



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

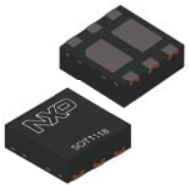
Features

- ▶ 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	Σ < 900 ppm

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Products for general applications

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

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Diodes

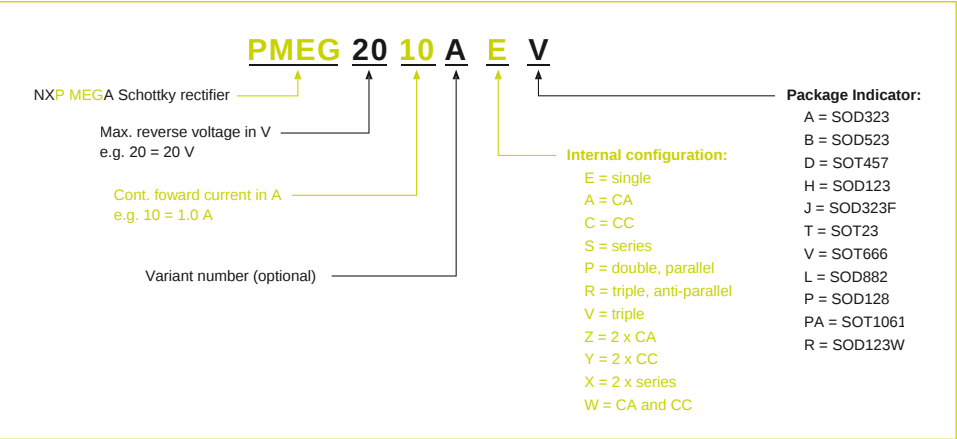
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Medium power low V_F Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

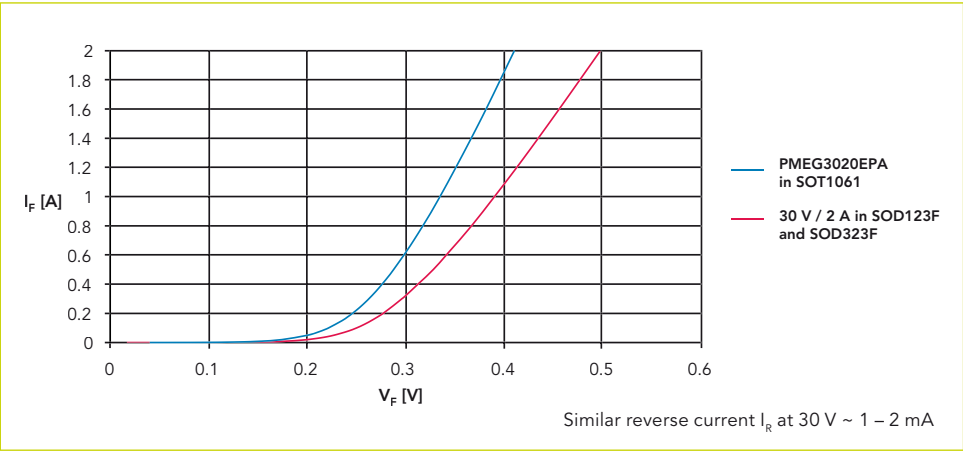
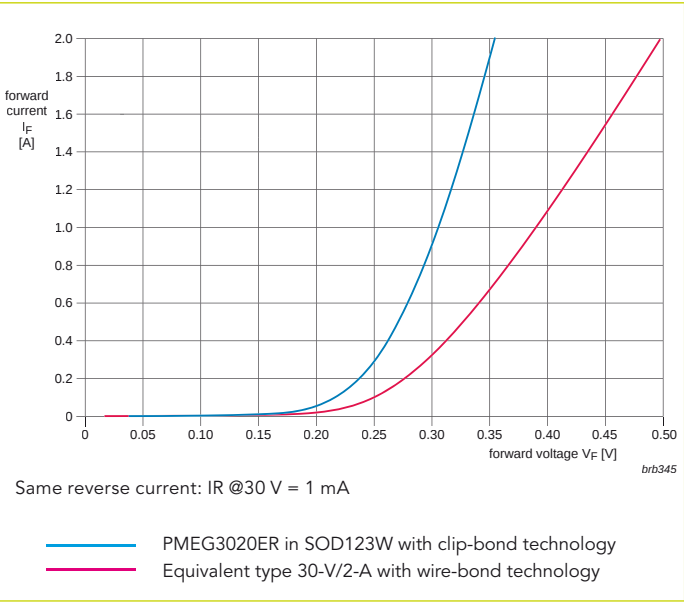
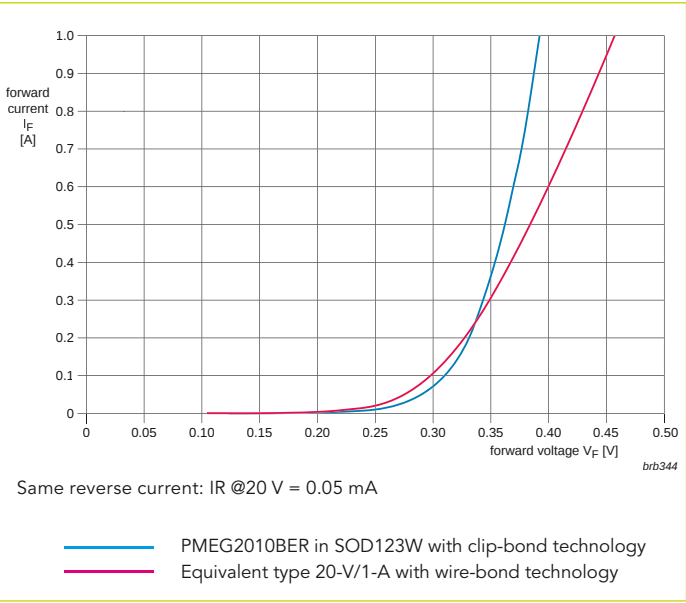
I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT1061	SOT666
									
					Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	1.6 x 1.2 x 0.55
					P_{TOT} (mW)	1500	250	1000	300
0.2	30	480	0.03	low V_F	dual isolated 				PMEG3002TV
	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			
	20	420	1.0	low V_F	dual c.c. 			PMEG2020CPA	
				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



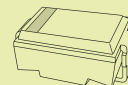
Low capacitance Schottky diodes

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)							
				P_{tot} (mW)	250	250	300	400	300	500	250
30	4	450	1	 single BAT17							
				 single 1PS76SB17				1PS76SB17		1PS79SB17	
				 triple isolated					1PS66SB17		
				 dual series PMBD353 PMBD354 ¹⁾							
	15	340	1	 single		1PS70SB82					1PS10SB82
				 triple isolated			1PS88SB82		1PS66SB82		
				 dual series		1PS70SB84					
				 dual c.c.		1PS70SB85					
				 dual c.a.		1PS70SB86					

¹⁾ diodes have matched capacitance

PN rectifiers in SMA, SMB, SMC

types in **bold** represent new products

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

General purpose switching diodes ≤ 100V

V_F max (V)	V_R max (V)	@ I_F (mA)	I_R max (mA)	@ V_R (V)	t_{rr} max (ns)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMelf)	SOT23		SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	SOD882	SOT883 (SC-101)	
																							
							Size (mm)	4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0		2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.5
							P_{tot} (mW)	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									
														BAV756S									
100	1	10	25	20	4		1N4148																
		50	500	80	4							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 (nA)	@ V_R (V)	t_{rr} max (ns)	Package	SOD27 (DO-35)	SOD80C (MiniMelf)	SOT457 (SC-74)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOD523 (SC-79)
						Size (mm)											
						P _{tot} (mW)	500	300	500	250	250	830	350	300	400	550	500
						Symbol											
150	1	100	100	150	50		BAV20										
≥ 200	1	100	100	200	150		BAV21	BAV103				BAS21H			BAS321		
					50					BAS21			BAS21W				
											BAV23						
																	
										BAV23A			BAS21AW				
										BAV23C							
										BAV23S			BAS21SW				
									BAS21VD								
															BAS21J	BAS521	
										BAS101							
										BAS101S							
300	1.1	100	150	250	50						BAW101						
														BAS101S			
																	

Controlled avalanche switching diodes

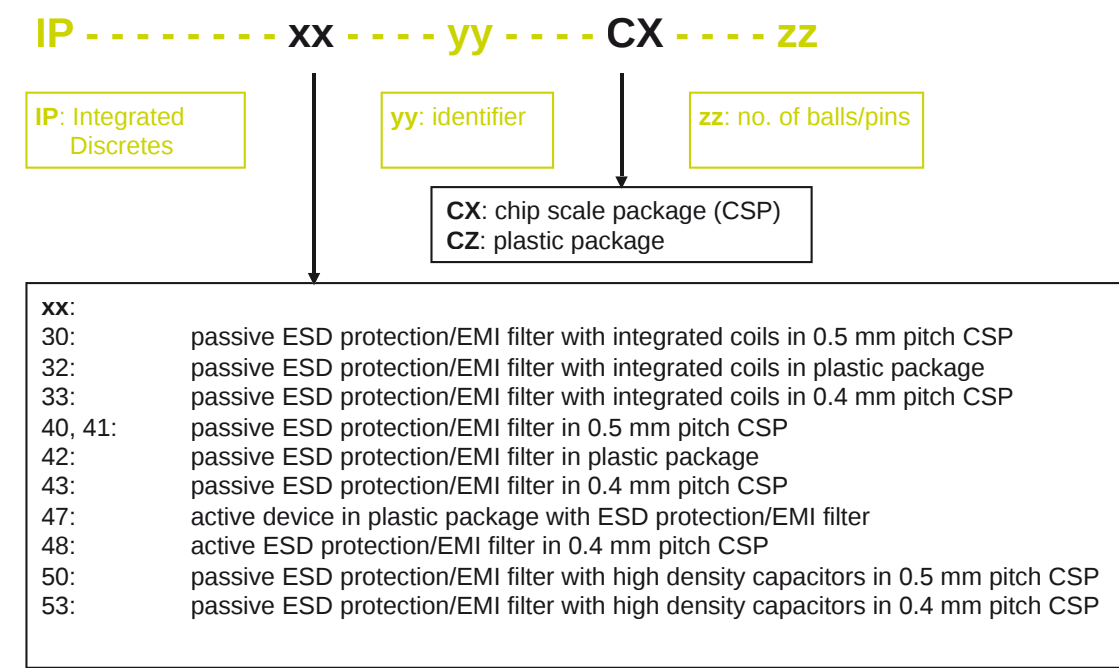
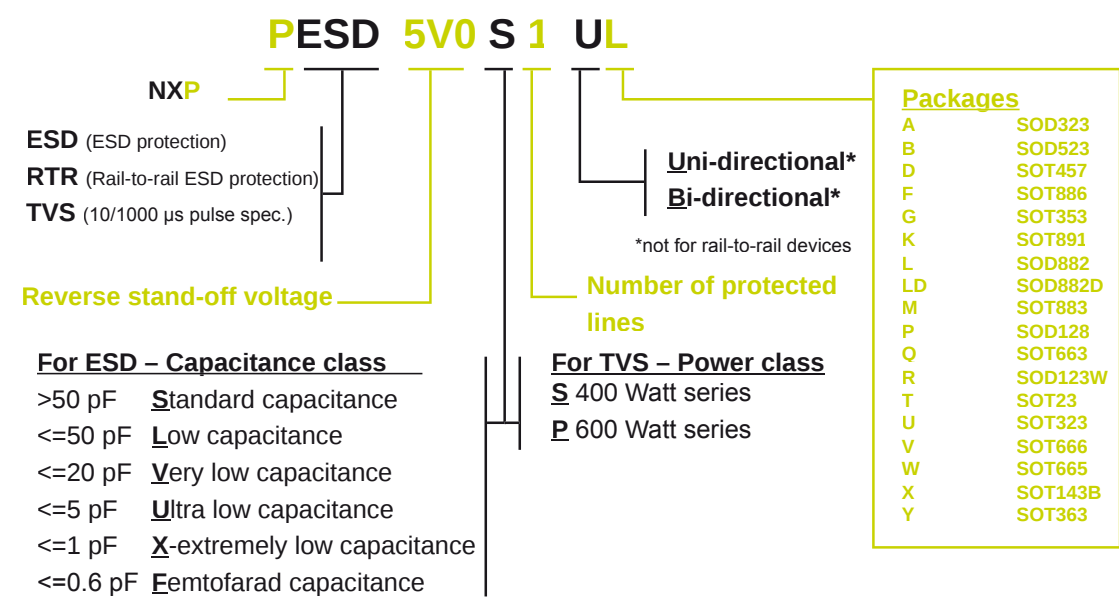
V_R max (V)	V_F max (V)	@ I_F (mA)	I_{gR} max (nA) @ V_R max	I_{FSM} max (A)	I_{PRM} max (mA)	C_j max (pF)	t_{rr} max (ns)	Package	SOT23	SOT143B
								Size (mm)		
								P _{tot} (mW)	250	250
								Symbol		
60	1	200	100	9	600	2.5	6			BAS56
90	1	200	100	10	600	35	50		BAS29	
									BAS31	
									BAS35	

Low leakage current switching diodes

types in **bold** represent new products

V_R max (V)	V_F max (V)	@ I_F (mA)	I_R max (nA) @ V_R max	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)								
					P _{tot} (mW)	300	500	250	830	250	400	170	500
					Symbol								
75	1	10	5	3					BAS116H		BAS416		BAS716
								BAS116				BAS116T	
								BAV199		BAV199W			
													
								BAW156					
								BAV170					
125	1	100	1	1.5 typ		BAS45AL	BAS45A						

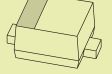
Protection and signal conditioning nomenclature



Protection and signal conditioning

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Low capacitance ESD protection devices

Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	P _{PP} ^[1] max (W)	ESD rating ^[2] max (kV)	I _R max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL		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		1.2 x 0.8 x 0.6
		5	25	30	42	26	0.1		PESD5V0L1UB		
		3.3	34								

Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	$P_{PP}^{[1]}$ max (W)	ESD rating ^[2] max (kV)	I_R max (μA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
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		PESD3V3L5UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5	16		25	20	0.025		PESD5V0L5UK		
		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

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

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

types in **bold** represent new products

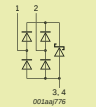
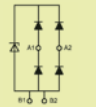
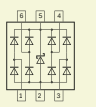
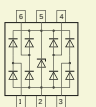
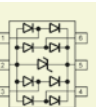
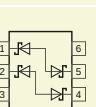
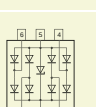
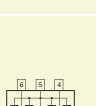
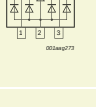
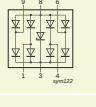
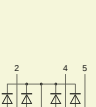
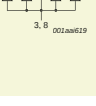
Number of protected lines		V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	ESD rating ^[2] max (kV)	I_R max (μA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
1	0	5	0.9	1	8	0.2		PESD5V0X1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	1.8	2	15	0.2		PESD5V0X1UAB		
		16	0.83	0.95	8	0.1		PESD16VX1UL	SOD882	1.0 x 0.6 x 0.5
		5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U1T	SOT23	2.9 x 1.3 x 1.0
0	1	5.5	0.4	0.55	10	0.1		PESD5V0F1BL	SOD882	1.0 x 0.6 x 0.5
		16	0.5	0.65	8	0.1		PESD16VF1BL		
		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		NUP1301		
	0	5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0
		5.5	1.8		12	0.1 (@ 3 V)		PRTR5V0U2AX		
		5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2K	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		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	-		IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	1.5	-	8	-		IP3219CZ6	SOT1082-1 (VSON6U)	2.3 x 3.5 x 0.85

^[1] 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

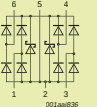
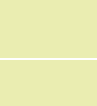
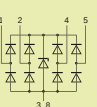
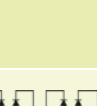
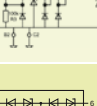
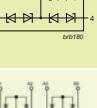
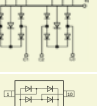
Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	ESD rating ^[1] max (kV)	I _R max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
2	0	5.5	0.7	-	8	-		IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1.3	-	15	-		IP4359CX4	CSP	0.76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

^[1] 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)

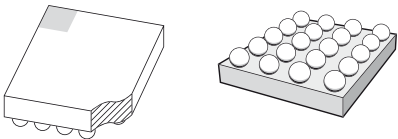
types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	ESD rating ^[1] max (kV)	I _R max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.6	-	8	-		IP4286CZ6-TBF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	0.6	-	8	-		IP4286CZ6-TTY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		5.5	0.5	-	8	-		IP4284CZ10-TB	SOT1059 (XSON10U)	1 x 2.5 x 0.5
5	0	5.5	0.5	-	8	-		IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		5.5	1.3	-	15	-		IP4358CX6	CSP	0.76 x 1.16 x 0.61
0	5	5.5	10	-	15	-		IP4310CX8	CSP	1.16 x 1.16 x 0.61
		5.5	0.5	0.65	8	0.2		PESD5V0F5BK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
8	0	5.5	1.3	-	15	-		IP4309CX9	CSP	1.16 x 1.16 x 0.61
		5.5	1	-	8	-		PRTR5V0U8S	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
11	0	5.5	0.7	-	8	-		IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1

^[1] 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



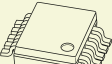
Audio interfaces

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_{line}	C_{line} (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	0.91 x 1.28 x 0.65	
		15 Ω	5000	-	Low-ohmic speaker (> ~8 Ω)	IP5311CX5/LF	5 ball CSP	0.80 x 1.16 x 0.61
		68 Ω	110	-	Single-ended or differential microphone	IP4049CX5/LF	0.91 x 1.28 x 0.65	
		470 Ω	35	-	Single-ended or differential microphone	IP4055CX6/LF	6 ball CSP	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 k Ω	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 k Ω	4000	-	Differential microphone filter with integrated biasing network for $\Sigma\Delta$ ADC converters	IP5006CX11/LF	11 ball CSP	1.41 x 1.91 x 0.65
		5 Ω / 20 Ω / 1.5 k Ω	550	-	Differential microphone filter with integrated biasing network for $\Sigma\Delta$ including coupling capacitors	IP5020CX16/LF	16 ball CSP	2.01 x 1.91 x 0.65
		0.25 Ω , 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3047CX6	6 ball CSP	1.60 x 1.15 x 0.65
		0.25 Ω , 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3048CX5	5 ball CSP	1.51 x 1.15 x 0.65
		2.2 k Ω / 1 k Ω / 0.8 k Ω	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

