



Discrete Semiconductors Selection Guide 2010

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



Introducing new package technology

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

Leadless powerhouse – SOT1061 and SOT1118

Features

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



Products in SOT1061

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



Products in SOT1118

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

FlatPower – SOD123W and SOD128

Features

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



Products in SOD123W and SOD128

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

Small, strong, perfectly visible – SOD882D

Features

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



Products in SOD882D

- Standard ESD protection devices, page 24

Transfer to halogen-free products

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

Substances	Limit
Antimony Oxides	< 900 ppm
Chlorinated + Brominated Compounds	Σ < 900 ppm

Discrete Semiconductors Selection Guide 2010

Products for general applications

Diodes

Page 7

Protection and signal conditioning

Page 23

Small-signal transistors

Page 47

Standard linear products

Page 67

MOSFETs

Page 71

Packages

Page 87

Index

Page 108

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

Table of Contents

Support tools	6
Diodes	7
Schottky barrier diodes and rectifiers	8
General purpose Schottky diodes \leq 250 mA	8
Medium power low V_f Schottky rectifiers single \geq 200 mA	10
Medium power low V_f Schottky rectifiers dual \geq 200 mA	12
Nomenclature of low V_f (MEGA) Schottky rectifiers	13
Improved forward characteristics of (MEGA) Schottky rectifiers in new packages	13
Low capacitance Schottky diodes	14
PN rectifiers	15
PN rectifiers in SMA, SMB, SMC	15
Zener diodes	16
General purpose Zener diodes	16
Zener diodes specification	17
Switching diodes	18
General purpose switching diodes \leq 100 V	18
General purpose switching diodes $>$ 100 V	20
Controlled avalanche switching diodes	21
Low leakage current switching diodes	21
Protection and signal conditioning	23
Standard ESD protection devices	24
Low capacitance ESD protection devices	26
ESD protection for very high speed interfaces ($<$ 2 pF)	29
Application specific ESD and ESD/EMI solutions	32
Audio interfaces	32
Video interfaces	33
Multichannel EMI filter, ESD protection for LCD and camera	36
SD-, SIM-card and MMC	38
Battery and charger protection	38
USB, LVDS, SATA, LAN	39
Automotive LIN/CAN/FlexRay	43
TVS diodes	44
TVS diodes, 24 W / 40 W	44
TVS diodes, 400 W	44
TVS diodes, 600 W	45
Small-signal transistors	47
General purpose bipolar transistors	48
Single transistors	48
Double transistors	49
Single and double switching transistors	49
Matched pair transistors	50
High voltage transistors	51
Low noise transistors	51
Darlington transistors	51
Medium frequency transistors	52
Schmitt trigger	52
MOSFET driver	53
Resistor-equipped transistors (RETs)	54
RETs 100 mA single	54
RETs 100 mA double	55
RETs 500 mA	55
Low V_{CEsat} (BISS) RETs	55

Low V_{CEsat} (BISS) transistors	56
Low V_{CEsat} (BISS) transistors single NPN	56
Low V_{CEsat} (BISS) transistors single PNP	58
Low V_{CEsat} (BISS) transistors double	60
Low V_{CEsat} (BISS) load switches	61
High voltage low V_{CEsat} (BISS) transistors	62
Low V_{CEsat} modules - Schottky diode / (BISS) transistor	62
Low V_{CEsat} (BISS) RETs	63
Advantages of low V_{CEsat} (BISS) technology	63
Medium power transistors	64
Medium power low V_{CEsat} (BISS) transistors NPN	64
Medium power low V_{CEsat} (BISS) transistors PNP	65
Medium power general purpose transistors	65
Standard linear products	67
Adjustable shunt voltage regulator IC	68
Low-dropout adjustable and fixed linear voltage regulator	69
Discrete voltage regulator	69
Constant current source	70
MOSFETs	71
Small-signal MOSFETs	72
Small-signal MOSFETs single (N-channel) $<$ 50 V	72
Small-signal MOSFETs single (N-channel) \geq 50 V	74
Small-signal MOSFETs dual (N-channel)	76
Small-signal MOSFETs single (P-channel)	76
Small-signal MOSFETs dual (P-channel) and FET-KYs	76
Power MOSFETs	78
Power MOSFETs single (N-channel)	78
Power MOSFETs single (P-channel)	84
Power MOSFETs dual (N- and P-channel)	85
Packages	87
Package cross reference	88
Packing methods	90
Minimized outline drawings and reflow soldering footprint	96
Package overview	107
Index	108

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Diodes

Schottky barrier diodes and rectifiers

8

General purpose Schottky diodes ≤ 250 mA	8
Medium power low V_f Schottky rectifiers single ≥ 200 mA	10
Medium power low V_f Schottky rectifiers dual ≥ 200 mA	12
Nomenclature of low V_f (MEGA) Schottky rectifiers	13
Improved forward characteristics of (MEGA) Schottky rectifiers in new packages	13
Low capacitance Schottky diodes	14

PN rectifiers

15

PN rectifiers in SMA, SMB, SMC	15
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Zener diodes

16

General purpose Zener diodes	16
Zener diodes specification	17

Switching diodes

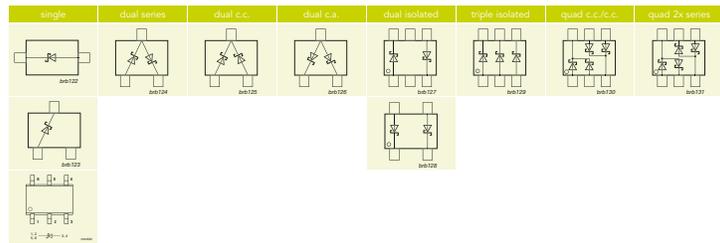
18

General purpose switching diodes ≤ 100 V	18
General purpose switching diodes > 100 V	20
Controlled avalanche switching diodes	21
Low leakage current switching diodes	21

General purpose Schottky diodes ≤ 250 mA

types in **bold** represent new products

$I_{F,max}$ (mA)	$V_{F,max}$ (V)	$V_{R,max}$ (mV)	θ_{j-c} (m ² /K)	$I_{F,max}(A)$	θ_{j-c} (V/W)	Package	SOD80C (MiniMell)	SOD68 (DO-34)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	SOD882/ SOT883 (SC-101)						
							Size (mm)	P_{tot} (mW)	$I_{F,max}$ (mA)	$I_{F,max}$ (mA)	$I_{F,max}$ (mA)	$I_{F,max}$ (mA)	$I_{F,max}$ (mA)	$I_{F,max}$ (mA)											
70	70	750	10	0.1	50	single	300	500	250	250	830	250	300	550	400	300	150	500	250						
						dual series			BAS70	BAS70H	BAS70W			1P5765B70											
						dual c.c.			BAS70-04																
						dual c.a.			BAS70-05																
						dual isolated			BAS70-06																
						triple isolated				BAS70-07							BAS70-07S				BAS70-07V				
						quad 2x series											BAS70XY				BAS70VW				
120	40	500	10	1	30	single					BAS40H	BAS40W			RB751V40										
						dual series			BAS40					1P5765B40											
						dual c.c.			BAS40-04																
						dual c.a.			BAS40-05													1P5755B45			
						dual isolated			BAS40-06			BAS40-07													
						quad c.c./c.c.											1P5885B48				BAS40-07V				
						quad 2x series											BAS40XY				BAS40-05V				
200	30	300	10	30	10	single																			
						dual series			BAT754																
						dual c.c.			BAT754S																
						dual c.a.			BAT754C																
						dual isolated			BAT754A																
						triple isolated											BAT754L								
						quad 2x series																			
	single			BAS85	BAT85	BAT54		BAT54H	BAT54W		BAT54J	1P5765B10													
	dual series					BAT54S			BAT54SW																
	dual c.c.					BAT54C			BAT54SW																
	dual c.a.					BAT54A			BAT54SW																
	dual isolated						BAT74			BAT74S							BAT74V								
	triple isolated																BAT54VW								
	quad c.c./c.c.																BAT54CV								
quad 2x series																									
250	100	950	250	1.8	75	single																			
						dual series																			
						dual c.c.																			
						dual c.a.																			
						dual isolated																			
						triple isolated																			
						quad 2x series																			
single																									
dual series																									
dual c.c.																									
dual c.a.																									
dual isolated																									
triple isolated																									
quad c.c./c.c.																									
quad 2x series																									
single																									
dual series																									
dual c.c.																									
dual c.a.																									
dual isolated																									
triple isolated																									
quad c.c./c.c.																									
quad 2x series																									
single																									
dual series																									
dual c.c.																									
dual c.a.																									
dual isolated																									
triple isolated																									
quad c.c./c.c.																									
quad 2x series																									
single																									
dual series																									
dual c.c.																									
dual c.a.																									
dual isolated																									
triple isolated																									
quad c.c./c.c.																									
quad 2x series																									



Medium power low V_F Schottky rectifiers single ≥ 200 mA

types in **bold** represent new products

$I_{F,max}$ (A)	V_F,max (V)	$V_F,max(mV)$ @ $I_{F,max}$	$I_{S,max}(mA)$ @ V_F,max	Package	SOD128	SOD87 (Meif)	SOT457 (SC-74)	SOT23	SOD123W		SOD123F	SOT1061	SOT323 (SC-70)	SOD323 (SC-74)	SOD323F (SC-90)	SOT466	SOD523 (SC-79)	SOD882		
																				
					Size (mm) $L \times W \times H$ (mm) Optimization	1050	3.5 x 2.05 x 2.05 1000	2.9 x 1.5 x 1.0 540	2.9 x 1.3 x 1.0 420	2.6 x 1.7 x 1.0 950		2.6 x 1.6 x 1.1 830	2.0 x 2.0 x 0.65 1000	2.0 x 1.25 x 0.95 250	1.7 x 1.25 x 0.95 570	1.7 x 1.25 x 0.7 830	1.6 x 1.2 x 0.55 570	1.2 x 0.8 x 0.6 450	1.0 x 0.6 x 0.5 250	
0.2	30	480	0.04	low V_F																
	40	600	0.01	low I_S																
	60	600	0.1	low V_F																
0.5	20	390	0.2	low V_F				PMEG200SET												
		440	1.5	low V_F																
		480	0.01	low I_S																
	30	500	0.03	low I_S																
		430	0.15	low V_F																
		500	0.5	low V_F																
40	470	0.1	low V_F																	
	550	0.1	low V_F																	
1.0	20	340	1	low V_F																
		375	1.9	low V_F																
		430	0.2	low V_F																
		450	0.05	low I_S																
		500	1.0	low V_F																
		550	0.2	low V_F																
	30	620	1.5	low V_F																
		450	1.0	low V_F																
		360	1.5	low V_F	PMEG3010EP															
		450	0.05	low I_S	PMEG3010BEP															
		520	0.05	low I_S																
		550	1	low V_F																
		560	0.15	low V_F																
		680	0.5	low V_F																
		490	0.05	low V_F	PMEG4010EP															
40	600	1.0	low V_F																	
	640	0.1	low V_F																	
	570	0.05	low I_S																	
	530	0.06	low V_F	PMEG6010EP																
	650	0.35	low V_F																	
	660	0.05	low I_S																	
1.5	20	660	0.07	low I_S																
	30	550	1.0	low V_F																
	10	460	3.0	low V_F																
	20	420	1.9	low V_F																
		525	0.2	low V_F																
		360	3.0	low V_F	PMEG3020EP															
		420	1.5	low V_F	PMEG3020CEP															
		450	0.1	low I_S	PMEG3020BEP															
		470	2.5	low V_F																
	30	520	0.05	low I_S	PMEG3020DEP															
		620	1.0	low V_F																
		490	0.1	low V_F	PMEG4020EP															
535		0.1	low V_F																	
530		0.15	low V_F	PMEG6020EP																
575		0.25	low V_F																	
30	10	530	3.0	low V_F																
	30	360	5.0	low V_F	PMEG3030EP															
	450	0.15	low I_S	PMEG3030BEP																
	40	490	0.2	low V_F	PMEG4030EP															
30	40	540	0.1	low I_S																
	60	530	0.2	low V_F																
	30	360	8.0	low V_F	PMEG4030EP															
5.0	30	450	0.25	low V_F	PMEG3050EP															
	40	450	0.25	low I_S	PMEG3050BEP															
	40	490	0.3	low V_F	PMEG4050EP															

Schottky barrier diodes and rectifiers

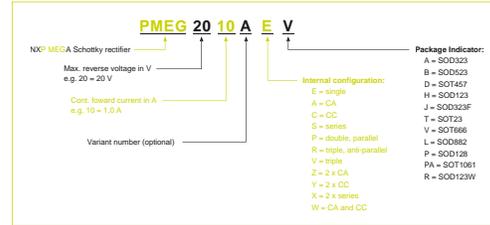
Medium power low V_F Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

I_F max (A)	V_F max (V)	V_F max (mV) @ I_F max	I_F max (mA) @ V_F 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	1500		1000	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			
1.0	40	470	0.1	low V_F			PMEG4005CT			
	60	25	450	1.0	low V_F	dual series		BAT120S		
low V_F					dual c.c.		BAT120C			
low V_F					dual c.a.		BAT120A			
50		0.05	500	low V_F	dual c.c.				PMEG4010CPA	
				low V_F	dual c.c.				PMEG6010CPA	
				low V_F	dual series		BAT160S			
650	0.35	650	low V_F	dual c.c.				BAT160C		
			low V_F	dual c.a.		BAT160A				
			low V_F	dual c.c.					PMEG2020CPA	
2.0	20	420	1.0	low V_F	dual c.c.				PMEG3020CPA	
	30	440	2.0	low V_F	dual c.c.				PMEG3020CPA	

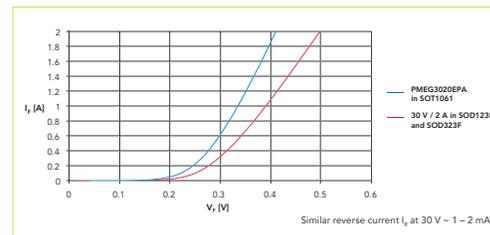
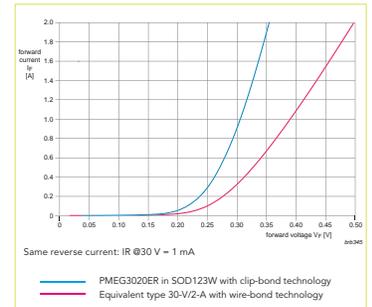
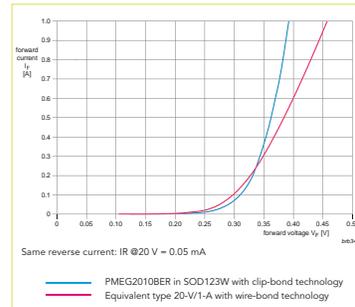
Schottky barrier diodes and rectifiers

Nomenclature of low V_F (MEGA) Schottky rectifiers



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

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



Schottky barrier diodes and rectifiers

Low capacitance Schottky diodes

$I_{F,max}$ (mA)	$V_{F,max}$ (V)	$V_{R,max}$ (V)	θ_{j-c} (m ² /K)	C_{j0} (pF)	Package	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	SOD882
					Size (mm)	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5
					ϕ (mm)	250	250	300	400	300	500	250
30	4	450	1	1	single	BAT17						
					single			1P5765B17		1P5795B17		
					triple isolated					1P5665B17		
					dual series	PMBD353 PMBD354 ^{*)}						
					single		1P5705B82				1P5105B82	
					triple isolated			1P5885B82		1P5665B82		
	15	340	1	1	dual series		1P5705B84					
					dual c.c.		1P5705B85					
					dual c.a.		1P5705B86					

^{*)} diodes have matched capacitance

PN rectifiers

PN rectifiers in SMA, SMB, SMC

types in **bold** represent new products

Package	SOD131 (SMA)				SOD132 (SMB)			SOD133 (SMC)					
													
Size (mm)	4.25 x 2.67 x 2.14				4.32 x 3.62 x 2.29			6.86 x 5.91 x 2.34					
t ₁ (ms)	30	60	300	2000	30	300	2000	30	60	300	2000		
$V_{F,max}$ (V)	$I_{F,max}$ (A)												
50	1	ES1A	US1A	RS1A	S1A								
	1.5			RS2AA			RS2A	S2A					
	2					ES2A							
100	1	ES1B	US1B	RS1B	S1B					ES3A	US3A	RS3A	S3A
	1.5			RS2BA			RS2B	S2B					
	2					ES2B							
200	1	ES1D	US1D	RS1D	S1D								
	1.5		US2DA	RS2DA	S2DA		RS2D	S2D					
	2					ES2D							
400	1	ES1G	US1G	RS1G	S1G								
	1.5		US2GA	RS2GA	S2GA		RS2G	S2G					
	2					ES2G							
600	1		US1J	RS1J	S1J		RS2J	S2J					
	1.5		US2JA	RS2JA	S2JA					US3J	RS3J	S3J	
	3												
800	1		US1K	RS1K	S1K		RS2K	S2K					
	1.5			RS2KA	S2KA					US3K	RS3K	S3K	
	3												
1000	1		US1M	RS1M	S1M		RS2M	S2M					
	1.5			RS2MA	S2MA					US3M	RS3M	S3M	
	3												

Zener diodes

General purpose Zener diodes

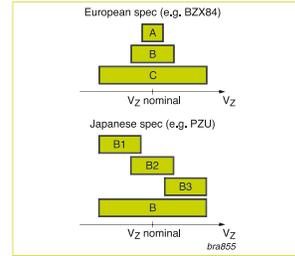
types in bold represent new products

I _z max (mA)	P _z (W)	V _z nom (V)	V _z tolerance	Note	Configuration	Series	Package	Size (mm)	P _z (mW)
500	-	3.3-24	C	Eur	single	1N47xxA series	SOD66 (DO-41)	4.8 x 2.6 x 0.81	1000
60	3.6-75	about 2 %	special	single	NZX series	SOD27 (DO-35)		4.25 x 1.85 x 0.56	400
250	40	2.4-75	B, C	Eur	single	BZX79 series			
400	40	2.4-75	C	Eur	single	BZV90 series	SOT223 (SC-73)	6.5 x 3.5 x 1.65	1500
250	40	2.4-75	C	Eur	single	BZV49 series	SOT89 (SC-62)	4.5 x 2.5 x 1.5	1000
250	40	2.4-75	B, C	Eur	single	BZV55 series	SOD80C (MiniMeil)	3.5 x 1.5 x 1.5	300
200	40	2.4-75	B, C	Eur	dual c.a.	BZB84 series	SOT23		
			A, B, C	single	BZX84 series			2.9 x 1.3 x 1.0	250
		0.2 V	Ave	dual c.a.	PLVA200A series				
250	30	5-8	0.2 V	Ave	dual c.a.	PLVA2600A series			
		3.0-30	about 2.5 %	special	NZH series	SOD123F		2.6 x 1.6 x 1.1	830
250	40	2.4-75	C	Eur	single	BZT52H series			
200	40	2.7-24	B2	Jap	dual isolated	PZUM82 series	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	300
200	40	2.4-15	C	Eur	dual c.a.	BZB784 series	SOT353 (SC-70)	2.0 x 1.25 x 0.95	350
200	30	100	C	Eur	back-to-back	BZB100A	SOD323 (SC-76)		
250	40	2.4-36	B2	Jap	single	PDZ-B series		1.7 x 1.25 x 0.95	300
250	40	2.4-75	B, C	Eur	single	BZX384 series			
200	40	2.4-36	B, B1, B2, B3	Eur	single	PZL18A series			
200	60	100	C	Eur	single	BZX100A	SOD323F (SC-90)		
200	40	2.4-36	B, B1, B2, B3	Jap	single	PZLx8 series		1.7 x 1.25 x 0.7	550
250	40	2.4-75	B, C	Eur	single	BZX84J series			
200	40	2.4-15	C	Eur	dual c.a.	BZB984 series	SOT663	1.6 x 1.2 x 0.55	350
200	40	2.4-75	B, C	Eur	single	BZXS85 series	SOD523 (SC-79)	1.2 x 0.8 x 0.6	300
200	40	2.4-36	B, B2	Jap	single	BZX884 series	SOD882	1.0 x 0.6 x 0.5	250
		2.4-36	B, B2	Jap	single	PZLx8L series			

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

Zener diodes

Differences in Zener specification



PZU-series in SOD323F, Japanese spec

V _z =	B-series	B1-series	B2-series	B3-series
V _z (V)				
PZU2.4y	2.3 - 2.6	-	-	-
PZU2.7y	2.5 - 2.9	2.5 - 2.75	2.65 - 2.9	-
PZU3.0y	2.8 - 3.2	2.8 - 3.05	2.95 - 3.2	-
PZU3.3y	3.1 - 3.5	3.1 - 3.35	3.35 - 3.5	-
PZU3.6y	3.4 - 3.8	3.4 - 3.65	3.55 - 3.8	-
PZU3.9y	3.7 - 4.1	3.7 - 3.97	3.97 - 4.1	-
PZU4.3y	4.01 - 4.48	4.01 - 4.21	4.15 - 4.34	4.28 - 4.48
PZU4.7y	4.42 - 4.9	4.42 - 4.61	4.55 - 4.75	4.69 - 4.9
PZU5.1y	4.84 - 5.37	4.84 - 5.04	4.98 - 5.2	5.14 - 5.37
PZU5.4y	5.31 - 5.92	5.31 - 5.55	5.49 - 5.73	5.67 - 5.92
PZU6.2y	5.86 - 6.53	5.86 - 6.12	6.06 - 6.33	6.26 - 6.53
PZU6.8y	6.47 - 7.14	6.47 - 6.73	6.65 - 6.93	6.86 - 7.14
PZU7.5y	7.06 - 7.84	7.06 - 7.36	7.28 - 7.6	7.52 - 7.84
PZU8.2y	7.76 - 8.64	7.76 - 8.1	8.02 - 8.36	8.28 - 8.64
PZU9.1y	8.56 - 9.55	8.56 - 8.93	8.85 - 9.23	9.15 - 9.55
PZU10y	9.45 - 10.55	9.45 - 9.87	9.77 - 10.21	10.11 - 10.55
PZU11y	10.44 - 11.56	10.44 - 10.88	10.76 - 11.22	11.1 - 11.56
PZU12y	11.42 - 12.6	11.42 - 11.9	11.74 - 12.24	12.08 - 12.6
PZU13y	12.47 - 13.96	12.47 - 13.03	12.91 - 13.49	13.37 - 13.96
PZU14y	-	-	13.7 - 14.3	-
PZU15y	13.84 - 15.52	13.84 - 14.44	14.34 - 14.98	14.85 - 15.52
PZU16y	15.37 - 17.09	15.37 - 16.01	15.65 - 16.51	16.35 - 17.09
PZU18y	16.94 - 19.03	16.94 - 17.7	17.56 - 18.35	18.21 - 19.03
PZU20y	18.86 - 21.08	18.86 - 19.7	19.52 - 20.39	20.21 - 21.08
PZU22y	20.88 - 23.17	20.88 - 21.77	21.54 - 22.47	22.23 - 23.17
PZU24y	22.93 - 25.57	22.93 - 23.96	23.72 - 24.78	24.54 - 25.57
PZU27y	25.1 - 28.9	-	-	-
PZU30y	28 - 32	-	-	-
PZU33y	31 - 35	-	-	-
PZU36y	34 - 38	-	-	-

