



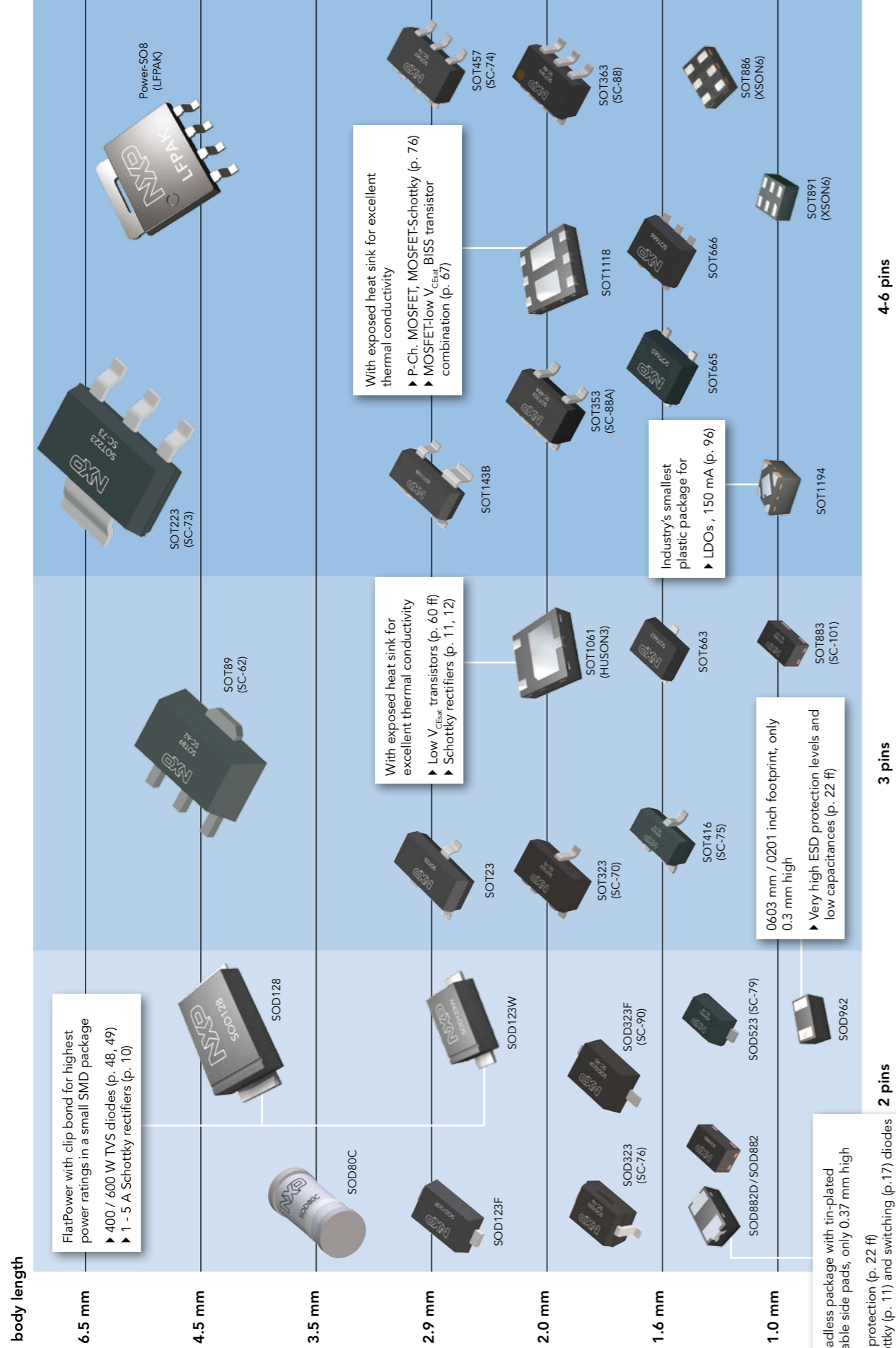
Discrete Semiconductors Selection Guide 2011

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

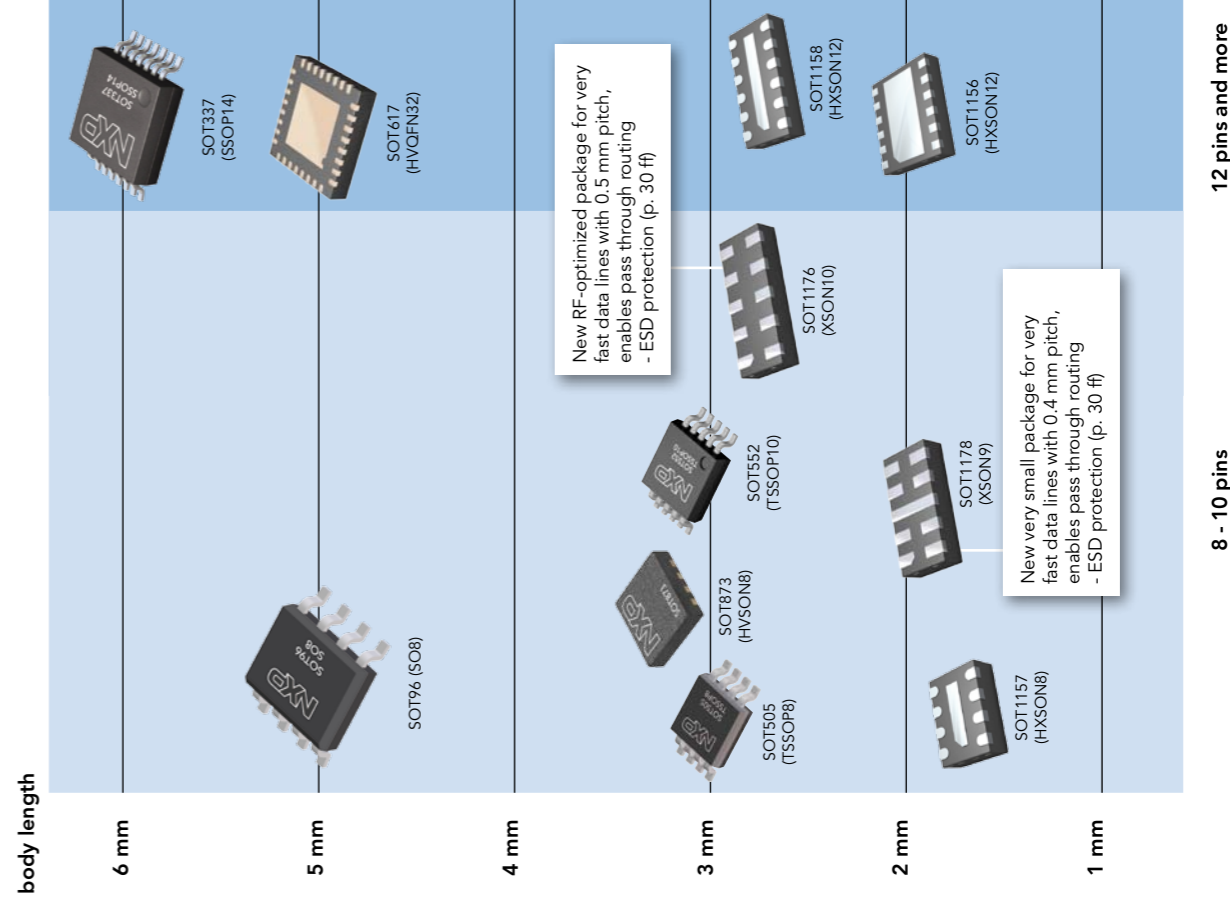


Discrete Semiconductors packages – portfolio and highlights

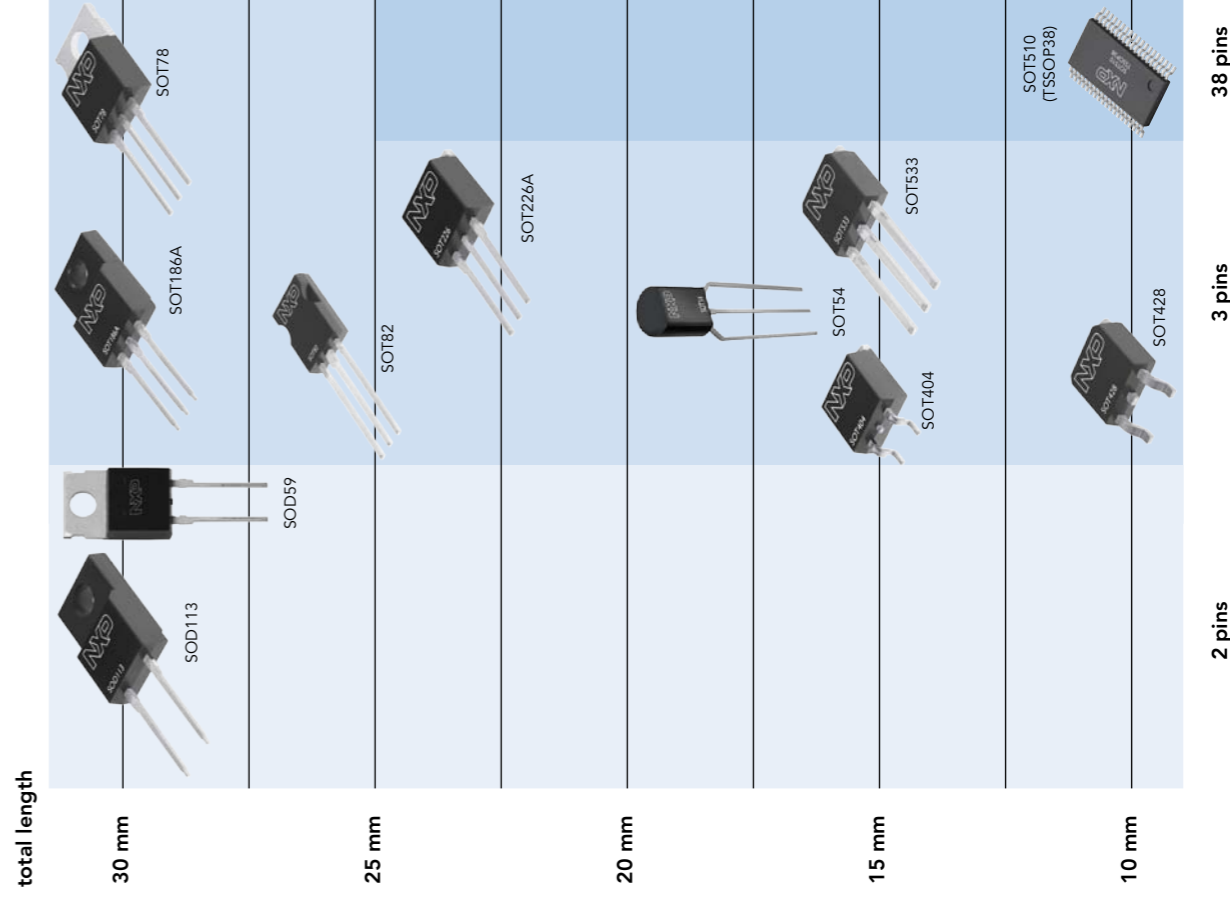
Small SMD packages with 2 - 6 pins



Small SMD packages with 8 pins and more



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



The first leadless package with solderable side pads

Solderable (Tin-plated) exposed side pads

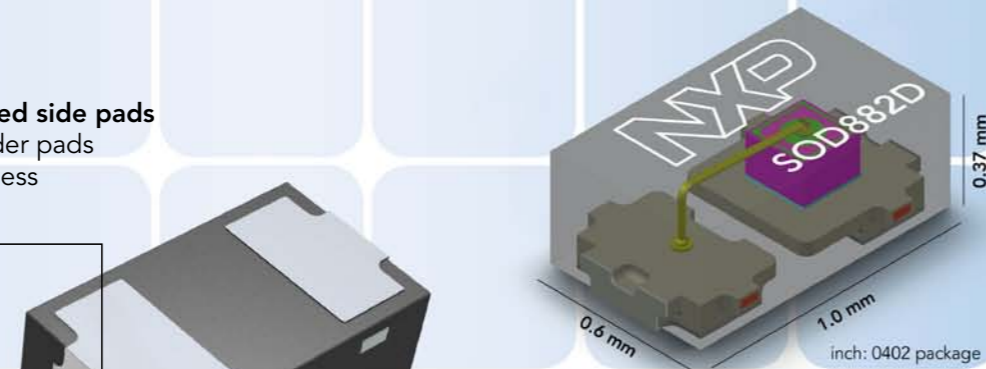
- ▶ Easy visible inspection of solder pads
- ▶ Very high mechanical robustness
- ▶ Post-soldering stability

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

- ▶ **Height only 0.37 mm**

Built for a range of functions

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



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

<http://standardproducts.nxp.com>



Discrete Semiconductors Selection Guide 2011

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Support tools

Check the NXP Standard Products Portal www.standardproducts.nxp.com

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

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- Recently launched products
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http://standardproducts.nxp.com/all_appnotes

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http://standardproducts.nxp.com/all_literature

Selection Guide (download pdf file)

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Models and test data

<http://www.nxp.com/models>

Technical support portal

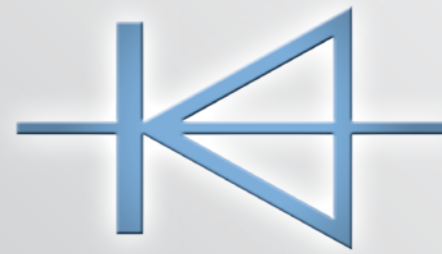
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Diodes

Schottky barrier diodes and rectifiers

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

Zener diodes

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- General purpose Zener diodes
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Switching diodes

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- General purpose switching diodes ≤ 100 V
- General purpose switching diodes > 100 V
- Controlled avalanche switching diodes
- Low leakage current switching diodes

Power diodes

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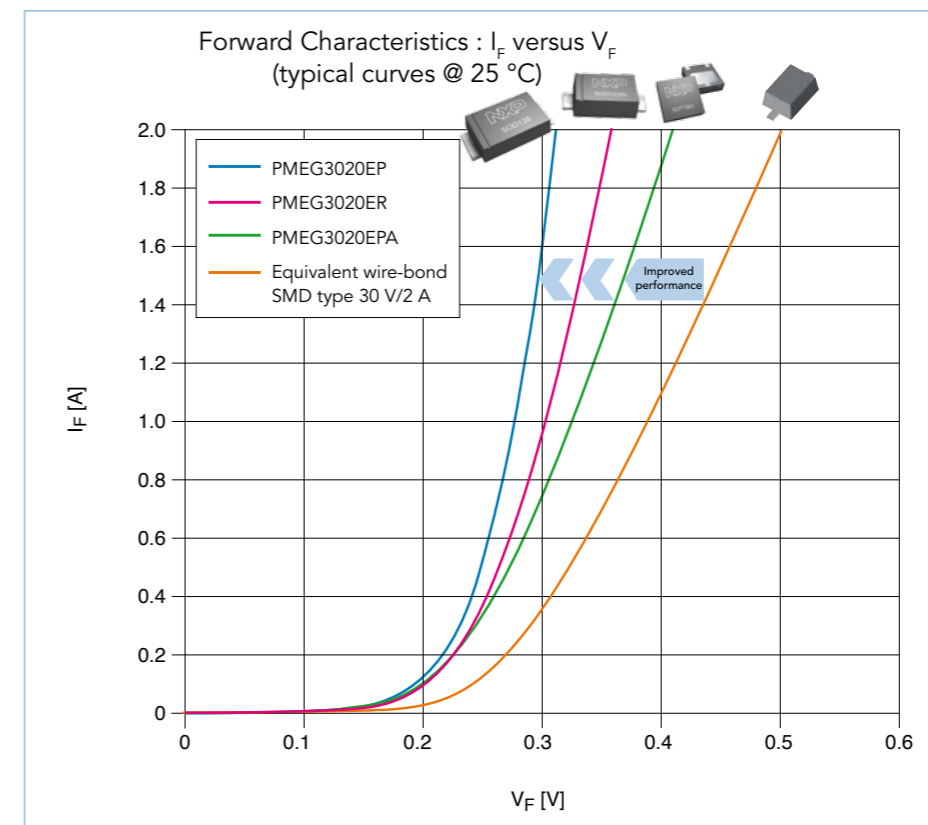
- Ultrafast recovery power diodes
- Hyperfast power diodes

Medium power low V_F Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

I_F max (A)	V_F max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT1061	SOT666
						Size (mm)	Size (mm)	Size (mm)	Size (mm)
0.2	30	480	0.03	low V_F	dual isolated				PMEG3002TV
	60	600	0.1	low V_F					PMEG6002TV
0.5	20	390	0.2	low V_F	dual c.c.		PMEG2005CT		
	30	430	0.15	low V_F			PMEG3005CT		
	40	470	0.1	low V_F			PMEG4005CT		
1.0	25	450	1.0	low V_F	dual series	BAT120S			
				low V_F	dual c.c.	BAT120C			
				low V_F	dual c.a.	BAT120A			
	40	500	0.05	low V_F	dual c.c.			PMEG4010CPA	
				low V_F	dual c.c.			PMEG6010CPA	
				low V_F	dual series	BAT160S			
60	650	0.35	low V_F	dual c.c.	BAT160C				
			low V_F	dual c.a.	BAT160A				
			low V_F	dual c.c.					
2.0	20	420	1.0	low V_F	dual c.c.				PMEG2020CPA
	30	440	2.0	low V_F	dual c.c.				PMEG3020CPA

Improved forward characteristics of (MEGA)¹ Schottky rectifiers in new packages



¹ Maximum Efficiency General Application

In the Spotlight

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

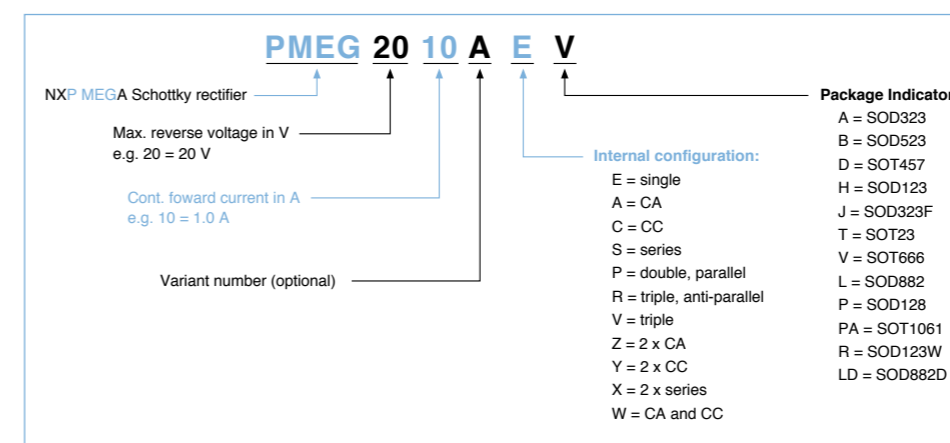
- Small FlatPower packages SOD123W/128, only 1 mm high
- Very low forward voltage drop V_F down to 340 mV
- Low reverse current I_R down to 0.05 mA
- High power capability due to clip-bonding technology and optimized die design
- AEC-Q101 qualified

In the Spotlight

Medium power single and dual Schottky rectifiers in SOT1061

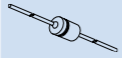
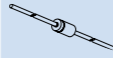
































- Small (2 x 2 x 0.65 mm) leadless medium power package SOT1061
- Exposed heat sink for excellent thermal and electrical performance ($P_{tot} > 1$ W)
- High forward-current capability (I_F up to 2 A) with low forward voltage drop
- High reverse voltage (V_F up to 60 V)
- AEC-Q101 qualified

Nomenclature of low V_F (MEGA) Schottky rectifiers



General purpose switching diodes ≤ 100V

types in **bold** represent new products

V _r max (V)	V _F max (V)	@ I _F (mA)	I _R max (mA)	@ V _R (V)	t _{tr} max (ns)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMelf)	SOT23	SOT143B	SOD123F		SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	SOD882	SOT883 (SC-101)	SOD882D						
																													
							4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1		2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37						
P _{tot} (mW)							500	500	500	250	250	830		200	300	400	550	180	170	500	250	250	250						
50	1	50	100	50	4					BAL74																			
										BAV74																			
70	1	50	1000	70	4					BAL99																			
75	1	10	25	20	4			1N4531																					
		50	1000	75	4					BAS28																			
		100	5000	75	4				BAS32L																				
90	1	50	500	80	4					BAW56				BAW56W						BAW56T			BAW56M						
																		BAW56S											
																			BAV756S										
100	1	50	500	80	4		1N4148																						
											BAS16H						BAS316	BAS16J											
											BAS16					BAS16W									BAS16T				
																									BAS516	BAS16L		BAS16LD	
																				BAS16VY				BAS16VW					
															BAV70					BAV70W						BAV70T			BAV70M
																				BAV70S									
															BAV99					BAV99W									
														BAV99S															

General purpose switching diodes > 100V

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

Controlled avalanche switching diodes









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

Low leakage current switching diodes

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





Ultrafast recovery power diodes

types in **bold** represent new products

V_{RRM} (V)	I_{FAV} (A)	V_F (typ) @ 150C (V)	I_F (A)	t_r (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT226 (I ² PAK)	SOT404 (D ² PAK)	SOT428 (DPAK)
												
100	8	0.8	8	20	BYW29E-100							
	2 x 10	0.72	8	20			BYV32E-100					
150	2 x 0.75	0.5	0.5	10					BYV40E-150			
	8	0.8	8	20	BYW29E-150							
	2 x 10	0.72	8	20			BYV32E-150					
200	2 x 15	0.78	15	20			BYV42E-150					
	8	0.8	8	20	BYW29E-200	BYW29EX-200						BYW29ED-200
	2 x 5	0.8	5	15			BYQ28E-200	BYQ28X-200				BYQ28ED-200
	14	0.83	14	20	BYV79E-200							
	2 x 8	0.84	8	20			BYQ30E-200					
	2 x 10	0.72	8	20			BYV32E-200			BYV32G-200	BYV32EB-200	
300	2 x 15	0.78	15	20			BYV42E-200			BYV42G-200	BYV42EB-200	
	2 x 5	0.95	5	50			BYT28-300					
	9	0.9	8	50	BYV29-400							
400	2 x 10	0.87	10	50			BYV34-400					
	9	0.9	8	50	BYV29-500	BYV29X-500					BYV29B-500	
500	2 x 5	0.95	5	50			BYT28-500					
	15	0.9	15	50	BYT79-500							
	2 x 10	0.87	10	50			BYV34-500					
	2 x 15	0.95	15	50			BYV44-500					
600	5	0.97	5	50		BYV25X-600				BYV25G-600		BYV25D-600
	8	1.07	8	60	BYR29-600	BYR29X-600						
	9	0.97	8	50	BYV29-600	BYV29X-600				BYV29G-600	BYV29B-600	
	15	1	15	50	BYT79-600	BYT79X-600						
	2 x 10	0.92	10	50			BYV34-600	BYV34X-600		BYV34G-600		
	5	1.1	5	17.5		BYV25FX-600	BYV25F-600				BYV25FB-600	BYV25FD-600
	9	1.25	8	17.5		BYV29FX-600	BYV29F-600				BYV29FB-600	BYV29FD-600
800	2 x 10	1.3	10	20			BYV410-600	BYV410X-600				
	8	1.07	8	60	BYR29-800	BYR29X-800						

Hyperfast power diodes

types in **bold** represent new products

V_{RRM} (V)	I_{FAV} (A)	V_F (typ) @ 150C (V)	I_F (A)	t_r (typ) @ 25C (ns)	SOD59 (TO220AC)	SOD113 (2-pin SOT186A)	SOT78 (TO220AB)	SOT404 (D ² PAK)
								
600	5	1.4	5	19	BYC5-600	BYC5X-600		BYC5B-600
	8	1.4	8	19	BYC8-600	BYC8X-600		BYC8B-600
	8	1.4	8	19	BYC8D-600	BYC8DX-600		
	8	2	8	12.5		BYC58X-600		
	10	1.4	10	19	BYC10-600	BYC10X-600		BYC10B-600
	2 x 5	1.4	5	19			BYC10-600CT	
	15	1.4	15	19	BYC15-600	BYC15X-600		
	20	1.4	20	19	BYC20-600	BYC20X-600		






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Standard ESD protection devices

types in **bold** represent new products







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

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

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

Standard ESD protection devices

types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	P _{pp} ^[1] max (W)	ESD rating ^[2] max (kV)	I _r max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
2	1	3.3	200	275	150	23	3		PESD3V3S2UQ	SOT663	1.6 x 1.2 x 0.55		
		5	150	215	150	30	0.3						
		12	38	100	150	30	0.03						
		15	32	70	150	30	0.05						
		24	23	50	150	23	0.05						
		24	23	50	150	23	0.05						
		3.3	207	300	330	30	2						
		5.2	152	200	260	30	1						
		12	38	75	180	30	1						
		15	32	70	160	30	1						
		24	23	50	160	23	1						
		36	17	35	160	30	1 (@ 30 V)						
	0	1	3.3	207	300	330	30	2		PESD3V3S2UAT	SOT23	2.9 x 1.3 x 1.0	
			5	152	200	260	30	1					
			12	38	75	180	30	0.05					
			15	32	70	160	30	0.05					
			24	23	50	160	23	0.05					
			24	23	50	160	23	0.05					
			5.5	45	60	-	15	0.1					
			5.5	30	40	-	15	0.1					
			3.3	110	300	110	30	1 (@ 3 V)					
			5	85	220	110	30	0.1 (@ 4.3 V)					
			3	107	125	-	8	1					
			4	90	105	-	8	0.5					
4	3	4.3	78	90	-	8	0.1		BZA956A	SOT665	1.6 x 1.2 x 0.55		
		3	200	240	-	8	2						
		3	107	125	-	8	1						
		4	165	200	-	8	0.7						
		4	90	105	-	8	0.5						
		4.3	145	180	-	8	0.2						
		4.3	78	90	-	8	0.1						
		15	37	50	-	8	0.1						
		3	200	240	-	8	2						
		4	165	200	-	15	0.7						
		14	37	48	-	8	0.075						
		15	37	48	-	8	0.1						
	0	3	3.3	215	300	200	30	0.8		BZA856A	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	
			5	165	220	200	30	0.2					
			12	73	100	200	30	0.015					
			15	60	90	200	30	0.015					
			24	40	70	200	23	0.015					
			24	40	70	200	23	0.015					
			3.3	215	300	200	30	0.8					
			5	165	220	200	30	0.2					
			12	73	100	200	30	0.015					
			15	60	90	200	30	0.015					
			24	45	70	200	23	0.015					
			24	45	70	200	23	0.015					
5	4	12	73	100	200	30	0.015		BZA820A	SOT457 (SC-74)	2.9 x 1.5 x 1.0		
		15	60	90	200	30	0.015						
		24	45	70	200	23	0.015						
		24	45	70	200	23	0.015						
0	4	5	45	75	-	15	0.1		BZA408B			SOT163 (SO20)	12.8 x 7.5 x 2.65
18		17	5.2	100	120	-	8		2				

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

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

Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{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	SOD882	1.0 x 0.6 x 0.5			
		5	25	30	42	26	0.1		PESD5V0L1UL					
		5	25	30	42	26	0.1		PESD5V0L1ULD	SOD882D	1.0 x 0.6 x 0.37			
		3.3	34	40	45	30	0.3		PESD3V3L1UB	SOD523 (SC-79)				
		5	25	30	42	26	0.1		PESD5V0L1UB		1.2 x 0.8 x 0.6			
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-76)				
		5	25	30	42	26	0.1		PESD5V0L1UA		1.7 x 1.25 x 0.95			
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UL	SOD882		1.0 x 0.6 x 0.5		
		5	2	2.6	-	9	0.1		PESD5V0U1UL					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6			
		5	2	2.6	-	9	0.1		PESD5V0U1UB					
		3.3	2.6	3.1	-	9	0.1 (@ 3 V)		PESD3V3U1UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95			
		5	2	2.6	-	9	0.1		PESD5V0U1UA					
		0	1	3.3	101	-	500		30	2		PESD3V3L1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95
				5	75	-	500		30	1		PESD5V0L1BA		
				12	19	-	200		30	0.05		PESD12VL1BA		
15	16			-	200	30	0.05	PESD15VL1BA						
24	11			-	200	23	0.05	PESD24VL1BA						
5.5	12			15.4	35	30	0.1	PESD5V0L1BSF	SOD962	0.6 x 0.3 x 0.3				
5	11			13	45	30	0.01	PESD5V0V1BL	SOD882					
5	11			13	45	30	0.01	PESD5V0V1BLD	SOD882D	1.0 x 0.6 x 0.37				
5	11			13	45	30	0.01	PESD5V0V1BB	SOD523 (SC-79)					
5	11			13	45	30	0.01	PESD5V0V1BA	SOD323 (SC-76)	1.7 x 1.25 x 0.95				
5.5	3.5			4.5	8	15	0.1	PESD5V0V1BSF	SOD962					
15	8			10	-	15	0.1	IP4302CX2/A	CSP2	0.7 x 0.52 x 0.40				

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

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

Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	P _{pp} ^[1] max (W)	ESD rating ^[2] max (kV)	I _r max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
0	1	5	2.9	3.5	-	10	0.1		PESD5V0U1BL	SOD882	1.0 x 0.6 x 0.5		
		5	2.9	3.5	-	10	0.1		PESD5V0U1BLD	SOD882D			
		5	2.9	3.5	-	10	0.1		PESD5V0U1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6		
		5	2.9	3.5	-	10	0.1		PESD5V0U1BA	SOD323 (SC-76)			
		2	1	3.3	22	28	30		15	0.3		PESD3V3L2UM	SOT883 (SC-101)
5	16			19	30	15	0.025	PESD5V0L2UM					
5	38			46	70	30	0.09 (@ 4 V)	PESD5V0L2UU	SOT323 (SC-70)	2.0 x 1.25 x 0.95			
6	34			40	60	30	0.018 (@ 4.3 V)	PESD6V0L2UU					
0	2	3.3	101	-	350	30	2		PESD3V3L2BT	SOT23	2.9 x 1.3 x 1.0		
		5	75	-	350	30	1		PESD5V0L2BT				
		12	19	-	200	30	0.05		PESD12VL2BT				
		15	16	-	200	30	0.05		PESD15VL2BT				
		24	11	-	200	23	0.05		PESD24VL2BT				
		5	35	45	130	30	0.1		PESD5V0S2BT				
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT	SOT883 (SC-101)	1.0 x 0.6 x 0.5		
		5	2.9	3.5	-	10	0.1		PESD5V0U2BM				
		15	13	15	-	15	0.1		-	IP4303CX4/P	CSP4		0.76 x 0.76 x 0.40

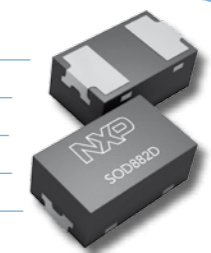
^[1] 8/20 μs surge pulse acc. to IEC 61000-4-5

