457 (SC-74)	2.9 x 1.5 x 1.0					
3	200			240	-	8	2	BZA456A							
4	165			200	-	15	0.7	BZA462A							
14	37			48	-	8	0.075	BZA418A							
15	37			48	-	8	0.1	BZA420A							
3.3	215			300	200	30	0.8	PESD3V3S4UD			SOT163 (SO20)	12.8 x 7.5 x 2.65			
5	165			220	200	30	0.2	PESD5V0S4UD							
12	73			100	200	30	0.015	PESD12VS4UD							
15	60			90	200	30	0.015	PESD15VS4UD							
24	40			70	200	23	0.015	PESD24VS4UD							
3.3	215			300	200	30	0.8	PESD3V3S5UD							
5	165			220	200	30	0.2	PESD5V0S5UD							
12	73			100	200	30	0.015	PESD12VS5UD							
15	60			90	200	30	0.015	PESD15VS5UD							
24	45			70	200	23	0.015	PESD24VS5UD							
0	4	5	45	75	-	15	0.1	BZA408B							
18	17	5.2	100	120	-	8	2	BZA100							

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

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

Low capacitance ESD protection devices






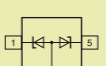

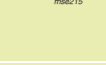

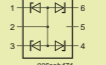



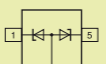



Number of protected lines		V <sub>RMV</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>IP</sub> <sup>(1)</sup> max (W)	ESD rating <sup>(2)</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RMV</sub>	Configuration	Type	Package	Size (mm)			
Unidirectional	Bidirectional													
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL	SOD882	1.0 x 0.6 x 0.5			
		5	25	30	42	26	0.1		PESD5V0L1UL					
		3.3	34	40	45	30	0.3		PESD3V3L1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6			
		5	25	30	42	26	0.1		PESD5V0L1UB					
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95			
		5	25	30	42	26	0.1		PESD5V0L1UA					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UL	SOD882	1.0 x 0.6 x 0.5			
		5	2	2.6	-	9	0.1		PESD5V0U1UL					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6			
		5	2	2.6	-	9	0.1		PESD5V0U1UB					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95			
		5	2	2.6	-	9	0.1		PESD5V0U1UA					
		0	1	3.3	101	-	500		30	2		PESD3V3L1BA		1.7 x 1.25 x 0.95
				5	75	-	500		30	1		PESD5V0L1BA		
12	19			-	200	30	0.05	PESD12VL1BA						
15	16			-	200	30	0.05	PESD15VL1BA						
24	11			-	200	23	0.05	PESD24VL1BA						
5	11			13	45	30	0.01	PESD5V0V1BL	SOD882	1.0 x 0.6 x 0.5				
5	11			13	45	30	0.01	PESD5V0V1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6				
5	11			13	45	30	0.01	PESD5V0V1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95				
5	2.9			3.5	-	10	0.1	PESD5V0U1BL	SOD882	1.0 x 0.6 x 0.5				
5	2.9			3.5	-	10	0.1	PESD5V0U1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6				
5	2.9			3.5	-	10	0.1	PESD5V0U1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95				

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

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

Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V <sub>RMV</sub> (V)	C <sub>line</sub> typ (pF)	C <sub>line</sub> max (pF)	P <sub>IP</sub> <sup>(1)</sup> max (W)	ESD rating <sup>(2)</sup> max (kV)	I <sub>R</sub> max (μA) @ V <sub>RMV</sub>	Configuration	Type	Package	Size (mm)			
Unidirectional	Bidirectional													
2	1	3.3	22	28	30	15	0.3		PESD3V3L2UM	SOT883 (SC-101)	1.0 x 0.6 x 0.5			
		5	16	19	30	15	0.025		PESD5V0L2UM					
		5	38	46	70	30	0.09 (@ 4 V)		PESD5V0L2UU	SOT323 (SC-70)	2.0 x 1.25 x 0.95			
		6	34	40	60	30	0.018 (@ 4.3 V)		PESD6V0L2UU					
0	2	3.3	101	-	350	30	2		PESD3V3L2BT	SOT23	2.9 x 1.3 x 1.0			
		5	75	-	350	30	1		PESD5V0L2BT					
		12	19	-	200	30	0.05		PESD12VL2BT					
		15	16	-	200	30	0.05		PESD15VL2BT					
		24	11	-	200	23	0.05		PESD24VL2BT					
		5	35	45	130	30	0.1		PESD5V0S2BT					
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT					
		5	2.9	3.5	-	10	0.1		PESD5V0U2BM	SOT883 (SC-101)	1.0 x 0.6 x 0.5			
		4	3	3.3	22	28	30		20	0.3		PESD3V3L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
				5	16	19	30		20	0.025		PESD5V0L4UF		
3.3	22			28	30	20	0.3		PESD3V3L4UW	SOT665	1.6 x 1.2 x 0.55			
5	16			19	30	20	0.025		PESD5V0L4UW					
3.3	22			28	30	20	0.3		PESD3V3L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95			
5	16			19	30	20	0.025		PESD5V0L4UG					
3.3	13			17	14	10	1		<b>PESD3V3V4UK</b>	SOT891 (XSON6)	1.0 x 1.0 x 0.5			
5	12			15	20	15	0.5		<b>PESD5V0V4UK</b>					
9	6.5			10	25	8	0.5		<b>PESD9V0V4UK</b>					
3.3	15			18	16	12	0.3		PESD3V3V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5			
5	12			15	16	12	0.025		PESD5V0V4UF					
3.3	15			18	16	12	0.3		PESD3V3V4UW	SOT665	1.6 x 1.2 x 0.55			
5	12			15	16	12	0.025		PESD5V0V4UW					
3.3	15			18	16	12	0.3		PESD3V3V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95			
5	12	15	16	12	0.025	PESD5V0V4UG								

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

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



## Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		$V_{RWM}$ (V)	$C_{in}$ typ (pF)	$C_{in}$ max (pF)	$P_{PP}^{[1]}$ max (W)	ESD rating <sup>[2]</sup> max (kV)	$I_R$ max (μA) @ $V_{RWM}$	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U4BW	SOT665	1.6 x 1.2 x 0.55
5	4	3.3	22		25	20	1		<b>PESD3V3L5UK</b>	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5	16		25	20	0.025		<b>PESD5V0L5UK</b>		
		3.3	22	28	25	20	0.3		PESD3V3L5UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	16	19	25	20	0.025		PESD5V0L5UF		
		3.3	22	28	25	20	0.3		PESD3V3L5UV	SOT666	1.6 x 1.2 x 0.55
		5	16	19	25	20	0.025		PESD5V0L5UV		
		3.3	22	28	25	20	0.3		PESD3V3L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5	16	19	25	20	0.025		PESD5V0L5UY		
0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U5BV	SOT666	1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6UAS	SOT505 (TSSOP8)	3.0 x 3.0 x 1.1
		5	16	19	35	20	0.025		PESD5V0L6US	SOT96 (SO8)	4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BAS	SOT505 (TSSOP8)	3.0 x 3.0 x 1.1
		5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8)	4.9 x 3.9 x 1.75

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

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

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

types in **bold** represent new products

Number of protected lines		$V_{RWM}$ (V)	$C_{in}$ typ (pF)	$C_{in}$ max (pF)	ESD rating <sup>[2]</sup> max (kV)	$I_R$ max (μA) @ $V_{RWM}$	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional										
1	0	5	0.9	1	8	0.2		<b>PESD5V0X1UB</b>	SOD523 (SC-79)	1.2 x 0.8 x 0.6	
		5	1.8	2	15	0.2		<b>PESD5V0X1UAB</b>	SOD882	1.0 x 0.6 x 0.5	
		16	0.83	0.95	8	0.1		<b>PESD16VX1UL</b>	SOT23	2.9 x 1.3 x 1.0	
0	1	5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U1T	SOT23	2.9 x 1.3 x 1.0	
		5.5	0.4	0.55	10	0.1		<b>PESD5V0F1BL</b>	SOD882	1.0 x 0.6 x 0.5	
		16	0.5	0.65	8	0.1		<b>PESD16VF1BL</b>			
		3.3	1.3	1.6	9	0.1		PESD3V3X1BL			
5	0.9	1.3	9	0.1	PESD5V0X1BL						
2	1	5	0.9	1.3	9	0.1		PESD5V0X1BQ	SOT663	1.6 x 1.2 x 0.55	
		5	0.9	1.3	9	0.1		PESD5V0X1BT	SOT23	2.9 x 1.3 x 1.0	
		80	0.6	0.75	30	0.1		<b>NUP1301</b>	SOT143B	2.9 x 1.3 x 1.0	
		5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2X	SOT891 (XSON6)	1.0 x 1.0 x 0.5	
	5.5	1.8		12	0.1 (@ 3 V)	PRTR5V0U2AX					
	0	0	5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2D	SOT457 (SC-74)	2.9 x 1.5 x 1.0
			5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2F	SOT886 (XSON6)	1.45 x 1.0 x 0.5
			5.5	2	-	15	-		<b>IP4234CZ6</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
5.5			1.5	-	8	-	<b>IP3219CZ6</b>		SOT1082-1 (VSON6U)	2.3 x 3.5 x 0.85	

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

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

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

types in **bold** represent new products

Number of protected lines		$V_{RWM}$ (V)	$C_{line}$ typ (pF)	$C_{line}$ max (pF)	ESD rating <sup>[1]</sup> max (kV)	$I_R$ max (μA) @ $V_{RWM}$	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
2	0	5.5	0.7	-	8	-		<b>IP4282CZ6</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1.3	-	15	-		<b>IP4359CX4</b>	CSP	0.76 x 0.76 x 0.61
4	0	5.5	1	-	8	-		<b>IP4220CZ6</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	1	-	8	-		<b>IP4221CZ6-S</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1	-	8	-		<b>IP4221CZ6-XS</b>	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5.5	1	-	8	-		<b>IP4233CZ6</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5.5	1	-	8	-		<b>PRTR5V0U4AD</b>	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	1	-	8	-		<b>PRTR5V0U4D</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5.5	1	-	8	-		<b>PRTR5V0U4Y</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5.5	0.7	-	8	-		<b>IP4280CZ10</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		5.5	0.7	-	8	-		<b>IP4281CZ10</b>	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5
		5.5	0.6	-	8	-		<b>IP4283CZ10-TB</b>	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5
		5.5	0.6	-	8	-		<b>IP4283CZ10-TT</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1

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

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

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

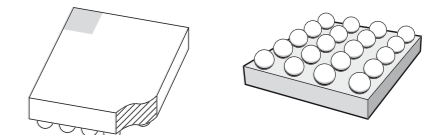
types in **bold** represent new products

Number of protected lines		$V_{RWM}$ (V)	$C_{line}$ typ (pF)	$C_{line}$ max (pF)	ESD rating <sup>[1]</sup> max (kV)	$I_R$ max (μA) @ $V_{RWM}$	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.6	-	8	-		<b>IP4286CZ6-TBF</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	0.6	-	8	-		<b>IP4286CZ6-TTY</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5.5	0.5	-	8	-		<b>IP4284CZ10-TB</b>	SOT1059 (XSON10U)	1 x 2.5 x 0.5
		5.5	0.5	-	8	-		<b>IP4284CZ10-TT</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
5	0	5.5	1.3	-	15	-		<b>IP4358CX6</b>	CSP	0.76 x 1.16 x 0.61
		5.5	10	-	15	-		<b>IP4310CX8</b>	CSP	1.16 x 1.16 x 0.61
0	5	5	0.5	0.65	8	0.2		<b>PESD5V0F5BK</b>	SOT891 (XSON6)	1.0 x 1.0 x 0.5
8	0	5.5	1.3	-	15	-		<b>IP4309CX9</b>	CSP	1.16 x 1.16 x 0.61
		5.5	1	-	8	-		<b>PRTR5V0U8S</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		5.5	0.7	-	8	-		<b>IP4790CZ38</b>	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1

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

### 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



Protection and signal conditioning

### Audio interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R <sub>line</sub>	C <sub>line</sub> (pF)					
Audio	2	0.9 Ω	290	-	Low-ohmic speaker (< ~8 Ω)	IP4047CX6/LF	6 ball CSP	1.56 x 1.01 x 0.65
		10 Ω	200	-	Low-ohmic speaker (> ~8 Ω)	IP4048CX5/LF	6 ball CSP	0.91 x 1.28 x 0.65
		15 Ω	5000	-	Low-ohmic speaker (> ~8 Ω)	IP5311CX5/LF		5 ball CSP
		68 Ω	110	-	Single-ended or differential microphone	IP4049CX5/LF	6 ball CSP	0.91 x 1.28 x 0.65
		470 Ω	35	-	Single-ended or differential microphone	IP4055CX6/LF		1.56 x 1.03 x 0.65
		470 Ω	20	-	Single-ended or differential microphone	IP4355CX6/LF	1.16 x 0.76 x 0.65	
		50 Ω / 2.2 kΩ	2000	-	Single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF	8 ball CSP	1.67 x 1.67 x 0.65
		2.25 kΩ	4000	-	Differential microphone filter with integrated biasing network for ΣΔ ADC converters	IP5006CX11/LF	11 ball CSP	1.41 x 1.91 x 0.65
		5 Ω / 20 Ω / 1.5 kΩ	550	-	Differential microphone filter with integrated biasing network for ΣΔ including coupling capacitors	IP5020CX16/LF	16 ball CSP	2.01 x 1.91 x 0.65
		0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	<b>IP3047CX6</b>	6 ball CSP	1.60 x 1.15 x 0.65
	0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	<b>IP3048CX5</b>	5 ball CSP	1.51 x 1.15 x 0.65	
	2.2 kΩ / 1 kΩ / 0.8 kΩ	0.8 nF / 1.6 nF	-	Differential microphone biasing ESD protection / EMI filtering	IP5306CX8	8 ball CSP	1.19 x 1.19 x 0.61	
	4	10 Ω	5000	-	Dual differential speaker	IP5040CX11/LF	11 ball CSP	1.41 x 2.01 x 0.65
	6	15 Ω / 95 Ω	65 / 33	-	Single-ended microphone and high-ohmic speaker (> ~8 Ω) with integrated 2 kohm pull-up resistor	IP4363CX10/LF	10 ball CSP	0.76 x 1.96 x 0.61
40 Ω / 1450 Ω / 10 Ω		50 / 20 / 200	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4025CX20/LF	20 ball CSP	1.98 x 2.53 x 0.65	
40 Ω / 1450 Ω / 10 Ω		50 / 20 / 200	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4027CX20/LF		1.91 x 2.52 x 0.65	
50 Ω / 10 Ω		50 / 100 / 1000	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4125CX20/LF		2.00 x 2.66 x 0.65	
8	0.8 Ω / 30 Ω / 200 Ω	20 / 50 / 150	~20	Fully integrated audio interface protection including EMI filtering for microphone and speaker, and additional 4-channel EMI filter	IP4110CX20/LF		1.91 x 2.47 x 0.65	

### Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C <sub>line</sub> (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)	
Display port	4	-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TB</b>	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5	
		-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TT</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TB</b>	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TT</b>	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		-	-	-	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TBF</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5	
		-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TTY</b>	SOT363 (SC-88)	2.0 x 1.25 x 0.95	
		11	-	-	0.7	-	ESD protection for display port	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
	LVDS	10	-	-	5	100	100 Ω termination	IP4263CZ14	SOT108 (SO14)	8.65 x 3.9 x 1.75
	HDMI	2	-	-	0.7	-	ESD protection for ultra high speed interfaces	<b>IP4282CZ6</b>	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		4	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
			-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4281CZ10	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5

Protection and signal conditioning

### Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C <sub>line</sub> (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)	
HDMI	4	-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TB</b>	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5	
		-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TT</b>	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1	
		-	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TBF</b>	SOT886 (XSON6) 	1.45 x 1.0 x 0.5	
		-	-				<b>IP4286CZ6-TTY</b>	SOT363 (SC-88) 	2.0 x 1.25 x 0.95	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TB</b>	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TT</b>	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1	
	5	-	-	0.5	-	ESD protection for up to 5 ultra high speed datalines	<b>PESD5V0F5BK</b>	SOT891 (XSON6) 	1.0 x 1.0 x 0.5	
		-	-	10	1.75 k, 100 k	HDMI, DDC, CEC, hotplug ESD protection and biasing	<b>IP4310CX8</b>	8 ball CSP	1.16 x 1.16 x 0.61	
	8	-	-	1.3	-	HDMI, TMDS line ESD protection	<b>IP4309CX9</b>	9 ball CSP	1.16 x 1.16 x 0.61	
	12	-	-	yes	0.7	-	ESD protection and level shifting for a complete HDMI port	<b>IP4776CZ38</b>		
		yes	yes	-	0.7	-	ESD protection, DDC buffering, noise reduction and Hot Plug application for a complete HDMI source port	<b>IP4777CZ38</b>	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1
		yes	yes	-	0.7	-	ESD protection, DDC buffering, noise reduction and Hot Plug application for a complete HDMI sink port	<b>IP4778CZ38</b>		

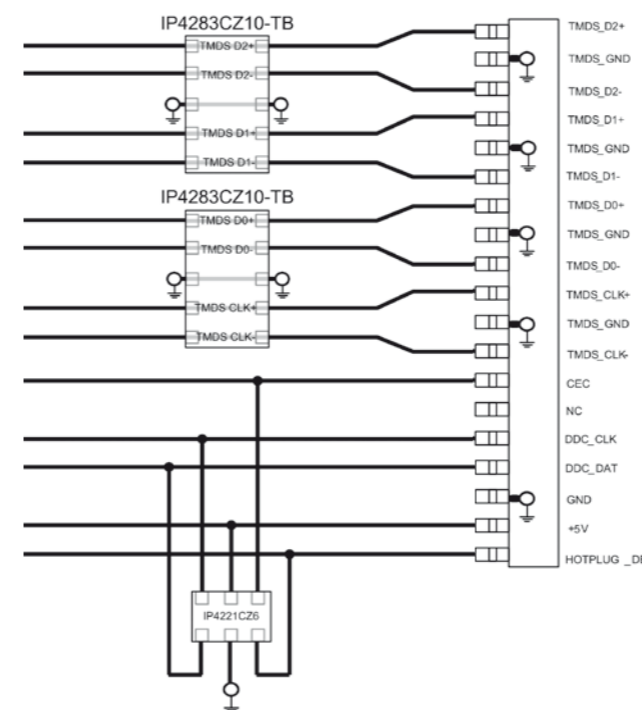
### Video interfaces

types in **bold** represent new products

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













For ultra high speed single line ESD protection please refer to pages 29 - 31

### HDMI ESD protection using IP4283CZ10-TB and IP4221CZ6-S



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

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R <sub>line</sub>	C <sub>line</sub> (pF)					
LCD display, camera, keypad	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	 SOT883 (SC-101)	1.0 x 0.6 x 0.5
	2	100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ5-W	 SOT665	1.6 x 1.2 x 0.5
		100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ6-F	 SOT886 (XSON6)	1.45 x 1.0 x 0.5
	4	100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ8-4	 SOT983 (8 pin QFN)	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
	6	100 Ω	60	~20	EMI filter, ESD protection plus 4x ESD	IP4054CX15/LF	 SOT984 (12 pin QFN)	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
		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		2.96 x 1.32 x 0.65
		100 Ω	30	~40	EMI filter, ESD protection	IP4153CX15/LF		15 ball CSP
	7	100 Ω	60	~20	EMI filter, ESD protection	IP4353CX15/LF	15 ball CSP	2.38 x 1.05 x 0.61
		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
	8	125 Ω	25	~60	60 nH coils RLC filter	<b>IP3337CX18/LF</b>		
		100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ16-8	 SOT985 (16 pin QFN)	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	~20	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
	10	125 Ω	25	~60	60 nH coils RLC filter	<b>IP3338CX24/LF</b>	24 ball CSP	2.11 x 2.11 x 0.61
		70 Ω	25	~40	EMI filter, ESD protection, extremely small size	<b>IP4338CX24/LF</b>		1.96 x 2.01 x 0.61
	10	200 Ω	50	~20	EMI filter, ESD protection	IP4041CX25/LF	25 ball CSP	2.41 x 2.41 x 0.65
		4	-	25	~175	LC low-pass filter	IP3253CZ8	 SOT983 (8 pin QFN)
	6	-	25	~175	LC low-pass filter	IP3253CZ12	 SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5
	8	-	25	~175	LC low-pass filter	IP3253CZ16	 SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5
	4	-	25	~175	LC low-pass filter	IP3254CZ8	 SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5
	6	-	25	~175	LC low-pass filter	IP3254CZ12	 SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5
	8	-	25	~175	LC low-pass filter	IP3254CZ16	 SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5

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

types in **bold** represent new products



Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)	
		R <sub>line</sub>	C <sub>line</sub> (pF)						
Generic ESD protection	1	-	10	~40	1x back-to-back diode with one common ground, extremely small size	IP4302CX2/LF	2 ball CSP	0.49 x 0.67 x 0.38	
	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	-	16 V ultra low capacitance ESD protection in 4 mm pitch	<b>IP4361CX4/LF</b>		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		0.91 x 1.28 x 0.65	
		-	15	Breakdown: min. 5.5 V	Quad diode array with ESD protection	IP4332CX5/LF		0.76 x 1.06 x 0.61	
		-	30	Breakdown: min. 5.5 V	Quad diode array with ESD protection	IP4342CX5/LF		0.76 x 1.06 x 0.61	
		-	16	~40	4x back-to-back diode with one common ground	IP4043CX5/LF		1.12 x 1.12 x 0.65	
	Special diode	1	-	65	Breakdown: min. 20 V Forward: 0.25 - 0.5 V	Schottky power diode in WLCSP	IP4306CX2/LF	2 ball CSP	0.49 x 0.67 x 0.38
			-	19	Breakdown: min. 15 V Forward: 0.25 - 0.45 V	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

Protection and signal conditioning



## SD-, SIM-card and MMC





types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		$R_{line}$	$C_{line}$ (pF)					
SIM card	3 + 2	47 $\Omega$ / 100 $\Omega$	10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	<b>IP4365CX11</b>	11 ball CSP	1.16 x 1.56 x 0.61
	3	47 $\Omega$ / 100 $\Omega$	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	8 ball CSP	1.46 x 1.49 x 0.65
		47 $\Omega$ / 100 $\Omega$	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4064CX8/LF/S		1.41 x 1.41 x 0.65
		47 $\Omega$ / 100 $\Omega$	20	~20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF		1.16 x 1.16 x 0.61
		47 $\Omega$ / 100 $\Omega$	10	~20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	<b>IP4366CX8/LF</b>		1.16 x 1.16 x 0.61
		47 $\Omega$ / 100 $\Omega$	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-40	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5
		47 $\Omega$ / 100 $\Omega$	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-20		1.7 x 1.35 x 0.5
		-	1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S	SOT886 (XSON6)	
SD-card / MMC	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
	6 (+3)	15 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	8	> 52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61
		40 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	20	> 52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF		2.02 x 2.01 x 0.61
		-	-	> 52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		40 $\Omega$ / 50 k $\Omega$ / 15 k $\Omega$	-	> 52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter	<b>IP4853CX24/LF</b>	24 ball CSP	2.01 x 2.01 x 0.61

For ultra high speed single line ESD protection please refer to pages 29 - 31





## Battery and charger protection

types in **bold** represent new products

Baseband interface	Number of protected lines	$C_{line}$ (pF)	Diode voltage	Remark	Type	Package	Size (mm)	
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4	4 ball CSP	0.91 x 0.91 x 0.65	
		450	Breakdown 7 V	Power diode	IP4385CX4		0.76 x 0.76 x 0.61	
		160	Breakdown 16 V	Power diode	<b>IP4386CX4</b>		0.76 x 0.76 x 0.61	
		290	Breakdown 10 V	Power diode	<b>IP4387CX4</b>		0.76 x 0.76 x 0.61	
		160	$V_{RWM} = 12 V$	Power diode	PESD12VS1UJ	SOD323F (SC-90)		1.7 x 1.25 x 0.7
		160	$V_{RWM} = 12 V$	Power diode	PESD12VS1UA	SOD323 (SC-76)		1.7 x 1.25 x 0.95
		480	$V_{RWM} = 5 V$	Power diode	PESD5V0S1UJ	SOD323F (SC-90)		1.7 x 1.25 x 0.7
		480	$V_{RWM} = 5 V$	Power diode	PESD5V0S1UA	SOD323 (SC-76)		1.7 x 1.25 x 0.95









## USB, LVDS, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)		
USB (CSP package)	2	33 $\Omega$ / 1.3 k $\Omega$	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4056CX8	8 ball CSP	1.27 x 1.83 x 0.65		
		33 $\Omega$ / 1.3 k $\Omega$ / 10 k $\Omega$	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4057CX10	10 ball CSP	1.56 x 1.91 x 0.65		
		33 $\Omega$ / 1.3 k $\Omega$ / 17 k $\Omega$ / 15 k $\Omega$	27	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4065CX11	11 ball CSP	1.47 x 1.97 x 0.65		
		33 $\Omega$ / 1.5 k $\Omega$	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4058CX8	8 ball CSP	0.91 x 1.91 x 0.65		
		17 $\Omega$ / 1.5 k $\Omega$	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4158CX8				
		33 $\Omega$	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection and impedance matching	<b>IP4078CX6</b>	6 ball CSP	0.91 x 1.41 x 0.65		
	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4359CX4</b>	4 ball CSP	0.76 x 0.76 x 0.61			
	3+2	47 $\Omega$ / 100 $\Omega$	10	~20/6	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11	11 ball CSP	1.16 x 1.56 x 0.61		
	4	-	3	>240	USB2.0 high-speed ESD protection	IP4059CX5	5 ball CSP	0.96 x 1.34 x 0.65		
			1.3	~1 GHz	USB2.0 high-speed ESD protection	<b>IP4358CX6</b>	6 ball CSP	0.76 x 1.16 x 0.41		
	USB2.0 (Plastic package)	2	-	1.5	-	2-channel common mode filter with integrated ESD protection	<b>IP3219CZ6</b>	SOT1082-1 (VSON6U)		2.3 x 3.5 x 0.85
			0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	<b>IP4234CZ6</b>	SOT457 (SC-74)		2.9 x 1.5 x 1.0
-		1.0	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2X	SOT143B		2.9 x 1.3 x 1.0		
-		1.8	-	ESD protection for up to 2 ultra high speed datalines with 12 kV ESD robustness	PRTR5V0U2AX					
-	0.7	-	ESD protection for ultra high speed interfaces	<b>IP4282CZ6</b>	SOT886 (XSON6)		1.45 x 1.0 x 0.5			