BZX-series, European spec

V _z =	C series	B series	A series
V _z (V)	V _z (V)	V _z (V)	V _z (V)
BZ84-y2V4	2.2 - 2.6	2.35 - 2.45	2.37 - 2.43
BZ84-y2V7	2.5 - 2.9	2.65 - 2.75	2.67 - 2.73
BZ84-y3V0	2.8 - 3.2	2.9 - 3.06	2.97 - 3.03
BZ84-y3V3	3.1 - 3.5	3.23 - 3.37	3.26 - 3.34
BZ84-y3V6	3.4 - 3.8	3.53 - 3.67	3.56 - 3.64
BZ84-y3V9	3.7 - 4.1	3.82 - 3.98	3.86 - 3.94
BZ84-y4V3	4 - 4.6	4.21 - 4.39	4.25 - 4.35
BZ84-y4V7	4.4 - 5	4.61 - 4.79	4.65 - 4.75
BZ84-y5V1	4.8 - 5.4	5 - 5.2	5.04 - 5.16
BZ84-y5V6	5.2 - 6	5.49 - 5.71	5.54 - 5.66
BZ84-y6V2	5.8 - 6.6	6.08 - 6.32	6.13 - 6.27
BZ84-y6V8	6.4 - 7.2	6.66 - 6.94	6.73 - 6.87
BZ84-y7V5	7 - 7.9	7.35 - 7.65	7.42 - 7.58
BZ84-y8V2	7.7 - 8.7	8.04 - 8.36	8.11 - 8.29
BZ84-y9V1	8.5 - 9.6	8.92 - 9.28	9 - 9.2
BZ84-y10	9.4 - 10.6	9.8 - 10.2	9.9 - 10.1
BZ84-y11	10.4 - 11.6	10.8 - 11.2	10.8 - 11.1
BZ84-y12	11.4 - 12.7	11.8 - 12.2	11.88 - 12.12
BZ84-y13	12.4 - 14.1	12.7 - 13.3	12.87 - 13.13
BZ84-y15	13.8 - 15.6	14.7 - 15.3	14.85 - 15.15
BZ84-y16	15.3 - 17.1	15.7 - 16.3	-
BZ84-y18	16.8 - 19.1	17.6 - 18.4	-
BZ84-y20	18.8 - 21.2	19.6 - 20.4	19.8 - 20.2
BZ84-y22	20.8 - 23.3	21.6 - 22.4	-
BZ84-y24	22.8 - 25.4	23.5 - 24.5	-
BZ84-y27	25.1 - 28.9	26.5 - 27.5	26.73 - 27.27
BZ84-y30	28 - 32	29.4 - 30.6	-
BZ84-y33	31 - 35	32.3 - 33.7	-
BZ84-y36	34 - 38	35.3 - 36.7	35.64 - 36.36
BZ84-y39	37 - 41	38.2 - 39.8	38.61 - 39.39
BZ84-y43	40 - 46	42.1 - 43.9	42.57 - 43.43
BZ84-y47	44 - 50	46.1 - 47.9	-
BZ84-y51	48 - 54	50 - 52	50.49 - 51.51
BZ84-y56	52 - 60	54.9 - 57.1	-
BZ84-y62	58 - 66	60.8 - 63.2	-
BZ84-y68	64 - 72	66.6 - 69.4	-
BZ84-y75	70 - 79	73.5 - 76.5	74.25 - 75.75

NZX-series in SOD27

V _z (V)	V _z (V)	V _z (V)	V _z (V)
NZXV4A	2.3 - 2.5	NZXV2D	6.1 - 6.4
NZXV4B	2.4 - 2.6	NZXV2E	6.3 - 6.6
NZXV7A	2.5 - 2.7	NZXV8A	6.4 - 6.7
NZXV7B	2.6 - 2.8	NZXV8B	6.6 - 6.9
NZXV8A	2.8 - 3	NZXV8C	6.9 - 7.2
NZXV8B	2.8 - 3	NZXV8D	6.9 - 7.2
NZXV8C	2.9 - 3.1	NZXV8A	7 - 7.3
NZXV8D	3 - 3.2	NZXV8B	7.2 - 7.6
NZXV9A	3.1 - 3.3	NZXV8C	7.3 - 7.7
NZXV9B	3.2 - 3.4	NZXV8D	7.5 - 7.9
NZXV9C	3.3 - 3.5	NZXV8E	7.07 - 7.45
NZXV9A	3.4 - 3.6	NZXV9A	7.7 - 8.1
NZXV9B	3.5 - 3.7	NZXV9B	7.9 - 8.3
NZXV9C	3.6 - 3.8	NZXV9C	8.1 - 8.5
NZXV9A	3.7 - 3.9	NZXV9D	8.3 - 8.7
NZXV9B	3.8 - 4	NZXV9A	8.5 - 8.9
NZXV9C	3.9 - 4.1	NZXV9B	8.7 - 9.1
NZXV9A	4 - 4.2	NZXV9C	8.9 - 9.3
NZXV9B	4.1 - 4.3	NZXV9D	9.1 - 9.5
NZXV9C	4.2 - 4.4	NZXV9E	9.3 - 9.7
NZXV9D	4.3 - 4.5	NZX10A	9.5 - 9.9
NZXV9E	4.4 - 4.6	NZX10B	9.7 - 10.1
NZXV9A	4.5 - 4.7	NZX10C	9.9 - 10.3
NZXV9B	4.6 - 4.8	NZX10D	10.2 - 10.6
NZXV9C	4.7 - 4.9	NZX11A	10.4 - 10.8
NZXV9A	4.8 - 5	NZX11B	10.7 - 11.1
NZXV9B	4.9 - 5.1	NZX11C	10.9 - 11.3
NZXV9C	5 - 5.2	NZX11D	11.1 - 11.6
NZXV9D	5.1 - 5.3	NZX12A	11.4 - 11.9
NZXV9A	5.2 - 5.5	NZX12B	11.6 - 12.1
NZXV9B	5.3 - 5.6	NZX12C	11.9 - 12.4
NZXV9C	5.4 - 5.7	NZX12D	12.2 - 12.7
NZXV9D	5.5 - 5.8	NZX12E	11.44 - 12.03
NZXV9E	5.6 - 5.9	NZX13A	12.4 - 12.9
NZXV9A	5.7 - 6	NZX13B	12.6 - 13.1
NZXV9B	5.8 - 6.1	NZX13C	12.9 - 13.4
NZXV9C	6 - 6.3	NZX14A	13.2 - 13.7
		NZX36X	35.36 - 37.19

General purpose switching diodes ≤ 100V

V _r max (V)	V _r max (V)	I _F (mA)	I _F max (mA)	V _{FM} (V)	I _{SM} max (mA)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMeff)	SOT23		SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT466	SOT416 (SC-75)	SOD523 (SC-79)	SOD882	SOT883 (SC-101)						
							Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	Size (mm)	
50	1	50	100	50	4																							
70	1	50	1000	70	4																							
75	1	10	25	20	4			1N4531																				
		50	1000	75	4																							
		100	5000	75	4				BAS32L																			
90	1	50	500	80	4					BAW56																		
100	1	50	500	80	4		1N4148																					

Switching diodes

General purpose switching diodes > 100V

types in **bold** represent new products

V _r max (V)	V _r max (V) @ I _r (mA)	I _r max (mA)	I _r max (mA) @ V _r (V)	I _s max (mA)	Package	SOD07 (DO-35)	SOD90C (MiniMe8)	SOT457 (SC-74)	SOT23	SOT1438	SOD123F	SOT123 (SC-70)	SOT363 (SC-88)	SOC323 (SC-76)	SOC323F (SC-90)	SOD523 (SC-79)	
						Size (mm)	3.5 x 1.85 x 0.86	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					
								BAW101									
										BAW101S							
300	1.1	100	150	250													

Switching diodes

Controlled avalanche switching diodes

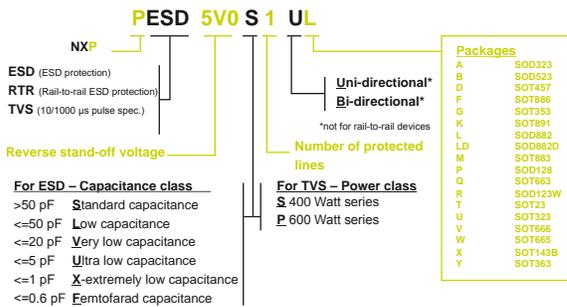
V _r max (V)	V _r max (V) @ I _r (mA)	I _r max (mA)	I _r max (mA) @ V _r max (V)	I _s max (mA)	I _{sm} max (kA)	C _j max (pF)	I _{sm} max (ns)	Package	SOT23	SOT1438	
									Size (mm)	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0
									P _{tot} (mW)	250	250
60	1	200	100	9	600	2.5	6			BAS56	
90	1	200	100	10	600	35	50		BAS29		
									BAS31		
									BAS35		

Low leakage current switching diodes

types in **bold** represent new products

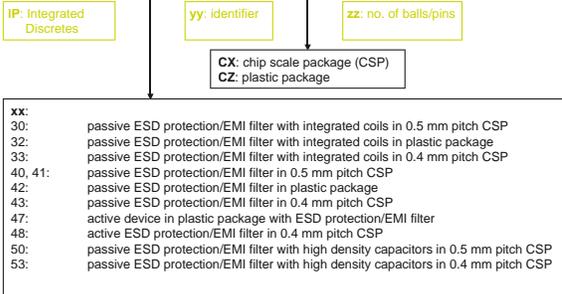
V _r max (V)	V _r max (V) @ I _r (mA)	I _r max (mA)	I _r max (mA) @ V _r max (V)	I _s max (nA)	Package	SOD90C (MiniMe8)	SOD48 (DO-34)	SOT23	SOD123F	SOT23 (SC-70)	SOC323 (SC-76)	SOT146 (SC-75)	SOD523 (SC-79)				
						Size (mm)	3.5 x 1.5 x 1.5	3.04 x 1.6 x 0.55	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 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			
															BAS116T		
												BAS116					
													BAS116H				
														BAS116H			
															BAS116H		
75	1	10	5	3						BAV199		BAV199W					
125	1	100	1	1.5 typ		BAS45AL	BAS45A										

Protection and signal conditioning nomenclature



Protection and signal conditioning

IP - - - - **xx** - - - - **yy** - - - - **CX** - - - - **zz**



Standard ESD protection devices	24
Low capacitance ESD protection devices	26
ESD protection for very high speed interfaces (< 2 pF)	29
Application specific ESD and ESD/EMI solutions	32
Audio interfaces	32
Video interfaces	33
Multichannel EMI filter, ESD protection for LCD and camera	36
SD-, SIM-card and MMC	38
Battery and charger protection	38
USB, LVDS, SATA, LAN	39
Automotive LIN/CAN/FlexRay	43
TVS diodes	44
TVS diodes, 24 W/ 40 W	44
TVS diodes, 400 W	44
TVS diodes, 600 W	45

Standard ESD protection devices

Standard ESD protection devices

types in bold represent new products

Number of protected lines		V _{max} (V)	C _{cl} , typ (pF)	C _{cl} , max (pF)	P _{tot} , II max (W)	ESD rating ¹⁾ II max (kV)	I _p max (µA) @ V _{max}	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional											
1	0	3.3	207	300	150	30	2		PESD3V351UL	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					
		5	152	200	150	30	1					
		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						
	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						
	0	1	5	35	45	130	30	0.1		PESD5V051BL	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		35	45	130	30	0.1						
5		35	45	130	30	0.1						
5		35	45	130	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

Standard ESD protection devices

Number of protected lines		V _{max} (V)	C _{cl} , typ (pF)	C _{cl} , max (pF)	P _{tot} , II max (W)	ESD rating ¹⁾ II max (kV)	I _p max (µA) @ V _{max}	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional											
2	1	3.3	200	275	150	23	3		PESD3V352UQ	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					
		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 (Ø 30 V)					
		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						
	4	3	3.3	110	300	110	30	1 (Ø 3 V)		PESD3V354UF	SOT884 (SON4)	1.45 x 1.0 x 0.5
			5	85	220	110	30	0.1 (Ø 4.3 V)				
			3	107	125	-	8	1				
			4	90	105	-	8	0.5				
			4.3	78	90	-	8	0.1				
			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							
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	40	70	200	23	0.015							
5	4	3.3	215	300	200	30	0.8		PESD3V355UD	SOT457 (SC-74)	2.9 x 1.5 x 1.0	
		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					
		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							
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		BZA100	SOT163 (SO20)	12.8 x 7.5 x 2.65	

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

Low capacitance ESD protection devices

Number of protected lines		V _{max} (V)	C _{cl} , typ (pF)	C _{cl} , max (pF)	P _{tot} , max (W)	ESD rating ¹⁾ (max. kV)	I _p , max (kA) @ V _{max}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
1	0	3.3	34	40	45	30	0.3		PESD3V3L1UL	SOD882	1.0 x 0.6 x 0.5
		5	25	30	42	26	0.1		PESD5V0L1UL		
		3.3	34	40	45	30	0.3		PESD3V3L1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	25	30	42	26	0.1		PESD5V0L1UB		
		3.3	34	40	45	30	0.3		PESD3V3L1UA	SOD323 (SC-74)	1.7 x 1.25 x 0.95
		5	25	30	42	26	0.1		PESD5V0L1UA		
		3.3	2.6	3.1	-	9	0.1 (Ø 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 (Ø 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 (Ø 3 V)		PESD3V3U1UA	SOD323 (SC-74)	1.7 x 1.25 x 0.95
		5	2	2.6	-	9	0.1		PESD5V0U1UA		
		3.3	101	-	500	30	2		PESD3V3L1BA		1.7 x 1.25 x 0.95
		5	75	-	500	30	1		PESD5V0L1BA		
12	19	-	200	30	0.05	PESD12V1L1BA					
15	16	-	200	30	0.05	PESD15V1L1BA					
24	11	-	200	23	0.05	PESD24V1L1BA					
0	1	5	11	13	45	30	0.01		PESD5V0V1BL	SOD882	1.0 x 0.6 x 0.5
		5	11	13	45	30	0.01		PESD5V0V1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	11	13	45	30	0.01		PESD5V0V1BA	SOD323 (SC-74)	1.7 x 1.25 x 0.95
		5	2.9	3.5	-	10	0.1		PESD5V0U1BL	SOD882	1.0 x 0.6 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U1BB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	2.9	3.5	-	10	0.1		PESD5V0U1BA	SOD323 (SC-74)	1.7 x 1.25 x 0.95

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

Low capacitance ESD protection devices

types in bold represent new products

Number of protected lines		V _{max} (V)	C _{cl} , typ (pF)	C _{cl} , max (pF)	P _{tot} , max (W)	ESD rating ¹⁾ (max. kV)	I _p , max (kA) @ V _{max}	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional											
2	1	3.3	22	28	30	15	0.3		PESD3V3L2UM	SOT883 (SC-101)	1.0 x 0.6 x 0.5	
		5	16	19	30	15	0.025		PESD5V0L2UM			
		5	38	46	70	30	0.09 (Ø 4 V)		PESD5V0L2UJ	SOT323 (SC-70)	2.0 x 1.25 x 0.95	
		6	34	40	60	30	0.018 (Ø 4.3 V)		PESD6V0L2UJ			
		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	PESD12V1L2BT						
15	16	-	200	30	0.05	PESD15V1L2BT						
24	11	-	200	23	0.05	PESD24V1L2BT						
0	2	5	35	45	130	30	0.1		PESD5V0S2BT			
		5	2.9	3.5	-	10	0.1		PESD5V0U2BT			
		5	2.9	3.5	-	10	0.1		PESD5V0L2BM	SOT883 (SC-101)	1.0 x 0.6 x 0.5	
		3.3	22	28	30	20	0.3			PESD3V3L4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	16	19	30	20	0.025			PESD5V0L4UF		
		3.3	22	28	30	20	0.3			PESD3V3L4UW	SOT665	1.6 x 1.2 x 0.55
5	16	19	30	20	0.025	PESD5V0L4UW						
3.3	22	28	30	20	0.3	PESD3V3L4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95				
5	16	19	30	20	0.025	PESD5V0L4UG						
4	3	3.3	13	17	14	10	1		PESD3V3V4UK	SOT891 (XSON6)	1.0 x 1.0 x 0.5	
		5	12	15	20	15	0.5		PESD5V0V4UK			
		9	6.5	10	25	8	0.5		PESD9V0V4UK			
		3.3	15	18	16	12	0.3		PESD3V3V4UF	SOT886 (XSON6)	1.45 x 1.0 x 0.5	
		5	12	15	16	12	0.025		PESD5V0V4UF			
		3.3	15	18	16	12	0.3		PESD3V3V4UW	SOT665	1.6 x 1.2 x 0.55	
		5	12	15	16	12	0.025		PESD5V0V4UW			
		3.3	15	18	16	12	0.3		PESD3V3V4UG	SOT353 (SC-88A)	2.0 x 1.25 x 0.95	
		5	12	15	16	12	0.025		PESD5V0V4UG			

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

Low capacitance ESD protection devices

types in **bold** represent new products

Number of protected lines		V _{max} (V)	C _{int} 1/5 (pF)	C _{int} max (pF)	P _{tot} 1/1 max (W)	ESD rating ¹⁾ (max kV)	I _p max (kA) @ V _{max}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional										
0	4	5	2.9	3.5	-	10	0.1		PESD5V0U4BF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U4BW	SOT665	1.6 x 1.2 x 0.55
5	4	3.3	22		25	20	1		PESD3V3LSUK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
		5	16		25	20	0.025		PESD5V0LSUK		
		3.3	22	28	25	20	0.3		PESD3V3LSUF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	16	19	25	20	0.025		PESD5V0LSUF		
	3.3	22	28	25	20	0.3	PESD3V3LSUV	SOT666	1.6 x 1.2 x 0.55		
	5	16	19	25	20	0.025	PESD5V0LSUV				
	3.3	22	28	25	20	0.3	PESD3V3LSUY	SOT363 (SC-88)	2.0 x 1.25 x 0.95		
	5	16	19	25	20	0.025	PESD5V0LSUY				
0	5	5	2.9	3.5	-	10	0.1		PESD5V0U5BF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5	2.9	3.5	-	10	0.1		PESD5V0U5BV	SOT666	1.6 x 1.2 x 0.55
6	5	5	16	19	35	20	0.025		PESD5V0L6UAS	SOT505 (TSSOP8)	3.0 x 3.0 x 1.1
		5	16	19	35	20	0.025		PESD5V0L6UAS	SOT96 (SO8)	4.9 x 3.9 x 1.75
0	7	5	8	10	35	10	0.025		PESD5V0L7BAS	SOT505 (TSSOP8)	3.0 x 3.0 x 1.1
		5	8	10	35	10	0.025		PESD5V0L7BS	SOT96 (SO8)	4.9 x 3.9 x 1.75

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

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

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

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

types in **bold** represent new products

Number of protected lines		V _{max} (V)	C _{int} 1/5 (pF)	C _{int} max (pF)	ESD rating ¹⁾ (max kV)	I _p max (kA) @ V _{max}	Configuration	Type	Package	Size (mm)	
Unidirectional	Bidirectional										
1	0	5	0.9	1	8	0.2		PESD5V0X1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6	
		5	1.8	2	15	0.2		PESD5V0X1UAB	SOD882	1.0 x 0.6 x 0.5	
		16	0.83	0.95	8	0.1		PESD16VX1UL	SOT23	2.9 x 1.3 x 1.0	
		5.5	1	1.5	8	0.1 (Ø 3 V)		PRTR5V0UIT	SOT23	2.9 x 1.3 x 1.0	
0	1	5.5	0.4	0.55	10	0.1		PESD5V0F1BL	SOD882	1.0 x 0.6 x 0.5	
		16	0.5	0.65	8	0.1		PESD16VFX1BL			
		3.3	1.3	1.6	9	0.1		PESD3V3X1BL			
		5	0.9	1.3	9	0.1		PESD5V0X1BL			
2	1	5	0.9	1.3	9	0.1		PESD5V0X1BIQ	SOT663	1.6 x 1.2 x 0.55	
		5	0.9	1.3	9	0.1		PESD5V0X1BT	SOT23	2.9 x 1.3 x 1.0	
		80	0.6	0.75	30	0.1		NUP1301	SOT143B	2.9 x 1.3 x 1.0	
		5.5	1	1.5	8	0.1 (Ø 3 V)		PRTR5V0UZX	SOT891 (XSON6)	1.0 x 1.0 x 0.5	
		5.5	1.8		12	0.1 (Ø 3 V)		PRTR5V0UZAX			
	0	0	5.5	1	1.5	8	0.1 (Ø 3 V)		PRTR5V0UZD	SOT457 (SC-74)	2.9 x 1.5 x 1.0
			5.5	1	1.5	8	0.1 (Ø 3 V)		PRTR5V0UZF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
			5.5	2	-	15	-		IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
			5.5	1.5	-	8	-		IP3219CZ6	SOT1082-1 (XSON6A)	2.3 x 3.5 x 0.85

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

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

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

types in **bold** represent new products

Number of protected lines		V _{nom} (V)	C _{int} , typ (pF)	C _{int} , max (pF)	ESD rating ¹⁾ (max. kV)	I _p , max (µA) @ V _{nom}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
2	0	5.5	0.7	-	8	-		IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	1.3	-	15	-		IP4359CK4	CSP	0.76 x 0.76 x 0.61
4	0	5.5	1	-	8	-		IP4220CZ6	SOT457 (6C-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 (6C-88)	2.0 x 1.25 x 0.95
		5.5	1	-	8	-		PRTRSVOL4AD	SOT457 (6C-74)	2.9 x 1.5 x 1.0
		5.5	1	-	8	-		PRTRSVOL4D	SOT363 (6C-88)	2.0 x 1.25 x 0.95
		5.5	1	-	8	-		PRTRSVOL4Y	SOT363 (6C-88)	2.0 x 1.25 x 0.95
		5.5	0.7	-	8	-		IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		5.5	0.7	-	8	-		IP4281CZ10	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5
		5.5	0.6	-	8	-		IP4283CZ10-TB	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		5.5	0.6	-	8	-		IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1

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

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

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

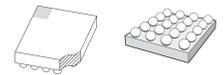
types in **bold** represent new products

Number of protected lines		V _{nom} (V)	C _{int} , typ (pF)	C _{int} , max (pF)	ESD rating ¹⁾ (max. kV)	I _p , max (µA) @ V _{nom}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
4	0	5.5	0.6	-	8	-		IP4286CZ6-TBF	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		5.5	0.6	-	8	-		IP4286CZ6-TTY	SOT363 (6C-88)	2.0 x 1.25 x 0.95
		5.5	0.5	-	8	-		IP4284CZ10-TB	SOT1059 (XSON10L)	1 x 2.5 x 0.5
		5.5	0.5	-	8	-		IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
5	0	5.5	1.3	-	15	-		IP4358CK6	CSP	0.76 x 1.16 x 0.61
		5.5	10	-	15	-		IP4310CK8	CSP	1.16 x 1.16 x 0.61
0	5	5	0.5	0.65	8	0.2		PESD5V0F5BK	SOT891 (XSON6)	1.0 x 1.0 x 0.5
8	0	5.5	1.3	-	15	-		IP4309CK9	CSP	1.16 x 1.16 x 0.61
		5.5	1	-	8	-		PRTRSVOL8S	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
11	0	5.5	0.7	-	8	-		IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1