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

In the Spotlight

New innovative ultra-small package SOD882D

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



Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line typ} (pF)	C _{line max} (pF)	P _{pp} ^[1] max (W)	ESD rating ^[2] max (kV)	I _R max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional												
3	0	5.5	3	4	-	15	0.1	-	IP4059CX5/LF	CSP5, staggered compressed	1.34 x 0.96 x 0.65		
4	3	3.3	22	28	30	20	0.3		PESD3V3L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		5	16	19	30	20	0.025		PESD5V0L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		3.3	22	28	30	20	0.3		PESD3V3L4UW	SOT665	1.6 x 1.2 x 0.55		
		5	16	19	30	20	0.025		PESD5V0L4UW	SOT665	1.6 x 1.2 x 0.55		
		3.3	22	28	30	20	0.3		PESD3V3L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5	16	19	30	20	0.025	PESD5V0L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95			
		3.3	13	17	25	10	1		PESD3V3V4UW	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		5	12	15	25	15	0.3		PESD5V0V4UW	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		9	6.5	10	28	8	0.1		PESD9V0V4UW	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		3.3	15	18	16	12	0.3		PESD3V3V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		5	12	15	16	12	0.025		PESD5V0V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		3.3	15	18	16	12	0.3		PESD3V3V4UW	SOT665	1.6 x 1.2 x 0.55		
		5	12	15	16	12	0.025	PESD5V0V4UW	SOT665	1.6 x 1.2 x 0.55			
		3.3	15	18	16	12	0.3		PESD3V3V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5	12	15	16	12	0.025		PESD5V0V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95		
		5.5	18	20	-	15	0.1		-	IP4142CX5/LF	5 ball CSP, staggered compressed	1.28 x 0.91 x 0.65	
		0	4	5.5	18	20	-	15	0.1		IP4343CX5/LF	5 ball CSP	1.06 x 0.76 x 0.61
				5.5	18	20	-	15	0.1		IP4043CX5/LF	5 ball CSP	1.12 x 1.12 x 0.65

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

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

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												
3	0	5.5	3	4	-	15	0.1	-	IP4059CX5/LF	CSP5, staggered compressed	1.34 x 0.96 x 0.65		
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	20	24	28	15	2		PESD3V3L5UW	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		5	18.5	22	30	20	0.5		PESD5V0L5UW	SOT891 (XSON6)	1.0 x 1.0 x 0.5		
		3.3	22	28	25	20	0.3		PESD3V3L5UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5		
		5	16	19	25	20	0.025	PESD5V0L5UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5			
		3.3	22	28	25	20	0.3		PESD3V3L5UV	SOT666	1.6 x 1.2 x 0.55		
		5	16	19	25	20	0.025		PESD5V0L5UV	SOT666	1.6 x 1.2 x 0.55		
		3.3	22	28	25	20	0.3		PESD3V3L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95		
		5	16	19	25	20	0.025	PESD5V0L5UY	SOT363 (SC-88)	2.0 x 1.25 x 0.95			
		0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF	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		PESD5V0L6US	SOT96 (SO8)	4.9 x 3.9 x 1.75		
0	7	5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8)	4.9 x 3.9 x 1.75		

^[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 ⁽¹⁾ max (kV)	Configuration	Type	Package	Size (mm)		
Unidirectional	Bidirectional										
1	0	5	1.55	1.75	15		PESD5V0X1ULD	SOD882D	1.0 x 0.6 x 0.37		
		5	0.95	1.15	8		PESD5V0X1UALD	SOD523 (SC-79)			
		5	0.95	1.15	8		PESD5V0X1UB				
		5	1.55	1.75	15		PESD5V0X1UAB				
		16	0.83	0.98	8	PESD16VX1UL	SOD882	1.0 x 0.6 x 0.5			
		5.5	1	1.5	8	PRTR5V0U1T	SOT23	2.9 x 1.3 x 1.0			
		80	0.6	0.75	30	NUP1301	SOT323	2.0 x 1.25 x 0.95			
		80	0.6	0.75	30	NUP1301U					
0	1	5.5	0.4	0.55	10		PESD5V0F1BL	SOD882	1.0 x 0.6 x 0.5		
		16	0.5	0.65	8		PESD16VF1BL				
		3.3	1.3	1.6	9		PESD3V3X1BL				
		5	0.9	1.3	9		PESD5V0X1BL				
		5.5	0.25	0.3	28		PESD5V0F1BSF			SOD962	0.6 x 0.3 x 0.3
2	1	5	0.9	1.3	9		PESD5V0X1BQ	SOT663	1.6 x 1.2 x 0.55		
		5	0.9	1.3	9		PESD5V0X1BT	SOT23	2.9 x 1.3 x 1.0		
	0	1	5.5	1	1.5	8		PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0	
			5.5	1.8	-	12		PRTR5V0U2AX			
		0	0	5.5	1	1.5	8		PRTR5V0U2K	SOT891 (XSON6)	1.0 x 1.0 x 0.5
				5.5	1	1.5	8		PRTR5V0U2D	SOT457 (SC-74)	2.9 x 1.5 x 1.0
				5.5	1	1.5	8		PRTR5V0U2F	SOT886 (XSON6)	1.45 x 1.0 x 0.5
				5.5	1	1.5	8				


⁽¹⁾ acc. to IEC 61000-4-2 (contact discharge)

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

In the Spotlight

Ultra low clamping ESD protection diodes in SOD523

- Ultra-low clamping voltage of V_{CL} = 10 V
- Ultra-low capacitance of C_d = 0.95 / 1.8 pF (high robustness version)
- Ultra-low dynamical resistance r_{dyn} = 0.25 / 0.15 Ω
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified



Protection and signal conditioning

types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line} typ (pF)	C _{line} max (pF)	ESD rating ⁽¹⁾ max (kV)	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional								
2	0	5.5	2	-	15		IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	0.7	-	8		IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1.3	-	15		IP4359CX4/LF	CSP4	0.76 x 0.76 x 0.61
3	2	5.5	1.4	1.5	15	-	IP4356CX4		
4	0	5.5	1.4	1.5	15	-	IP4319CX10	CSP10, staggered compressed	1.56 x 1.05 x 0.61
		5.5	1	-	8		IP4220CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	1	-	8		IP4221CZ6-S	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1	-	8		IP4221CZ6-XS	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5.5	1	-	8		IP4233CZ6	SOT363 (SC-88)	2.0 x 1.25 x 0.95

⁽¹⁾ acc. to IEC 61000-4-2 (contact discharge)

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

types in **bold** represent new products

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

⁽¹⁾ acc. to IEC 61000-4-2 (contact discharge)

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

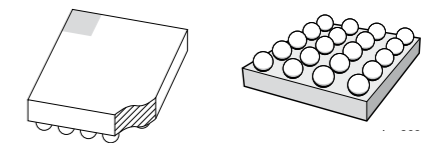
types in **bold** represent new products

Number of protected lines		V _{RWM} (V)	C _{line typ} (pF)	C _{line max} (pF)	ESD rating ⁽¹⁾ max (kV)	I _R max (μA) @ V _{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.5	-	8	-		IP4292CZ10-TBR	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
5	0	5.5	1.3	-	15	-		IP4358CX6	CSP 	0.76 x 1.16 x 0.61
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⁾ acc. to IEC 61000-4-2 (contact discharge)

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

- ▶ Smallest possible solution for ESD and EMI circuits, saving maximum of space
- ▶ Lowest parasitic inductance to GND contact, ensures best performance
- ▶ High mechanical robustness



Audio interfaces

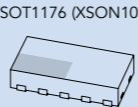

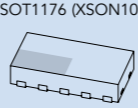





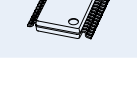
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R _{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	5 ball CSP	0.91 x 1.28 x 0.65
		68 Ω	110	-	Single-ended or differential microphone	IP4049CX5/LF	6 ball CSP	1.56 x 1.03 x 0.65
		470 Ω	35	-	Single-ended or differential microphone	IP4055CX6/LF		
		470 Ω	20	-	Single-ended or differential microphone	IP4355CX6/LF	8 ball CSP	1.16 x 0.76 x 0.65
		50 Ω / 2.2 kΩ	2000	-	Single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF	6 ball CSP	1.67 x 1.67 x 0.65
		0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3047CX6	5 ball CSP	1.60 x 1.15 x 0.65
	0.25 Ω, 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3048CX5	20 ball CSP	1.51 x 1.15 x 0.65	
6	40 Ω / 1450 Ω / 10 Ω	50 / 20 / 200	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4027CX20/LF	20 ball CSP	1.91 x 2.52 x 0.65	

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

Video interfaces

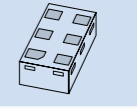
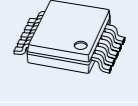

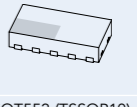
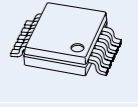
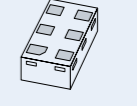
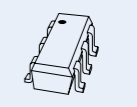
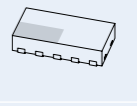
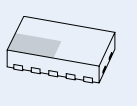
types in **bold** represent new products

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

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

Video interfaces

types in **bold** represent new products

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

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

In the Spotlight

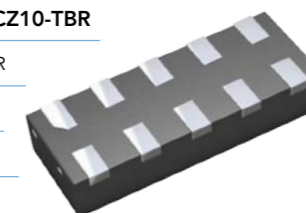
HDMI: High-speed 4 channel ESD protection – IP4283CZ10-TBR

Low capacitance 4 channel ESD protection array: IP4283CZ10-TBR

Optimized for high level ESD protection of HDMI ports

Straight through routing → best signal integrity

10 pin QFN package with exposed leads (SOT1176)



Protection and signal conditioning

Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C _{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
HDMI	4	-	-	0.5	-	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		-	-	0.5	-	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR	SOT1176 (XSON10)	1.0 x 2.5 x 0.5
	5	-	-	10	1.75 k, 100 k	HDMI, DDC, CEC, hot plug ESD protection and biasing	IP4310CX8/P	8 ball CSP	1.16 x 1.16 x 0.61
		yes	yes	-	internal	Fully integrated solution for HDMI low-speed signals, buffer and level shifter for DDC, CEC, HP	IP4791CZ12	SOT1156	2.5 x 2.1 x 0.5
	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	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
		yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and hot plug application for a complete HDMI source port	IP4777CZ38		
		yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and hot plug application for a complete HDMI sink port	IP4778CZ38		
	13	yes	yes	100 Ω differential impedance	internal	Fully integrated HDMI solution with current limiter, buffer and level shifter for DDC, CEC, HP	IP4786CZ32	SOT617	5.0 x 5.0 x 1.0
	LVDS	2	-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	IP3348CX5	CSP5, staggered compressed
4		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	IP3348CX10	CSP10, staggered compressed	1.56 x 1.06 x 0.61
6		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	IP3348CX15	CSP15, staggered compressed	2.36 x 1.06 x 0.61
8		-	-	30	10	EMI filter with ESD protection for MIPI or MDDI	IP3348CX20	CSP20, staggered compressed	3.16 x 1.06 x 0.61

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

Video interfaces

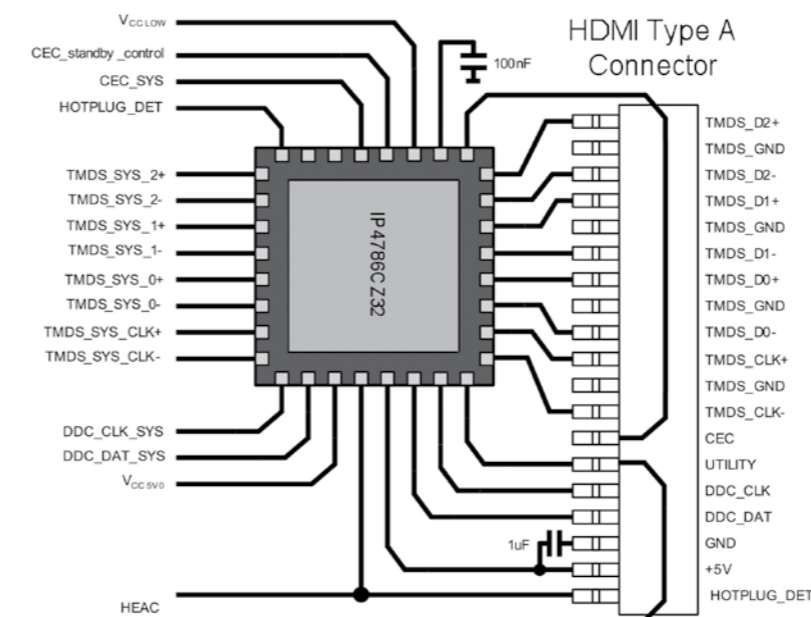
types in **bold** represent new products

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

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

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

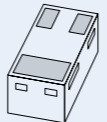
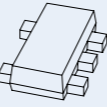
Transmitter HDMI companion chip IP4786CZ32



Protection and signal conditioning

Multichannel EMI filters, ESD protection for LCD and camera

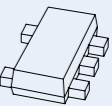
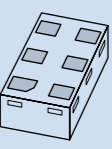
types in bold represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)					
LCD display, camera, keypad	1	75	36	-	~50	155	IP4307CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
		20	40	-	~50	153	PEMI1QFN/CT		1.0 x 0.6 x 0.5
		20	36	-	~55	170	PEMI1QFN/CR		
		20	32	-	~60	185	PEMI1QFN/CP		
		20	28	-	~70	218	PEMI1QFN/CM		
		20	23	-	~90	264	PEMI1QFN/CK		
		20	19	-	~105	317	PEMI1QFN/CG		
		20	15	-	~130	397	PEMI1QFN/CE		
		45	40	-	~50	145	PEMI1QFN/HT		
		45	36	-	~55	161	PEMI1QFN/HR		
		45	32	-	~60	175	PEMI1QFN/HP		
		45	28	-	~70	206	PEMI1QFN/HM		
		45	23	-	~80	249	PEMI1QFN/HK		
		45	19	-	~100	300	PEMI1QFN/HG		
		45	15	-	~125	376	PEMI1QFN/HE		
		65	40	-	~45	139	PEMI1QFN/LT		
		65	36	-	~50	155	PEMI1QFN/LR		
		65	32	-	~55	168	PEMI1QFN/LP		
		65	28	-	~65	197	PEMI1QFN/LM		
		65	23	-	~80	239	PEMI1QFN/LK		
		65	19	-	~95	288	PEMI1QFN/LG		
		65	15	-	~120	361	PEMI1QFN/LE		
		100	40	-	~45	131	PEMI1QFN/RT		
		100	36	-	~50	145	PEMI1QFN/RR		
		100	32	-	~55	159	PEMI1QFN/RP		
		100	28	-	~60	187	PEMI1QFN/RM		
		100	30	-	~65	200	IP4256CZ3-M		
		100	23	-	~75	227	PEMI1QFN/RK		
		100	19	-	~90	272	PEMI1QFN/RG		
		100	15	-	~115	343	PEMI1QFN/RE		
		200	40	-	~40	119	PEMI1QFN/WT		
	200	36	-	~45	132	PEMI1QFN/WR			
	200	32	-	~50	143	PEMI1QFN/WP			
	200	28	-	~55	169	PEMI1QFN/WM			
	200	23	-	~70	205	PEMI1QFN/WK			
	200	19	-	~80	247	PEMI1QFN/WG			
	200	15	-	~105	311	PEMI1QFN/WE			
	2	10	35	15	~115	350	IP3348CX5	5 ball CSP	0.76 x 1.06 x 0.61
		18	65	40	~60	175	IP3088CX5		0.96 x 1.28 x 0.65
		100	45	35	~50	150	IP3053CX5		0.96 x 1.28 x 0.65
		20	40	-	~50	153	PEMI2STD/CT		1.6 x 1.2 x 0.5
20		36	-	~55	170	PEMI2STD/CR			
20		32	-	~60	185	PEMI2STD/CP			
20		28	-	~70	218	PEMI2STD/CM			

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

Multichannel EMI filters, ESD protection for LCD and camera

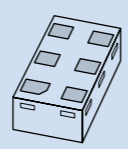
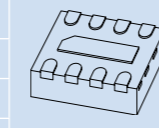
types in bold represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)					
LCD display, camera, keypad	2	20	23	-	~90	264	PEMI2STD/CK		1.6 x 1.2 x 0.5
		20	19	-	~105	317	PEMI2STD/CG		
		20	15	-	~130	397	PEMI2STD/CE		
		45	40	-	~50	145	PEMI2STD/HT		
		45	36	-	~55	161	PEMI2STD/HR		
		45	32	-	~60	175	PEMI2STD/HP		
		45	28	-	~70	206	PEMI2STD/HM		
		45	23	-	~80	249	PEMI2STD/HK		
		45	19	-	~100	300	PEMI2STD/HG		
		45	15	-	~125	376	PEMI2STD/HE		
		65	40	-	~45	139	PEMI2STD/LT		
		65	36	-	~50	155	PEMI2STD/LR		
		65	32	-	~55	168	PEMI2STD/LP		
		65	28	-	~65	197	PEMI2STD/LM		
		65	23	-	~80	239	PEMI2STD/LK		
		65	19	-	~95	288	PEMI2STD/LG		
		65	15	-	~120	361	PEMI2STD/LE		
		100	40	-	~45	131	PEMI2STD/RT		
		100	36	-	~50	145	PEMI2STD/RR		
		100	32	-	~55	159	PEMI2STD/RP		
		100	30	-	~65	200	IP4256CZ5-W		
		100	28	-	~60	187	PEMI2STD/RM		
		100	23	-	~75	227	PEMI2STD/RK		
		100	19	-	~90	272	PEMI2STD/RG		
		100	15	-	~115	343	PEMI2STD/RE		
		200	40	-	~40	119	PEMI2STD/WT		
		200	36	-	~45	132	PEMI2STD/WR		
		200	32	-	~50	143	PEMI2STD/WP		
		200	28	-	~55	169	PEMI2STD/WM		
		200	23	-	~70	205	PEMI2STD/WK		
		200	19	-	~80	247	PEMI2STD/WG		
		200	15	-	~105	311	PEMI2STD/WE		
	1	20	40	-	~50	153	PEMI2QFN/CT		1.45 x 1.0 x 0.5
		20	36	-	~55	170	PEMI2QFN/CR		
		20	32	-	~60	185	PEMI2QFN/CP		
		20	28	-	~70	218	PEMI2QFN/CM		
		20	23	-	~90	264	PEMI2QFN/CK		
		20	19	-	~105	317	PEMI2QFN/CG		
		20	15	-	~130	397	PEMI2QFN/CE		
		45	40	-	~50	145	PEMI2QFN/HT		
		45	36	-	~55	161	PEMI2QFN/HR		
45	32	-	~60	175	PEMI2QFN/HP				
45	28	-	~70	206	PEMI2QFN/HM				

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

Multichannel EMI filters, ESD protection for LCD and camera

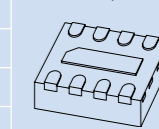
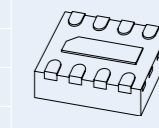
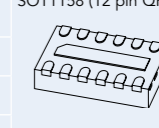
types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)					
LCD display, camera, keypad	2	45	23	-	~80	249	PEMI2QFN/HK	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		45	19	-	~100	300	PEMI2QFN/HG		
		45	15	-	~125	376	PEMI2QFN/HE		
		65	40	-	~45	139	PEMI2QFN/LT		
		65	36	-	~50	155	PEMI2QFN/LR		
		65	32	-	~55	168	PEMI2QFN/LP		
		65	28	-	~65	197	PEMI2QFN/LM		
		65	23	-	~80	239	PEMI2QFN/LK		
		65	19	-	~95	288	PEMI2QFN/LG		
		65	15	-	~120	361	PEMI2QFN/LE		
		100	40	-	~45	131	PEMI2QFN/RT		
		100	36	-	~50	145	PEMI2QFN/RR		
		100	32	-	~55	159	PEMI2QFN/RP		
		100	30	-	~65	200	IP4256CZ6-F		
		100	28	-	~60	187	PEMI2QFN/RM		
		100	23	-	~75	227	PEMI2QFN/RK		
		100	19	-	~90	272	PEMI2QFN/RG		
		100	15	-	~115	343	PEMI2QFN/RE		
		200	40	-	~40	119	PEMI2QFN/WT		
		200	36	-	~45	132	PEMI2QFN WR		
	200	32	-	~50	143	PEMI2QFN/WP			
	200	28	-	~55	169	PEMI2QFN/WM			
	200	23	-	~70	205	PEMI2QFN/WK			
	200	19	-	~80	247	PEMI2QFN/WG			
	200	15	-	~105	311	PEMI2QFN/WE			
	10	35	15	~115	350	IP3348CX10	10 ball CSP	1.56 x 1.06 x 0.61	
	18	65	40	~60	175	IP3088CX10		1.96 x 1.28 x 0.65	
	100	54	-	~30	98	PEMI4CSP/RW		1.56 x 1.06 x 0.61	
	100	45	35	~20	150	IP3053CX10		1.96 x 1.28 x 0.65	
	100	41	-	~40	125	PEMI4CSP/RT		1.56 x 1.06 x 0.61	
	20	40	-	~50	153	PEMI4QFN/CT	SOT1157 (8 pin QFN) 	1.7 x 1.2 x 0.5	
	20	36	-	~55	170	PEMI4QFN/CR			
	20	32	-	~60	185	PEMI4QFN/CP			
	20	28	-	~70	218	PEMI4QFN/CM			
	20	23	-	~90	264	PEMI4QFN/CK			
	20	19	-	~105	317	PEMI4QFN/CG			
	20	15	-	~130	397	PEMI4QFN/CE			
	45	40	-	~50	145	PEMI4QFN/HT			
	45	36	-	~55	161	PEMI4QFN/HR			
	45	32	-	~60	175	PEMI4QFN/HP			
45	28	-	~70	206	PEMI4QFN/HM				
45	23	-	~80	249	PEMI4QFN/HK				
45	19	-	~100	300	PEMI4QFN/HG				

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

Multichannel EMI filters, ESD protection for LCD and camera

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)		
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)							
LCD display, camera, keypad	4	45	15	-	~125	376	PEMI4QFN/HE	SOT1157 (8 pin QFN) 	1.7 x 1.2 x 0.5		
		65	40	-	~45	139	PEMI4QFN/LT				
		65	36	-	~50	155	PEMI4QFN/LR				
		65	32	-	~55	168	PEMI4QFN/LP				
		65	28	-	~65	197	PEMI4QFN/LM				
		65	23	-	~80	239	PEMI4QFN/LK				
		65	19	-	~95	288	PEMI4QFN/LG				
		65	15	-	~120	361	PEMI4QFN/LE				
		100	40	-	~45	131	PEMI4QFN/RT				
		100	36	-	~50	145	PEMI4QFN/RR				
		100	32	-	~55	159	PEMI4QFN/RP				
		100	28	-	~60	187	PEMI4QFN/RM				
		100	23	-	~75	227	PEMI4QFN/RK				
		100	19	-	~90	272	PEMI4QFN/RG				
		100	15	-	~115	343	PEMI4QFN/RE				
		200	40	-	~40	119	PEMI4QFN/WT				
		200	36	-	~45	132	PEMI4QFN/WR				
		200	32	-	~50	143	PEMI4QFN/WP				
		200	28	-	~55	169	PEMI4QFN/WM				
		200	23	-	~70	205	PEMI4QFN/WK				
		200	19	-	~80	247	PEMI4QFN/WG				
		200	15	-	~105	311	PEMI4QFN/WE				
		15	43	12	~60	175	IP3253CZ8-4-TTL			SOT1166 (8 pin QFN) 	1.7 x 1.35 x 0.5
		15	50	18	~50	145	IP3254CZ8-4-TTL				
		40	18	-	~100	300	IP4252CZ8-4-TTL				
		100	45	-	~40	130	IP4254CZ8-4-TTL				
		100	15	-	~110	330	IP4251CZ8-4-TTL				
		200	45	-	~35	110	IP4253CZ8-4-TTL				
		10	35	15	~115	350	IP3348CX15			15 ball CSP	2.36 x 1.06 x 0.61
		18	65	40	~60	175	IP3088CX15				2.96 x 1.28 x 0.65
		100	60	-	~40	120	IP4053CX15/LF				2.96 x 1.32 x 0.65
		100	60	-	~40	120	IP4353CX15/LF				2.38 x 1.05 x 0.61
	100	54	-	~30	98	PEMI6CSP/RW	2.36 x 1.06 x 0.61				
	100	45	35	~20	150	IP3053CX15	2.96 x 1.28 x 0.65				
	100	41	-	~40	125	PEMI6CSP/RT	2.36 x 1.06 x 0.61				
	100	30	-	~70	210	IP4153CX15/LF	2.91 x 1.28 x 0.65				
	20	40	-	~50	153	PEMI6QFN/CT	SOT1158 (12 pin QFN) 	2.5 x 1.2 x 0.5			
	20	36	-	~55	170	PEMI6QFN/CR					
	20	32	-	~60	185	PEMI6QFN/CP					
	20	28	-	~70	218	PEMI6QFN/CM					
20	23	-	~90	264	PEMI6QFN/CK						
20	19	-	~105	317	PEMI6QFN/CG						
20	15	-	~130	397	PEMI6QFN/CE						
45	40	-	~50	145	PEMI6QFN/HT						

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

Protection and signal conditioning

Multichannel EMI filters, ESD protection for LCD and camera

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)					
LCD display, camera, keypad	6	45	36	-	~55	161	PEMI6QFN/HR	SOT1158 (12 pin QFN)	2.5 x 1.2 x 0.5
		45	32	-	~60	175	PEMI6QFN/HP		
		45	28	-	~70	206	PEMI6QFN/HM		
		45	23	-	~80	249	PEMI6QFN/HK		
		45	19	-	~100	300	PEMI6QFN/HG		
		45	15	-	~125	376	PEMI6QFN/HE		
		65	40	-	~45	139	PEMI6QFN/LT		
		65	36	-	~50	155	PEMI6QFN/LR		
		65	32	-	~55	168	PEMI6QFN/LP		
		65	28	-	~65	197	PEMI6QFN/LM		
		65	23	-	~80	239	PEMI6QFN/LK		
		65	19	-	~95	288	PEMI6QFN/LG		
		65	15	-	~120	361	PEMI6QFN/LE		
		100	40	-	~45	131	PEMI6QFN/RT		
		100	36	-	~50	145	PEMI6QFN/RR		
		100	32	-	~55	159	PEMI6QFN/RP		
		100	28	-	~60	187	PEMI6QFN/RM		
		100	23	-	~75	227	PEMI6QFN/RK		
		100	19	-	~90	272	PEMI6QFN/RG		
		100	15	-	~115	343	PEMI6QFN/RE		
		200	40	-	~40	119	PEMI6QFN/WT		
		200	36	-	~45	132	PEMI6QFN/WR		
		200	32	-	~50	143	PEMI6QFN/WP		
		200	28	-	~55	169	PEMI6QFN/WM		
	200	23	-	~70	205	PEMI6QFN/WK			
	200	19	-	~80	247	PEMI6QFN/WG			
	200	15	-	~105	311	PEMI6QFN/WE			
	15	50	18	~50	145	IP3254CZ12-6-TTL	SOT1167 (12 pin QFN)	2.5 x 1.35 x 0.5	
	15	43	12	~60	175	IP3253CZ12-6-TTL			
	40	18	-	~100	300	IP4252CZ12-6-TTL			
	100	45	-	~40	130	IP4254CZ12-6-TTL			
	100	15	-	~110	330	IP4251CZ12-6-TTL			
	200	45	-	~35	110	IP4253CZ12-6-TTL			
	7	70	25	-	~75	220	IP4337CX18/LF	18 ball CSP	1.96 x 1.61 x 0.61
	125	25	60	~60	180	IP3337CX18/LF	2.06 x 1.66 x 0.61		
	8	10	35	15	~115	350	IP3348CX20	20 ball CSP	3.16 x 1.06 x 0.61
		18	65	40	~60	175	IP3088CX20		3.96 x 1.28 x 0.65
		100	54	-	~30	98	PEMI8CSP/RW		3.16 x 1.06 x 0.61
		100	50	-	~40	120	IP4088CX20/LF		3.91 x 1.28 x 0.65
100		45	35	~20	150	IP3053CX20	3.96 x 1.28 x 0.65		
100		41	-	~40	125	PEMI8CSP/RT	3.16 x 1.06 x 0.61		
20		40	-	~50	153	PEMI8QFN/CT	SOT1159 (16 pin QFN)		3.3 x 1.2 x 0.5
20		36	-	~55	170	PEMI8QFN/CR			
20		32	-	~60	185	PEMI8QFN/CP			
20		28	-	~70	218	PEMI8QFN/CM			
20		23	-	~90	264	PEMI8QFN/CK			
20		19	-	~105	317	PEMI8QFN/CG			
20		15	-	~130	397	PEMI8QFN/CE			

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

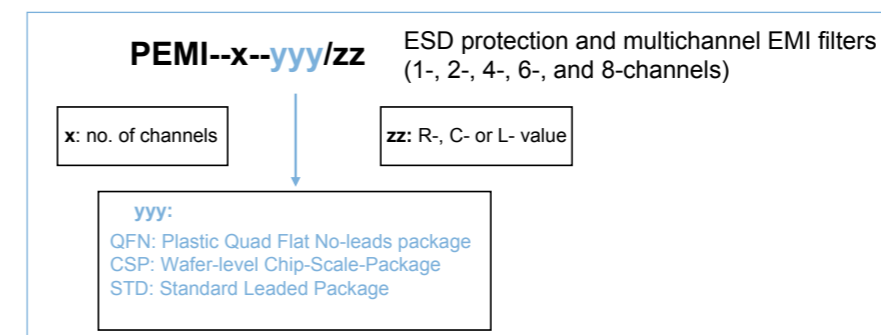
Multichannel EMI filters, ESD protection for LCD and camera

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents			Digital interface clock speed (MHz)	Insertion Loss S21 ~ -3 dB (MHz)	Type	Package	Size (mm)
		R _{line} (Ω)	C _{line} (pF)	L _{line} (nH)					
LCD display, camera, keypad	8	45	40	-	~50	145	PEMI8QFN/HT	SOT1159 (16 pin QFN)	3.3 x 1.2 x 0.5
		45	36	-	~55	161	PEMI8QFN/HR		
		45	32	-	~60	175	PEMI8QFN/HP		
		45	28	-	~70	206	PEMI8QFN/HM		
		45	23	-	~80	249	PEMI8QFN/HK		
		45	19	-	~100	300	PEMI8QFN/HG		
		45	15	-	~125	376	PEMI8QFN/HE		
		65	40	-	~45	139	PEMI8QFN/LT		
		65	36	-	~50	155	PEMI8QFN/LR		
		65	32	-	~55	168	PEMI8QFN/LP		
		65	28	-	~65	197	PEMI8QFN/LM		
		65	23	-	~80	239	PEMI8QFN/LK		
		65	19	-	~95	288	PEMI8QFN/LG		
		65	15	-	~120	361	PEMI8QFN/LE		
		100	40	-	~45	131	PEMI8QFN/RT		
		100	36	-	~50	145	PEMI8QFN/RR		
		100	32	-	~55	159	PEMI8QFN/RP		
		100	28	-	~60	187	PEMI8QFN/RM		
		100	23	-	~75	227	PEMI8QFN/RK		
		100	19	-	~90	272	PEMI8QFN/RG		
		100	15	-	~115	343	PEMI8QFN/RE		
		200	40	-	~40	119	PEMI8QFN/WT		
		200	36	-	~45	132	PEMI8QFN/WR		
		200	32	-	~50	143	PEMI8QFN/WP		
	200	28	-	~55	169	PEMI8QFN/WM			
	200	23	-	~70	205	PEMI8QFN/WK			
	200	19	-	~80	247	PEMI8QFN/WG			
	200	15	-	~105	311	PEMI8QFN/WE			
	15	43	12	~60	175	IP3253CZ16-8-TTL	SOT1168 (16 pin QFN)	3.3 x 1.35 x 0.5	
	15	50	18	~50	145	IP3254CZ16-8-TTL			
	40	18	-	~100	300	IP4252CZ16-8-TTL			
	100	45	-	~40	130	IP4254CZ16-8-TTL			
	100	15	-	~110	330	IP4251CZ16-8-TTL			
	200	45	-	~35	110	IP4253CZ16-8-TTL			
	70	25	-	~75	220	IP4338CX24/LF	24 ball CSP	1.96 x 2.01 x 0.61	
	125	25	60	~60	180	IP3338CX24/LF		2.11 x 2.11 x 0.61	
	1000	50	-	~7	22	IP4035CX24/LF	25 ball CSP	2.41 x 2.41 x 0.65	
	80	40	-	~30	100	IP4032CX25/LF		2.41 x 2.41 x 0.65	
	200	50	-	~35	105	IP4041CX25/LF			