### USB, LVDS, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB2.0 (Plastic package)	2	-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2K		1.0 x 1.0 x 0.5
		-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2D		2.9 x 1.5 x 1.0
		-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2F		1.45 x 1.0 x 0.5
	4	-	1	-	ESD protection for USB2.0 high- speed, SD-Card, SIM card	IP4221CZ6-S		2.9 x 1.5 x 1.0
		-	1	-	ESD protection for USB2.0 high- speed, SD-Card, SIM card	IP4220CZ6		
		-	1	-	Dual USB2.0, ESD protection	IP4220CZ6		
		-	1	-	ESD protection, as IP4220CZ6 but different bonding	PRTR5V0U4AD		
		-	1	-	ESD protection, as IP4220CZ6 but different package	PRTR5V0U4Y		2.0 x 1.25 x 0.95
		-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4221CZ6-S		1.45 x 1.0 x 0.5
		-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4221CZ6-XS		1.0 x 1.0 x 0.5
	1	3	-	>15 kV IEC contact ESD protection with pi-filter	<b>IP4225CZ10</b>		2.9 x 1.5 x 1.0	











### USB, LVDS, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB3.0 SuperSpeed USB / USB2.0	4	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TB</b>		1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TT</b>		3.0 x 3.0 x 1.1
		-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TB</b>		1.0 x 2.5 x 0.5
		-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TT</b>		3.0 x 3.0 x 1.1
	5	-	0.5	-	ESD protection for up to 5 ultra high speed datalines	<b>PESD5V0F5BK</b>		1.0 x 1.0 x 0.5
Display port	4	0.6	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TB</b>		1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TT</b>		3.0 x 3.0 x 1.1
		-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TB</b>		1.0 x 2.5 x 0.5
		-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TT</b>		3.0 x 3.0 x 1.1
		-	0.6	-	ESD protection for high speed interfaces	<b>IP4286CZ6-TBF</b>		1.45 x 1.0 x 0.5




## USB, LVDS, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	$R_{line}$	$C_{line}$ (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
Display port	4	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TTY</b>	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	11	-	0.7	-	ESD protection	IP4790CZ38	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1
LVDS	10	-	5	-	100 $\Omega$ termination	IP4263CZ14	SOT108 (SO14) 	8.65 x 3.9 x 1.75
SATA	2	-	0.7	-	ESD protection for ultra high speed interfaces	<b>IP4282CZ6</b>	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TBF</b>		
	4	-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4286CZ6-TTY</b>	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
		-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TB</b>	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	<b>IP4283CZ10-TT</b>	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
4	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TB</b>	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5	
	-	0.5	-	ESD protection for ultra high speed interfaces	<b>IP4284CZ10-TT</b>	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1	
IEEE1394	4	55	5	-	ESD protection and termination for IEEE1394	IP4224CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0

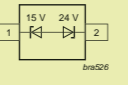

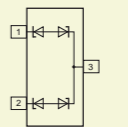

## USB, LVDS, SATA, LAN

types in **bold** represent new products

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

For ultra high speed single line ESD protection please refer to pages 29 - 31

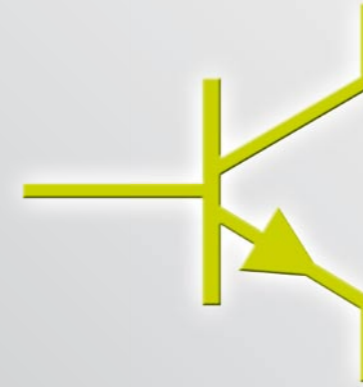
## Automotive LIN/CAN/FlexRay

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

<sup>(1)</sup> 8/20  $\mu$ s surge pulse acc. to IEC 61000-4-5

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





# Small-signal transistors

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

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### 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	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	
P <sub>tot</sub> (mW)						250	200	150	250	
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	25	100	450	1200	100		PMST5089			
	30	100	110 - 200	450 - 800	100	BC848B	BC848W			
			350	900	100		PMST5088			
	32	100	110 - 420	220 - 800	100	BCW31 / 32 / 33				
			180 - 380	310 - 630	250	BCW60B / C / D				
	40	100	120 - 270	270 - 560	100				2PC4617QM / RM	
	45	100	110 - 420	220 - 800	100	BC847 / A / B / C	BC847W / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM	
			120 - 380	220 - 630	100	BCX70G / H / J / K				
			110 - 200	220 - 450	100	BCW71 / 72				
	50	100	210 - 290	340 - 460	100 - 150	2PD601ART 2PD601ARL 2PD601ASL	2PD601ARW / SW			
			250	650	100	PMBT6428	PMST6428			
	60	100	110 - 200	220 - 450	100	BCV71 / 72				
	65	100	110 - 200	220 - 450	100	BC846 / A / B	BC846W / AW / BW	BC846T / AT / BT		
	80	100	20	80	60	BSS64				
	50	150	120 - 270	270 - 560	100		2PC4081Q / R / S	2PC4617Q / R		
	45	500	100 - 250	250 - 600	100	BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W			
			100	600	100	BCX19				
	50	500	85 - 170	170 - 340	140 - 180	2PD602AQL 2PD602ARL 2PD602ASL	2PD1820AR / S			
	60	500	50	-	100		PMSTA05			
	80	500	100	-	100		PMBTA06			
PNP	30	100	125 - 220	500 - 800	100	BC858B	BC858W			
	32	100	120 - 215	260 - 500	100	BCW29 / 30				
			180 - 380	310 - 630	100	BCW61B / C / D				
	40	100	120 - 270	270 - 560	100				2PA1774QM / RM / SM	
	45	100	210 - 290	340 - 460	70 - 80	2PB709ART 2PB709ARL 2PB709ASL	2PB709ARW / SW			
			180 - 380	310 - 630	100	BCX71H / J / K				
			120 - 215	260 - 500	100	BCW69 / 70				
	45	100	125 - 420	250 - 800	100	BC857 / A / B / C	BC857W / AW / BW / CW	BC857T / AT / BT / CT	BC857AM / BM / CM	
			120	260	150	BCW89				
	65	100	125 - 200	250 - 475	100	BC856 / A / B	BC856W / AW / BW	BC856T / AT / BT		
	100	100	30	-	50	BSS63				
	50	150	120 - 270	270 - 560	100		2PA1576Q / R / S	2PA1774Q / R / S		
	25	500	100	600	80	BCX18				
	45	500	100 - 250	250 - 600	80	BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W			
			100	600	80	BCX17				
50	500	85 - 170	170 - 340	100 - 140	2PB710ARL 2PB710ASL	2PB1219AQ / R / S				
60	500	100	-	50		PMSTA55				
80	500	100	-	50		PMBTA56				

### Double transistors

types in **bold** represent new products

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

Small-signal transistors

### Single and double switching transistors

Package							SOT223 (SC-73)	SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT666	SOT883 (SC-101)
Size (mm)							6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5
P <sub>tot</sub> (mW)							1700	1300	250	200	300	300	250
Configuration							single	single	single	single	double	double	single
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)	t <sub>off</sub> (ns)							
NPN	12	100	40	120	400	20			BSV52				
	40	100	100	300	180	250			PMBS3904	PMSS3904			
			300	250		PXT2222A							
	15	200	40	120	500	20			PMBT2369	PMST2369			
	40	200	100	300	300	250			MMBT3904				
			300	250		PMBT3904	PMST3904	PMBT3904YS	PMBT3904VS	PMBT3904M			
	30	600	100	300	250	250			PMBT2222	PMST2222			
	40	600	100	300	300	250	250	PZT4401	PXT4401	PMBT4401	PMST4401		
										MMBT2222A			
								PZT2222A		PMBT2222A	PMST2222A		
PNP	40	800	100	300	300	250			BSR14				
	40	100	100	300	150	700			PMBS3906	PMSS3906			
									MMBT3906				
	40	200	100	300	250	300			PMBT3906	PMST3906	PMBT3906YS	PMBT3906VS	PMBT3906M
									PZT4403	PXT4403	PMBT4403	PMST4403	
	40	600	100	300	200	365			PMBT2907				
										PMST2907A			
60	600	100	300	200	365			BSR16					
							PZT2907A	PXT2907A	PMBT2907A				
NPN/PNP	40	200	100	300	300/250	250/300					PMBT3946YPN	PMBT3946VFN	

### Matched pair transistors

Package		SOT143B	SOT457 (SC-74)	SOT353 (SC-88A)	SOT363 (SC-88)	SOT666
Size (mm)		2.9 x 1.3 x 1.0	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P <sub>tot</sub> (mW)		250	380	300	300	300
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	h <sub>FE1</sub> /h <sub>FE2</sub>	V <sub>BE1</sub> - V <sub>BE2</sub> (mV)
NPN	30	100	110	800	0.7 <sup>1)</sup>	n.a.
	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
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

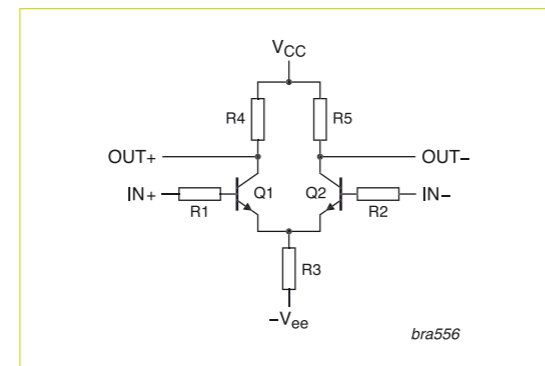
#### Key benefits

- ▶ 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

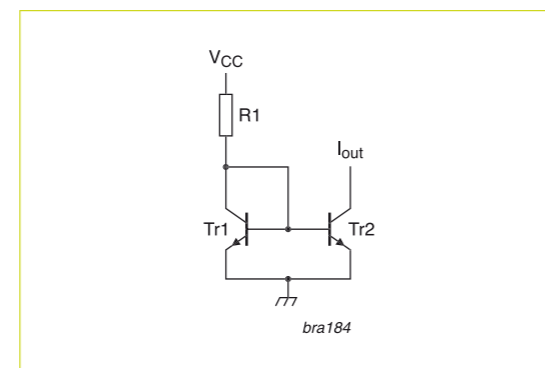
#### Key applications

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

#### Differential amplifier



#### Current mirror



### High voltage transistors

Package		SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT323 (SC-70)	
Size (mm)		6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	
P <sub>tot</sub> (mW)		1700	1300	600	250	200	
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)		
NPN	80	100	20	-	60	BSS64	
	140	100	60	250	100	PMBT5550	
	160	300	80	250	100	PMBT5551/BSR19A	
	250	100	50	-	60	BF722	BF622
						BF720	BF620
	300	100	40	-	50	PZTA42	PXTA42
	350	100	40	-	70	BSP19	BST39
400	300	50	200	20	PZTA44		
PNP	100	100	30	-	50	BSS63	
	250	100	50	-	60	BF723	
			50	-	60		BF623
	300	100	50	-	60		BF621
2 x NPN	300	100	40	-	50	PZTA92	PXTA92
Configuration						PMBTA92	
						PMBTA42DS	
						PMBTA44	
						PMSTA42	

For high voltage transistors with increased performance please refer to our high voltage low V<sub>CEsat</sub> (BISS) transistor portfolio on pages 56 - 64.

### Low noise transistors

Package		SOT23	SOT323 (SC-70)			
Size (mm)		2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95			
P <sub>tot</sub> (mW)		250	200			
Polarity	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	NF max (dB)	h <sub>FE</sub> min	h <sub>FE</sub> max	f <sub>T</sub> min (MHz)
NPN	30	100	4	200	450	100
	45	100	4	420	800	100
200				450	100	
PNP	30	100	4	220	475	100
				420	800	100
	45	100	4	220	475	100
				420	800	100

### 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>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub> min	f <sub>T</sub> typ (MHz)
NPN	30	500	10000	125
			20000	125
	45	1000	2000	200
			500	10000
	60	1000	2000	200
			1000	2000
PNP	30	500	20000	125
			20000	125
	45	1000	2000	200
			500	10000
60	1000	2000	200	
		1000	2000	200
80	1000	2000	200	
		2000	200	

### 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	BF570	
	20	25	40	85	> 275	BFS20	BFS20W
		30	65	225	260		
PNP	40	25	67	220	380	BF840	
	30	25	25	50	250	BF824	BF824W
		40	25	50	-	> 325	BF550

### 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) TR1	V <sub>CE0</sub> (V) TR2	I <sub>C</sub> (mA)	h <sub>FE</sub> min	h <sub>FE</sub> max	V <sub>CEsat</sub> typ (mV)
NPN	30	6	100	110	800	250
PNP	30	6	100	220	475	250

#### Key features

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

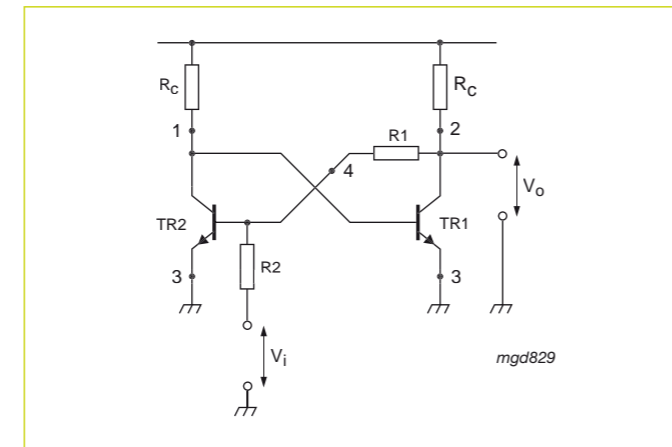
#### Key benefits

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

#### Key applications

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

#### Schmitt trigger



### MOSFET driver

Package		SOT457 (SC-74)				
Size (mm)		2.9 x 1.5 x 1.0				
P <sub>tot</sub> (mW)		400	400	580		
Configuration						
Contains	I <sub>C</sub> (A)	I <sub>CM</sub> (A)	R1 = R2 (kΩ)			
General purpose transistors	0.1	0.2	PMD9050D	PMD9010D	BCV65 (SOT143B)	
				2.2	PMD9001D	
				4.7	PMD9002D	
				10	PMD9003D	
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

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

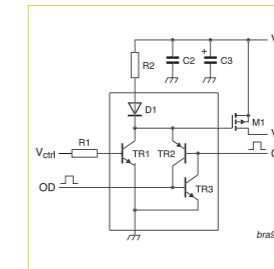
#### Key benefits

- ▶ Reduced component count
- ▶ Smaller end products

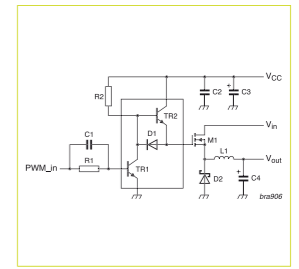
#### Key applications

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



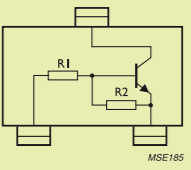
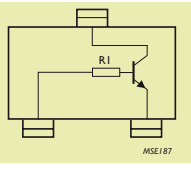
#### MOSFET driver with hardware output disable function



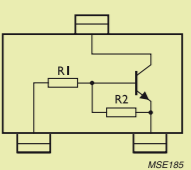
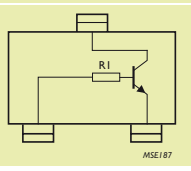


#### High-side MOSFET driver with level shifter function






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		
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		
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		
			R1 ≠ R2	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	


Small-signal transistors

RETs 500 mA

types in **bold** represent new products

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)	NPN/NPN	NPN/PNP	PNP	
50	500	R1 = R2	1.0	1.0			PDTD113ET	PDTB113ET
			2.2	2.2			PDTD123ET	PDTB123ET
			1.0	10	PIMN31	<b>PIMC31</b>	PDTD113ZT	PDTB113ZT
		R1 ≠ R2	2.2	10			PDTD123YT	PDTB123YT
			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
				1	10	PBRN113ZT
			R1 ≠ R2	2.2	10	PBRN123YT
				1	1	PBRP113ET
				2.2	2.2	PBRP123ET
PNP	40	600	R1 = R2	1	10	PBRP113ZT
				2.2	10	PBRP123YT
				1	10	PBRP113ZT







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

types in **bold** represent new products

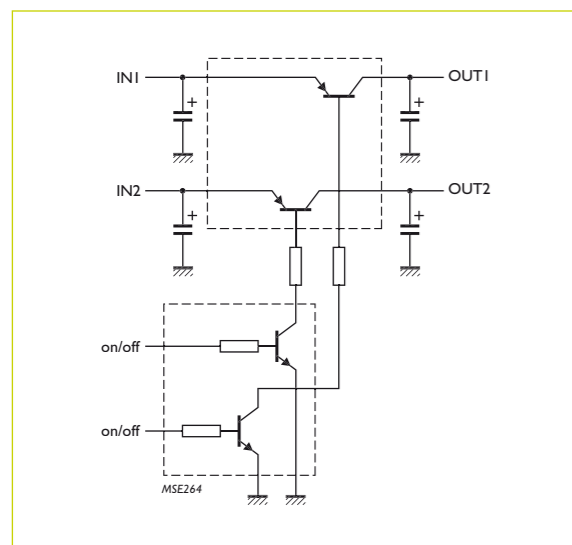
Package											SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666
Size (mm)											4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
$P_{tot}$ (mW)											2000 <sup>2)</sup>	750	430	500
$V_{CE0}$ (V)	$I_C$ (A)	Polarity	$h_{FE}$ min	@ $I_C$ (A)	@ $V_{CE}$ (V)	$V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	$V_{CEsat}$ max (mV)	@ $I_C$ (A)	@ $I_B$ (A)					
15	0.5	2 x NPN	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05					PBSS2515VS
		2 x PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05					PBSS3515VS
		NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05					PBSS2515VPN
		NPN/PNP	200	0.01	2	170 <sup>1)</sup>	250	0.5	0.05					PBSS2515YPN
20	7.5	NPN/NPN	300	0.5	2	15	150	4	0.2	<b>PBSS4021SN</b>				
	6.3	PNP/PNP	250	0.5	2	24	225	4	0.2	<b>PBSS4021SP</b>				
	7.5 / 6.3	NPN/PNP	300/250	0.5	2	15/24	150/225	4	0.2	<b>PBSS4021SPN</b>				
30	5.7	NPN/NPN	300	0.5	2	57	250	4	0.4	<b>PBSS4032SN</b> <sup>3)</sup>				
	4.8	PNP/PNP	200	0.5	2	70	390	4	0.4	<b>PBSS4032SP</b> <sup>3)</sup>				
	5.7 / 4.8	NPN/PNP	300/200	0.5	2	57/70	250/390	4	0.4	<b>PBSS4032SPN</b> <sup>3)</sup>				
40	1.0	NPN/PNP	300/250	0.5	5	130/150	500	1	0.1		PBSS4140DPN			
	2.0	NPN/PNP	300/250	0.5	5	80/100	400/530	2	0.2		PBSS4240DPN			
50	2.7	2 x NPN	300	0.5	2	50	340	2.7	0.27	PBSS4350SS				
		2 x PNP	200	0.5	2	60	370	2.7	0.27	PBSS5350SS				
		NPN/PNP	300/200	0.5	2	50/60	340/370	2.7	0.27	PBSS4350SPN				
60	1.0	2 x NPN	200	0.5	5	115	250	1	0.1		PBSS4160DS			
		2 x PNP	150	0.5	5	120	330	1	0.1		PBSS5160DS			
		NPN/PNP	200/150	0.5	5	115/120	250/330	1	0.1		PBSS4160DPN			
	6.7	NPN/NPN	300	0.5	2	20	190	4	0.2	<b>PBSS4041SN</b>				
	5.9	PNP/PNP	200	0.5	2	35	330	4	0.2	<b>PBSS4041SP</b>				
6.7 / 5.9	NPN/PNP	300/200	0.5	2	20/35	190/330	4	0.2	<b>PBSS4041SPN</b>					

<sup>1)</sup>  $I_C/I_B=20$

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

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

Dual load switch using double RETs and double BISS transistors



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

types in **bold** represent new products

Package					SOT96 (SO8)	SOT457 (SC-74)	SOT363 (SC-88)	SOT666			
Size (mm)					4.9 x 3.9 x 1.75	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55			
$P_{tot}$ (mW)					1500 <sup>1)</sup>	750 <sup>1)</sup>	600 <sup>1)</sup>	300 <sup>2)</sup>			
$V_{CE0}$ (V)	$I_C$ (A)	$V_{CEsat}$ max (mV); $I_C = 0.5$ A; $I_B = 0.05$ A	R1, R2 (kΩ)								
15	0.5	250	2.2					PBLS1501Y	PBLS1501V		
			4.7					PBLS1502Y	PBLS1502V		
			10					PBLS1503Y	PBLS1503V		
			22					PBLS1504Y	PBLS1504V		
20	1	150	2.2					PBLS2001D			
			4.7					PBLS2002D			
			10					PBLS2003D			
			22					PBLS2004D			
	1.8	70	2.2					<b>PBLS2021D</b>			
			4.7					<b>PBLS2022D</b>			
			10					<b>PBLS2023D</b>			
			22					<b>PBLS2024D</b>			
3	75	2.2					PBLS2001S				
		4.7					PBLS2002S				
		10					PBLS2003S				
		22									
40	0.5	350	2.2					PBLS4001Y	PBLS4001V		
			4.7					PBLS4002Y	PBLS4002V		
			10					PBLS4003Y	PBLS4003V		
			22					PBLS4004Y	PBLS4004V		
			47					PBLS4005Y	PBLS4005V		
			2.2						PBLS4001D		
	1	170	4.7						PBLS4002D		
			10						PBLS4003D		
			22						PBLS4004D		
			47						PBLS4005D		
			2.2							PBLS6001D	
			4.7							PBLS6002D	
60	1	180	10						PBLS6003D		
			22						PBLS6004D		
			47						PBLS6005D		
			2.2						<b>PBLS6021D</b>		
			4.7						<b>PBLS6022D</b>		
			10						<b>PBLS6023D</b>		
1.5	100	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

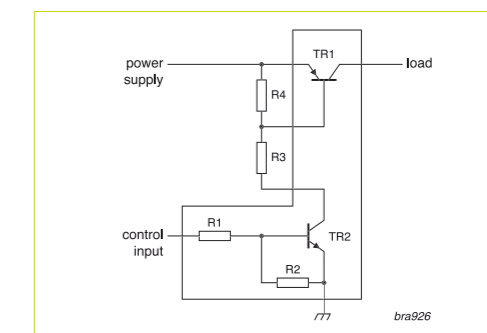
Key benefits

- ▶ 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 load switch



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

types in **bold** 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		PBHV8115T
			<b>2</b>	<b>PBHV8215Z</b>		
		500	400	0.5	PBHV8540Z	
	<b>1</b>			<b>PBHV8140Z</b>		
	500		0.15			<b>PMBTA45</b>
	PNP	-	150	1	PBHV9115Z	<b>PBHV9115X</b>
<b>2</b>				<b>PBHV9215Z</b>		
500			400	0.25	PBHV9040Z	
		<b>0.5</b>		<b>PBHV9540Z</b>		
		500	0.15			<b>PBHV9050T</b>
				0.25	<b>PBHV9050Z</b>	

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

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

Package							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			Configuration		
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>R</sub> max (V)	V <sub>F</sub> max (mV)			
15	0.5	250	0.5	20	390			PMEM1505NG
40	2.0	400	1	20	550			PMEM4010ND PMEM4020ND
				40	640			PMEM4020AND
15	0.5	250	0.5	20	390			PMEM1505PG
40	2.0	530	1	20	550			PMEM4010PD PMEM4020PD
				40	640			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

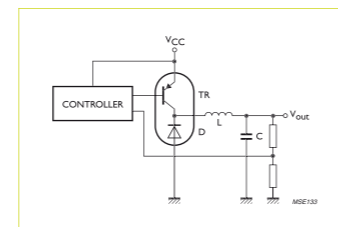
### Key benefits

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

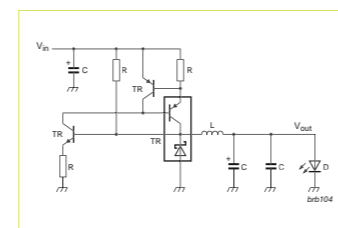
### Key applications

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

### Step-down DC/DC converter



### Power LED driver



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

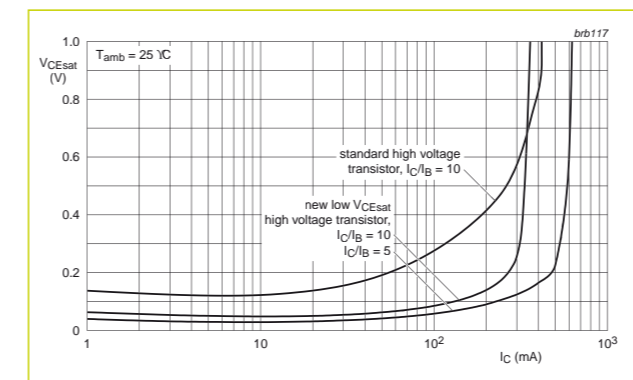
Package						SOT23	
Size (mm)						2.9 x 1.3 x 1.0	
P <sub>tot</sub> (mW)						250	
V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	R1 = R2	R1 (kΩ)	R2 (kΩ)	NPN	PNP	
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET	
			2.2	2.2	PBRN123ET	PBRP123ET	
		R1 ≠ R2	1	10	PBRN113ZT	PBRP113ZT	
			2.2	10	PBRN123YT	PBRP123YT	

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

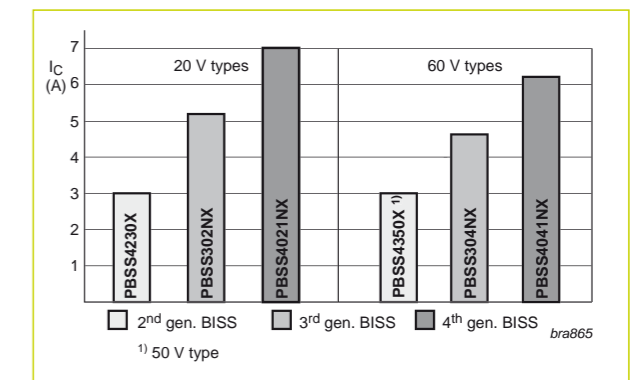
Our BISS (Breakthrough In Small-Signal) transistors show lowest V<sub>CEsat</sub> values due to an innovative mesh-emitter technology and further technology improvement.