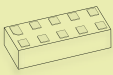
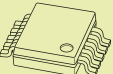
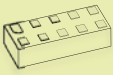
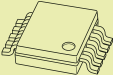
Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C_{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
Display port	4	-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB		1.0 x 2.5 x 0.5
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT		3.0 x 3.0 x 1.1
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB		1.0 x 2.5 x 0.5
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5
		-	-			ESD protection for ultra high speed interfaces	IP4286CZ6-TTY		2.0 x 1.25 x 0.95
	11	-	-	0.7	-	ESD protection for display port	IP4790CZ38		9.7 x 4.4 x 1.1
		-	-	5	100	100 Ω termination	IP4263CZ14		8.65 x 3.9 x 1.75
HDMI	2	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6		1.45 x 1.0 x 0.5
	4	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4280CZ10		3.0 x 3.0 x 1.1
		-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4281CZ10		1.0 x 2.5 x 0.5

Video interfaces

types in **bold** represent new products

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

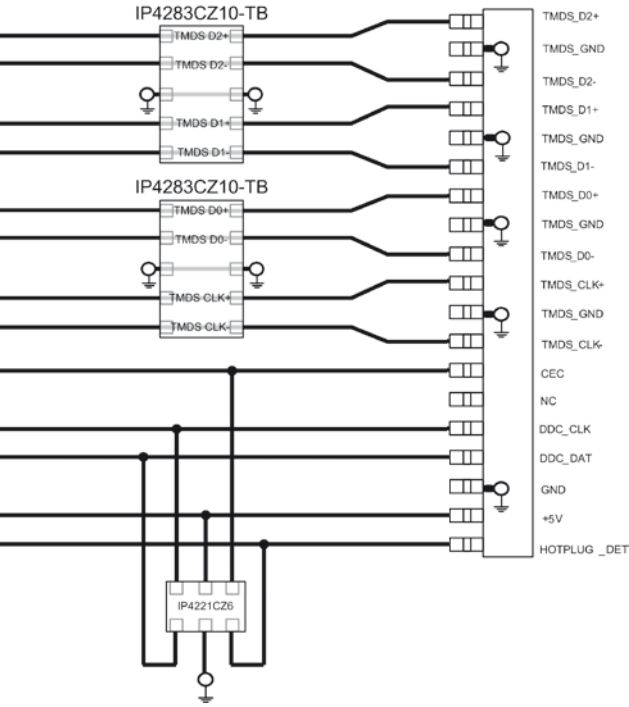
Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C _{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
VGA	7	yes	yes	5	55	H&V sync buffer, DDC level shifter	IP4770CZ16		4.9 x 3.9 x 1.73
		yes	yes	5	65	H&V sync buffer, DDC level shifter	IP4771CZ16		4.9 x 3.9 x 1.73
		yes	yes	5	10	H&V sync buffer, DDC level shifter	IP4772CZ16		4.9 x 3.9 x 1.73
		yes	no	4	10	VGA receivers and transmitters, H&V sync buffer	IP4773CZ14		6.2 x 5.3 x 2.0
		yes	no	4	10	VGA receivers and transmitters, H sync buffer	IP4774CZ14		6.2 x 5.3 x 2.0
		no	yes	4	1.3 - 2.4	VGA receivers and transmitters, DDC level shifter	IP4769CZ14		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 _{line}	C _{line} (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	15 ball CSP	2.96 x 1.32 x 0.65
		100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ12-6	SOT984 (12 pin QFN) 	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	15 ball CSP	2.96 x 1.32 x 0.65
		100 Ω	30	~40	EMI filter, ESD protection	IP4153CX15/LF		2.91 x 1.28 x 0.65
		100 Ω	60	~20	EMI filter, ESD protection	IP4353CX15/LF		2.38 x 1.05 x 0.61
	7	70 Ω	25	~40	EMI filter, ESD protection, extremely small size	IP4337CX18/LF/E	18 ball CSP	1.96 x 1.61 x 0.61
		125 Ω	25	~60	60 nH coils RLC filter	IP3337CX18/LF		2.11 x 1.81 x 0.61
	8	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	IP3338CX24/LF	24 ball CSP	2.11 x 2.11 x 0.61
		70 Ω	25	~40	EMI filter, ESD protection, extremely small size	IP4338CX24/LF		1.96 x 2.01 x 0.61
		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) 	1.7 x 1.35 x 0.5
	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 _{line}	C _{line} (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	IP4361CX4/LF		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
		-	16	~40	4x back-to-back diode with one common ground, extremely small size	IP4343CX5/LF		0.93 x 0.93 x 0.61
	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
	2	-	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 Ω / 100 Ω	10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	IP4365CX11	11 ball CSP	1.16 x 1.56 x 0.61
	3	47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	8 ball CSP	1.46 x 1.49 x 0.65
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4064CX8/LF/S		1.41 x 1.41 x 0.65
		47 Ω / 100 Ω	20	~20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	10	~20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	IP4366CX8/LF		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	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 Ω / 100 Ω	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) 	1.45 x 1.0 x 0.5
SD-card / MMC	4	47 Ω / 13 k Ω / 56 k Ω	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP	1.44 x 1.96 x 0.65
		50 Ω / 75 k Ω / 7 k Ω	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 Ω / 50 k Ω / 25 k Ω	18	~20	(Mini) SD/trans flash card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	20 ball CSP	2.54 x 1.96 x 0.65
		-	5	~24	Memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP	1.46 x 1.52 x 0.65
	6 (+3)	15 Ω / 50 k Ω / 15 k Ω	8	> 52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61
		40 Ω / 50 k Ω / 15 k Ω	20	> 52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF		2.02 x 2.01 x 0.61
		-	-	> 52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		40 Ω / 50 k Ω / 15 k Ω	-	> 52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter	IP4853CX24/LF	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

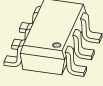
Battery and charger protection

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	IP4386CX4		0.76 x 0.76 x 0.61
		290	Breakdown 10 V	Power diode	IP4387CX4		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 Ω / 1.3 k Ω	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 Ω / 1.3 k Ω / 10 k Ω	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 Ω / 1.3 k Ω / 17 k Ω / 15 k Ω	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 Ω / 1.5 k Ω	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 Ω / 1.5 k Ω	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4158CX8		
		33 Ω	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection and impedance matching	IP4078CX6	6 ball CSP	0.91 x 1.41 x 0.65
	3+2	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	IP4359CX4	4 ball CSP	0.76 x 0.76 x 0.61
		47 Ω / 100 Ω	10	~20/6	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11	11 ball CSP	1.16 x 1.56 x 0.61
		-	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	IP4358CX6	6 ball CSP	0.76 x 1.16 x 0.41
	2	-	1.5	-	2-channel common mode filter with integrated ESD protection	IP3219CZ6	SOT1082-1 (VSON6U) 	2.3 x 3.5 x 0.85
		0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0
		-	1.0	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2X	SOT143B 	2.9 x 1.3 x 1.0
		-	1.8	-	ESD protection for up to 2 ultra high speed datalines with 12 kV ESD robustness	PRTR5V0U2AX		
		-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6	SOT886 (XSON6) 	1.45 x 1.0 x 0.5

Protection and signal conditioning

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	IP4225CZ10		2.9 x 1.5 x 1.0

USB, LVDS, SATA, LAN

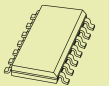
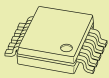
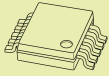
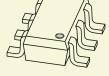
types in **bold** represent new products

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	IP4283CZ10-TB		1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT		3.0 x 3.0 x 1.1
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB		1.0 x 2.5 x 0.5
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
	5	-	0.5	-	ESD protection for up to 5 ultra high speed datalines	PESD5V0F5BK		1.0 x 1.0 x 0.5
Display port	4	0.6	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB		1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT		3.0 x 3.0 x 1.1
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB		1.0 x 2.5 x 0.5
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
		-	0.6	-	ESD protection for high speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5

Protection and signal conditioning

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	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	11	-	0.7	-	ESD protection	IP4790CZ38	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1
LVDS	10	-	5	-	100 Ω termination	IP4263CZ14	SOT108 (SO14) 	8.65 x 3.9 x 1.75
SATA	2	-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TBF		
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	4	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB	SOT1059 (XSON10U) 	1.0 x 2.5 x 0.5
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
	4	55	5	-	ESD protection and termination for IEEE1394	IP4224CZ6	SOT457 (SC-74) 	2.9 x 1.5 x 1.0

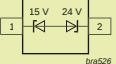
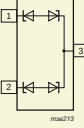
USB, LVDS, SATA, LAN

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	IP4233CZ6	SOT363 (SC-88) 	2.0 x 1.25 x 0.95

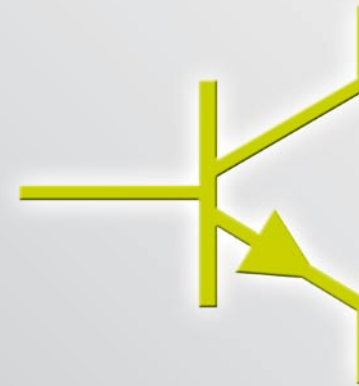
For ultra high speed single line ESD protection please refer to pages 29 - 31

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 ^[2] max (kV)	I_T max [μA] @ V_{RWM}	Configuration	Type	Package	Size (mm)
1	15 (diode 1) 24 (diode 2)	13	17	160	23	0.05		PESD1LIN	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
2	24	11	17	200	23	0.05		PESD1CAN		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

^[1] 8/20 μ s surge pulse acc. to IEC 61000-4-5

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



Small-signal transistors

General purpose bipolar transistors

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Single transistors	48
Double transistors	49
Single and double switching transistors	49
Matched pair transistors	50
High voltage transistors	51
Low noise transistors	51
Darlington transistors	51
Medium frequency transistors	52
Schmitt trigger	52
MOSFET driver	53

Resistor-equipped transistors (RETs)

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RETs 100 mA single	54
RETs 100 mA double	55
RETs 500 mA	55
Low V_{CEsat} (BISS) RETs	55

Low V_{CEsat} (BISS) transistors

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Low V_{CEsat} (BISS) transistors single NPN	56
Low V_{CEsat} (BISS) transistors single PNP	58
Low V_{CEsat} (BISS) transistors double	60
Low V_{CEsat} (BISS) load switches	61
High voltage low V_{CEsat} (BISS) transistors	62
Low V_{CEsat} modules - Schottky diode / (BISS) transistor	62
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Medium power transistors

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Medium power low V_{CEsat} (BISS) transistors NPN	64
Medium power low V_{CEsat} (BISS) transistors PNP	65
Medium power general purpose transistors	65

Medium frequency transistors

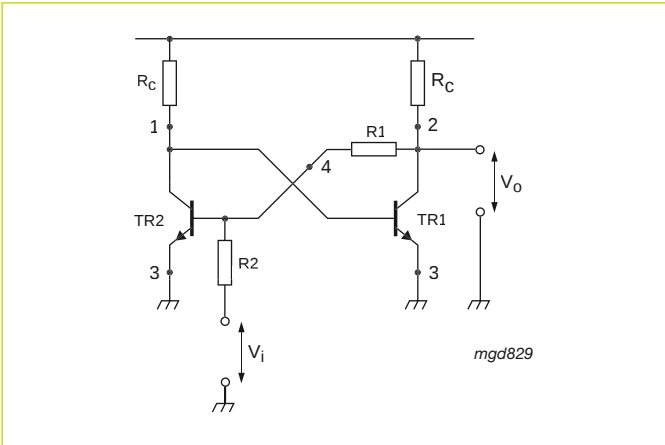
Package						SOT23	SOT323 (SC-70)
							
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95
P _{tot} (mW)						250	200
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T typ (MHz)		
NPN	15	100	40	-	500	BF570	
	20	25	40	85	> 275	BFS20	BFS20W
		30	65	225	260	BFS19	
PNP	40	25	67	220	380	BF840	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

Schmitt trigger

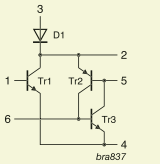
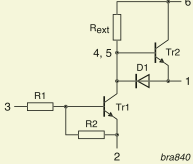
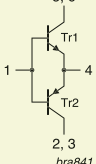
Package							SOT143B
							
Size (mm)							2.9 x 1.3 x 1.0
P _{tot} (mW)							250
Polarity	V _{CEO} (V) TR1	V _{CEO} (V) TR2	I _C (mA)	h _{FE} min	h _{FE} max	V _{CEsat} typ (mV)	
NPN	30	6	100	110	800	250	BCV63 / B
PNP	30	6	100	220	475	250	BCV64B

- 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

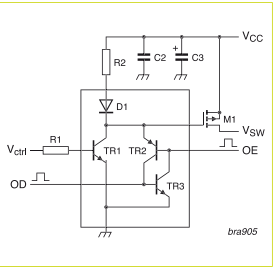


MOSFET driver

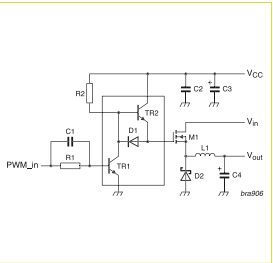
Package						SOT457 (SC-74)		
								
Size (mm)						2.9 x 1.5 x 1.0		
P _{tot} (mW)						400	400	580
Configuration								
Contains		I _C (A)	I _{CM} (A)			R1 = R2 (kΩ)		
						PMD9050D	-	PMD9010D
General purpose transistors		0.1	0.2				2.2	PMD9001D
							4.7	PMD9002D
							10	PMD9003D
Switching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

- Key features
- ▶ Three different configurations
 - ▶ Types available with standard, switching and low V_{CEsat} (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



Low V_{CEsat} (BISS) transistors single NPN

types in **bold** represent new products

Package											SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)		SOT23	SOT1061	SOT323 (SC-70)	SOT363 (SC-88)	SOT416 (SC-75)	SOT666	SOT883 (SC-101)
Size (mm)																					
P _{tot} (mW)											1700	1650	750		480	1400	3				

Low V_{CEsat} (BISS) transistors

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 _{tot} (mW)				1700	1300	250
Polarity	V _{CESM} ⁽¹⁾	V _{CEO} (V)	I _C (A)			
NPN	-	150	1	PBHV8115Z		PBHV8115T
			2	PBHV8215Z		
	500	400	0.5	PBHV8540Z		PBHV8540T
			1	PBHV8140Z		
		500	0.15			PMBTA45
			0.4	PBHV8550Z		
PNP	-	150	1	PBHV9115Z	PBHV9115X	PBHV9115T
			2	PBHV9215Z		
	500	400	0.25	PBHV9040Z		PBHV9040T
			0.5	PBHV9540Z		
		500	0.15			PBHV9050T
			0.25	PBHV9050Z		

¹⁾ Collector-emitter peak voltage

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_{tot} (mW)						500	250
Transistor			Schottky rectifier			Configuration	
V_{CEO} max (V)	I_C max (A)	V_{CEsat} max (mV)	I_F max (A)	V_R max (V)	V_F max (mV)		
15	0.5	250	0.5	20	390		PMEM1505NG
40	1.0	210	1	20	550		PMEM4010ND
	2.0	400	1	20	550		PMEM4020ND
40	2.0	400	1	40	640		PMEM4020AND
	2.0	400	1	40	640		
15	0.5	250	0.5	20	390		PMEM1505PG
40	1.0	410	1	20	550		PMEM4010PD
	2.0	530	1	20	550		PMEM4020PD
40	2.0	530	1	40	640		PMEM4020APD
	2.0	530	1	40	640		

Key features

- ▶ Combination of low V_F (MEGA) Schottky rectifier and low V_{CEsat} (BISS) transistor in one package
- ▶ High forward current capability
- ▶ Low power dissipation

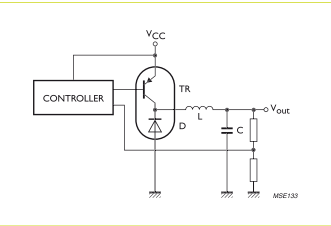
Key benefits

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

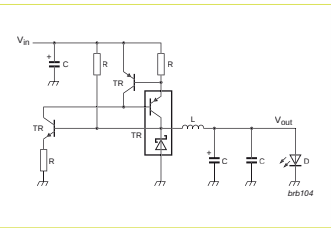
Key applications

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

Step-down DC/DC converter



Power LED driver



Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) RETs

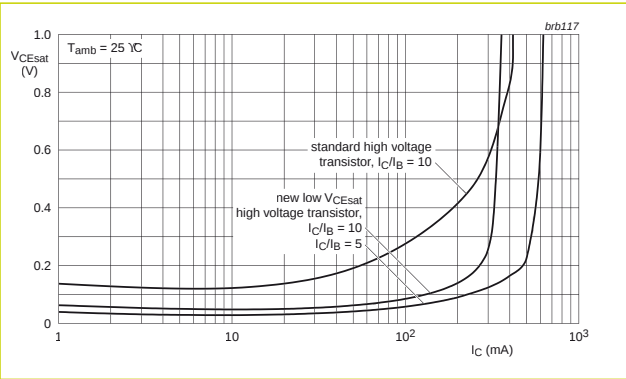
Package					SOT23	
						
Size (mm)					2.9 x 1.3 x 1.0	
P _{tot} (mW)					250	
V _{CEO} (V)	I _C (mA)		R1 (kΩ)	R2 (kΩ)	NPN	PNP
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET
			2.2	2.2	PBRN123ET	PBRP123ET
		R1 ≠ R2	1	10	PBRN113ZT	PBRP113ZT
			2.2	10	PBRN123YT	PBRP123YT

Advantages of low V_{CEsat} (BISS) technology

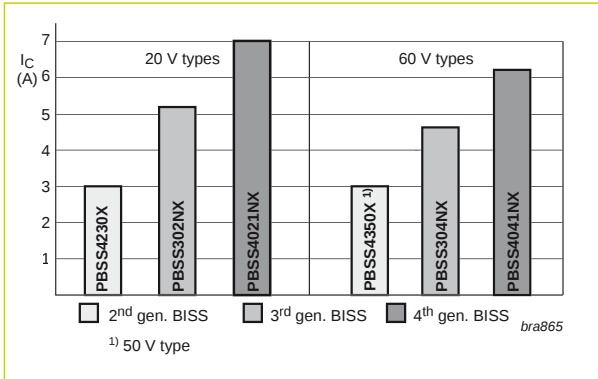
Our BISS (Breakthrough In Small-Signal) transistors show lowest V_{CEsat} values due to an innovative mesh-emitter technology and further technology improvement.