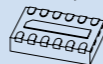
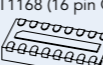
ESD protection acc. to IEC 61000-4-2 (level 4)

PEMI-series nomenclature



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/P		1.41 x 1.41 x 0.65
		47 Ω / 100 Ω	20	~20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF/P		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	10	~20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	IP4366CX8/P		
		47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-40-TTL		
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-20-TTL		1.7 x 1.35 x 0.5
		47 Ω / 100 Ω	10	~20	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-10-TTL		
-	1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S		1.45 x 1.0 x 0.5		
SD-card / MMC	4	47 Ω / 13 kΩ / 56 kΩ	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP	1.44 x 1.96 x 0.65
		50 Ω / 75 kΩ / 7 kΩ	18	~50	High-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	16 ball CSP	1.96 x 1.97 x 0.65
	6	40 Ω	12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	IP4252CZ12-6-TTL		2.5 x 1.35 x 0.5
	6 + 2	40 Ω	12	>52	(Mini) SD card/trans flash ESD protection, EMI filter	IP4252CZ16-8-TTL		3.3 x 1.35 x 0.5
	7	40 Ω / 50 kΩ / 25 kΩ	18	~20	(Mini) SD/trans flash card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	20 ball CSP	2.54 x 1.96 x 0.65
		-	5	~24	Memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP	1.46 x 1.52 x 0.65
	6 (+3)	15 Ω / 50 kΩ / 15 kΩ	8	>52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61
		40 Ω / 50 kΩ / 15 kΩ	20	>52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF		2.02 x 2.01 x 0.61
		-	-	>52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		40 Ω / 50 kΩ / 15 kΩ	-	>52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter	IP4853CX24/P	24 ball CSP	

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

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

Battery and charger protection

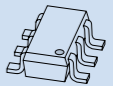


types in **bold** represent new products

Baseband interface	Number of protected lines	C _{line} (pF)	Diode voltage	Remark	Type	Package	Size (mm)
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4		0.91 x 0.91 x 0.65
		450	Breakdown 7 V	Power diode	IP4385CX4		
		160	Breakdown 16 V	Power diode	IP4386CX4		
		290	Breakdown 10 V	Power diode	IP4387CX4		
		160	V _{RWM} = 12 V	Power diode with 2 A integrated fuse	IP4389CX4		1.7 x 1.25 x 0.7
		160	V _{RWM} = 12 V	Power diode	PESD12VS1UJ		
		160	V _{RWM} = 12 V	Power diode	PESD12VS1UA		
		480	V _{RWM} = 5 V	Power diode	PESD5V0S1UJ		
480	V _{RWM} = 5 V	Power diode	PESD5V0S1UA		1.7 x 1.25 x 0.95		

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

USB, SATA, LAN

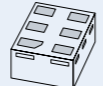
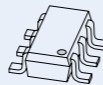
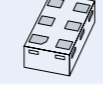

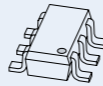
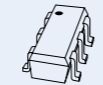
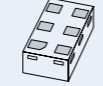

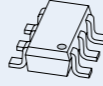
types in **bold** represent new products

Baseband interface	Number of protected lines	R _{line}	C _{line} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB (CSP package)	2	33 Ω / 1.3 kΩ	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4056CX8/LF	8 ball CSP	1.27 x 1.83 x 0.65
		33 Ω / 1.3 kΩ / 10 kΩ	30	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4057CX10/LF	10 ball CSP	1.56 x 1.91 x 0.65
		33 Ω / 1.3 kΩ / 17 kΩ / 15 kΩ	27	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4065CX11/LF	11 ball CSP	1.47 x 1.97 x 0.65
		33 Ω / 1.5 kΩ	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4058CX8/LF	8 ball CSP	0.91 x 1.91 x 0.65
		17 Ω / 1.5 kΩ	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4158CX8/LF		
		33 Ω	35	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection and impedance matching	IP4078CX6/LF	6 ball CSP	0.91 x 1.41 x 0.65
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	IP4359CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
	3	-	1.3	~1 GHz	USB2.0 high-speed ESD protection	IP4356CX4	4 ball CSP	0.76 x 0.76 x 0.61
	3+2	47 Ω / 100 Ω	10	~20/6	Integrated low capacitance SIM-Card & USB passive filter array with ESD protection	IP4365CX11/P	11 ball CSP	1.16 x 1.56 x 0.61
	4	33 Ω / 1.5 kΩ / 20 kΩ	17	>6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4368CX9/P	5 ball CSP	1.16 x 1.16 x 0.61
		-	3	>240	USB2.0 high-speed ESD protection	IP4059CX5/LF	5 ball CSP	0.96 x 1.34 x 0.65
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	IP4358CX6	6 ball CSP	0.76 x 1.16 x 0.41
		-	1.3	~1 GHz	USB2.0 high-speed ESD protection	IP4319CX10	10 ball CSP	1.56 x 1.05 x 0.61
	USB2.0 (Plastic package)	2	0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	
-			1.0	-	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2X		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		1.45 x 1.0 x 0.5

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

USB, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
USB2.0 (Plastic package)	2	-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2K		1.0 x 1.0 x 0.5
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2D		2.9 x 1.5 x 1.0
		-	1	ESD protection for up to 2 ultra high-speed datalines	PRTR5V0U2F		1.45 x 1.0 x 0.5
	3 + 1	-	0.8	USB protection for USB OTG with 5.5 V Vbat protection	PUSBM5V5X4-TL		1.6 x 1.6 x 0.5
		-	0.8	USB protection for USB OTG with 12 V Vbat protection	PUSBM12VX4-TL		
		-	0.8	USB protection for USB OTG with 15 V Vbat protection	PUSBM15VX4-TL		
		-	0.8	USB protection for USB OTG with 27 V Vbat protection	PUSBM27VX4-TL		
	4	-	1	Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4220CZ6		2.9 x 1.5 x 1.0
		-	1	Dual ESD protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4D		
		-	1	Dual ESP protection for USB2.0 high-speed, SD-card, SIM card	PRTR5V0U4Y		2.0 x 1.25 x 0.95
		-	1	ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-S		1.45 x 1.0 x 0.5
		-	1	ESD protection for USB2.0 high-speed, SD-card, SIM card	IP4221CZ6-XS		1.0 x 1.0 x 0.5
		1	3	>15 kV IEC contact ESD protection with pi-filter	IP4225CZ10		2.9 x 1.5 x 1.0

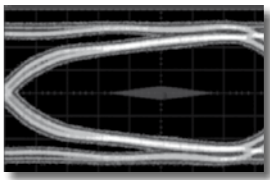
ESD protection acc. to IEC 61000-4-2 (level 4)

USB, SATA, LAN

In the Spotlight

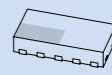
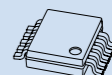
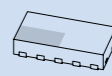
USB3.0: Ultra high-speed 4 channel ESD protection – IP4292CZ10-TBR

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



Protection and signal conditioning

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
USB3.0 SuperSpeed USB	4	-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TBR		1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
		-	0.5	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR		1.0 x 2.5 x 0.5

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

USB, SATA, LAN




types in **bold** represent new products

Baseband interface	Number of protected lines	R_{line}	C_{line} (pF)	Remark	Type	Package	Size (mm)
Display port	4	-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	11	-	0.7	ESD protection	IP4790CZ38	SOT510 (TSSOP38) 	9.7 x 4.4 x 1.1
SATA	2	-	0.7	ESD protection for ultra high-speed interfaces	IP4282CZ6	SOT886 (XSON6) 	1.45 x 1.0 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88) 	2.0 x 1.25 x 0.95
	4	-	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TBR	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		-	0.6	ESD protection for ultra high-speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TBR	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10) 	3.0 x 3.0 x 1.1
		-	0.8	ESD protection for ultra high-speed interfaces	IP4285CZ9-TBB	SOT1178 (XSON9) 	1.0 x 2.5 x 0.1
		-	0.5	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5
		-	0.5	ESD protection for ultra high-speed interfaces	IP4292CZ10-TBR	SOT1176 (XSON10) 	1.0 x 2.5 x 0.5

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

USB, SATA, LAN

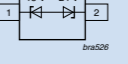

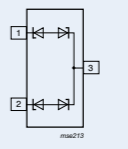

types in **bold** represent new products

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

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

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

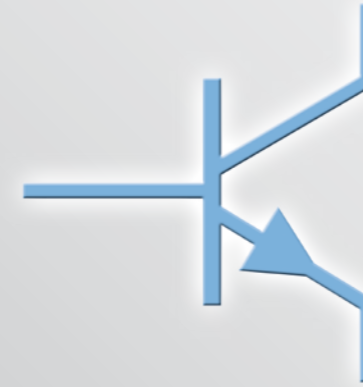
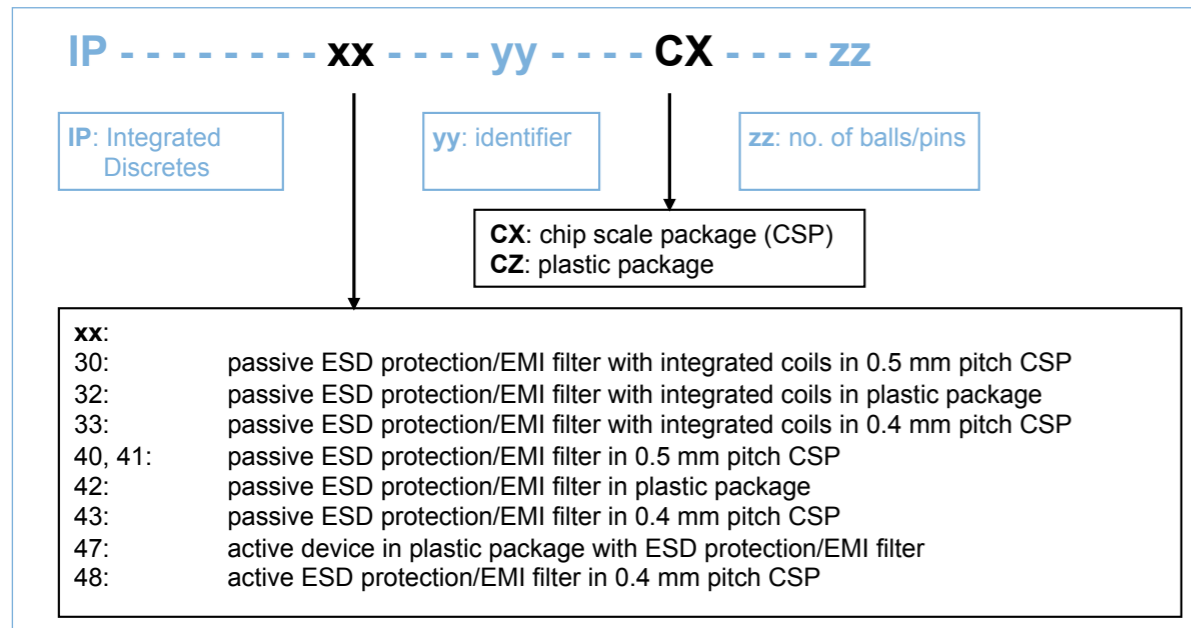
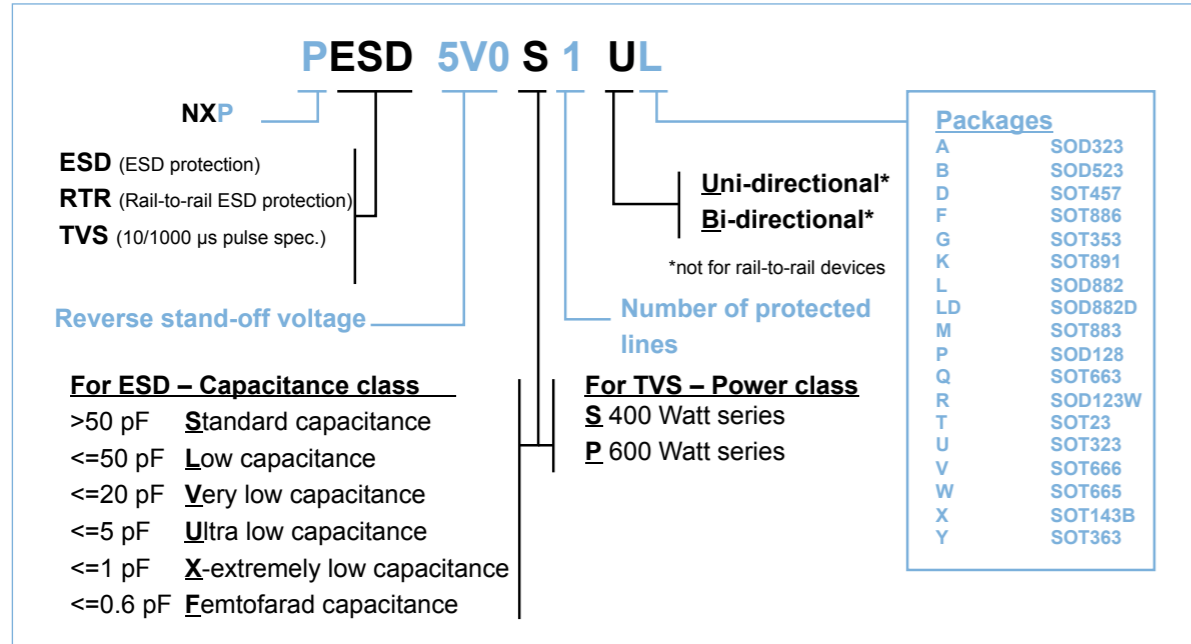
Automotive LIN/CAN/FlexRay

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

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

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

Protection and signal conditioning nomenclature



Bipolar transistors

General purpose bipolar transistors

52

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Single transistors PNP	52
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Medium frequency transistors	57

Resistor-equipped transistors (RETs)

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RETs 100 mA single	58
RETs 100 mA double	59
RETs 500 mA	59
Low V_{CEsat} (BISS) RETs	59

Low V_{CEsat} (BISS) transistors

60

Low V_{CEsat} (BISS) transistors single NPN	60
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Advantages of low V_{CEsat} (BISS) technology	67

High voltage power bipolar transistors

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High voltage bipolar transistors for lighting, SMPS and industrial applications	68
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Medium power general purpose transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5
P _{tot} (mW)						1700	1300
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)		
NPN	20	1000	85 - 160	375	40	BCP68 / -25	BC868 / -25
	45	1000	63 - 100	160 - 250	100	BCP54 / -10 / -16	BCX54 / -10 / -16
	60	1000	63 - 100	160 - 250	100	BCP55 / -10 / -16	BCX55 / -10 / -16
			100	300	100	BSP41	BSR41
80	1000	63 - 100	160 - 250	100	BCP56 / -10 / -16	BCX56 / -10 / -16	
		40 - 100	120 - 300	100	BSP43	BSR42 / 43	
PNP	20	1000	85 - 160	250 - 375	40	BCP69 / -16 / -25	BC869 / -16 / -25
	45	1000	63 - 100	160 - 250	115 ¹⁾ - 145 ¹⁾	BCP51 / -10 / -16	BCX51 / -10 / -16
	60	1000	63 - 100	160 - 250	100	BCP52 / -10 / -16	BCX52 / -10 / -16
			40 - 100	120 - 300	100	BSP31	BSR30 / 31
80	1000	63 - 100	160 - 250	115 ¹⁾ - 145 ¹⁾	100	BCP53 / -10 / -16	BCX53 / -10 / -16
		40 - 100	120 - 300	100	BSP32 / 33	BSR33	

¹⁾ typical value

High voltage transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-74)	SOT23	SOT323 (SC-70)	
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	
P _{tot} (mW)						1700	1300	600	250	200	
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)						
NPN	80	100	20	-	60				BSS64		
	140	100	60	250	100				PMBT5550	PMST5550	
	160	300	80	250	100				PMBT5551/BSR19A	PMST5551	
	250	100	50	-	60	BF722	BF622		BF822		
			50	-	60	BF720	BF620		BF820	BF820W	
	300	100	40	-	50	PZTA42	PXTA42		PMBTA42	PMSTA42	
350	100	40	-	70	BSP19	BST39					
400	300	50	200	20	PZTA44			PMBTA44			
PNP	100	100	30	-	50				BSS63		
	250	100	50	-	60	BF723			BF823		
			50	-	60		BF623		BF823		
	300	100	50	-	60		BF621		BF821		
40			-	50	PZTA92	PXTA92		PMBTA92	PMSTA92		
2 x NPN	300	100	40	-	50				PMBTA42DS		

For high voltage transistors with increased performance please refer to our high voltage low V_{CEsat} (BISS) transistor portfolio on page 66.

Low noise transistors

Package						SOT23	SOT323 (SC-70)	
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	
P _{tot} (mW)						250	200	
Polarity	V _{CEO} (V)	I _C (mA)	NF max (dB)	h _{FE} min	h _{FE} max	f _T min (MHz)		
NPN	30	100	4	200	450	100	BC849B	BC849BW
				420	800	100	BC849C	BC849CW
	45	100	4	200	450	100	BC850B	BC850BW
				420	800	100	BC850C	BC850CW
PNP	30	100	4	220	475	100	BC859B	BC859BW
				420	800	100	BC859C	BC859CW
	45	100	4	220	475	100	BC860B	BC860BW
				420	800	100	BC860C	BC860CW

Matched pair transistors

Package							SOT143B	SOT457 (SC-74)	SOT353 (SC-88A)	SOT363 (SC-88)	SOT666
Size (mm)							2.9 x 1.3 x 1.0	2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P _{tot} (mW)							250	380	300	300	300
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	h _{FE1} /h _{FE2}	V _{BE1} - V _{BE2} (mV)					
NPN	30	100	110	800	0.7 ¹⁾	n.a.	BCV61/A/B/C ¹⁾				
						n.a.	BCM61B ¹⁾				
	45	100	200	450	0.9 ¹⁾	2	BCM847DS	BCM847BS	BCM847BV		
						0.95	2	PMP4501G	PMP4501Y	PMP4501V	
0.98	2	PMP4201G	PMP4201Y	PMP4201V							
Configuration											
PNP	30	100	100	800	0.7 ¹⁾	n.a.	BCV62/A/B/C ¹⁾				
						n.a.	BCM62B ¹⁾				
	45	100	200	450	0.95	2	BCM857DS	BCM857BS	BCM857BV		
						0.98	2	PMP5501G	PMP5501Y	PMP5501V	
	0.98	2	PMP5201G	PMP5201Y	PMP5201V						
	65	100	200	450	0.9	2	BCM856DS	BCM856BS			
Configuration											

¹⁾ I_{C1}/I_{E2}

Key features

- ▶ Current gain matching to 10%, 5% or 2%
- ▶ Base-emitter voltage matching to 2 mV
- ▶ Choice of standard double transistor pinout or application-optimized pinout
- ▶ Common-emitter configuration for 5-pin type
- ▶ Range of small, very small and ultra small packages

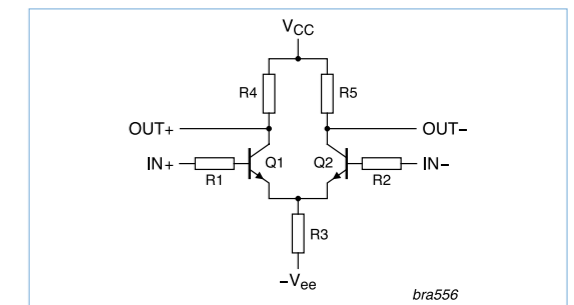
Key benefits

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

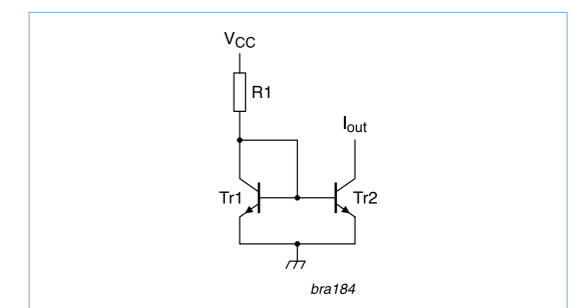
Key applications

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

Differential amplifier



Current mirror



Darlington transistors

Package						SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Size (mm)						6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
P _{tot} (mW)						1700	1300	250
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	f _T min (MHz)				
NPN	30	500	10000	125			PMBTA13	
			20000	125	PZTA14	PXTA14	PMBTA14	
	45	1000	2000	220			BCV27	
			2000	200	BSP50	BCV29	BCV27	
			10000	200	BSP51	BST51	BCV47	
80	1000	2000	200	BSP52	BST52			
PNP	30	500	20000	125			PMBTA64	
			20000	220			BCV28	BCV26
	45	1000	2000	200		BSP60	BST60	
			10000	220			BCV48	BCV46
			2000	200	BSP61	BST61		
80	1000	2000	200	BSP62	BST62			

Schmitt trigger

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)

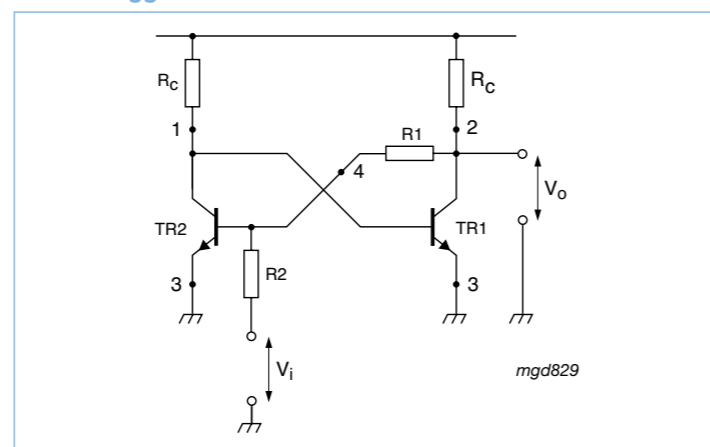
Key benefits

- ▶ 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)		
General purpose transistors	0.1	0.2	PMD9050D	-	PMD9010D	BCV65 (SOT143B)
				2.2	PMD9001D	
				4.7	PMD9002D	
Switching transistors - reduced storage time	0.6	1.0		10	PMD9003D	
				-		PMD2001D
Low V _{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

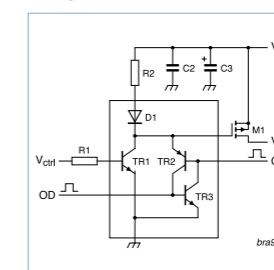
Key benefits

- ▶ Reduced component count
- ▶ Smaller end products

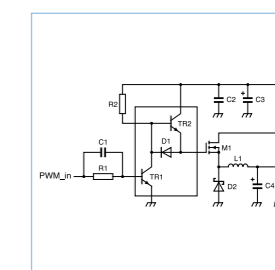
Key applications

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

MOSFET driver with hardware output disable function



High-side MOSFET driver with level shifter function



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	

In the Spotlight

New low V_{CEsat} (BISS) transistors

Industry's first combination of reduced switching times (down to 125 ns) with minimized saturation voltage (below 50 mV)

Voltage range from 12 V to 100 V

Flexible package options, from standard SMD to brand new medium power leadless package SOT1061 (2 x 2 x 0.65 mm)

Benchmark for reduced on-state-resistance

Low V_{CEsat} (BISS) double transistors

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

¹⁾ I_C/I_B = 20

²⁾ Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

³⁾ Optimized for high speed switching

Low V_{CEsat} (BISS) load switches

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

¹⁾ Device mounted on a ceramic PCB, Al₂O₃, standard footprint

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

Key features

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

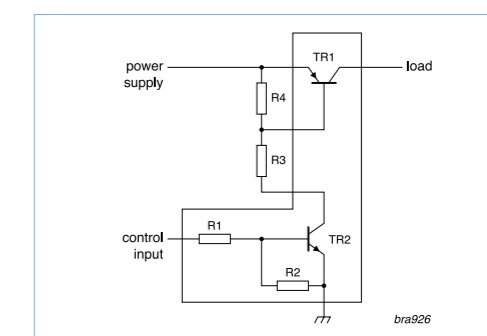
Key benefits

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

Key applications

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

BISS load switch



High voltage low V_{CEsat} (BISS) transistors

types in **bold** represent new products

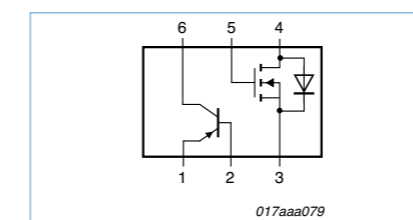
				SOT223 (SC-73)	SOT89 (SC-62)	SOT23
Package						
Size (mm)				6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0
P_{tot} (mW)				1700	1300	250
Polarity	$V_{CESM}^{1)}$	V_{CEO} (V)	I_C (A)			
NPN	-	150	1	PBHV8115Z		PBHV8115T
			2	PBHV8215Z		
		180	1			PBHV8118T
	500	400	0.5	PBHV8540Z		PBHV8540T
			1	PBHV8140Z		
		500	0.15			PMBTA45
PNP	-	150	1	PBHV9115Z	PBHV9115X	PBHV9115T
			2	PBHV9215Z		
		0.25	PBHV9040Z		PBHV9040T	
	500	400	0.5	PBHV9540Z		
			0.15			PBHV9050T
		500	0.25	PBHV9050Z		

¹⁾ Collector-emitter peak voltage

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

types in **bold** represent new products

											SOT1118
Package											
Size (mm)											2.0 x 2.0 x 0.65
P_{tot} (mW)											1300
V_{CEO} (V)	I_C (A)	h_{FE} min	h_{FE} max	@ I_C (mA)	@ V_{CE} (V)	R_{CEsat} typ (mΩ)	V_{DS} (V)	V_{GS} (V)	I_D (A)	R_{Dson} typ (mΩ)	
40	2	300	800	100	5	240	30	0.7	0.66	390	PBSM5240PF



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

In the Spotlight

High voltage low V_{CEsat} (BISS) transistors in SOT223 & SOT23

- Voltage V_{CEO} up to 500 V
- Current I_C up to 1 A (continuous), 2 A (peak)
- V_{CEsat} down to 33 mV at $I_B = 20$ mA
- AEC-Q101 qualified

Low V_{CEsat} (BISS) RETs

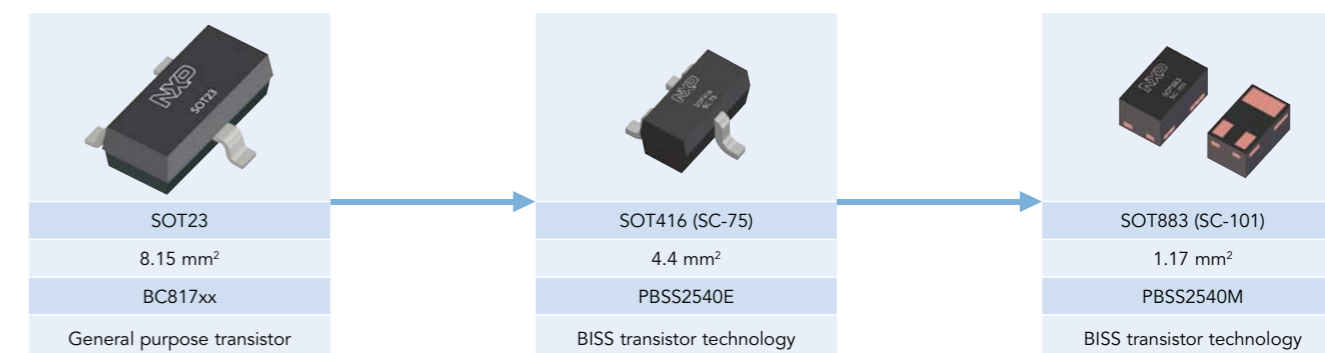
					SOT23	
Package						
Size (mm)					2.9 x 1.3 x 1.0	
P_{tot} (mW)					250	
V_{CEO} (V)	I_C (mA)		R1 (kΩ)	R2 (kΩ)	NPN	PNP
40	600	R1 = R2	1	1	PBRN113ET	PBRP113ET
			2.2	2.2	PBRN123ET	PBRP123ET
		R1 ≠ R2	1	10	PBRN113ZT	PBRP113ZT
			2.2	10	PBRN123YT	PBRP123YT

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. Benefit from:

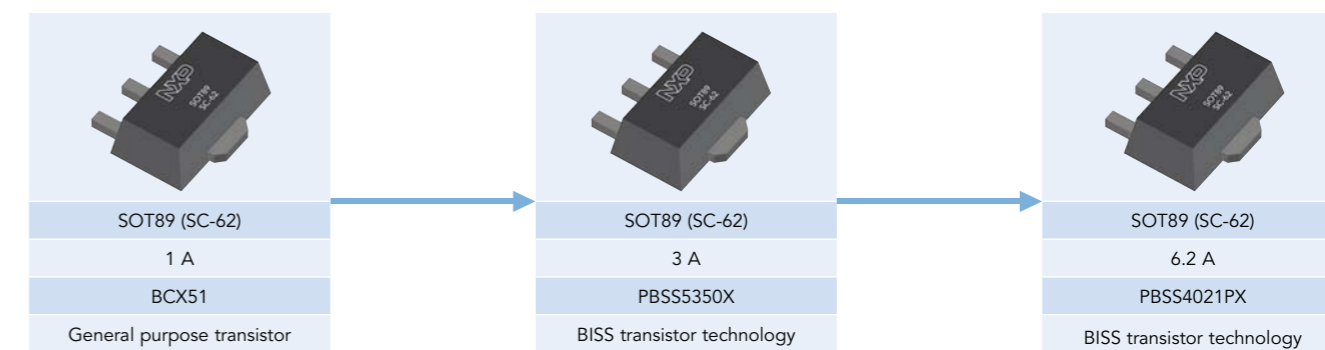
Reduction in board space

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






Improved collector current capabilities

- 17.87 mm² footprint

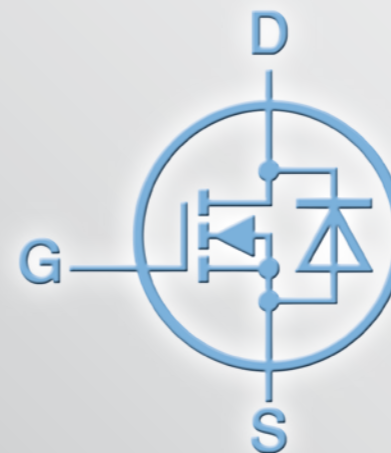


High voltage bipolar transistors for lighting, SMPS and industrial applications

types in **bold** represent new products

V_{CESM} (V)	$I_{C(DC)}$ (max) (A)	25 °C ind. t_f (typ) (ns)	@ I_C (A)	h_{FE} (typ)	@ I_C (A)	SOT54 (TO92)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D ² PAK)	SOT428 (DPAK)
										