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

V<sub>CEsat</sub> improvement leads to higher I<sub>C</sub> capability

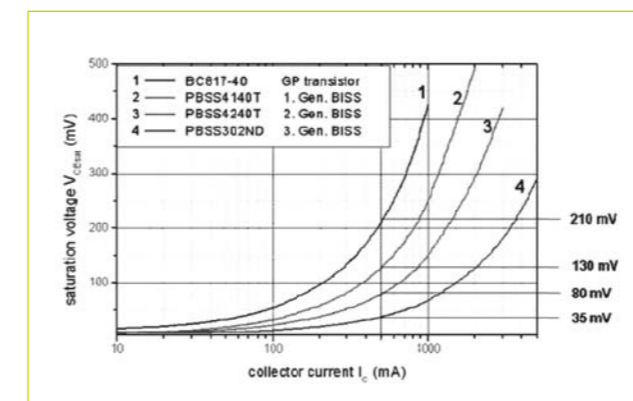


### Improved collector current capabilities

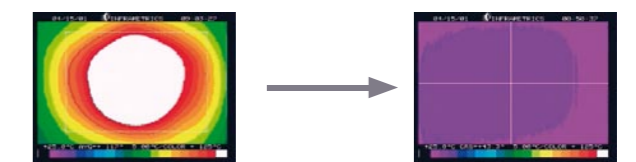


### Saturation voltage:

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



### 65 % heat reduction by BISS transistors

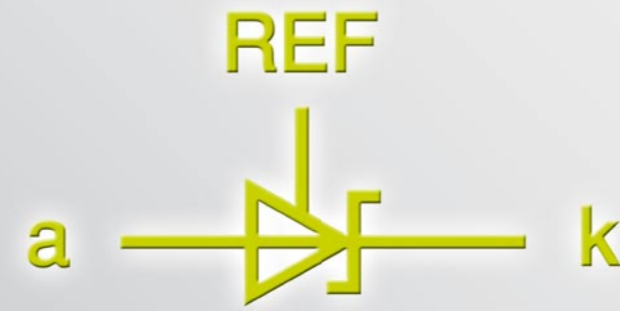


General purpose transistor T<sub>case</sub> = 110°C

3<sup>rd</sup> generation BISS transistor T<sub>case</sub> = 40°C

Temperature profile of device surface (T<sub>case</sub>). Comparison of a general purpose transistor and a 3<sup>rd</sup> generation BISS transistor.





## Standard linear products

Adjustable shunt voltage regulator IC	68
Low-dropout adjustable and fixed linear voltage regulator	69
Discrete voltage regulator	69
Constant current source	70

## Adjustable shunt voltage regulator IC

types in **bold** represent new products

Package				SOT23					
Size (mm)				2.9 x 1.3 x 1.0					
P <sub>tot</sub> (mW)				580					
Pinning configuration				normal pinning <sup>1)</sup>	mirrored pinning <sup>1)</sup>				
V <sub>KA</sub> (V)	I <sub>K</sub> (mA)	V <sub>ref</sub>	T <sub>amb</sub> (°C)						
20	80	1.24 V	1.5%	0 to 70	<b>TLVH431CDBZR</b>				
				-40 to 85	<b>TLVH431IDBZR</b>				
				-40 to 125	<b>TLVH431QDBZR</b>	<b>TLVH431MQDBZR</b>			
			1%	0 to 70	<b>TLVH431ACDBZR</b>				
				-40 to 85	<b>TLVH431AIDBZR</b>				
				-40 to 125	<b>TLVH431AQDBZR</b>	<b>TLVH431AMQDBZR</b>			
		0.5%	0 to 70	<b>TLVH431BCDBZR</b>					
			-40 to 85	<b>TLVH431BIDBZR</b>					
			-40 to 125	<b>TLVH431BQDBZR</b>	<b>TLVH431BMQDBZR</b>				
			36	100	2.495 V	2%	0 to 70	TL431CDBZR	
							-40 to 85	TL431IDBZR	
							-40 to 125	TL431QDBZR	TL431MSDT <sup>1)</sup>
1%	0 to 70	TL431ACDBZR							
	-40 to 85	TL431AIDBZR							
	-40 to 125	TL431AQDBZR				TL431ASDT <sup>1)</sup>			
0.5%	0 to 70	TL431BCDBZR							
	-40 to 85	TL431BIDBZR							
	-40 to 125	TL431BQDBZR	TL431BSDT <sup>1)</sup>						

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

### \* Normal pinning vs. mirrored pinning

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

## Low-dropout adjustable and fixed linear voltage regulator

types in **bold** represent new products

Package				SOT223 (SC-73)	
Size (mm)				6.5 x 3.5 x 1.65	
P <sub>tot</sub> (mW)				1700	
Pinning configuration				T <sub>amb</sub> (°C)	
V <sub>max</sub> (V)	I <sub>max</sub> (A)	V <sub>out</sub> (V)	V <sub>tolerance</sub>	0 to 125	-40 to 125
20	1	1.25 adj	1%	<b>NX1117CADJZ</b>	<b>NX1117IADJZ</b>
		1.2		<b>NX1117C12Z</b>	<b>NX1117I12Z</b>
		1.5		<b>NX1117C15Z</b>	<b>NX1117I15Z</b>
		1.8		<b>NX1117C18Z</b>	<b>NX1117I18Z</b>
		1.9		<b>NX1117C19Z</b>	<b>NX1117I19Z</b>
		2.0		<b>NX1117C20Z</b>	<b>NX1117I20Z</b>
		2.5		<b>NX1117C25Z</b>	<b>NX1117I25Z</b>
		2.85		<b>NX1117C285Z</b>	<b>NX1117I285Z</b>
		3.3		<b>NX1117C33Z</b>	<b>NX1117I33Z</b>
		5.0		<b>NX1117C50Z</b>	<b>NX1117I50Z</b>
		12.0		<b>NX1117C120Z</b>	<b>NX1117I120Z</b>

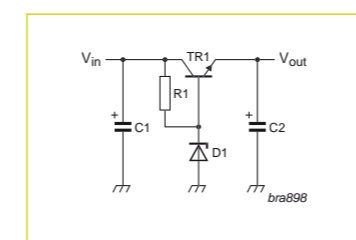
## Discrete voltage regulator

Package		SOT223 (SC-73)	SOT457 (SC-74)			
Size (mm)		6.5 x 3.5 x 1.65	2.9 x 1.5 x 1.0			
P <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)			
	@ I <sub>Z</sub> = 5 mA		h <sub>FE</sub> min			
			@ I <sub>C</sub> = 100 mA			
2.5	3.23 - 3.37	45	0.1	160	PVR100AZ-B2V5	PVR100AD-B2V5
3.0	3.53 - 3.67	45	0.1	160	PVR100AZ-B3V0	PVR100AD-B3V0
3.3	3.82 - 3.98	45	0.1	160	PVR100AZ-B3V3	PVR100AD-B3V3
5.0	5.49 - 5.71	45	0.1	160	PVR100AZ-B5V0	PVR100AD-B5V0
12.3	12.7 - 13.3	45	0.1	160	PVR100AZ-B12V	PVR100AD-B12V

### Key features

- ▶ A bipolar transistor and an integrated Zener diode, internally connected to build a voltage regulator
- ▶ Output voltage options V<sub>out</sub>: 2.5 V, 3 V, 3.3 V, 5 V and 12 V
- ▶ Output power dissipation capability: 1300 mW in SOT223 and 380 mW in SOT457
- ▶ SMD plastic packages

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



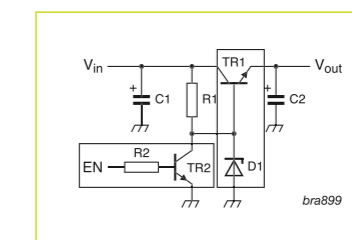
### Key benefits

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

### Key applications


- ▶ Linear voltage regulation

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



Constant current source

## Constant current source

SOT353 (SC-88A)							
Package							
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

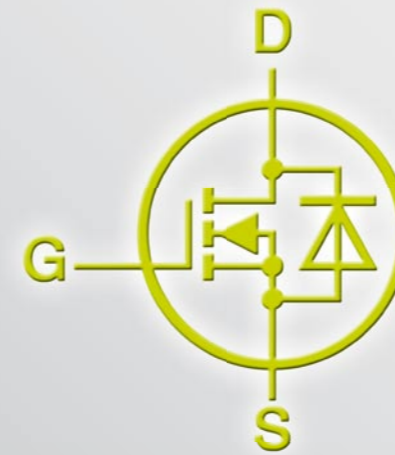
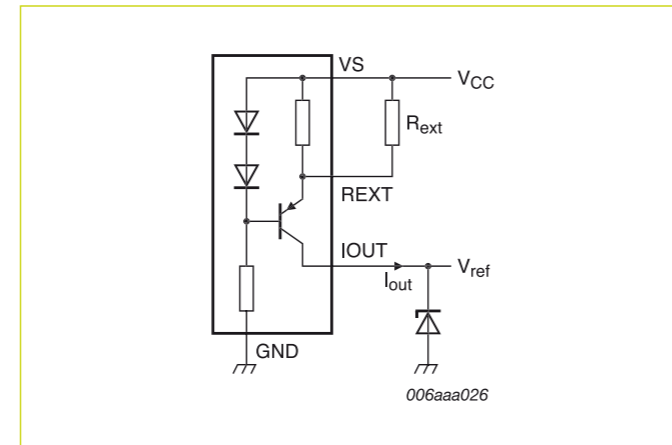
### Key benefits

- ▶ 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



## MOSFETs

### Small-signal MOSFETs

72

- Small-signal MOSFETs single (N-channel) < 50 V 72
- Small-signal MOSFETs single (N-channel) ≥ 50 V 74
- Small-signal MOSFETs dual (N-channel) 76
- Small-signal MOSFETs single (P-Channel) 76
- Small-signal MOSFET dual (P-channel) and FET-KYs 76

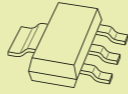
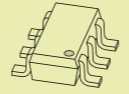





### Power MOSFETs

78

- Power MOSFETs single (N-channel) 78
- Power MOSFETs single (P-channel) 84
- Power MOSFETs dual (N- and P-channel) 85



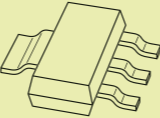
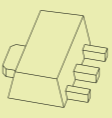

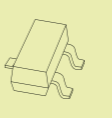

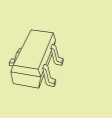

Small-signal MOSFETs single (N-channel) < 50V

													SOT223 (SC-73)		TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Package																				
Size (mm)													6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P <sub>tot</sub> (mW)													1700		600	250	300	200	150	250
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	R <sub>DSon</sub> typ (mΩ) @ V <sub>gs</sub> =											
									10 V	4.5 V	2.5 V	1.8 V								
12	8	5.7	0.4	-	23	67	10.1	-	-	28	-	39			PMN28UN					
20	8	6.3	2	4	23	71	10.6	-	-	23	-	37			PMN23UN					
		5.7	0.4	-	23	71	10.6	-	-	27	-	39			PMN27UN					
		5.7	0.45	-	20	66	7.4	-	-	30	-	44				PMV30UN <sup>1)</sup>				
		3.76	0.65	-	35	84	5.4	-	-	56	77	-				PMV56XN <sup>1)</sup>				
		2.5	0.65	-	35	84	5.4	-	-	56	77	-				SI2302DS				
		1.05	0.4	-	6.5	65	-	-	-	140	-	240				BSH105				
	2.28	0.45	0.95	14.5	23.5	0.89	-	-	250	-	420							PMZ250UN		
	1	0.45	1	14.5	23.5	0.89	-	-	280	-	460					PMF280UN	PMR280UN			
	12	5.9	0.5	1.5	25	37	5.8	-	-	31	44	-				PMV31XN <sup>1)</sup>				
			2.15	0.5	1.5	16	17	0.72	-	-	270	440	-						PMZ270XN	
		1	0.5	1.5	16	17	0.72	-	-	290	460	-								
	15	5.7	1	2	24	35	13.1	-	28	34	-	-				PMN34LN				
4.1			1	2	24	35	13.1	-	55	70	-	-				PMN55LN				
30	8	4.9	0.45	-	22	60	9.9	-	-	38	-	54			PMN34UN					
		4.9	0.45	-	18	50	9.3	-	-	40	-	55				PMV40UN <sup>1)</sup>				
		1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550						PMZ390UN		
		0.85	0.4	-	6	27	-	-	-	400 <sup>2)</sup>	-	600 <sup>2)</sup>				BSH103				
	12	1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-					PMF400UN	PMR400UN		
			0.87	0.35		16	19.5	-	-	370	550	-							PMZ350XN	
		0.9	0.5	1.5	16	19.5	0.65	-	-	370	550	-								
	15	5.4	1	2	12	27	13.8	-	32	40	-	-				PMG370XN		PMR370XN		
	20	10	1	2.8	18	44	24	-	20	30	-	-	BSP030							
			5.4	1	2	33	44	6.1	-	31	38	-	-				PMN38EN			
		5.2	1	2	33	44	6.1	-	32	42	-	-				PMN45EN				
		5.4	1	2	12	21.5	9.4	-	35	45	-	-				PMV45EN <sup>1)</sup>				
4.6		1	2	8.4	17.8	8.8	-	40	49	-	-				PMN49EN					
4.7		1	2	12	23.5	9.4	-	47	60	-	-				PMV60EN <sup>1)</sup>					
1.9		1	2	11	41	6.4	-	77	102	-	-				BSH108					
2.5		1.5	-	12	23.5	4.6	-	74	117	-	-				PMV117EN					
6	1	2.8	14	36	-	-	80	120	-	-	BSP100									
1.7	1.5	-	11.5	31	4.6	-	117 <sup>2)</sup>	190 <sup>2)</sup>	-	-				SI2304DS						

<sup>1)</sup> enhanced thermal capability  
<sup>2)</sup> max values

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

types in **bold** represent new products

										SOT223 (SC-73)		SOT89 (SC-62)	SOT873	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)				
Package																					
Size (mm)										6.5 x 3.5 x 1.65		4.5 x 2.5 x 1.5	3.3 x 3.3 x 0.85	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5				
P <sub>tot</sub> (mW)										1700		1300	250	250	200	150	250				
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>b</sub> (A)	V <sub>GS(th) min</sub> (V)	V <sub>GS(th) max</sub> (V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>g</sub> typ (nC)	ESD protection	R <sub>Dson</sub> typ (mΩ) @ V <sub>gs</sub> =												
									10 V	4.5 V	2.5 V	1.8 V									
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 <sup>3)</sup>	-	-						BSN20			
55	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100						BSH121			
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100						BSH111			
	13	4.9	1	2	-	-	-	-	2KV	-	30	-	-	PHT11N06LT							
		3.5	1	2	-	-	-	-	2KV	-	65	-	-	PHT8N06LT							
60	15	2.5	1	2	-	-	-	2KV	-	120	-	-	PHT6N06LT								
		2.5	2	4	-	-	-	-	2KV	120	-	-	-	PHT6N06T							
	0.26	1	3.3	3	9	-	-	1KV	2800	3800	-	-					PMF3800SN				
	0.34	1	-	3	9	-	-	1KV	2800	3800	-	-					2N7002K				
	0.3	1	-	3	9	-	-	yes	2800	3800	-	-					BSH112				
	0.3	1	2.5	16	60	1.09	-	3KV	1100	1300	-	-						<b>2N7002CK</b>			
	0.3	1	2.5	tbd	tbd	tbd	-	-	2000 <sup>2)</sup>	3000 <sup>2)</sup>	-	-						<b>2N7002P</b>	<b>2N7002PW</b>	<b>2N7002PT</b>	<b>2N7002PM</b>
	0.3	1	2.5	tbd	tbd	tbd	-	2KV	1600 <sup>2)</sup>	3000 <sup>2)</sup>	-	-						<b>2N7002BK</b>	<b>2N7002BKW</b>	<b>2N7002BKT</b>	<b>2N7002BKM</b>
	0.57	1	-	6	7.2	-	-	-	780	1100	-	-						PMF780SN			
	0.55	1	3	6	7.2	1.05	-	-	780	1100	-	-						PMR780SN			
30	15	1.22	1	3	6	7.2	1.05	-	760	1100	-	-									
		0.25	0.8	3	-	-	-	-	-	2500	-	-	-								
	0.385	1	2.5	2.5	11	0.69	-	-	780	1200	-	-						PMBF170			
	0.475	1	2.5	2.5	11	0.69	-	-	780	1200	-	-						2N7002E			
100	16	0.3	1	2.5	2.5	11	-	-	2800	3800	-	-							2N7002F		
		0.3	1	2.5	2.5	11	-	-	-	2800	3800	-	-						2N7002		
	20	3.5	1	2	14	73	-	-	-	200	-	-	PHT4NQ10LT								
		0.19	1	-	3	12	-	-	-	5000	-	-	-						BST82		
		0.52	1	-	3	12	-	-	-	5000	-	-	BSP110								
		0.85	2	4	19	13	4.6	-	-	400	-	-	-						BSH114		
		0.15	1	2.8	3	12	-	-	-	3500	-	-	-						BSS123		
3.5	2	4	21	31	7.4	-	-	200	-	-	-	PHT4NQ10T									
3	2	4	-	-	-	-	-	57	-	-	-	PHT6NQ10T									
200	20	1.9	2	4	10.5	12.5	7	-	213	-	-	-						PMV213SN <sup>1)</sup>			
		0.55	0.4	2	10	45	-	-	-	1700	-	3000	-	BSP122							
		0.4	0.8	2.8	6	49	-	-	-	1600	-	-	-						BSS87		
220	20	7.3	2	4	20.8	24.3	13.2	-	320	-	-	-						PML260SN			
240	20	0.375	0.8	2	6	47	-	-	2800	7500 <sup>2)</sup>	-	-	BSP89								
250	20	0.35	0.8	2	6	47	-	-	2800	-	-	-	BSP126								
300	20	0.35	0.8	2	6	46	-	-	3700	-	4800	-	BSP130								

<sup>1)</sup> enhanced thermal capability  
<sup>2)</sup> max values  
<sup>3)</sup> @ V<sub>gs</sub> = 5 V

Small-signal MOSFETs dual (N-channel)

types in **bold** represent new products

Package										SOT363 (SC-88)	SOT666 (SC-88)			
Size (mm)										2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55			
P <sub>tot</sub> (mW)										300	300			
V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min(V)	V <sub>GS(th)</sub> max(V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	R <sub>Dson</sub> typ (mΩ) @ V <sub>gs</sub> =					
									10 V	4.5 V	2.5 V	1.8 V		
20	8	0.87	0.45	1	14.5	23.5	-	-	-	280	-	460	PMGD280UN	
	12	0.86	0.5	1.5	16	17	0.72	-	-	290	460	-	PMGD290XN	
30	8	0.71	0.45	1	11.5	22.5	0.89	-	-	400	-	580	PMGD400UN	
	12	0.74	0.5	1.5	17	19.5	0.65	-	-	370	550	-	PMGD370XN	
	15	0.125	0.8	1.5	17	22	0.35	-	-	1800	2900	-	PMGD8000LN	
60	20	0.3	1	2.5	tbd	tbd	tbd	-	2000 <sup>2)</sup>	3000 <sup>2)</sup>	-	-	<b>2N7002PS</b>	<b>2N7002PV</b>
		0.3	1	2.5	tbd	tbd	tbd	2KV	1600 <sup>2)</sup>	3000 <sup>2)</sup>	-	-	<b>2N7002BKS</b>	<b>2N7002BKV</b>
		0.49	1	-	6	7.2	1.05	-	780	1100	-	-	PMGD780SN	

<sup>1)</sup> enhanced thermal capability <sup>2)</sup> max values

Small-signal MOSFETs single (P-channel)

Package										SOT223 (SC-73)	SOT89 (SC-62)	TSOP6 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)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min(V)	V <sub>GS(th)</sub> max(V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	R <sub>Dson</sub> typ (mΩ) @ V <sub>gs</sub> =				
									10 V	4.5 V	2.5 V	1.8 V	
12	8	1.52	0.4	-	6.5	65	-	-	-	80	-	140	
		0.75	0.4	-	6.5	65	-	-	-	180	-	420	BSH207
20	12	4.8	0.55	0.95	16	117	10	-	-	48	65	-	PMN50XP
		3.9	0.55	0.95	28	101	7.6	-	-	65	90	-	PMV65XP <sup>1)</sup>
30	8	0.47	0.4	-	6.5	65	-	-	-	660	-	1100	BSH203
	20	3	1	2.8	20	50	-	-	220	330	-	-	BSP250
50	20	0.52	1	-	6.5	65	-	-	630	890	-	-	BSH202
		0.13	0.8	2	3	7	-	-	6000	-	-	-	BSS84
60	20	0.3	1	-	6.5	65	-	-	2100	2700	-	-	BSH201
200	20	0.225	0.8	2.8	5	20	-	-	10000	-	-	-	BSP220
240	20	0.2	0.8	2.8	5	20	-	-	10000	-	-	-	BSS192
250	20	0.225	0.8	2.8	5	10	-	-	10000	-	-	-	BSP225
300	20	0.21	1.95	2.8	5	15	-	-	17000 <sup>2)</sup>	-	-	-	BSP230

<sup>1)</sup> enhanced thermal capability <sup>2)</sup> max values


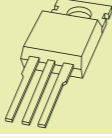
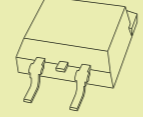
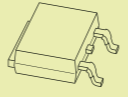
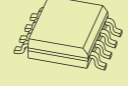
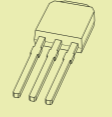
Small-signal MOSFET dual (P-channel) and FET-KYs

types in **bold** represent new products

Package													SOT1118			
Size (mm)													2.0 x 2.0 x 0.65			
P <sub>tot</sub> (mW)													>500			
Configuration	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS(th)</sub> min(V)	V <sub>GS(th)</sub> max(V)	t <sub>on</sub> typ (ns)	t <sub>off</sub> typ (ns)	Q <sub>G</sub> typ (nC)	ESD protection	I <sub>F</sub> (A)	V <sub>R</sub> (V)	V <sub>F</sub> typ. (mA)	R <sub>Dson</sub> typ (mΩ) @ V <sub>gs</sub> =			
													4.5 V	2.5 V	1.8 V	
dual	20	8	3.3	0.5	1.5	tbd	tbd	tbd	800 V	-	-	-	65	95	130	<b>PMDPB65UP</b>
single + schottky	20	8	3.3	0.5	1.5	tbd	tbd	tbd	800 V	2	30	455	65	95	130	<b>PMFPB6545UP</b>
			3.3	0.5	1.5	tbd	tbd	tbd	800 V	2.2	30	325	65	95	130	<b>PMFPB6532UP</b>

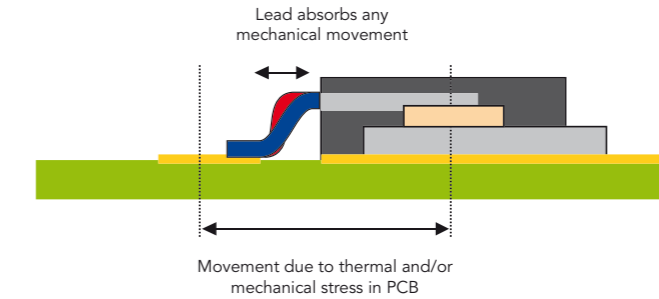
Power MOSFETs single (N-channel)

types in **bold** represent new products

$V_{DS}$ (max) (V)	$R_{DS(on)}$ (max) (m $\Omega$ ) @ $V_{gs} = 10$ V	$R_{DS(on)}$ (max) (m $\Omega$ ) @ $V_{gs} = 4.5$ V	$I_D$ (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)	SO8 (SOT96-1)	IPAK (SOT533)
									
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75	6 x 6.6 x 2.3
20	2.65	3.7	100	PH3120L					
	-	2.7	100	PH2520U					
	-	5	32					PSMN006-20K	
	-	16 @ 5 V	44.7				PHD38N02LT		
	-	20 @ 5 V	10.9					PHKD6N02LT	
25	1.2	1.85	100	<b>PSMN1R2-25YL</b>					
	1.5	2.2	100	<b>PSMN1R5-25YL</b>					
	2.5	3.9	100	PH2525L					
	2.8	4.1	100	PH2625L					
	4	-	99	PH4025L					
	4.95	-	75				PHD96NQ03LT		
	5.5	8.2	81.7	PH5525L					
	5.8	-	75				PSMN005-25D		
	6	-	75				PHD108NQ03LT		
	6.3	9.5	78.7	PH6325L					
	6.3	10.6	75				PHD97NQ03LT		
	6.6	-	75						PHU97NQ03LT
	9	13	66	PH9025L					
	9	-	66.4				PHD78NQ03LT		PHU78NQ03LT
	9	-	61		PHP78NQ03LT				
	9.5	-	75				PHD77NQ03T		PHU77NQ03T
	10.5	-	66			PHB66NQ03LT	PHD66NQ03LT		
	-	3	100	PH2925U					

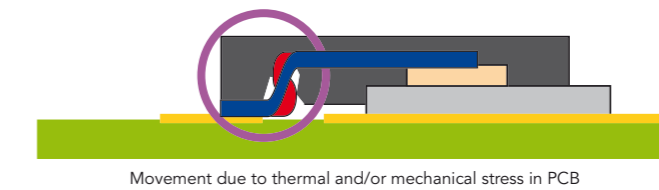
LFPAK for mechanical & thermal ruggedness

NXP LFPAK



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


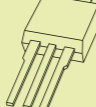
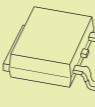
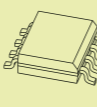
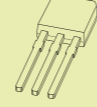
QFN Based Power-SO8



QFN sawn or micro-lead pins are fully encapsulated and do not allow for movement. Cracks in the mould compound can lead to moisture ingress & ionic contamination causing early failure of the MOSFET

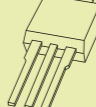
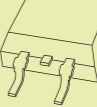
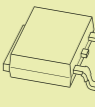
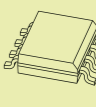
Power MOSFETs single (N-channel)

types in **bold** represent new products



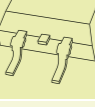
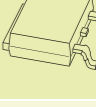
$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 10$ V	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 4.5$ V	$I_D$ (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	PAK (SOT428)	SO8 (SOT96-1)	IPAK (SOT533)
								