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

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

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



Application specific ESD and ESD/EMI solutions

Audio interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R_{line}	C_{line} (pF)					
Audio	2	0.9 Ω	290	-	Low-ohmic speaker (< -8 Ω)	IP4047CX6/LF	6 ball CSP	1.56 x 1.01 x 0.65
		10 Ω	200	-	Low-ohmic speaker (> -8 Ω)	IP4048CX5/LF		0.91 x 1.28 x 0.65
		15 Ω	5000	-	Low-ohmic speaker (> -8 Ω)	IP5311CX5/LF	5 ball CSP	0.80 x 1.16 x 0.61
		68 Ω	110	-	Single-ended or differential microphone	IP4049CX5/LF		0.91 x 1.28 x 0.65
		470 Ω	35	-	Single-ended or differential microphone	IP4055CX6/LF		1.56 x 1.03 x 0.65
		470 Ω	20	-	Single-ended or differential microphone	IP4355CX6/LF	6 ball CSP	1.16 x 0.76 x 0.65
		50 Ω / 2.2 k Ω	2000	-	Single-ended to quasi-differential microphone channel with integrated biasing network	IP5002CX8/LF	8 ball CSP	1.67 x 1.67 x 0.65
		2.25 k Ω	4000	-	Differential microphone filter with integrated biasing network for $\Sigma\Delta$ ADC converters	IP5006CX11/LF	11 ball CSP	1.41 x 1.91 x 0.65
		5 Ω / 20 Ω / 1.5 k Ω	550	-	Differential microphone filter with integrated biasing network for $\Sigma\Delta$ including coupling capacitors	IP5020CX16/LF	16 ball CSP	2.01 x 1.91 x 0.65
		0.25 Ω , 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3047CX6	6 ball CSP	1.60 x 1.15 x 0.65
		0.25 Ω , 3 nH	-	-	Inductive, low-ohmic differential channel LC filter	IP3048CX5	5 ball CSP	1.51 x 1.15 x 0.65
		2.2 k Ω / 1 k Ω / 0.8 k Ω	0.8 nF / 1.6 nF	-	Differential microphone biasing ESD protection / EMI filtering	IP5306CX8	8 ball CSP	1.19 x 1.19 x 0.61
	4	10 Ω	5000	-	Dual differential speaker	IP5040CX11/LF	11 ball CSP	1.41 x 2.01 x 0.65
	6	15 Ω / 95 Ω	65 / 33	-	Single-ended microphone and high-ohmic speaker (> -8 Ω) with integrated 2 kohm pull-up resistor	IP4363CX10/LF	10 ball CSP	0.76 x 1.96 x 0.61
		40 Ω / 1450 Ω / 10 Ω	50 / 20 / 200	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4025CX20/LF		1.98 x 2.53 x 0.65
40 Ω / 1450 Ω / 10 Ω		50 / 20 / 200	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4027CX20/LF	20 ball CSP	1.91 x 2.52 x 0.65	
50 Ω / 10 Ω		50 / 100 / 1000	-	Fully integrated audio interface protection for differential microphone and differential speaker, including EMI filtering and pull up resistors	IP4125CX20/LF		2.00 x 2.66 x 0.65	
8	0.8 Ω / 30 Ω / 200 Ω	20 / 50 / 150	-20	Fully integrated audio interface protection including EMI filtering for microphone and speaker, and additional 4-channel EMI filter	IP4110CX20/LF		1.91 x 2.47 x 0.65	

Application specific ESD and ESD/EMI solutions

Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C_{line} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)	
Display port	4	-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5	
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5	
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		-	-	-	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TBF	SOT886 (XSON6)	1.45 x 1.0 x 0.5	
		-	-	-	-	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 for display port	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
	LVDS	10	-	-	5	100	100 Ω termination	IP4263CZ14	SOT1108 (SO14)	8.65 x 3.9 x 1.75
	HDMI	2	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5
			-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
		4	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4281CZ10	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5

Protection and signal conditioning

Video interfaces

types in bold represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C _{in} (pF)	Resistor (Ω)	Remark	Type	Package	Size (mm)
HDMI	4	-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB		1.0 x 2.5 x 0.5
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT		3.0 x 3.0 x 1.1
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TBF		1.45 x 1.0 x 0.5
		-	-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TTY		2.0 x 1.25 x 0.95
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB		1.0 x 2.5 x 0.5
		-	-	0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TT		3.0 x 3.0 x 1.1
	5	-	-	0.5	-	ESD protection for up to 5 ultra high speed datalines	PES05V0F5BK		1.0 x 1.0 x 0.5
		-	-	10	1.75 k, 100 k	HDMI, DDC, CEC, hotplug ESD protection and biasing	IP4310CX8	8 ball CSP	1.16 x 1.16 x 0.61
	8	-	-	1.3	-	HDMI, TMD5 line ESD protection	IP4309CX9	9 ball CSP	1.16 x 1.16 x 0.61
		-	yes	0.7	-	ESD protection and level shifting for a complete HDMI port	IP4776CZ38		
	12	yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and Hot Plug application for a complete HDMI source port	IP4777CZ38		9.7 x 4.4 x 1.1
		yes	yes	0.7	-	ESD protection, DDC buffering, noise reduction and Hot Plug application for a complete HDMI sink port	IP4778CZ38		

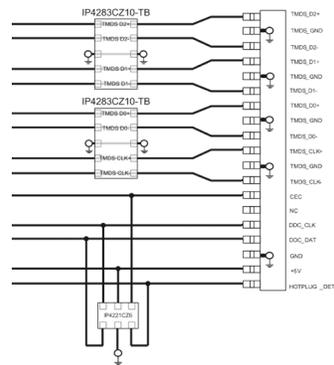
Video interfaces

types in bold represent new products

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

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

HDMI ESD protection using IP4283CZ10-TB and IP4211CZ6-S



Low capacitance ESD protection devices

Multichannel EMI filter, ESD protection for LCD and camera

types in bold represent new products

Baseband interface	Number of protection lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)	
		R _L	C _L (pF)						
LCD display, camera, keypad	1	75 Ω	36	-40	EMI filter, ESD protection with common ground	IP4307CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61	
		100 Ω	30	-40	EMI filter, ESD protection	IP4256CZ3-M	SOT883 (SC-101)	1.0 x 0.6 x 0.5	
	2	100 Ω	30	-40	EMI filter, ESD protection	IP4256CZ3-W	SOT665	1.6 x 1.2 x 0.5	
		100 Ω	30	-40	EMI filter, ESD protection	IP4256CZ6-F	SOT886 (XSON6)	1.45 x 1.0 x 0.5	
		100 Ω	15	-50	EMI filter, ESD protection	IP4251CZ8-4	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5	
	4	40 Ω	18	-70	EMI filter, ESD protection	IP4252CZ8-4		1.7 x 1.35 x 0.5	
		100 Ω	45	-30	EMI filter, ESD protection	IP4254CZ8-4		1.7 x 1.35 x 0.5	
		200 Ω	45	-30	EMI filter, ESD protection	IP4253CZ8-4		1.7 x 1.35 x 0.5	
		100 Ω	60	-20	EMI filter, ESD protection plus 4x ESD	IP4054CX15/LF	15 ball CSP	2.96 x 1.32 x 0.65	
	6	100 Ω	15	-50	EMI filter, ESD protection	IP4251CZ12-6	SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5	
		40 Ω	18	-70	EMI filter, ESD protection	IP4252CZ12-6		2.5 x 1.35 x 0.5	
		100 Ω	45	-30	EMI filter, ESD protection	IP4254CZ12-6		2.5 x 1.35 x 0.5	
		200 Ω	45	-30	EMI filter, ESD protection	IP4253CZ12-6		2.5 x 1.35 x 0.5	
		100 Ω	60	-20	EMI filter, ESD protection	IP4053CX15/LF		2.96 x 1.32 x 0.65	
		100 Ω	30	-40	EMI filter, ESD protection	IP4153CX15/LF	15 ball CSP	2.91 x 1.28 x 0.65	
	7	100 Ω	60	-20	EMI filter, ESD protection	IP4353CX15/LF		2.38 x 1.05 x 0.61	
		70 Ω	25	-40	EMI filter, ESD protection, extremely small size	IP4337CX1B/LF	18 ball CSP	1.96 x 1.61 x 0.61	
		125 Ω	25	-60	60 nH coils RLC filter	IP3337CX18/LF		2.11 x 1.81 x 0.61	
		100 Ω	15	-50	EMI filter, ESD protection	IP4251CZ16-8	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5	
	8	40 Ω	18	-70	EMI filter, ESD protection	IP4252CZ16-8		3.3 x 1.35 x 0.5	
		100 Ω	45	-30	EMI filter, ESD protection	IP4254CZ16-8		3.3 x 1.35 x 0.5	
		200 Ω	45	-20	EMI filter, ESD protection	IP4253CZ16-8		3.3 x 1.35 x 0.5	
		100 Ω	50	-25	EMI filter, ESD protection	IP4088CX20/LF	20 ball CSP	3.91 x 1.28 x 0.65	
	10	125 Ω	25	-60	60 nH coils RLC filter	IP3338CX24/LF		2.11 x 2.11 x 0.61	
		70 Ω	25	-40	EMI filter, ESD protection, extremely small size	IP4338CX24/LF	24 ball CSP	1.96 x 2.01 x 0.61	
	LC low-pass filter	4	200 Ω	50	-20	EMI filter, ESD protection	IP4041CX25/LF	25 ball CSP	2.41 x 2.41 x 0.65
			-	25	-175	LC low-pass filter	IP3253CZ8	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5
		6	-	25	-175	LC low-pass filter	IP3253CZ12	SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5
			-	25	-175	LC low-pass filter	IP3253CZ16	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5
		4	-	25	-175	LC low-pass filter	IP3254CZ8	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5
-			25	-175	LC low-pass filter	IP3254CZ12	SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5	
6		-	25	-175	LC low-pass filter	IP3254CZ16	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5	
		-	25	-175	LC low-pass filter	IP3254CZ18	SOT985 (18 pin QFN)	3.3 x 1.35 x 0.5	

Low capacitance ESD protection devices

Multichannel EMI filter, ESD protection for LCD and camera

types in bold represent new products

Baseband interface	Number of protection lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R _L	C _L (pF)					
Generic ESD protection	1	-	10	-40	1x back-to-back diode with one common ground, extremely small size	IP4302CX2/LF	2 ball CSP	0.49 x 0.67 x 0.38
		-	10	-40	2x back-to-back diode with one common ground, extremely small size	IP4303CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61
	2	-	0.6	-	16 V ultra low capacitance ESD protection in 4 mm pitch	IP4361CX4/LF		0.76 x 0.76 x 0.61
		-	30	-30	4x single diode with one common ground	IP4042CX5/LF		0.91 x 1.28 x 0.65
	4	-	14	-40	4x single diode with one common ground	IP4142CX5/LF		0.91 x 1.28 x 0.65
		-	15	Breakdown: min. 5.5 V	Quad diode array with ESD protection	IP4332CX5/LF	5 ball CSP	0.76 x 1.06 x 0.61
		-	30	Breakdown: min. 5.5 V	Quad diode array with ESD protection	IP4342CX5/LF		0.76 x 1.06 x 0.61
		-	16	-40	4x back-to-back diode with one common ground	IP4043CX5/LF		1.12 x 1.12 x 0.65
		-	16	-40	4x back-to-back diode with one common ground, extremely small size	IP4343CX5/LF		0.93 x 0.93 x 0.61
		Special diode	1	-	65	Breakdown: min. 20 V Forward: 0.25 - 0.5 V	Schottky power diode in WL CSP	IP4306CX2/LF
2	-		19	Breakdown: min. 15 V Forward: 0.25 - 0.45 V	1x back-to-back diode with integrated dual Schottky diode array incl. ESD protection	IP4305CX4/LF	4 ball CSP	0.96 x 0.96 x 0.61

Protection and signal conditioning

Application specific ESD and ESD/EMI solutions

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_{in}	C_{in} (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
			40	-12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	8 ball CSP	1.46 x 1.49 x 0.65
	20	-20	Integrated SIM-card EMI filter and ESD protection	IP4064CX8/LF/5	1.41 x 1.41 x 0.65			
	20	-20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF	1.16 x 1.16 x 0.61			
	10	-20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	IP4366CX8/LF	1.16 x 1.16 x 0.61			
	40	-12	Integrated SIM-card EMI filter and ESD protection	IP4264CX8-40	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5		
	20	-20	Integrated SIM-card EMI filter and ESD protection	IP4264CX8-20		1.7 x 1.35 x 0.5		
			1	-240	Quad channel low capacitance ESD protection	IP4221CZ4-5	SOT886 (XSON6)	1.45 x 1.0 x 0.5
SD-card / MMC	4	47 Ω / 13 k Ω / 56 k Ω	25	-30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP	1.44 x 1.96 x 0.65
			18	-50	High-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	16 ball CSP	1.96 x 1.97 x 0.65
	7	40 Ω / 50 k Ω / 25 k Ω	18	-20	(Mini) SD/trans flash card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	20 ball CSP	2.54 x 1.96 x 0.65
			5	-24	Memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP	1.46 x 1.52 x 0.65
	6 (+3)	40 Ω / 50 k Ω / 15 k Ω	8	> 52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61
			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
			-	> 52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter.	IP4853CX24/LF	24 ball CSP	2.01 x 2.01 x 0.61

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

Battery and charger protection

types in **bold** represent new products

Baseband interface	Number of protected lines	C_{in} (pF)	Diode voltage	Remark	Type	Package	Size (mm)	
Battery & charger protection	1	180	Breakdown 16 V	Power diode	IP4085CX4	4 ball CSP	0.91 x 0.91 x 0.65	
			450	Breakdown 7 V	Power diode		IP4385CX4	0.76 x 0.76 x 0.61
			160	Breakdown 16 V	Power diode		IP4386CX4	0.76 x 0.76 x 0.61
			290	Breakdown 10 V	Power diode		IP4387CX4	0.76 x 0.76 x 0.61
		160	$V_{fwd} = 12 V$	Power diode	PESD12V51UJ	SOD323F (SC-90)	1.7 x 1.25 x 0.7	
		160	$V_{fwd} = 12 V$	Power diode	PESD12V51UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95	
		480	$V_{fwd} = 5 V$	Power diode	PESD5V51UJ	SOD323F (SC-90)	1.7 x 1.25 x 0.7	
		480	$V_{fwd} = 5 V$	Power diode	PESD5V51UA	SOD323 (SC-76)	1.7 x 1.25 x 0.95	

Application specific ESD and ESD/EMI solutions

USB, LVDS, SATA, LAN

types in **bold** represent new products

Baseband interface	Number of protected lines	R_{in}	C_{in} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB (CSP package)	2	33 Ω / 1.3 k Ω	30	> 6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4056CX8	8 ball CSP	1.27 x 1.83 x 0.65
			30	> 6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4057CX10	10 ball CSP	1.56 x 1.91 x 0.65
		33 Ω / 1.3 k Ω / 17 k Ω / 15 k Ω	27	> 6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4065CX11	11 ball CSP	1.47 x 1.97 x 0.65
			35	> 6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4058CX8	8 ball CSP	0.91 x 1.91 x 0.65
		35	> 6	Fully integrated USB low / fullspeed interface with EMI filter, ESD protection, pull-up resistors and impedance matching	IP4158CX8	6 ball CSP		0.91 x 1.41 x 0.65
		-	1.3	-1 GHz	USB2.0 high-speed ESD protection	IP4359CX4	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	11 ball CSP	1.16 x 1.56 x 0.61
			3	> 240	USB2.0 high-speed ESD protection	IP4059CX5	5 ball CSP	0.96 x 1.34 x 0.65
		1.3	-1 GHz	USB2.0 high-speed ESD protection	IP4358CX6	6 ball CSP	0.76 x 1.16 x 0.61	
		-	1.5	-	2-channel common mode filter with integrated ESD protection	IP3219CZ6	SOT1082-1 (XSON6L)	2.3 x 3.5 x 0.85
USB2.0 (Plastic package)	2	0.5	2	-	>15 kV IEC contact ESD protection with pi-filter	IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
			-	1.0	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0UZX	SOT143B
	-	1.8	-	ESD protection for up to 2 ultra high speed datalines with 12 kV ESD robustness	PRTR5V0UZA			
	-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6	SOT884 (XSON6)	1.45 x 1.0 x 0.5	

Protection and signal conditioning

Application specific ESD and ESD/EMI solutions

USB, LVDS, SATA, LAN

types in **bold** represent new products

Board-level interface	Number of protected lines	R_{int}	C_{int} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
USB2.0 (Plastic package)	2	-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2K	SOT891 (XSON4)	1.0 x 1.0 x 0.5
		-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2D	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		-	1	-	ESD protection for up to 2 ultra high speed datalines	PRTR5V0U2F	SOT886 (XSON4)	1.45 x 1.0 x 0.5
	4	-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4221C26-S		
		-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4220C26	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		-	1	-	Dual USB2.0, ESD protection	IP4220C26		
		-	1	-	ESD protection, as IP4220C26 but different bonding	PRTR5V0U4AD	SOT363 (SC-88)	2.0 x 1.25 x 0.95
		-	1	-	ESD protection, as IP4220C26 but different package	PRTR5V0U4Y		
		-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4221C26-S	SOT886 (XSON4)	1.45 x 1.0 x 0.5
		-	1	-	ESD protection for USB2.0 high-speed, SD-Card, SIM card	IP4221C26-XS	SOT891 (XSON4)	1.0 x 1.0 x 0.5
	1	3	-	>15 kV IEC contact ESD protection with pi-filter	IP4225C210	SOT457 (SC-74)	2.9 x 1.5 x 1.0	

Application specific ESD and ESD/EMI solutions

USB, LVDS, SATA, LAN

types in **bold** represent new products

Board-level interface	Number of protected lines	R_{int}	C_{int} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)	
USB3.0 SuperSpeed USB / USB2.0	4	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283C210-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5	
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4283C210-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284C210-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5	
		-	0.5	-	ESD protection for ultra high speed interfaces	IP4284C210-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
	5	-	0.5	-	ESD protection for up to 5 ultra high speed datalines	PES05V0F5BK	SOT891 (XSON4)	1.0 x 1.0 x 0.5	
	Display port	4	0.6	0.6	-	ESD protection for ultra high speed interfaces	IP4283C210-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5
			-	0.6	-	ESD protection for ultra high speed interfaces	IP4283C210-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
			-	0.5	-	ESD protection for ultra high speed interfaces	IP4284C210-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5
-			0.5	-	ESD protection for ultra high speed interfaces	IP4284C210-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
-	0.6	-	-	ESD protection for high speed interfaces	IP4286C26-TBF	SOT886 (XSON4)	1.45 x 1.0 x 0.5		

Application specific ESD and ESD/EMI solutions

USB, LVDS, SATA, LAN

types in **bold** represent new products

Board-level interface	Number of protected lines	R_{int}	C_{int} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
Display port	4	-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TTY	SOT363 (SC-88)	2.0 x 1.25 x 0.95
	11	-	0.7	-	ESD protection	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
LVDS	10	-	5	-	100 Ω termination	IP4263CZ14	SOT108 (SO14)	8.45 x 3.9 x 1.75
SATA	2	-	0.7	-	ESD protection for ultra high speed interfaces	IP4286CZ6	SOT886 (XSON4)	1.45 x 1.0 x 0.5
		-	0.6	-	ESD protection for ultra high speed interfaces	IP4286CZ6-TBF	SOT363 (SC-88)	2.0 x 1.25 x 0.95
	4	-	0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5
-		0.6	-	ESD protection for ultra high speed interfaces	IP4283CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
-		0.5	-	ESD protection for ultra high speed interfaces	IP4284CZ10-TB	SOT1059 (XSON10L)	1.0 x 2.5 x 0.5	
				ESD protection for ultra high speed interfaces	IP4284CZ10-TT	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1	
IEEE1394	4	55	5	-	ESD protection and termination for IEEE1394	IP4224CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0

Application specific ESD and ESD/EMI solutions

USB, LVDS, SATA, LAN

types in **bold** represent new products

Board-level interface	Number of protected lines	R_{int}	C_{int} (pF)	Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
LAN	1	-	0.6	-	Ethernet ESD protection $V_{dmm}=3.3$ V	PESD3V3U1UT	SOT23	2.9 x 1.3 x 1.0
		-	0.6	-	Ethernet ESD protection $V_{dmm}=5.0$ V	PESD5V0U1UT		
		-	0.6	-	Ethernet ESD protection $V_{dmm}=12$ V	PESD12VU1UT		
		-	0.6	-	Ethernet ESD protection $V_{dmm}=15$ V	PESD15VU1UT		
	-	0.6	-	Ethernet ESD protection $V_{dmm}=24$ V	PESD24VU1UT			
4	-	1	-	Ethernet ESD protection	IP4220CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0	
	-	1	-	Ethernet line surge ESD protection	IP4233CZ6	SOT363 (SC-88)	2.0 x 1.25 x 0.95	

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

Automotive LIN/CAN/FlexRay

Number of protected line (bidirectional)	V_{dmm} (V)	C_{int} typ. (pF)	C_{int} max. (pF)	$P_{sur}^{(1)}$ max. (W)	ESD rating in max. (kV)	I_{max} (μ A) @ V_{dmm}	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	SOT23	2.9 x 1.3 x 1.0
		25	30	230	30	0.01		PESD2CAN		2.9 x 1.3 x 1.0
		11	17	200	23	0.05		PESD1FLEX		2.9 x 1.3 x 1.0

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

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

TVS diodes

TVS diodes, 24 W/40 W

types in bold represent new products

Power (W) (10/1000 µs waveform) ⁽¹⁾	V _{max} (V)	V _{BR} min (V) @ I _{BR}	V _{BR} typ (V) @ I _{BR}	V _{BR} max (V) @ I _{BR}	I _{BR} (mA)	ESD rating ⁽²⁾ max (kV)	C _{cl} typ (pF)	V _{CL} max (V) @ V _{max}	I _{CL} (A)	I _{CL} max (A) @ V _{max}	Configuration	Type	Package	Size (mm)
24	3	5.32	5.6	5.88	20	30	210	8	3	5		MMBZ56VAL MMBZ62VAL MMBZ68VAL MMBZ69VAL MMBZ70VAL MMBZ12VAL MMBZ15VAL MMBZ18VAL MMBZ20VAL MMBZ27VAL MMBZ33VAL MMBZ12VCL MMBZ15VCL MMBZ18VCL MMBZ20VCL MMBZ27VCL MMBZ33VCL	SOT23	2.9 x 1.3 x 1.0
	3	5.89	6.2	6.51	1	30	175	8.7	2.76	0.2				
	6	6.48	6.8	7.14	1	30	150	9.6	2.5	0.3				
	6	8.65	9.1	9.56	1	30	155	14	1.7	0.1				
	4.5	9.5	10	10.5	1	30	130	14.2	1.7	0.03				
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005				
40	12	14.25	15	15.75	1	30	85	21	1.9	0.005				
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005				
	17	19	20	21	1	30	65	28	1.4	0.005				
	22	25.65	27	28.35	1	30	48	40	1	0.005				
	26	31.35	33	34.65	1	30	45	46	0.87	0.005				
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005				
	12.8	14.3	15	15.8	1	30	85	21.2	1.9	0.005				
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005				
	17	19	20	21	1	30	65	28	1.4	0.005				
	22	25.65	27	28.35	1	30	48	38	1	0.005				
	26	31.35	33	34.65	1	30	45	46	0.87	0.005				

⁽¹⁾ acc. to IEC 61643-321 ⁽²⁾ acc. to IEC 61000-4-2 (contact discharge)