High voltage low V_{CEsat} (BISS)

V_{CEsat} improvement leads to higher I_C capability

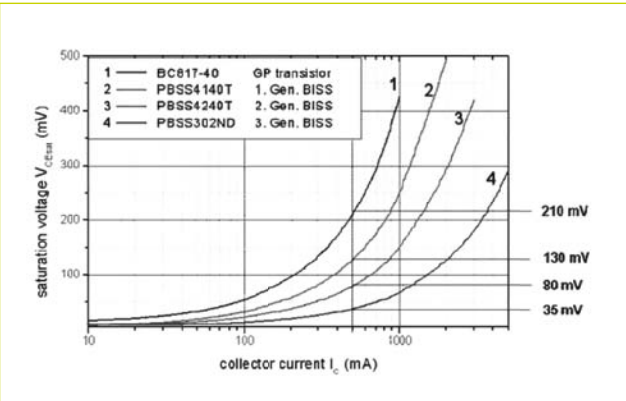


Improved collector current capabilities

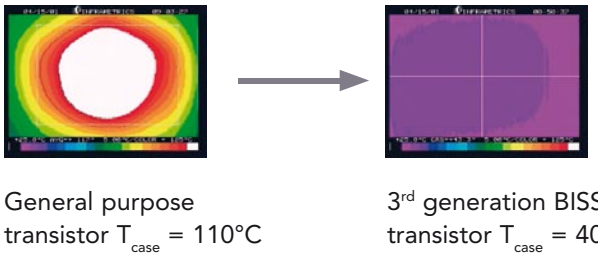


Saturation voltage:

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



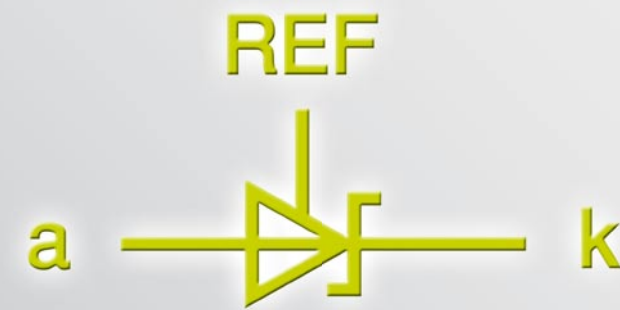
65 % heat reduction by BISS transistors



General purpose transistor $T_{case} = 110^{\circ}\text{C}$

3rd generation BISS transistor $T_{case} = 40^{\circ}\text{C}$

Temperature profile of device surface (T_{case}). Comparison of a general purpose transistor and a 3rd 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

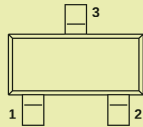
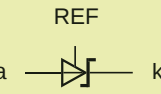
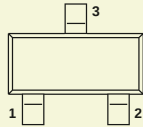
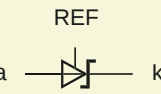
Adjustable shunt voltage regulator IC

types in **bold** represent new products

Package				SOT23	
					
Size (mm)				2.9 x 1.3 x 1.0	
P _{tot} (mW)				580	
Pinning configuration				normal pinning ¹⁾	mirrored pinning ¹⁾
V _{KA} (V)	I _K (mA)	V _{ref}		T _{amb} (°C)	
20	80	1.24 V	1.5%	0 to 70	TLVH431CDBZR
				-40 to 85	TLVH431IDBZR
				-40 to 125	TLVH431QDBZR
			1%		TLVH431MQDBZR
				0 to 70	TLVH431ACDBZR
				-40 to 85	TLVH431AIDBZR
				-40 to 125	TLVH431AQDBZR
		0.5%			TLVH431AMQDBZR
				0 to 70	TLVH431BCDBZR
				-40 to 85	TLVH431BIDBZR
				-40 to 125	TLVH431BQDBZR
			2%		TLVH431BMQDBZR
36	100	2.495 V		0 to 70	TL431CDBZR
				-40 to 85	TL431IDBZR
				-40 to 125	TL431QDBZR
			1%		TL431MSDT ¹⁾
					TL431MSDT ¹⁾
				0 to 70	TL431ACDBZR
				-40 to 85	TL431AIDBZR
				-40 to 125	TL431AQDBZR
		0.5%			TL431ASDT ¹⁾
					TL431ASDT ¹⁾
				0 to 70	TL431BCDBZR
				-40 to 85	TL431BIDBZR
				-40 to 125	TL431BQDBZR
			TL431BMSDT ¹⁾		TL431BMSDT ¹⁾

¹⁾ optimized for use with dedicated capacitive load

* Normal pinning vs. mirrored pinning

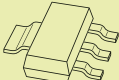
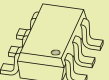
	Pin	Symbol	Description	Simplified outline	Grafic symbol
normal pinning	1	k	cathode		
	2	REF	reference		
	3	a	anode		
mirrored pinning	1	REF	reference		
	2	k	cathode		
	3	a	anode		

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 _{tot} (mW)				1700	
				T _{amb} (°C)	
				0 to 125	-40 to 125
V _{max} (V)	I _{max} (A)	V _{out} (V)	V _{tolerance}		
20	1	1.25 adj	1%	NX1117CADJZ	NX1117IADJZ
		1.2		NX1117C12Z	NX1117I12Z
		1.5		NX1117C15Z	NX1117I15Z
		1.8		NX1117C18Z	NX1117I18Z
		1.9		NX1117C19Z	NX1117I19Z
		2.0		NX1117C20Z	NX1117I20Z
		2.5		NX1117C25Z	NX1117I25Z
		2.85		NX1117C285Z	NX1117I285Z
		3.3		NX1117C33Z	NX1117I33Z
		5.0		NX1117C50Z	NX1117I50Z
		12.0		NX1117C120Z	NX1117I120Z

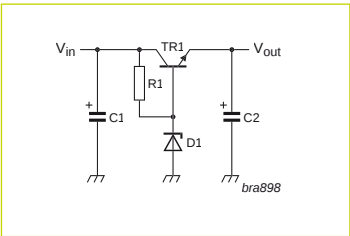
Discrete voltage regulator

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

Key features

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



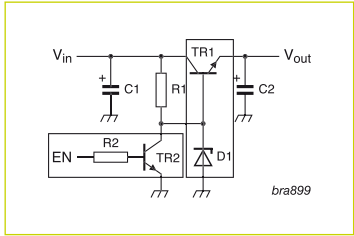
Key benefits

- ▶ 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 _{tot} (mW)	335						
Type	PSSI2021SAY						
Description	maximum supply voltage	maximum supply current	typical stabilized output current	minimum stabilized output current	maximum stabilized output current	typical load stability of stabilized output current	typical output current change over ambient temperature
Parameter	V _S max (V)	I _S max (mA)	I _{out} typ (μA)	I _{out} min (mA)	I _{out} max (mA)	ΔI _{out} /I _{out} typ (%)	ΔI _{out} /I _{out} typ (°C/K)
Condition		@ V _S = 12 V; I _{out} = 15 μA; V _{out} = 1 V to 10 V	@ V _S = 12 V; V _{out} = 1 V to 10 V; R _{ext} = open			@ V _S = 12 V; V _{out} = 1 V to 10 V	@ V _S = 12 V; V _{out} = 1 V; T _{amb} = -55 °C to 150 °C
Value	75>	2.2	15	0.015	50	0.5	0.15

Key features

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

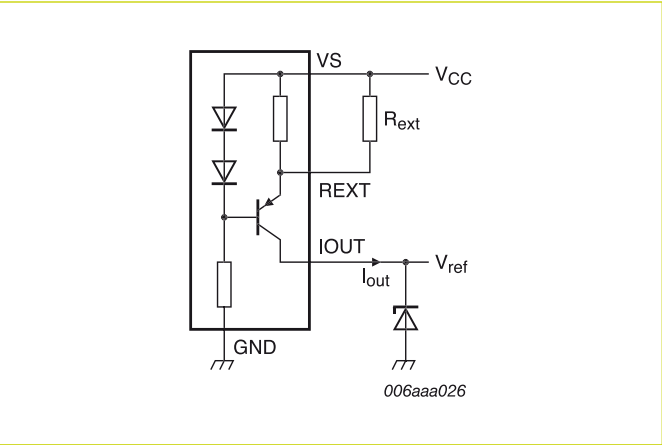
Key benefits

- ▶ 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

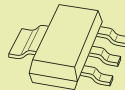
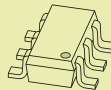
Small-signal MOSFETs72

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 MOSFETs78

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

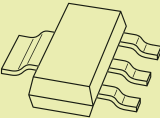
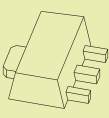
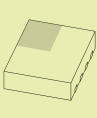
Small-signal MOSFETs single (N-channel) < 50V

Package													SOT223 (SC-73)		TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
																				
Size (mm)													6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 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 _{tot} (mW)													1700		600	250	300	200	150	250
V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS(th)} min(V)	V _{GS(th)} max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection	R _{DSon} typ (mΩ) @ V _{gs} =											
									10 V	4.5 V	2.5 V	1.8 V								
12	8	5.7	0.4	-	23	67	10.1	-	-	28	-	39			PMN28UN					
20	8	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 ¹⁾				
		3.76	0.65	-	35	84	5.4	-	-	56	77	-				PMV56XN ¹⁾				
		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	PMR2			

¹⁾ enhanced thermal capability
²⁾ max values

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

types in **bold** represent new products

Package													SOT223 (SC-73)		SOT89 (SC-62)	SOT873	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
																				
Size (mm)													6.5 x 3.5 x 1.65		4.5 x 2.5 x 1.5	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 _{tot} (mW)													1700		1300	250	250	200	150	250
V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS(th)} min(V)	V _{GS(th)} max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection	R _{DS(on)} typ (mΩ) @ V _{gs} =											
									10 V	4.5 V	2.5 V	1.8 V								
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 ³⁾	-	-					BSN20			
55	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100						BSH121		
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100					BSH111			
	13	4.9	1	2	-	-	-	2KV	-	30	-	-	PHT11N06LT							
		3.5	1	2	-	-	-	2KV	-	65	-	-	PHT8N06LT							
		2.5	1	2	-	-	-	2KV	-	120	-	-	PHT6N06LT							
		2.5	2	4	-	-	-	2KV	120	-	-	-	PHT6N06T							
60	15	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	-	-					2N7002CK			
		0.3	1	2.5	tbd	tbd	tbd	-	2000 ²⁾	3000 ²⁾	-	-					2N7002P	2N7002PW	2N7002PT	2N7002PM
		0.3	1	2.5	tbd	tbd	tbd	2KV	1600 ²⁾	3000 ²⁾	-	-					2N7002BK	2N7002BKW	2N7002BKT	2N7002BKM
		0.57	1	-	6	7.2	-	-	780	1100	-	-						PMF780SN		
		0.55	1	3	6	7.2	1.05	-	780	1100	-	-							PMR780SN	
		1.22	1	3	6	7.2	1.05	-	760	1100	-	-								PMZ760SN
		0.25	0.8	3	-	-	-	-	2500	-	-	-					PMBF170			
	30	0.385	1	2.5	2.5	11	0.69	-	780	1200	-	-					2N7002E			
		0.475	1	2.5	2.5	11	0.69	-	780	1200	-	-					2N7002F			
		0.3	1	2.5	2.5	11	-	-	2800	3800	-	-					2N7002			
100	16	3.5	1	2	14	73	-	-	-	200	-	-	PHT4NQ10LT							
	20	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							
	30	1.9	2	4	10.5	12.5	7	-	213	-	-	-					PMV213SN ¹⁾			
200	20	0.55	0.4	2	10	45	-	-	1700	-	3000	-	BSP122							
		0.4	0.8	2.8	6	49	-	-	1600	-	-	-			BSS87					
		8.8	2	4	18	26	13.3	-	250	-	-	-				PML260SN				
220	20	7.3	2	4	20.8	24.3	13.2	-	320	-	-	-				PML340SN				
240	20	0.375	0.8	2	6	47	-	-	2800	7500 ²⁾	-	-	BSP89							
250	20	0.35	0.8	2	6	47	-	-	2800	-	-	-	BSP126							
300	20	0.35	0.8	2	6	46	-	-	3700	-	4800	-	BSP130							

¹⁾ enhanced thermal capability
²⁾ max values
³⁾ @ V_{gs} = 5 V

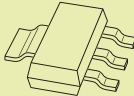
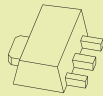
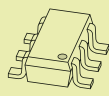
Small-signal MOSFETs dual (N-channel)

types in **bold** represent new products

Package														SOT363 (SC-88)	SOT666 (SC-88)
Size (mm)															
P _{tot} (mW)														300	300
V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS} (th) min(V)	V _{GS} (th) max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection	R _{DSon} typ (mΩ) @ V _{gs} =						
									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 ²⁾	3000 ²⁾	-	-		2N7002PS	2N7002PV
		0.3	1	2.5	tbd	tbd	tbd	2KV	1600 ²⁾	3000 ²⁾	-	-		2N7002BKS	2N7002BKV
		0.49	1	-	6	7.2	1.05	-	780	1100	-	-		PMGD780SN	

¹⁾ enhanced thermal capability ²⁾ max values

Small-signal MOSFETs single (P-channel)

Package														SOT223 (SC-73)	SOT89 (SC-62)	TSOP6 SOT457 (SC-74)	SOT23
Size (mm)																	
P _{tot} (mW)														1700	1300	600	250
V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS} (th) min(V)	V _{GS} (th) max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection	R _{DSon} typ (mΩ) @ V _{gs} =								
									10 V	4.5 V	2.5 V	1.8 V					
12	8	1.52	0.4	-	6.5	65	-	-	-	80	-	140				BSH207	
		0.75	0.4	-	6.5	65	-	-	-	180	-	420					BSH205 ¹⁾
20	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 ¹⁾
30	8	0.47	0.4	-	6.5	65	-	-	-	660	-	1100					BSH203
	20	3	1	2.8	20	50	-	-	220	330	-	-		BSP250			
		0.52	1	-	6.5	65	-	-	630	890	-	-					BSH202
50	20	0.13	0.8	2	3	7	-	-	6000	-	-	-					BSS84
60	20	0.3	1	-	6.5	65	-	-	2100	2700	-	-					BSH201
200	20	0.225	0.8	2.8	5	20	-	-	10000	-	-	-		BSP220			
240	20	0.2	0.8	2.8	5	20	-	-	10000	-	-	-			BSS192		
250	20	0.225	0.8	2.8	5	10	-	-	10000	-	-	-		BSP225			
300	20	0.21	1.95	2.8	5	15	-	-	17000 ²⁾	-	-	-		BSP230			

¹⁾ enhanced thermal capability ²⁾ max values

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 _{tot} (mW)														>500			
Configuration	V _{DS} (V)	V _{GS} (V)	I _D (A)	V _{GS} (th) min(V)	V _{GS} (th) max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _G typ (nC)	ESD protection	I _F (A)	V _R (V)	V _F typ. (mA)		R _{DSon} typ (mΩ) @ V _{gs} =			
														4.5 V	2.5 V	1.8 V	
dual	20	8	3.3	0.5	1.5	tbd	tbd	tbd	800 V	-	-	-		65	95	130	PMDPB65UP
single + schottky	20	8	3.3	0.5	1.5	tbd	tbd	tbd	800 V	2	30	455		65	95	130	PMFPB6545UP
			3.3	0.5	1.5	tbd	tbd	tbd	800 V	2.2	30	325		65	95	130	PMFPB6532UP

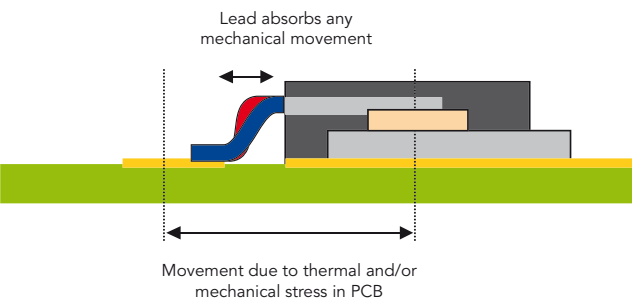
Power MOSFETs single (N-channel)

types in **bold** represent new products

V _{DS} (max) (V)	R _{DSon} (max) (mΩ) @ V _{gs} = 10 V	R _{DSon} (max) (mΩ) @ 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	PSMN1R2-25YL						
	1.5	2.2	100	PSMN1R5-25YL						
	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						

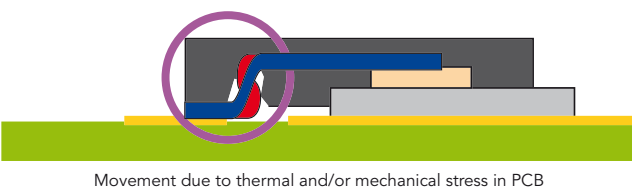
LFPAK for mechanical & thermal ruggedness

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

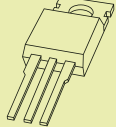
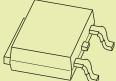
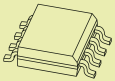
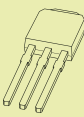
QFN Based Power-SO8



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

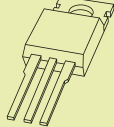
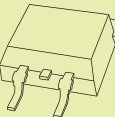
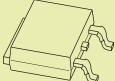
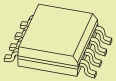
Power MOSFETs single (N-channel)

types in **bold** represent new products

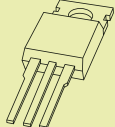
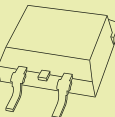
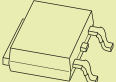
V_{DS} (max) (V)	R_{DSon} (max) (mΩ) @ $V_{gs} = 10\text{ V}$	R_{DSon} (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	I_D (max) (A) @ 25 °C	Power-SO8 (LFPAK) 	TO-220AB (SOT78) 	DPAK (SOT428) 	SO8 (SOT96-1) 	IPAK (SOT533) 
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75	6 x 6.6 x 2.3
30	1.3	1.95	100	PSMN1R3-30YL				
	1.7	2.1	100		PSMN1R6-30PL			
	1.7	2.6	100	PSMN1R7-30YL				
	1.8	-	-		PSMN1R8-30PL			
	2	3.2	100	PSMN2R0-30YL				
	2.1	2.8	100		PSMN2R0-30PL			
	2.4	3.9	100	PSMN2R5-30YL				
	2.7	-	-		PSMN2R7-30PL			
	2.8	-	75		PSMN003-30P			
	3	4.8	100	PSMN3R0-30YL				
	3.2	-	100	PH3230S				
	3.3	4.5	100	PH3330L				
	3.4	-	-		PSMN3R4-30PL			
	3.5	5.6	100	PSMN3R5-30YL				
	3.8	-	98	PH3830L				
	4	6.5	99	PSMN4R0-30YL				
	4.3	6.2	100		PSMN4R3-30PL			
	4.3	-	95.9	PH4330L				
	4.4	-	30.4				PHK31NQ03LT	
	4.8	-	84	PH4830L				
	5	8	84	PSMN5R0-30YL				
	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	PSMN6R0-30YL				
	6.5	-	23.7				PHK28NQ03LT	
	7	11.3	65	PSMN7R0-30YL				
	7.9	11	68	PH7030L				
	8	13.8	55	PSMN9R0-30YL				
	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