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75	6 x 6.6 x 2.3
30	1.3	1.95	100	<b>PSMN1R3-30YL</b>				
	1.7	2.1	100		<b>PSMN1R6-30PL</b>			
	1.7	2.6	100	<b>PSMN1R7-30YL</b>				
	1.8	-	-		<b>PSMN1R8-30PL</b>			
	2	3.2	100	<b>PSMN2R0-30YL</b>				
	2.1	2.8	100		<b>PSMN2R0-30PL</b>			
	2.4	3.9	100	<b>PSMN2R5-30YL</b>				
	2.7	-	-		<b>PSMN2R7-30PL</b>			
	2.8	-	75		PSMN003-30P			
	3	4.8	100	<b>PSMN3R0-30YL</b>				
	3.2	-	100	PH3230S				
	3.3	4.5	100	PH3330L				
	3.4	-	-		<b>PSMN3R4-30PL</b>			
	3.5	5.6	100	<b>PSMN3R5-30YL</b>				
	3.8	-	98	PH3830L				
	4	6.5	99	<b>PSMN4R0-30YL</b>				
	4.3	6.2	100		<b>PSMN4R3-30PL</b>			
	4.3	-	95.9	PH4330L				
	4.4	-	30.4					PHK31NQ03LT
	4.8	-	84	PH4830L				
	5	8	84	<b>PSMN5R0-30YL</b>				
	5.5	-	20 @ 80 °C					PSMN005-30K
	5.5	-	75		PHP101NQ03LT	PHD101NQ03LT		PHU101NQ03LT
	5.7	-	80	PH5330E				
	5.9	-	76.7	PH8030L				
	6	9.7	76.7	PH6030L				
	6	9.7	73	<b>PSMN6R0-30YL</b>				
	6.5	-	23.7					PHK28NQ03LT
	7	11.3	65	<b>PSMN7R0-30YL</b>				
	7.9	11	68	PH7030L				
8	13.8	55	<b>PSMN9R0-30YL</b>					
8.2	-	67	PH8230E					
8.9	-	20.3					PHK18NQ03LT	
9	12.5	63	PH9030L					
9.9	-	63	PH9930L					

Power MOSFETs single (N-channel)

types in **bold** represent new products


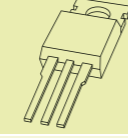
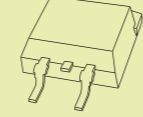

$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 10$ V	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 4.5$ V	$I_D$ (max) (A) @ 25 °C	TO-220AB (SOT78)	D2PAK (SOT404)	PAK (SOT428)	SO8 (SOT96-1)
							
				15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75
30	10	-	75			PHD71NQ03LT	
	13	-	68.9			PHD63NQ03LT	
	13.5	20	10				SI4410DY
	17	-	43.4	PHP36N03LT		PHD36N03LT	
	20	26	13.8				PHK13N03LT
	20	26	10.4				PHKD13N03LT
	22.0	-	-	<b>PSMN022-30PL</b>			
	30	-	6.3				PHN203
	100	200	3.4				PHN210
	100	200	3.4				PHN210T
	-	14	11.8				PHK12NQ03LT
	36	4	-	75		PSMN004-36B	

types in **bold** represent new products

$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 10$ V	$R_{DSon}$ (max) (m $\Omega$ ) @ $V_{gs} = 4.5$ V	$I_D$ (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	PAK (SOT428)	
								
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	
40	2	-	-	<b>PSMN2R0-40YS</b>				
	2.1	-	100		<b>PSMN2R2-40PS</b>			
	2.8	-	-		<b>PSMN2R8-40PS</b>			
	2.8	-	100	<b>PSMN2R6-40YS</b>				
	3.3	-	-	<b>PSMN3R3-40YS</b>				
	4.1	-	94.5	PH4840S				
	4.2	-	100	<b>PSMN4R0-40YS</b>				
	4.3	-	75		PHP176NQ04T			
	4.6	-	100		<b>PSMN4R5-40PS</b>			
	5.2	-	75		PHP143NQ04T			
	5.7	-	-	<b>PSMN5R8-40YS</b>				
	7.6	-	77		<b>PSMN8R0-40PS</b>			
	8	-	75		PHP101NQ04T	PHB101NQ04T		
	8.6	-	70	<b>PSMN8R3-40YS</b>				
	14	-	-	<b>PSMN014-40YS</b>				
	55	3.7	-	75		PHP191NQ06LT	PHB191NQ06LT	
		5.8	-	75		PSMN005-55P	PSMN005-55B	
		7	-	75		PHP110NQ06LT	PHB110NQ06LT	
7.1		-	75		PHP119NQ06T	PHB119NQ06T		
8.3		9.9	62.5	PH955L				
10.5		-	75				PSMN010-55D	
17.3		21	40	PH1955L				
20		-	54		PHP54N06T			
36		45	24	PH3855L				
70		-	19		PHP21N06LT	PHB21N06LT	PHD21N06LT	
75		-	21		PHP21N06T			
75		-	20.3		PHP20N06T	PHB20N06T		
77	-	18				PHD20N06T		

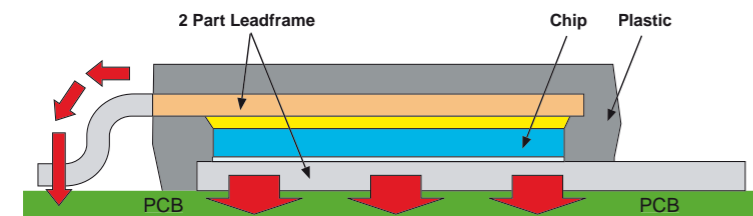
Power MOSFETs single (N-channel)


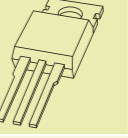
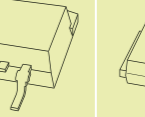
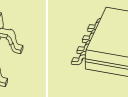

types in **bold** represent new products

V <sub>DS</sub> (max) (V)	R <sub>DSon</sub> (max) (mΩ) @ V <sub>gs</sub> = 10 V	R <sub>DSon</sub> (max) (mΩ) @ V <sub>gs</sub> = 4.5 V	I <sub>D</sub> (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)
							
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3
60	3.6	-	75			PSMN004-60B	
	22	-	52		PHP52N06T		
	150	-	10.3		PHP3055E		PHD3055E
	-	43	34		PHP32N06LT	PHB32N06LT	
75	5	-	75		PHP165NQ08T		
	5	-	75		PSMN005-75P	PSMN005-75B	
	5.6	-	75		PHP160NQ08T	PHB160NQ08T	
	8.5	-	75		PSMN008-75P	PSMN008-75B	
	9	-	75		PHP110NQ08T	PHB110NQ08T	
	13	-	75		PHP75NQ08T		
	16	-	73		PHP79NQ08LT		
	16.5	-	45.8		PH1875L		
	28	34	30		PH3075L		
	50 @ 11 V	-	27			PHP29N08T	PHB29N08T
80	4.1	-	100			<b>PSMN4R4-80PS</b>	
	4.7	-	100			<b>PSMN5R0-80PS</b>	
	6.4	-	-		<b>PSMN6R0-80YS</b>		
	6.5	-	-			<b>PSMN6R5-80PS</b>	
	8.5	-	82		<b>PSMN8R2-80YS</b>		
	8.7	-	-			<b>PSMN8R7-80PS</b>	
	11	-	-		<b>PSMN011-80YS</b>		
	11	-	74			<b>PSMN012-80PS</b>	
	12.9	-	60		<b>PSMN013-80YS</b>		
	17.0	-	-			<b>PSMN017-80PS</b>	
	19.5	-	-		<b>PSMN018-80YS</b>		
	27.5	-	34		<b>PSMN026-80YS</b>		
	46	-	-		<b>PSMN045-80YS</b>		
	46	-	22			<b>PSMN050-80PS</b>	

Power-SO8 (LFPAK) Design

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



V <sub>DS</sub> (max) (V)	R <sub>DSon</sub> (max) (mΩ) @ V <sub>gs</sub> = 10 V	R <sub>DSon</sub> (max) (mΩ) @ V <sub>gs</sub> = 4.5 V	I <sub>D</sub> (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)	SO8 (SOT96-1)
								
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75
100	8.8	-	75		PSMN009-100P	PSMN009-100B		
	15	-	75		PSMN015-100P	PSMN015-100B		
	23	-	34.3	PH20100S				
	25	-	47		PHP45NQ10T	PHB45NQ10T		
	25	-	47		PHP45NQ10TA			
	25	-	47				PSMN025-100D	
	28	-	47			PHB47NQ10T		
	28	-	11.6					PHK12NQ10T
	38	-	6.3 @ 80 °C					PSMN038-100K
	40	-	35					PHD34NQ10T
	50	-	28			PHB27NQ10T		
	90	-	18		PHP18NQ10T	PHB18NQ10T	PHD18NQ10T	
	90	-	3					PHKD3NQ10T
	90	-	3					
105	25	-	47		PHP45NQ11T			
110	15	-	75		PSMN015-110P			
	40	-	35		PHP34NQ11T			
	50	-	27.6		PHP27NQ11T			
	70	-	23		PHP23NQ11T			
	90	-	18		PHP18NQ11T			

NXP Power solutions make your PC Energy Efficient

MOSFETs for high efficiency power management

Smaller, faster, cooler


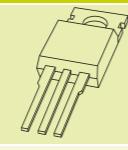
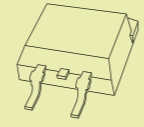
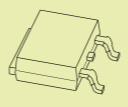
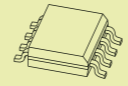

- ▶ Class leading LFPAK package with state of the art Trench 6 silicon technology
  - **Smaller:** Power-SO8 form factor LFPAK
  - **Faster:** Best in class switching performance
  - **Cooler:** Higher efficiency equals lower temperatures
  - **Easier:** easier to use in development and production than other Power-SO8 packages

High performance MOSFETs for DC-DC converters, OR-ing and load switching

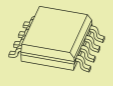
- ▶ Supported by Secure supply/Capacity availability (Silicon & Package)



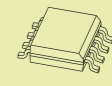
Power MOSFETs single (N-channel)

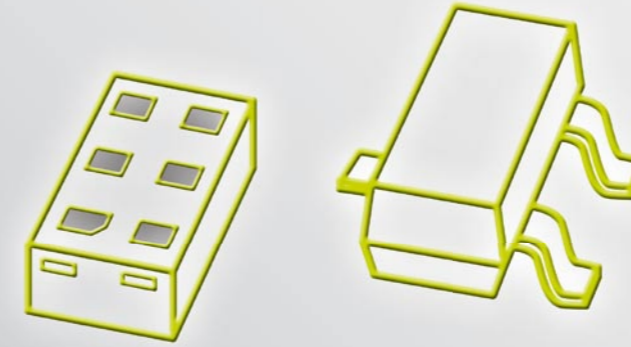
$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 10\text{ V}$	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	$I_D$ (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)	SO8 (SOT96-1)	HVSON8 (SOT873-1)
									
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75	3.3 x 3.3 x 0.85
150	30	-	55.5		PSMN030-150P	PSMN030-150B			
	35	-	50		PSMN035-150P	PSMN035-150B			
	42	-	45.1			PHB45NQ15T			
	59	-	43	PSMN059-150Y					
	63	-	29		PHP30NQ15T		PSMN063-150D		
	65	-	28.5		PHP28NQ15T				
	75	-	5					PHK5NQ15T	
			3.5 @ 80 °C					PSMN085-150K	
200	57	-	39		PSMN057-200P	PSMN057-200B			
	70	-	35		PSMN070-200P	PSMN070-200B			
	77	-	32.7		PHP33NQ20T	PHB33NQ20T			
	102	-	21.5	PSMN102-200Y					
	130	-	20		PHP20NQ20T	PHB20NQ20T	PSMN130-200D		
	165	-	2.9 @ 80 °C					PSMN165-200K	
	294	-	8.8						PML260SN
400	-	8.7		PHP9NQ20T		PHD9NQ20T			
220	386	-	7.3					PML340SN	

Power MOSFETs single (P-channel)

$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 10\text{ V}$	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	$I_D$ (max) (A) @ 25 °C	SO8 (SOT96-1)
				
				4.9 x 3.9 x 1.75
-16	-	120	-4.66	PHK04P02T
-20	-	50	-7.9	PMK50XP
-30	19	-	-14.9	PMK30EP PMK35EP

Power MOSFETs dual (N- and P-channel)

$V_{DS}$ (max) (V)	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 10\text{ V}$	$R_{DSon}$ (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	$I_D$ (max) (A) @ 25 °C	Configuration	SO8 (SOT96-1)
					
					4.9 x 3.9 x 1.75
20	-	20 @ 5 V	10.9	dual N-channel	PHKD6N02LT
30	20	26	10.4	dual N-channel	PHKD13N03LT
30	30	-	6.3	dual N-channel	PHN203
30	100	200	3.4	dual N-channel	PHN210 PHN210T
30, -30	100, 250	-	3.5, -2.3 @ 80 °C	complementary pair	PHC21025
-30	250	-	-2.3 @ 80 °C	dual P-channel	PHP225
100	90	-	3	dual N-channel	PHKD3NQ10T
300, -300	6000, 17000	-	0.34, -0.235 @ 80 °C	complementary pair	PHC2300



## Packages

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Minimized outline drawings and reflow soldering footprint	96
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### Package cross reference

types in **bold** 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	Vishay
SOD27	DO-35	4.25 x 1.85 x 0.56	2	500		GSD			DO-35		DO-35		DO-204AH
SOD66	DO-41	4.8 x 2.6 x 0.81	2	1300		GSR	DO-41				DO-41		DO-204AL
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		MiniMELF		MiniMELF
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			Power-DI123	SMF	
SOD123W	-	2.6 x 1.7 x 1.0	2	900			S-Flat	SOD-123-FL			Power-DI123		
SOD128	-	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	SOD323
SOD323F	SC-90	1.7 x 1.25 x 0.7	2	830		UMD2	US-Flat				Power-DI323		
SOD523	SC-79	1.2 x 0.8 x 0.6	2	500		EMD2	ESC/TESC	SOD-523	UFP	SC79		ESC	SOD523
SOD882	-	1.0 x 0.6 x 0.5	2	250			CTS2			TSLP-2	DFN1006-2		
<b>SOD882D</b>	-	1.0 x 0.6 x 0.37	2	250						TSLP-2-7	DFN1006H4-2		
<b>SOD131 SMA</b>	DO-214AC	4.25 x 2.67 x 2.14	2	900		PMDS (SOD-106)		SMA Case 403D-02			SMA	SMA	
<b>SOD132 SMB</b>	DO-214AA	4.32 x 3.62 x 2.29	2	1000				SMB Case 403A-03			SMB		
<b>SOD133 SMC</b>	DO-214AB	6.86 x 5.91 x 2.34	2	1200				SMC Case 403-03			SMC		
<b>SOT1061</b>	HUSON3	2.0 x 2.0 x 0.65	3	1300				WDFN3			DFN2020-3		PowerPAK SC706L
SOT23	-	2.9 x 1.3 x 1.0	3	250		SSD3/SST3		SOT-23		SOT23	SOT-23	SOT-23	SOT23
SOT323	SC-70	2.0 x 1.25 x 0.95	3	200		UMD3/UMT3	USM	SC-70	CMAK/CMPAK	SOT323	SOT-323	USM	SC-70 3 leads
SOT416	SC-75	1.6 x 0.8 x 0.77	3	150		EMD3/EMT3	SSM	SC-75	SMPAK	SC75			SC-75A
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		MPAK-4R	SOT143	SOT-143		
SOT223	SC-73	6.5 x 3.5 x 1.65	4	1700				SOT-223		SOT223	SOT-223	SOT-223	SOT223

types in **bold** 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	Vishay
SOT353	SC-88A	2.0 x 1.25 x 0.95	5	300		UMD5/UMT5	USV	SC-88A	CMPAK-5(T)			USV	SOT353
SOT665	-	1.6 x 1.2 x 0.55	5	300		EMD5/EMT5	ESV	SOT-553	VSON-5			TESV	
SOT1082	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	SOT363
SOT457	SC-74	2.9 x 1.5 x 1.0	6	750		SMD6/SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6	TSOP-6
SOT666	-	1.6 x 1.2 x 0.55	6	300		EMD6/EMT6	ES6	SOT-563	SMFPAK-6	SOT666	SOT563	TES6	SC89-6lead
<b>SOT1118</b>	-	2.0 x 2.0 x 0.65	6	1300				6 Lead DFN			DFN2020B-6		
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	SO8
SOT983	HXSON8	1.7 x 1.35 x 0.5	8	-							TSSOP38		
SOT1059	XSON10U	1.0 x 2.5 x 0.5	10	-									
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

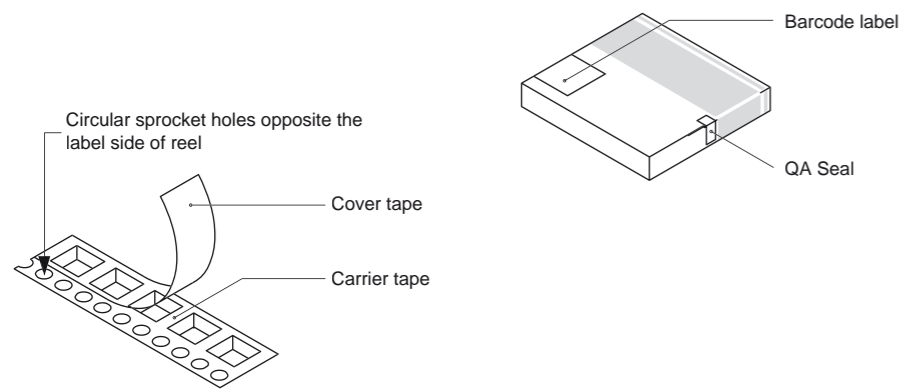
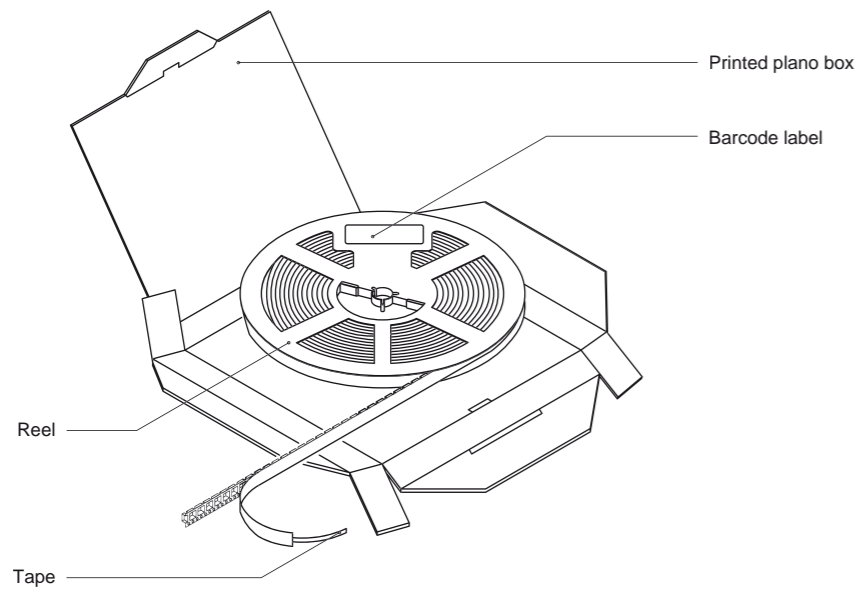
types in **bold** represent new products

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	-	-	-	-
SOD123W	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOD128	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>SOD882D</b>	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

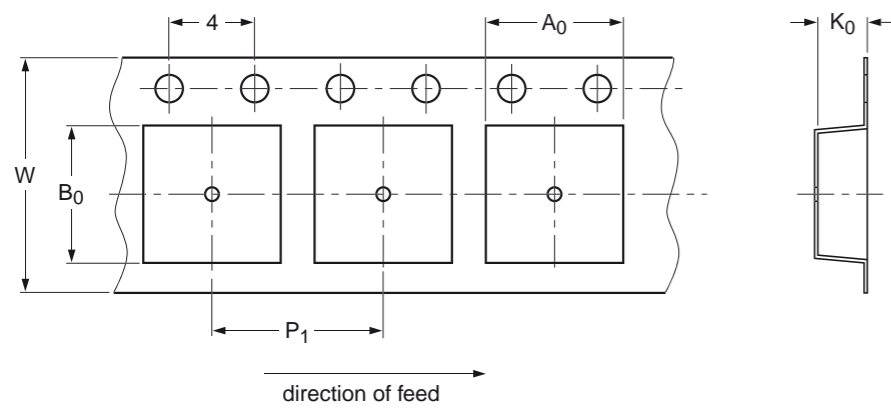
types in **bold** represent new products

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	-	-	-	-
<b>SOT1118</b>	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

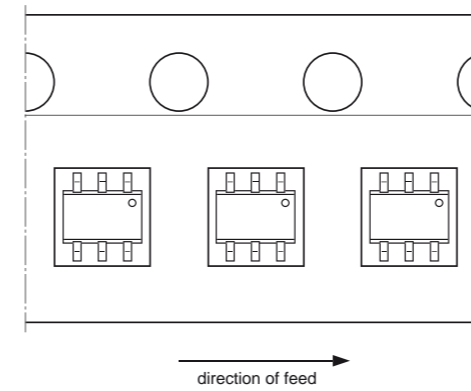


P1 = pitch (see table packing methods)  
 W = tape width (see table packing methods)

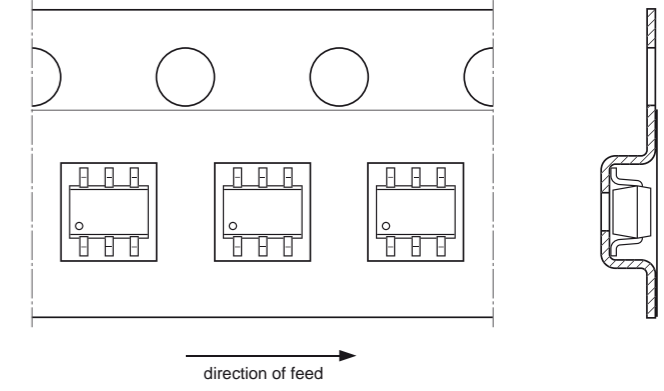
Compartment width ( $A_0$ ), length ( $B_0$ ) and depth ( $K_0$ ) depending on package

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

#### T1 taping

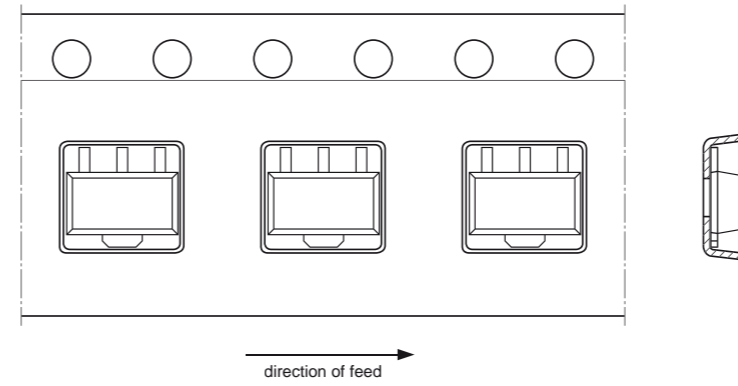


#### T2 taping

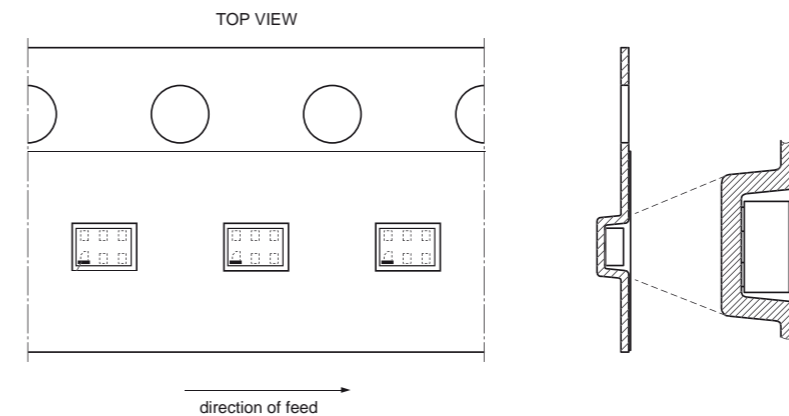


#### T3 taping

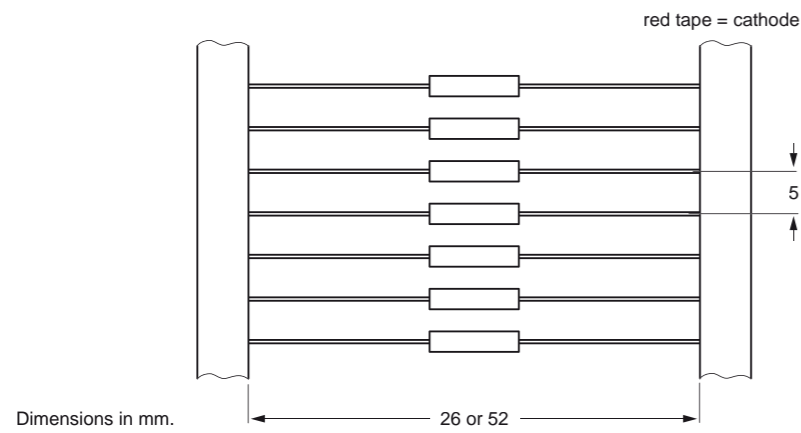
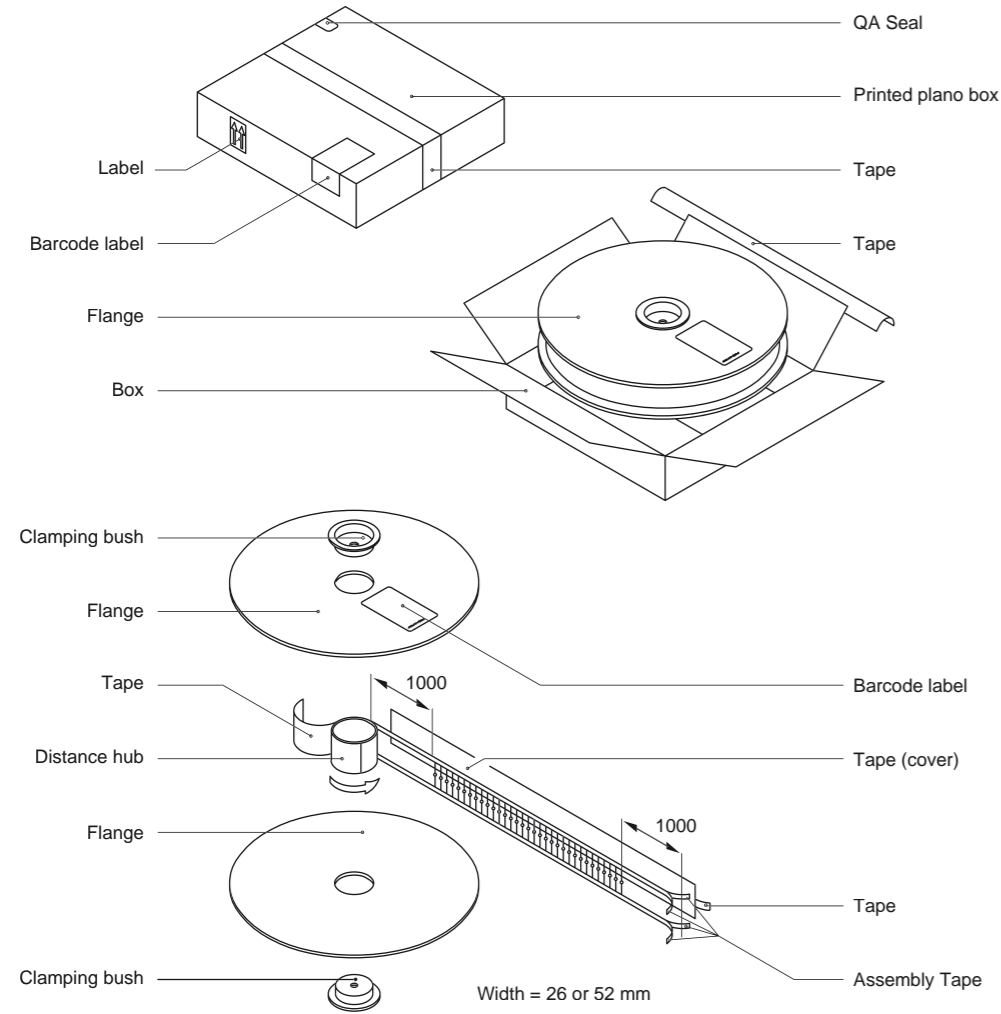
Standard product orientation SOT89 (T3)