TVS diodes, 400 W

Power (W) (10/1000 µs waveform) ⁽¹⁾	V _{max} (V)	V _{BR} min (V) @ I _{BR}	V _{BR} typ (V) @ I _{BR}	V _{BR} max (V) @ I _{BR}	I _{BR} (mA)	ESD rating ⁽²⁾ max (kV)	C _{cl} typ (pF)	V _{CL} max (V) @ V _{max}	I _{CL} (A)	I _{CL} max (A) @ V _{max}	Type	Package	Size (mm)
350	3.5	5.20	5.60	6.00	10	8.0	43.8	5	400	PTV53V51UR	SOD123W	2.6 x 1.7 x 1.0	
	5.0	6.40	6.70	7.00	10	9.2	43.5	5	400	PTV55V51UR			
	6.0	6.67	7.02	7.37	10	10.3	38.8	5	400	PTV56V51UR			
	6.5	7.22	7.60	7.98	10	11.2	35.7	5	250	PTV56V551UR			
	7.0	7.78	8.20	8.60	10	12.0	33.3	3	100	PTV57V51UR			
	7.5	8.33	8.77	9.21	1	12.9	31.0	0.2	50	PTV57V551UR			
	8.0	8.89	9.36	9.83	1	13.6	29.4	0.03	25	PTV58V51UR			
	8.5	9.44	9.92	10.40	1	14.4	27.8	0.01	10	PTV58V551UR			
	9.0	10.00	10.55	11.10	1	15.4	26.0	0.005	5	PTV59V51UR			
	10	11.10	11.70	12.30	1	17.0	23.5	0.005	2.5	PTV510V51UR			
	11	12.20	12.85	13.50	1	18.2	22.0	0.005	2.5	PTV511V51UR			
	12	13.30	14.00	14.70	1	19.9	20.1	0.005	2.5	PTV512V51UR			
	13	14.40	15.15	15.90	1	21.5	18.6	0.001	0.1	PTV513V51UR			
	14	15.60	16.40	17.20	1	23.2	17.2	0.001	0.1	PTV514V51UR			
400	15	16.70	17.60	18.50	1	24.4	16.4	0.001	0.1	PTV515V51UR			
	16	17.80	18.75	19.70	1	26.0	15.4	0.001	0.1	PTV516V51UR			
	17	18.90	19.90	20.90	1	27.6	14.5	0.001	0.1	PTV517V51UR			
	18	20.00	21.00	22.10	1	29.2	13.7	0.001	0.1	PTV518V51UR			
	20	22.20	23.35	24.50	1	32.4	12.3	0.001	0.1	PTV520V51UR			
	22	24.40	25.60	26.90	1	35.5	11.3	0.001	0.1	PTV522V51UR			
	24	26.70	28.10	29.50	1	38.9	10.3	0.001	0.1	PTV524V51UR			
	26	28.90	30.40	31.90	1	42.1	9.5	0.001	0.1	PTV526V51UR			
	28	31.10	32.80	34.40	1	45.4	8.8	0.001	0.1	PTV528V51UR			
	30	33.30	35.10	36.80	1	48.4	8.3	0.001	0.1	PTV530V51UR			
	33	36.70	38.70	40.60	1	53.3	7.5	0.001	0.1	PTV533V51UR			
	36	40.00	42.10	44.20	1	58.1	6.9	0.001	0.1	PTV536V51UR			
	40	44.40	46.80	49.10	1	64.5	6.2	0.001	0.1	PTV540V51UR			
	43	47.80	50.30	52.80	1	69.4	5.8	0.001	0.1	PTV543V51UR			
	45	50.00	52.65	55.30	1	72.7	5.5	0.001	0.1	PTV545V51UR			
	48	53.30	56.10	58.90	1	77.4	5.2	0.001	0.1	PTV548V51UR			
51	56.70	59.70	62.70	1	82.4	4.9	0.001	0.1	PTV551V51UR				
54	60.00	63.15	66.30	1	87.1	4.6	0.001	0.1	PTV554V51UR				
58	64.40	67.80	71.20	1	93.6	4.3	0.001	0.1	PTV558V51UR				
60	66.70	70.20	73.70	1	96.8	4.1	0.001	0.1	PTV560V51UR				
64	71.10	74.85	78.60	1	103.0	3.9	0.001	0.1	PTV564V51UR				

⁽¹⁾ 10/1000 µs acc. to IEC 61643-321

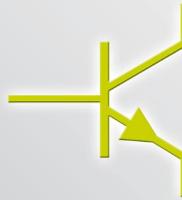
TVS diodes

TVS diodes, 600 W

types in bold represent new products

Power (W) (10/1000 µs waveform) ⁽¹⁾	V _{max} (V)	V _{BR} min (V) @ I _{BR}	V _{BR} typ (V) @ I _{BR}	V _{BR} max (V) @ I _{BR}	I _{BR} (mA)	ESD rating ⁽²⁾ max (kV)	C _{cl} typ (pF)	V _{CL} max (V) @ V _{max}	I _{CL} (A)	I _{CL} max (A) @ V _{max}	Type	Package	Size (mm)
600	3.5	5.20	5.60	6.00	10	8	75	5	600	PTV53V91UP	SOD128	3.8 x 2.6 x 1.0	
	5	6.40	6.70	7.00	10	9.2	65.2	5	400	PTV55V91UP			
	6	6.67	7.02	7.37	10	10.3	58.3	5	400	PTV56V91UP			
	6.5	7.22	7.60	7.98	10	11.2	53.6	5	250	PTV56V951UP			
	7	7.78	8.20	8.60	10	12	50	3	100	PTV57V91UP			
	7.5	8.33	8.77	9.21	1	12.9	46.5	0.2	50	PTV57V951UP			
	8	8.89	9.36	9.83	1	13.6	44.1	0.03	25	PTV58V91UP			
	8.5	9.44	9.92	10.40	1	14.4	41.7	0.01	10	PTV58V951UP			
	9	10.00	10.55	11.10	1	15.4	39	0.005	5	PTV59V91UP			
	10	11.10	11.70	12.30	1	17	35.3	0.005	2.5	PTV510V91UP			
	11	12.20	12.85	13.50	1	18.2	33	0.005	2.5	PTV511V91UP			
	12	13.30	14.00	14.70	1	19.9	30.2	0.005	2.5	PTV512V91UP			
	13	14.40	15.15	15.90	1	21.5	27.9	0.001	0.1	PTV513V91UP			
	14	15.60	16.40	17.20	1	23.2	25.9	0.001	0.1	PTV514V91UP			
	15	16.70	17.60	18.50	1	24.4	24.6	0.001	0.1	PTV515V91UP			
	16	17.80	18.75	19.70	1	26	23.1	0.001	0.1	PTV516V91UP			
	17	18.90	19.90	20.90	1	27.6	21.7	0.001	0.1	PTV517V91UP			
	18	20.00	21.00	22.10	1	29.2	20.5	0.001	0.1	PTV518V91UP			
	20	22.20	23.35	24.50	1	32.4	18.5	0.001	0.1	PTV520V91UP			
	22	24.40	25.60	26.90	1	35.5	16.9	0.001	0.1	PTV522V91UP			
	24	26.70	28.10	29.50	1	38.9	15.4	0.001	0.1	PTV524V91UP			
	26	28.90	30.40	31.90	1	42.1	14.2	0.001	0.1	PTV526V91UP			
	28	31.10	32.80	34.40	1	45.4	13.2	0.001	0.1	PTV528V91UP			
	30	33.30	35.10	36.80	1	48.4	12.4	0.001	0.1	PTV530V91UP			
33	36.70	38.70	40.60	1	53.3	11.3	0.001	0.1	PTV533V91UP				
36	40.00	42.10	44.20	1	58.1	10.3	0.001	0.1	PTV536V91UP				
40	44.40	46.80	49.10	1	64.5	9.3	0.001	0.1	PTV540V91UP				
43	47.80	50.30	52.80	1	69.4	8.6	0.001	0.1	PTV543V91UP				
45	50.00	52.65	55.30	1	72.7	8.3	0.001	0.1	PTV545V91UP				
48	53.30	56.10	58.90	1	77.4	7.8	0.001	0.1	PTV548V91UP				
51	56.70	59.70	62.70	1	82.4	7.3	0.001	0.1	PTV551V91UP				
54	60.00	63.15	66.30	1	87.1	6.9	0.001	0.1	PTV554V91UP				
58	64.40	67.80	71.20	1	93.6	6.4	0.001	0.1	PTV558V91UP				
60	66.70	70.20	73.70	1	96.8	6.2	0.001	0.1	PTV560V91UP				
64	71.10	74.85	78.60	1	103	5.8	0.001	0.1	PTV564V91UP				

⁽¹⁾ 10/1000 µs acc. to IEC 61643-321



Small-signal transistors

General purpose bipolar transistors	48
Single transistors	48
Double transistors	49
Single and double switching transistors	49
Matched pair transistors	50
High voltage transistors	51
Low noise transistors	51
Darlington transistors	51
Medium frequency transistors	52
Schmitt trigger	52
MOSFET driver	53
Resistor-equipped transistors (RETs)	54
RETs 100 mA single	54
RETs 100 mA double	55
RETs 500 mA	55
Low $V_{CE(sat)}$ (BISS) RETs	55
Low $V_{CE(sat)}$ (BISS) transistors	56
Low $V_{CE(sat)}$ (BISS) transistors single NPN	56
Low $V_{CE(sat)}$ (BISS) transistors single PNP	58
Low $V_{CE(sat)}$ (BISS) transistors double	60
Low $V_{CE(sat)}$ (BISS) load switches	61
High voltage low $V_{CE(sat)}$ (BISS) transistors	62
Low $V_{CE(sat)}$ modules + Schottky diode / (BISS) transistor	62
Low $V_{CE(sat)}$ (BISS) RETs	63
Advantages of low $V_{CE(sat)}$ (BISS) technology	63
Medium power transistors	64
Medium power low $V_{CE(sat)}$ (BISS) transistors NPN	64
Medium power low $V_{CE(sat)}$ (BISS) transistors PNP	65
Medium power general purpose transistors	65

General purpose bipolar transistors

Single transistors

Package							SOT23	SOT23 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Size (mm)							2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P _{tot} (mW)							250	200	150	250
Polarity	V _{CE} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)					
NPN	25	100	450	1200	100					
	30	100	110 - 200	450 - 800	100	BC848B	BC848B	PMST5089		
	32	100	110 - 420	220 - 800	100	BCW31 / 32 / 33	PMST5088			
			180 - 380	310 - 630	250	BCW60B / C / D				
	40	100	120 - 270	270 - 560	100			2PC4617QM / RM		
	45	100	110 - 420	220 - 800	100	BC847 / A / B / C	BC847M / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM	
			120 - 380	220 - 630	100	BCX70G / H / J / K				
			110 - 200	220 - 450	100	BCW11 / 72				
			500	1250	100	PMST4429	PMST4429			
	50	100	210 - 290	340 - 460	100 - 150	2PD401ART 2PD401ARL 2PD401ASL	2PD401ARW / SW			
			250	650	100	PMST4428	PMST4428			
	60	100	110 - 200	220 - 450	100	BCV71 / 72				
	65	100	110 - 200	220 - 450	100	BC846 / A / B	BC846W / AW / BW	BC846T / AT / BT		
	80	100	20	80	40	B5564				
	50	150	120 - 270	270 - 560	100		2PC4081Q / R / S	2PC4617Q / R		
	45	500	100 - 250	250 - 600	100	BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W			
	PNP	45	100	100	600	100	BCX19			
				85 - 170	170 - 340	140 - 180	2PD1820ACL 2PD402ASL	2PD1820AR / S		
		60	500	50	-	100	PMST405			
		80	500	100	-	100	PMST406	PMST406		
30		100	125 - 220	500 - 800	100	BC858B	BC858W			
32		100	120 - 215	260 - 500	100	BCW29 / 30				
			180 - 380	310 - 630	100	BCW61B / C / D				
40		100	120 - 270	270 - 560	100			2PA1774QM / RM / SM		
PNP		45	100	210 - 290	340 - 460	70 - 80	2PB709ART 2PB709ARL 2PB709ASL	2PB709ARW / SW		
				180 - 380	310 - 630	100	BCX71H / J / K			
	120 - 215			260 - 500	100	BCW89 / 70				
	125 - 420			250 - 800	100	BC857 / A / B / C	BC857W / AW / BW / CW	BC857T / AT / BT / CT	BC857AM / BM / CM	
	60	100	120	260	150	BCW89				
	65	100	125 - 200	250 - 475	100	BC856 / A / B	BC856W / AW / BW	BC856T / AT / BT		
	100	100	30	-	50	B5563				
	50	150	120 - 270	270 - 560	100		2PA1576Q / R / S	2PA1774Q / R / S		
	25	500	100	600	80	BCX18				
	45	500	100 - 250	250 - 600	80	BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W			
100			600	80	BCX17					
50	500	85 - 170	170 - 340	100 - 140	2PB1219ARL 2PB1219ASL	2PB1219AQ / R / S				
60	500	100	-	50	PMST455					
80	500	100	-	50	PMST456					

General purpose bipolar transistors

Double transistors

types in bold represent new products

Package							SOT457 (SC-74)	SOT363 (SC-88)	SOT666
Size (mm)							2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55
P _{tot} (mW)							600	300	300
Polarity	V _{CE} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)				
NPN	40	100	120	450	100				
	45	100	200	450	100	BC847DS	BC847BS	BC847BV	
	65	100	110	-	100		BC846S		
	50	150	120	560	100	BC844DS	BC846BS	PUMX2	
PNP	45	500	160	400	80	BC817DS			
	40	100	120	450	100	PIMT1	PUMT1	PEMT1	
	45	100	200	450	100		BC857BS	BC857BV	
	65	100	200	450	100		BC856S		
NPN/PNP	45	500	160	400	80	BC807DS			
	40	100	120	450	100		PUMZ1	PEMZ1	
	45	100	200	450	100		BC847BPN	BC847BPN	
	50	100	120	560	100	PIMZ2	PUMZ2		
	65	100	200	450	100		BC846BPN		
	12	500	200	-	250/100			PEMZ7	
45	500	160	400	100/80		BC817DPN			

Small-signal transistors

Single and double switching transistors

Package							SOT223 (SC-73)	SOT109 (SC-62)	SOT223	SOT363 (SC-70)	SOT363 (SC-88)	SOT666	SOT883 (SC-101)	
Size (mm)							4.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	
P _{tot} (mW)							1700	1300	250	200	300	300	250	
Configuration							single	single	single	single	double	double	single	
Polarity	V _{CE} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)	t _{on} (ns)								
NPN	12	100	40	120	400	20			B5V52					
	40	100	100	300	180	1200			PMBS3904	PMSS3904				
									PXT2222A					
	15	200	40	120	500	20			PMBT2269	PMST2269				
	40	200	100	300	300	250			MMBT3904	PMST3904				
	40	200	100	300	300	250			PMBT3904	PMST3904	PMBT3904YS	PMST3904YS		
	30	600	100	300	250	250			PMBT2222	PMST2222				
	40	600	100	300	250	250			PZT4401	PXT4401	PMBT4401	PMST4401		
									MMBT2222A	PMST2222A				
	40	800	100	300	300	250			BSR14					
40	100	100	300	150	700			PMBS3906	PMSS3906					
PNP	40	200	100	300	250	300			MMBT3906	PMST3906	PMBT3906YS	PMST3906YS		
	40	600	100	300	200	350			PMBT3906	PMST3906	PMBT3906YS	PMST3906YS		
	40	600	100	300	200	365			PZT4403	PXT4403	PMBT4403	PMST4403		
	60	600	100	300	200	300			PMBT2907	PMST2907				
NPN/PNP	40	200	100	300	300/250	250/300			PZT2907A	PXT2907A	PMBT2907A			
											BSR16			
											PMBT3946PN	PMBT3946PN		

General purpose bipolar transistors

Matched pair transistors

Package		SOT143B	SOT143T (SC-74)	SOT333 (SC-66A)	SOT333 (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	1.4 x 1.2 x 0.55
P _{tot} (mW)		250	380	300	300	300
Polarity	V _{CE} (V)	I _C (mA)	h _{FE} min	h _{FE} max	h _{FE} typ	V _{CE(sat)} , V _{BE(sat)} (mV)
NPN	30	100	110	800	0.7 ¹⁾	n.a.
	45	100	200	450	0.9 ²⁾	2
	Configuration					
	65	100	200	450	0.98	2
PNP	30	100	100	800	0.7 ¹⁾	n.a.
	45	100	200	450	0.95 ²⁾	2
	Configuration					
	65	100	200	450	0.98	2

¹⁾ I_C = I_{CE}

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

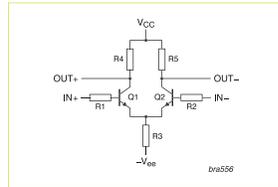
Key benefits

- ▶ 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

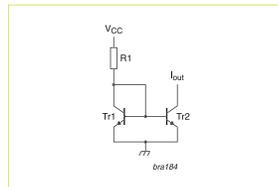
Key applications

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

Differential amplifier



Current mirror



General purpose bipolar transistors

High voltage transistors

Package		SOT223 (SC-73)	SOT89 (SC-62)	SOT1457 (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 _{CE} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)	
NPN	80	100	20	-	60	BSS34
	140	100	60	250	100	PMBT5550 PMST5550
	140	300	80	250	100	PMBT5551/BSP19A PMST5551
	250	100	50	-	60	BF722 BF422
	300	100	40	-	50	PZTA42 PXTA42
	350	100	40	-	70	BSP19 BST39
	400	300	50	200	20	PZTA44
	100	100	30	-	50	PMBTA44
PNP	250	100	50	-	60	BF723
	300	100	40	-	60	BF421
	300	100	40	-	50	PZTA92 PXTA92
	2 x NPN	300	100	40	-	50

For high voltage transistors with increased performance please refer to our high voltage low V_{CE(sat)} (BIS5) transistor portfolio on pages 56 - 64.

Low noise transistors

Package		SOT23	SOT323 (SC-70)				
Size (mm)		2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95				
P _{tot} (mW)		250	200				
Polarity	V _{CE} (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
	45	100	4	200	450	100	BC849C BC849CW
	45	100	4	420	800	100	BC850B BC850BW
PNP	30	100	4	220	475	100	BC859B BC859BW
	45	100	4	420	800	100	BC859C BC859CW
	45	100	4	220	475	100	BC860B BC860BW

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 _{CE} (V)	I _C (mA)	h _{FE} min	f _T typ (MHz)	
NPN	30	500	10000	125	PMBTA13
	45	1000	20000	220	PMBTA14
	60	500	10000	220	BCV29 BCV27
	80	1000	20000	200	BST50
	80	1000	20000	200	BSP50
PNP	30	500	20000	125	PMBTA44
	45	1000	20000	200	BCV28 BCV26
	60	500	10000	220	BSP60
	80	1000	20000	200	BST60
	80	1000	20000	200	BSP61

General purpose bipolar transistors

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 _{CE} (V)	I _C (mA)	f _T typ (MHz)
NPN	15	100	500
	20	25	> 275
	40	25	> 275
PNP	30	25	> 325
	40	25	> 325
	40	25	> 325

Schmitt trigger

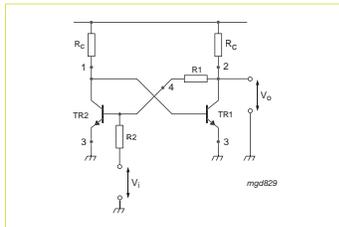
Package		SOT143B				
Size (mm)		2.9 x 1.3 x 1.0				
P _{tot} (mW)		250				
Polarity	V _{CE} (V) TR1	V _{CE} (V) TR2	I _C (mA)	f _T min	f _T max	V _{CE} typ (mV)
NPN	30	6	100	110	800	250
PNP	30	6	100	220	475	250

- Key features**
- Low current (max. 100 mA)
 - Low voltage (max. 30 and 6 V)

- Key benefits**
- Reduced component count and pick-and-place costs
 - Smaller designs

- Key applications**
- General purpose switching and amplification
 - Schmitt trigger applications

Schmitt trigger



General purpose bipolar transistors

MOSFET driver

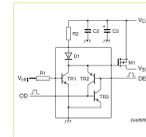
Package		SOT1457 (SC-74)		
Size (mm)		2.9 x 1.5 x 1.0		
P _{tot} (mW)		400	400	580
Configuration				
Contains	I _C (A)	I _{CM} (A)	R1 = R2 (Ω)	
General purpose transistors	0.1	0.2	PMD9050D	PMD9010D
				PMD9011D
				PMD9020D
Switching transistors - reduced storage time	0.6	1.0		PMD2001D
				PMD3001D
Low V _{CE(sat)} (BISS) transistors - Low V _{CE(sat)} , high f _T and I _C	1.0	2.0		

- Key features**
- Three different configurations
 - Types available with standard, switching and low V_{CE(sat)} (BISS) transistors
 - Small footprint packages

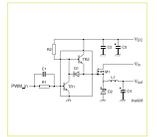
- Key benefits**
- Reduced component count
 - Smaller end products

- 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



Small-signal transistors

Resistor-equipped transistors (RETs)

RETs 100 mA single

Package		SOT23		SOT323 (SC-70)					
Size (mm)		2.9 x 1.3 x 1.0		2.0 x 1.25 x 0.95					
P _{tot} (mW)		250		200					
V _{CE(sat)} (V)	I _C (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP	
50	100		1	1		PDTA113ET		PDTA113EU	
			2.2	2.2	PDTC123ET	PDTA123ET	PDTC123EU	PDTA123EU	
			4.7	4.7	PDTC143ET	PDTA143ET	PDTC143EU	PDTA143EU	
			10	10	PDTC114ET	PDTA114ET	PDTC114EU	PDTA114EU	
			22	22	PDTC124ET	PDTA124ET	PDTC124EU	PDTA124EU	
			47	47	PDTC144ET	PDTA144ET	PDTC144EU	PDTA144EU	
			100	100	PDTC115ET	PDTA115ET	PDTC115EU	PDTA115EU	
			1	10		PDTA113ZT		PDTA113ZU	
			2.2	10	PDTC123YT	PDTA123YT	PDTC123YU	PDTA123YU	
			2.2	47	PDTC123JT	PDTA123JT	PDTC123JU	PDTA123JU	
			4.7	10	PDTC143YT	PDTA143YT	PDTC143YU	PDTA143YU	
			4.7	47	PDTC143ZT	PDTA143ZT	PDTC143ZU	PDTA143ZU	
			10	47	PDTC114YT	PDTA114YT	PDTC114YU	PDTA114YU	
			22	47	PDTC124XT	PDTA124XT	PDTC124XU	PDTA124XU	
		47	10	PDTC144VT	PDTA144VT	PDTC144VU	PDTA144VU		
		47	22	PDTC144WT	PDTA144WT	PDTC144WU	PDTA144WU		
		2.2	-	PDTC123TT	PDTA123TT	PDTC123TU	PDTA123TU		
		4.7	-	PDTC143TT	PDTA143TT	PDTC143TU	PDTA143TU		
		10	-	PDTC114TT	PDTA114TT	PDTC114TU	PDTA114TU		
		22	-	PDTC124TT	PDTA124TT	PDTC124TU	PDTA124TU		
		47	-	PDTC144TT	PDTA144TT	PDTC144TU	PDTA144TU		
		100	-	PDTC115TT	PDTA115TT	PDTC115TU	PDTA115TU		
			1						
			2.2						
			4.7						
			10						
			22						
			47						
100									
1									
2.2									
2.2									
4.7									
10									
22									
47									
100									

Resistor-equipped transistors (RETs)