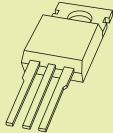
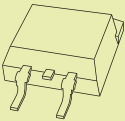
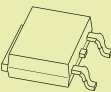
V_{DS} (max) (V)	R_{DSon} (max) (mΩ) @ $V_{gs} = 10\text{ V}$	R_{DSon} (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	I_D (max) (A) @ 25 °C	TO-220AB (SOT78) 	D2PAK (SOT404) 	DPAK (SOT428) 	SO8 (SOT96-1) 
				15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75
30	10	-	75			PHD71NQ03LT	
	13	-	68.9			PHD63NQ03LT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

types in **bold** represent new products

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) 
				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	-	-	PSMN2R0-40YS			
	2.1	-	100		PSMN2R2-40PS		
	2.8	-	-		PSMN2R8-40PS		
	2.8	-	100	PSMN2R6-40YS			
	3.3	-	-	PSMN3R3-40YS			
	4.1	-	94.5	PH4840S			
	4.2	-	100	PSMN4R0-40YS			
	4.3	-	75		PHP176NQ04T		
	4.6	-	100		PSMN4R5-40PS		
	5.2	-	75		PHP143NQ04T		
	5.7	-	-	PSMN5R8-40YS			
	7.6	-	77		PSMN8R0-40PS		
	8	-	75		PHP101NQ04T	PHB101NQ04T	
	8.6	-	70	PSMN8R3-40YS			
	14	-	-	PSMN014-40YS			
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

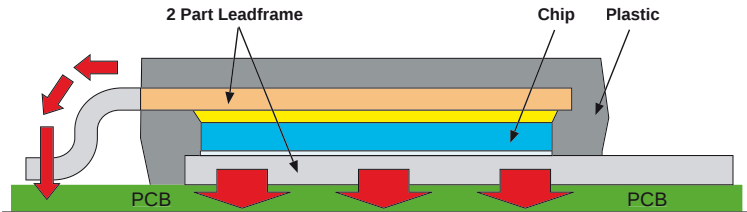
Power MOSFETs single (N-channel)

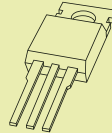
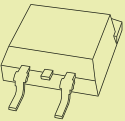
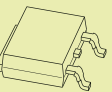
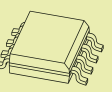
types in **bold** represent new products

V_{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) 
				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	
	4.1	-	100		PSMN4R4-80PS		
	4.7	-	100		PSMN5R0-80PS		
80	6.4	-	-	PSMN6R0-80YS			
	6.5	-	-		PSMN6R5-80PS		
	8.5	-	82	PSMN8R2-80YS			
	8.7	-	-		PSMN8R7-80PS		
	11	-	-	PSMN011-80YS			
	11	-	74		PSMN012-80PS		
	12.9	-	60	PSMN013-80YS			
	17.0	-	-		PSMN017-80PS		
	19.5	-	-	PSMN018-80YS			
	27.5	-	34	PSMN026-80YS			
	46	-	-	PSMN045-80YS			
	46	-	22		PSMN050-80PS		

Power-SO8 (LFPAK) Design

- Low Thermal resistance
- Low Electrical resistance
- Low Inductance



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) 
				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					
	90	-	3					PHKD3NQ10T
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

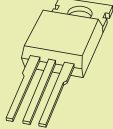
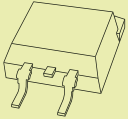
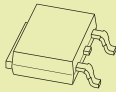
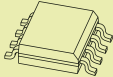
Smaller, faster, cooler

- 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

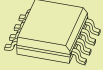
High performance MOSFETs for DC-DC converters, OR-ing and load switching

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

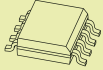
Power MOSFETs single (N-channel)

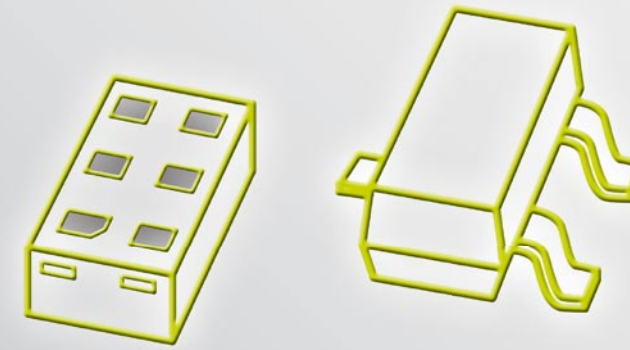
V_{DS} (max) (V)	R_{DSon} (max) (mΩ) @ $V_{gs} = 10\text{ V}$	R_{DSon} (max) (mΩ) @ $V_{gs} = 4.5\text{ V}$	I_D (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)		SO8 (SOT96-1)	HVSON8 (SOT873-1)
										
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3		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	
	85	-	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

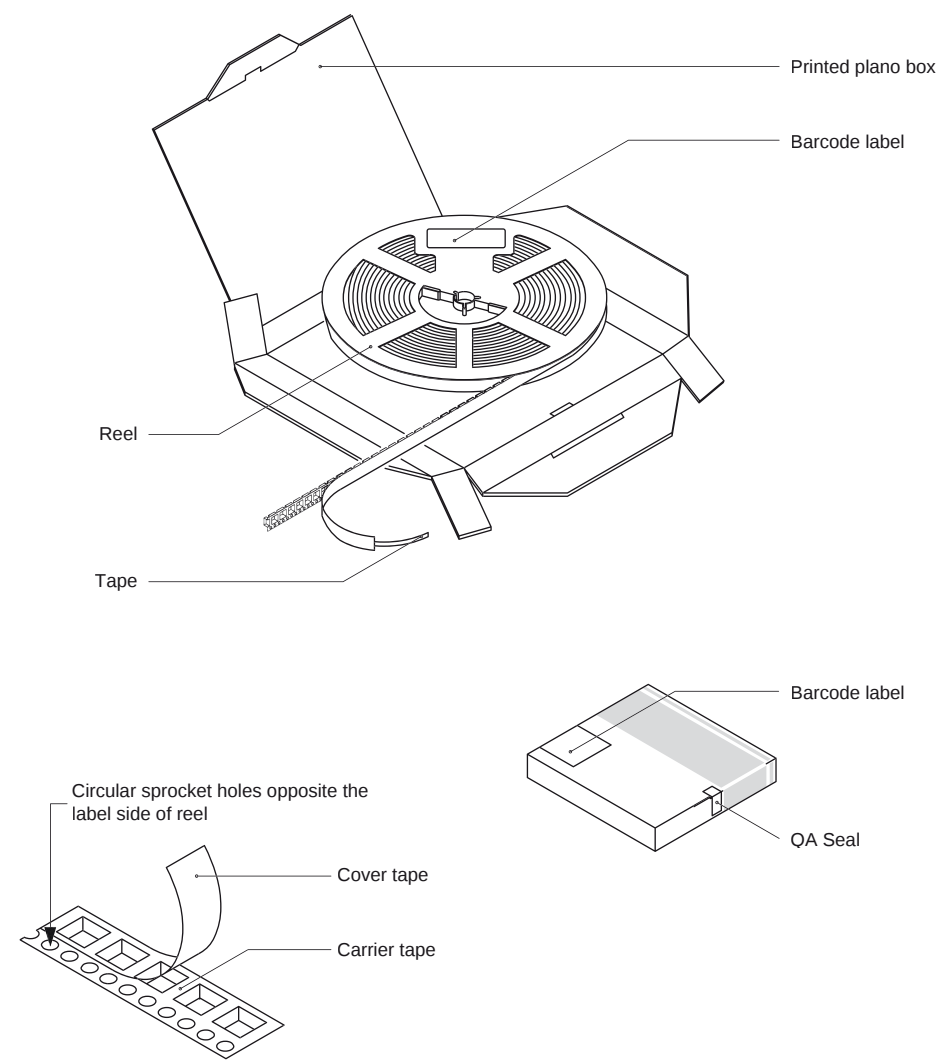
Package cross reference	88
Packing methods	90
Minimized outline drawings and reflow soldering footprint	96
Package overview	107

Package cross reference

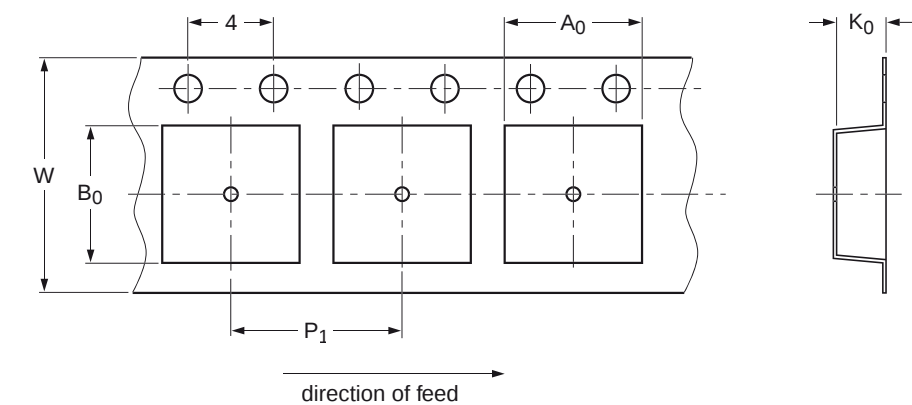
NXP	Industry standard names	Size (l x w x h)	Pins / leads	P _{tot} (mW)	Package	Competitor synonyms							
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay
SOD27	DO-35	4.25 x 1.85 x 0.56	2	500		GSD			DO-35		DO-35		DO-204AH
SOD66	DO-41	4.8 x 2.6 x 0.81	2	1300		GSR	DO-41				DO-41		DO-204AL
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		
SOD882D	-	1.0 x 0.6 x 0.37	2	250						TSLP-2-7	DFN1006H4-2		
SOD131 SMA	DO-214AC	4.25 x 2.67 x 2.14	2	900		PMDS (SOD-106)		SMA Case 403D-02			SMA	SMA	
SOD132 SMB	DO-214AA	4.32 x 3.62 x 2.29	2	1000				SMB Case 403A-03			SMB		
SOD133 SMC	DO-214AB	6.86 x 5.91 x 2.34	2	1200				SMC Case 403-03			SMC		
SOT1061	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

NXP	Industry standard names	Size (l x w x h)	Pins / leads	P _{tot} (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
SOT1118	-	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	-									

Tape and reel pack for SMD packages



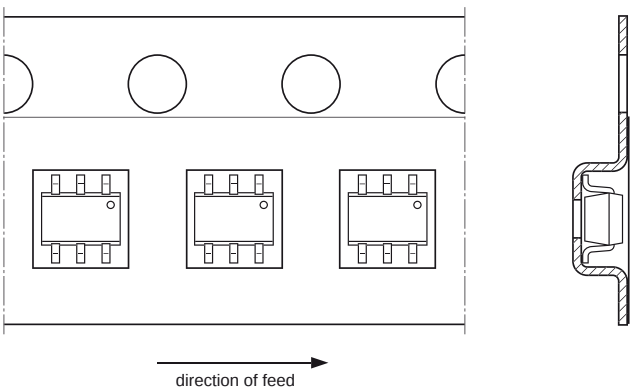
Carrier tape - tape and reel



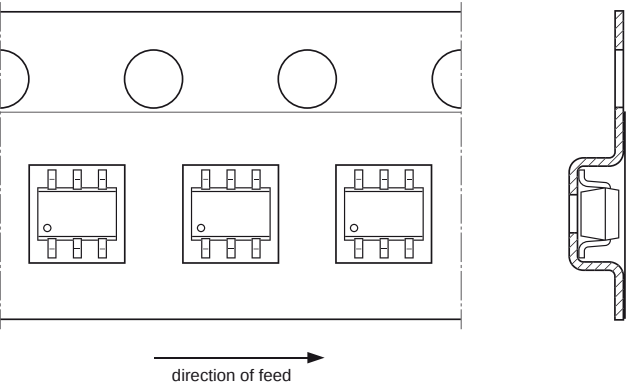
P_1 = pitch (see table packing methods)
 W = tape width (see table packing methods)
Compartment width (A_0), length (B_0) and depth (K_0) depending on package

Product orientation (tape and reel pack) T1-T4

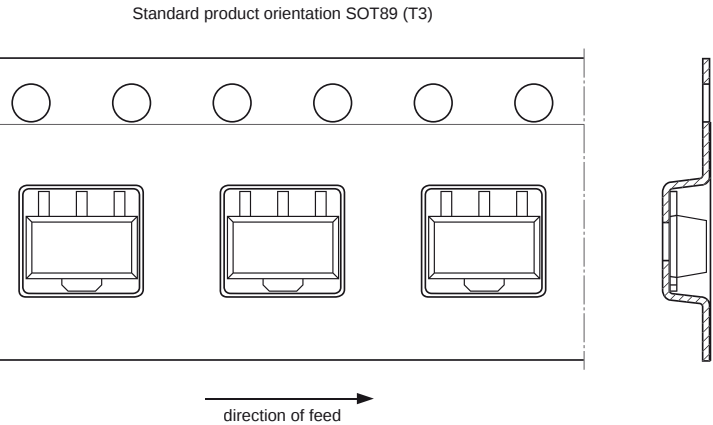
T1 taping



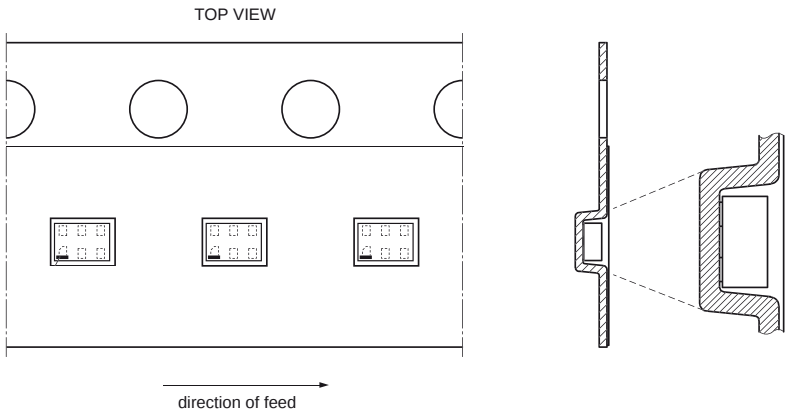
T2 taping



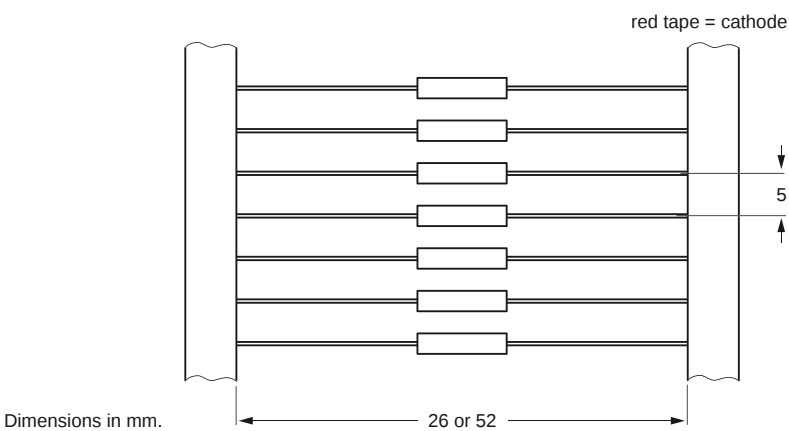
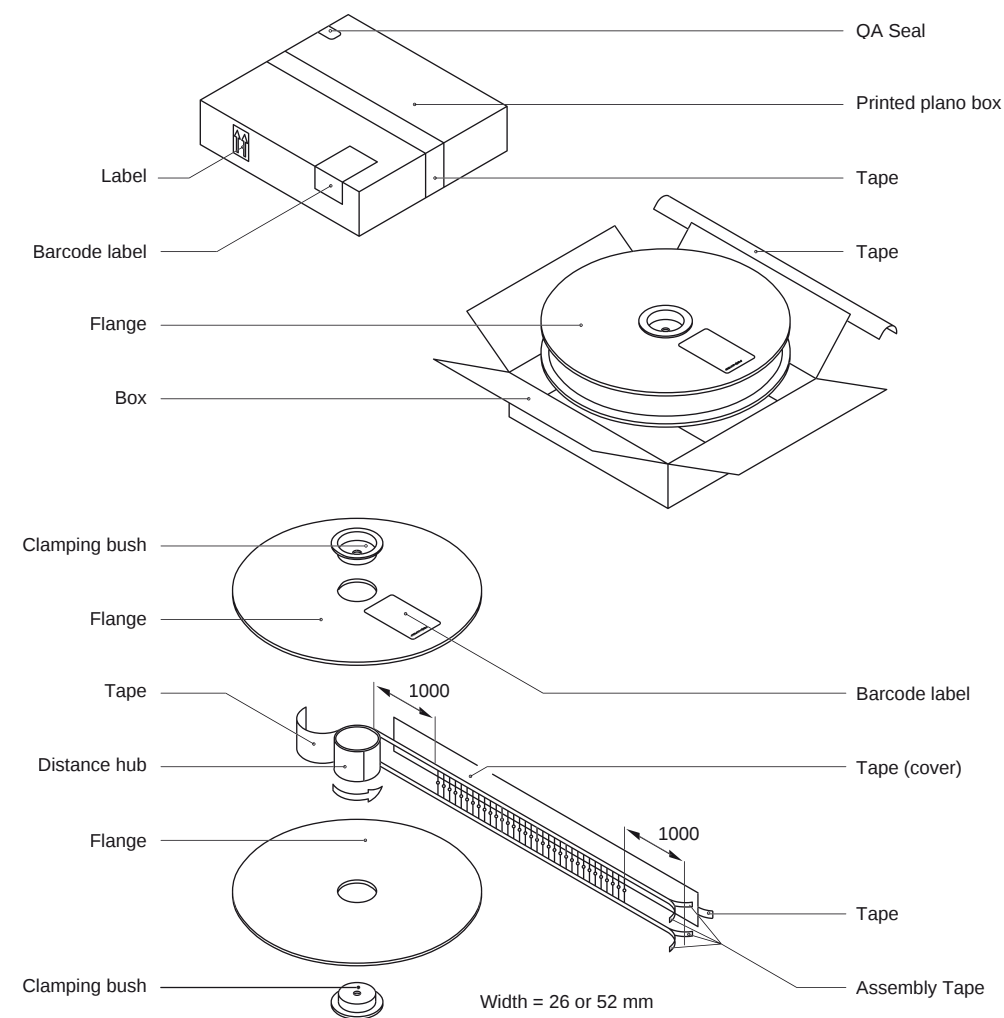
T3 taping