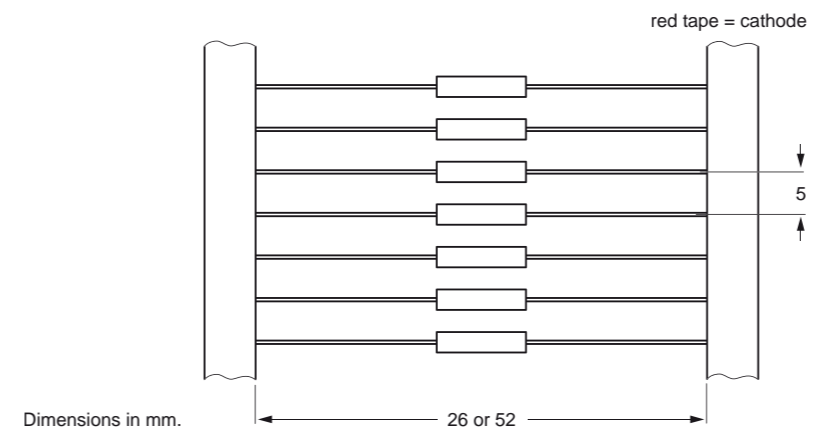
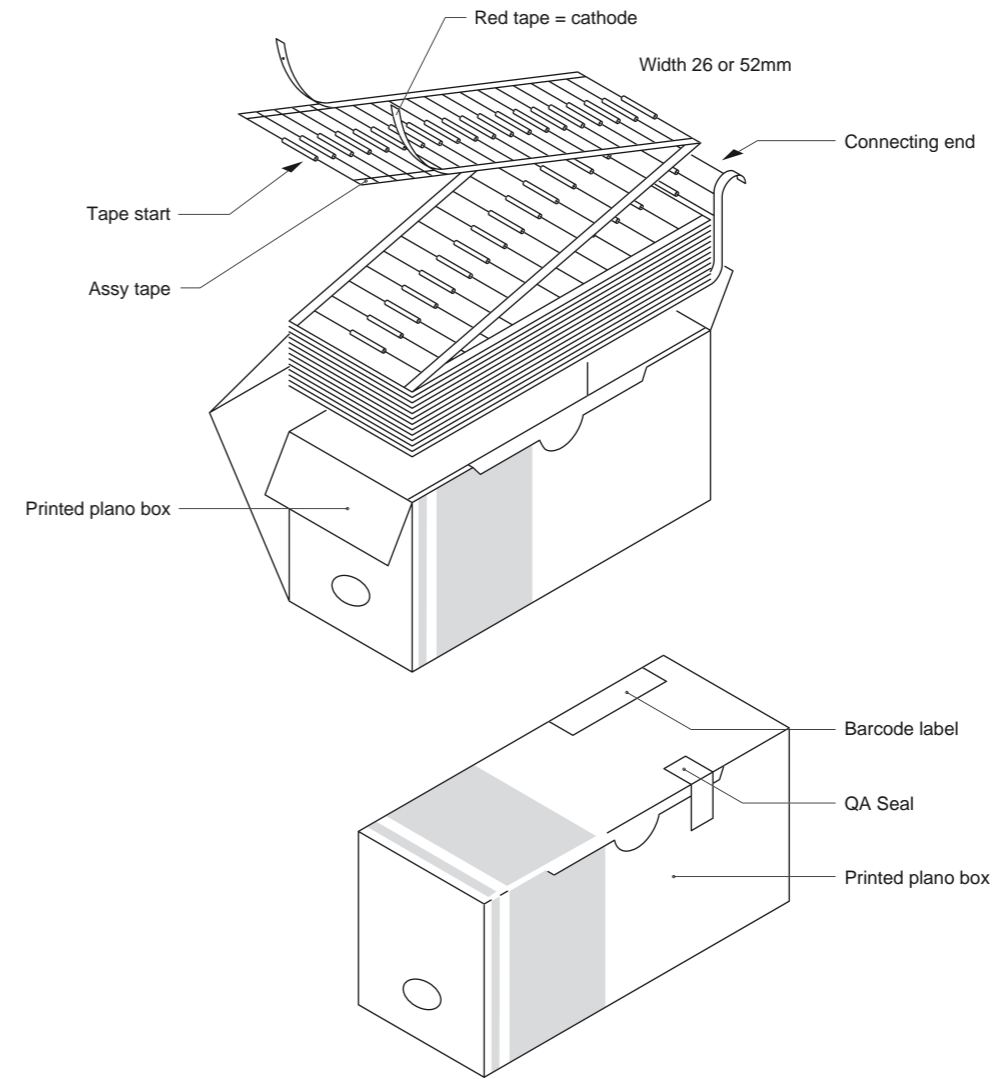
#### T4 taping



### Reel pack axial tape for glass diodes

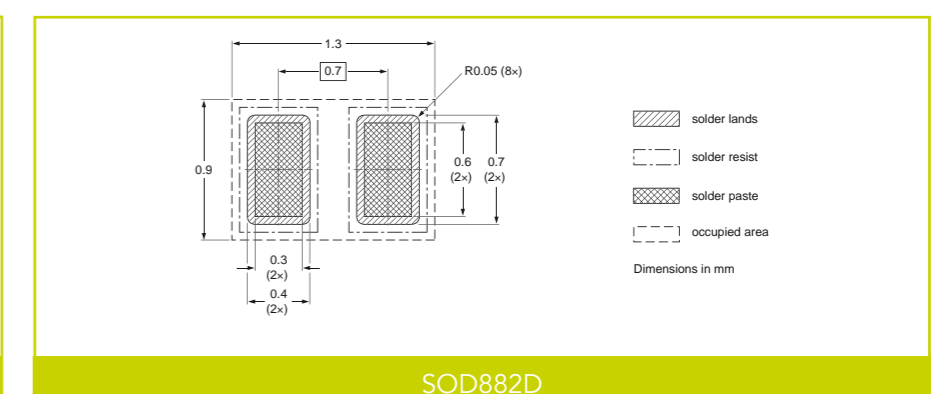
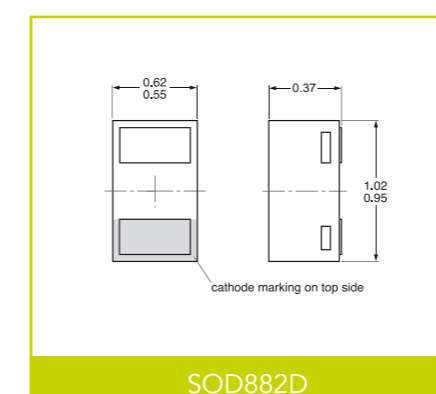
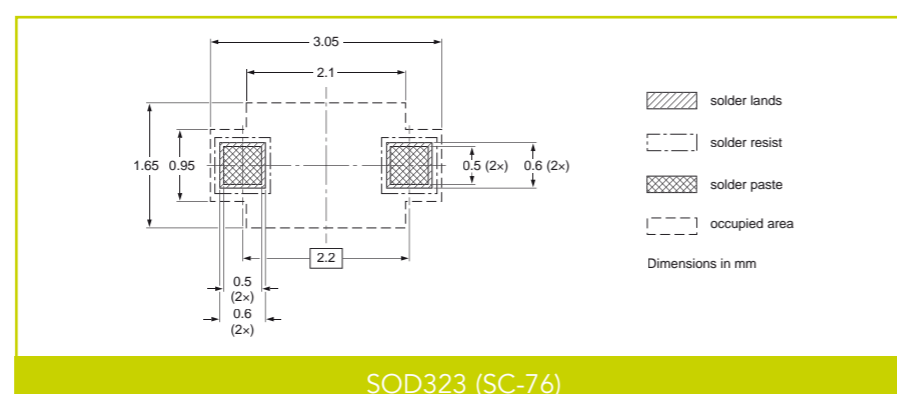
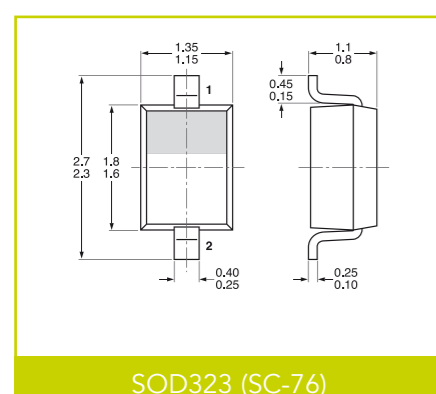
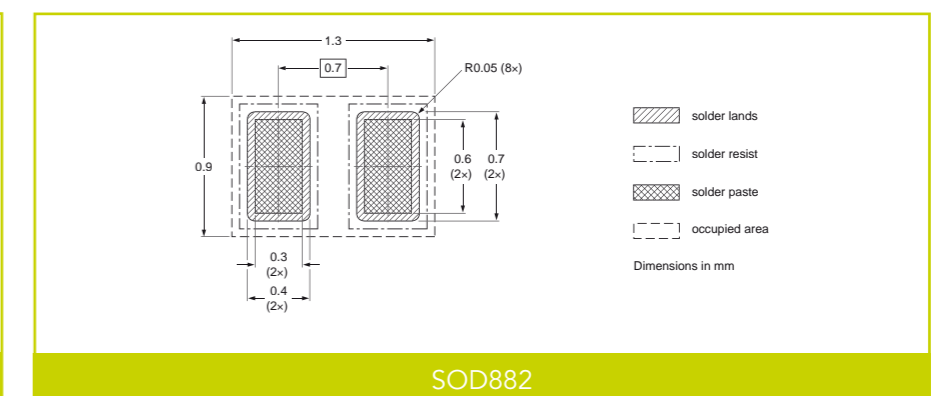
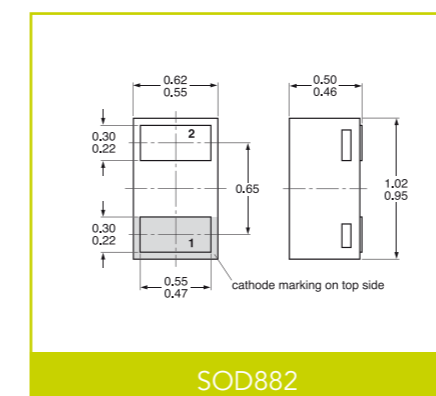
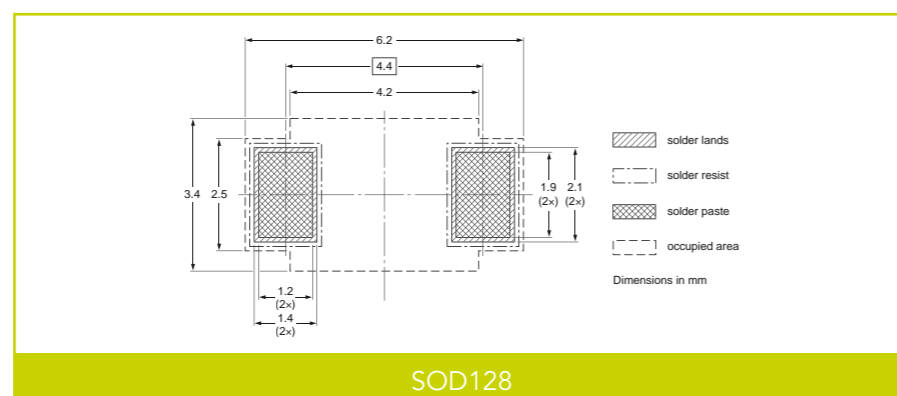
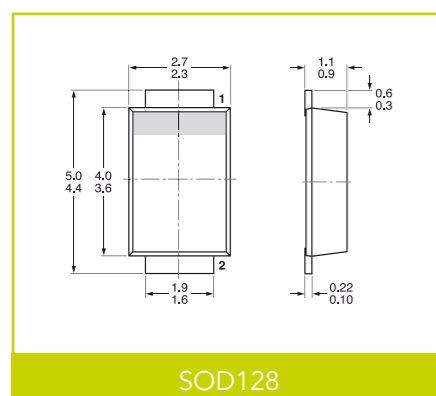
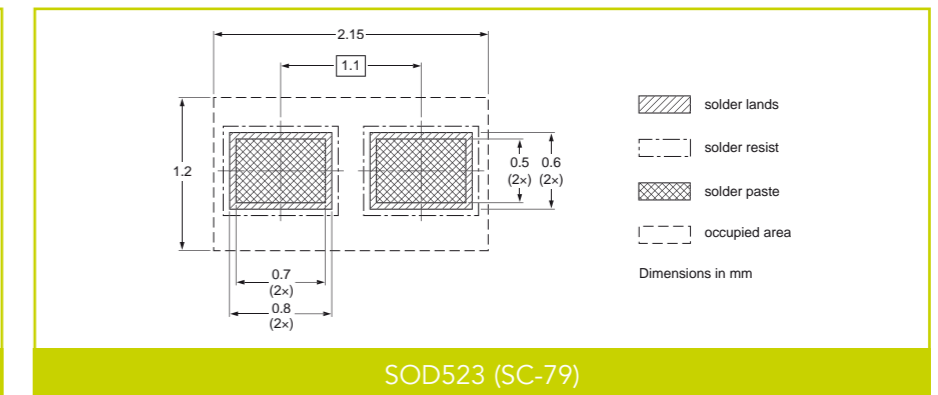
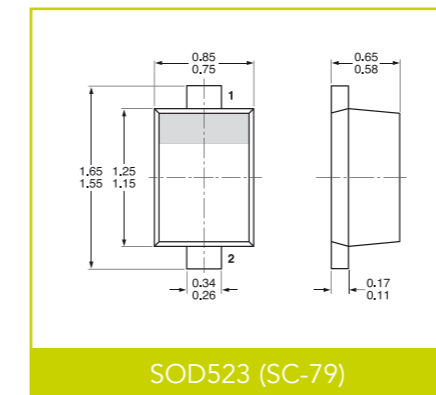
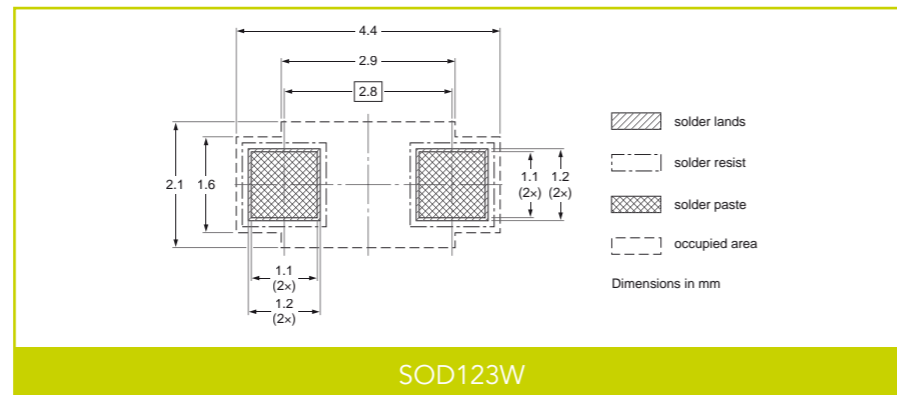
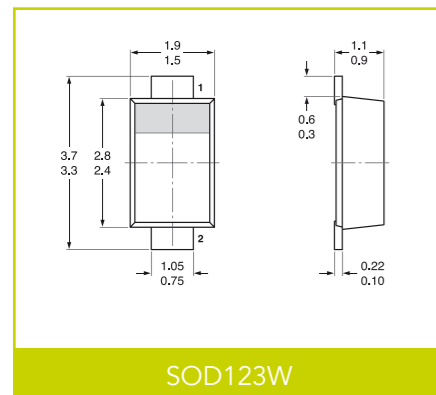
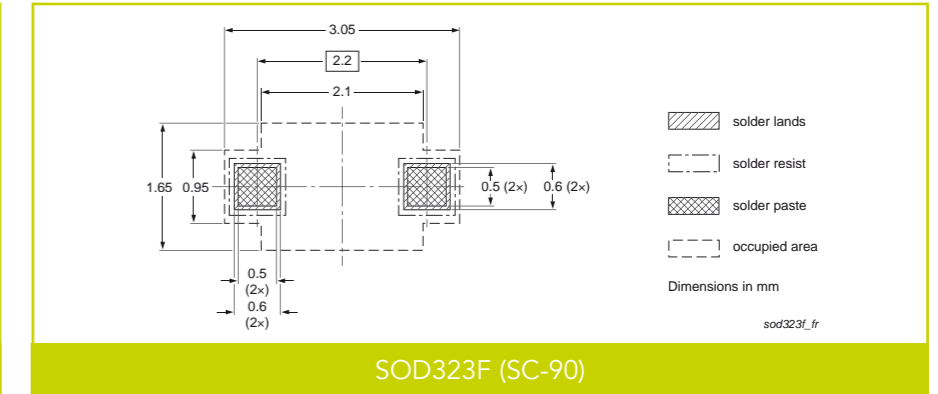
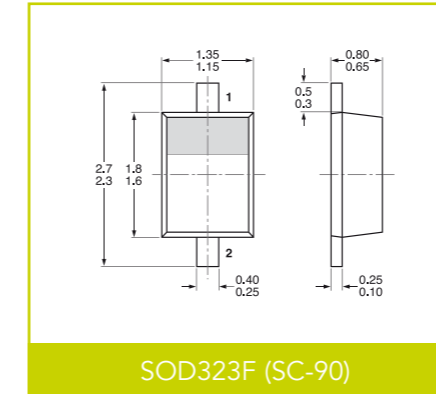
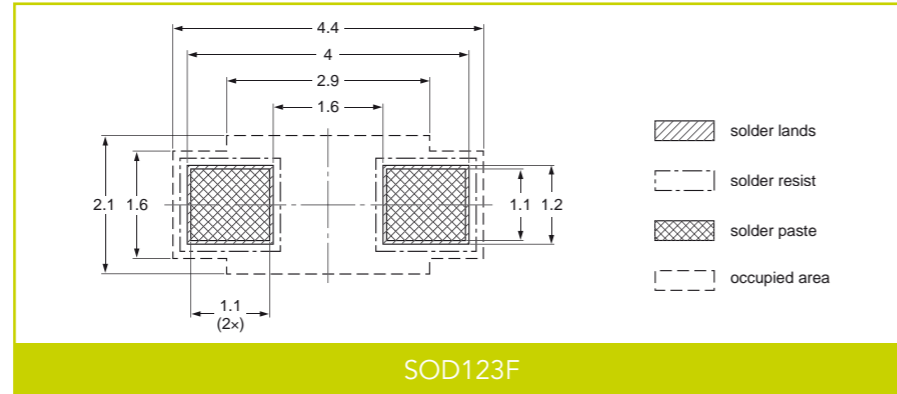
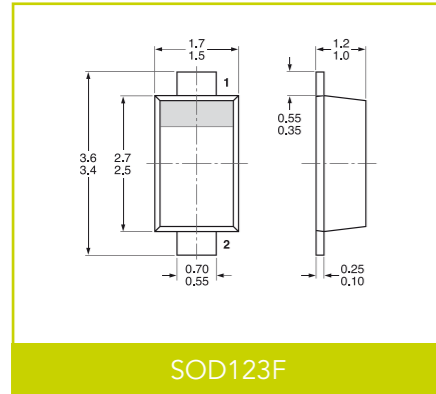


### Ammo pack axial tape for glass diodes



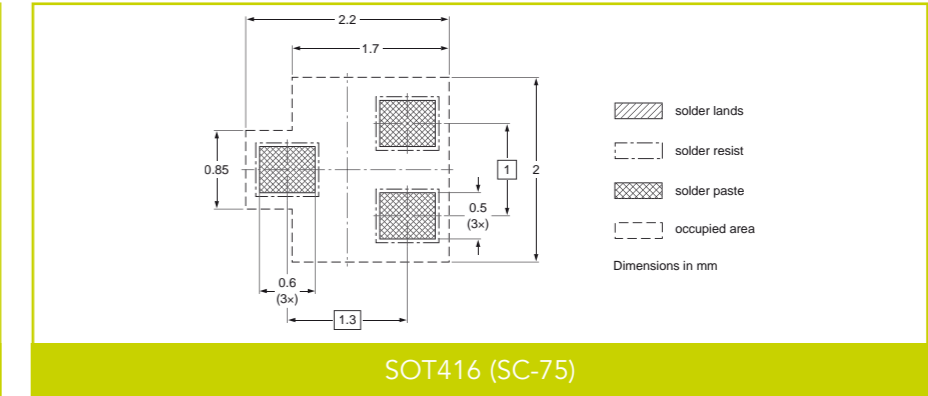
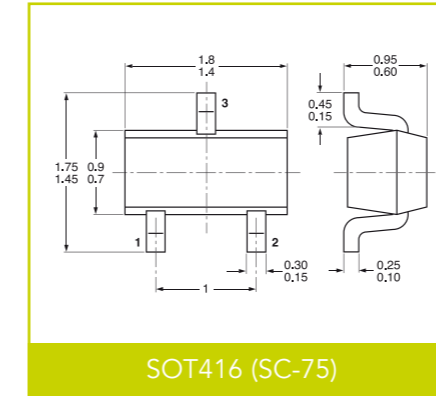
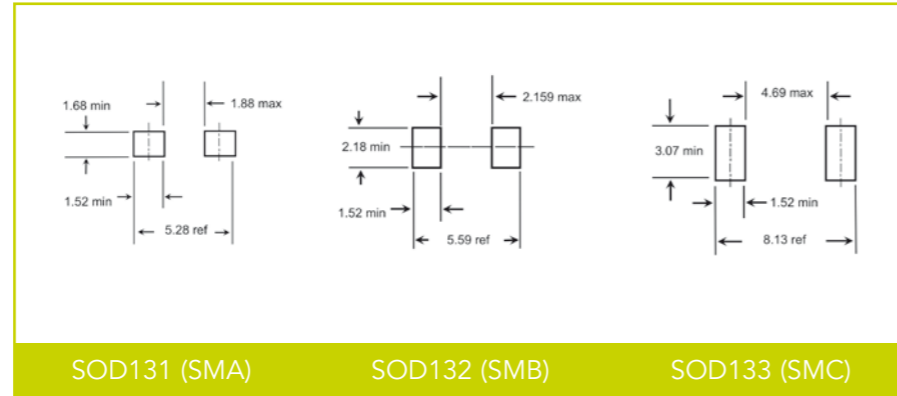
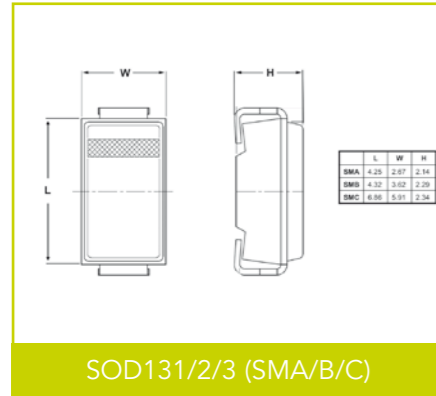