700	1	80	1	7.5	0.8	BUJ100LR				
	1	80	1	7.5	0.8	PHE13003A				
	1	50	1	14	0.75	BUJ100				
	1.5	100	0.5	9	1	PHE13003C				
	1.5	100	0.5	9	1	PHD13003C ¹⁾				
	4	30	2	12.5	3		BUJ103A	BUJ103AX		BUJ103AD
	4	30	2	12.5	3					BUJD103AD ¹⁾
	4	100	2	17	2		PHE13005	PHE13005X		
	4	100	2	17	2		PHD13005 ¹⁾			
	8	20	5	11	4		BUJ105A		BUJ105AB	BUJ105AD
	8	20	5	11	4					BUJD105AD ¹⁾
	8	40	5	9	5		PHE13007			
	10	20	5	11	6		BUJ106A			
12	100	5	6 min - 30 max	8		PHE13009				
850	4	30	2	12.5	3		BUJD203A¹⁾	BUJD203AX¹⁾		BUJD203AD¹⁾
1000	5	145	2.5	12	3		BUJ303A	BUJ303AX		BUJ303AD
1050	4	520	2	41	0.8		BUJ302A	BUJ302AX		BUJ302AD
	5	200	2.5	10.5	3		BUJ303B			
1200	6	170	2.5	15.5	3		BUJ403A			

¹⁾ Integrated freewheeling diode



MOSFETs

Small-signal MOSFETs

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

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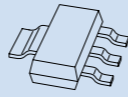
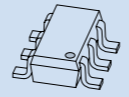

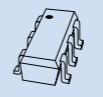
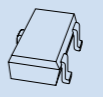
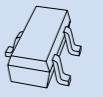
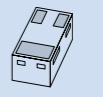
Power MOSFETs

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

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

													SOT223 (SC-73)		TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Package																				
Size (mm)													6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P _{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 (kV)	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	tbd	tbd	tbd	tbd	tbd	tbd	-	-	16	tbd	tbd					PMN23UN			
		6.3	2	4	23	71	10.6	-	-	23	-	37					PMN27UN			
		5.7	0.4	-	23	71	10.6	-	-	27	-	39								
		tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	-	28	tbd	tbd					PMV28UN ¹⁾		
		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		
																		PMR280UN		
		12	tbd	tbd	tbd	tbd	tbd	tbd	-	-	30	tbd	-						PMV30XN [*]	
			5.9	0.5	1.5	25	37	5.8	-	-	31	44	-						PMV31XN ¹⁾	
	2.15		0.5	1.5	16	17	0.72	-	-	270	440	-						PMZ270XN		
	15	1	0.5	1.5	16	17	0.72	-	-	290	460	-						PMF290XN		
																		PMR290XN		
	8	5.7	1	2	24	35	13.1	-	28	34	-	-						PMN34LN		
			4.1	1	2	24	35	13.1	-	55	70	-	-						PMN55LN	
30	8		4.9	0.45	-	22	60	9.9	-	-	38	-	54					PMN34UN		
			4.9	0.45	-	18	50	9.3	-	-	40	-	55					PMV40UN ¹⁾		
			1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550						PMZ390UN	
			0.85	0.4	-	6	27	-	-	400 ²⁾	-	600 ²⁾							BSH103	
		0.8	0.45	1	11.5	22.5	0.89	-	-	400	-	580						PMF400UN		
			tbd	tbd	tbd	tbd	tbd	tbd	-	-	20	tbd	-						PMV20XN [*]	
		12	tbd	tbd	tbd	tbd	tbd	tbd	-	-	250	tbd	-						PMF250XN [*]	
			1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-						PMZ350XN	
			0.87	0.35	-	16	19.5	-	-	370	550	-							PMF370XN	
		15	0.9	0.5	-	16	19.5	0.65	-	-	370	550	-						PMG370XN	
			5.4	1	2	12	27	13.8	-	32	40	-	-						PMN40LN	
		20	tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	15	tbd	-						PMN15EN [*]	
			tbd	tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	18	tbd	-						PMV18EN [*]
			10	1	2.8	18	44	24	-	20	30	-	-	BSP030					PMV31EN [*]	
	tbd		tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	31	tbd	-						PMN35EN [*]	
	tbd		tbd	tbd	tbd	tbd	tbd	tbd	-	tbd	35	tbd	-						PMN38EN	
	5.4		1	2	33	44	6.1	-	31	38	-	-						PMN45EN		
	5.2		1	2	33	44	6.1	-	32	42	-	-						PMV45EN ¹⁾		
	5.4		1	2	12	21.5	9.4	-	35	45	-	-						PMN49EN		
	4.6		1	2	8.4	17.8	8.8	-	40	49	-	-						PMV60EN ¹⁾		
	4.7		1	2	12	23.5	9.4	-	47	60	-	-						BSH108		
	1.9	1	2	11	41	6.4	-	77	102	-	-						PMV117EN			
	2.5	1.5	-	12	23.5	4.6	-	74	117	-	-						BSP100			
	6	1	2.8	14	36	-	-	80	120	-	-						SI2304DS			
	1.7	1.5	-	11.5	31	4.6	-	117 ²⁾	190 ²⁾	-	-									

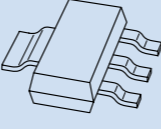
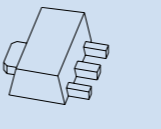
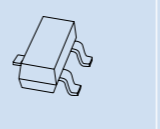
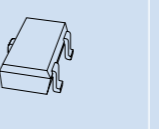
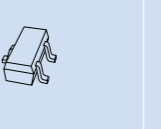
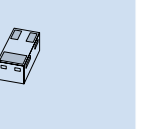
¹⁾ Enhanced thermal capability

²⁾ Max values

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

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

types in **bold** represent new products

													SOT223 (SC-73)		SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Package																			
Size (mm)													6.5 x 3.5 x 1.65		4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P _{tot} (mW)													1700		1300	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 (kV)	R _{DSon typ} (mΩ) @ V _{GS} =										
									10 V	4.5 V	2.5 V	1.8 V							
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 ³⁾	-	-					BSN20		
55	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100					BSH121		
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100					BSH111		
	13	2.5	2	4	-	-	-	-	2	120	-	-	-					PHT6N06T	
3.5		1	2	-	-	-	-	2	-	65	-	-					PHT8N06LT		
2.5		1	2	-	-	-	-	2	-	120	-	-					PHT6N06LT		
60	15	0.26	1	3.3	3	9	-	1	2800	3800	-	-					PMF3800SN		
	20	0.25	0.8	3	-	-	-	-	-	2500	-	-	-					PMBF170	
		0.36	0.9	1.5	5	13	0.72	-	-	900	1000	-	-					BSS138P BSS138PW	
		1.22	1	3	6	7.2	1.05	-	-	760	1100	-	-					PMZ760SN	
		0.57	1	-	6	7.2	-	-	-	780	1100	-	-					PMF780SN	
		0.55	1	3	6	7.2	1.05	-	-	780	1100	-	-					PMR780SN	
		0.3	1	2.5	7	15	0.6	-	-	1000	1300	-	-					2N7002P 2N7002PW 2N7002PT	
	0.3	1	2.5	11	19	0.5	2	-	1000	1300	-	-					2N7002BK 2N7002BKW 2N7002BKT 2N7002BKM		
	0.3	1	2.5	16	60	1.09	3	-	1100	1300	-	-					2N7002CK		
	0.34	1	-	3	9	-	1	-	2800	3800	-	-					2N7002K		
	30	0.385	1	2.5	2.5	11	0.69	-	-	780	1200	-	-					2N7002E	
0.475		1	2.5	2.5	11	0.69	-	-	780	1200	-	-					2N7002F		
0.3		1	2.5	2.5	11	-	-	-	2800	3800	-	-					2N7002		
16		3.5	1	2	14	73	-	-	-	-	200	-	-					PHT4NQ10LT	
		3	2	4	-	-	-	-	-	57	-	-	-					PHT6NQ10T	
	3.5	2	4	21	31	7.4	-	-	200	-	-	-					PHT4NQ10T		
100	0.85	2	4	19	13	4.6	-	-	400	-	-	-					BSH114		
	0.15	1	2.8	3	12	-	-	-	3500	-	-	-					BSS123		
	0.19	1	-	3	12	-	-	-	-	5000	-	-					BST82		
	0.52	1	-	3	12	-	-	-	-	5000	-	-					BSP110		
200	1.9	2	4	10.5	12.5	7	-	-	213	-	-	-					PMV213SN ¹⁾		
	0.4	0.8	2.8	6	49	-	-	-	1600	-	-	-					BSS87		
240	0.55	0.4	2	10	45	-	-	-	1700	-	3000	-					BSP122		
	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

In the Spotlight

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



- ESD protection up to 2 kV in several SMD packages

- Available in single and dual configuration

- Very fast switching

- TrenchMOS technology

- AEC-Q101 qualified

Small-signal MOSFETs dual (N-channel)

types in **bold** represent new products

Package										SOT363 (SC-88)	SOT666 (SC-88)		
Size (mm)										2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55		
P _{tot} (mW)										300	300		
V _{DS} (V)	V _{GS} (V)	I _b (A)	V _{GS(th) min} (V)	V _{GS(th) max} (V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _g typ (nC)	ESD protection (kV)	R _{DS(on)} typ (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	0.49	1	-	6	7.2	1.05	-	-	780	1100	-	PMGD780SN
		0.36	0.9	1.5	5	13	0.72	-	-	900	1000	-	BSS138PS
		0.3	1	2.5	7	15	0.6	-	-	1000	1300	-	2N7002PS
		0.3	1	2.5	11	19	0.5	2	-	1000	1300	-	2N7002BKS

In the Spotlight

20 V, 100 mΩ P-channel enhancement mode Field-Effect Transistor (FET) – NX2301P


Housed in a small SMD plastic package SOT23

Very fast switching

TrenchMOS technology

AEC-Q101 qualified

1.8 V R_{DS(on)} rated for Low Voltage Gate Drive



Small-signal MOSFETs single (P-channel)

types in **bold** represent new products

Package										SOT223 (SC-73)	SOT89 (SC-62)	TSOP6 SOT457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Size (mm)										6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P _{tot} (mW)										1700	1300	600	250	300	200	150	250
V _{DS} (V)	V _{GS} (V)	I _b (A)	V _{GS(th) min} (V)	V _{GS(th) max} (V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _g typ (nC)	ESD protection (kV)	R _{DS(on)} typ (mΩ) @ V _{GS} =								
									10 V	4.5 V	2.5 V	1.8 V					
12	8	1.52	0.4	-	6.5	65	-	-	-	80	-	140	BSH207				
		0.75	0.4	-	6.5	65	-	-	-	180	-	420	BSH205 ¹⁾				
20	8	tbd	tbd	tbd	tbd	tbd	tbd	-	-	21	tbd	tbd	PMN21UP*				
		tbd	tbd	tbd	tbd	tbd	tbd	-	-	27	tbd	tbd	PMN27UP*				
		2	0.5	1.1	7	50	6	-	-	100	-	-	NX2301P				
	12	4.8	0.55	0.95	16	117	10	-	-	48	65	-	PMN50XP				
		3.5	0.75	1.25	24	84	8.5	-	-	48	71	-	PMN48XP*				
		3.9	0.55	0.95	28	101	7.6	-	-	65	90	-	PMV65XP ¹⁾				
3.5	0.75	1.25	tbd	tbd	tbd	-	-	85	tbd	tbd	-	PMG85XP*					
3.5	0.75	1.25	tbd	tbd	tbd	-	-	170	tbd	tbd	-	PMF170XP*					
30	8	0.47	0.4	-	6.5	65	-	-	-	660	-	1100	BSH203				
		3	1	2.8	20	50	-	-	220	330	-	-	BSP250				
		0.52	1	-	6.5	65	-	-	630	890	-	-	BSH202				
50	20	0.2	tbd	tbd	tbd	tbd	tbd	1	5300	6000	-	-	BSS84AK*				
		0.13	0.8	2	3	7	-	-	6000	-	-	-	BSS84				
60	20	0.3	1	-	6.5	65	-	-	2100	2700	-	-	BSH201				
200	20	0.225	0.8	2.8	5	20	-	-	10000	-	-	-	BSP220				
240	20	0.2	0.8	2.8	5	20	-	-	10000	-	-	-	BSS192				
250	20	0.225	0.8	2.8	5	10	-	-	10000	-	-	-	BSP225				
300	20	0.21	1.95	2.8	5	15	-	-	17000 ²⁾	-	-	-	BSP230				

¹⁾ Enhanced thermal capability

²⁾ Max values

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

Small-signal MOSFET – Schottky combination

types in **bold** represent new products

Package														SOT1118		
Size (mm)														2.0 x 2.0 x 0.65		
P _{tot} (mW)														1250		
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 (kV)	I _F (A)	V _R (V)	V _{F typ.} (mA)	R _{DSon typ} (mΩ) @ V _{GS} =			
													4.5 V	2.5 V	1.8 V	
single + schottky	20	8	3.3	0.5	1.5	15	92	4.5	1	2	30	455	58	72	100	PMFPB6545UP
			3.3	0.5	1.5	15	92	4.5	1	2.2	30	325	58	72	100	PMFPB6532UP

Small-signal MOSFETs dual (P-channel)

types in **bold** represent new products


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

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

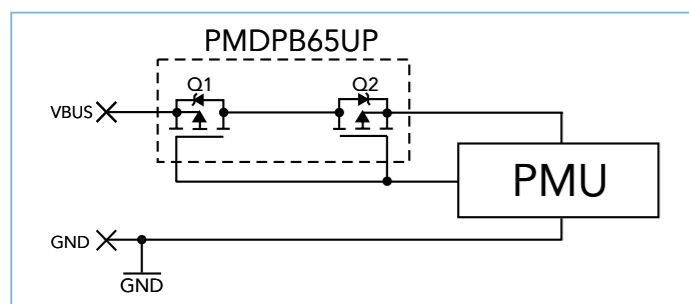
In the Spotlight

Dual P-channel ESD protected MOSFET in small 0.65 mm flat, 2 x 2 mm leadless package (PMDPB65UP)

- ESD protected MOSFET of >1 kV HBM
- Very low R_{DSon} of <70 mΩ at V_{GS} = 4.5 V
- 1.8 V R_{DSon} rating for operation at low voltage gate drive levels
- Best-in-class thermal performance due to extra heatsink
- Smallest 2 x 2 mm leadless package dual P-channel; 0.65 mm package height



USB OTG Vbus protection



12 V - 25 V N-channel MOSFETs

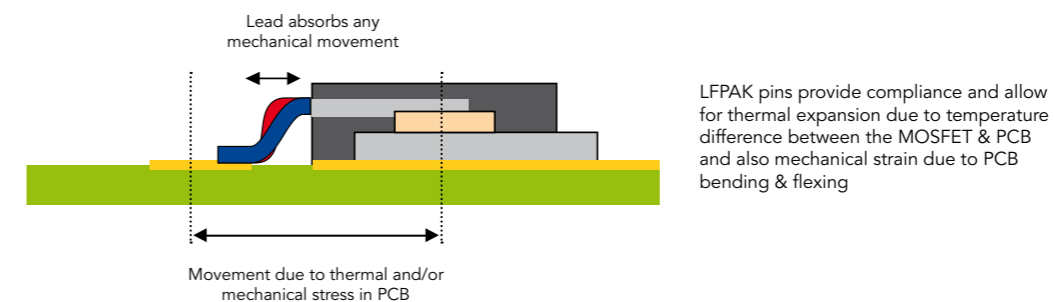
types in **bold** represent new products

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

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

LFAK for mechanical & thermal ruggedness

NXP LFAK



30 V N-channel MOSFETs

types in **bold** represent new products

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

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

40 V - 55 V N-channel MOSFETs

types in **bold** represent new products

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


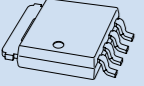

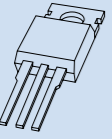
For the most up to date product information, please visit <http://standardproducts.nxp.com/mosfets>

Part numbering for PSMN types

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

60V - 80V N-channel MOSFETs


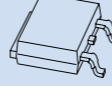
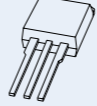
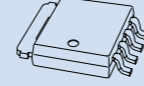

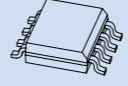
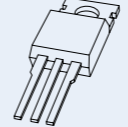
types in **bold** represent new products

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

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

100V - 110V N-channel MOSFETs

types in **bold** represent new products

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

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

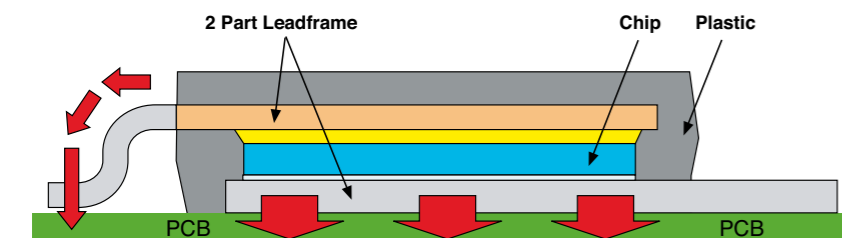
150V - 300V N-channel MOSFETs

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

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

Power-SO8 (LFAK) Design

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



P-channel MOSFETs

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

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

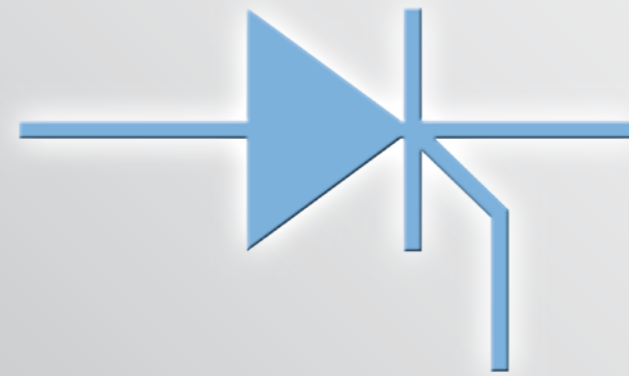
Multi-chip MOSFETs

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

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

Part numbering for PH types

P	H	P	4	4	N	Q	0	3	L	T
MOSFET Brand name	Package type	Current rating I_D (A)	MOSFET type N-ch or P-ch		Q-Trench	MOSFET voltage V_{DSS}	Gate threshold voltage		Trench MOS	
PH	B = D ² PAK	44 = 44 A	N = N-ch		Q = low gate charge Q _{GD}	02 = 20 V	'Blank' = Standard level		T = Trench	
PH	D = DPAK	33 = 33 A	P = P-ch			03 = 25 - 30 V	L = logic level			
PH	P = TO220AB	20 = 20 A				06 = 55 - 60 V				
PH	T = SOT223	12 = 12 A				08 = 75 - 80 V				
PH	X = SOT186A (isolated TO220AB)					10 = 100 V				
PH	K = SO8					11 = 110 V				
PH	KD = Dual SO8					15 = 150 V				



Thyristors

4-Quadrant Triacs 86









3-Quadrant Triacs 88

AC Thyristors 89

Silicon Controlled Rectifiers 89




4-Quadrant Triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D ² PAK)	SOT428 (DPAK)
										
0.6	400	5/5/5/7	MAC97A6							
	600	5/5/5/7	MAC97A8							
	400 / 600	5/5/5/7	BT1306-D							
0.8	400 / 600	5/5/5/7	BT1308-D					BT1308W-D		
	600	5/5/5/7	Z00607MA							
1	600	3/3/3/7						BT131W		
	600 / 800	3/3/3/7	BT131							
	600 / 800	5/5/5/7	BT131-D							
	600 / 800	10/10/10/10	BT131-E							
	600 / 800	3/3/3/5	Z0103MA/NA					Z0103MN/NN		
	600 / 800	5/5/5/7	Z0107MA/NA					Z0107MN/NN		
	600 / 800	10/10/10/10	Z0109MA/NA					Z0109MN/NN		
	600 / 800	3/3/3/5	Z0103MA0/NA0**					Z0103MN0/NN0**		
	600 / 800	5/5/5/7	Z0107MA0/NA0**					Z0107MN0/NN0**		
	600 / 800	10/10/10/10	Z0109MA0/NA0**					Z0109MN0/NN0**		
4	600	5/5/5/10	BT132-D*							
	600	D/E/-/G						BT134		
	800	E/-						BT134		
	600	D/-		BT136				BT136X		BT136S
	600	F						BT136X		BT136S
	600 / 800	E		BT136				BT136X	BT136B	BT136S
	800	F						BT136X		BT136S
6	600	F/-/G						BT236X		
	800	-/G						BT236X		
8	600	D/-/G		BT137				BT137X		BT137S
	600	E		BT137				BT137X	BT137B	BT137S
	600	F						BT137X	BT137B	BT137S
	800	E		BT137				BT137X		BT137S
	800	F						BT137X	BT137B	BT137S
	800	-		BT137				BT137X	BT137B	
	800	G						BT137X	BT137B	BT137S
12	600	D		BT138				BT138X		
	600	-/G		BT138				BT138X	BT138B	
	600	F						BT138X	BT138B	
	600 / 800	E		BT138	BT138Y			BT138X	BT138B	
	800	F						BT138X		
	800	-		BT138				BT138X		
	800	G		BT138				BT138X		

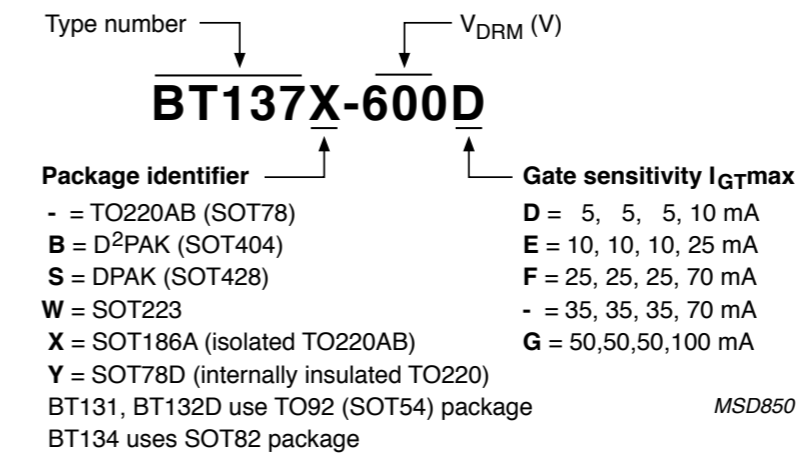
* Large chip / high I_{TSM}
 ** Enhanced immunity to false triggering

4-Quadrant Triacs

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT78 (TO220AB)	SOT186A (isolated TO220AB)	SOT404 (D ² PAK)
					
16	600	E/-	BT139	BT139X	BT139B
	600	F		BT139X	BT139B
	600	G		BT139X	BT139B
	800	E	BT139		BT139B
	800	F			BT139B
	800	-	BT139	BT139X	BT139B
20	600	50/50/50/75		MAC223A8X	
	600 / 800	-	BTA140		

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

4-Quadrant Triacs part numbering



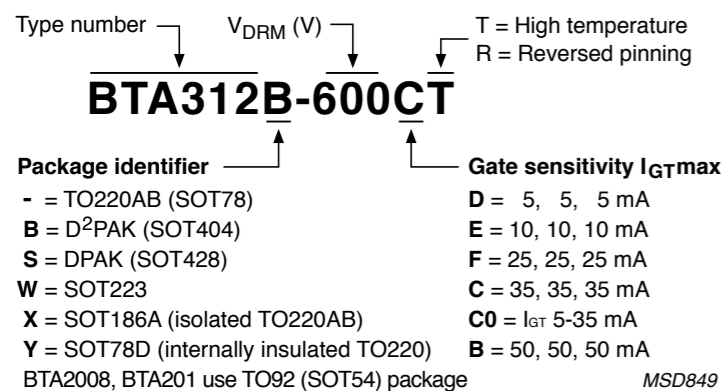
3-Quadrant Triacs

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT78D (internally insulated TO220AB)	SOT186A (isolated TO220AB)	SOT223	SOT404 (D ² PAK)	SOT428 (DPAK)
0.8	600 / 800	D/E	BTA2008						
1	600 / 800	B/E/ER	BTA201						
	600 / 800	E					BTA201W		
2	600 / 800	D/E				BTA202X			
4	600	B/C/D/E/F		BTA204		BTA204X			BTA204S
	800	B/C/E		BTA204		BTA204X			BTA204S
	1000	C				BTA204X			BTA204S
8	600	B/D/E/F		BTA208		BTA208X			BTA208S
	800	B/E		BTA208		BTA208X			BTA208S
	800	F		BTA208		BTA208X			BTA208S
	1000	B				BTA208X			
	1000	C				BTA208X		BTA208B	
	1000	5 min - 35 max				BTA208X-1000C0			
12	600	D		BTA312		BTA312X		BTA312B	
	600	CT		BTA312				BTA312B	
	600 / 800	B/C/E		BTA312		BTA312X		BTA312B	
	600 / 800	C			BTA312Y				
	800	ET		BTA312				BTA312B	
16	600 / 800	B/C			BTA412Y				
	600	BT/D		BTA316					
	600 / 800	B/C/E		BTA316		BTA316X		BTA316B	
	600 / 800	ET		BTA316					
25	800	10 min - 50 max				BTA316X-800B0			
	600 / 800	B/C			BTA416Y				
	600	BT		BTA225					
25	600 / 800	B		BTA225				BTA225B	

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

3-Quadrant Triacs part numbering

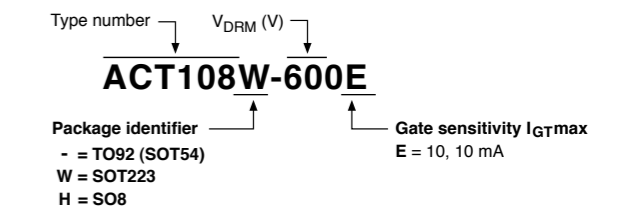


AC Thyristors

types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT223	SO8
0.2	600	D			ACT102H
0.8	600	D	ACT108	ACT108W	
	600	E	ACT108	ACT108W	

AC Thyristors part numbering



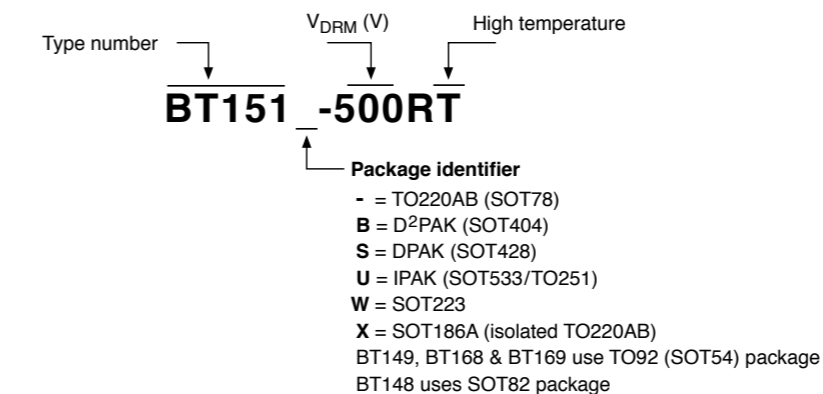
Silicon Controlled Rectifiers

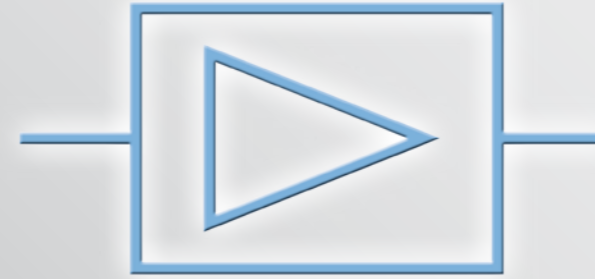
types in **bold** represent new products

$I_{T(RMS)}$ (A)	V_{DRM} & V_{RRM} (V)	I_{GT} (max) (mA)	SOT54 (TO92)	SOT78 (TO220AB)	SOT82	SOT186A (isolated TO220AB)	SOT223	SOT404 (D ² PAK)	SOT428 (DPAK)	SOT533 (IPAK)
0.8	400	0.012	EC103D1							
	400 (V_{DRM} only)	0.2	NXL0840							
	200 / 400 / 600	0.2	BT149B/D/G							
	200 / 400 / 600	0.2	BT169B/D/G							
	400	0.05	BT169D-L							
	800	0.1	BT169H							
	500 / 600	0.02 min - 0.2 max	BT168E/G							
	200	0.2						MCR08BT1		
	600	0.02 min - 0.2 max							BT168GW	
	600	0.07 min - 0.45 max							BT168GWF**	
4	400 / 500 / 600	0.2			BT148-R					
	600	0.2							BT150S-R	
	500	0.2			BT150-R					
8	800	0.05							BT258S-LT	
	500 / 600 / 800	0.2			BT258-R		BT258X-R			
	600	0.2								BT258U-R
	800	0.2							BT258S-R	
12	600	5							BT300S-R	
	500 / 650	5			BT151-L				BT151S-L	
	500 / 650 / 800	15			BT151-R		BT151X-R		BT151S-R	
	650	15							BTH151S-R	
	500 / 650 / 800	15			BT151-C		BT151X-C			BT151U-C
20	400 / 600 / 800	32			BT152-R		BT152X-R		BT152B-R	
	500	32			BT152-RT					
	800	35			BT145-R					

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

SCRs part numbering





Standard & advanced linear products

Adjustable shunt voltage regulator TL431 92

Adjustable shunt voltage regulator TLVH431 93

Discrete voltage regulator / Constant current source 94

Low-dropout regulator 95

Advanced linear ultra low-dropout voltage regulators 96

Adjustable shunt voltage regulator TL431

types in **bold** represent new products

Package				SOT23		
Size (mm)				2.9 x 1.3 x 1.0		
P _{tot} (mW)				580		
Pinning configuration				Normal pinning*	Mirrored pinning*	
V _{KA} (V)	I _k (mA)	V _{ref}	T _{amb} (°C)			
36	100	2.495	2%	0 to 70	TL431CDBZR ¹⁾	
				-40 to 85	TL431IDBZR ¹⁾	
				-40 to 125	TL431QDBZR ¹⁾	
			-40 to 125	TL431FDT²⁾	TL431MFD²⁾	
				TL431SDT ³⁾	TL431MSDT ³⁾	
				TL431ACDBZR ¹⁾		
		1%	0 to 70	TL431ACDBZR ¹⁾		
			-40 to 85	TL431AIDBZR ¹⁾		
			-40 to 125	TL431AQDBZR ¹⁾		
		0.5%	-40 to 125	TL431AFDT²⁾	TL431AMFD²⁾	
				TL431ASDT ³⁾	TL431AMSDT ³⁾	
				TL431BCDBZR ¹⁾		
	-40 to 85	TL431BIDBZR ¹⁾				
	-40 to 125	TL431BQDBZR ¹⁾				
	-40 to 125	TL431BFDT²⁾	TL431BMFD²⁾			
		TL431BSDT ³⁾	TL431BMSDT ³⁾			