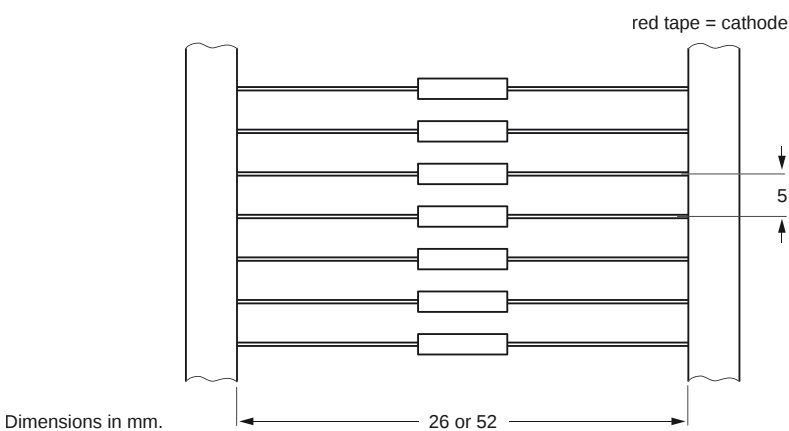
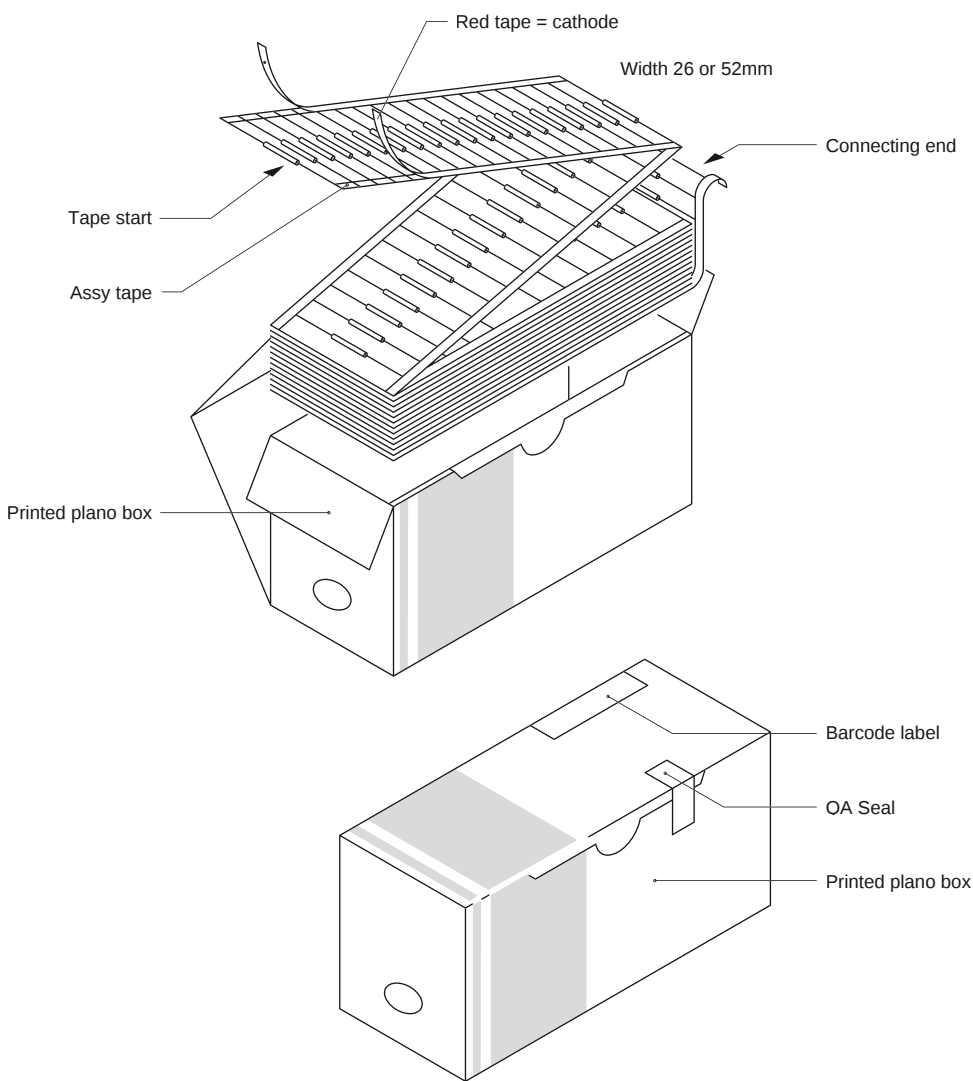
T4 taping



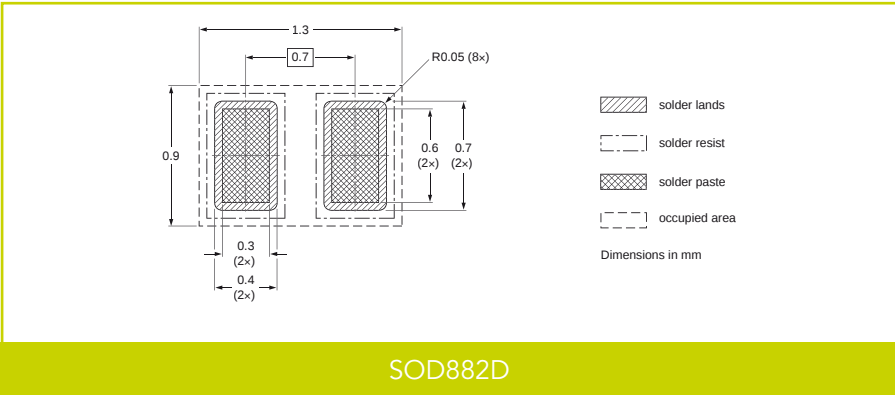
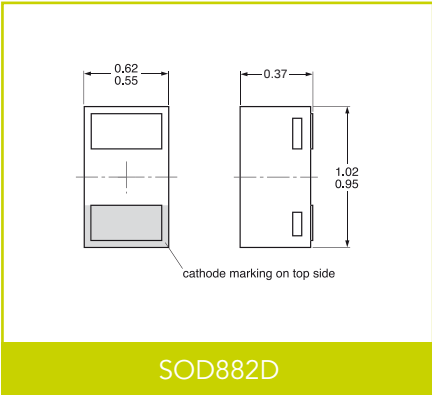
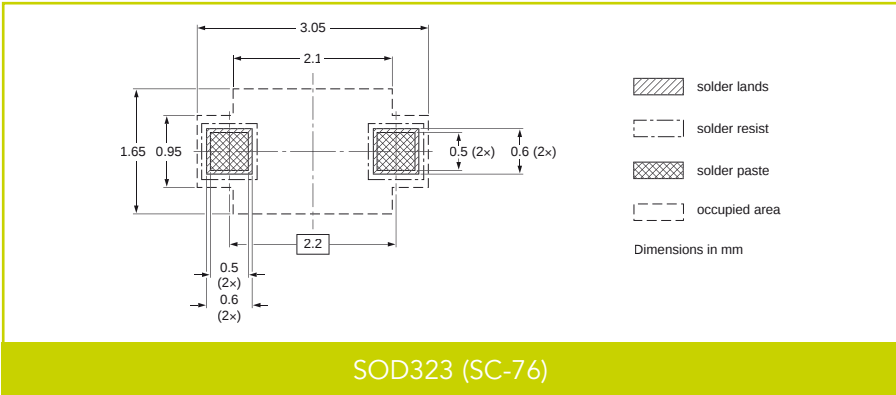
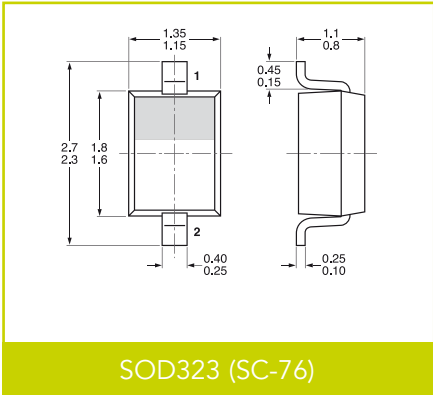
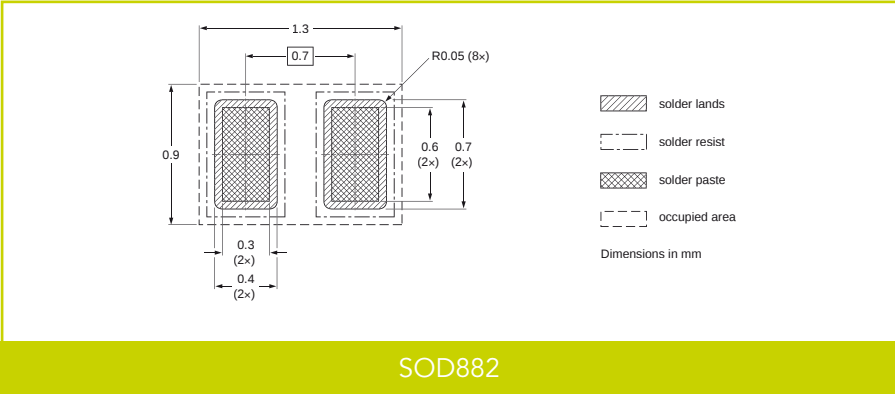
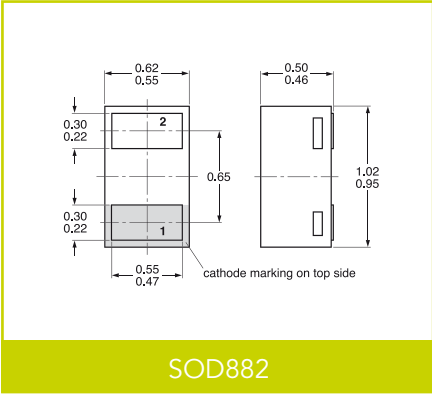
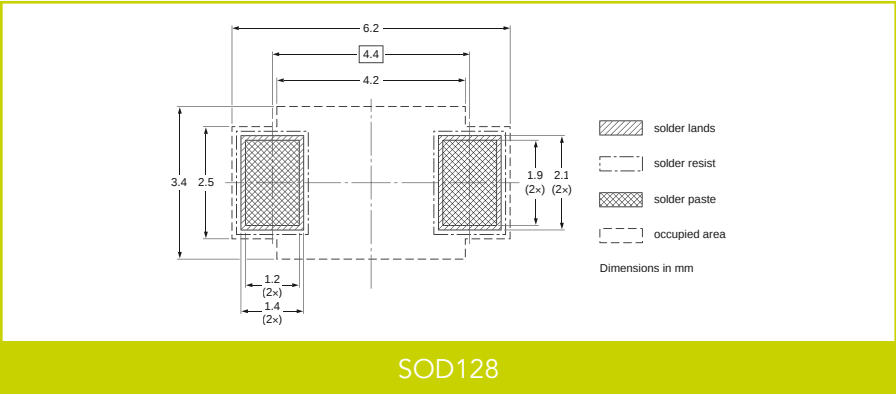
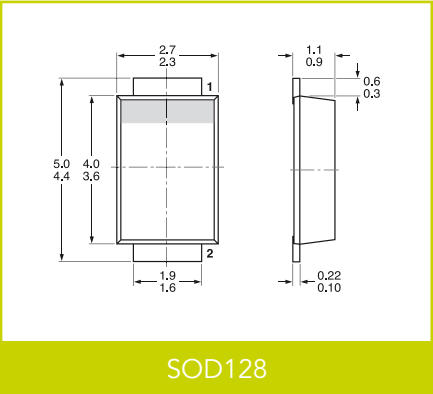
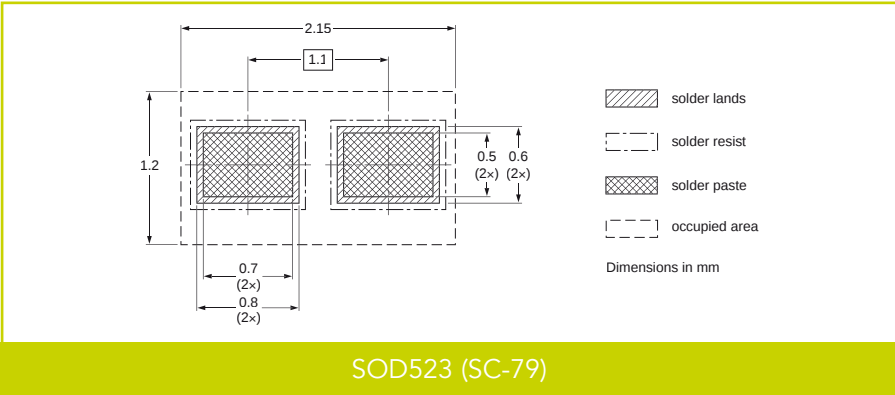
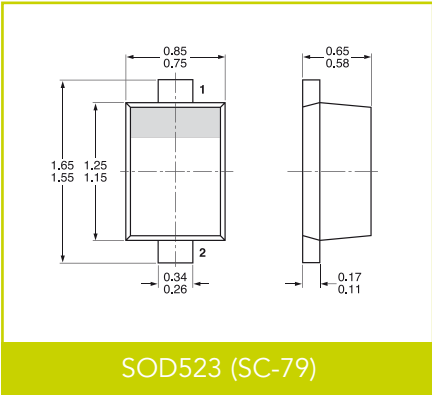
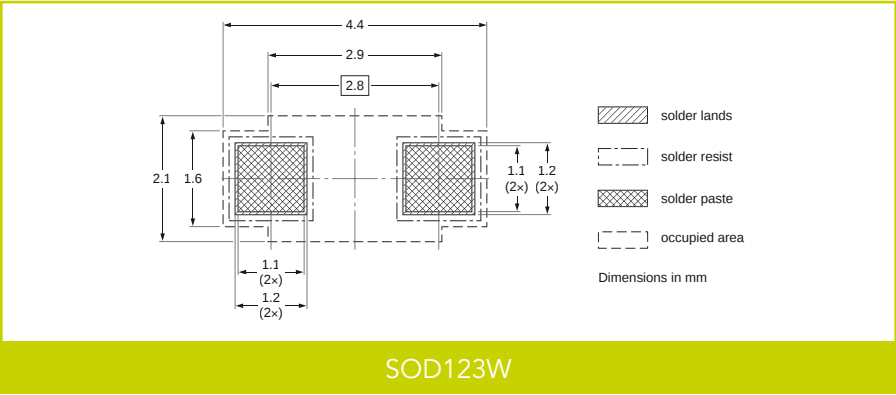
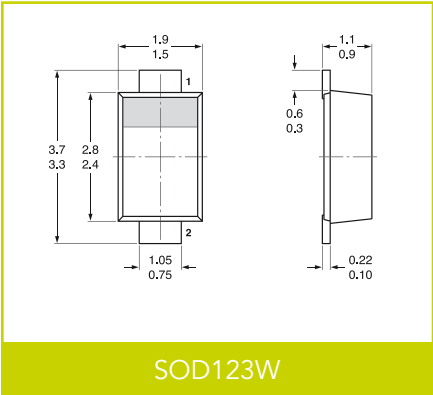
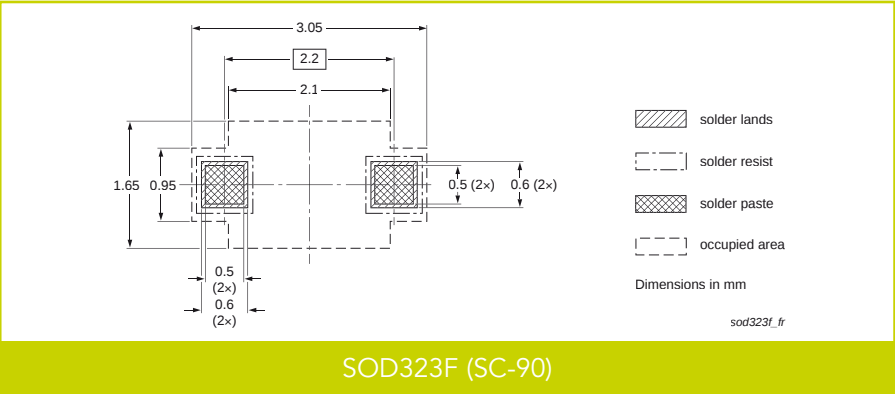
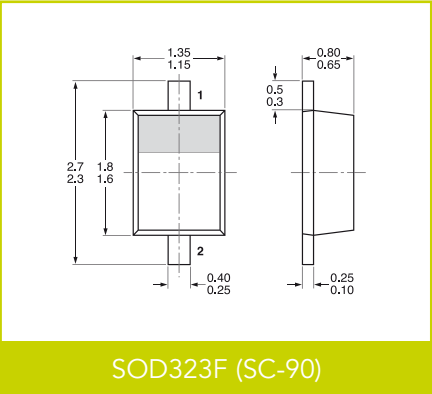
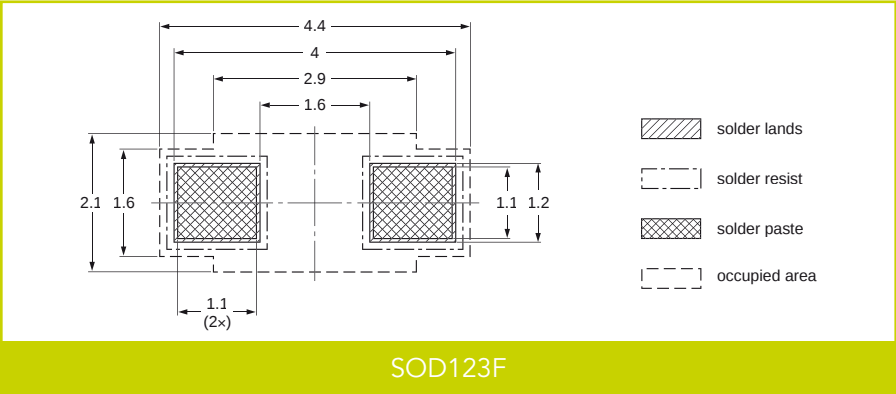
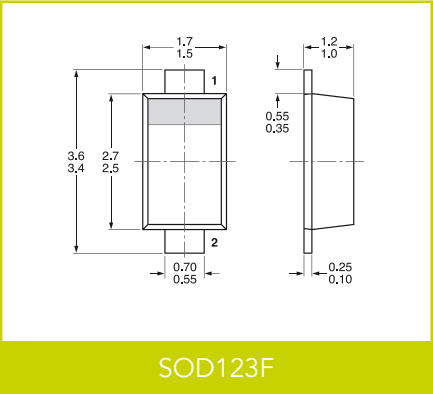
Reel pack axial tape for glass diodes