## 2-Pin SMD Packages

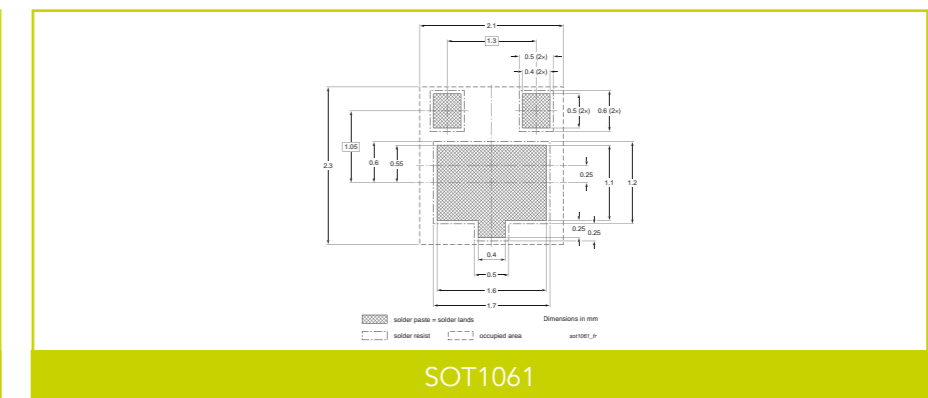
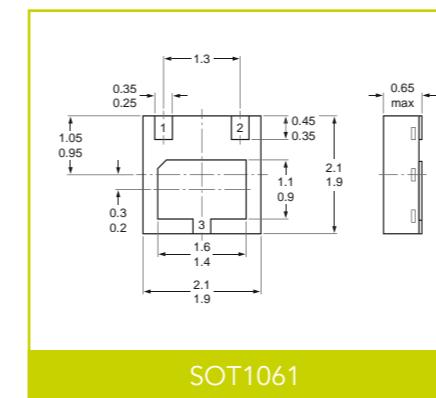
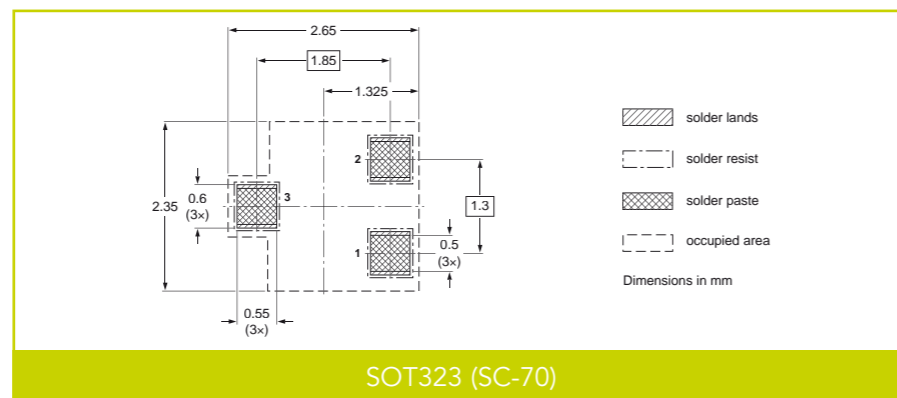
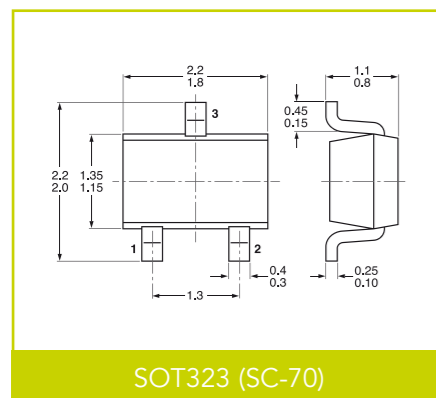
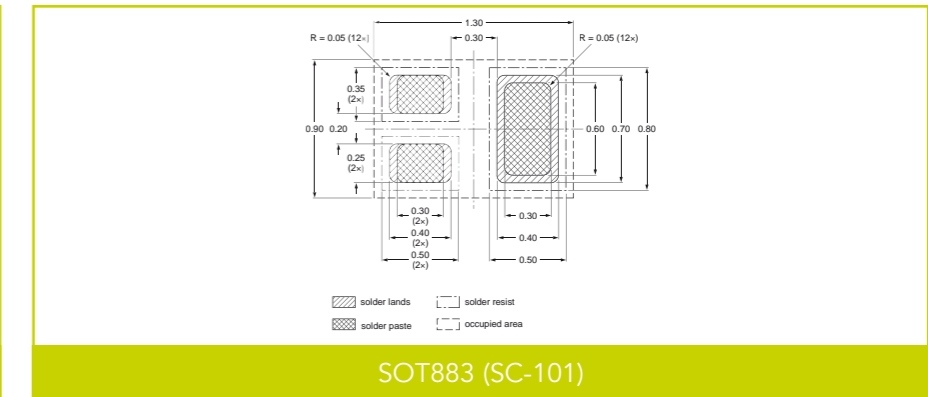
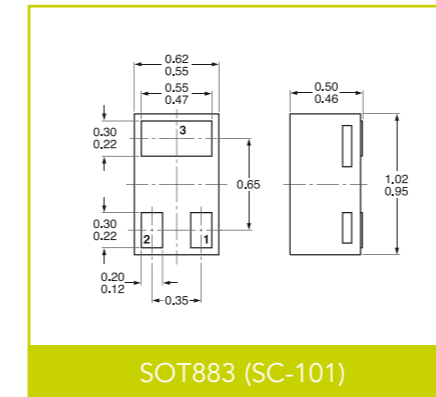
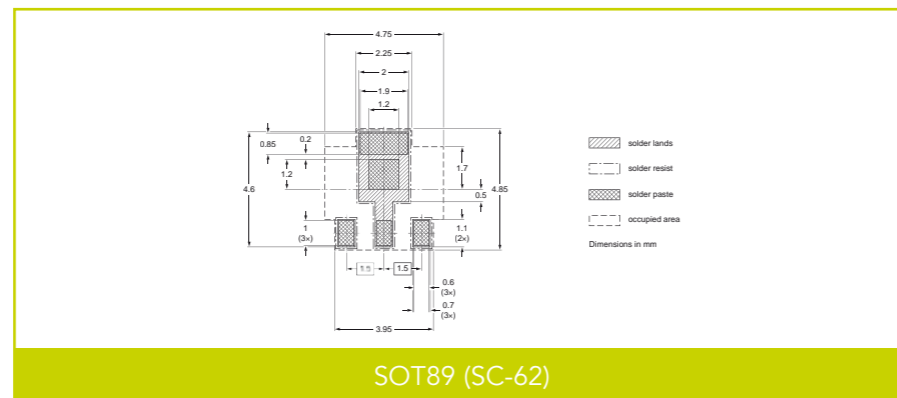
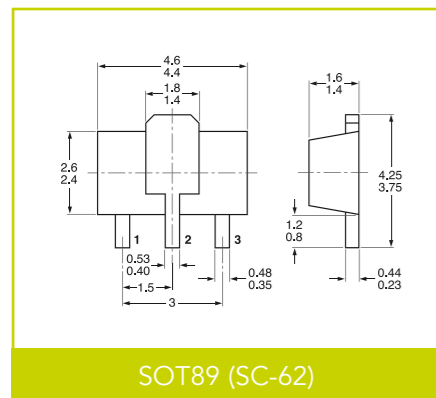
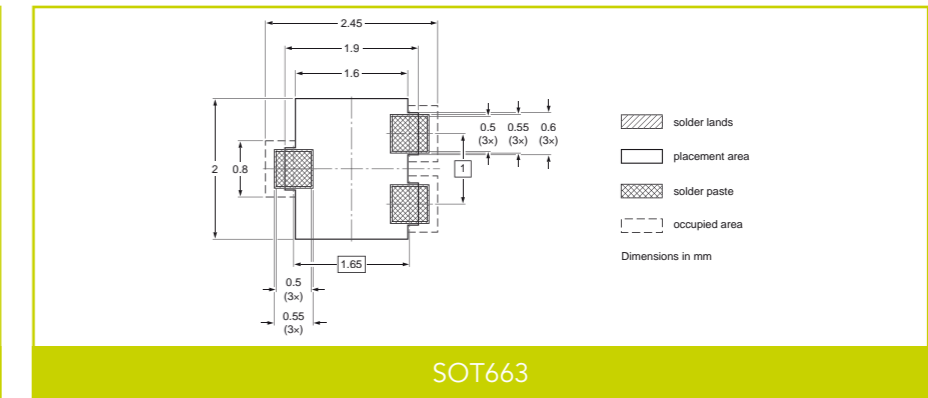
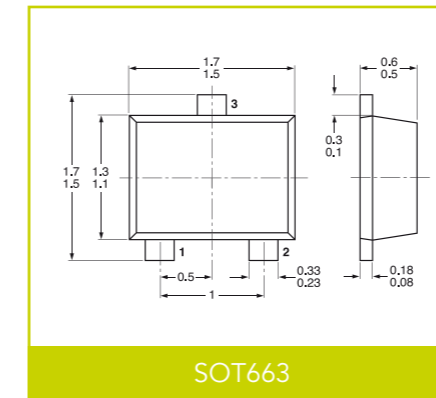
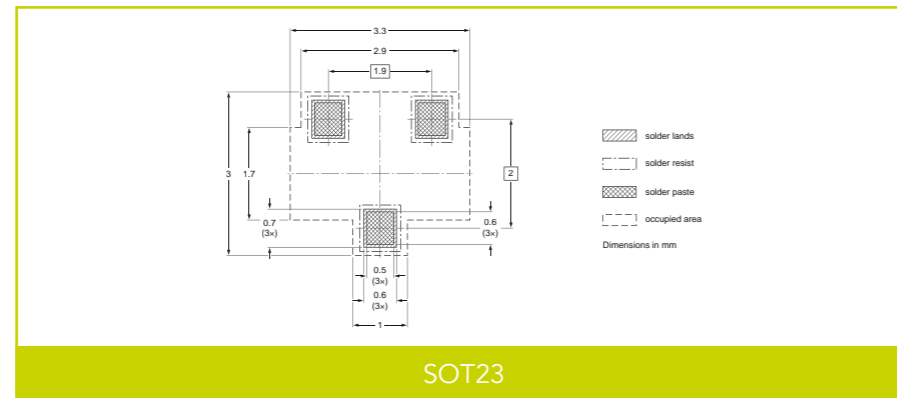
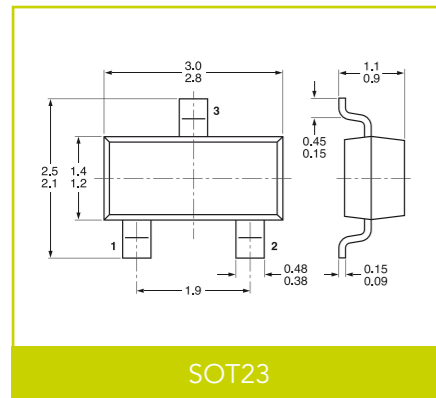


Dimensions in mm

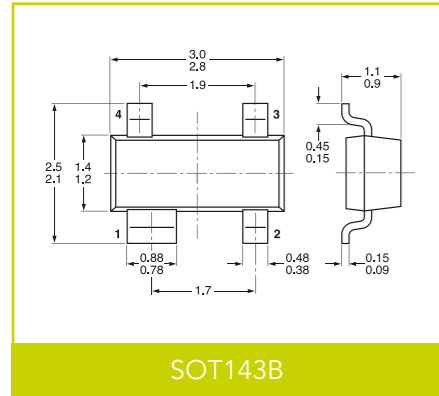
Dimensions in mm



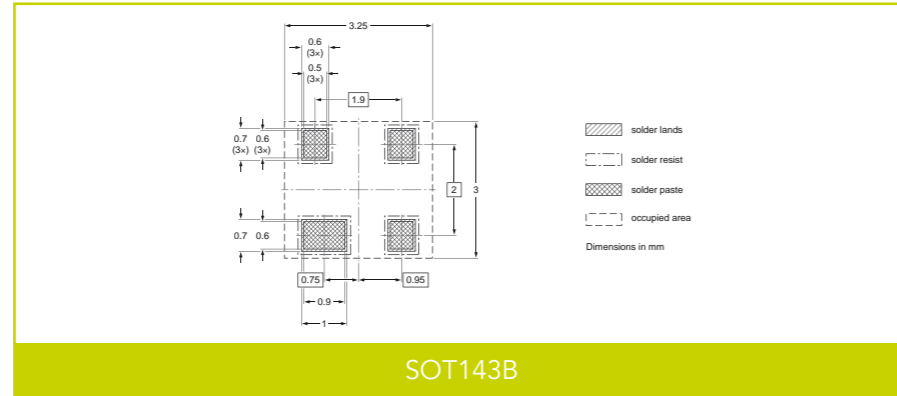
3-Pin SMD Packages



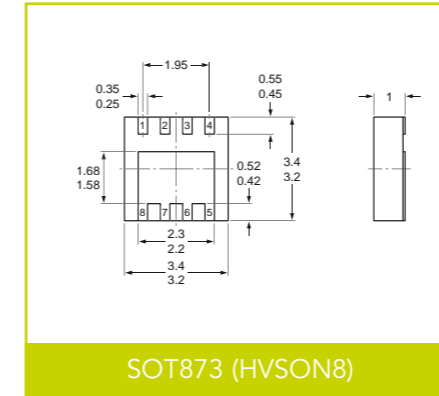
### 4-/5-Pin SMD Packages



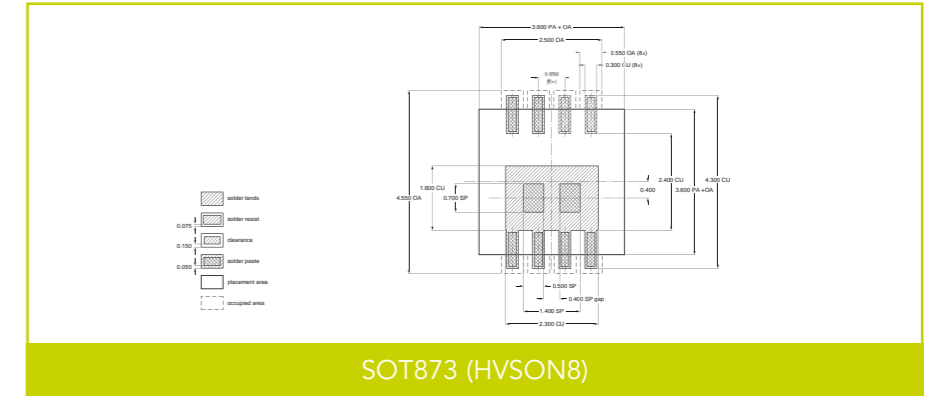
SOT143B



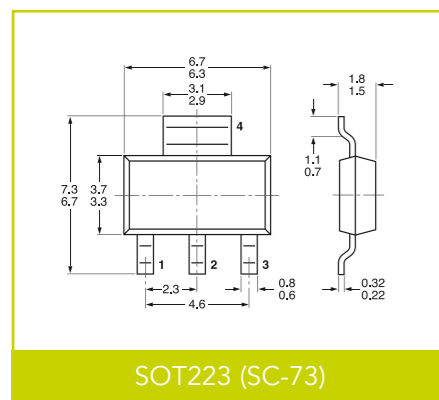
SOT143B



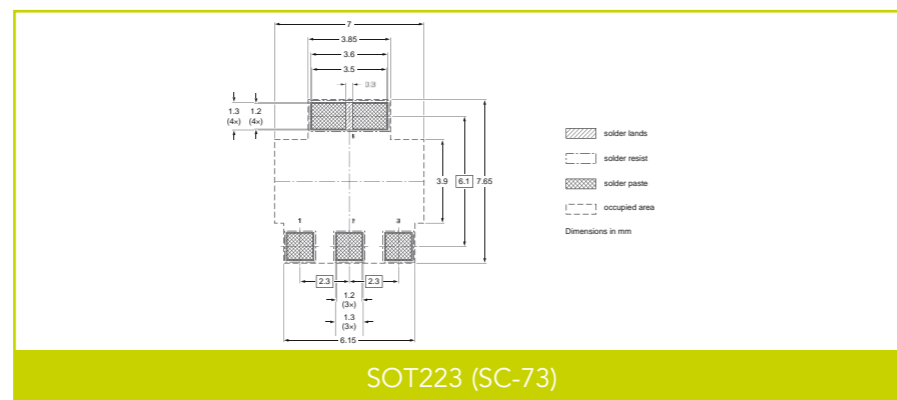
SOT873 (HVSON8)



SOT873 (HVSON8)

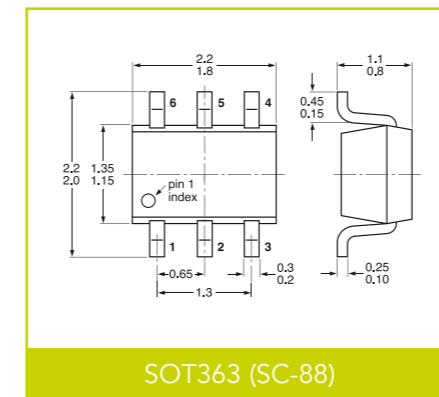


SOT223 (SC-73)

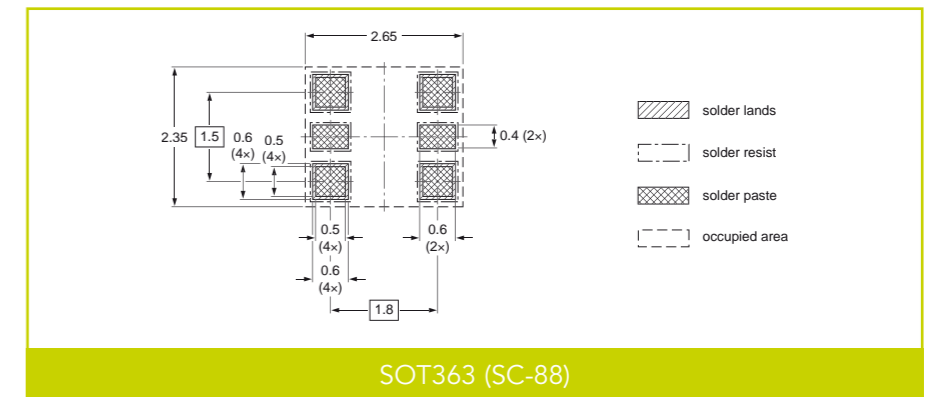


SOT223 (SC-73)

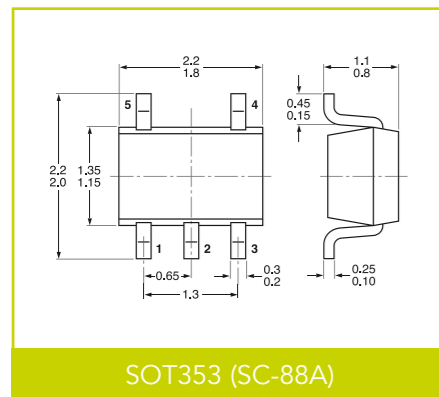
### 6-Pin SMD Packages



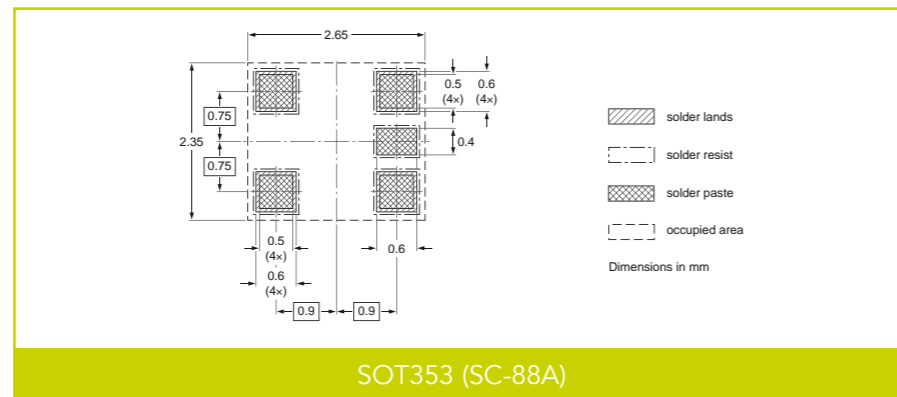
SOT363 (SC-88)



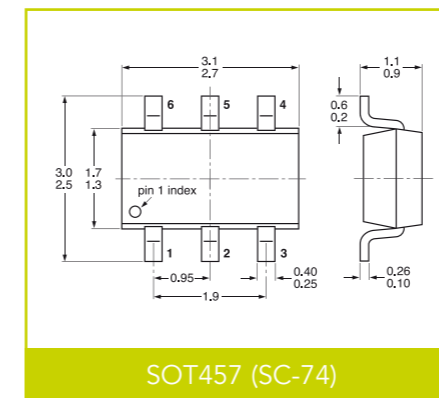
SOT363 (SC-88)



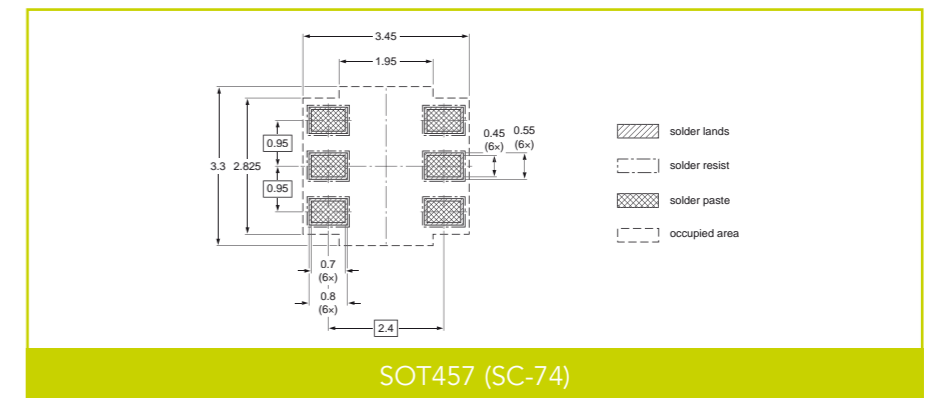
SOT353 (SC-88A)



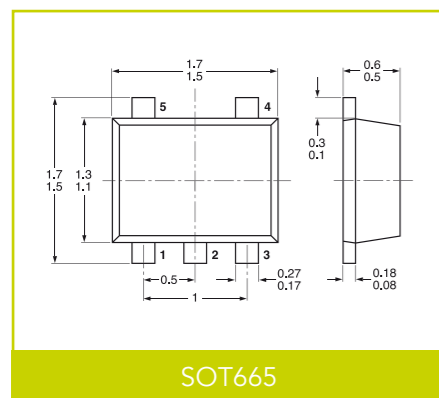
SOT353 (SC-88A)



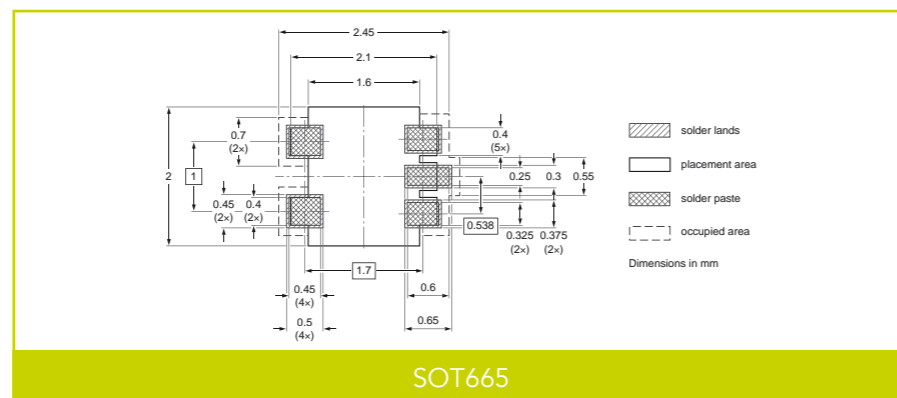
SOT457 (SC-74)



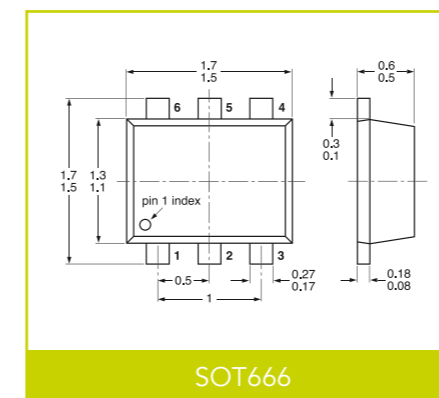
SOT457 (SC-74)