¹⁾ Offers enhanced stability area and very low load capacity requirement

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

³⁾ Is designed for standard requirements and linear applications

* Normal pinning vs. mirrored pinning for TL431

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

Adjustable shunt voltage regulator TLVH431

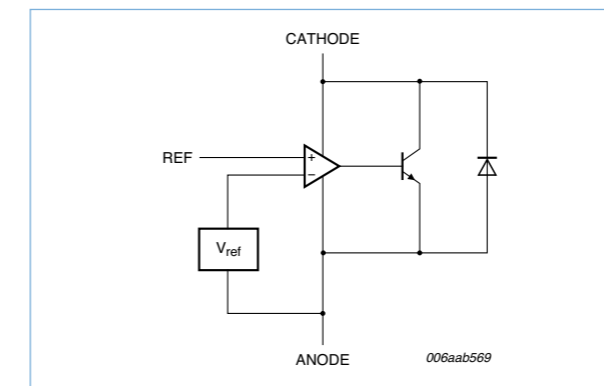
types in **bold** represent new products

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

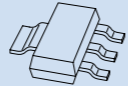
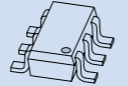
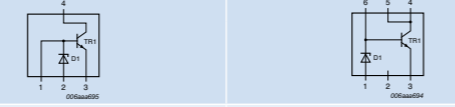
* Normal pinning vs. mirrored pinning for TLVH431

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

Functional diagram



Discrete voltage regulator

					SOT223 (SC-73)	SOT457 (SC-74)
Package						
Size (mm)					6.5 x 3.5 x 1.65	2.9 x 1.5 x 1.0
P_{tot} (mW)					1300	380
Zener diode		Transistor				
V _{out} (V)	V _z min - V _z max (V) @ I _z = 5 mA	V _{CE0} (V)	I _c (A)	h _{FE} min @ I _c = 100 mA		
2.5	3.23 - 3.37	45	0.1	160	PVR100AZ-B2V5	PVR100AD-B2V5
3.0	3.53 - 3.67	45	0.1	160	PVR100AZ-B3V0	PVR100AD-B3V0
3.3	3.82 - 3.98	45	0.1	160	PVR100AZ-B3V3	PVR100AD-B3V3
5.0	5.49 - 5.71	45	0.1	160	PVR100AZ-B5V0	PVR100AD-B5V0
12.3	12.7 - 13.3	45	0.1	160	PVR100AZ-B12V	PVR100AD-B12V

Key features

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


Key benefits

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

Key applications

- ▶ Linear voltage regulation

Constant current source

SOT353 (SC-88A)							
							
Size (mm) 2.0 x 1.25 x 0.95							
P_{tot} (mW) 335							
Type PSSI2021SAY							
Description	maximum supply voltage	maximum supply current	typical stabilized output current	minimum stabilized output current	maximum stabilized output current	typical load stability of stabilized output current	typical output current change over ambient temperature
Parameter	V _s max (V)	I _s max (mA)	I _{out} typ (μA)	I _{out} min (mA)	I _{out} max (mA)	ΔI _{out} /I _{out} typ (%)	ΔI _{out} /I _{out} typ (°C)
Condition		@ V _s = 12 V; I _{out} = 15 μA; V _{out} = 1 V to 10 V	@ V _s = 12 V; V _{out} = 1 V to 10 V; R _{ext} = open			@ V _s = 12 V; V _{out} = 1 V to 10 V	@ V _s = 12 V; V _{out} = 1 V; T _{amb} = -55 °C to 150 °C
Value	75	2.2	15	0.015	50	0.5	0.15

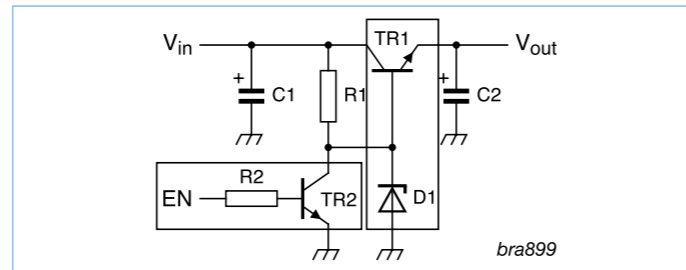
Key features and benefits

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

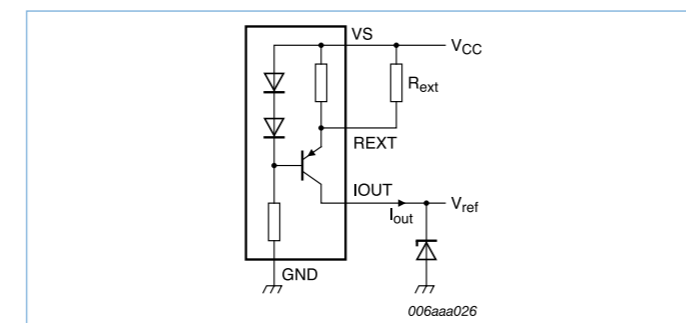
Key applications

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

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

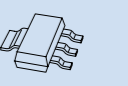


Voltage reference

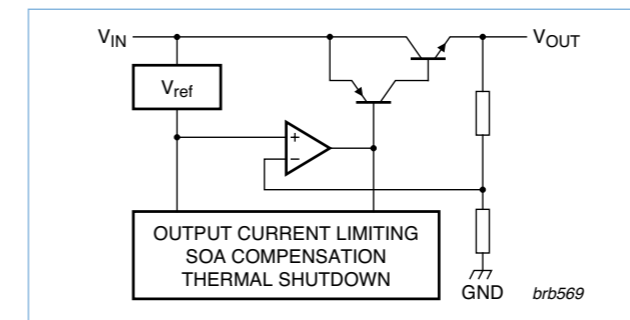


Low-dropout adjustable and fixed linear voltage regulator NX1117

types in **bold** represent new products

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

Functional diagram: fixed output voltage version



Key applications

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

In the Spotlight


Low-dropout linear voltage regulator NX1117

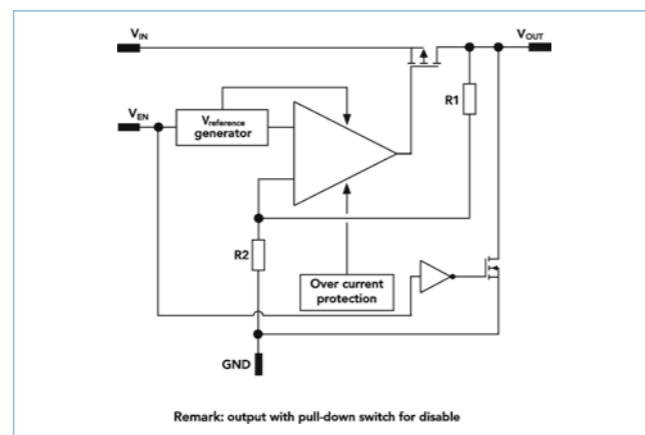
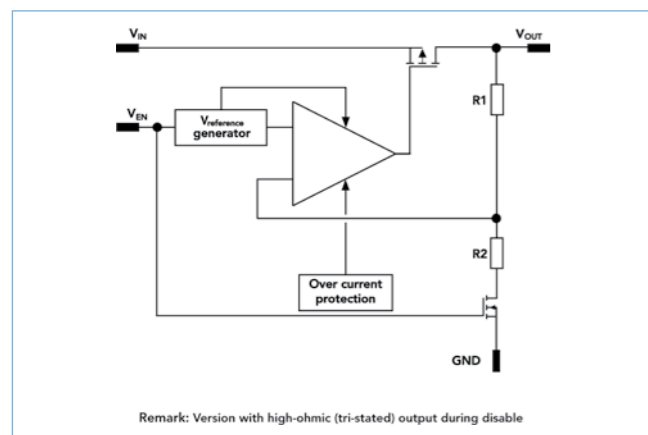
- Adjustable or fixed output voltage version in SOT223 package
- Output voltage accuracy of 1%
- Wide input voltage range up to 20 V
- Maximum output current of 1 A
- Output current limiting and thermal shutdown
- Temperature range -40 °C to 125 °C



LD6805 Ultra low-dropout voltage regulators – 150 mA

types in **bold** represent new products

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



Key features

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

Key benefits



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

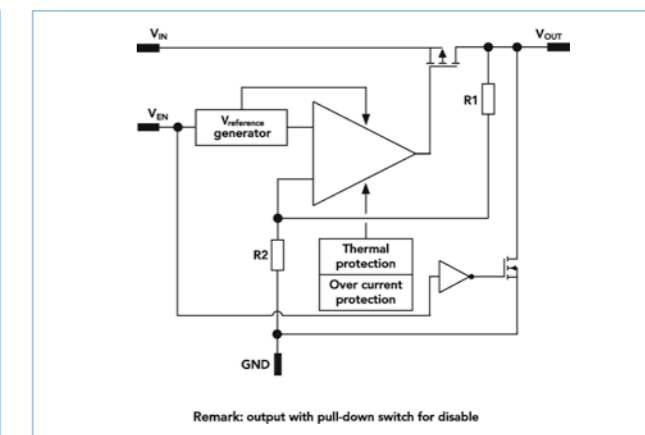
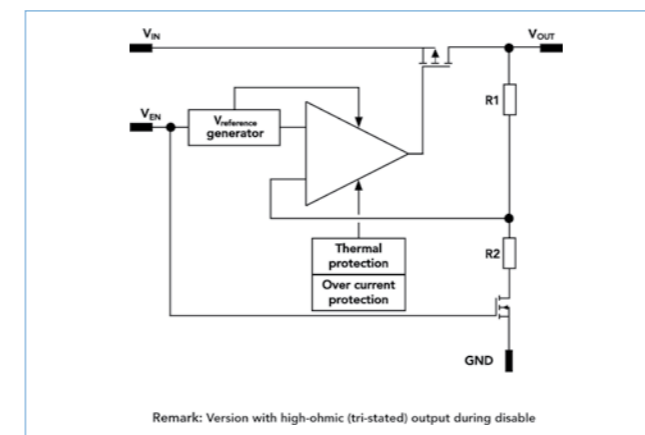
Key applications

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

LD6806 Ultra low-dropout voltage regulators – 200 mA

types in **bold** represent new products

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



Key benefits

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


Key applications

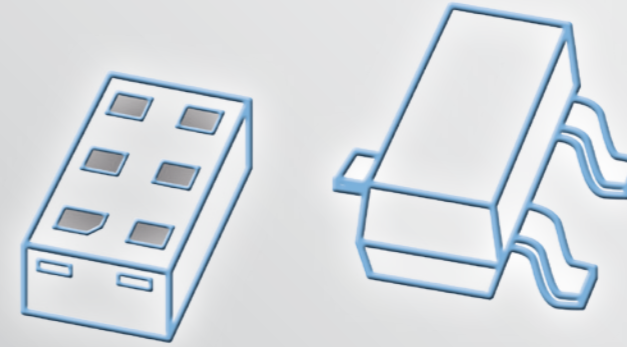
- ▶ Mobile phone handsets, cordless telephones, personal digital devices (applications requiring component miniaturization)

In the Spotlight

Ultra low-dropout voltage regulators – LD680x

- Typical output current 150 mA (LD6805) and 200 mA LDOs (LD6806)
- Ultra low-dropout voltage → 60 mV @ 200 mA (LD6806)
- Ultra high power supply ripple rejection (PSRR): 75 dB (LD6805)
- Low noise → 30 μVrms for LD6806 and 50μVrms for LD6805
- Smallest packages (WLCSP and Plastic SMD)





Packages

Package cross reference 100

Packing methods 102

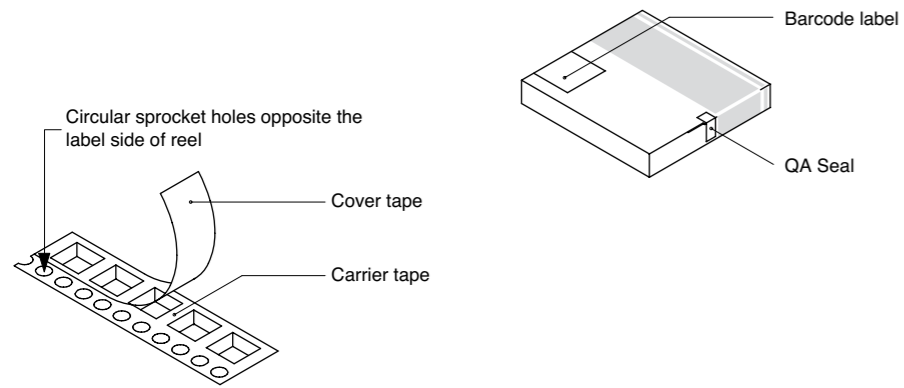
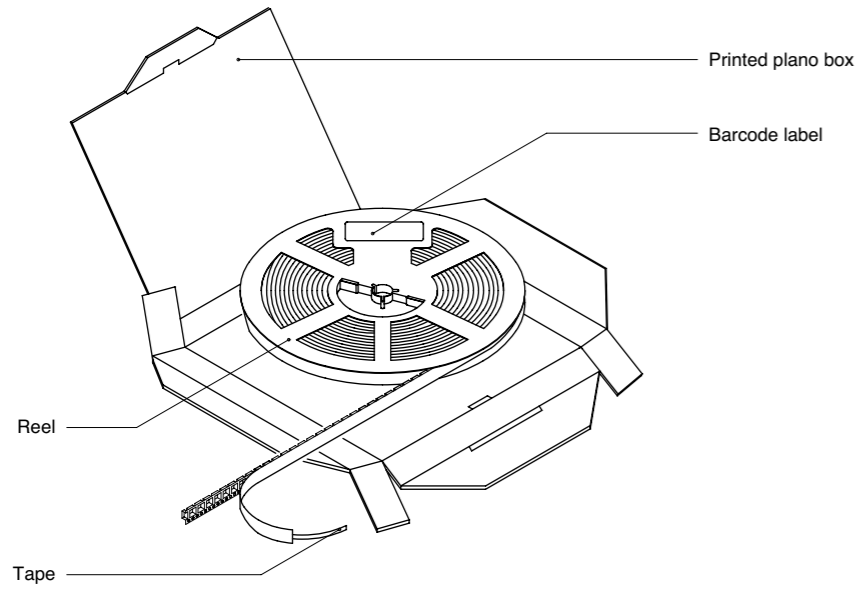
Minimized outline drawings and reflow soldering footprint 108

Package cross reference

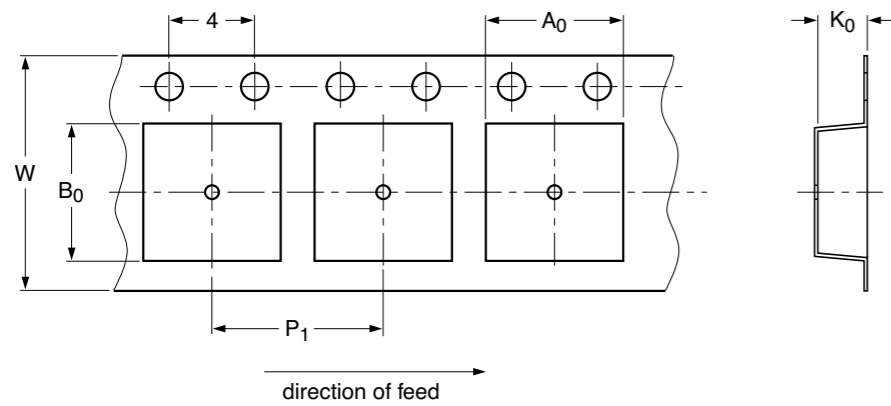
Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P _{tot} (mW)	Package	Competitor synonyms								
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay	Semtech
2	SOD27	DO-35	4.25 x 1.85 x 0.56	500		GSD			DO-35		DO-35		DO-204AH	
	SOD66	DO-41	4.8 x 2.6 x 0.81	1300		GSR	DO-41				DO-41		DO-204AL	
	SOD68	DO-34	3.04 x 1.6 x 0.55	500		MSD								
	SOD80C	MiniMelf	3.5 x 1.5 x 1.5	300		LLDS			LLD		MiniMELF		MiniMELF	
	SOD123F	-	2.6 x 1.6 x 1.1	830		PMDU	S-Flat	SOD-123-FL			PowerDI123	SMF		
	SOD123W	-	2.6 x 1.7 x 1.0	900			S-Flat	SOD-123-FL			PowerDI123			
	SOD128	-	3.8 x 2.5 x 1.0	1000		PMDT	M-Flat							
	SOD323	SC-76	1.7 x 1.25 x 0.95	400			USC	SOD-323	URP	SOD323	SOD-323	USC	SOD323	
	SOD323F	SC-90	1.7 x 1.25 x 0.7	830		UMD2	US-Flat				PowerDI323			
	SOD523	SC-79	1.2 x 0.8 x 0.6	500		EMD2	ESC/TESE	SOD-523	UFP	SC79		ESC	SOD523	
	SOD882	-	1.0 x 0.6 x 0.5	250			CTS2			TSLP-2	DFN1006-2			
	SOD882D	-	1.0 x 0.6 x 0.37	250						TSLP-2-7	DFN1006H4-2			
3	SOT1061	HUSON3	2.0 x 2.0 x 0.65	1300				WDFN3		DFN2020-3		PowerPAK SC706L		
	SOT23	-	2.9 x 1.3 x 1.0	250		SSD3/SST3		SOT-23		SOT23	SOT-23	SOT-23	SOT23	
	SOT323	SC-70	2.0 x 1.25 x 0.95	200		UMD3/UMT3	USM	SC-70	CMAK/CM-PAK	SOT323	SOT-323	USM	SC-70 3 leads	
	SOT416	SC-75	1.6 x 0.8 x 0.77	150		EMD3/EMT3	SSM	SC-75	SMPAK	SC75			SC-75A	
	SOT883	SC-101	1.0 x 0.6 x 0.5	250			SS CSP2			TSLP-3-1	DFN1006-3			
4	SOT89	SC-62	4.5 x 2.5 x 1.5	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89		SOT-89		
	SOT143B	-	2.9 x 1.3 x 1.0	250			CP4		MPAK-4R	SOT143	SOT-143			
5	SOT223	SC-73	6.5 x 3.5 x 1.65	1700				SOT-223		SOT223	SOT-223	SOT-223	SOT223	
	SOT353	SC-88A	2.0 x 1.25 x 0.95	300		UMD5/UMT5	USV	SC-88A	CMPAK-5(T)		USV	SOT353		
	SOT665	-	1.6 x 1.2 x 0.55	300		EMD5/EMT5	ESV	SOT-553	VSON-5		TESV			
6	SOT363	SC-88	2.0 x 1.25 x 0.95	300		UMD6/UMT6	US6	SC-88	CMPAK-6	SOT363	SOT-363	US6	SOT363	
	SOT457	SC-74	2.9 x 1.5 x 1.0	750		SMD6/SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6	TSOP-6	
	SOT666	-	1.6 x 1.2 x 0.55	300		EMD6/EMT6	ES6	SOT-563	SMFPAK-6	SOT666	SOT563	TES6	SC89-6lead	
	SOT1118	-	2.0 x 2.0 x 0.65	1300				6 Lead DFN			DFN2020B-6			
	SOT886	XSON6	1.45 x 1.0 x 0.5	250										SLP1510N6
SOT891	XSON6	1.0 x 1.0 x 0.5	-											

Pins / leads	NXP	Industry standard names	Size (l x w x h) (mm)	P _{tot} (mW)	Package	Competitor synonyms									
						Rohm	Toshiba	ON Semi	Renesas	Infineon	KEC	Vishay	Semtech		
8	SOT505	TSSOP8	3.0 x 3.0 x 1.1	-								TSSOP-8		TSSOP8	
	SOT96	SO8	4.9 x 3.9 x 1.75	1500		SOP8	FM8	SOIC-8 NB	SOP-8			FLP-8	SO8		
8 + 1	SOT983	HXSON8	1.7 x 1.35 x 0.5	-								UDFN 1.7 x 1.35, 0.4P			SLP1713P8
	SOT1157	HXSON8	1.2 x 1.7 x 0.5	-								UDFN8, 1.8 x 1.2, 0.4P			
	SOT1166	HUSON8	1.35 x 1.7 x 0.55	-											SLP1713P8
9	SOT1178	XSON9	1.0 x 2.1 x 0.5	-											SLP2010P8T
10	SOT1165	XSON10	1.0 x 2.5 x 0.5	-								UDFN10 2.5 x 1, 0.5P		TSLP-9-1	SLP1610P4
	SOT1176	XSON10	1.0 x 2.5 x 0.5	-								UDFN10 2.5 x 1, 0.5P		TSLP-9-1	SLP1610P4
	SOT552	TSSOP10	3.0 x 3.0 x 1.1	-								Micro10		TSSOP10	MSOP-10L
12+1	SOT984	HXSON12	2.5 x 1.35 x 0.5	-											SLP2513P12
	SOT1158	HXSON12	1.2 x 2.5 x 0.5	-								UDFN12, 2.5 x 1.2, 0.4P			
14	SOT1167	HUSON12	1.35 x 2.5 x 0.55	-								UDFN12, 2.5 x 1.35, 0.4P			SLP2513P12
	SOT108	SO14	8.65 x 3.9 x 1.75	-		SOP14								DSO14	
16 + 1	SOT985	HXSON16	3.3 x 1.35 x 0.5	-								UDFN16, 3.3 x 1.35, 0.4P			SLP3313P16
	SOT1159	HXSON16	1.2 x 3.3 x 0.5	-								UDFN16, 3.5 x 1.2, 0.4P			
	SOT1168	HUSON16	1.35 x 3.3 x 0.55	-											SLP3313P16
20	SOT360	TSSOP20	6.5 x 4.4 x 1.1	-								TSSOP20		TSSOP20	
38	SOT510	TSSOP38	9.7 x 4.4 x 1.1	-										TSSOP38	

Tape and reel pack for SMD packages



Carrier tape - tape and reel

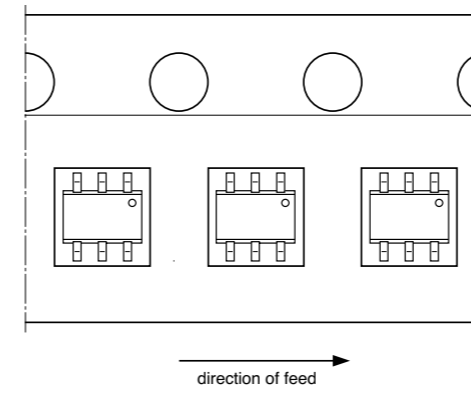


P1 = pitch (see table packing methods)
W = tape width (see table packing methods)

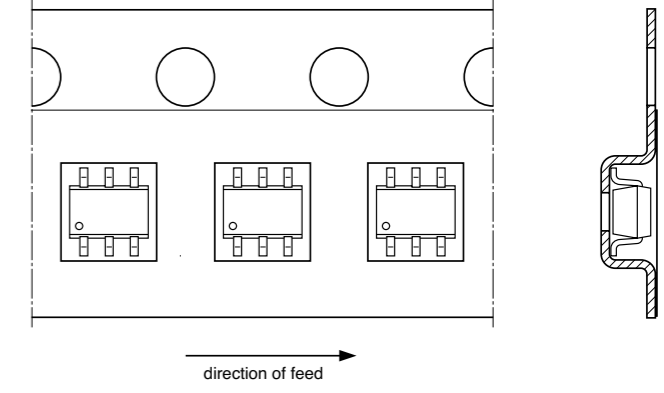
Compartment width (A_0), length (B_0) and depth (K_0) depending on package

Product orientation (tape and reel pack) T1-T4

T1 taping

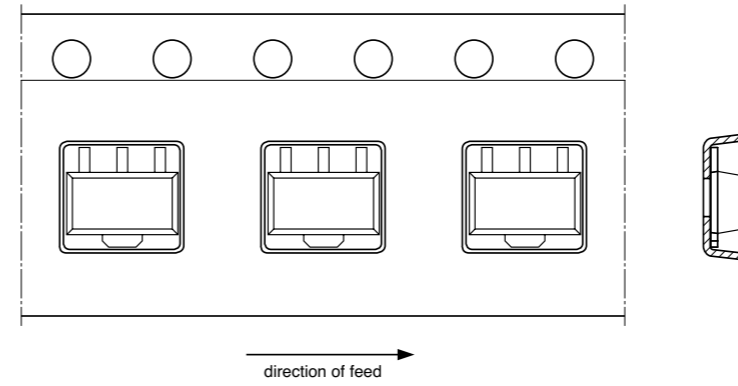


T2 taping

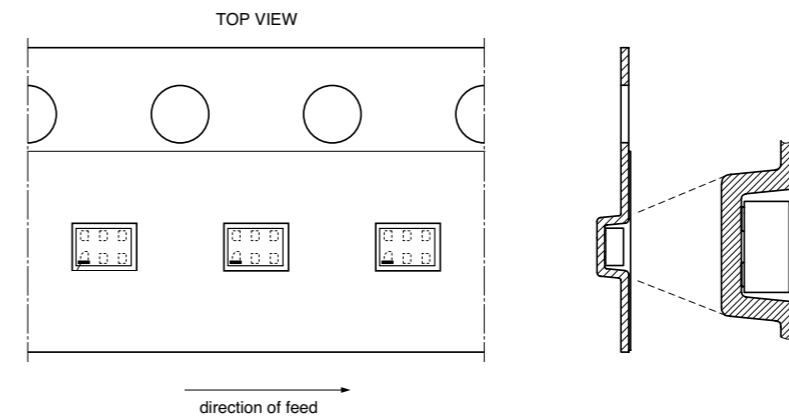


T3 taping

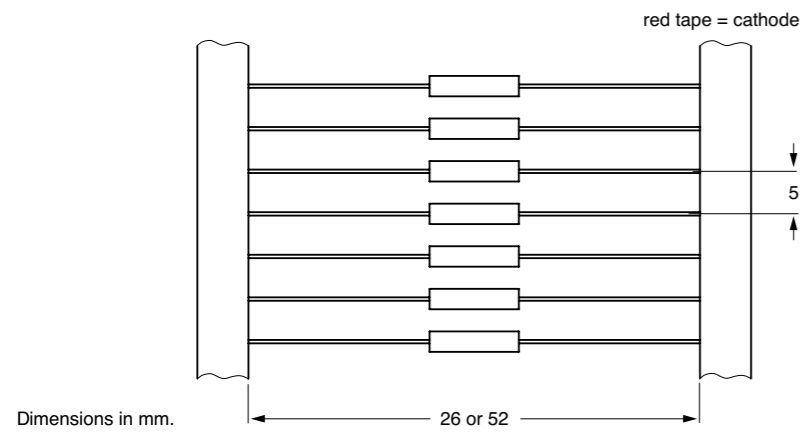
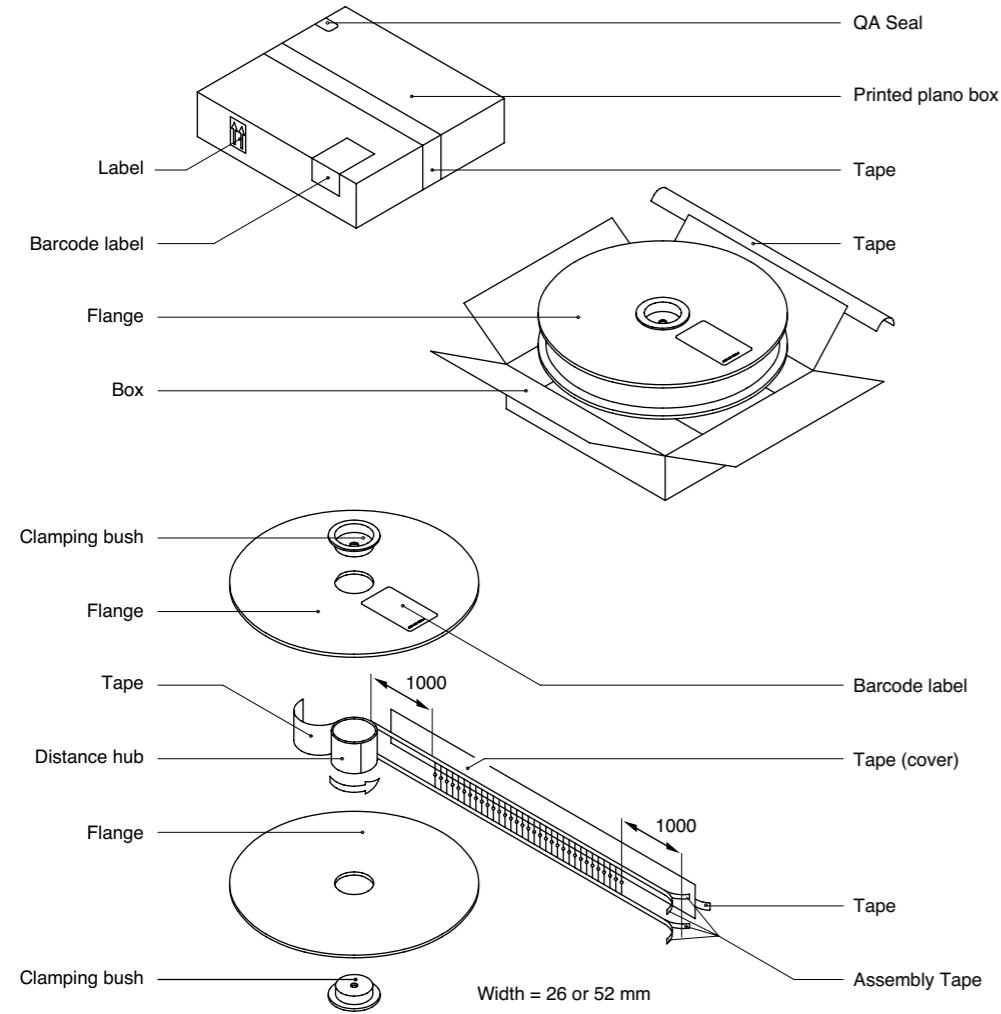
Standard product orientation SOT89 (T3)