RETs 100 mA double

Package		SOT457 (SC-74)		SOT363 (SC-88)			SOT666						
Size (mm)		2.9 x 1.5 x 1.0		2.0 x 1.25 x 0.95			1.6 x 1.2 x 0.55						
P _{tot} (mW)		600		300			300						
V _{CE(sat)} (V)	I _C (mA)	R1 (kΩ)	R2 (kΩ)	NPN/NPN	NPN/PNP	NPN/NPN	NPN/PNP	NPN/NPN	NPN/PNP				
50	100	R1 = R2	2.2	2.2			PUMH20	PUMD20	PUMB20	PEMH20	PEMD20	PEMB20	
			4.7	4.7			PUMH15	PUMD15	PUMB15	PEMH15	PEMD15	PEMB15	
			10	10		PIMD3	PUMH11	PUMD3	PUMB11	PEMH11	PEMD3	PEMB11	
			22	22		PIMD2	PUMH1	PUMD2	PUMB1	PEMH1	PEMD2	PEMB1	
			47	47			PUMH2	PUMD12	PUMB2	PEMH2	PEMD12	PEMB2	
			100	100			PUMH24	PUMD24	PUMB24	PEMH24	PEMD24	PEMB24	
			2.2	47			PUMH10	PUMD10	PUMB10	PEMH10	PEMD10	PEMB10	
			4.7	10			PUMH18	PUMD18	PUMB18	PEMH18	PEMD18	PEMB18	
			4.7	47			PUMH13	PUMD13	PUMB13	PEMH13	PEMD13	PEMB13	
			10	47		PIMH9	PUMH9	PUMD9	PUMB9	PEMH9	PEMD9	PEMB9	
			22	47			PUMH16	PUMD16	PUMB16	PEMH16	PEMD16	PEMB16	
			47	22			PUMH17	PUMD17	PUMB17	PEMH17	PEMD17	PEMB17	
			47/2.2	47/47					PUMD48			PEMD48	
			2.2	-			PUMH30	PUMD30	PUMB30	PEMH30	PEMD30	PEMB30	
		4.7	-			PUMH7	PUMD6	PUMB3	PEMH7	PEMD6	PEMB3		
		10	-			PUMH4	PUMD4	PUMB4	PEMH4	PEMD4	PEMB4		
		22	-			PUMH19	PUMD19	PUMB19	PEMH19	PEMD19	PEMB19		
		47	-			PUMH14	PUMD14	PUMB14	PEMH14	PEMD14	PEMB14		

Small-signal transistors

RETs 500 mA

types in **bold** represent new products

Package		SOT416 (SC-75)		SOT883 (SC-101)					
Size (mm)		1.6 x 0.8 x 0.77		1.0 x 0.6 x 0.5					
P _{tot} (mW)		150		250					
V _{CE(sat)} (V)	I _C (mA)	Configuration	R1 (kΩ)	R2 (kΩ)	NPN	PNP	NPN	PNP	
50	100		1	1		PDTA113EE		PDTA113EM	
			2.2	2.2	PDTC123EE	PDTA123EE	PDTC123EM	PDTA123EM	
			4.7	4.7	PDTC143EE	PDTA143EE	PDTC143EM	PDTA143EM	
			10	10	PDTC114EE	PDTA114EE	PDTC114EM	PDTA114EM	
			22	22	PDTC124EE	PDTA124EE	PDTC124EM	PDTA124EM	
			47	47	PDTC144EE	PDTA144EE	PDTC144EM	PDTA144EM	
			100	100	PDTC115EE	PDTA115EE	PDTC115EM	PDTA115EM	
			1	10		PDTA113ZM		PDTA113ZM	
			2.2	10	PDTC123YE	PDTA123YE	PDTC123YM	PDTA123YM	
			2.2	47	PDTC123JE	PDTA123JE	PDTC123JM	PDTA123JM	
			4.7	10	PDTC143XE	PDTA143XE	PDTC143XM	PDTA143XM	
			4.7	47	PDTC143ZE	PDTA143ZE	PDTC143ZM	PDTA143ZM	
			10	47	PDTC114YE	PDTA114YE	PDTC114YM	PDTA114YM	
			22	47	PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM	
		47	10	PDTC144VE	PDTA144VE	PDTC144VM	PDTA144VM		
		47	22	PDTC144WE	PDTA144WE	PDTC144WM	PDTA144WM		
		2.2	-	PDTC123TE	PDTA123TE	PDTC123TM	PDTA123TM		
		4.7	-	PDTC143TE	PDTA143TE	PDTC143TM	PDTA143TM		
		10	-	PDTC114TE	PDTA114TE	PDTC114TM	PDTA114TM		
		22	-	PDTC124TE	PDTA124TE	PDTC124TM	PDTA124TM		
		47	-	PDTC144TE	PDTA144TE	PDTC144TM	PDTA144TM		
		100	-	PDTC115TE	PDTA115TE	PDTC115TM	PDTA115TM		
			1						
			2.2						
			4.7						
			10						
			22						
			47						
100									
1									
2.2									
2.2									
4.7									
10									
22									
47									
100									

Low V_{CE(sat)} (BISS) RETs

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



Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors single NPN

types in **bold** represent new products

Package	SOT223 (SC-73)	SOT89 (SC-62)	SOT457 (SC-18)	SOT723	SOT1061	SOT1323 (SC-73)	SOT1343 (SC-62)	SOT1416 (SC-73)	SOT666	SOT883 (SC-18)
Size (mm)	6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5
P_{tot} (mW)	1700	1650	750	480	1400	350	430	250	500	250
V_{CE} (V)										
I_C (A)										
I_{CM} (A)										
h_{FE} min typ										
θ_{LC} (A)										
θ_{VC} (K)										
$R_{th(j-c)}$ typ (mK/W)										
V_{CEsat} typ (mV)										
V_{CEsat} max (mV)										
θ_{LC} (A)										
θ_{VC} (K)										
12	5.3 10.6 300530 0.5 2 27 ¹⁾ 18 200 5.3 0.265									
	5.8 11.4 300530 0.5 2 29 ¹⁾ 18 235 5.8 0.29									
	6.0 7.0 280440 0.5 2 33 ¹⁾ 20 275 6 0.3									
15	0.5 1.0 200325 0.01 2 360 - 250 0.5 0.05									
	200425 0.01 2 300 200 250 0.5 0.05									
	350470 0.1 2 220 110 ²⁾ 250 1 0.05									
	220410 0.5 2 140 70 350 2 0.2									
	220330 0.1 2 80 45 310 3 0.3									
	220290 0.5 2 85 40 310 3 0.3									
	300450 0.5 2 80 30 290 4 0.4									
	300550 0.5 2 36 21 220 4 0.2									
	300450 0.5 2 32 35 220 5 0.5									
	300570 0.5 2 27 ¹⁾ 20 200 5.3 0.265									
	10.2 300570 0.5 2 30 ¹⁾ 20 250 5.8 0.29									
	7.0 280440 0.5 2 33 ¹⁾ 20 275 6 0.3									
	15.0 300550 0.5 2 19 12 210 7 0.35									
	8.0 20.0 300550 0.5 2 14 9 170 8 0.4									
	1.0 3.0 300450 0.5 2 140 130 ²⁾ 270 1 0.05									
	2.0 3.0 300450 0.5 2 120 70 320 2 0.2									
	2.6 5.0 300500 0.5 2 76 80 320 3 0.3									
	3.0 5.0 300490 0.5 2 80 45 300 3 0.3									
	3.5 4.0 300500 0.5 2 80 45 300 4 0.4									
	4.7 10.0 300500 0.5 2 45 57 250 4 0.4									
	5.1 10.2 300480 0.5 2 30 ¹⁾ 20 220 5.1 0.255									
	5.4 10.0 300500 0.5 2 45 57 340 5.4 0.27									
	5.5 11.0 300480 0.5 2 31 ¹⁾ 20 240 5.5 0.275									
	6.0 7.0 280450 0.5 2 35 ¹⁾ 21 275 6 0.3									
	200550 0.01 2 380 200 ¹⁾ 250 0.5 0.05									
	200350 0.01 2 380 190 250 0.5 0.05									
	300 - 0.5 5 150 70 440 2 0.2									
	300440 0.5 5 240 130 500 1 0.1									
	300510 0.5 5 230 120 500 1 0.1									
	300420 0.5 5 150 130 500 1 0.1									
	300400 0.5 5 150 70 400 2 0.2									
	350470 0.1 2 120 70 320 2 0.2									
	300450 0.5 2 120 70 320 2 0.2									
	15.0 300520 0.5 2 55 35 300 4 0.4									
	10.0 300500 0.5 2 40 21 255 5 0.5									
	10.0 300500 0.5 2 42 25 355 5 0.5									
50	2.0 5.0 300495 0.5 2 100 60 260 2 0.2									
	300 - 0.5 2 160 90 ¹⁾ 320 2 0.2									
	200280 0.5 2 110 65 290 2 0.2									
	3.0 5.0 300460 0.5 2 75 50 370 3 0.3									
	200280 0.5 2 110 60 ¹⁾ 290 2 0.2									
60	1.0 2.0 200400 0.5 5 200 110 250 1 0.1									
	200420 0.5 5 200 120 280 1 0.1									
	200350 0.5 5 200 110 250 1 0.1									
	3.0 6.0 345570 0.5 2 65 40 260 3 0.3									
	3.8 8.0 300500 0.5 2 46 29 200 3 0.3									
	4.7 9.4 300520 0.5 2 37 ¹⁾ 25 245 4.7 0.235									
	5.2 10.4 300520 0.5 2 39 ¹⁾ 25 280 5.2 0.26									
	6.0 7.0 280440 0.5 2 34 ¹⁾ 22 290 6 0.3									
	6.2 15.0 300500 0.5 2 25 17 230 6 0.3									
	7.0 15.0 300500 0.5 2 17.5 13 195 7 0.35									
	3.0 6.0 240360 0.5 2 67 40 255 3 0.3									
	4.0 10.0 250400 0.5 2 43 ¹⁾ 25 230 4 0.2									
	4.6 9.2 300470 0.5 2 37 ¹⁾ 25 240 4.6 0.23									
	5.1 10.2 300470 0.5 2 38 ¹⁾ 25 270 5.1 0.255									
	5.6 7.0 270425 0.5 2 40 ¹⁾ 25 320 5.6 0.28									
80	150400 0.25 10 160 80 200 1 0.1									
	150300 0.25 10 165 70 200 1 0.1									
	150290 0.25 10 160 75 200 1 0.1									
	150290 0.25 10 165 73 200 1 0.1									
	150290 0.25 10 160 73 200 1 0.1									
	3.0 4.0 170275 0.5 2 72 45 360 4 0.4									
	4.5 9.0 200330 0.5 2 38 ¹⁾ 27 245 4.5 0.235									
	5.1 10.2 200330 0.5 2 43 ¹⁾ 27 300 5.1 0.255									
	5.2 6.0 180285 0.5 2 48 ¹⁾ 30 340 5.2 0.26									
100	150400 0.25 10 160 80 200 1 0.1									
	150300 0.25 10 165 70 200 1 0.1									
	150290 0.25 10 160 75 200 1 0.1									
	150290 0.25 10 165 73 200 1 0.1									
	150290 0.25 10 160 73 200 1 0.1									
	3.0 4.0 170275 0.5 2 72 45 360 4 0.4									
	4.5 9.0 200330 0.5 2 38 ¹⁾ 27 245 4.5 0.235									
	5.1 10.2 200330 0.5 2 43 ¹⁾ 27 300 5.1 0.255									
	5.2 6.0 180285 0.5 2 48 ¹⁾ 30 340 5.2 0.26									

¹⁾ $I_C/I_E = 20$
²⁾ V_{CEsat} (max)
³⁾ optimized for high speed switching

Small-signal transistors

Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) transistors single PNP

types in **bold** represent new products

Package		SOT223 (DC-73)	SOT89 (DC-62)	SOT457 (DC-74)	SOT23	SOT1061	SOT323 (DC-76)	SOT363 (DC-88)	SOT416 (DC-79)	SOT666	SOT185 (DC-101)
Size (mm)		6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5
P_{tot} (mW)		1700	1650	750	480	1400	350	430	250	500	250
V_{CE0} (V)	I_C (A)	I_{CE0} (A)	h_{FE} min/typ	θ_{VC} (V)	$R_{th(jc)}$ TYP (mK/W)	V_{CEsat} TYP (mV)	V_{CEsat} (mV)	θ_{VC} (A)	θ_{VC} (A)		
		$I_C/I_{CE0} = 10$		$I_C/I_{CE0} = 0.5$		$I_C/I_{CE0} = 0.5$					
12	5.3	10.6	250/400	0.5	2	28 ¹⁾	20	210	5.3	0.265	
	5.7	11.4	250/400	0.5	2	30 ¹⁾	20	245	5.7	0.285	
	4.0	7.0	220/335	0.5	2	31 ¹⁾	20	300	6	0.3	
15	0.5	1.0	200/260	0.01	2	300	150	250	0.5	0.05	
			200/325	0.01	2	300	150	250	0.5	0.05	
	1.0	2.0	300/450	0.1	2	250	125 ¹⁾	250	1	0.05	
20	4.0	4.0	220/440	0.1	2	140	75	390	2	0.2	
	2.0	3.0	225/-	0.5	2	115	80 ¹⁾	225	2	0.2	
	5.0	5.0	220/420	0.5	2	75	50	210	2	0.2	
	4.0	7.0	230/45	0.5	2	85	80 ¹⁾	400	3	0.3	
	3.0	5.0	220/450	0.5	2	90	50	300	3	0.3	
	3.5	8.0	250/400	0.5	2	55	35	375	4	0.2	
	4.0	15.0	250/400	0.5	2	50	35	280	4	0.4	
	5.0	10.0	300/430	0.5	2	34	45	270	5	0.5	
	5.1	10.2	250/370	0.5	2	32 ¹⁾	25	230	5.1	0.255	
	5.5	11.0	250/370	0.5	2	34 ¹⁾	25	265	5.5	0.275	
30	4.0	7.0	230/45	0.5	2	39 ¹⁾	25	350	6	0.3	
	6.2	15.0	250/400	0.5	2	25	18	240	6	0.3	
	6.6	20.0	250/400	0.5	2	22	16	240	7	0.35	
	1.0	3.0	260/350	0.5	2	200	110	225	1	0.05	
	2.0	3.0	300/450	0.1	2	140	70	350	2	0.2	
	2.4	5.0	200/320	0.5	2	110	95	330	2	0.2	
	2.7	5.0	200/350	0.5	2	88	87	395	3	0.3	
	3.0	5.0	200/380	0.5	2	80	50	320	3	0.3	
	4.2	10.0	200/350	0.5	2	58	70	345	4	0.4	
	4.4	10.0	200/350	0.5	2	58	70	400	4	0.2	
40	5.1	10.2	250/400	0.5	2	35 ¹⁾	25	230	5.1	0.255	
	5.3	10.6	250/400	0.5	2	35 ¹⁾	25	265	5.3	0.265	
	6.0	7.0	200/335	0.5	2	39 ¹⁾	25	350	6	0.3	
	0.5	1.0	200/280	0.01	2	440	220	350	0.5	0.05	
			200/380	0.01	2	440	230	350	0.5	0.05	
			300/-	0.1	5	200	120	310	1	0.1	
	1.0	2.0	300/520	0.1	5	230	130	500	1	0.1	
			300/800	0.1	5	250	130	500	1	0.1	
			300/510	0.1	5	230	130	500	1	0.1	
	1.8	3.0	300/450	0.1	5	185	100	530	2	0.2	
50	2.0	3.0	300/-	0.1	2	200	110 ¹⁾	350	2	0.2	
	2.0	3.0	300/450	0.1	2	150	70	350	2	0.2	
	4.0	15.0	200/310	0.5	2	55	46	300	4	0.4	
	4.0	10.0	250/370	0.5	2	45	33	375	5	0.5	
	5.0	10.0	250/350	0.5	2	55	40	160	2	0.2	
	3.0	3.0	200/-	0.5	2	150	90 ¹⁾	300	2	0.1	
	2.0	5.0	200/360	0.5	2	90	55	270	2	0.2	
	2.0	5.0	200/-	0.5	2	140	90 ¹⁾	320	2	0.2	
	2.0	3.0	200/300	0.5	2	120	70	300	2	0.2	
	3.0	5.0	200/375	0.5	2	120	70	390	3	0.3	
60	1.0	2.0	200/300	0.5	2	120	70	300	2	0.2	
			150/250	0.5	5	220	120	330	1	0.1	
			150/250	0.5	5	255	135	340	1	0.1	
	2.7	8.0	200/300	0.5	2	80	49	360	3	0.3	
	3.0	6.0	180/265	0.5	2	70	55	290	3	0.3	
	4.2	8.4	200/295	0.5	2	53 ¹⁾	35	310	4.2	0.21	
	4.5	9.0	200/295	0.5	2	59 ¹⁾	35	375	4.5	0.225	
	4.0	4.0	170/260	0.5	2	35 ¹⁾	55	450	5	0.25	
	5.0	15.0	200/300	0.5	2	40	30	300	5	0.5	
	5.7	15.0	200/300	0.5	2	29	22	285	6	0.3	
80	3.0	5.0	155/225	0.5	2	71	55	290	3	0.3	
	4.0	5.0	180/265	0.5	2	65 ¹⁾	40	420	4	0.2	
	4.0	10.0	200/300	0.5	2	50	35	380	5	0.5	
	8.0	200/280	0.5	2	43	36	240	4	0.4		
	4.5	9.0	200/280	0.5	2	40 ¹⁾	36	450	4.5	0.225	
	150/-	0.25	5	170	93	320	1	0.1			
	150/350	0.5	5	170	95	320	1	0.1			
	150/350	0.5	5	170	100	320	1	0.1			
	150/350	0.5	5	170	90	320	1	0.1			
	2.0	3.0	175/275	0.5	2	88	65	250	2	0.2	
100	2.7	4.0	180/295	0.5	2	110 ¹⁾	45	450	2.7	0.135	
	3.7	7.4	200/300	0.5	2	52	45	300	4	0.4	
	4.1	8.2	200/300	0.5	5	57	45	325	4.1	0.41	

¹⁾ $I_C/I_{CE0} = 20$
²⁾ V_{CEsat} (max)
³⁾ optimized for high speed switching

Small-signal transistors

Low V_{CEsat} (BISS) transistors

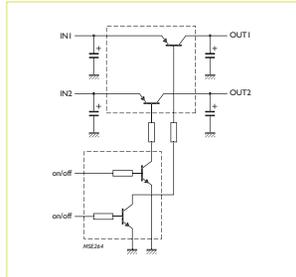
Low V_{CEsat} (BISS) transistors double

types in **bold** represent new products

Package		SOT196 (SO8)		SOT457 (SC-76)		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 ¹⁾		750		430		500		
V _{CE} (V)	I _C (A)	Polarity	h _{FE} (min)	θ _{VC} (A)	θ _{VC} (V)	V _{CEsat} typ (mV) I _C = 0.5 A; I _B = 0.05 A	V _{CEsat} max (mV)	θ _{VC} (A)	θ _{VC} (V)	
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	PBSS2515VFN
		NPN/PNP	200	0.01	2	170 ¹⁾	250	0.5	0.05	PBSS2515VFN
20	7.5	NPN/PNP	300	0.5	2	15	150	4	0.2	PBSS4021SN
	6.3	PNP/PNP	250	0.5	2	24	225	4	0.2	PBSS4021SP
30	7.5 / 6.3	NPN/PNP	300/250	0.5	2	15/24	150/225	4	0.2	PBSS4021SPN
	5.7	NPN/PNP	300	0.5	2	57	250	4	0.4	PBSS4032SN ²⁾
	4.8	PNP/PNP	200	0.5	2	70	390	4	0.4	PBSS4032SP ²⁾
	5.7 / 4.8	NPN/PNP	300/200	0.5	2	57/70	250/390	4	0.4	PBSS4032SPN ²⁾
40	1.0	NPN/PNP	300/250	0.5	5	130/150	500	1	0.1	PBSS4140DPN
	2.0	NPN/PNP	300/250	0.5	5	80/100	400/530	2	0.2	PBSS4240DPN
50	2.7	2 x NPN	300	0.5	2	50	340	2.7	0.27	PBSS4350SS
		2 x PNP	200	0.5	2	60	370	2.7	0.27	PBSS5350SS
		NPN/PNP	300/200	0.5	2	50/60	340/370	2.7	0.27	PBSS4350SPN
		NPN/PNP	300/250	0.5	5	115	250	1	0.1	PBSS4160DS
60	1.0	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
		NPN/PNP	300	0.5	2	20	190	4	0.2	PBSS4041SN
		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_B/I_C = 20
²⁾ Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
³⁾ Optimized for high speed switching

Dual load switch using double RETs and double BISS transistors



Low V_{CEsat} (BISS) transistors

Low V_{CEsat} (BISS) load switches

types in **bold** represent new products

Package		SOT196 (SO8)		SOT457 (SC-76)		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 ¹⁾	
V _{CE} (V)	I _C (A)	V _{CEsat} max (mV); I _C = 0.5A; I _B = 0.05A	R1, R2 (Ω)	SOT196 (SO8)		SOT457 (SC-76)		SOT363 (SC-88)	
15	0.5	250	2.2 4.7 10 22					PBL51501V PBL51501V	
								PBL51502V PBL51502V	
								PBL51503V PBL51503V	
								PBL51504V PBL51504V	
20	1	150	2.2 4.7 10 22			PBL52001D			
						PBL52002D			
						PBL52003D			
						PBL52004D			
	1.8	70	2.2 4.7 10 22			PBL52021D			
						PBL52022D			
						PBL52023D			
						PBL52024D			
3	75	2.2 4.7 10 22	PBL52001S						
			PBL52002S						
			PBL52003S						
			PBL52004S						
40	0.5	350	2.2 4.7 10 22			PBL54001Y PBL54001Y		PBL54001V PBL54001V	
						PBL54002Y PBL54002Y		PBL54002V PBL54002V	
						PBL54003Y PBL54003Y		PBL54003V PBL54003V	
						PBL54004Y PBL54004Y		PBL54004V PBL54004V	
1	170	2.2 4.7 10 22			PBL56001D				
					PBL56002D				
					PBL56003D				
					PBL56004D				
60	1	180	2.2 4.7 10 22			PBL56001D			
						PBL56002D			
						PBL56003D			
						PBL56004D			
1.5	100	2.2 4.7 10 22			PBL56021D				
					PBL56022D				
					PBL56023D				
					PBL56024D				

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

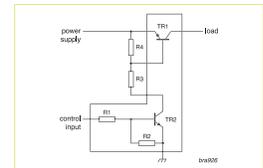
Key benefits

- ▶ 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



Low V_{CEsat} (BISS) transistors

High voltage low V_{CEsat} (BISS) transistors

		types in bold represent new products			
Package	SOT223 (SC-73)	SOT89 (SC-62)	SOT23		
Size (mm)	6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0		
P_{tot} (mW)	1700	1300	250		
Polarity	$V_{CEsat}^{(1)}$	$V_{CEsat}^{(1)}$	I_c (A)		
NPN	500	150	1	PBHV8115Z	PBHV8115T
		150	2	PBHV8215Z	
		400	0.5	PBHV8540Z	PBHV8540T
		400	1	PBHV8140Z	
		500	0.15		PMBTA45
PNP	500	150	1	PBHV8556Z	
		150	2	PBHV9115Z	PBHV9115X
		400	0.25	PBHV9040Z	PBHV9040T
		400	0.5	PBHV9540Z	
		500	0.15		PBHV9050T
			0.25	PBHV9050Z	