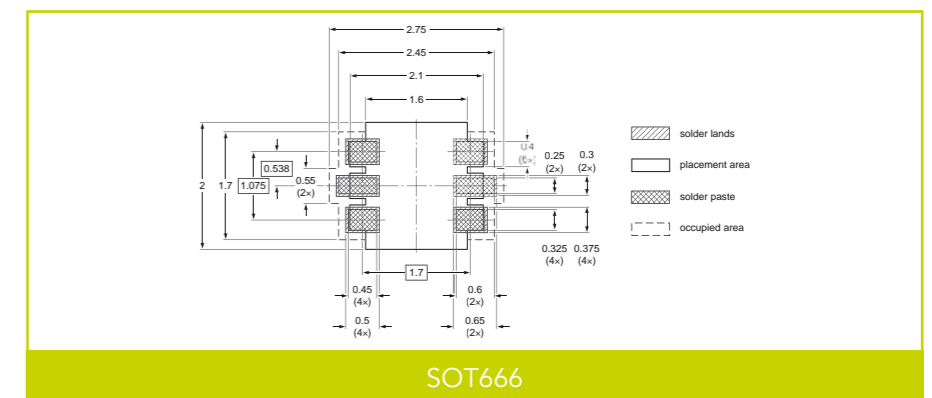
SOT665



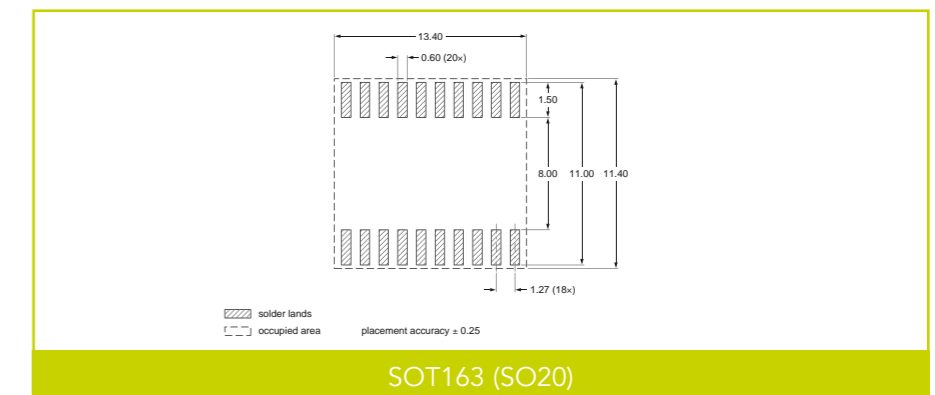
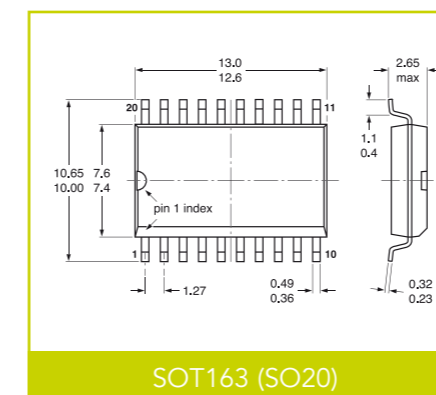
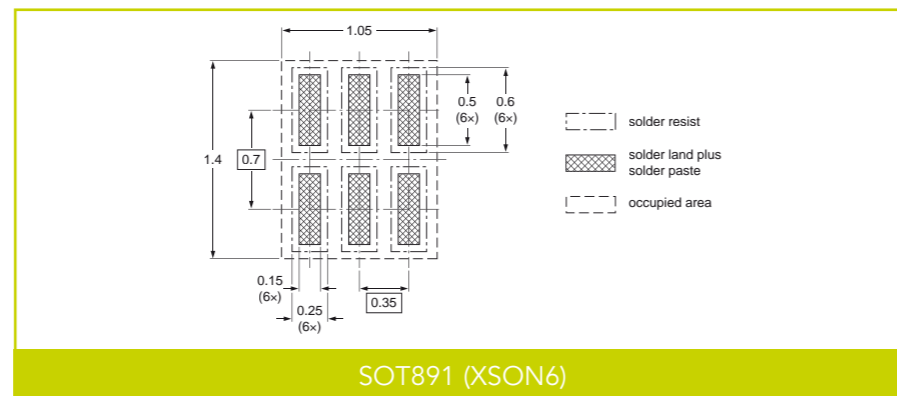
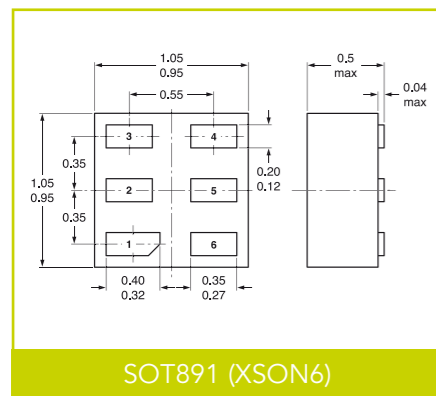
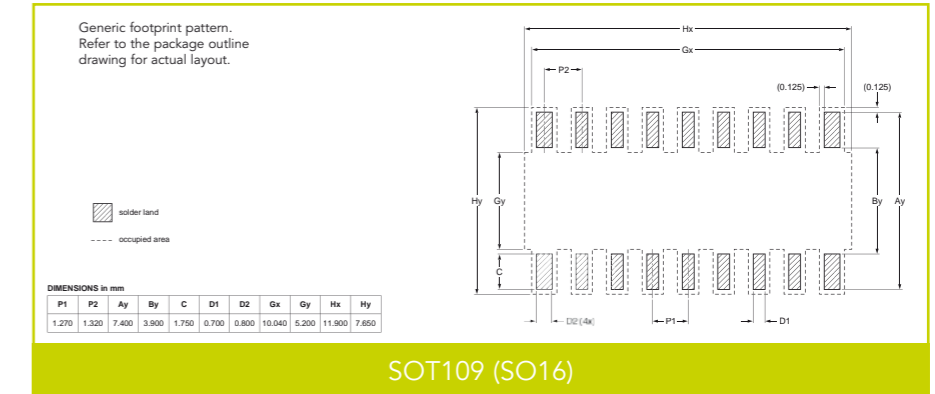
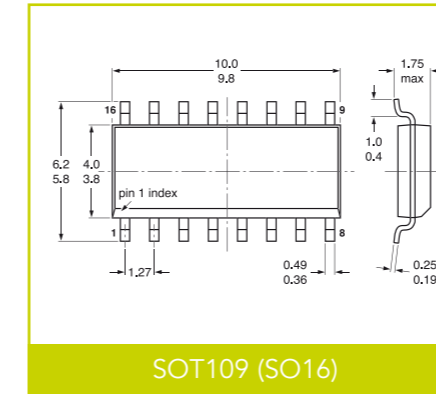
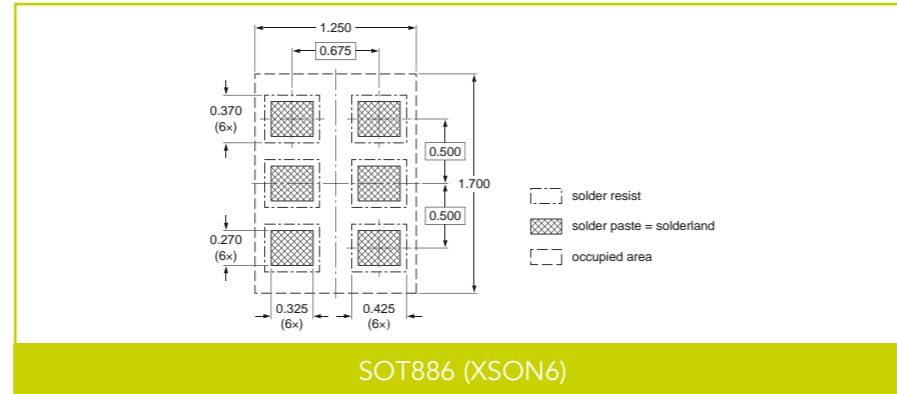
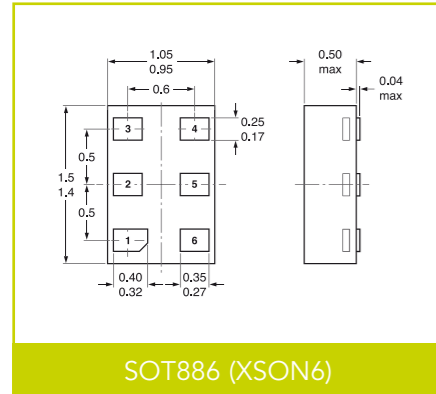
SOT665



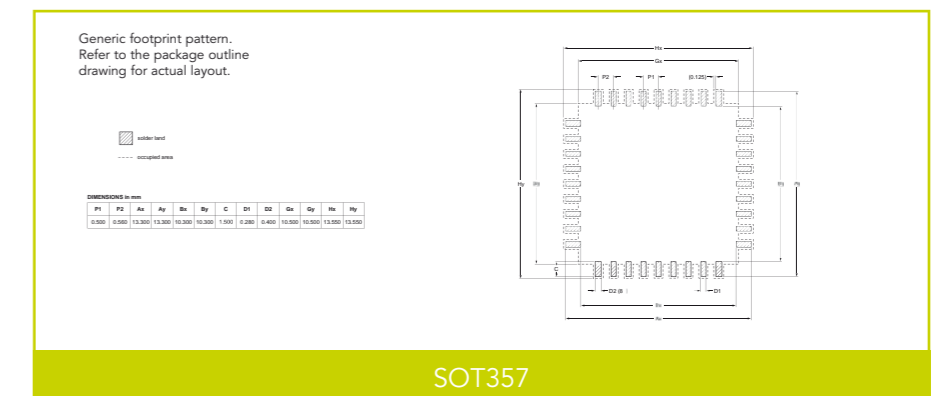
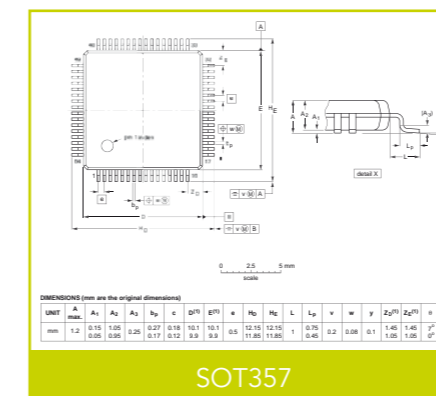
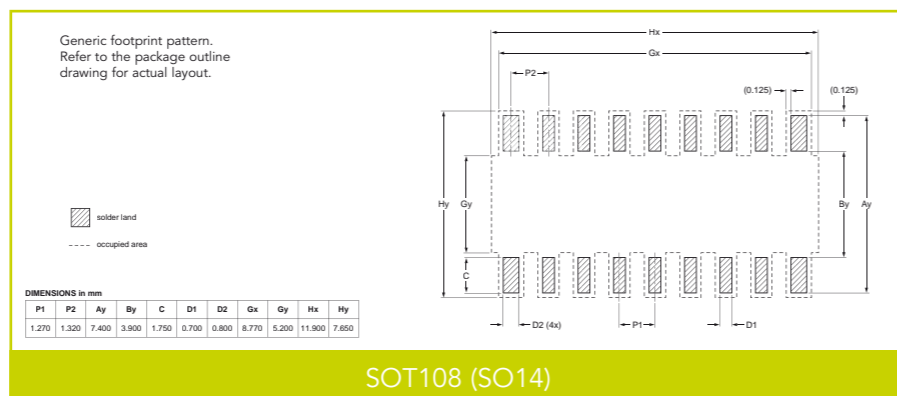
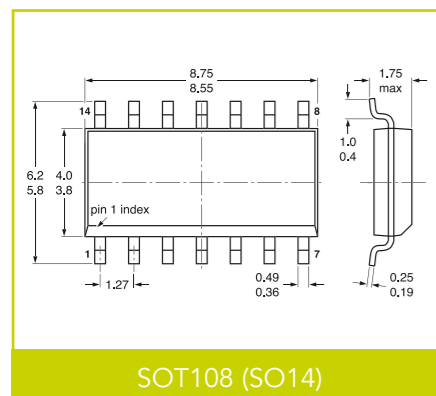
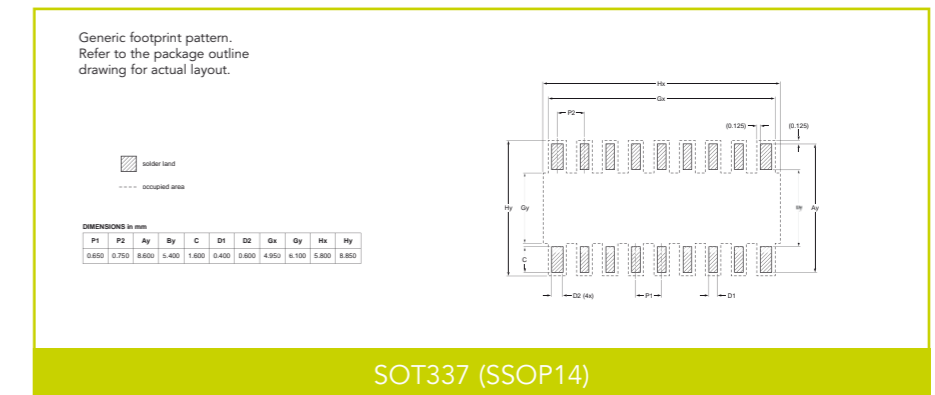
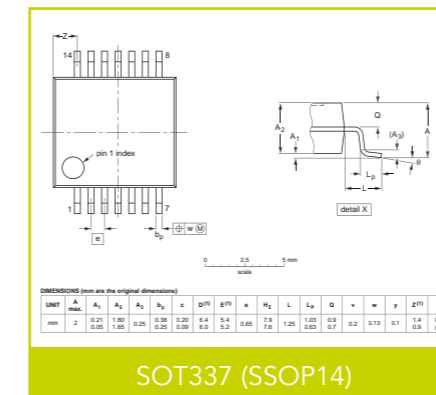
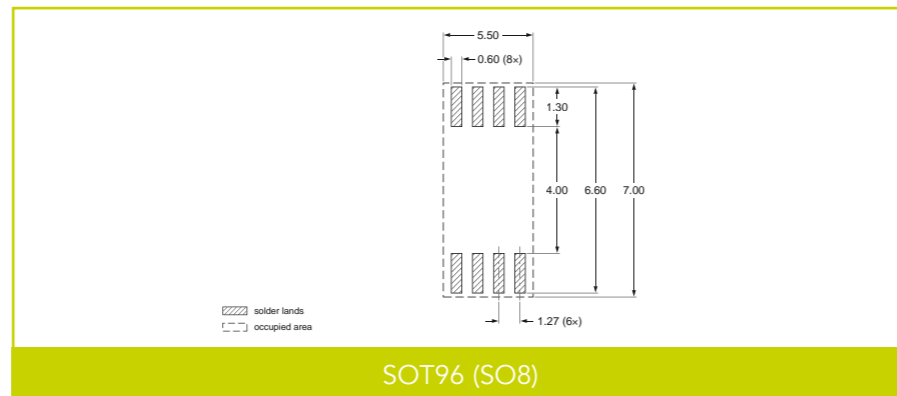
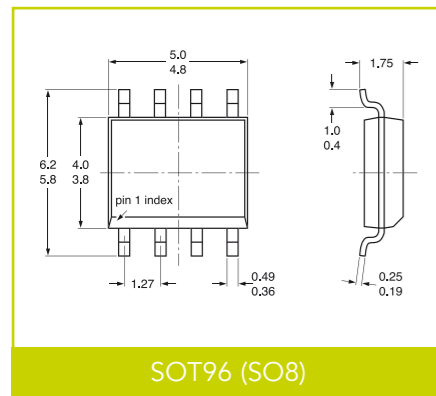
SOT666

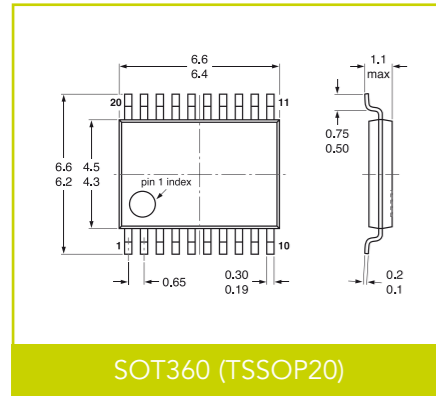


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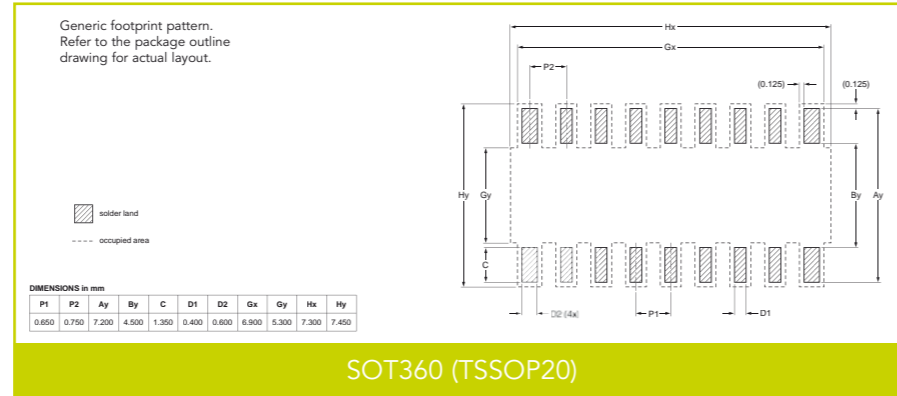


Multi-Pin SMD Packages

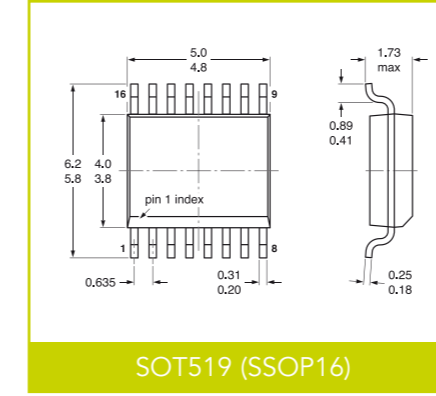




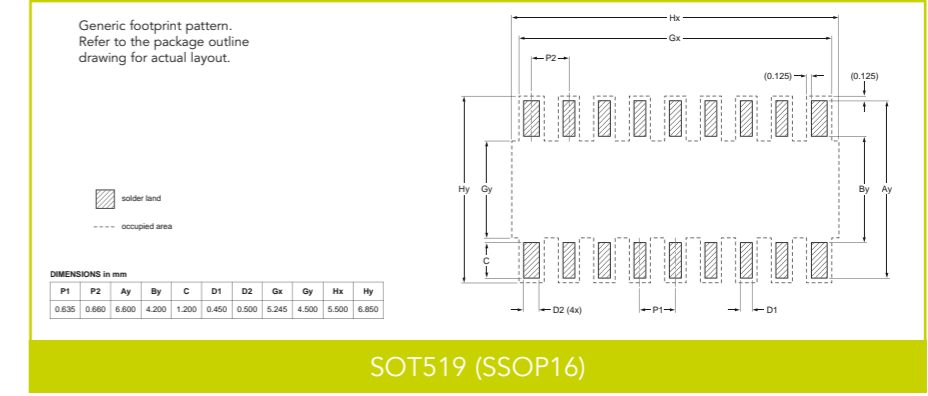
SOT360 (TSSOP20)



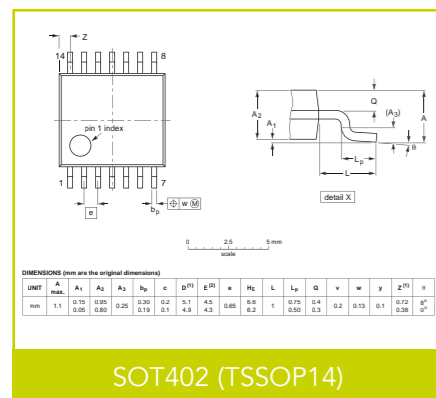
SOT360 (TSSOP20)



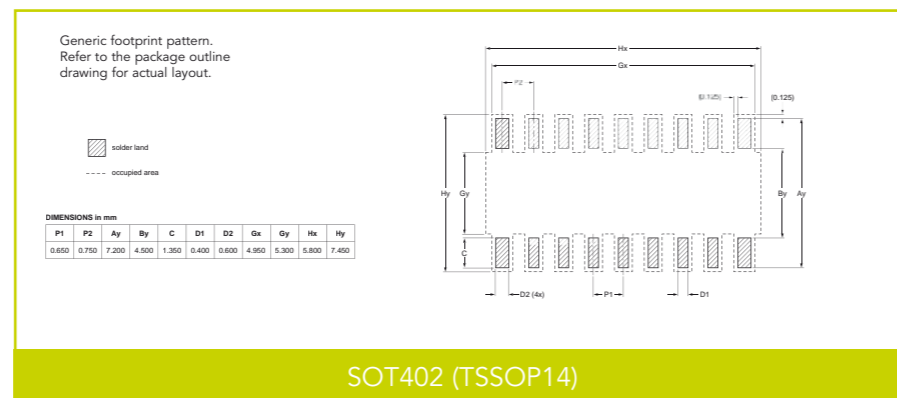
SOT519 (SSOP16)



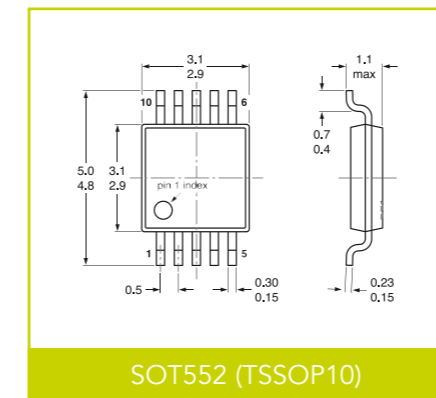
SOT519 (SSOP16)



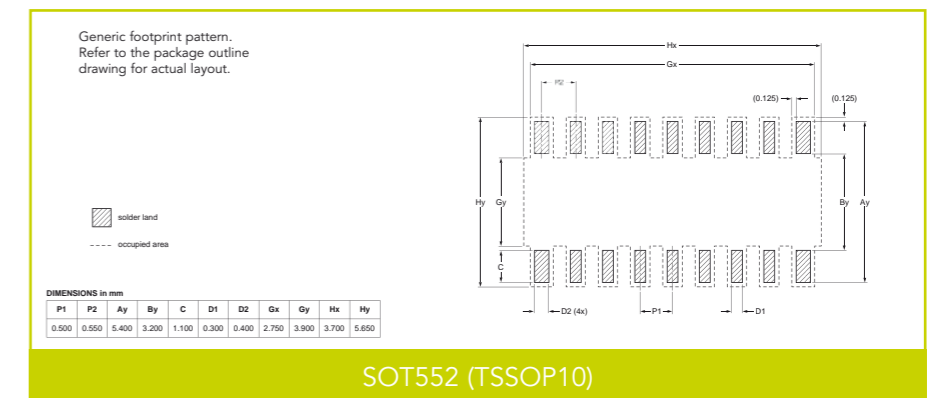
SOT402 (TSSOP14)



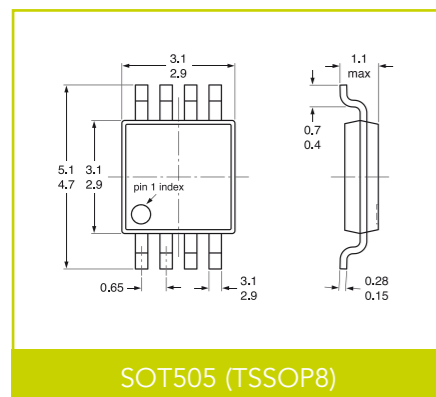
SOT402 (TSSOP14)



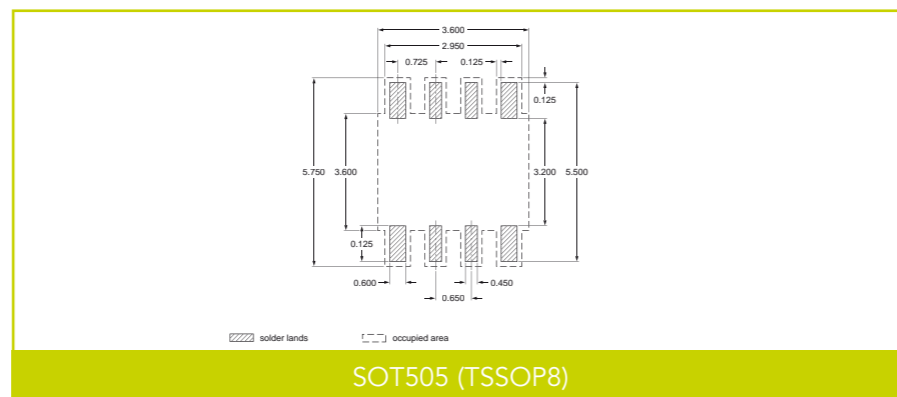
SOT552 (TSSOP10)



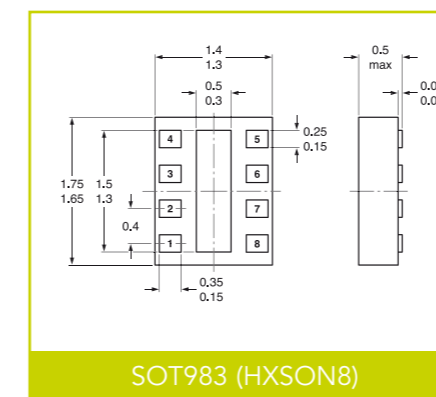
SOT552 (TSSOP10)



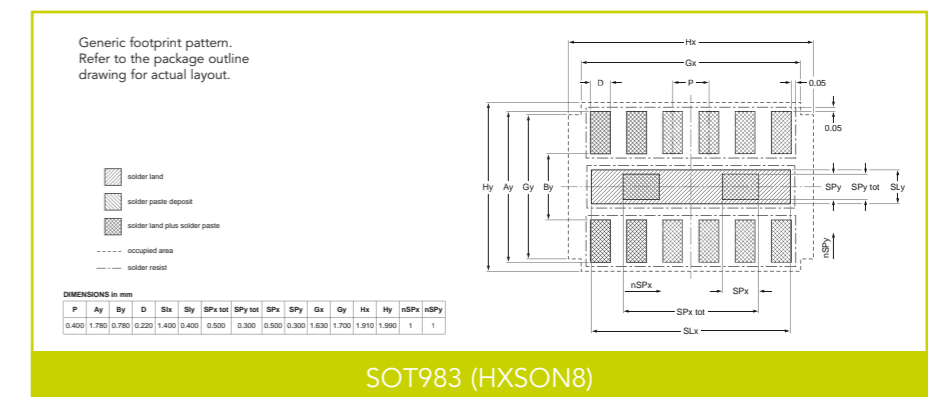
SOT505 (TSSOP8)



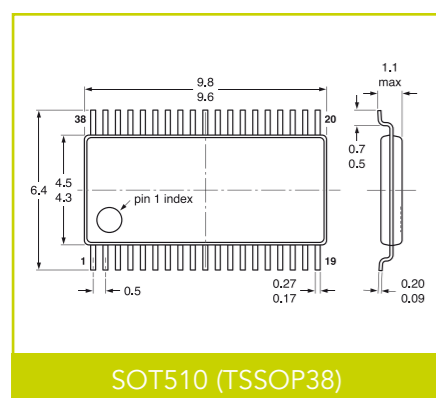
SOT505 (TSSOP8)



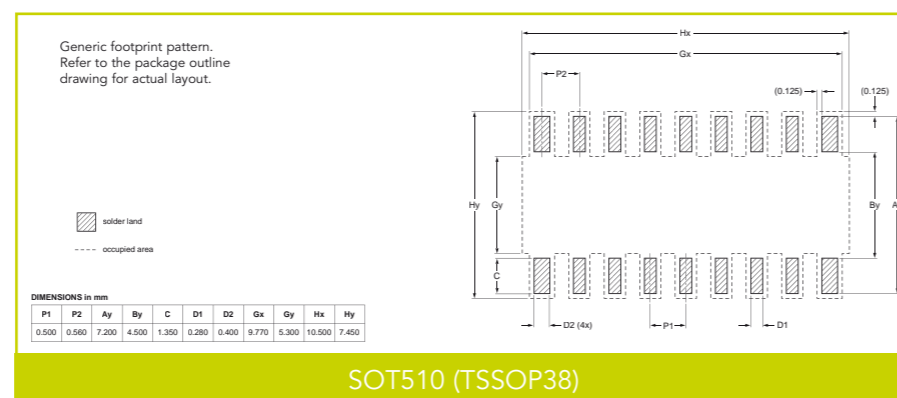
SOT983 (HXSON8)



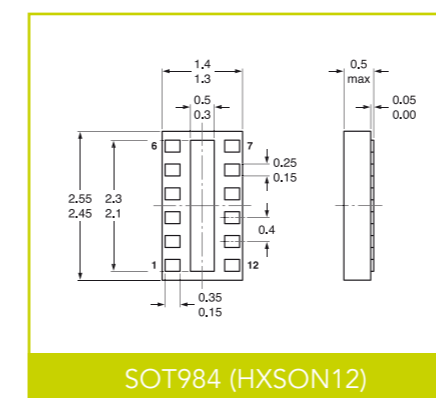
SOT983 (HXSON8)