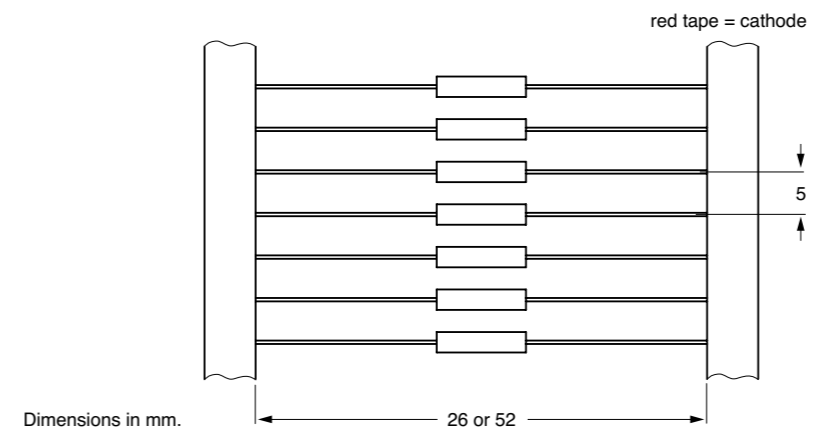
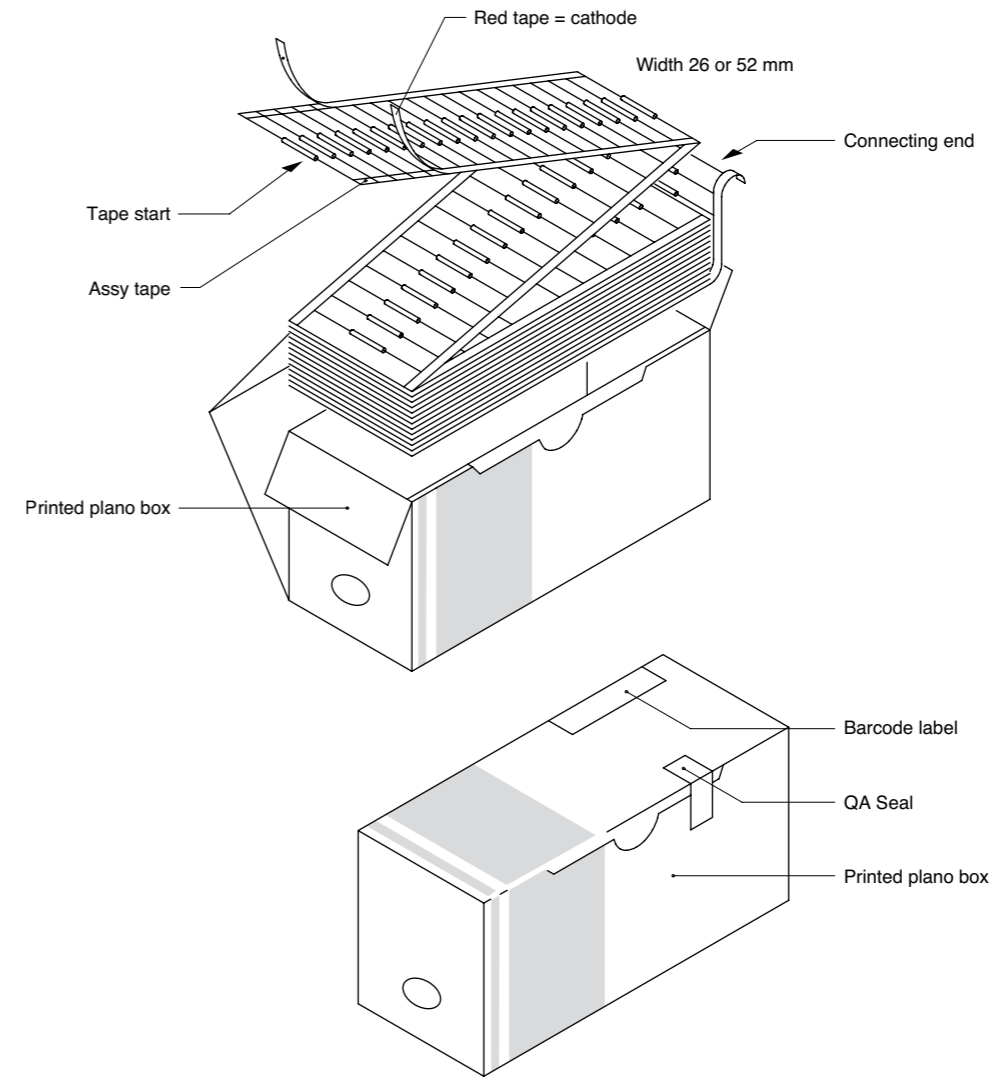
T4 taping



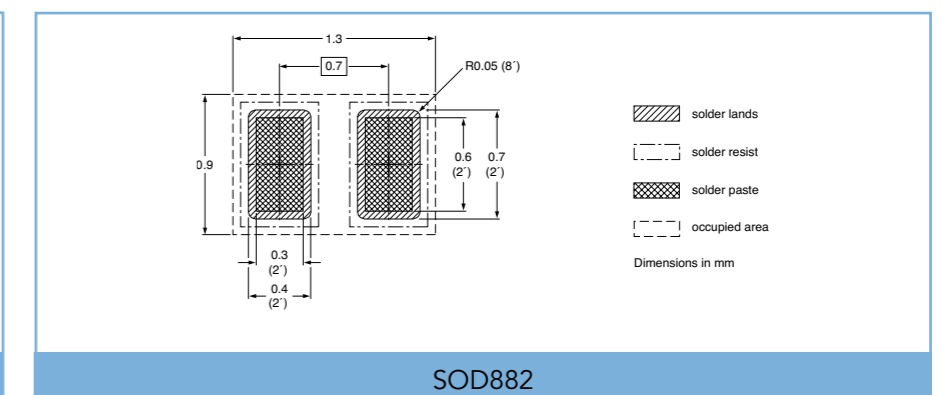
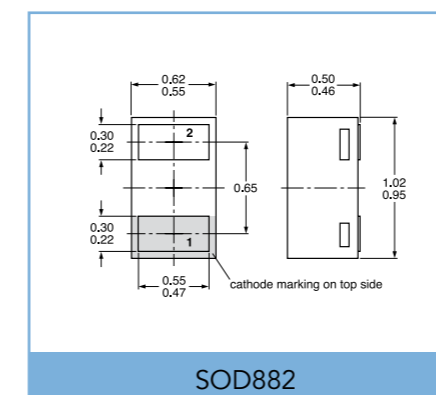
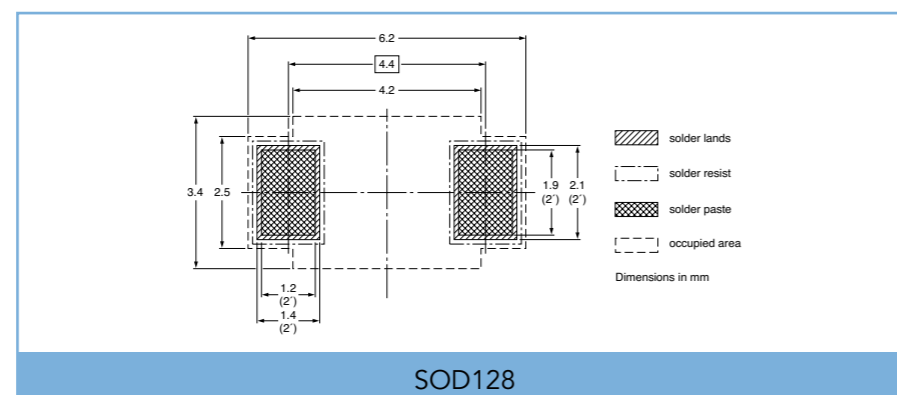
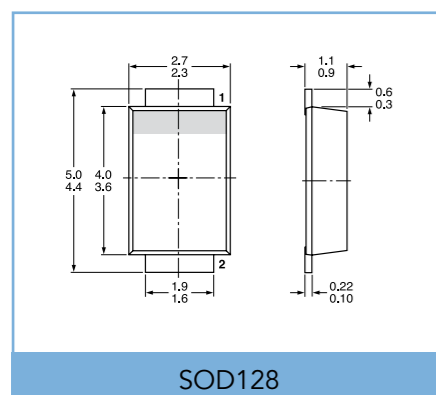
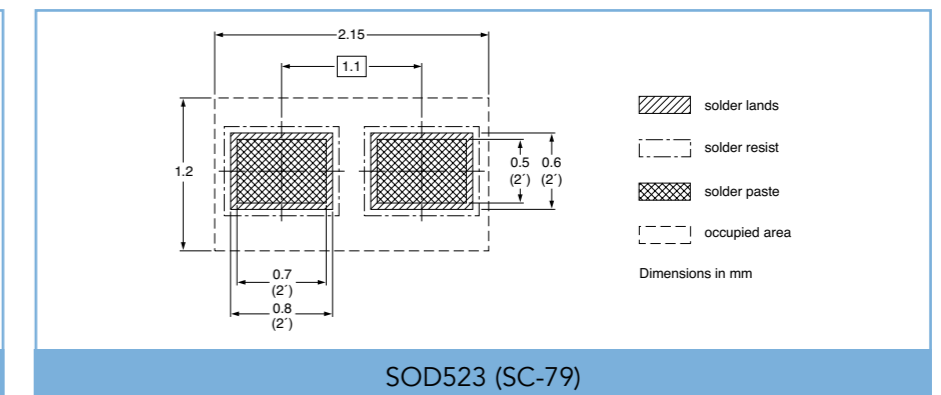
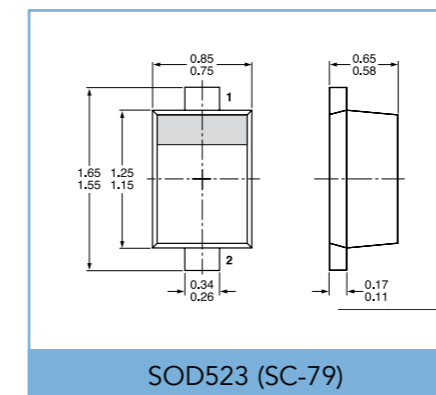
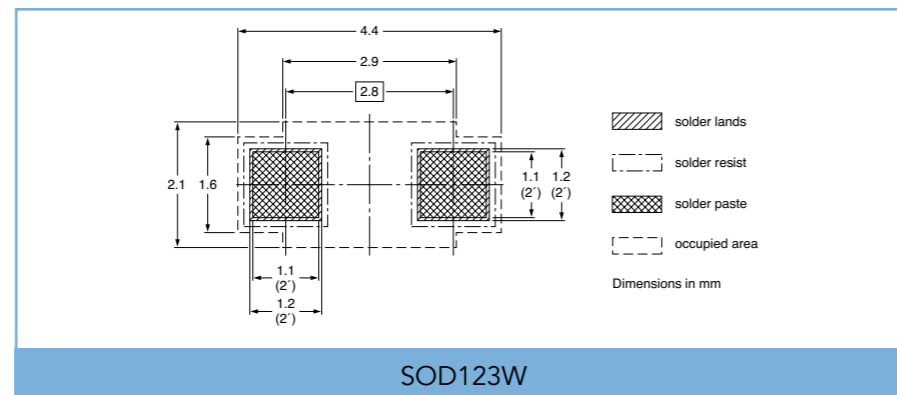
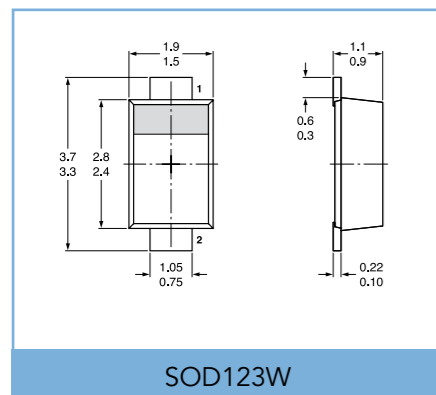
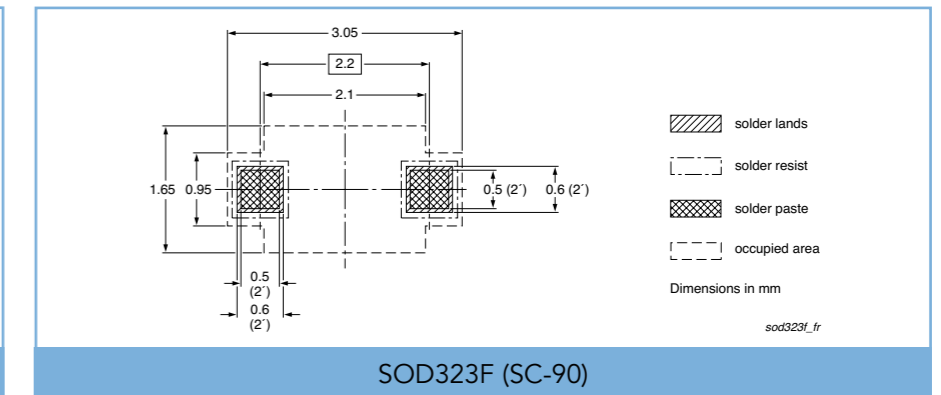
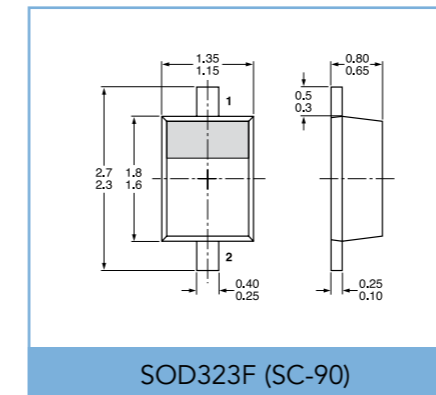
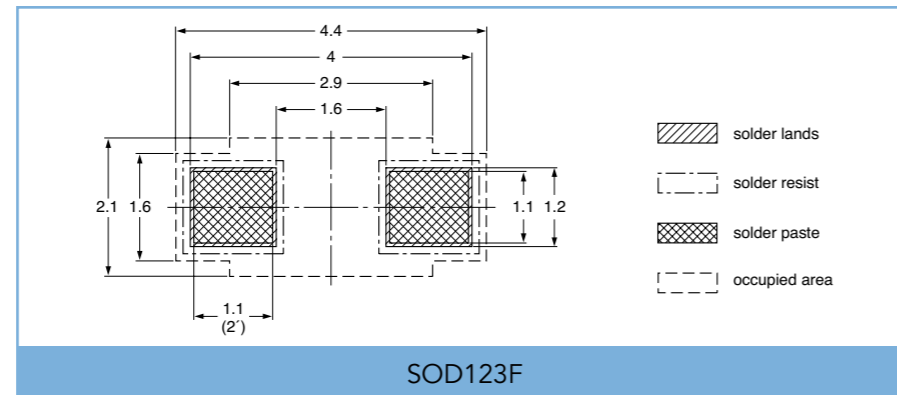
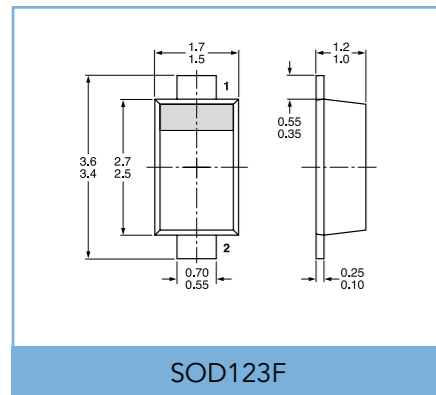
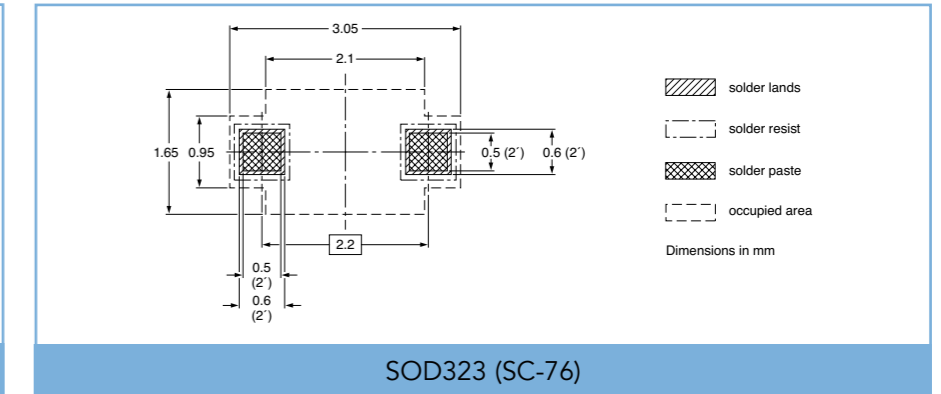
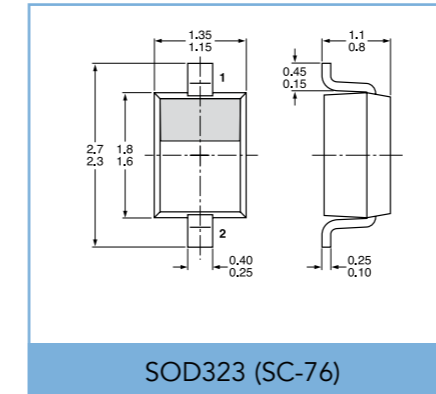
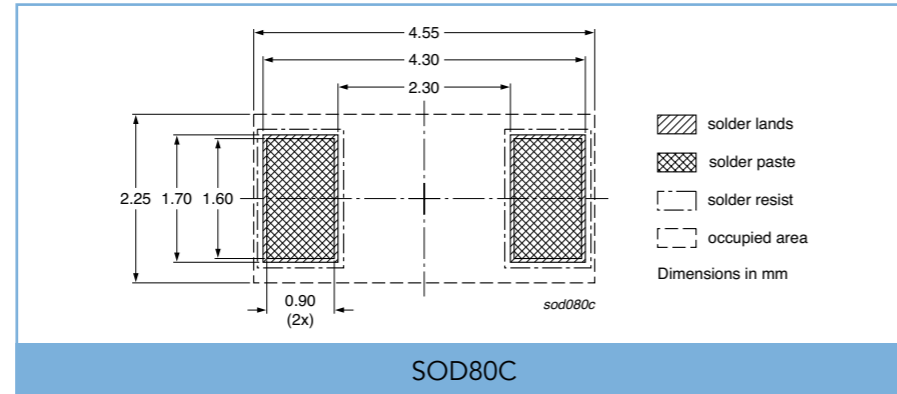
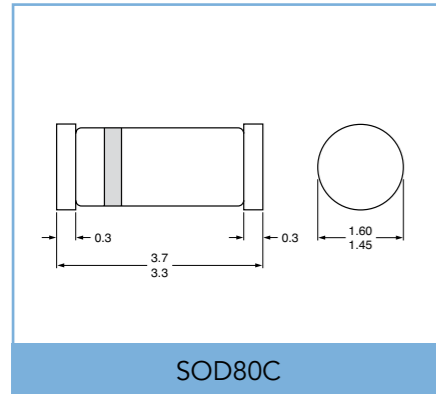
Reel pack axial tape for glass diodes

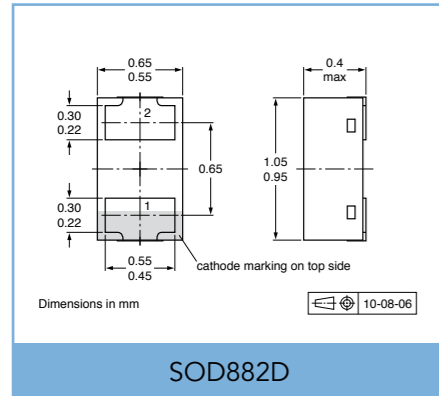


Ammo pack axial tape for glass diodes

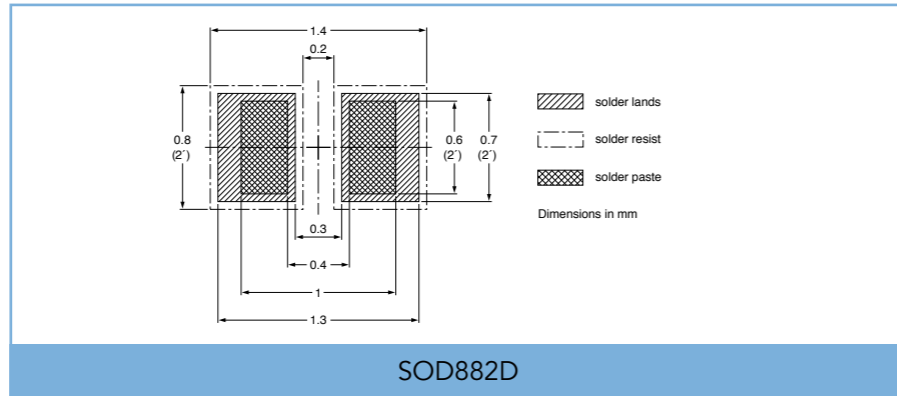


2-Pin SMD Packages

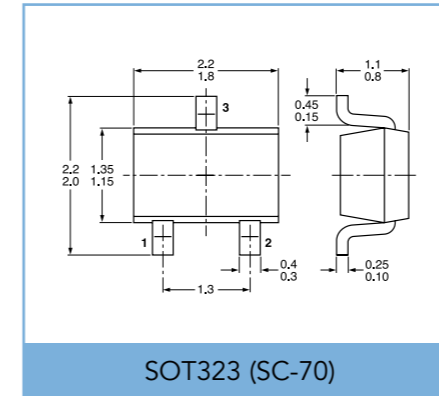




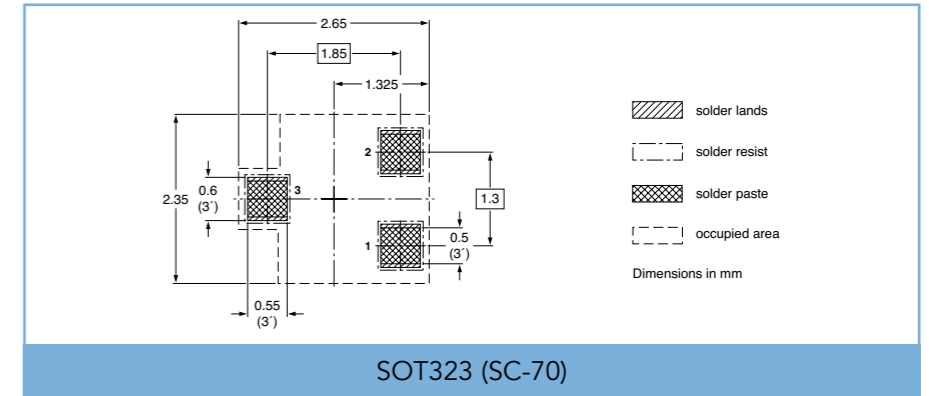
SOD882D



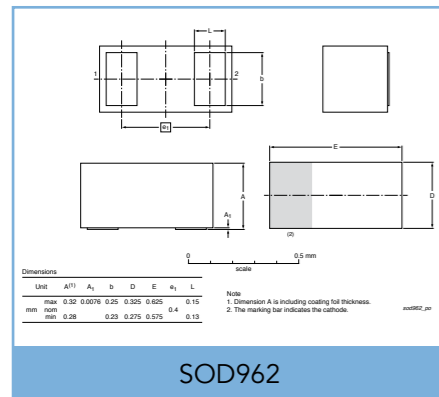
SOD882D



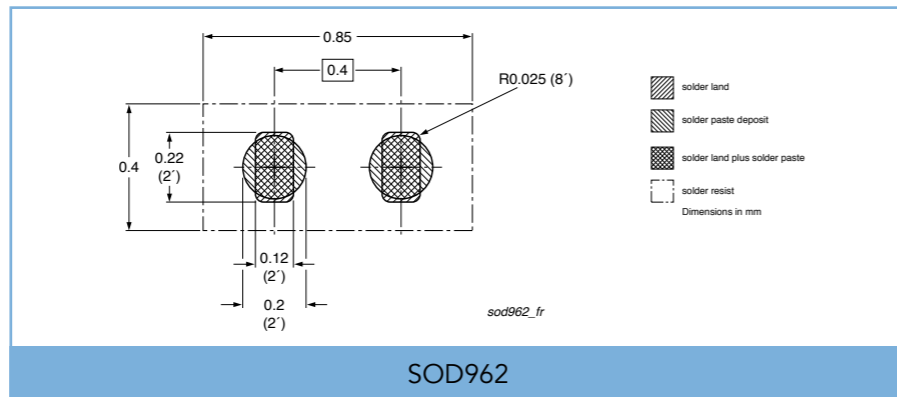
SOT323 (SC-70)



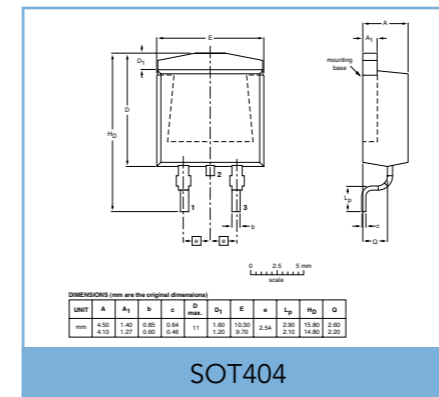
SOT323 (SC-70)



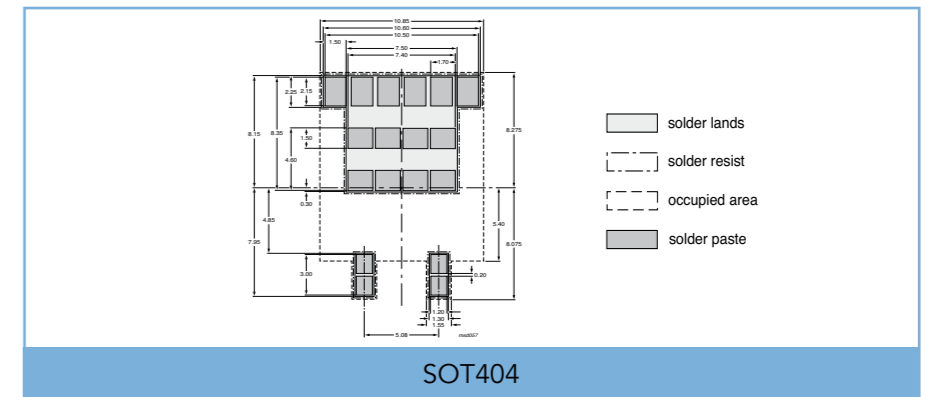
SOD962



SOD962

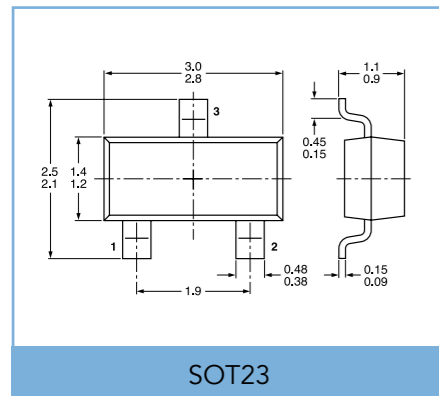


SOT404

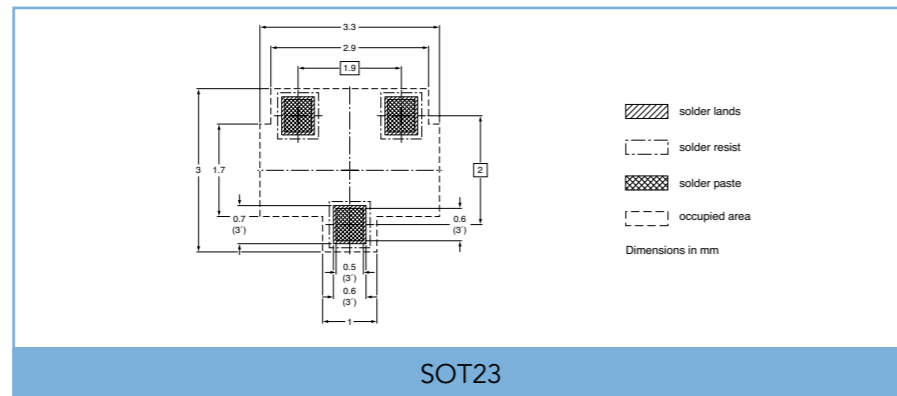


SOT404

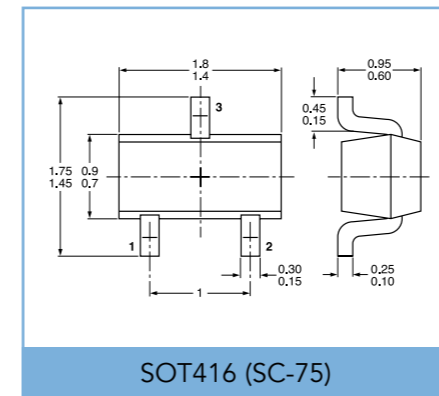
3-Pin SMD Packages



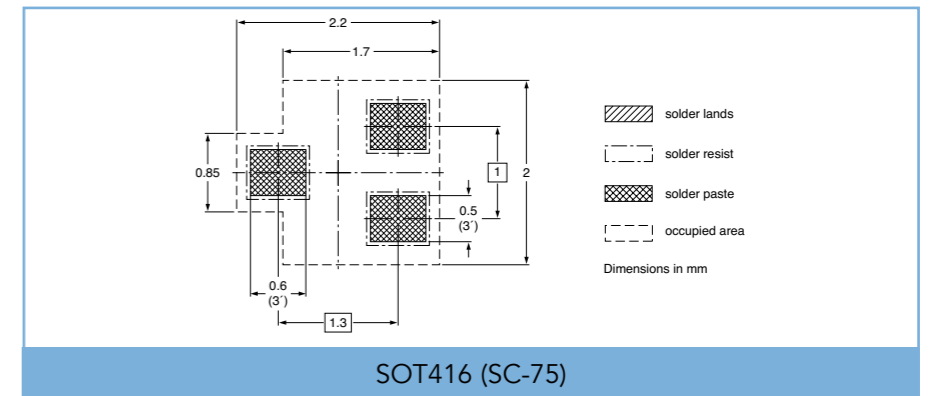
SOT23



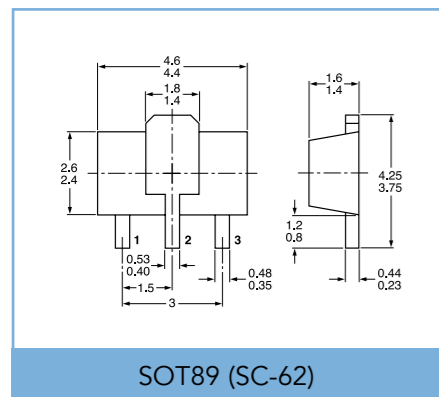
SOT23



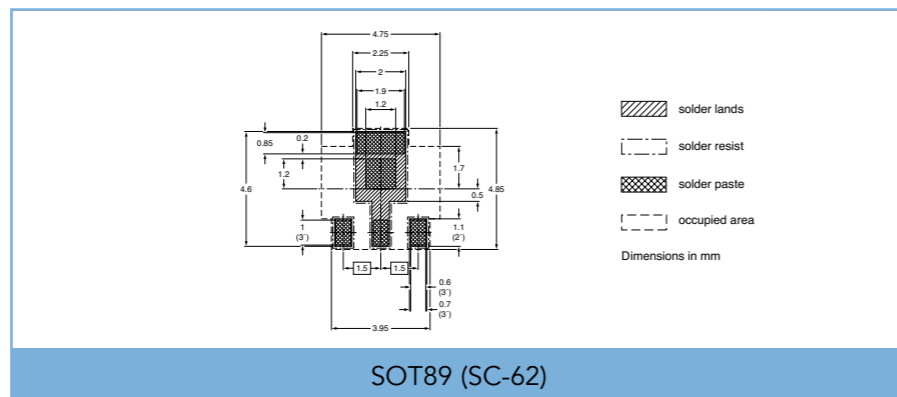
SOT416 (SC-75)