⁽¹⁾ Collector-emitter peak voltage

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

		SOT457 (SC-74)	SOT353 (SC-88A)				
Package							
Size (mm)		2.9 x 1.5 x 1.0	2.0 x 1.25 x 0.95				
P_{tot} (mW)		500	250				
Transistor	Schottky rectifier		Configuration				
V_{CEsat}^{max} (V)	I_c^{max} (A)	V_{SD}^{max} (mV)		I_{SM}^{max} (A)			
15	0.5	250	0.5	20	390		PMEM1505NG
40	1.0	210	1	20	550		PMEM4010ND
	2.0	400	1	40	640		PMEM4020ND
15	0.5	250	0.5	20	390		PMEM1505PG
	1.0	410	1	20	550		PMEM4010PD
40	2.0	530	1	40	640		PMEM4020PD
	2.0	530	1	40	640		PMEM4020APD

Key features

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

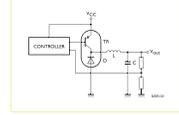
Key benefits

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

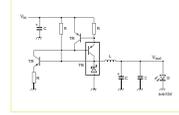
Key applications

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

Step-down DC/DC converter



Power LED driver



Low V_{CEsat} (BISS) transistors

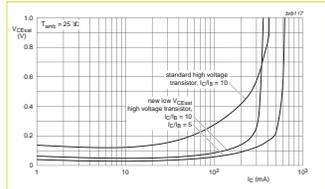
Low V_{CEsat} (BISS) RETs

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

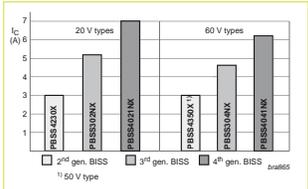
Advantages of low V_{CEsat} (BISS) technology

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

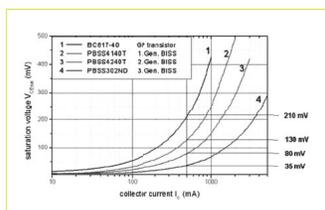
High voltage low V_{CEsat} (BISS) V_{CEsat} improvement leads to higher I_c capability



Improved collector current capabilities



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



65 % heat reduction by BISS transistors



General purpose transistor $T_{case} = 110^\circ\text{C}$ 3rd generation BISS transistor $T_{case} = 40^\circ\text{C}$

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

Small-signal transistors

Medium power transistors

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

														types in bold represent new products			
Package														SOT223 (SC-73)	SOT189 (SC-49)	SOT457 (SC-74)	SOT1061
Size (mm)														6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.0 x 2.0 x 0.65
P_{tot} (mW)														1700	1650	750	1400
Polarity	V_{CE} (V)	I_C (A)	I_{CM} (A)	I_{CM}/I_C	f_T (MHz)	θ_{VC} (°C/W)	$R_{\theta VC}$ (typ) (m°C/W)	$R_{\theta VC}$ (max) (m°C/W)	V_{CEsat} (max) (mV)	θ_{VC} (A)	θ_{VC} (A)						
NPN	12	5.3	10.6	300/530	0.5	2	27 ¹⁾	18	200	5.3	0.265		PBSS301NX				
		5.8	11.6	300/530	0.5	2	29 ¹⁾	18	235	5.8	0.29	PBSS301NZ					
	6.0	7.0	280/440	0.5	2	33 ¹⁾	20	275	6	0.3		PBSS4612PA					
	20	3.0	5.0	220/390	0.5	2	85	40	310	3	0.3		PBSS4320X				
		4.0	15.0	300/450	0.5	2	50	30	280	4	0.4		PBSS301ND				
		5.0	10.0	300/450	0.5	2	32	35	220	5	0.5		PBSS4520X				
		5.3	10.6	300/570	0.5	2	27 ¹⁾	20	250	5.3	0.265		PBSS302NX				
		5.8	10.2	300/570	0.5	2	30 ¹⁾	20	250	5.8	0.29		PBSS302NZ				
		6.0	7.0	280/440	0.5	2	33 ¹⁾	20	275	6	0.3		PBSS4620PA				
		7.0	15.0	300/550	0.5	2	19	12	210	7	0.35		PBSS4021NX				
		8.0	20.0	300/550	0.5	2	14	9	170	8	0.4		PBSS4021NZ				
		3.0	5.0	300/490	0.5	2	80	45	300	3	0.3		PBSS4330X				
		3.5	6.0	300/500	0.5	2	50	70	300	4	0.4		PBSS4032NZ ²⁾				
	4.7	10.0	300/500	0.5	2	45	57	250	4	0.4		PBSS4032NX ²⁾					
	5.1	10.2	300/480	0.5	2	30 ¹⁾	20	220	5.1	0.255		PBSS303NX					
	5.4	10.0	300/500	0.5	2	45	57	340	5.4	0.27		PBSS4032NZ ²⁾					
	5.5	11.0	300/480	0.5	2	31 ¹⁾	20	240	5.5	0.275		PBSS4032NX ²⁾					
	6.0	7.0	280/450	0.5	2	35	21	275	6	0.3		PBSS4630PA					
	40	4.0	10.0	300/520	0.5	2	55	35	300	4	0.4		PBSS4540X				
		5.0	10.0	300/500	0.5	2	40	21	355	5	0.5		PBSS4540Z				
		2.0	5.0	300/495	0.5	2	100	60	240	2	0.2		PBSS4250X				
		3.0	5.0	300/460	0.5	2	160	90 ¹⁾	320	2	0.2		PBSS4350D				
		200/280	0.5	2	110	65	290	2	0.2			PBSS4350D					
		3.0	5.0	300/460	0.5	2	75	50	370	3	0.3		PBSS4350Z				
		200/280	0.5	2	110	60 ¹⁾	290	2	0.2			PBSS4350Z					
		3.0	6.0	345/570	0.5	2	65	40	260	3	0.3		PBSS303ND				
		4.7	9.4	300/520	0.5	2	37 ¹⁾	25	245	4.7	0.235		PBSS304NX				
		5.2	10.4	300/520	0.5	2	39 ¹⁾	25	280	5.2	0.26		PBSS304NZ				
	60	4.0	7.0	280/440	0.5	2	34 ¹⁾	22	290	4	0.3						
		4.2	15.0	300/500	0.5	2	25	17	230	4	0.3		PBSS4041NX				
		7.0	15.0	300/500	0.5	2	17.5	13	195	7	0.35		PBSS4041NZ				
		3.0	6.0	240/360	0.5	2	67	40	255	3	0.3		PBSS304ND				
		4.0	10.0	250/400	0.5	2	43 ¹⁾	25	230	4	0.2		PBSS4480X				
		4.6	9.2	300/470	0.5	2	37 ¹⁾	25	240	4.6	0.23		PBSS305NX				
		5.1	10.2	300/470	0.5	2	38 ¹⁾	25	270	5.1	0.255		PBSS305NZ				
		5.6	7.0	270/425	0.5	2	40 ¹⁾	25	320	5.6	0.28		PBSS4580PA				
		150/290	0.25	10	165	75	200	1	0.1			PBSS8110X					
		150/290	0.25	10	165	75	200	1	0.1			PBSS8110Z					
	100	3.0	4.0	170/275	0.5	2	72	45	340	4	0.4		PBSS306NX				
		4.5	9.0	200/330	0.5	2	38 ¹⁾	27	245	4.5	0.225		PBSS306NZ				
		5.1	10.2	200/330	0.5	2	43 ¹⁾	27	300	5.1	0.255		PBSS306NZ				
		5.2	6.0	180/285	0.5	2	48 ¹⁾	30	340	5.2	0.26		PBSS8510PA				

¹⁾ $I_{L/I_C} = 20$
²⁾ V_{CEsat} (max)
³⁾ optimized for high speed switching

Medium power transistors

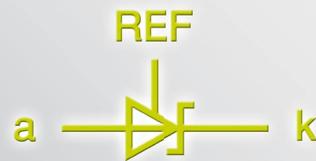
Medium power low V_{CEsat} (BISS) transistors PNP

														types in bold represent new products			
Package														SOT223 (SC-73)	SOT189 (SC-49)	SOT457 (SC-74)	SOT1061
Size (mm)														6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.5 x 1.0	2.0 x 2.0 x 0.65
P_{tot} (mW)														1700	1650	750	1400
Polarity	V_{CE} (V)	I_C (A)	I_{CM} (A)	I_{CM}/I_C	f_T (MHz)	θ_{VC} (°C/W)	$R_{\theta VC}$ (typ) (m°C/W)	$R_{\theta VC}$ (max) (m°C/W)	V_{CEsat} (max) (mV)	θ_{VC} (A)	θ_{VC} (A)						
PNP	12	5.3	10.6	250/400	0.5	2	28 ¹⁾	20	210	5.3	0.265		PBSS301PZ				
		5.7	11.4	250/400	0.5	2	30 ¹⁾	20	245	5.7	0.285		PBSS4612PA				
	6.0	7.0	220/335	0.5	2	33 ¹⁾	20	300	6	0.3							
	20	3.0	5.0	200/300	0.5	2	85	80 ¹⁾	400	3	0.3		PBSS5320X				
		4.0	15.0	250/400	0.5	2	50	35	280	4	0.4		PBSS531PD				
		5.0	10.0	300/430	0.5	2	34	45	270	5	0.5		PBSS5320X				
		5.3	10.2	250/370	0.5	2	32 ¹⁾	25	230	5.1	0.255		PBSS302PX				
		5.5	11.0	250/370	0.5	2	34 ¹⁾	25	265	5.5	0.275		PBSS302PZ				
		6.0	7.0	230/345	0.5	2	39 ¹⁾	25	350	6	0.3		PBSS4620PA				
		6.2	15.0	250/400	0.5	2	25	18	240	6	0.3		PBSS4021PZ				
		6.6	20.0	250/400	0.5	2	22	16	240	7	0.35		PBSS4021PZ				
		2.7	5.0	200/350	0.5	2	88	87	395	3	0.3		PBSS4032PZ ²⁾				
		3.0	5.0	200/380	0.5	2	80	50	320	3	0.3		PBSS5330X				
	4.2	10.0	200/350	0.5	2	58	70	345	4	0.4		PBSS4032PX ²⁾					
	4.4	10.0	200/350	0.5	2	58	70	400	4	0.2		PBSS4032PZ ²⁾					
	5.1	10.2	250/400	0.5	2	32 ¹⁾	25	230	5.1	0.255		PBSS303PX					
	5.3	10.6	250/400	0.5	2	35 ¹⁾	25	265	5.3	0.265		PBSS303PZ					
	6.0	7.0	230/345	0.5	2	39 ¹⁾	25	350	6	0.3		PBSS4630PA					
	4.0	10.0	250/370	0.5	2	45	33	375	5	0.5		PBSS5302PD					
	5.0	10.0	250/350	0.5	2	55	40 ¹⁾	160	2	0.2		PBSS5540Z					
	2.0	5.0	200/300	0.5	2	160	90 ¹⁾	320	2	0.2		PBSS5250X					
	3.0	5.0	200/375	0.5	2	120	70	390	3	0.3		PBSS5350D					
	3.0	6.0	180/265	0.5	2	120	70	300	2	0.2		PBSS5350Z					
	4.2	8.4	200/295	0.5	2	53 ¹⁾	35	310	4.2	0.21		PBSS303PD					
	4.5	9.0	200/295	0.5	2	59 ¹⁾	35	375	4.5	0.225		PBSS304PX					
	5.0	15.0	200/300	0.5	2	40	30	300	5	0.5		PBSS4041PZ					
	5.7	15.0	200/300	0.5	2	29	22	285	6	0.3		PBSS4041PZ					
	3.0	5.0	155/225	0.5	2	71	55	290	3	0.3		PBSS304PD					
	4.0	5.0	180/265	0.5	2	65 ¹⁾	40	420	4	0.2		PBSS580PA					
	4.5	9.0	200/280	0.5	2	69 ¹⁾	36	450	4.5	0.225		PBSS303PZ					
	5.7	15.0	200/300	0.5	2	29	22	285	6	0.3		PBSS441PZ					
	150/350	0.5	5	170	100	320	1	0.1									
	150/350	0.5	5	170	90	320	1	0.1									
	150/350	0.5	5	170	90	320	1	0.1									
	100	2.0	3.0	175/275	0.5	2	88	65	250	2	0.2		PBSS59110Z				
	2.7	4.0	180/295	0.5	2	110 ¹⁾	45	450	2.7	0.135		PBSS59110X					
	3.7	7.4	200/300	0.5	2	52	45	300	4	0.4		PBSS305PD					
	4.1	8.2	200/300	0.5	5	57	45	325	4.1	0.41		PBSS9410PA					
												PBSS306PX					

¹⁾ $I_{L/I_C} = 20$
²⁾ V_{CEsat} (max)
³⁾ optimized for high speed switching

Medium power general purpose transistors

														SOT223 (SC-73)		SOT189 (SC-49)	
Package																	
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_{CE} (V)	I_C (mA)	I_{CM} (mA)	I_{CM}/I_C	f_T (MHz)	θ_{VC} (°C/W)	$R_{\theta VC}$ (typ) (m°C/W)	$R_{\theta VC}$ (max) (m°C/W)	V_{CEsat} (max) (mV)	θ_{VC} (A)	θ_{VC} (A)						
NPN	20	1000	85	160	375	40	BCP68 / 25	BC868 / 25									
		45	1000	83	100	160	250	100	BCP64 / 10 / 16	BC854 / 10 / 16							
	60	1000	63	150	160	250	100	BCP65 / 10 / 16	BC853 / 10 / 16								
		100	100	300	100			BC941	BC941								
	80	1000	63	100	160	250	100	BCP66 / 10 / 16	BC856 / 10 / 16								
		40	1000	40	100	120	300	100	BC943	BC943 / 43							
	PNP	20	1000	85													



Standard linear products

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

Adjustable shunt voltage regulator IC

Adjustable shunt voltage regulator IC

types in bold represent new products

Package		SOT23					
Size (mm)		2.9 x 1.3 x 1.0					
P _{tot} (mW)		580					
Pinning configuration		normal pinning ¹⁾	mirrored pinning ¹⁾				
V _{in} (V)	I _L (mA)	V _{out}	T _{amb} (°C)				
20	80	1.5%	0 to 70	TLVH431CD8Z			
			-40 to 85	TLVH431ID8Z			
			-40 to 125	TLVH431OD8Z	TLVH431MOD8Z		
		1%	0 to 70	TLVH431ACD8Z			
			-40 to 85	TLVH431AID8Z			
			-40 to 125	TLVH431AQD8Z	TLVH431AMQD8Z		
	0.5%	0 to 70	TLVH431BCD8Z				
		-40 to 85	TLVH431BID8Z				
		-40 to 125	TLVH431BQD8Z	TLVH431BMQD8Z			
		36	100	2%	0 to 70	TL431CD8Z	
					-40 to 85	TL431ID8Z	
					-40 to 125	TL431OD8Z	TL431MSDT ¹⁾
1%	0 to 70			TL431ASDT ¹⁾	TL431MSDT ¹⁾		
	-40 to 85			TL431AID8Z			
	-40 to 125			TL431AQD8Z			
0.5%	0 to 70	TL431BCD8Z					
	-40 to 85	TL431BID8Z					
	-40 to 125	TL431BQD8Z	TL431BMSDT ¹⁾				

¹⁾ optimized for use with dedicated capacitive load

Normal pinning vs. mirrored pinning

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

Voltage regulator

Low-dropout adjustable and fixed linear voltage regulator

types in bold represent new products

Package		SOT223 (SC-73)					
Size (mm)		6.5 x 3.5 x 1.45					
P _{tot} (mW)		1700					
V _{in} (V)	I _{out} (A)	V _{out} (V)	V _{dropout}				
20	1	1.25 adj	1%	0 to 125	NX1117CADJZ	-40 to 125	NX1117ADJZ
		1.2		NX1117C12Z	NX1117I12Z		
		1.5		NX1117C15Z	NX1117I15Z		
		1.8		NX1117C18Z	NX1117I18Z		
		1.9		NX1117C19Z	NX1117I19Z		
		2.0		NX1117C20Z	NX1117I20Z		
		2.5		NX1117C25Z	NX1117I25Z		
		2.85		NX1117C285Z	NX1117I285Z		
		3.3		NX1117C33Z	NX1117I33Z		
		5.0		NX1117C50Z	NX1117I50Z		
		12.0		NX1117C120Z	NX1117I120Z		

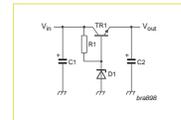
Discrete voltage regulator

Package	SOT223 (SC-73)	SOT457 (SC-74)	
Size (mm)	6.5 x 3.5 x 1.45	2.9 x 1.5 x 1.0	
P _{tot} (mW)	1300	380	
Zener diode			
Transistor			
V _{in} (V)	V _{out} (V)	I _L (A)	I _L (A)
2.5	3.23 - 3.37	45	0.1
3.0	3.53 - 3.67	45	0.1
3.3	3.82 - 3.98	45	0.1
5.0	5.49 - 5.71	45	0.1
12.3	12.7 - 13.3	45	0.1

Key features

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

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



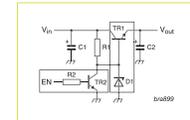
Key benefits

- Component count reduction
- Board space reduction
- Improved reliability

Key applications

- Linear voltage regulation

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



Constant current source

Constant current source

SOT353 (SC-88A)							
Package							
Size (mm)	2.0 x 1.25 x 0.95						
P _{tot} (mW)	335						
Type	PSS20215AV						
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 _{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} ΔT _{amb} ⁻¹ (1/°C)
Condition	⊖ V _s = 12 V; I _{out} = 15 µA; V _{ref} = 1 V to 10 V		⊖ V _s = 12 V; V _{ref} = 1 V to 10 V; R _{ext} = open			⊖ V _s = 12 V; V _{ref} = 1 V to 10 V	⊖ V _s = 12 V; V _{ref} = 1 V; T _{amb} = -55 °C to 150 °C
Value	75>	2.2	15	0.015	50	0.5	0.15

Key features

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

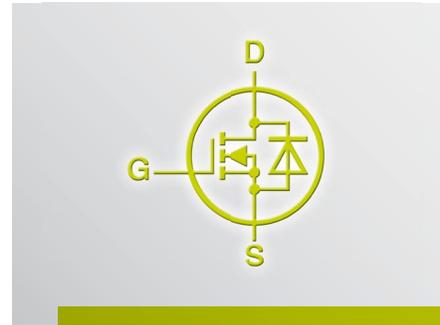
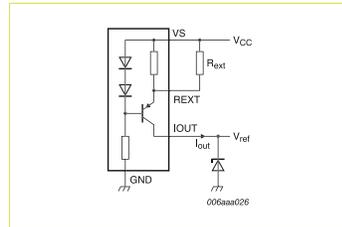
Key benefits

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

Key applications

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

Voltage reference



MOSFETs

Small-signal MOSFETs

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

Power MOSFETs

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

Small-signal MOSFETs

Small-signal MOSFETs

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

Package													SOT223 (SC-73)		TSOP6 SOT1457 (SC-74)	SOT23	SOT363 (SC-88)	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)
Size (mm)													6.5 x 3.5 x 1.65		2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5
P _{tot} (mW)													1700		600	250	300	200	150	250
V _{GS} (V)	V _{DS} (V)	I _S (A)	V _{GS(th)} min(V)	V _{GS(th)} max(V)	t _{on} typ (ns)	t _{off} typ (ns)	Q _s typ (nC)	ESD protection	R _{DS(on)} 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								
20	8	6.3	2	4	23	71	10.6	-	-	23	-	37								
		5.7	0.4	-	23	71	10.6	-	-	27	-	39								
		5.7	0.45	-	20	66	7.4	-	-	30	-	44								
		3.76	0.65	-	35	84	5.4	-	-	56	77	-								
		2.5	0.65	-	35	84	5.4	-	-	56	77	-								
		1.05	0.4	-	6.5	65	-	-	-	140	-	240								
		2.28	0.45	0.95	14.5	23.5	0.89	-	-	250	-	420								
		1	0.45	1	14.5	23.5	0.89	-	-	280	-	460								
		5.9	0.5	1.5	25	37	5.8	-	-	31	44	-								
		2.15	0.5	1.5	16	17	0.72	-	-	270	440	-								
1	0.5	1.5	16	17	0.72	-	-	290	460	-										
15	5.7	1	2	24	35	13.1	-	-	28	34	-	-								
	4.1	1	2	24	35	13.1	-	-	55	70	-	-								
30	8	4.9	0.45	-	22	60	9.9	-	-	38	-	54								
		4.9	0.45	-	18	50	9.3	-	-	40	-	55								
		1.78	0.45	0.95	11.5	22.5	0.89	-	-	390	-	550								
		0.85	0.4	-	6	27	-	-	-	400 ¹⁾	-	600 ²⁾								
		0.8	0.45	1	11.5	22.5	0.89	-	-	400	-	580								
		1.87	0.5	1.5	16	19.5	0.65	-	-	350	520	-								
		0.87	0.35	-	16	19.5	-	-	-	370	550	-								
		0.9	0.5	1.5	16	19.5	0.65	-	-	370	550	-								
		5.4	1	2	12	27	13.8	-	-	32	40	-	-							
		10	1	2.8	18	44	24	-	-	20	30	-	-	BSP030						
20	5.4	1	2	33	44	6.1	-	-	31	38	-	-								
	5.2	1	2	33	44	6.1	-	-	32	42	-	-								
	5.4	1	2	12	21.5	9.4	-	-	35	45	-	-								
	4.6	1	2	8.4	17.8	8.8	-	-	40	49	-	-								
	4.7	1	2	12	23.5	9.4	-	-	47	60	-	-								
	1.9	1	2	11	41	6.4	-	-	77	102	-	-								
	2.5	1.5	-	12	23.5	4.6	-	-	74	117	-	-								
	6	1	2.8	14	36	-	-	-	80	120	-	-	BSP100							
	1.7	1.5	-	11.5	31	4.6	-	-	117 ²⁾	190 ²⁾	-	-								