Ammo pack axial tape for glass diodes

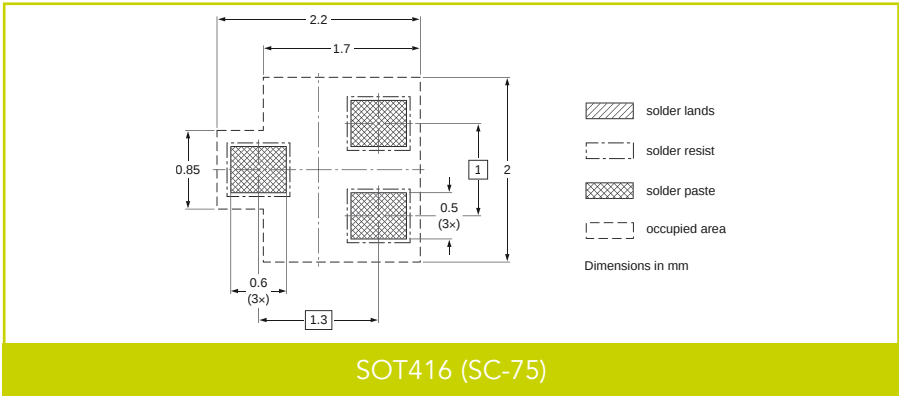
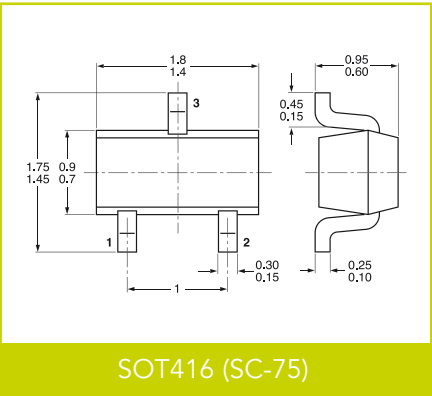
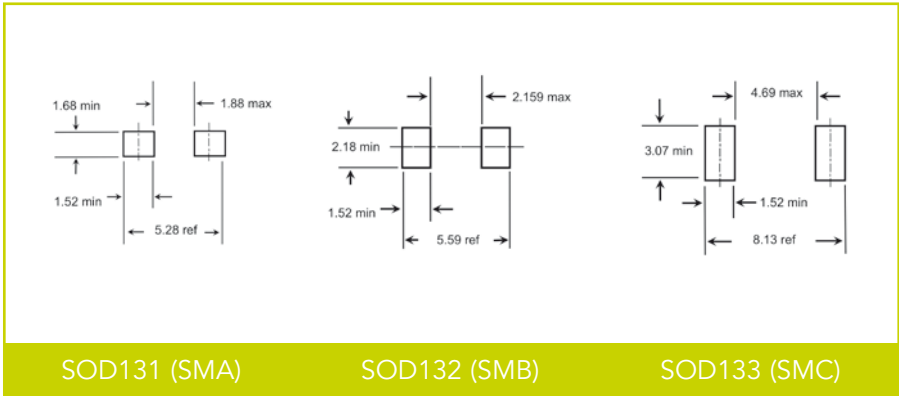
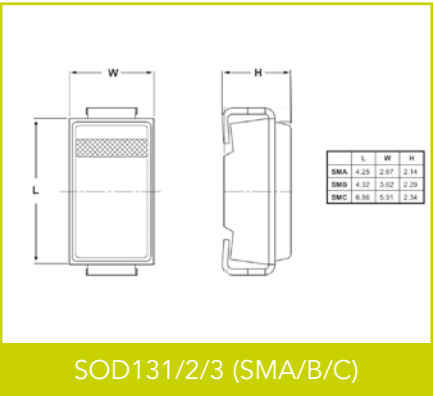


2-Pin SMD Packages

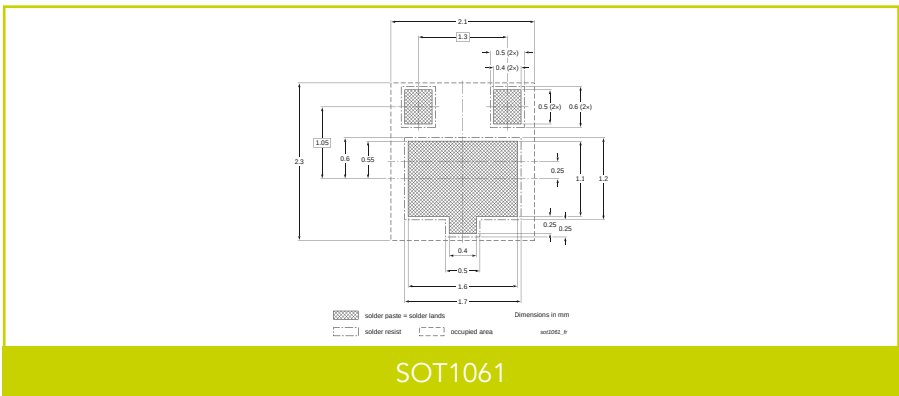
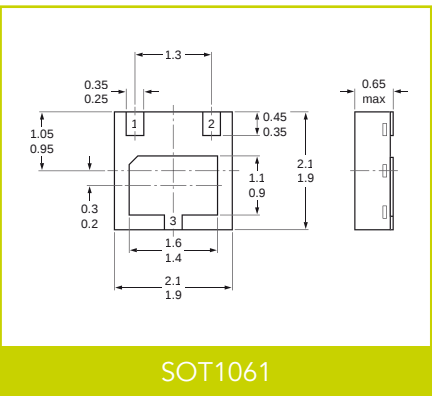
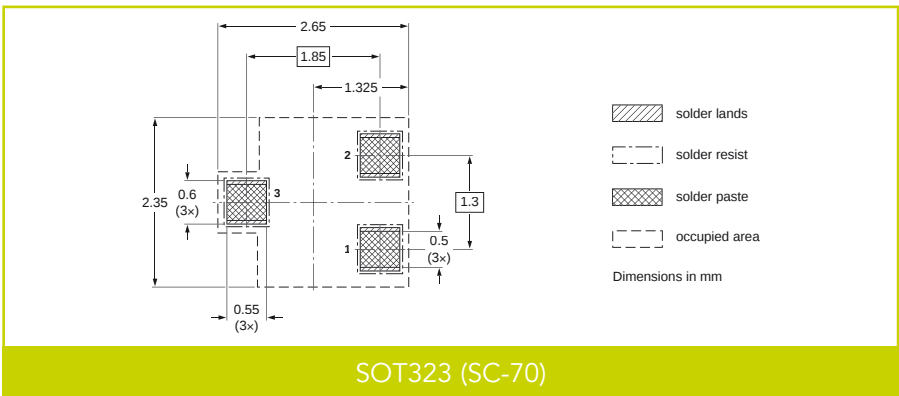
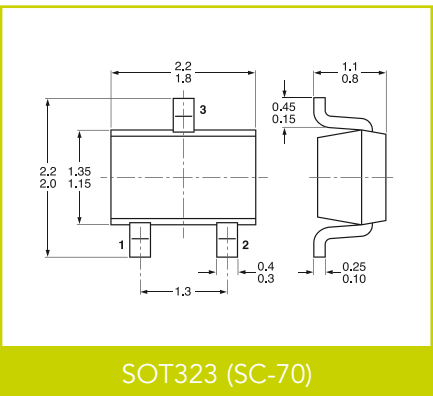
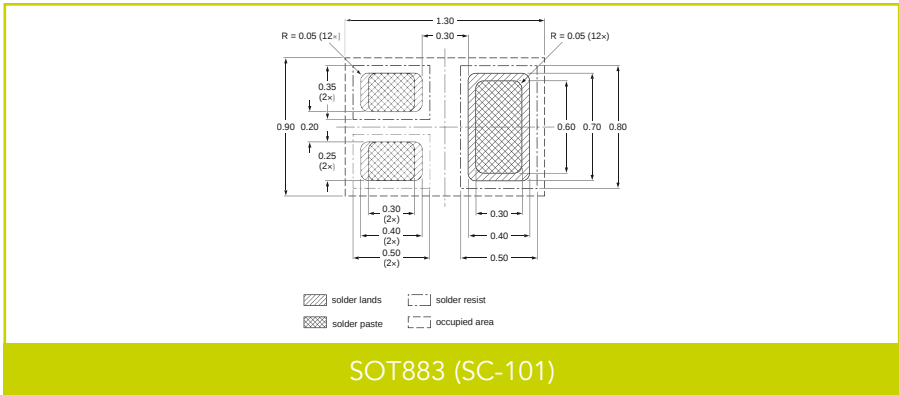
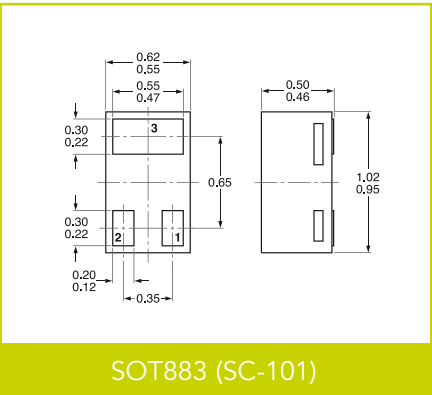
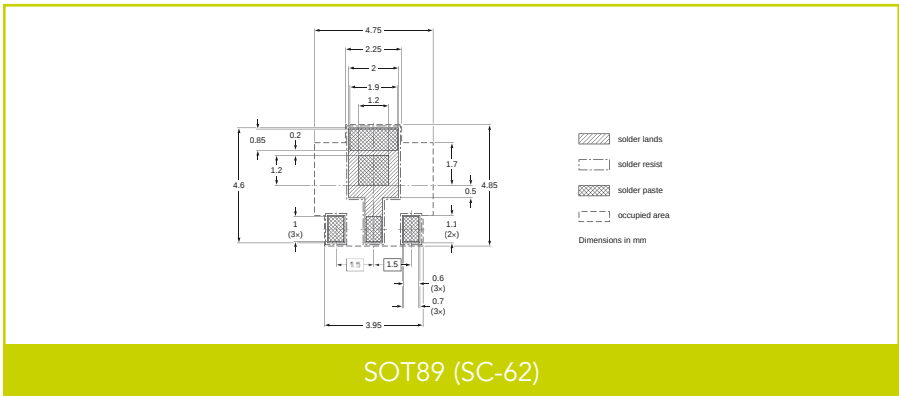
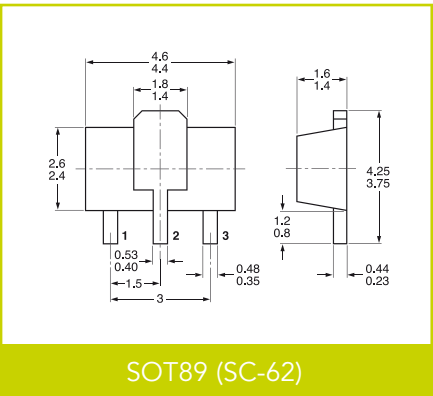
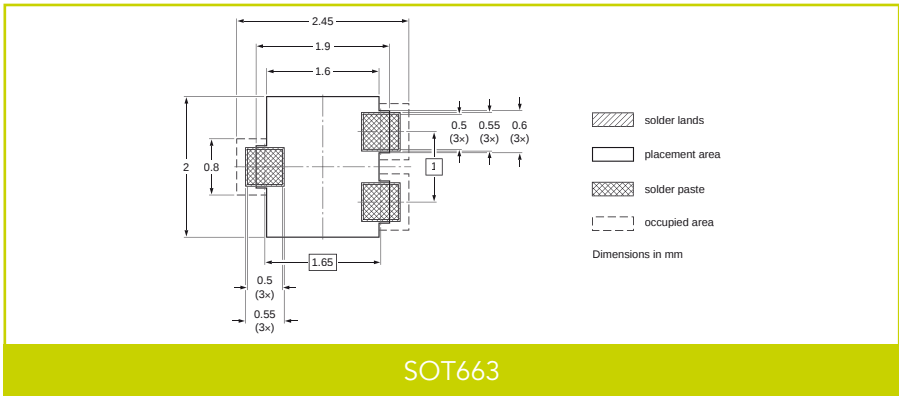
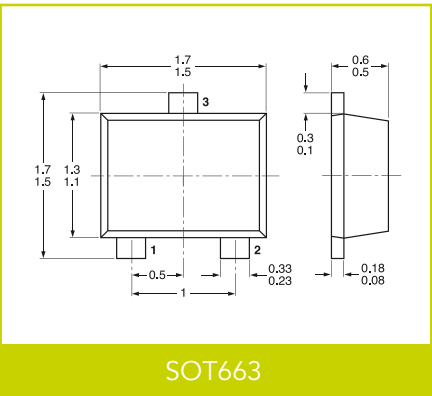
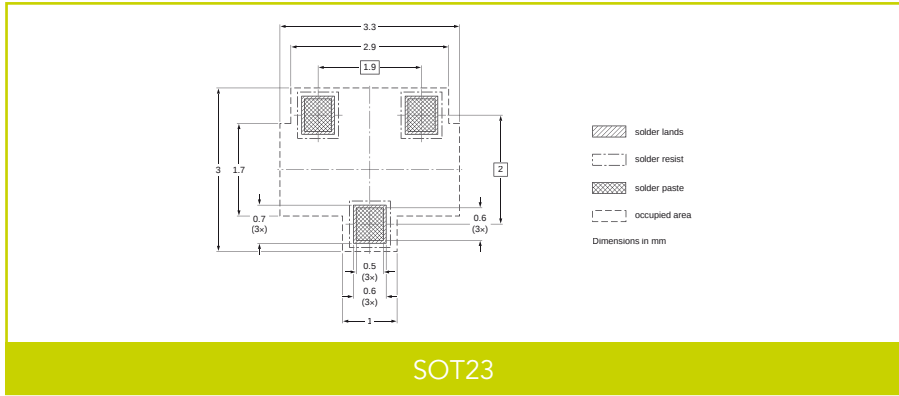
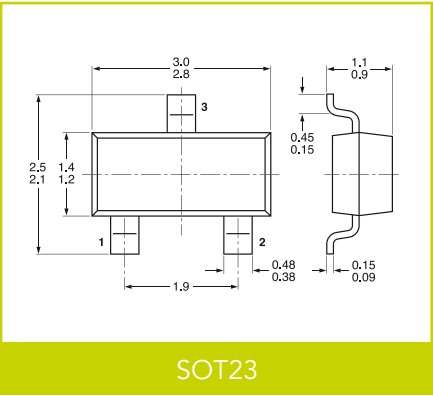


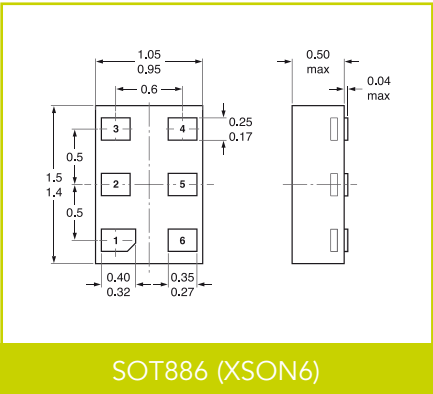
Dimensions in mm

Dimensions in mm

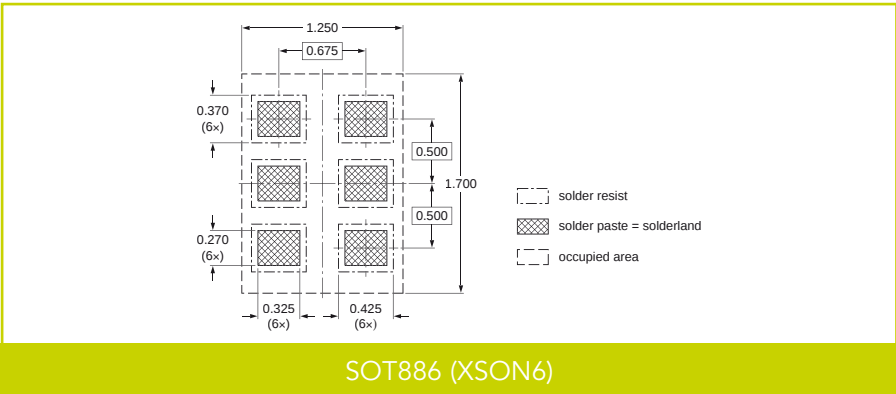


3-Pin SMD Packages

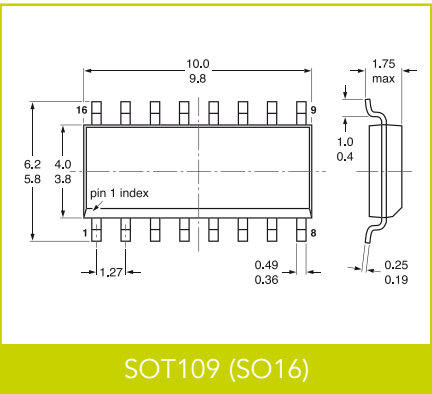




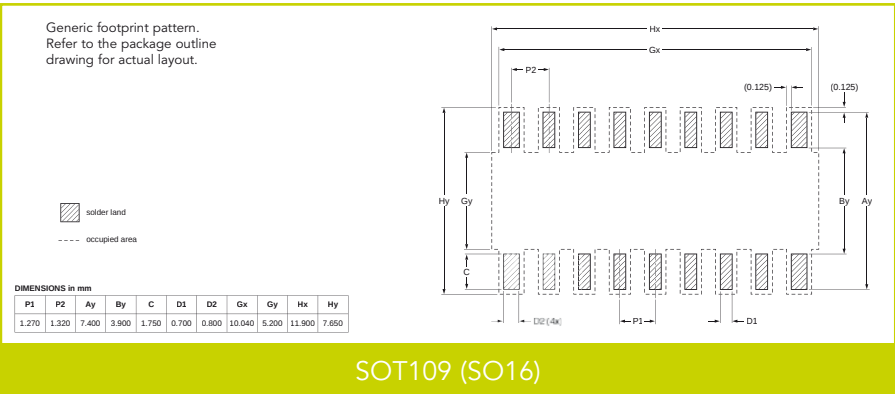
SOT886 (XSON6)



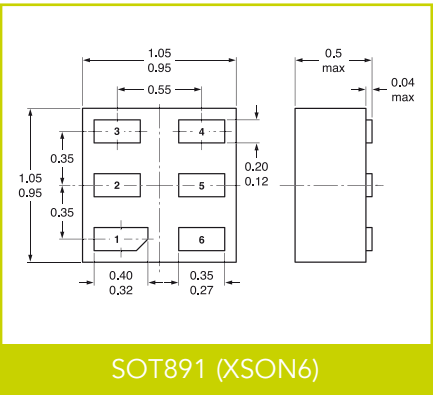
SOT886 (XSON6)