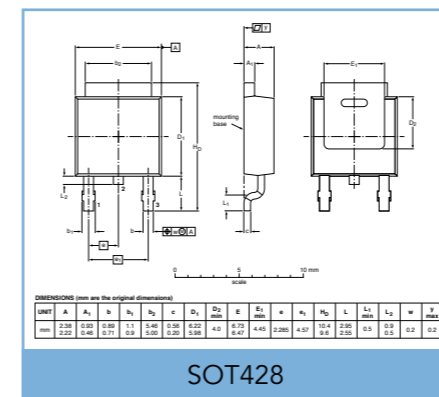
SOT416 (SC-75)



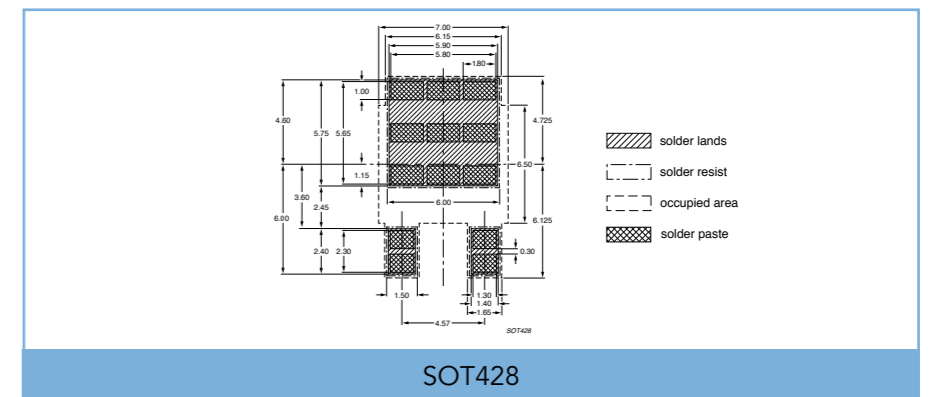
SOT89 (SC-62)



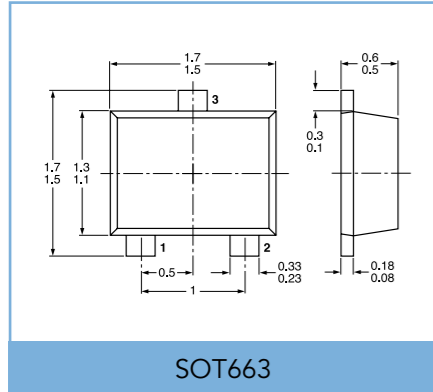
SOT89 (SC-62)



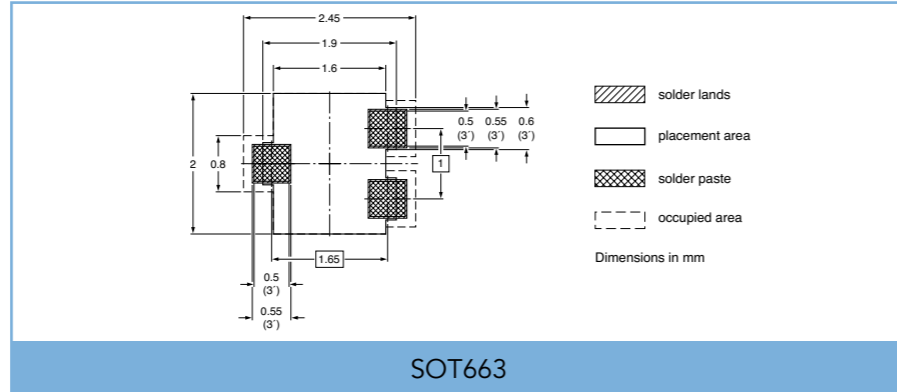
SOT428



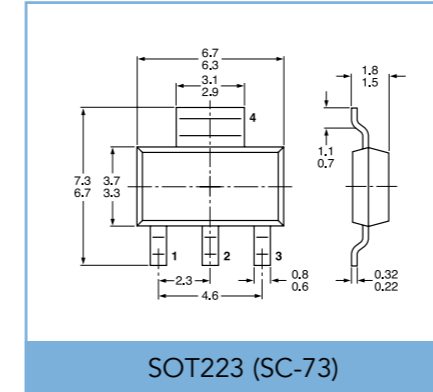
SOT428



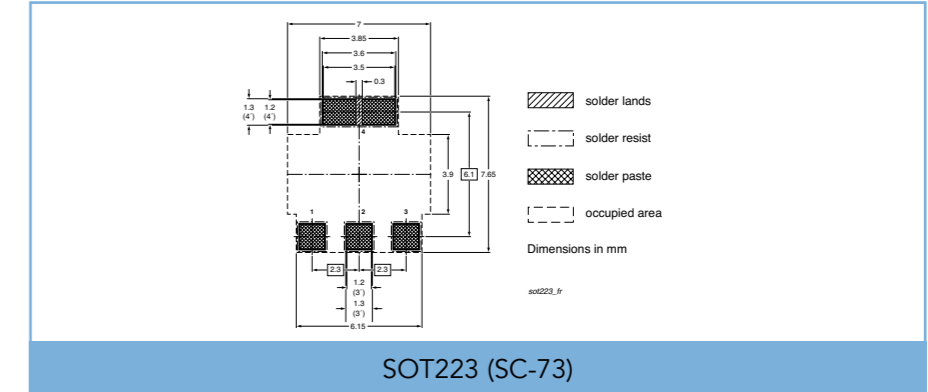
SOT663



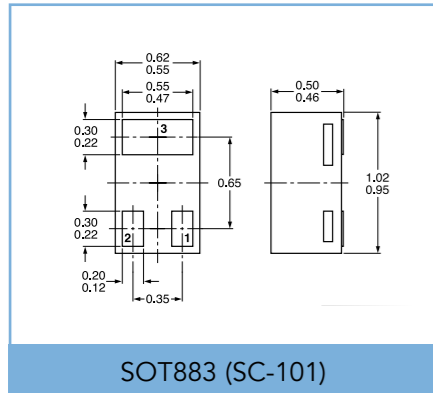
SOT663



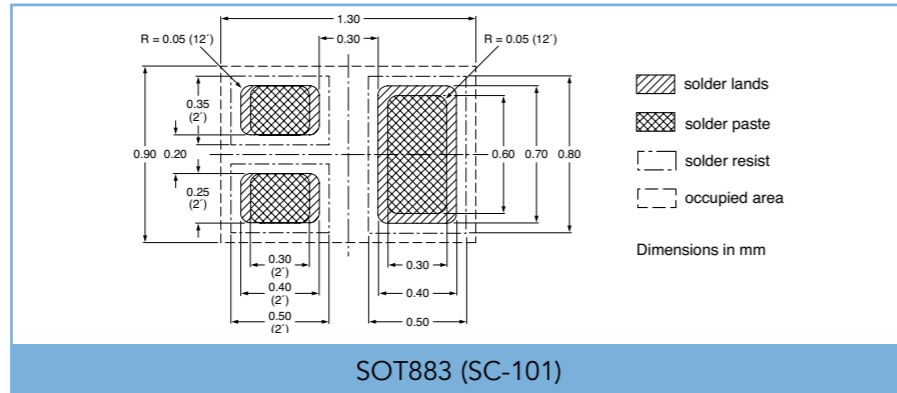
SOT223 (SC-73)



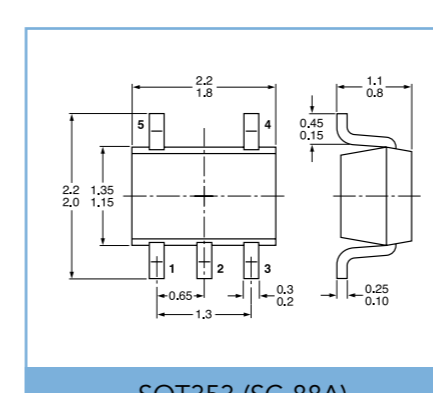
SOT223 (SC-73)



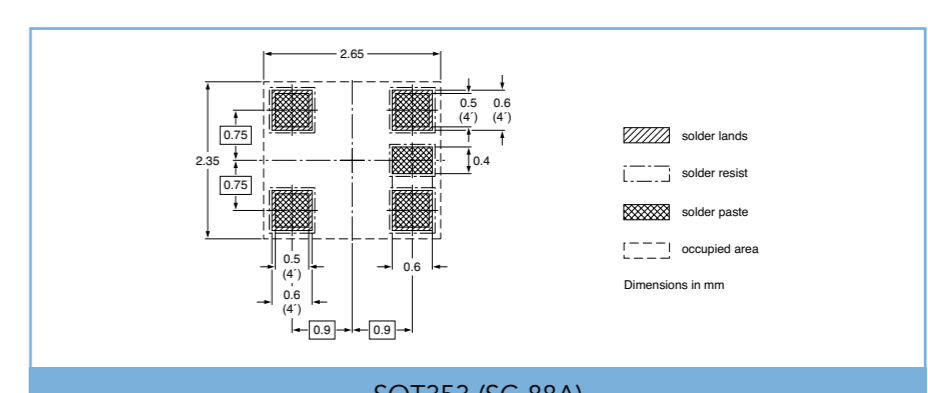
SOT883 (SC-101)



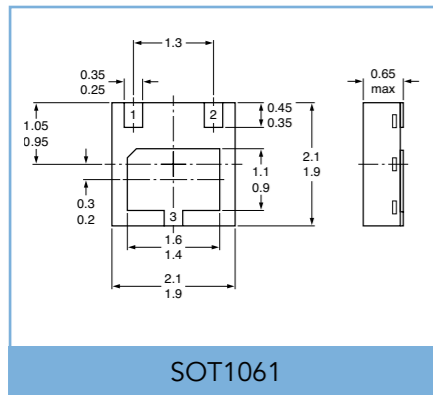
SOT883 (SC-101)



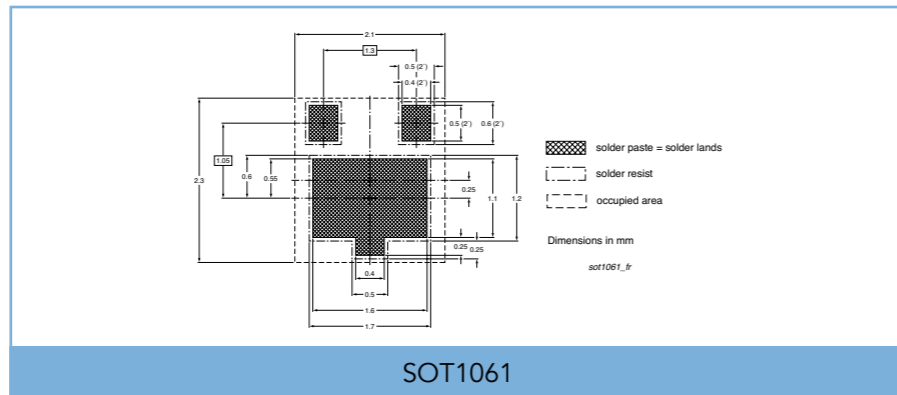
SOT353 (SC-88A)



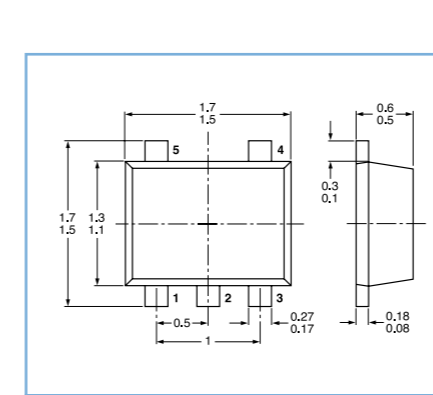
SOT353 (SC-88A)



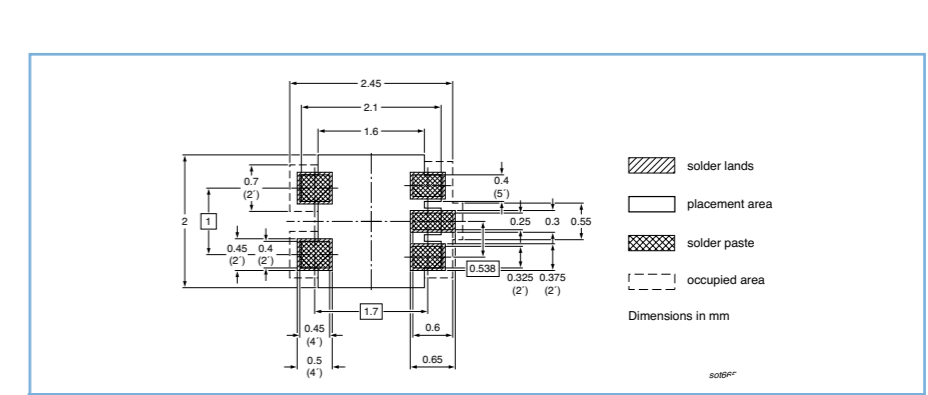
SOT1061



SOT1061

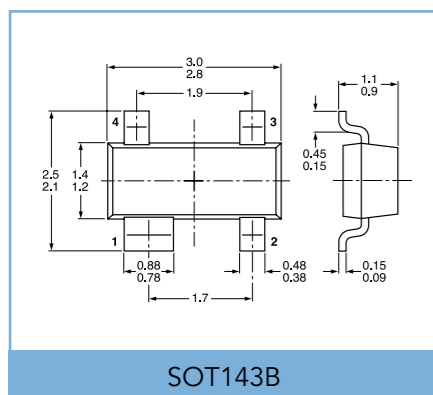


SOT665

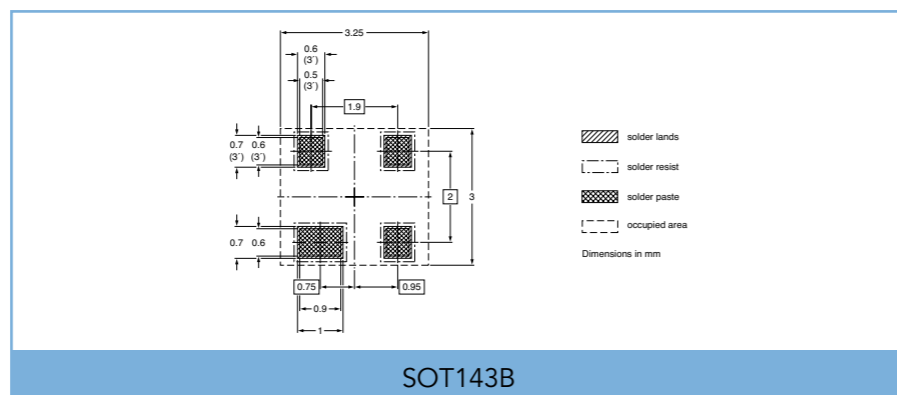


SOT665

4-/5-Pin SMD Packages

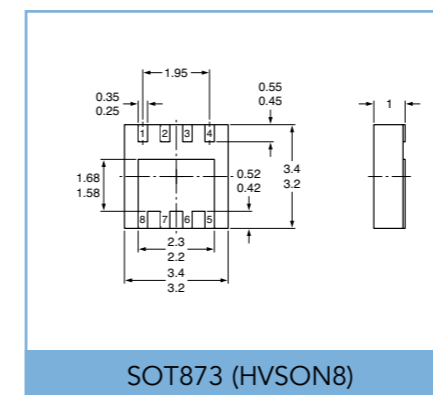


SOT143B



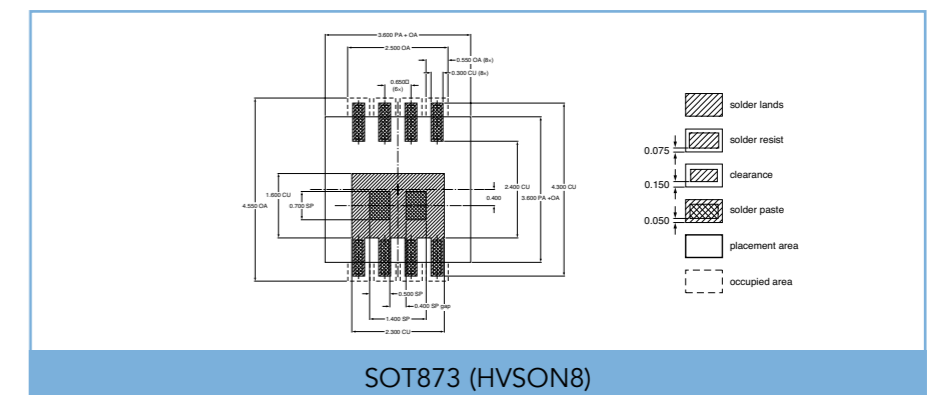
SOT143B

Dimensions in mm



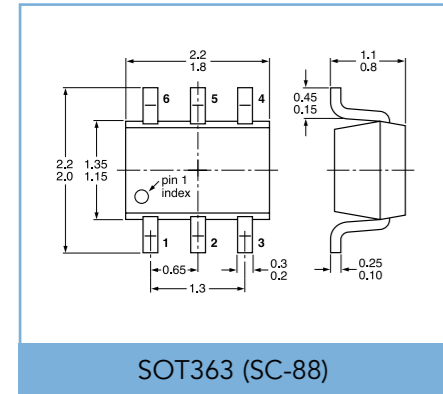
SOT873 (HVSON8)

Dimensions in mm

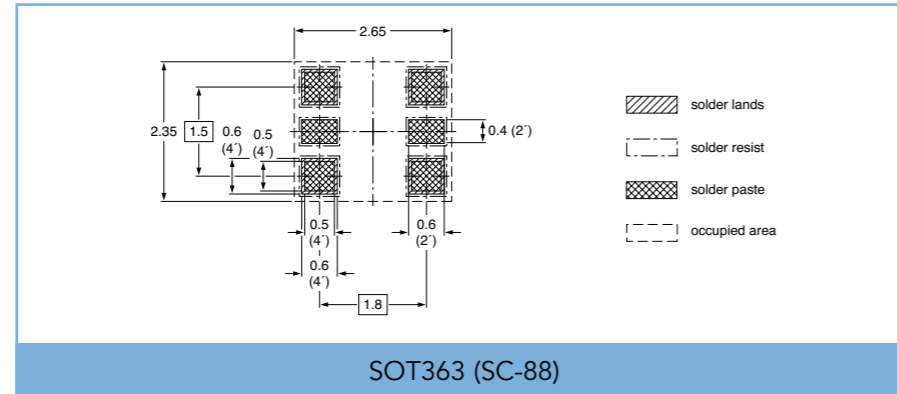


SOT873 (HVSON8)

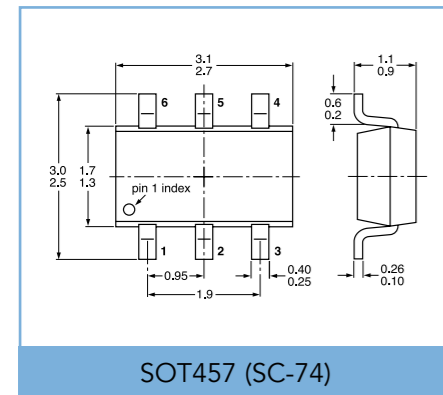
6-Pin SMD Packages



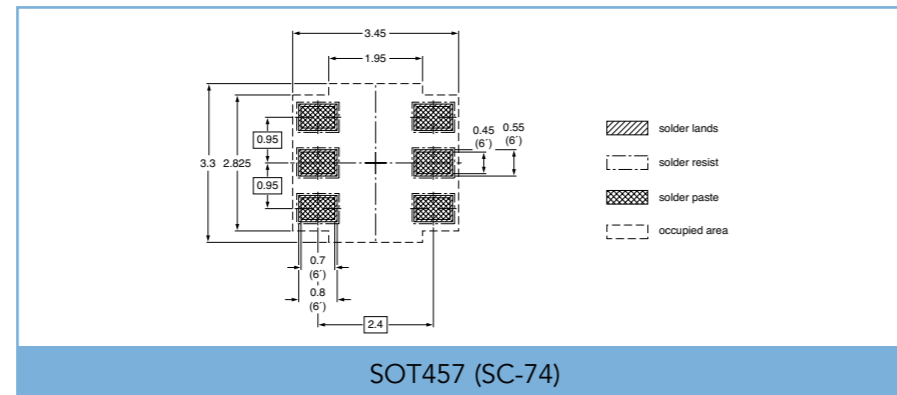
SOT363 (SC-88)



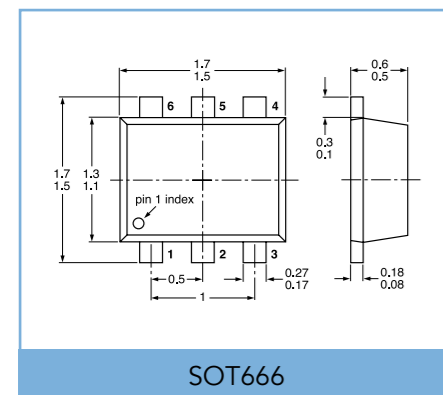
SOT363 (SC-88)



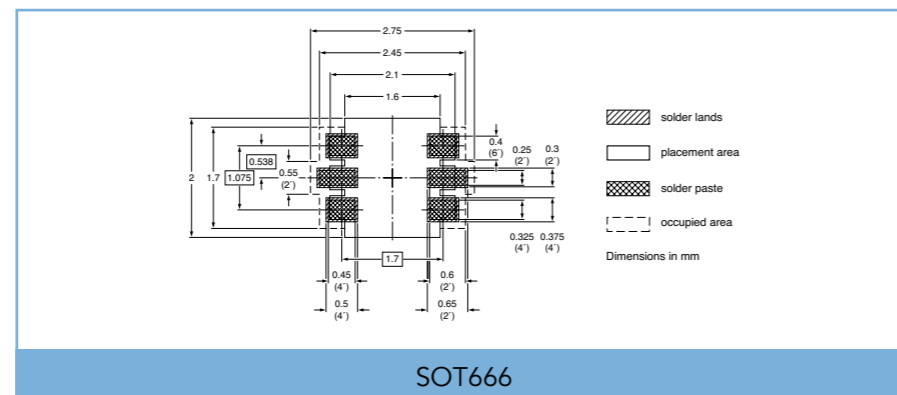
SOT457 (SC-74)



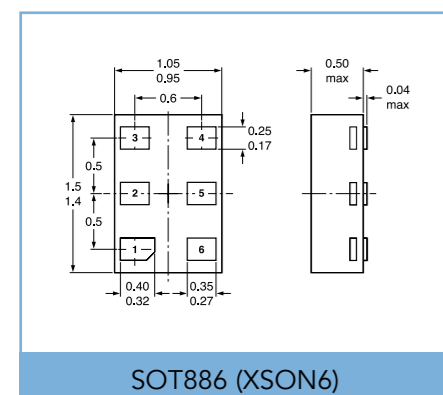
SOT457 (SC-74)



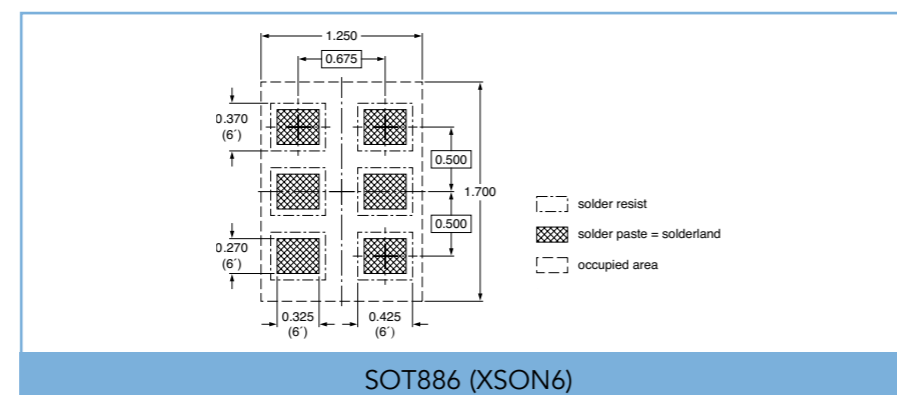
SOT666



SOT666

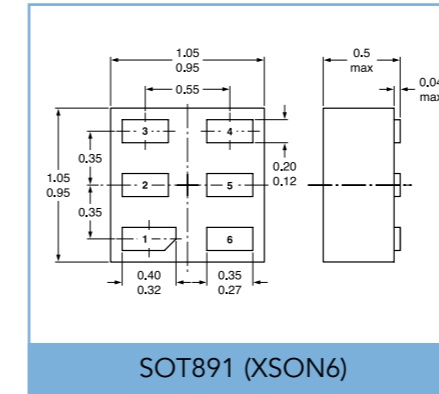


SOT886 (XSON6)

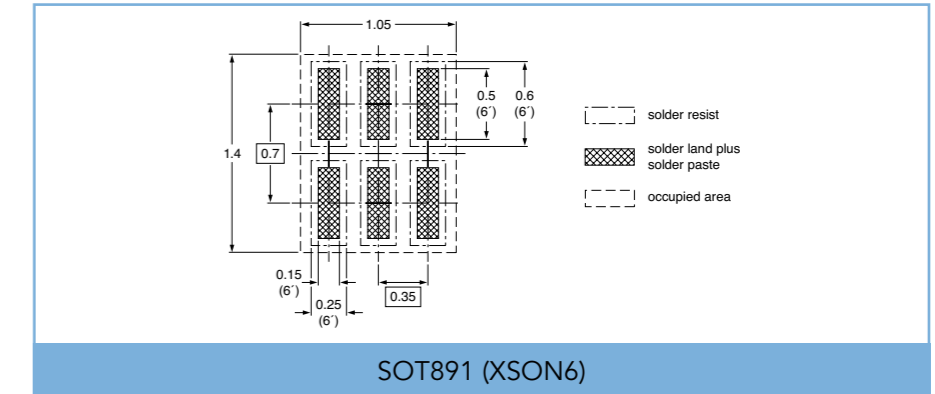


SOT886 (XSON6)

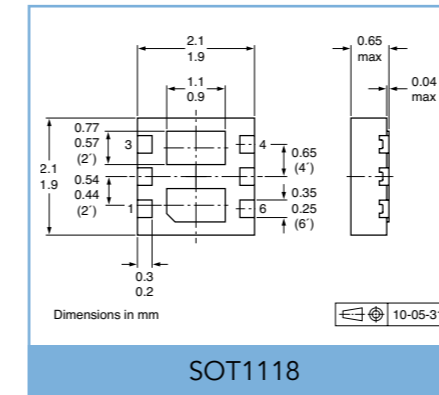
Dimensions in mm



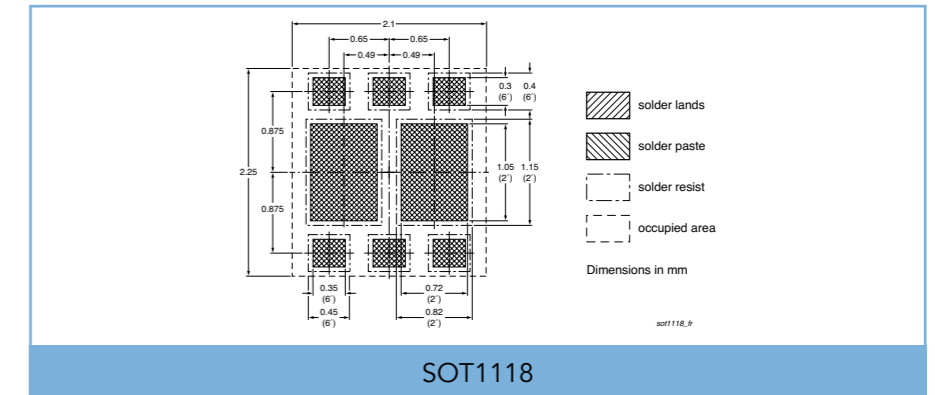
SOT891 (XSON6)



SOT891 (XSON6)

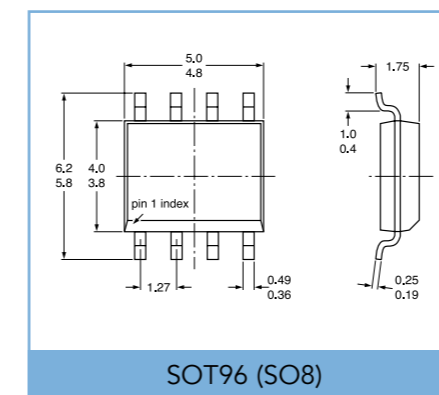


SOT1118

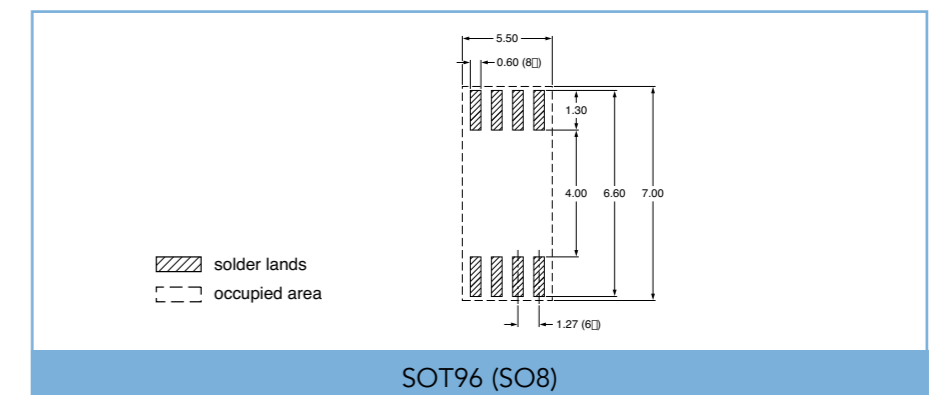


SOT1118

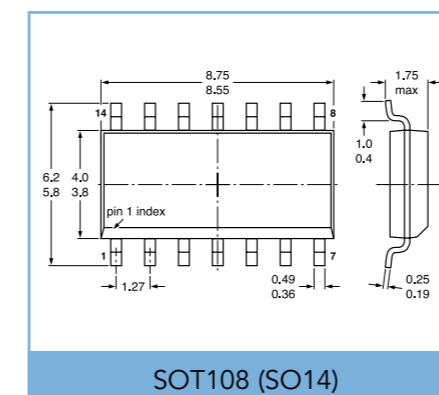
Multi-Pin SMD Packages



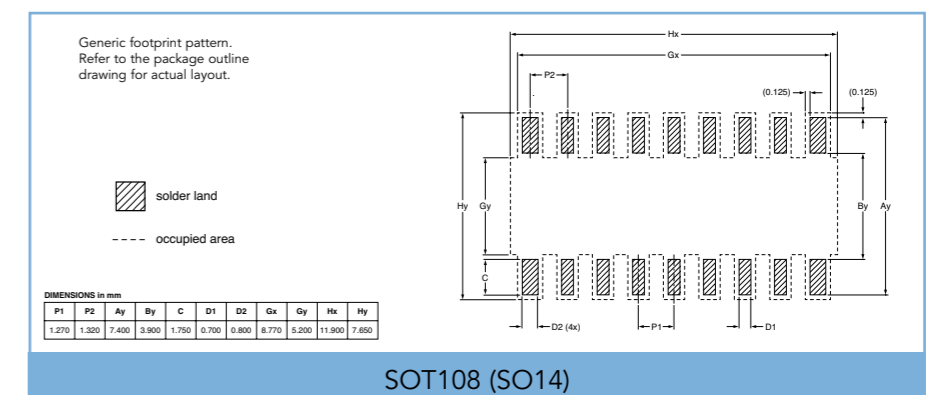
SOT96 (SO8)