¹⁾ enhanced thermal capability
²⁾ max values

Small-signal MOSFETs

Small-signal MOSFETs

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

types in **bold** represent new products

Package													SOT223 (SC-73)	SOT89 (SC-42)	SOT873	SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)				
Size (mm)													6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	3.3 x 3.3 x 0.85	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5				
P _{tot} (mW)													1700	1300	250	250	200	150	250				
V _{GS} (V)	V _{DS} (V)	I _S (A)	V _{GS(th)} min(V)	V _{GS(th)} max(V)	t _{tr} typ (ns)	t _{tr} typ (ns)	Q _g typ (nC)	ESD protection	R _{DS(on)} typ (mΩ) @ V _{GS} =				PHT11N06LT	PHT8N06LT	PHT6N06LT	PHT6N06T	BSN20	BSH111	BSH121	BSH112	BSH122	BSH123	
									10 V	4.5 V	2.5 V	1.8 V											
50	20	0.1	0.4	1.8	2	5	-	-	2800	3800 ¹⁾	-	-	-	-	-	-	-	-	-	-	-	-	-
	8	0.3	0.4	1.3	4	11	1	-	-	2300	2400	3100	-	-	-	-	-	-	-	-	-	-	-
	10	0.335	0.4	1.3	4	11	1	-	-	2300	2400	3100	-	-	-	-	-	-	-	-	-	-	-
	13	4.9	1	2	-	-	-	-	2KV	-	30	-	-	-	-	-	-	-	-	-	-	-	-
		3.5	1	2	-	-	-	-	2KV	-	65	-	-	-	-	-	-	-	-	-	-	-	-
		2.5	1	2	-	-	-	-	2KV	-	120	-	-	-	-	-	-	-	-	-	-	-	-
		2.5	2	4	-	-	-	-	2KV	120	-	-	-	-	-	-	-	-	-	-	-	-	-
	15	0.26	1	3.3	3	9	-	-	1KV	2800	3800	-	-	-	-	-	-	-	-	-	-	-	-
		0.34	1	-	3	9	-	-	1KV	2800	3800	-	-	-	-	-	-	-	-	-	-	-	-
		0.3	1	-	3	9	-	yes	2800	3800	-	-	-	-	-	-	-	-	-	-	-	-	-
		0.3	1	2.5	16	60	1.09	-	3KV	1100	1300	-	-	-	-	-	-	-	-	-	-	-	-
		0.3	1	2.5	tbid	tbid	tbid	-	2000 ²⁾	3000 ²⁾	-	-	-	-	-	-	-	-	-	-	-	-	-
		0.3	1	2.5	tbid	tbid	tbid	-	2KV	1600 ²⁾	3000 ²⁾	-	-	-	-	-	-	-	-	-	-	-	-
		0.57	1	-	6	7.2	-	-	-	780	1100	-	-	-	-	-	-	-	-	-	-	-	-
		0.55	1	3	6	7.2	1.05	-	-	780	1100	-	-	-	-	-	-	-	-	-	-	-	-
		1.22	1	3	6	7.2	1.05	-	-	760	1100	-	-	-	-	-	-	-	-	-	-	-	-
		0.25	0.8	3	-	-	-	-	-	2500	-	-	-	-	-	-	-	-	-	-	-	-	-
	30	0.385	1	2.5	2.5	11	0.69	-	780	1200	-	-	-	-	-	-	-	-	-	-	-	-	
		0.475	1	2.5	2.5	11	0.69	-	780	1200	-	-	-	-	-	-	-	-	-	-	-	-	
		0.3	1	2.5	2.5	11	-	-	2800	3800	-	-	-	-	-	-	-	-	-	-	-	-	
	100	16	3.5	1	2	14	73	-	-	200	-	-	-	-	-	-	-	-	-	-	-	-	
		20	0.19	1	-	3	12	-	-	-	5000	-	-	-	-	-	-	-	-	-	-	-	-
			0.52	1	-	3	12	-	-	-	5000	-	-	-	-	-	-	-	-	-	-	-	-
			0.85	2	4	19	13	4.6	-	-	400	-	-	-	-	-	-	-	-	-	-	-	-
		0.15	1	2.8	3	12	-	-	-	3500	-	-	-	-	-	-	-	-	-	-	-	-	
		3.5	2	4	21	31	7.4	-	-	200	-	-	-	-	-	-	-	-	-	-	-	-	
		3	2	4	-	-	-	-	-	57	-	-	-	-	-	-	-	-	-	-	-	-	
	30	1.9	2	4	10.5	12.5	7	-	213	-	-	-	-	-	-	-	-	-	-	-	-		
	200	0.55	0.4	2	10	45	-	-	1700	-	3000	-	-	-	-	-	-	-	-	-	-	-	
		0.4	0.8	2.8	6	49	-	-	1600	-	-	-	-	-	-	-	-	-	-	-	-	-	
		8.8	2	4	18	26	13.3	-	-	250	-	-	-	-	-	-	-	-	-	-	-	-	
	220	20	7.3	2	4	20.8	24.3	13.2	-	320	-	-	-	-	-	-	-	-	-	-	-	-	
	240	20	0.375	0.8	2	6	47	-	-	2800	7500 ³⁾	-	-	-	-	-	-	-	-	-	-	-	
	250	20	0.35	0.8	2	6	47	-	-	2800	-	-	-	-	-	-	-	-	-	-	-	-	
	300	20	0.35	0.8	2	6	46	-	-	3700	-	4800	-	-	-	-	-	-	-	-	-	-	

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

Power MOSFETs

Power MOSFETs

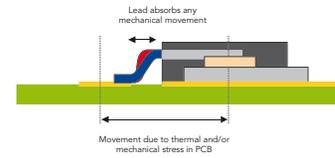
Power MOSFETs single (N-channel)

types in **bold** represent new products

V _{DS} (max) (V)	R _{DS(on)} (max) (mΩ) @ V _{GS} = 10 V	R _{DS(on)} (max) (mΩ) @ V _{GS} = 4.5 V	I _D (max) (A) @ 25 °C	Power-SO8 (LFAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)		SO8 (SOT96-1)	IPAK (SOT533)
										
20	2.65	3.7	100	3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3		4.9 x 3.9 x 1.75	6 x 6.6 x 2.3
	-	2.7	100	PH3120L						
	-	5	32	PH2520U						
	-	16 @ 5 V	44.7					PHD38N02LT	PSMN006-20K	
	-	20 @ 5 V	10.9						PHKD6N02LT	
25	1.2	1.85	100	PSMN1R2-25YL						
	1.5	2.2	100	PSMN1R5-25YL						
	2.5	3.9	100	PH2525L						
	2.8	4.1	100	PH2625L						
	4	-	99	PH4025L						
	4.95	-	75					PHD96NQ03LT		
	5.5	8.2	81.7	PH5525L						
	5.8	-	75					PSMN005-25D		
	6	-	75					PHD108NQ03LT		
	6.3	9.5	78.7	PH6325L						
	6.3	10.6	75					PHD97NQ03LT		
	6.6	-	75							PHU97NQ03LT
	9	13	66	PH9025L						
	9	-	66.4					PHD78NQ03LT		PHU78NQ03LT
	9	-	61							
	9.5	-	75			PHP78NQ03LT				
	10.5	-	66					PHB66NQ03LT		PHU77NQ03LT
	-	3	100	PH2925U				PHD66NQ03LT		

LFAK for mechanical & thermal ruggedness

NXP LFAK



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

QFN Based Power-S08



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

Power MOSFETs

Power MOSFETs single (N-channel)

types in **bold** represent new products

V_{DS} (max) (V)	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 10$ V	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 4.5$ V	I_D (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	DPAK (SOT428)	SO8 (SOT96-1)	IPAK (SOT533)
								
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75	6 x 6.6 x 2.3
30	1.3	1.95	100	PSMN1R3-30YL				
	1.7	2.1	100		PSMN1R6-30PL			
	1.7	2.6	100	PSMN1R7-30YL				
	1.8	-	-		PSMN1R8-30PL			
	2	3.2	100	PSMN2R0-30YL				
	2.1	2.8	100		PSMN2R0-30PL			
	2.4	3.9	100	PSMN2R5-30YL				
	2.7	-	-		PSMN2R7-30PL			
	2.8	-	75		PSMN003-30P			
	3	4.8	100	PSMN3R0-30YL				
	3.2	-	100		PH3230S			
	3.3	4.5	100		PH3330L			
	3.4	-	-			PSMN3R4-30PL		
	3.5	5.6	100	PSMN3R5-30YL				
	3.8	-	98		PH3830L			
	4	6.5	99	PSMN4R0-30YL				
	4.3	6.2	100		PSMN4R3-30PL			
	4.3	-	95.9		PH4330L			
	4.4	-	30.4				PHK31N0Q3LT	
	4.8	-	84		PH4830L			
5	8	84	PSMN5R0-30YL					
5.5	-	20 @ 80 °C					PSMN005-30K	
5.5	-	75		PHP101N0Q3LT	PHD101N0Q3LT		PHU101N0Q3LT	
5.7	-	80		PH5330E				
5.9	-	76.7		PH8030L				
6	9.7	76.7		PH6030L				
6	9.7	73	PSMN6R0-30YL					
6.5	-	23.7				PHK28N0Q3LT		
7	11.3	65	PSMN7R0-30YL					
7.9	11	68		PH7030L				
8	13.8	55	PSMN9R0-30YL					
8.2	-	67		PH8230E				
8.9	-	20.3				PHK18N0Q3LT		
9	12.5	63		PH9030L				
9.9	-	63		PH9930L				

Power MOSFETs

Power MOSFETs single (N-channel)

types in **bold** represent new products

V_{DS} (max) (V)	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 10$ V	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 4.5$ V	I_D (max) (A) @ 25 °C	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)	SO8 (SOT96-1)
							
30	10	-	75	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75
	13	-	68.9			PHD71N0Q3LT	
	13.5	20	10			PHD63N0Q3LT	
	17	-	43.4	PHP36N03LT		PHD36N03LT	SI4410DY
	20	26	13.8				PHK13N03LT
	20	26	10.4				PHKD13N03LT
	22.0	-	-	PSMN022-30PL			
	30	-	6.3				PHN203
	100	200	3.4				PHN210
	100	200	3.4				PHN210T
36	4	-	75		PSMN004-36B		PHKT2N0Q3LT

types in **bold** represent new products

V_{DS} (max) (V)	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 10$ V	$R_{DS(on)}$ (max) (mΩ) @ $V_{GS} = 4.5$ V	I_D (max) (A) @ 25 °C	Power-SO8 (LFPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)
							
40	2	-	-	3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3
	2.1	-	100	PSMN2R0-40YS			PSMN2R2-40PS
	2.8	-	-				PSMN2R8-40PS
	2.8	-	100	PSMN2R6-40YS			
	3.3	-	-	PSMN3R3-40YS			
	4.1	-	94.5	PH4840S			
	4.2	-	100	PSMN4R0-40YS			
	4.3	-	75		PHP176N0Q4T		
	4.6	-	100	PSMN4R5-40PS		PHP176N0Q4T	
	5.2	-	75		PHP143N0Q4T		
	5.7	-	-	PSMN5R8-40YS			
	7.6	-	77		PSMN8R0-40PS		
	8	-	75		PHP101N0Q4T	PHB101N0Q4T	
	8.6	-	70	PSMN8R3-40YS			
	14	-	-	PSMN014-40YS			
	3.7	-	75		PHP191N0Q6LT	PHB191N0Q6LT	
	5.8	-	75		PSMN005-55P	PSMN005-55B	
	7	-	75		PHP110N0Q6LT	PHB110N0Q6LT	
7.1	-	75		PHP119N0Q6T	PHB119N0Q6T		
8.3	9.9	62.5		PH955L			
10.5	-	75				PSMN010-55D	
17.3	21	40		PH1955L			
20	-	54			PHP54N06T		
36	45	24		PH3855L			
70	-	19			PHP21N06LT	PHB21N06LT	
75	-	21			PHP21N06T	PHD21N06LT	
75	-	20.3			PHP20N06T	PHB20N06T	
77	-	18				PHD20N06T	

Power MOSFETs

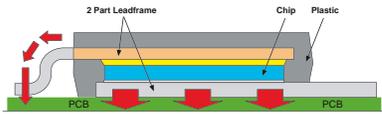
Power MOSFETs single (N-channel)

types in **bold** represent new products

V _{DS} (max) (V)	R _{DS(on)} (max) (mΩ) @ V _{GS} = 10 V	R _{DS(on)} (max) (mΩ) @ V _{GS} = 4.5 V	I _D (max) (A) @ 25 °C	Power-SO8 (LFAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)
							
60	3.6	-	75	3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3
	22	-	52		PHP52N06T	PSMN004-60B	
	150	-	10.3		PHP305SE		PHD305SE
	-	43	34		PHP32N06LT	PHB32N06LT	
75	5	-	75		PHP165NQ08T		
	5	-	75		PSMN005-75P	PSMN005-75B	
	5.6	-	75		PHP160NQ08T	PHB160NQ08T	
	8.5	-	75		PSMN008-75P	PSMN008-75B	
	9	-	75		PHP110NQ08T	PHB110NQ08T	
	13	-	75		PHP75NQ08T		
	16	-	73		PHP79NQ08LT		
	16.5	-	45.8		PH1875L		
	28	34	30		PH3075L		
	50 @ 11 V	-	27			PHP29N08T	PHB29N08T
80	4.1	-	100		PSMN4R4-80PS		
	4.7	-	100		PSMN5R0-80PS		
	6.4	-	-	PSMN6R0-80YS			
	6.5	-	-		PSMN6R5-80PS		
	8.5	-	82	PSMN8R2-80YS			
	8.7	-	-		PSMN8R7-80PS		
	11	-	-	PSMN011-80YS			
	11	-	74		PSMN012-80PS		
	12.9	-	60	PSMN013-80YS			
	17.0	-	-		PSMN017-80PS		
	19.5	-	-	PSMN018-80YS			
	27.5	-	34	PSMN026-80YS			
46	-	-	PSMN045-80YS				
46	-	22		PSMN050-80PS			

Power-SO8 (LFAK) Design

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



Power MOSFETs

V _{DS} (max) (V)	R _{DS(on)} (max) (mΩ) @ V _{GS} = 10 V	R _{DS(on)} (max) (mΩ) @ V _{GS} = 4.5 V	I _D (max) (A) @ 25 °C	Power-SO8 (LFAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)	SO8 (SOT96-1)
								
60	8.8	-	75	3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3	4.9 x 3.9 x 1.75
	15	-	75		PSMN009-100P	PSMN009-100B		
	23	-	34.3	PH20100S	PSMN015-100P	PSMN015-100B		
	25	-	47		PHP45NQ10T	PHB45NQ10T		
	25	-	47		PHP45NQ10TA			
	25	-	47				PSMN025-100D	
	28	-	47			PHB47NQ10T		
	28	-	11.6					PHK12NQ10T
	38	-	6.3 @ 80 °C					PSMN038-100K
	40	-	35					
	50	-	28				PHB47NQ10T	
	90	-	18		PHP18NQ10T	PHB18NQ10T	PHD18NQ10T	
	90	-	3					
	90	-	3					PHKD3NQ10T
105	25	-	47		PHP45NQ11T			
	15	-	75		PSMN015-110P			
	40	-	35		PHP34NQ11T			
	50	-	27.6		PHP27NQ11T			
	70	-	23		PHP23NQ11T			
110	90	-	18		PHP18NQ11T			

NXP Power solutions make your PC Energy Efficient

MOSFETs for high efficiency power management

Smaller, faster, cooler

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

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

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

Power MOSFETs

Power MOSFETs

Power MOSFETs single (N-channel)

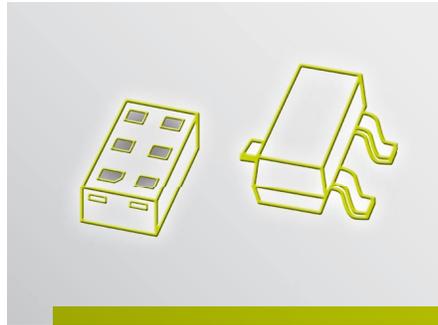
V_{DS} (max) (V)	$R_{DS(on)}$ (max) (m Ω) @ $V_{GS} = 10$ V	$R_{DS(on)}$ (max) (m Ω) @ $V_{GS} = 4.5$ V	I_D (max) (A) @ 25 °C	Power-SOB (LPAK)	TO-220AB (SOT78)	D2PAK (SOT404)	DPAK (SOT428)		SO8 (SOT96-1)	HVSON8 (SOT873-1)
										
				3.95 x 4.9 x 1.1	15.6 x 10 x 4.4	11 x 10 x 4.3	6 x 6.6 x 2.3		4.9 x 3.9 x 1.75	3.3 x 3.3 x 0.85
150	30	-	55.5		PSMN030-150P	PSMN030-150B				
	35	-	50		PSMN035-150P	PSMN035-150B				
	42	-	45.1			PHB45NQ15T				
	59	-	43	PSMN059-150Y						
	63	-	29		PHP30NQ15T		PSMN063-150D			
	65	-	28.5		PHP28NQ15T					
	75	-	5						PHK5NQ15T	
85	-	3.5 @ 80 °C						PSMN085-150K		
200	57	-	39		PSMN057-200P	PSMN057-200B				
	70	-	35		PSMN070-200P	PSMN070-200B				
	77	-	32.7		PHP33NQ20T	PHB33NQ20T				
	102	-	21.5	PSMN102-200Y						
	130	-	20		PHP20NQ20T	PHB20NQ20T	PSMN130-200D			
	165	-	2.9 @ 80 °C						PSMN165-200K	
	294	-	8.8							PML260SN
400	-	8.7		PHP9NQ20T		PHD9NQ20T				
220	386	-	7.3						PML340SN	

Power MOSFETs single (P-channel)

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

Power MOSFETs dual (N- and P-channel)

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



Packages

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

Package cross reference

Package cross reference

types in **bold** represent new products

NXP	Industry standard names	Size (l x w x h)	Pins/ leads	P (mW)	Package	Competitor synonyms							
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay
SOD27	DO-35	4.25 x 1.85 x 0.56	2	500		GSD			DO-35		DO-35		DO-204AH
SOD66	DO-41	4.8 x 2.6 x 0.81	2	1300		GSR	DO-41				DO-41		DO-204AL
SOD68	DO-34	3.04 x 1.6 x 0.55	2	500		MSD							
SOD90C	MiniMelf	3.5 x 1.5 x 1.5	2	300		LLDS			LLD		MiniMELF		MiniMELF
SOD87	Melf	3.5 x 2.05 x 2.05	2	1000									
SOD123F	-	2.6 x 1.6 x 1.1	2	830		PMDU	S-Flat	SOD-123-FL			Power-DI123	SMF	
SOD123W	-	2.6 x 1.7 x 1.0	2	900			S-Flat	SOD-123-FL			Power-DI123		
SOD128	-	3.8 x 2.6 x 1.0	2	1000		PMDT	M-Flat						
SOD323	SC-76	1.7 x 1.25 x 0.95	2	400			USC	SOD-323	URP	SOD323	SOD-323	USC	SOD323
SOD323F	SC-90	1.7 x 1.25 x 0.7	2	830		UMD2	US-Flat				Power-DI323		
SOD523	SC-79	1.2 x 0.8 x 0.6	2	500		EMD2	ESC/TEEC	SOD-523	UPP	SC79		ESC	SOD523
SOD882	-	1.0 x 0.6 x 0.5	2	250			CTS2			TSLP-2	DFN1006-2		
SOD882D	-	1.0 x 0.6 x 0.37	2	250						TSLP-2.7	DFN1006H4.2		
SOD131 SMA	DO-214AC	4.25 x 2.67 x 2.14	2	900		PMDS (SOD-106)		SMA Case 403D-02			SMA	SMA	
SOD132 SMB	DO-214AA	4.32 x 3.62 x 2.29	2	1000				SMB Case 403A-03			SMB		
SOD133 SMC	DO-214AB	6.86 x 5.91 x 2.34	2	1200				SMC Case 403-03			SMC		
SOT1061	HUSON3	2.0 x 2.0 x 0.65	3	1300				WDFN3			DFN2020-3		PowerPAK SC706L
SOT23	-	2.9 x 1.3 x 1.0	3	250		SSD3/SS13		SOT-23		SOT23	SOT-23	SOT-23	SOT23
SOT323	SC-70	2.0 x 1.25 x 0.95	3	200		UMD3/UMT3	USM	SC-70	CMAK/CMPAK	SOT323	SOT-323	USM	SC-70 3 leads
SOT416	SC-75	1.6 x 0.8 x 0.77	3	150		EMD3/EMT3	SSM	SC-75	SMPAK	SC75			SC-75A
SOT663	-	1.6 x 1.2 x 0.55	3	300									
SOT883	SC-101	1.0 x 0.6 x 0.5	3	250			SS CSP2			TSLP-3-1	DFN1006-3		
SOT89	SC-62	4.5 x 2.5 x 1.5	3	1300		MPT3	PW-Mini	SOT-89	UPAK (SOT89)	SOT89		SOT-89	
SOT143B	-	2.9 x 1.3 x 1.0	4	250			CP4		MPAK-4R	SOT143	SOT-143		
SOT223	SC-73	6.5 x 3.5 x 1.65	4	1700				SOT-223		SOT223	SOT-223	SOT-223	SOT223

Package cross reference

types in **bold** represent new products

NXP	Industry standard names	Size (l x w x h)	Pins/ leads	P (mW)	Package	Competitor synonyms							
						Rohm	Toshiba	ON Semi	Renesas	Infineon	Diodes Inc	KEC	Vishay
SOT353	SC-88A	2.0 x 1.25 x 0.95	5	300		UMDS/UMT5	USV	SC-88A	CMPAK-5(T)			USV	SOT353
SOT665	-	1.6 x 1.2 x 0.55	5	300		EMDS/EMT5	ESV	SOT-553	VSON-5			TESV	
SOT1082	VSON6U	2.3 x 3.5 x 0.85	6	-									
SOT363	SC-88	2.0 x 1.25 x 0.95	6	300		UMDA/UMT6	US6	SC-88	CMPAK-6	SOT363	SOT-363	US6	SOT363
SOT457	SC-74	2.9 x 1.5 x 1.0	6	750		SMDA/SMT6	SM6	SC-74	TSOP-6	SC74		TSOP6	TSOP-6
SOT666	-	1.6 x 1.2 x 0.55	6	300		EMDA/EMT6	ES6	SOT-563	SMFPAK-6	SOT666	SOT563	TES6	SC89-6lead
SOT1118	-	2.0 x 2.0 x 0.65	6	1300					6 Lead DFN			DFN2020B-6	
SOT886	XSON6	1.45 x 1.0 x 0.5	6	250									
SOT891	XSON6	1.0 x 1.0 x 0.5	6	-			CS6						
SOT505	TSSOP8	3.0 x 3.0 x 1.1	8	-					TSSOP-8				TSSOP8
SOT873	HVSON8	3.3 x 3.3 x 0.85	8	1500									
SOT96	SO8	4.9 x 3.9 x 1.75	8	1500		SO8	FMB	SOIC-8 NB	SO8			FLP-8	SO8
SOT983	HXSON8	1.7 x 1.35 x 0.5	8	-							TSSOP38		
SOT1059	XSON10U	1.0 x 2.5 x 0.5	10	-									
SOT552	TSSOP10	3.0 x 3.0 x 1.1	10	-					Micro10		TSSOP10		
SOT984	HXSON12	2.5 x 1.35 x 0.5	12	-									
SOT108	SO14	8.65 x 3.9 x 1.75	14	-		SO14					DSO14		
SOT402	TSSOP14	5.0 x 4.4 x 1.1	14	-									
SOT109	SO16	9.9 x 3.9 x 1.75	16	-		SO16		SOIC-16			DSO16		FLP-16
SOT519	SSOP16	4.9 x 3.9 x 1.73	16	-									
SOT985	HXSON16	3.3 x 1.35 x 0.5	16	-					Micro10		TSSOP10		
SOT163	SO20	12.8 x 7.5 x 2.65	20	1250									
SOT360	TSSOP20	6.5 x 4.4 x 1.1	20	-					TSSOP20		TSSOP20		
SOT510	TSSOP38	9.7 x 4.4 x 1.1	38	-							TSSOP38		
SOT357	TOFP44	10 x 10 x 1	64	-									

Packages

Packing methods

Packing methods

types in bold represent new products

Package	Packing method and tape dimension	Reel dimension (d x w)	Package	Packing quantity						
				2000	2500	3000	4000	5000	6000	10000
SOD27	26 mm tape ammo pack, axial			-	-	-	-	-143	-	-
	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
	52 mm reel pack, axial			-	-	-	-	-	-	-113
SOD66	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
	52 mm reel pack, axial			-	-	-	-	-	-	-113
SOD48	26 mm tape ammo pack, axial			-	-	-	-	-143	-	-
	52 mm reel pack, axial			-	-	-	-	-	-	-113
	52 mm tape ammo pack, axial			-	-	-	-	-	-	-133
SOD80C	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-115	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	330 x 8 mm		-	-	-	-	-	-	-135
SOD87	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-115	-	-	-	-	-	-
	4 mm pitch, 8 mm tape and reel	330 x 8 mm		-	-	-	-	-	-	-135
SOD123F	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOD123W	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOD128	4 mm pitch, 12 mm tape and reel	180 x 12 mm		-	-	-115	-	-	-	-
SOD323	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOD323F	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOD523	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315
	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOD882	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315
SOD882D	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315
SOT1061	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
SOT23	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-215	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-235
SOT323	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOT416	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-115	-	-	-	-
	4 mm pitch, 8 mm tape and reel	286 x 8 mm		-	-	-	-	-	-	-135
SOT463	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-115	-	-	-
SOT883	2 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-	-	-	-315