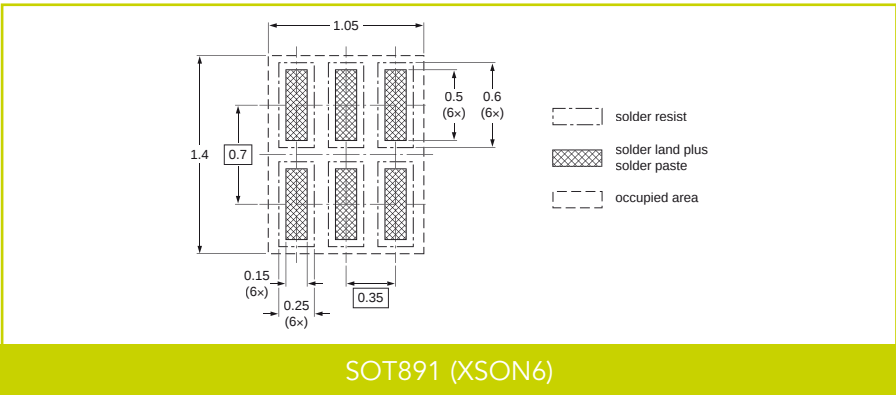
SOT109 (SO16)



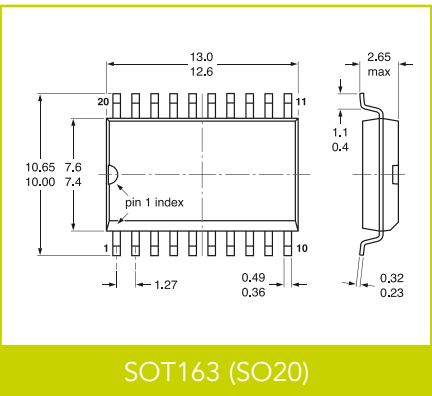
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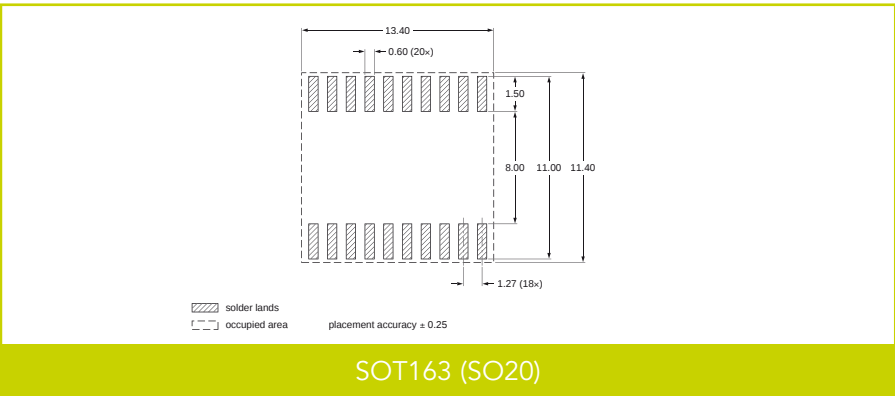
SOT891 (XSON6)



SOT891 (XSON6)

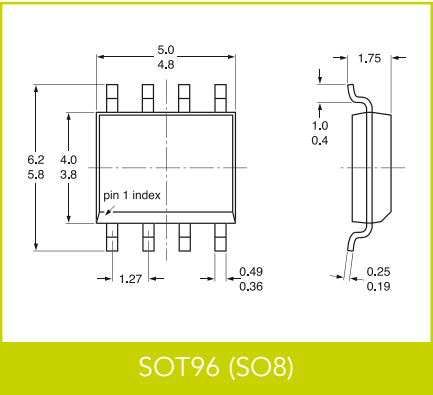


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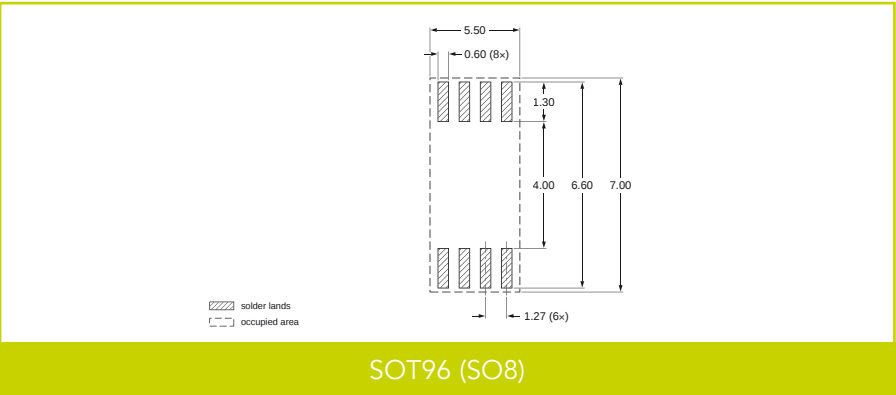


SOT163 (SO20)

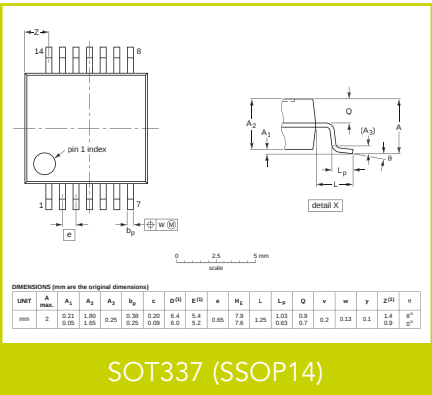
Multi-Pin SMD Packages



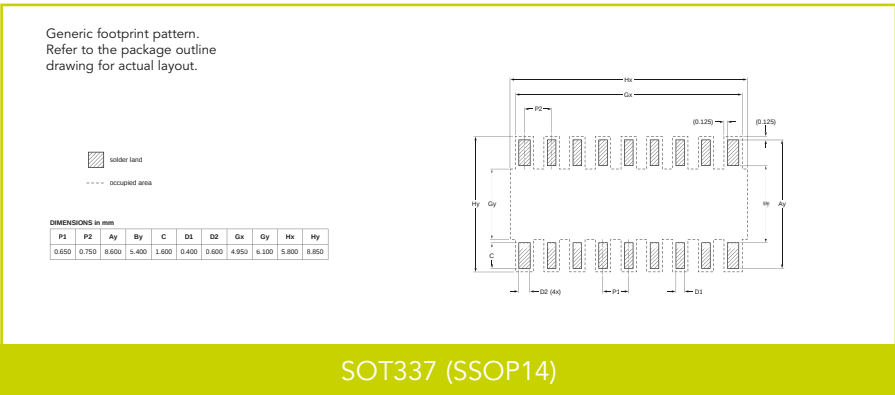
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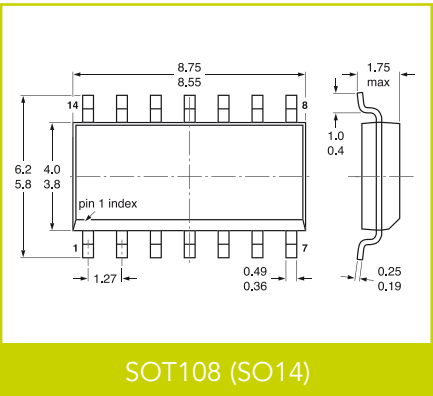
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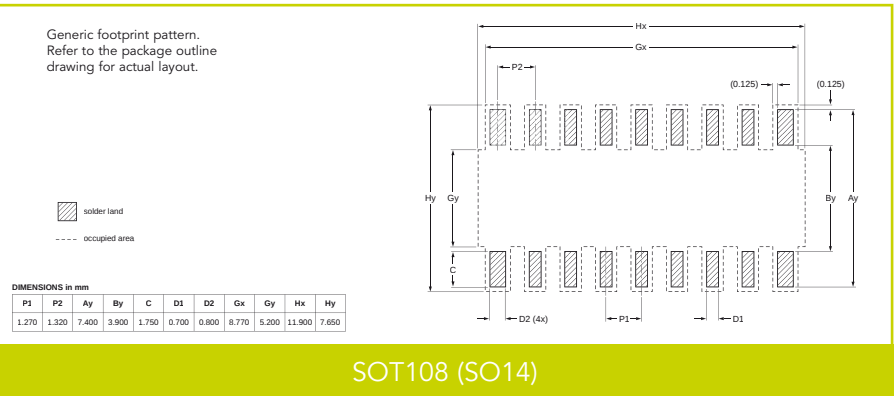
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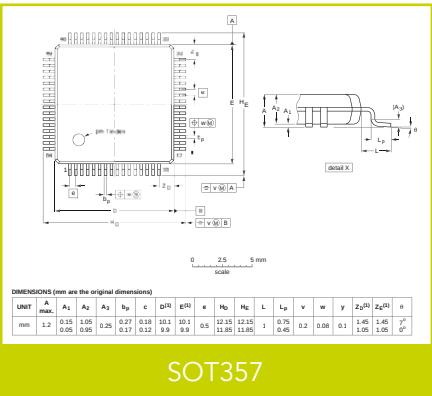
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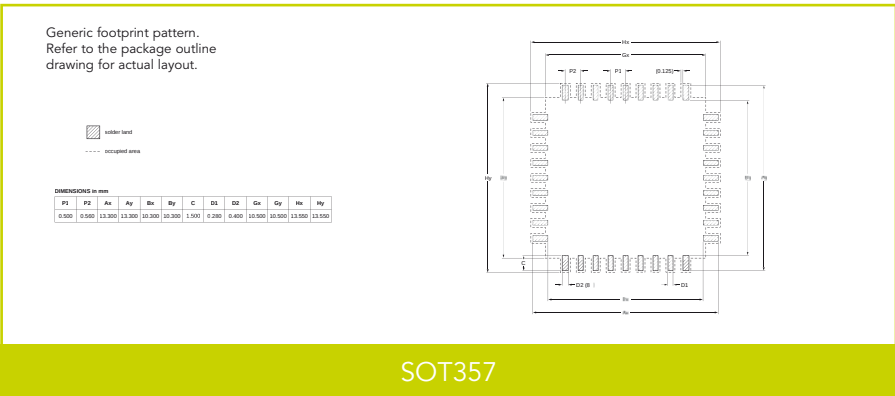
SOT108 (SO14)



SOT108 (SO14)

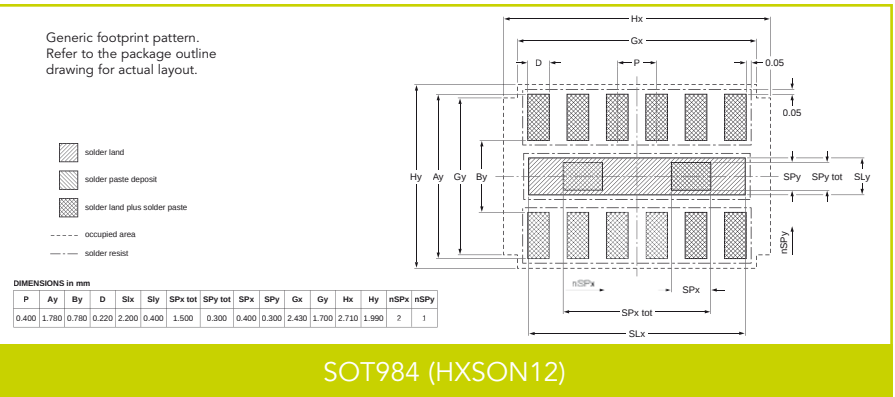
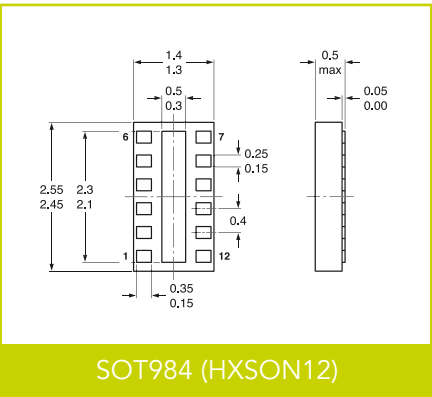
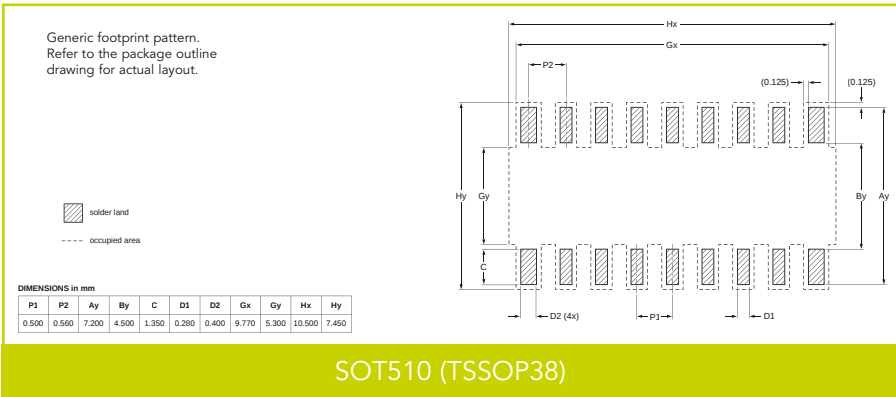
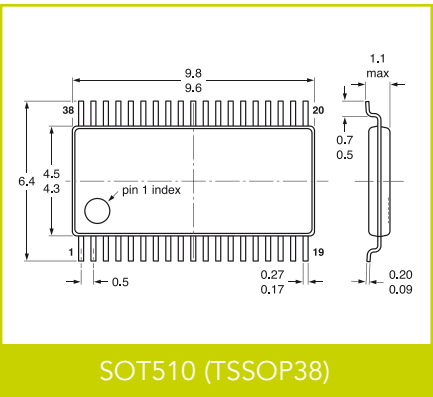
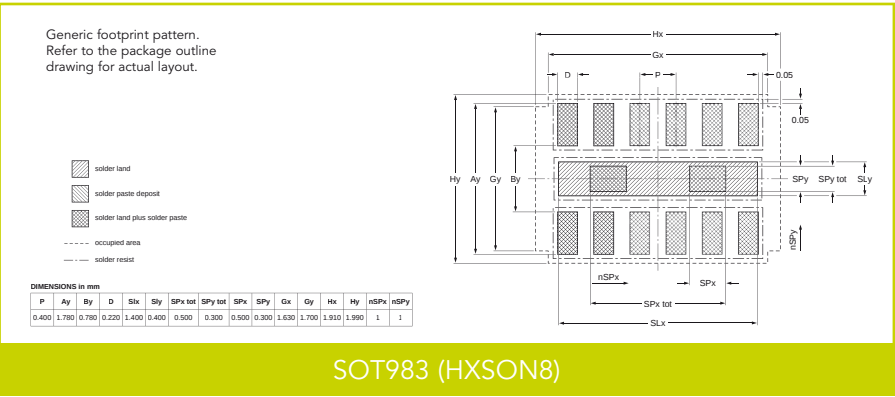
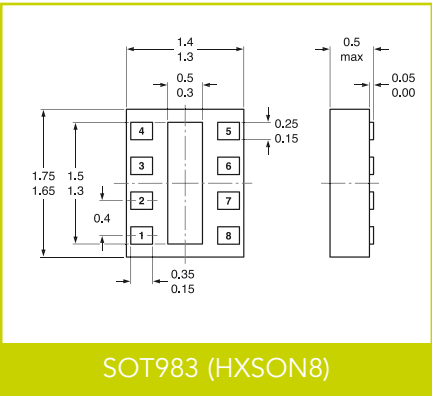
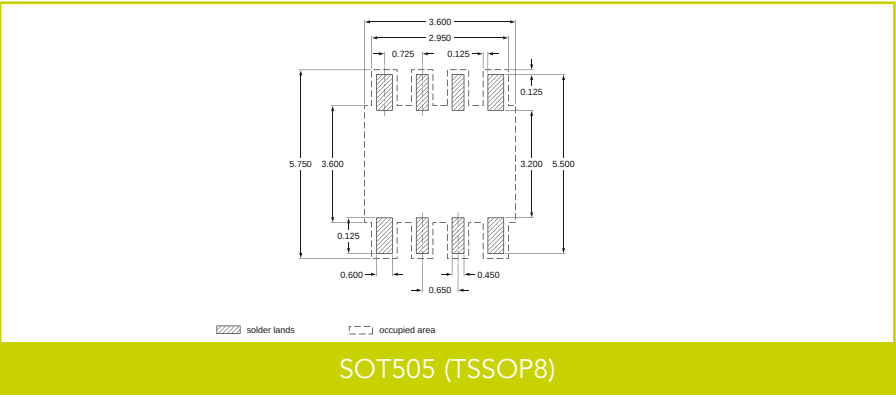
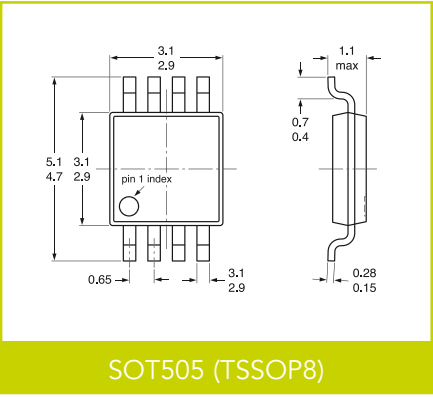
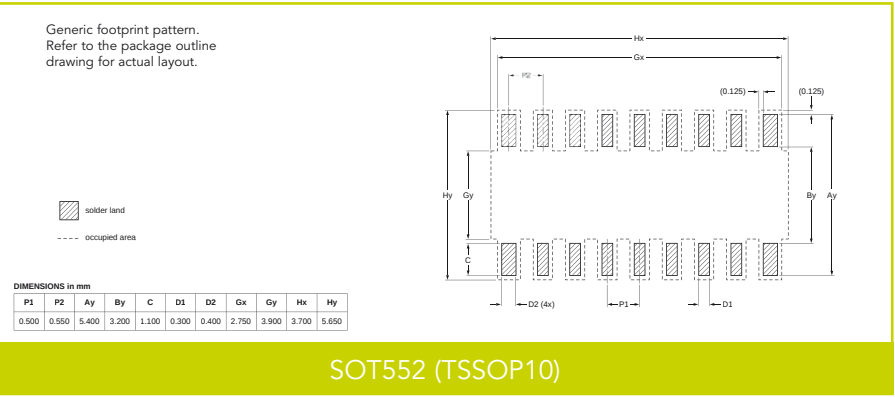
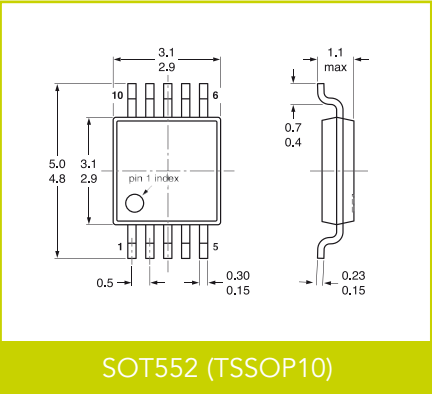
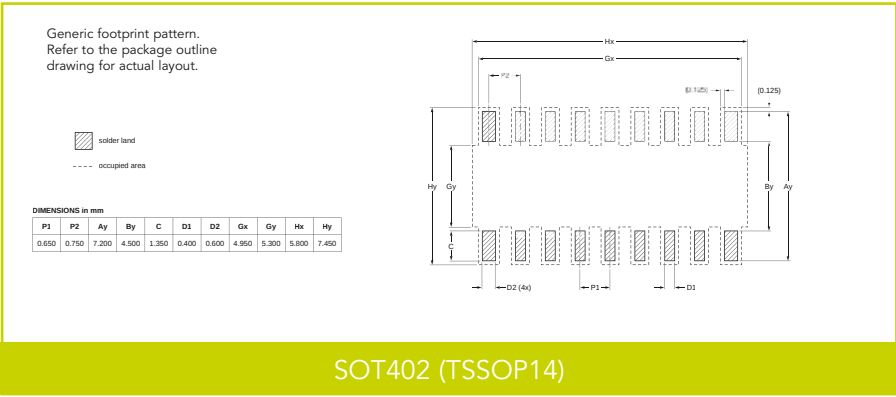
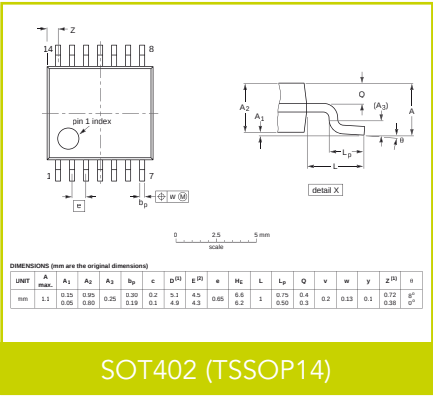
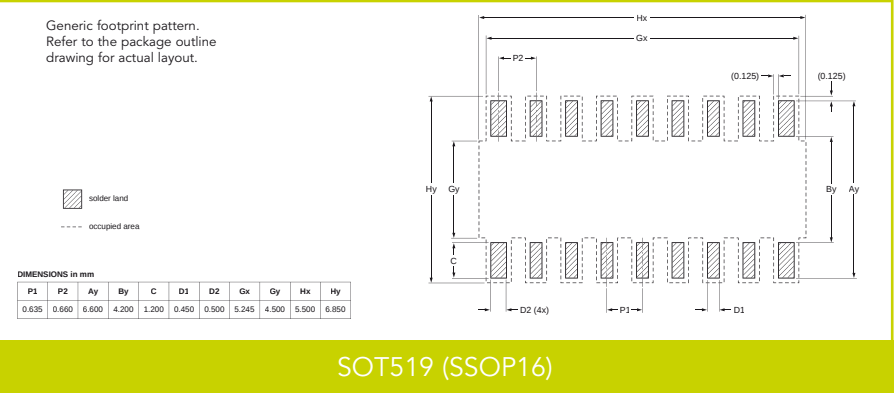
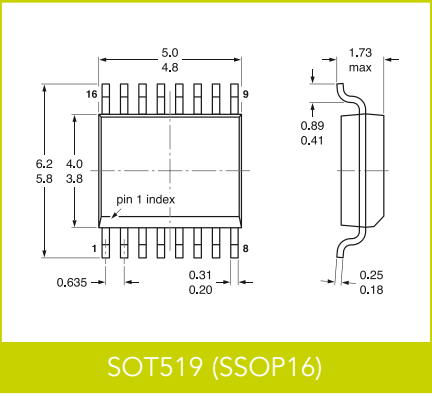
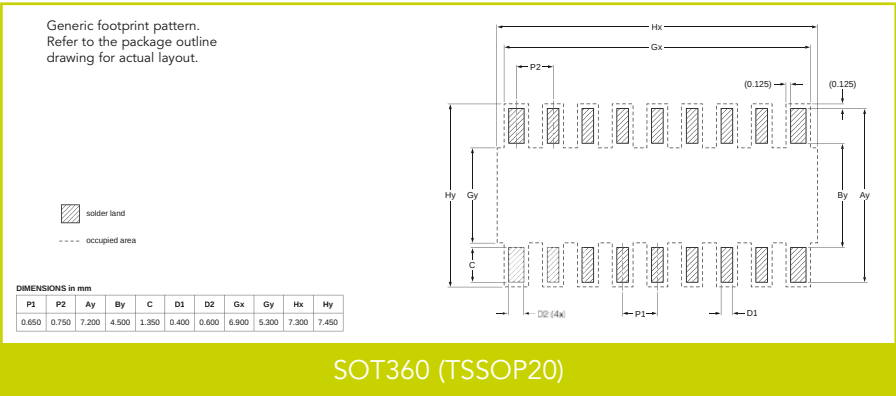
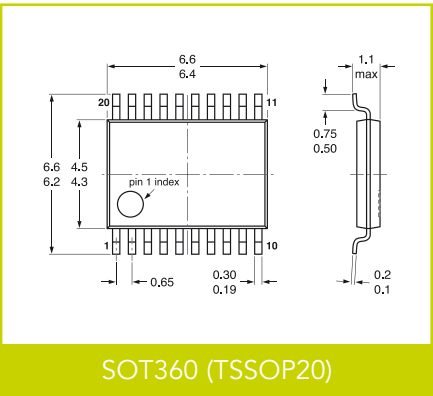