SOT96 (SO8)

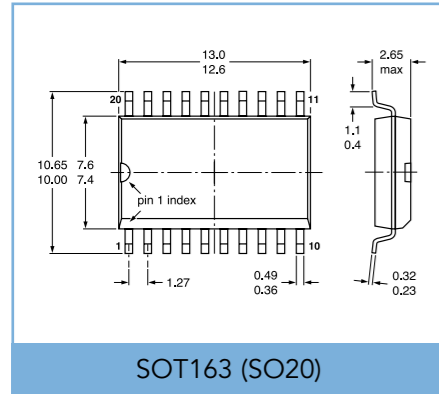


SOT108 (SO14)

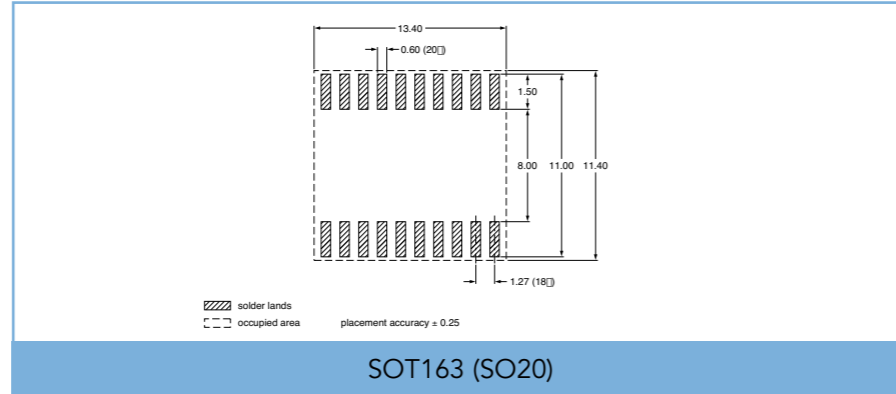


SOT108 (SO14)

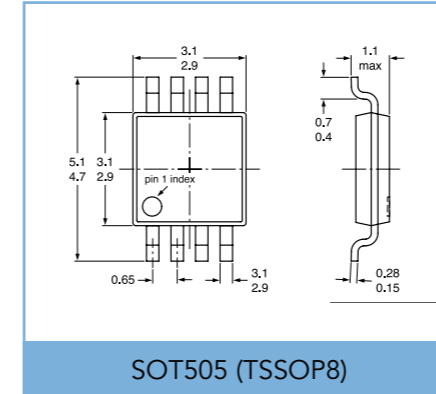
Dimensions in mm



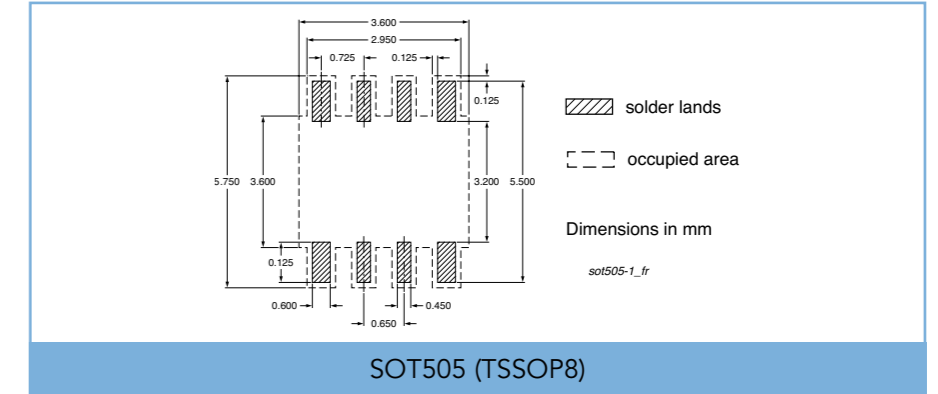
SOT163 (SO20)



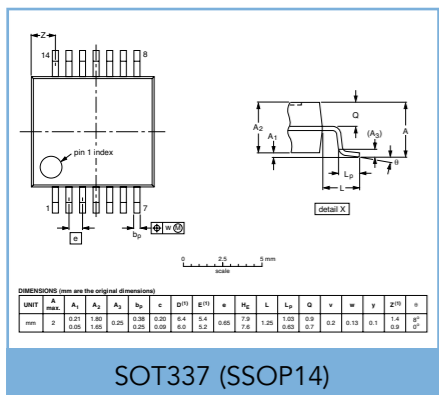
SOT163 (SO20)



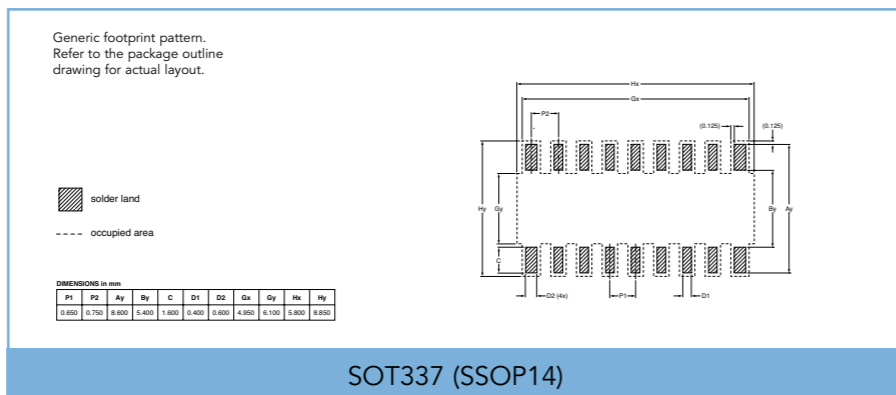
SOT505 (TSSOP8)



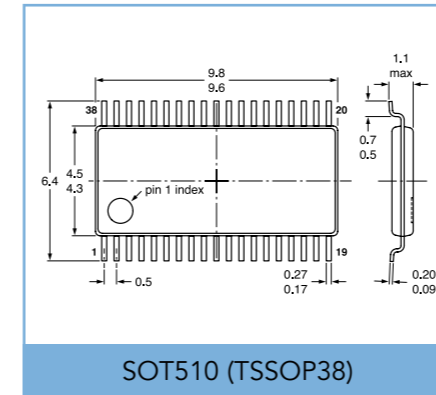
SOT505 (TSSOP8)



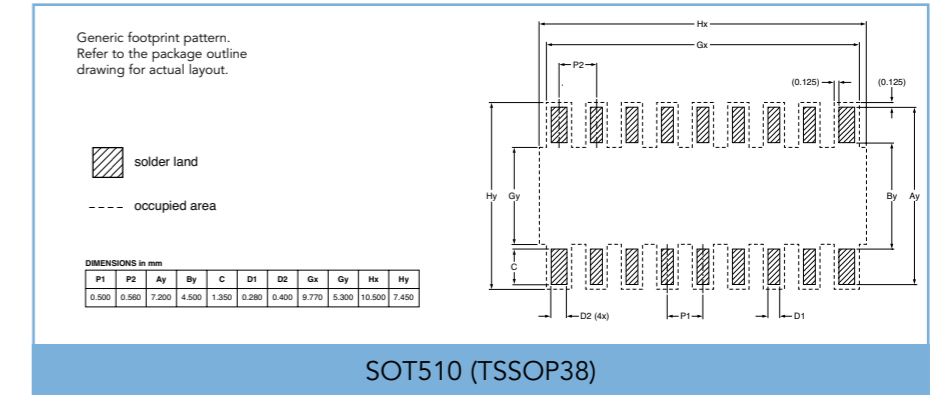
SOT337 (SSOP14)



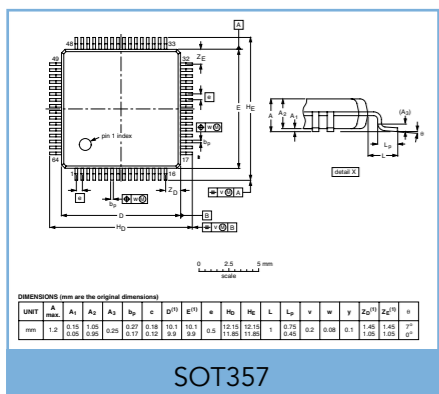
SOT337 (SSOP14)



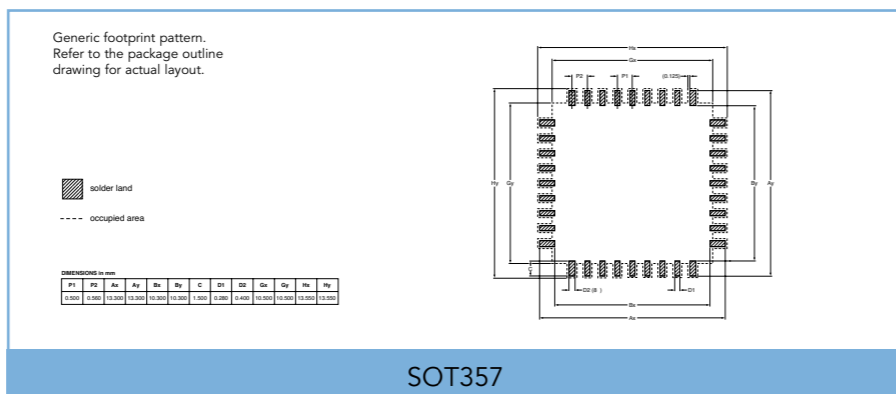
SOT510 (TSSOP38)



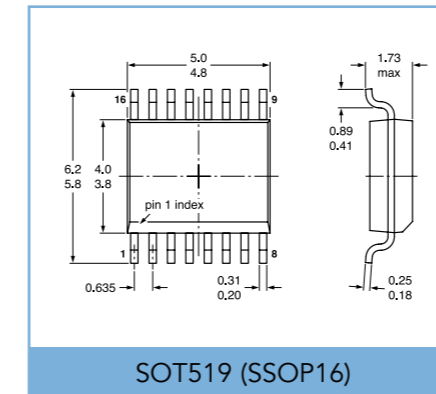
SOT510 (TSSOP38)



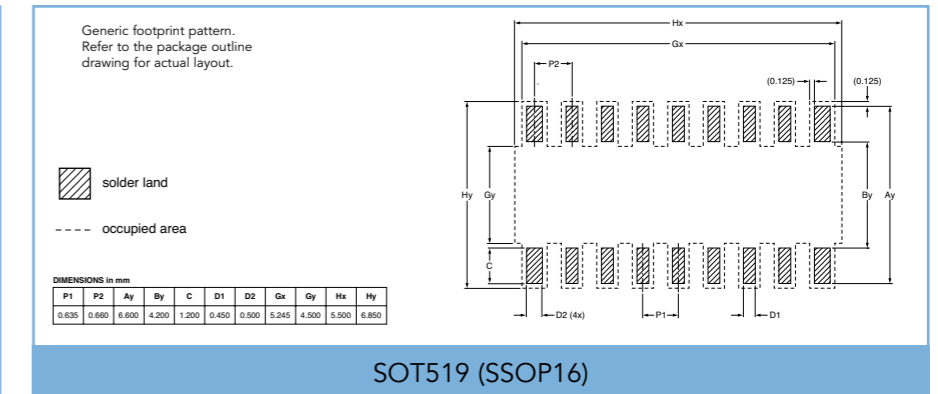
SOT357



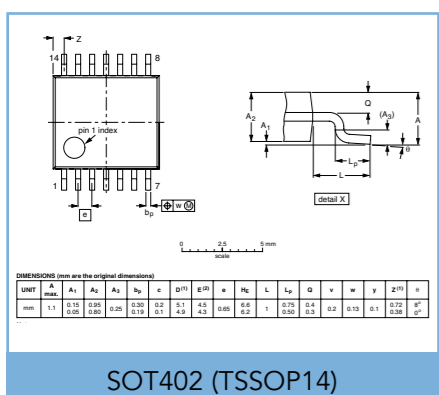
SOT357



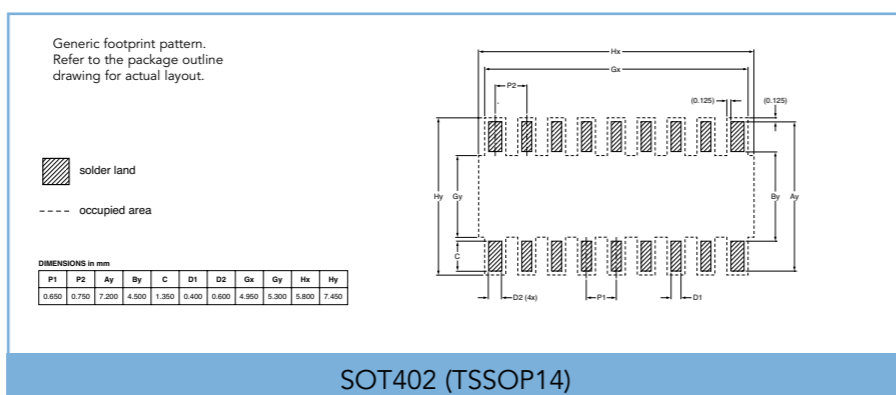
SOT519 (SSOP16)



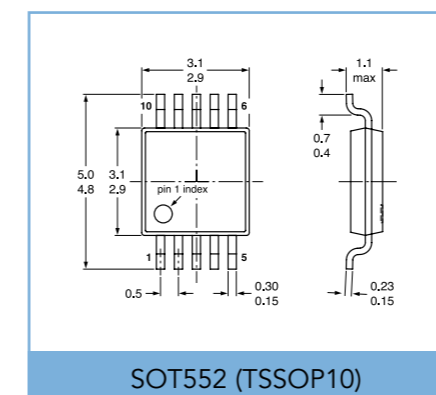
SOT519 (SSOP16)



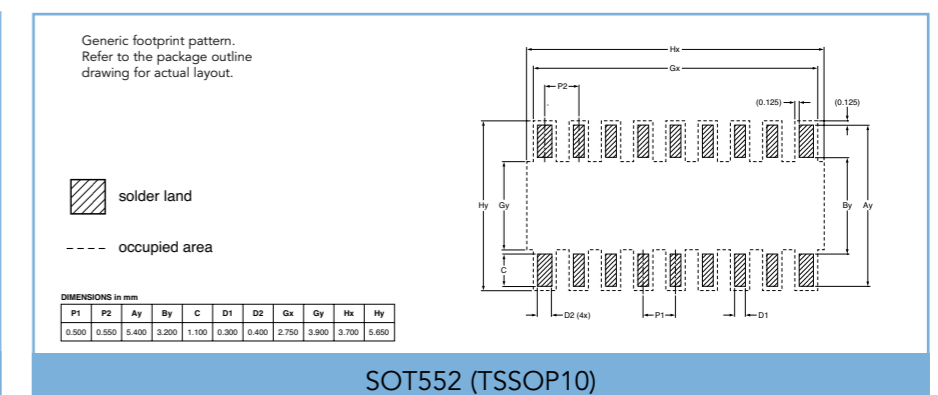
SOT402 (TSSOP14)



SOT402 (TSSOP14)



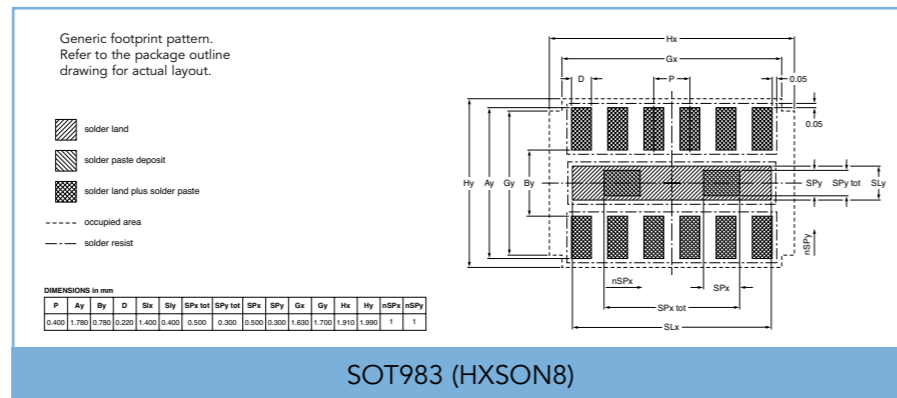
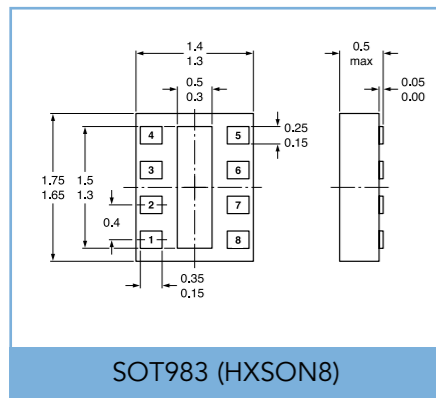
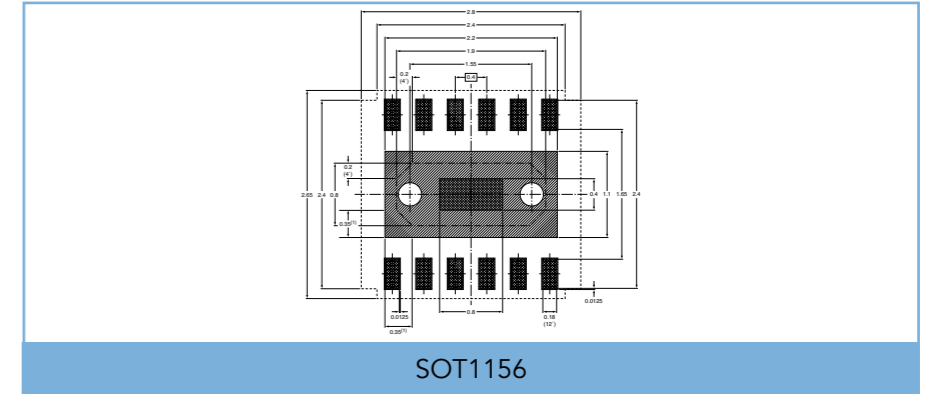
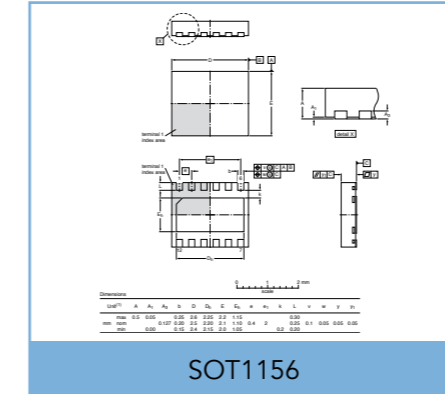
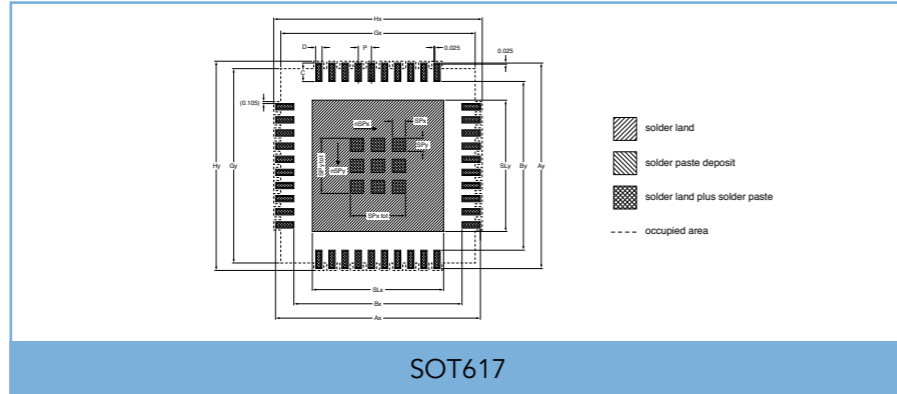
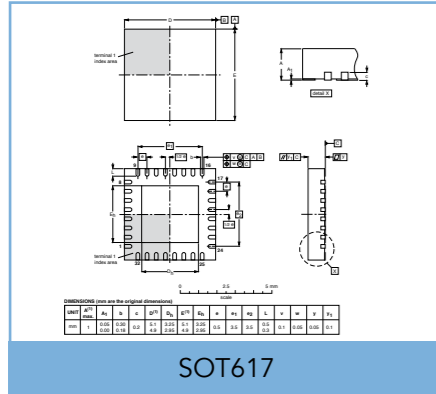
SOT552 (TSSOP10)



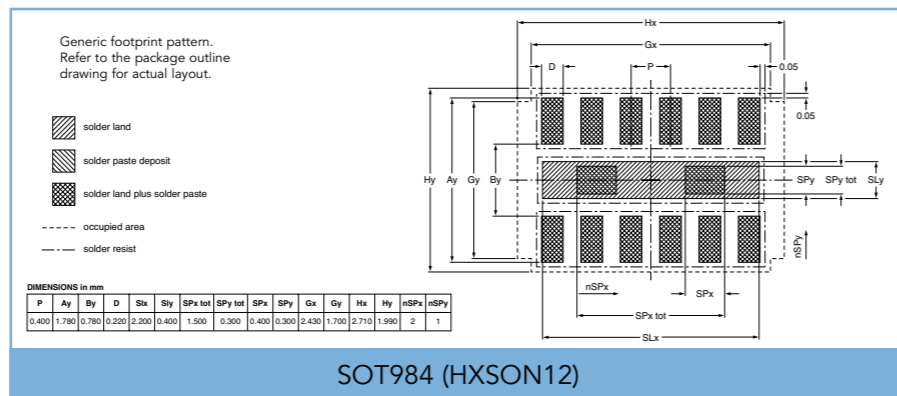
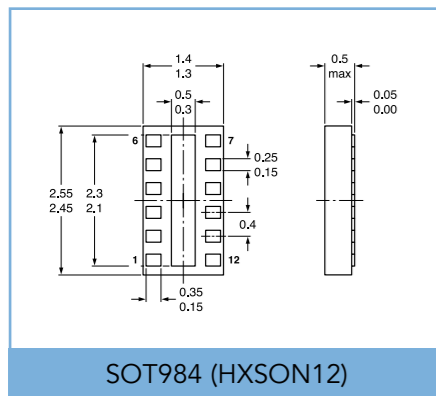
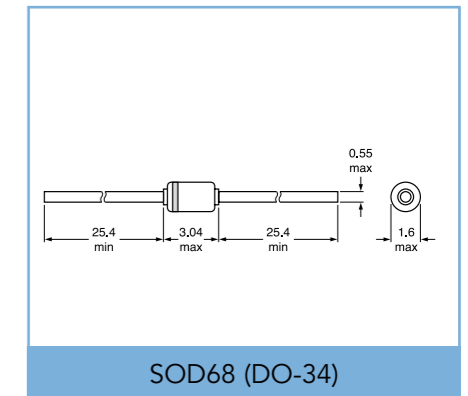
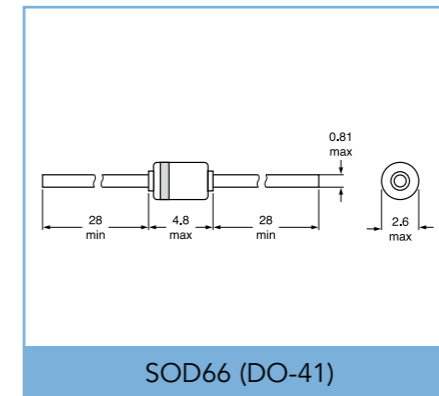
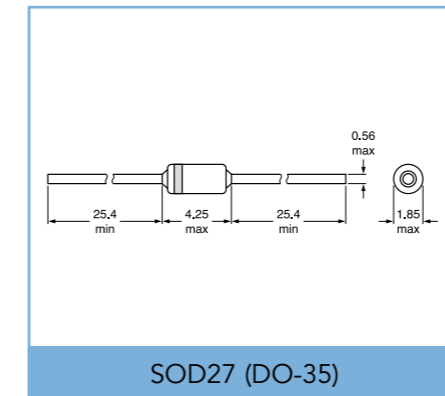
SOT552 (TSSOP10)

Minimized outline drawings and reflow soldering footprint

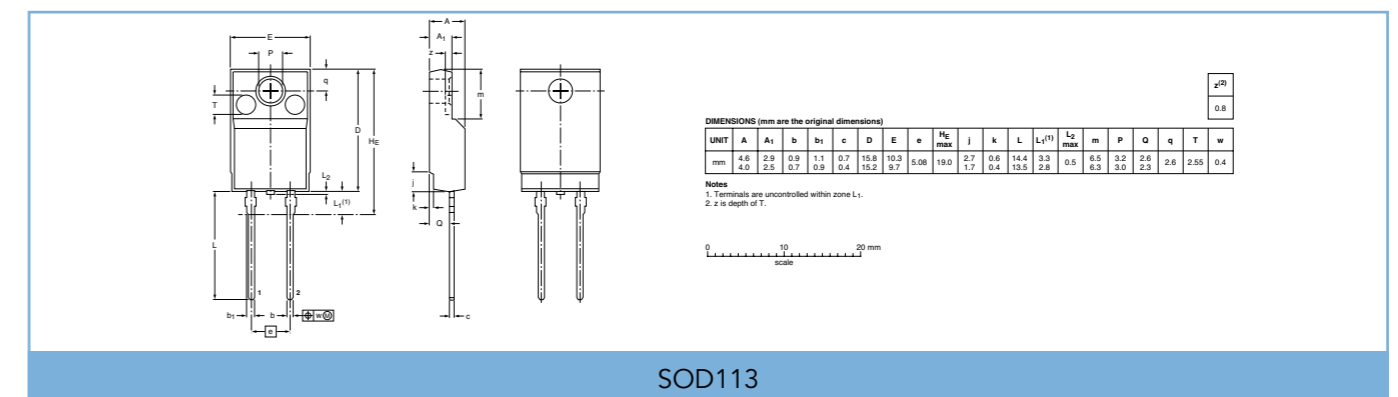
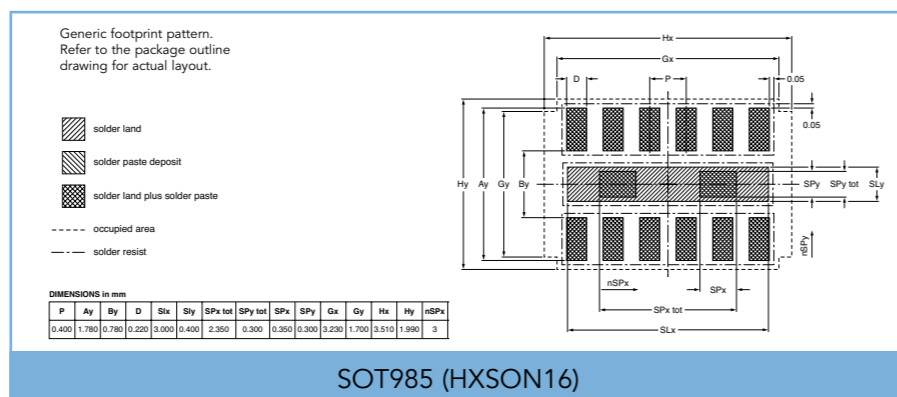
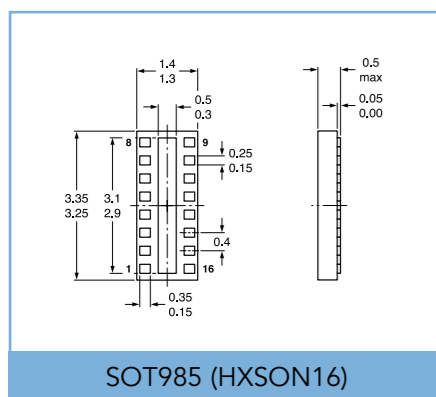
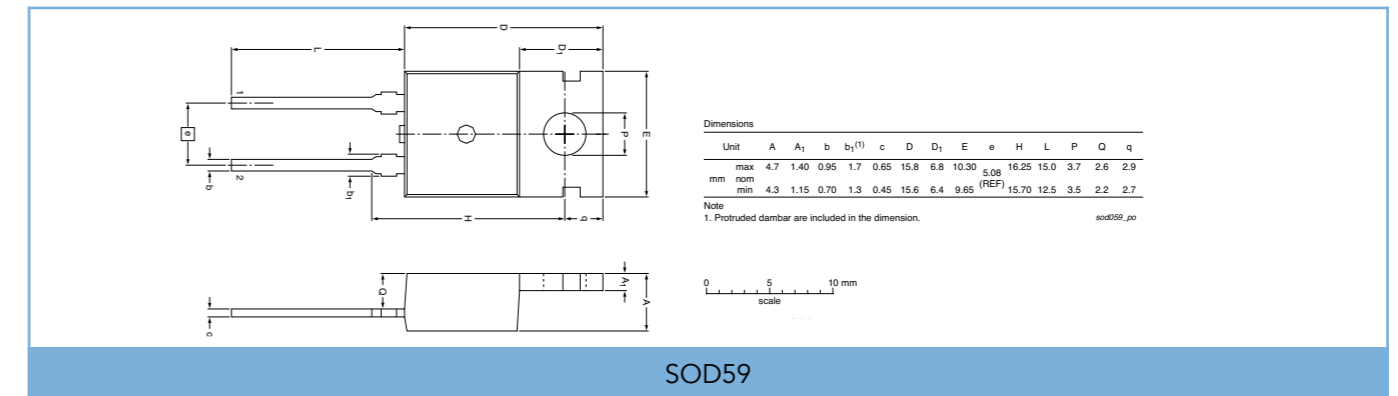
Minimized outline drawings and reflow soldering footprint



Glass diodes



Through Hole Packages



DIMENSIONS (mm are the original dimensions)

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

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

0 2.5 5 mm
scale

SOT54

DIMENSIONS (mm are the original dimensions)

UNIT	A ₁	b	b ₁	b ₂	c	D	D ₁	E	e	e ₁	j	K	L	L ₁	L ₂ ⁽¹⁾ max.	P	Q	q	y ⁽²⁾	w	
mm	4.6	2.9	0.9	1.1	1.4	0.7	15.8	6.5	10.3	2.54	5.08	2.7	0.6	14.4	3.30	3	3.2	2.6	3.0	2.5	0.4
	4.0	2.5	0.7	0.9	1.0	0.4	15.2	6.3	9.7		1.7	0.4	13.5	2.79		3.0	2.3	2.6	2.5		

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

0 5 10 mm
scale

SOT186A

DIMENSIONS (mm are the original dimensions)

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

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

0 5 10 mm
scale

SOT78

DIMENSIONS (mm are the original dimensions)

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

0 5 10 mm
scale

SOT226

DIMENSIONS (mm are the original dimensions)

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

0 5 10 mm
scale

SOT78D

DIMENSIONS (mm are the original dimensions)

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

Notes
1. Basic spacing between centers.
2. Terminal dimensions are uncontrolled within zone L₁.

0 2.5 5 mm
scale

SOT533

DIMENSIONS (mm are the original dimensions)

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

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

0 2.5 5 mm
scale

SOT82

Table with 4 columns: Type Number, Page Number, Type Number, Page Number. It lists various part numbers and their corresponding page numbers, such as BZV90 series (14) and IP4221CZ6-XS (29, 44).

Table with 4 columns: Type Number, Page Number, Type Number, Page Number. It continues the list of part numbers and page numbers, such as PBL4004Y (65) and PBSS306NZ (60).

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