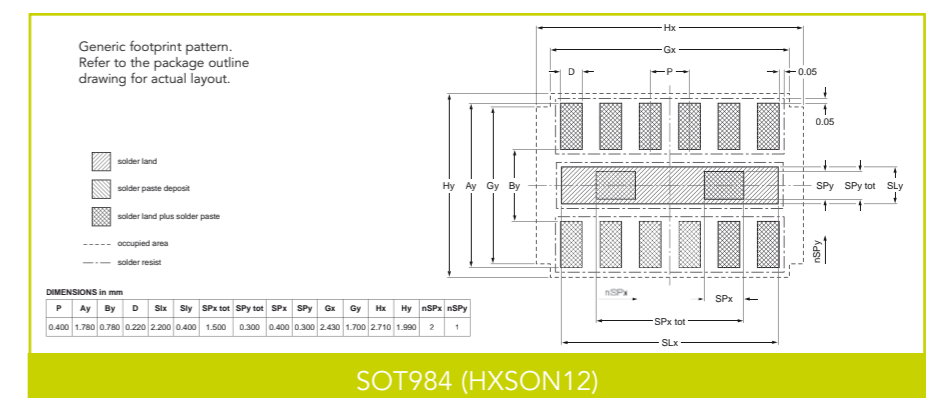
SOT510 (TSSOP38)



SOT510 (TSSOP38)

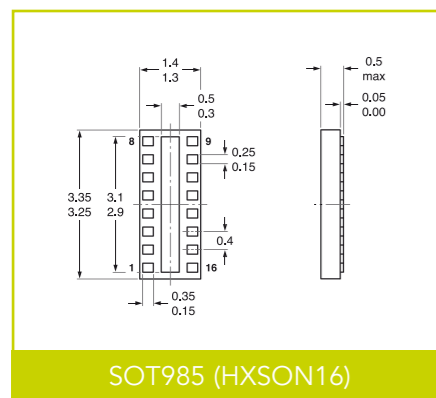


SOT984 (HXSON12)

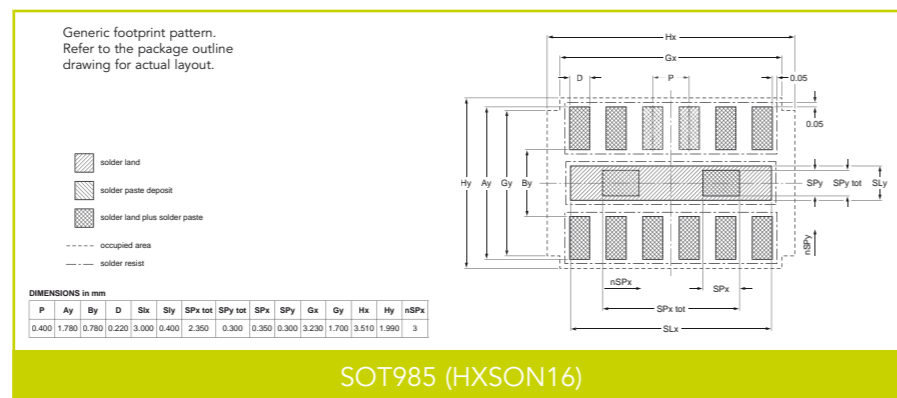


SOT984 (HXSON12)

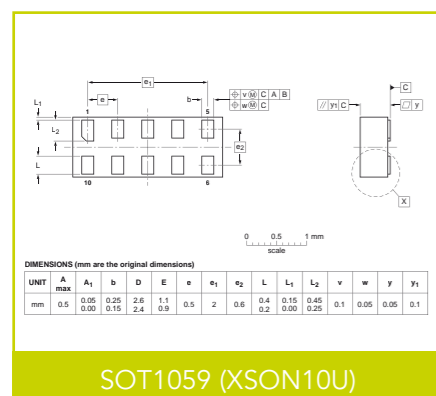
## Minimized outline drawings and reflow soldering footprint



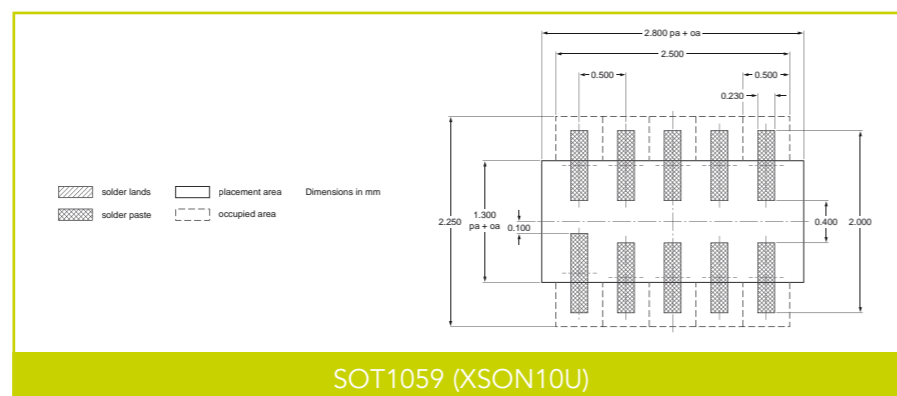
SOT985 (HXSON16)



SOT985 (HXSON16)

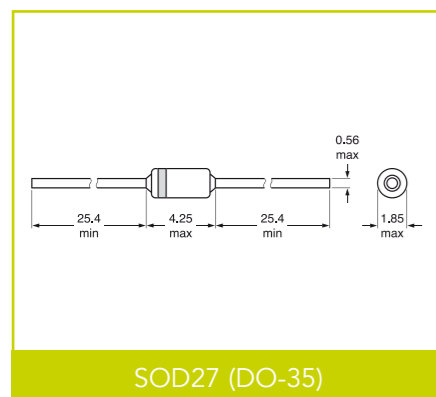


SOT1059 (XSON10U)

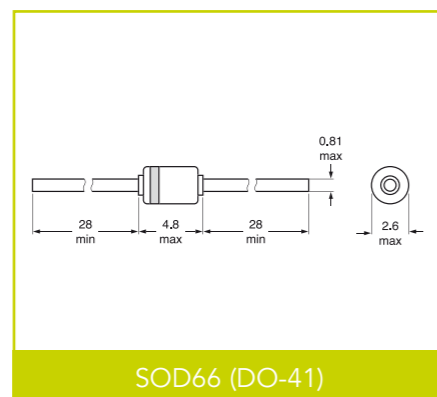


SOT1059 (XSON10U)

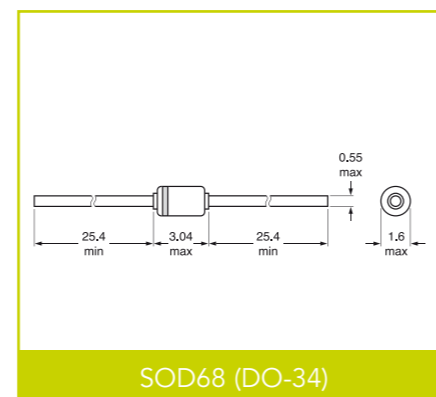
## Glass diodes



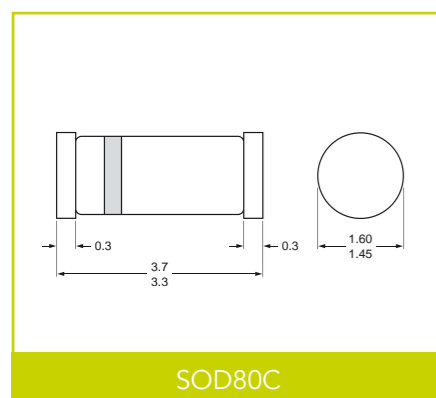
SOD27 (DO-35)



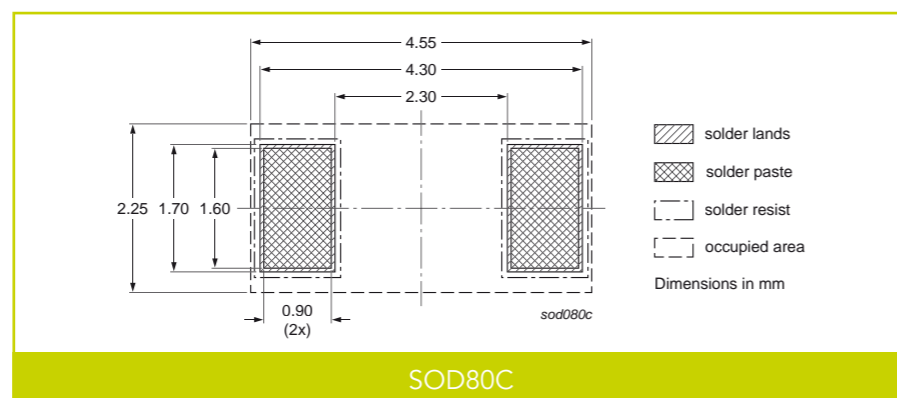
SOD66 (DO-41)



SOD68 (DO-34)



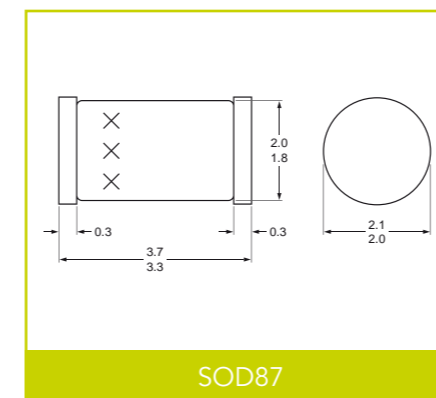
SOD80C



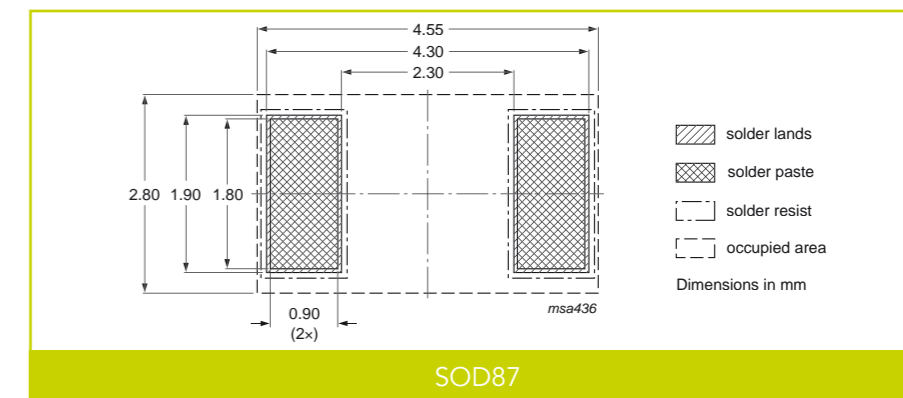
SOD80C

Dimensions in mm

## Minimized outline drawings and reflow soldering footprint



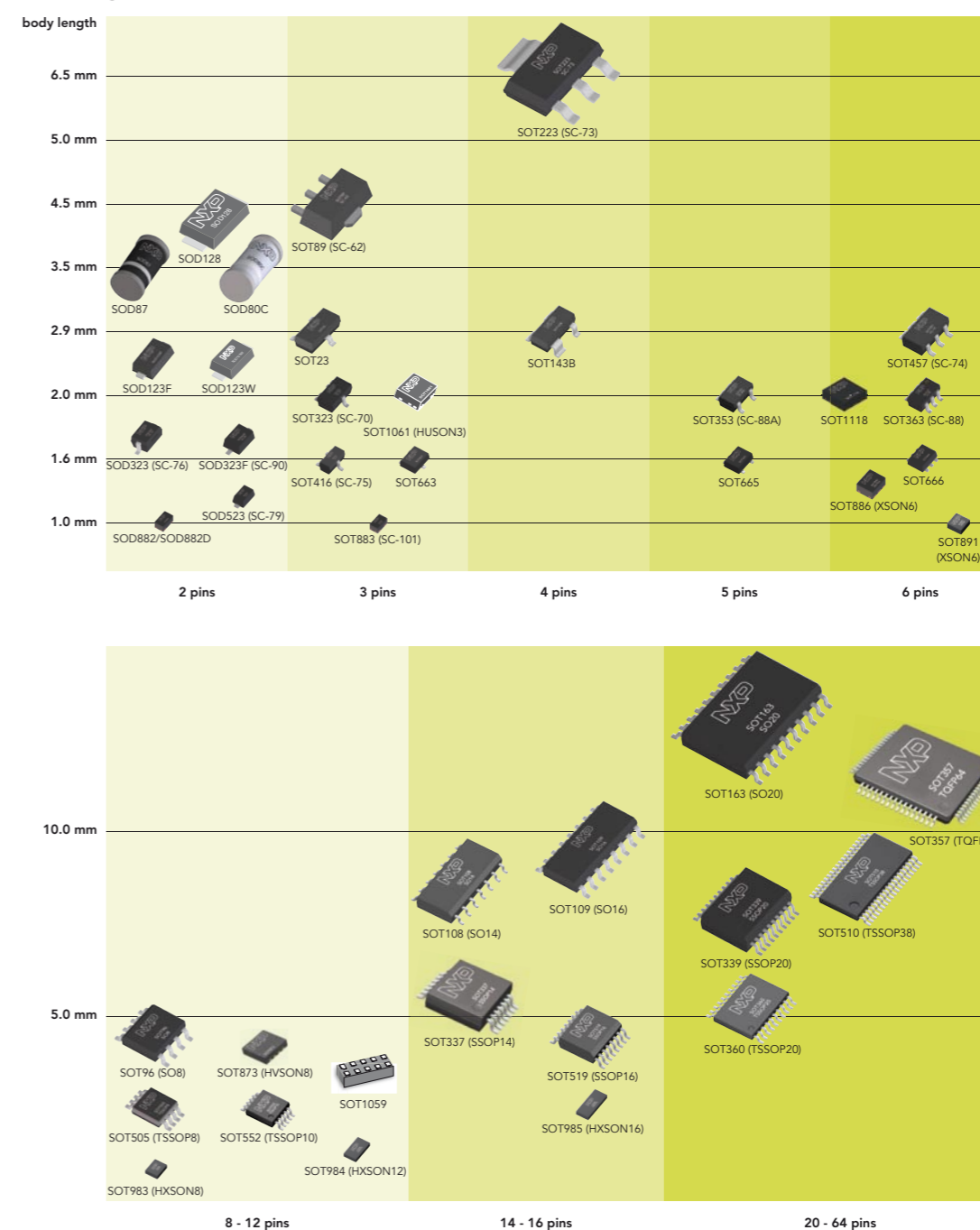
SOD87



SOD87

Dimensions in mm

## Package overview





Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
1N4148	18	2PD601ARW / SW	48	BAS70-06	8	BAV103	20	BC850CW	51
1N4531	18	2PD601ASL	48	BAS70-06W	9	BAV170	21	BC856 / A / B	48
1N47xxA series	16	2PD602AQL	48	BAS70-07	8	BAV199	21	BC856BS	49
1PS105B82	14	2PD602ARL	48	BAS70-07S	9	BAV199W	21	BC856S	49
1PS665B17	14	2PD602ASL	48	BAS70-07V	9	BAV20	20	BC856T / AT / BT	48
1PS665B82	14	BAL74	18	BAS70H	9	BAV21	20	BC856W / AW / BW	48
1PS705B20	11	BAL99	18	BAS70L	9	BAV23	20	BC857 / A / B / C	48
1PS705B82	14	BAS101	20	BAS70VV	9	BAV23A	20	BC857AM / BM / CM	48
1PS705B84	14	BAS101S	20	BAS70W	9	BAV23C	20	BC857BS	49
1PS705B85	14	BAS116	21	BAS70XY	9	BAV23S	20	BC857BV	49
1PS705B86	14	BAS116H	21	BAS716	21	BAV70	18	BC857T / AT / BT / CT	48
1PS745B23	10	BAS116T	21	BAS85	8	BAV70M	19	BC857W / AW / BW / CW	48
1PS755B45	9	BAS16	18	BAS86	8	BAV70S	19	BC858B	48
1PS765B10	9	BAS16H	19	BAT120A	12	BAV70T	19	BC858W	48
1PS765B17	14	BAS16J	19	BAT120C	12	BAV70W	19	BC859B	51
1PS765B21	9	BAS16L	19	BAT120S	12	BAV756S	19	BC859BW	51
1PS765B40	9	BAS16T	19	BAT160A	12	BAV99	18	BC859C	51
1PS765B70	9	BAS16VV	19	BAT160C	12	BAV99S	19	BC859CW	51
1PS795B10	9	BAS16VY	19	BAT160S	12	BAV99W	19	BC860B	51
1PS795B17	14	BAS16W	19	BAT17	14	BAW101	20	BC860BW	51
1PS795B30	9	BAS21	20	BAT46WH	9	BAW101S	20	BC860C	51
1PS795B31	9	BAS21AW	20	BAT46WJ	9	BAW156	21	BC860CW	51
1PS795B40	9	BAS21H	20	BAT54	8	BAW56	18	BC868 / -25	65
1PS795B70	9	BAS21J	20	BAT54A	8	BAW56M	19	BC869 / -16 / -25	65
1PS885B48	9	BAS21SW	20	BAT54AW	9	BAW56S	19	BCM61B	50
1PS885B82	14	BAS21VD	20	BAT54C	8	BAW56T	19	BCM62B	50
2N7002	77	BAS21W	20	BAT54CM	9	BAW56W	19	BCM847BS	50
2N7002BK	77	BAS28	19	BAT54CV	9	BC807 / -16 / -25 / -40	48	BCM847BV	50
2N7002BKM	77	BAS29	21	BAT54CW	9	BC807DS	49	BCM847DS	50
2N7002BK5	79	BAS31	21	BAT54H	9	BC807W / -16W / -25W / -40W	48	BCM856BS	50
2N7002BKT	77	BAS316	19	BAT54J	9	BC817 / -16 / -25 / -40	48	BCM856DS	50
2N7002BKV	79	BAS321	20	BAT54L	9	BC817DPN	49	BCM857BS	50
2N7002BKW	77	BAS32L	18	BAT54S	8	BC817DS	49	BCM857BV	50
2N7002CK	77	BAS35	21	BAT54SW	9	BC817W / -16W / -25W / -40W	48	BCM857DS	50
2N7002E	77	BAS40	8	BAT54T	9	BC846 / A / B	48	BCP51 / -10 / -16	65
2N7002F	77	BAS40-04	8	BAT54VV	9	BC846BPN	49	BCP52 / -10 / -16	65
2N7002K	77	BAS40-04W	9	BAT54W	9	BC846BS	49	BCP53 / -10 / -16	65
2N7002P	77	BAS40-05	8	BAT54XY	9	BC846DS	49	BCP54 / -10 / -16	65
2N7002PM	77	BAS40-05V	9	BAT720	10	BC846S	49	BCP55 / -10 / -16	65
2N7002PS	79	BAS40-05W	9	BAT721	8	BC846T / AT / BT	48	BCP56 / -10 / -16	65
2N7002PT	77	BAS40-06	8	BAT721A	8	BC846W / AW / BW	48	BCP68 / -25	65
2N7002PV	79	BAS40-06W	9	BAT721C	8	BC847 / A / B / C	48	BCP69 / -16 / -25	65
2N7002PW	77	BAS40-07	8	BAT721S	8	BC847AM / BM / CM	48	BCV26	51
2PA1576Q / R / S	48	BAS40-07V	9	BAT74	8	BC847BPN	49	BCV27	51
2PA1774Q / R / S	48	BAS40H	9	BAT74S	9	BC847BS	49	BCV28	51
2PA1774QM / RM / SM	48	BAS40L	9	BAT74V	9	BC847BV	49	BCV29	51
2PB1219AQ / R / S	48	BAS40W	9	BAT754	8	BC847BVN	49	BCV46	51
2PB709ARL	48	BAS40XY	9	BAT754A	8	BC847DS	49	BCV47	51
2PB709ART	48	BAS416	21	BAT754C	8	BC847T / AT / BT / CT	48	BCV48	51
2PB709ARW / SW	48	BAS45A	21	BAT754L	9	BC847W / AW / BW / CW	48	BCV49	51
2PB709ASL	48	BAS45AL	21	BAT754S	8	BC848B	48	BCV61/A/B/C	50
2PB710ARL	48	BAS516	19	BAT760	11	BC848W	48	BCV62/A/B/C	50
2PB710ASL	48	BAS521	20	BAT85	8	BC849B	51	BCV63 / B	52
2PC4081Q / R / S	48	BAS56	21	BAT854AW	9	BC849BW	51	BCV64B	52
2PC4617Q / R	48	BAS70	8	BAT854CW	9	BC849C	51	BCV65 (SOT143B)	53
2PC4617QM / RM	48	BAS70-04	8	BAT854SW	9	BC849CW	51	BCV71 / 72	48
2PD1820AR / S	48	BAS70-04W	9	BAT854W	9	BC850B	51	BCW29 / 30	48
2PD601ARL	48	BAS70-05	8	BAT86	8	BC850BW	51	BCW31 / 32 / 33	48
2PD601ART	48	BAS70-05W	9	BAT960	11	BC850C	51	BCW60B / C / D	48

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BCW61B / C / D	48	BSP32 / 33	65	BZX79 series	16	IP3254CZ12	36	IP4263CZ14	33
BCW69 / 70	48	BSP41	65	BZX84 series	16	IP3254CZ16	36	IP4264CZ8-20	38
BCW71 / 72	48	BSP43	65	BZX84J series	16	IP3254CZ8	36	IP4264CZ8-40	38
BCW89	48	BSP50	51	BZX84-y10	17	IP3337CX18/LF	36	IP4280CZ10	30
BCX17	48	BSP51	51	BZX84-y11	17	IP3338CX24/LF	36	IP4281CZ10	30
BCX18	48	BSP52	51	BZX84-y12	17	IP4025CX20/LF	32	IP4282CZ6	33
BCX19	48	BSP60	51	BZX84-y13	17	IP4027CX20/LF	32	IP4282CZ6	30
BCX51 / -10 / -16	65	BSP61	51	BZX84-y15	17	IP4041CX25/LF	36	IP4283CZ10-TB	30
BCX52 / -10 / -16	65	BSP62	51	BZX84-y16	17	IP4042CX5/LF	37	IP4283CZ10-TT	30
BCX53 / -10 / -16	65	BSP89	76	BZX84-y18	17	IP4043CX5/LF	37	IP4284CZ10-TB	31
BCX54 / -10 / -16	65	BSR14	49	BZX84-y20	17	IP4044CX8/LF	38	IP4284CZ10-TT	31
BCX55 / -10 / -16	65	BSR16	49	BZX84-y22	17	IP4047CX6/LF	32	IP4286CZ6-TBF	31
BCX56 / -10 / -16	65	BSR30 / 31	65	BZX84-y24	17	IP4048CX5/LF	32	IP4286CZ6-TTY	31
BCX70G / H / J / K	48	BSR33	65	BZX84-y27	17	IP4049CX5/LF	32	IP4302CX2/LF	37
BCX71H / J / K	48	BSR41	65	BZX84-y2V4	17	IP4051CX11/LF	38	IP4303CX4/LF	37
BF550	52	BSR42 / 43	65	BZX84-y2V7	17	IP4052CX20/LF	38	IP4305CX4/LF	37
BF570	52	BSS123	77	BZX84-y30	17	IP4053CX15/LF	36	IP4306CX2/LF	37
BF620	51	BSS192	79	BZX84-y33	17	IP4054CX15/LF	36	IP4307CX4/LF	36
BF621	51	BSS63	48	BZX84-y36	17	IP4055CX6/LF	32	IP4309CX9	31
BF622	51	BSS64	48	BZX84-y39	17	IP4056CX8	39	IP4310CX8	31
BF623	51	BSS84	79	BZX84-y3V0	17	IP4057CX10	39	IP4332CX5/LF	37
BF720	51	BSS87	77	BZX84-y3V3	17	IP4058CX8	39	IP4337CX18/LF/E	36
BF722	51	BST39	51	BZX84-y3V6	17	IP4059CX5	39	IP4338CX24/LF	36
BF723	51	BST50	51	BZX84-y3V9	17	IP4060CX16/LF	38	IP4342CX5/LF	37
BF820	51	BST51	51	BZX84-y43	17	IP4064CX8/LF/S	38	IP4343CX5/LF	37
BF820W	51	BST52	51	BZX84-y47	17	IP4065CX11	39	IP4350CX24/LF	38
BF821	51	BST60	51	BZX84-y4V3	17	IP4067CX9/LF	38	IP4352CX24/LF	38
BF822	51	BST61	51	BZX84-y4V7	17	IP4078CX6	39	IP4353CX15/LF	36
BF823	51	BST62	51	BZX84-y51	17	IP4085CX4	38	IP4355CX6/LF	32
BF824	52	BST82	77	BZX84-y56	17	IP4088CX20/LF	36	IP4358CX6	31
BF824W	52	BSV52	49	BZX84-y5V1	17	IP4110CX20/LF	32	IP4359CX4	30
BF840	52	BZA100	25	BZX84-y5V6	17	IP4125CX20/LF	32	IP4359CX4	39
BFS19	52	BZA408B	25	BZX84-y62	17	IP4142CX5/LF	37	IP4361CX4/LF	37
BFS20W	52	BZA420A	25	BZX84-y6V2	17	IP4153CX15/LF	36	IP4363CX10/LF	32
BSH103	75	BZA456A	25	BZX84-y6V8	17	IP4158CX8	39	IP4364CX8/LF	38
BSH105	75	BZA462A	25	BZX84-y75	17	IP4220CZ6	43	IP4365CX11	38
BSH108	75	BZA820A	25	BZX84-y7V5	17	IP4220CZ6	40	IP4366CX8/LF	38
BSH111	77	BZA856A	25	BZX84-y8V2	17	IP4221CZ6-S	30	IP4385CX4	38
BSH112	77	BZA856AL	25	BZX84-y9V1	17	IP4221CZ6-XS	30	IP4387CX4	38
BSH114	77	BZA862A	25	BZX884 series	16	IP4224CZ6	42	IP4769CZ14	35
BSH121	77	BZA862AL	25	ES1A	15	IP4225CZ10	40	IP4770CZ16	35
BSH201	79	BZA868A	25	ES1B	15	IP4233CZ6	30	IP4771CZ16	35
BSH202	79	BZA868AL	25	ES1D	15	IP4234CZ6	29	IP4772CZ16	35
BSH203	79	BZA956A	25	ES1G	15	IP4251CZ12-6	36	IP4773CZ14	35
BSH205	79	BZA962A	25	ES2A	15	IP4251CZ16-8	36	IP4774CZ14	35
BSH207	79	BZA968A	25	ES2B	15	IP4251CZ8-4	36	IP4776CZ38	34
BSN20	77	BZB100A	16	ES2D	15	IP4252CZ12-6	36	IP4777CZ38	34
BSP030	74	BZB784 series	16	ES2G	15	IP4252CZ16-8	36	IP4778CZ38	34
BSP100	74	BZB84 series	16	ES3A	15	IP4252CZ8-4	36	IP4790CZ38	31
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