SOT357

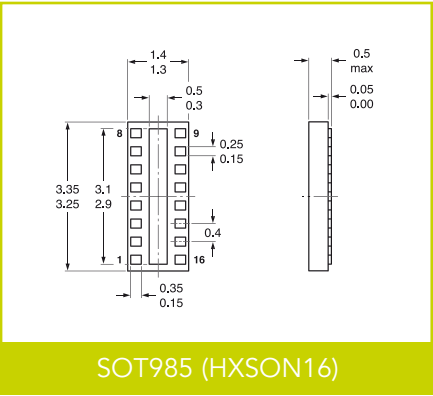


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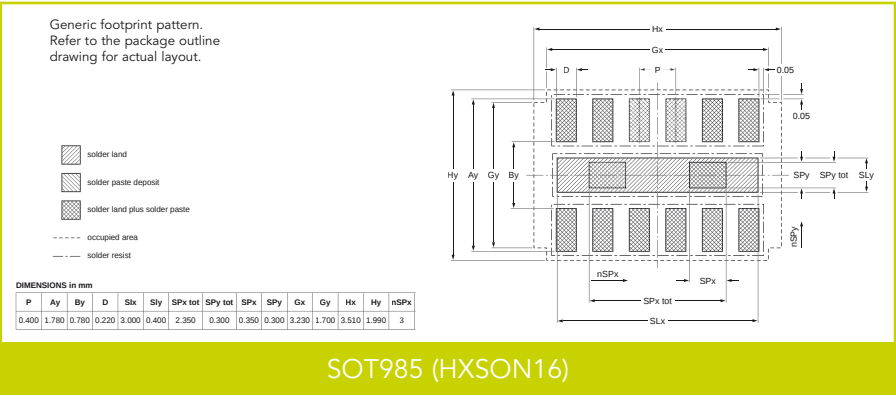
Minimized outline drawings and reflow soldering footprint



Minimized outline drawings and reflow soldering footprint

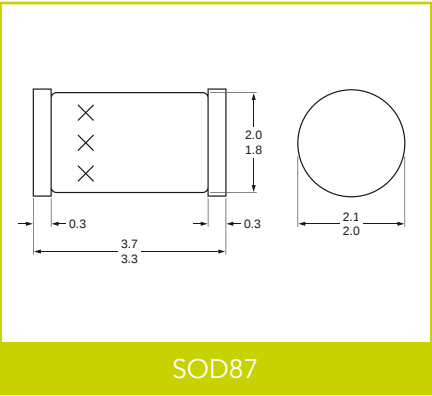


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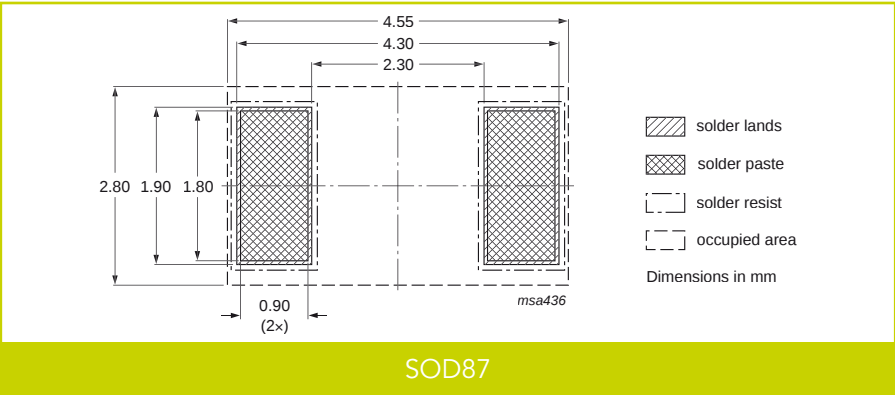


SOT985 (HXSON16)

Minimized outline drawings and reflow soldering footprint



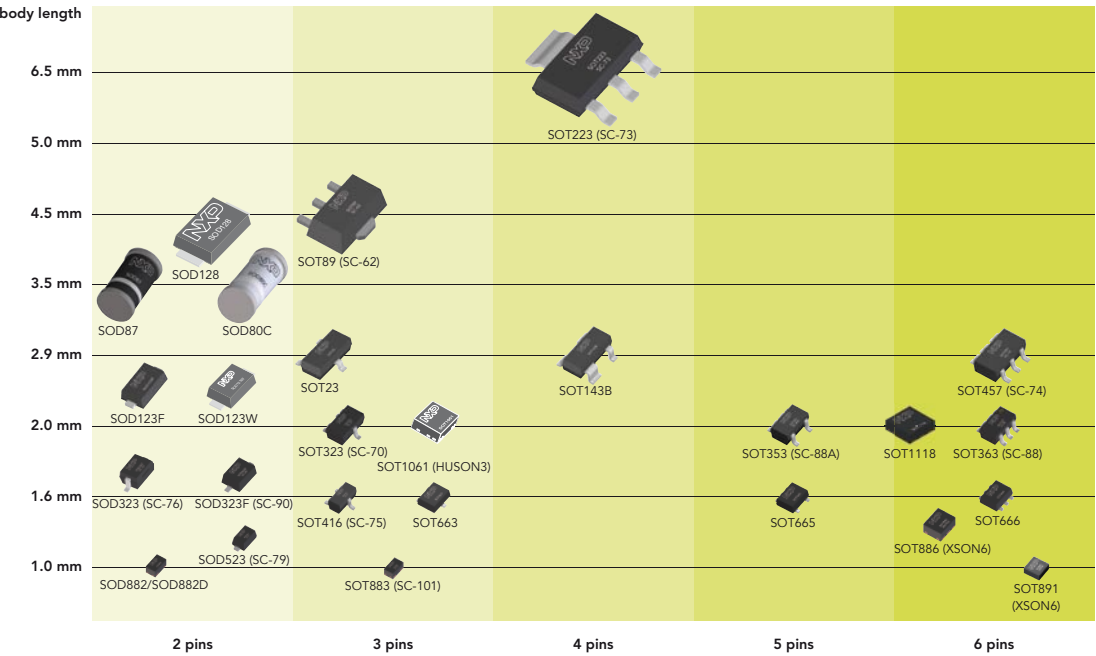
SOD87



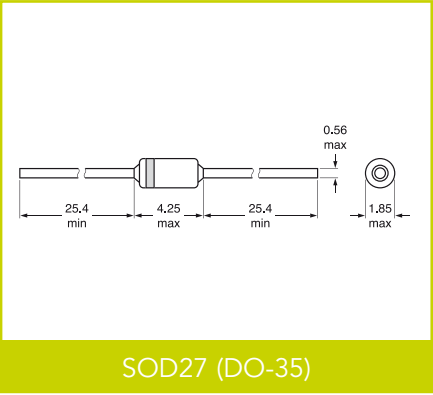
SOD87

Dimensions in mm

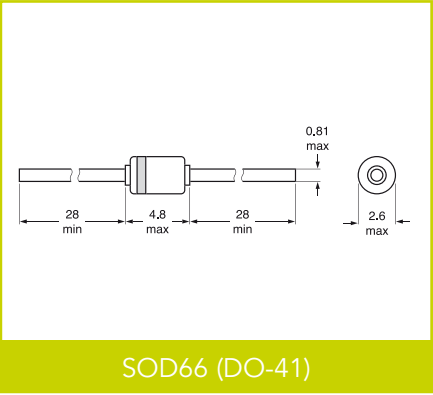
Package overview



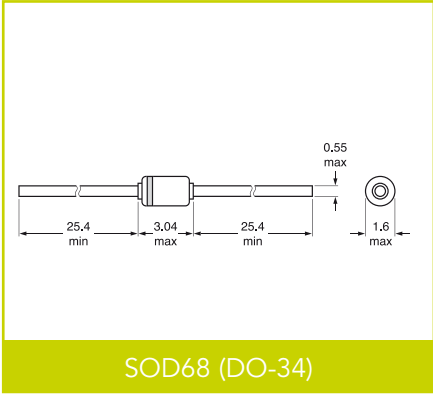
Glass diodes



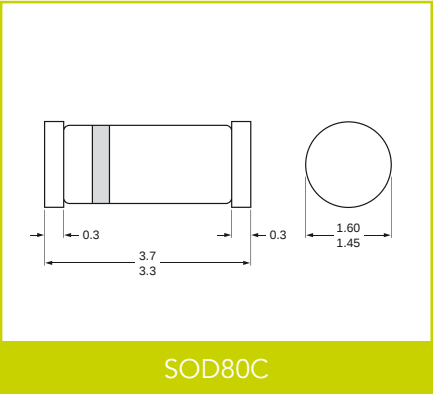
SOD27 (DO-35)



SOD66 (DO-41)

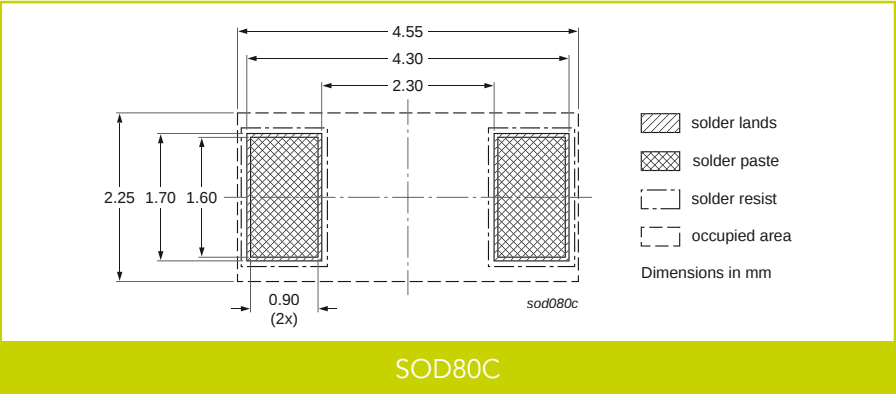


SOD68 (DO-34)

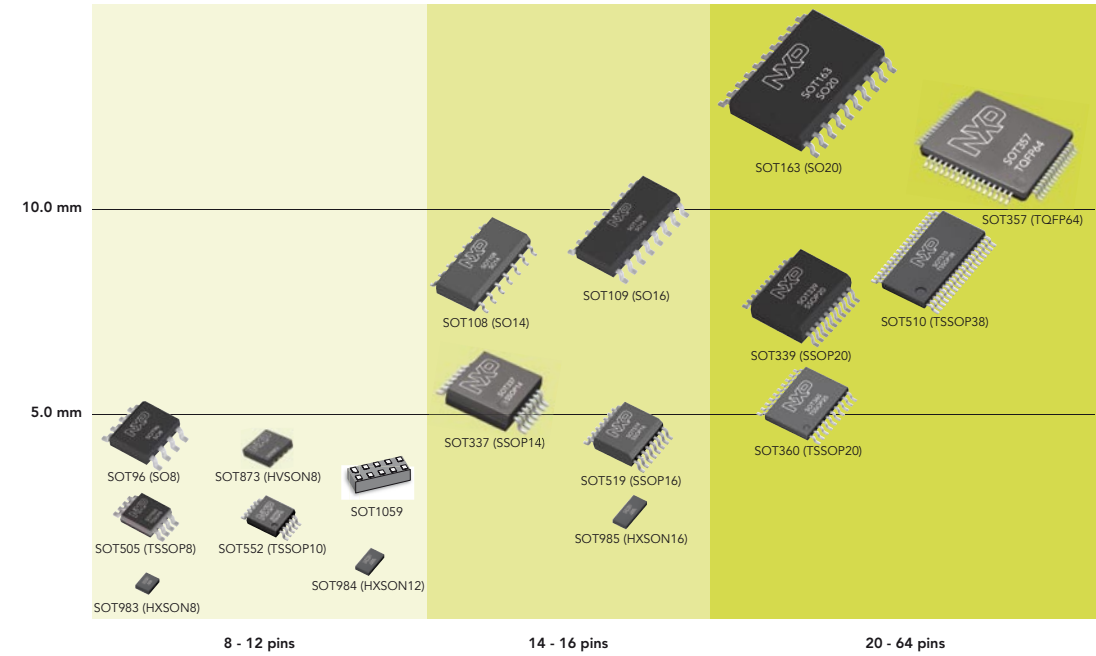


SOD80C

Dimensions in mm



SOD80C



8 - 12 pins

14 - 16 pins

20 - 64 pins

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PSMN026-80YS	84	PTVS12VS1UR	44	PTVS8V0P1UP	45	PUMX1	49	PZUxB series	16
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PSMN030-150P	86	PTVS13VS1UR	44	PTVS8V5P1UP	45	PUMZ1	49	PZUxBL series	16
PSMN035-150B	86	PTVS14VP1UP	45	PTVS8V5S1UR	44	PUMZ2	49	PZUxDB2 series	16
PSMN035-150P	86	PTVS14VS1UR	44	PTVS9V0P1UP	45	PVR100AD-B12V	69	RB520S30	9
PSMN038-100K	85	PTVS15VP1UP	45	PTVS9V0S1UR	44	PVR100AD-B2V5	69	RB521S30	9
PSMN045-80YS	84	PTVS15VS1UR	44	PUMB1	55	PVR100AD-B3V0	69	RB751CS40	9
PSMN050-80PS	84	PTVS16VP1UP	45	PUMB10	55	PVR100AD-B3V3	69	RB751S40	9
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PSMN059-150Y	86	PTVS17VS1UR	44	PUMB14	55	PVR100AZ-B2V5	69	RS1B	15
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