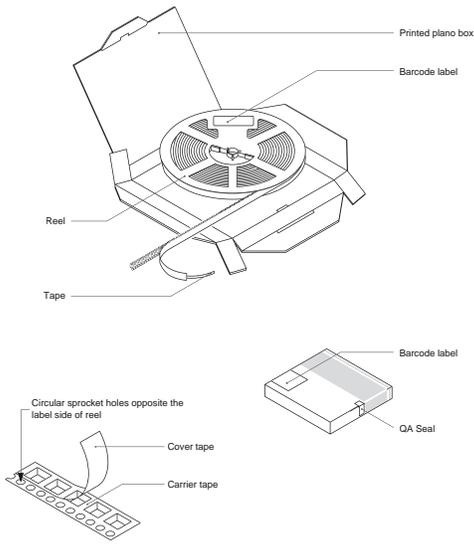
Packing methods

types in bold represent new products

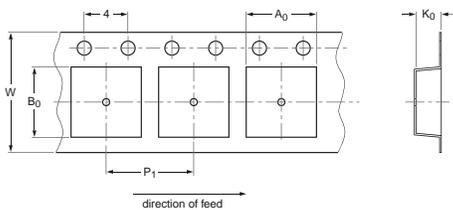
Package	Packing method and tape dimension	Reel dimension (d x w)	Taping	Package	Packing quantity									
					1000	1400	2500	3000	4000	5000	8000	10000		
SOT89	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T1		-115	-	-	-	-	-	-	-	-	-
	8 mm pitch, 12 mm tape and reel	330 x 12 mm	T1		-	-	-	-	-135	-	-	-	-	
	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T3		-146	-	-	-	-	-	-	-	-	
SOT143B	8 mm pitch, 12 mm tape and reel	180 x 12 mm	T4		-147	-	-	-	-	-	-	-	-	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-215	-	-	-	-		
SOT223	4 mm pitch, 8 mm tape and reel	286 x 8 mm			-	-	-	-	-	-	-	-	-235	
	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-115	-	-	-	-	-	-	-		
SOT353	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-	-	-135	-	-	-	-	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-		
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T1		-	-	-	-	-	-	-	-135		
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-		
SOT665	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T2		-	-	-	-	-	-	-	-	-165	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-	-	-	-315		
SOT7363	2 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-	-	-	-	-	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-		
	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T1		-	-	-	-	-	-	-	-135		
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-		
SOT457	4 mm pitch, 8 mm tape and reel	286 x 8 mm	T2		-	-	-	-	-	-	-	-	-165	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-115	-	-	-	-		
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-	-	-	-	-135		
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T2		-	-	-	-125	-	-	-	-		
SOT666	2 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-	-	-	-	-315	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm			-	-	-	-	-115	-	-	-		
SOT1118	4 mm pitch, 8 mm tape and reel	180 x 8 mm		-	-	-	-115	-	-	-	-	-		
SOT886	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T1		-	-	-	-	-	-	-	-115	-	
	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T4		-	-	-	-	-	-	-	-132	-	
SOT891	4 mm pitch, 8 mm tape and reel	180 x 8 mm	T4		-	-	-	-	-	-	-	-132	-	
SOT505	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-118	-	-	-	-	-		
SOT873	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-	-118	-	-	-	-	-	-		
SOT96	8 mm pitch, 12 mm tape and reel	180 x 12 mm			-115	-	-	-	-	-	-	-		
	8 mm pitch, 12 mm tape and reel	330 x 12 mm			-	-	-118	-	-	-	-	-		

Packing methods

Tape and reel pack for SMD packages



Carrier tape - tape and reel

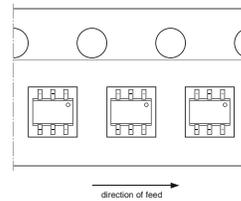


P1 = pitch (see table packing methods)
 W = tape width (see table packing methods)
 Compartment width (A₀), length (B₀) and depth (K₀) depending on package

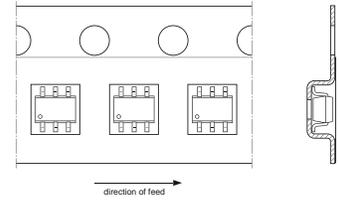
Packing methods

Product orientation (tape and reel pack) T1-T4

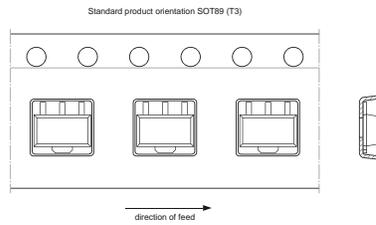
T1 taping



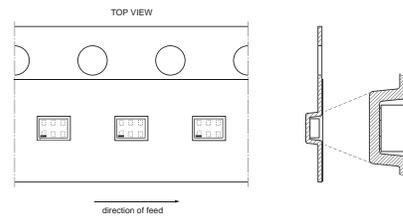
T2 taping



T3 taping

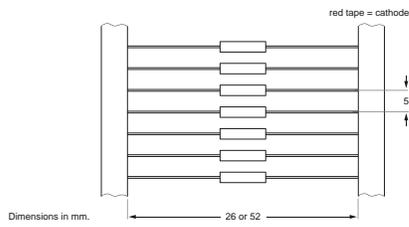
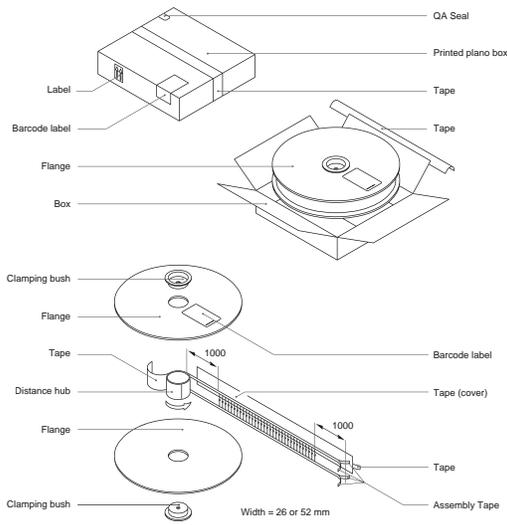


T4 taping



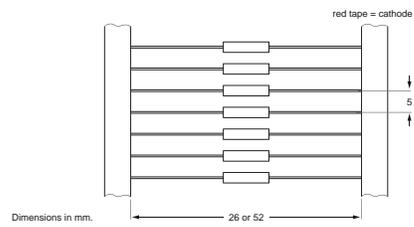
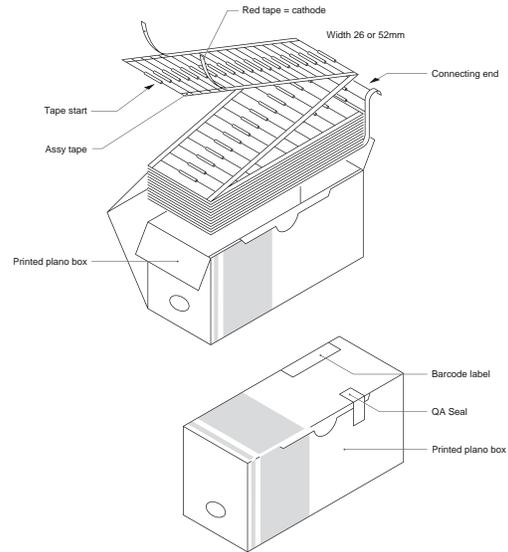
Packing methods

Reel pack axial tape for glass diodes



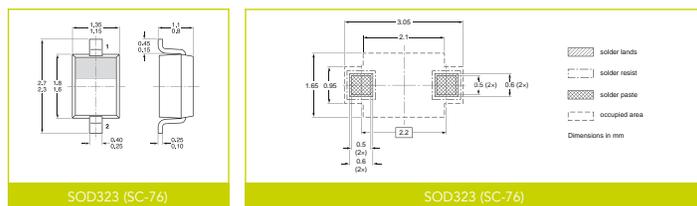
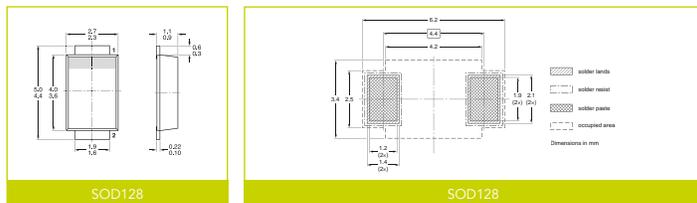
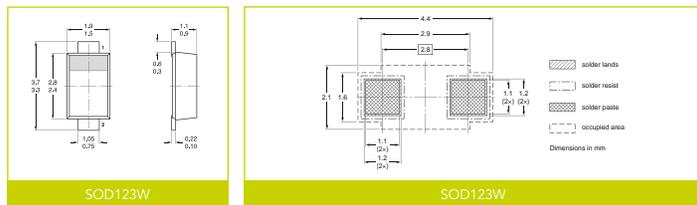
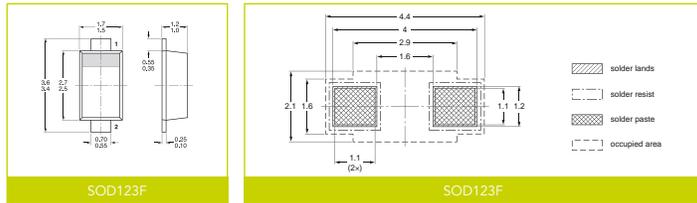
Packing methods

Ammo pack axial tape for glass diodes



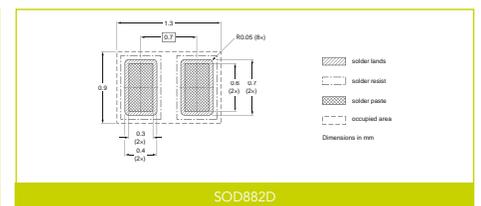
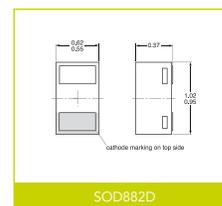
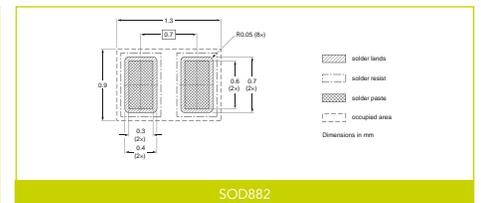
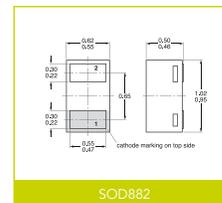
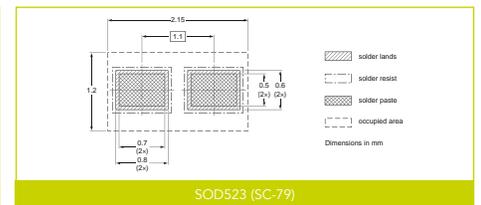
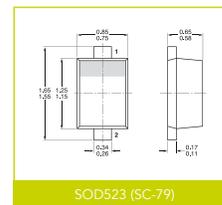
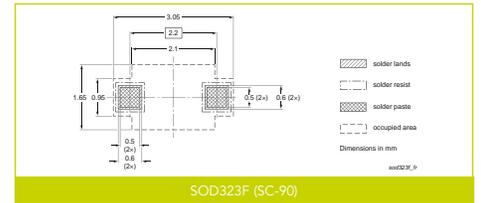
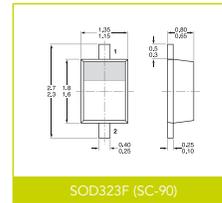
Minimized outline drawings and reflow soldering footprint

2-Pin SMD Packages



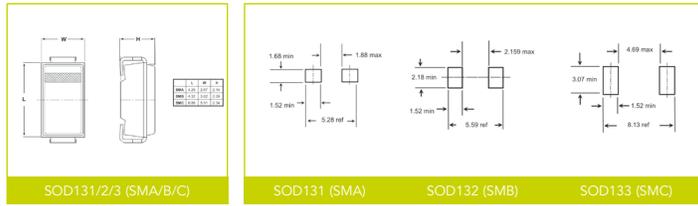
Dimensions in mm

Minimized outline drawings and reflow soldering footprint

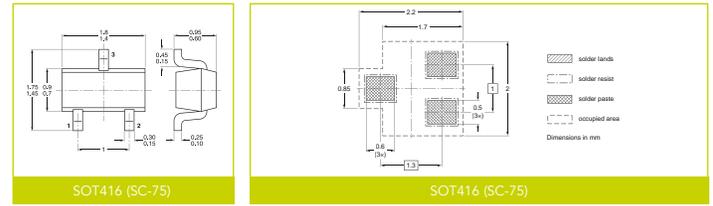


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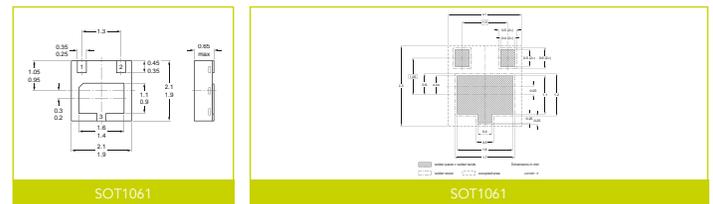
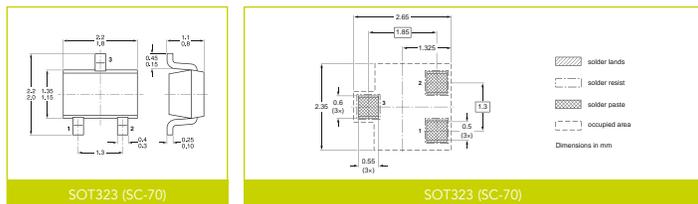
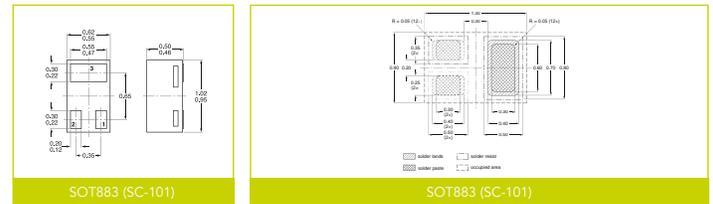
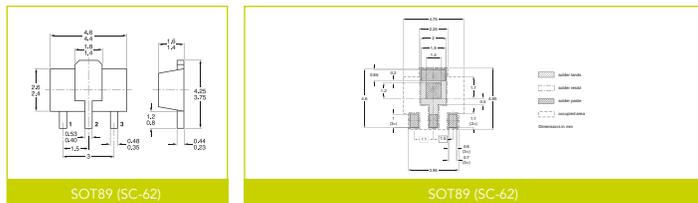
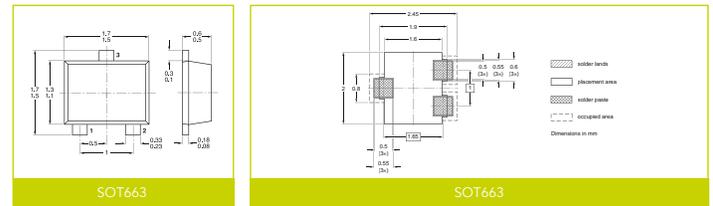
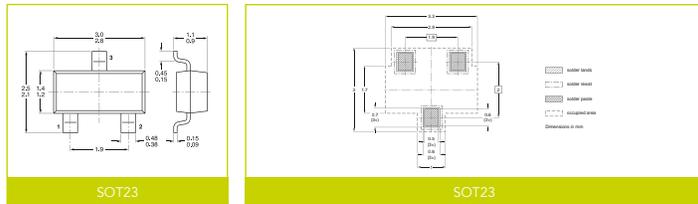
Minimized outline drawings and reflow soldering footprint



Minimized outline drawings and reflow soldering footprint



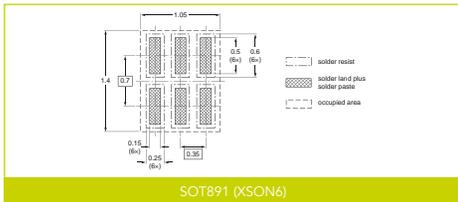
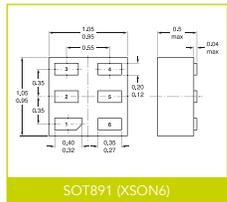
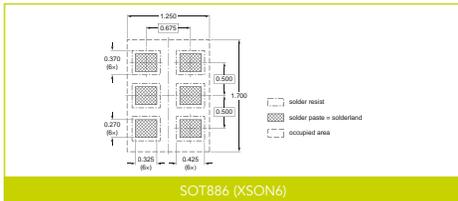
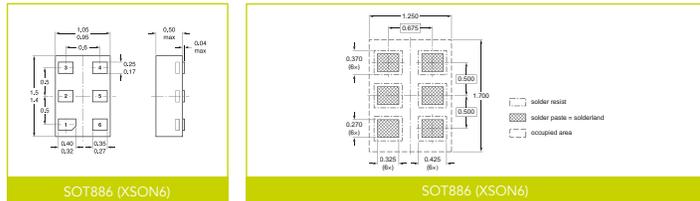
3-Pin SMD Packages



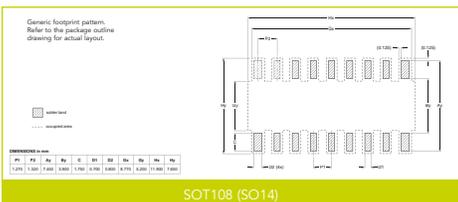
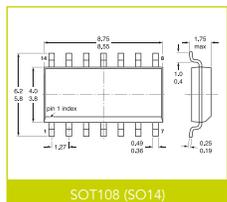
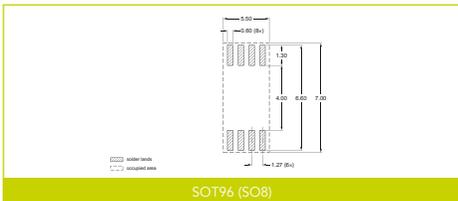
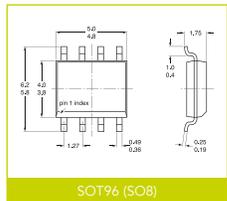
Dimensions in mm

Dimensions in mm

Minimized outline drawings and reflow soldering footprint

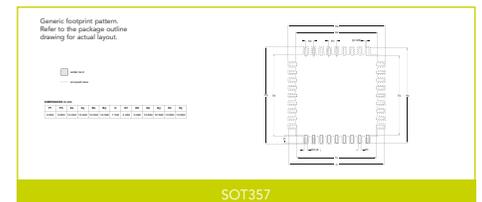
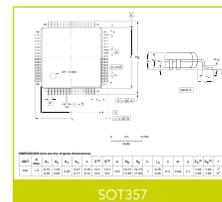
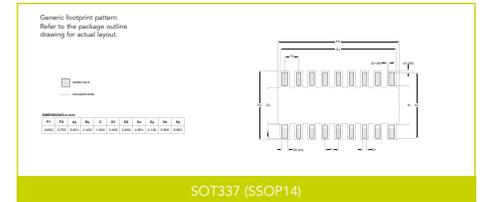
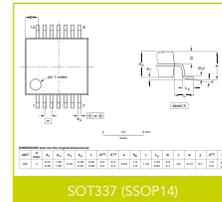
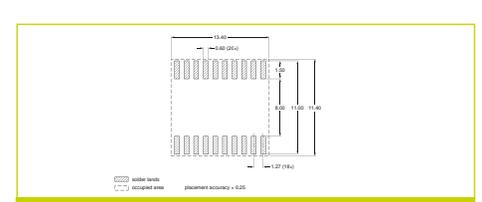
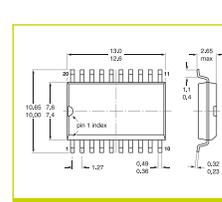
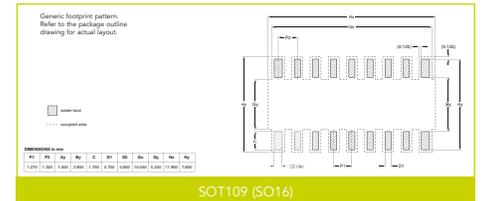
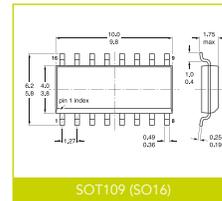


Multi-Pin SMD Packages



Dimensions in mm

Minimized outline drawings and reflow soldering footprint



Dimensions in mm

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
1N4148	18	2PD601ARW / SW	48	BA570-D6	8	BAV103	20	BC850CV	51
1N4531	18	2PD601ASL	48	BA570-D6W	9	BAV170	21	BC856 / A / B	48
1N47xxA series	16	2PD602AQL	48	BA570-07	8	BAV199	21	BC856B5	49
1P51058B2	14	2PD602ARL	48	BA570-07S	9	BAV199W	21	BC856S	49
1P5665B17	14	2PD602ASL	48	BA570-07V	9	BAV20	20	BC856T / AT / BT	48
1P5665B82	14	BAL74	18	BA570H	9	BAV21	20	BC856W / AW / BW	48
1P5705820	11	BAL99	18	BA570L	9	BAV23	20	BC857 / A / B / C	48
1P5705882	14	BA5101	20	BA570VV	9	BAV23A	20	BC857AM / BM / CM	48
1P5705884	14	BA5101S	20	BA570W	9	BAV23C	20	BC857B5	49
1P5705885	14	BA5116	21	BA570XY	9	BAV23S	20	BC857BV	49
1P5705886	14	BA5116H	21	BA5716	21	BAV70	18	BC857T / AT / BT / CT	48
1P5745823	10	BA5116T	21	BA585	8	BAV70M	19	BC857W / AW / BW / CW	48
1P5755845	9	BA516	18	BA586	8	BAV70S	19	BC858B	48
1P5765810	9	BA516H	19	BAT120A	12	BAV70T	19	BC858W	48
1P5765817	14	BA516J	19	BAT120C	12	BAV70W	19	BC859B	51
1P5765821	9	BA516L	19	BAT120S	12	BAV7565	19	BC859BV	51
1P5765840	9	BA516T	19	BAT160A	12	BAV99	18	BC859CV	51
1P5765870	9	BA516V	19	BAT160C	12	BAV99S	18	BC859CW	51
1P5795810	9	BA516VY	19	BAT160S	12	BAV99W	19	BC860B	51
1P5795817	14	BA516W	19	BAT17	14	BAV101	20	BC860BW	51
1P5795830	9	BA521	20	BAT46WH	9	BAW101S	20	BC860C	51
1P5795831	9	BA521AW	20	BAT46WJ	9	BAW156	21	BC860CV	51
1P5795840	9	BA521H	20	BAT54	8	BAW56	18	BC861B -25	65
1P5795870	9	BA521J	20	BAT54A	8	BAW56M	19	BC861B -25	65
1P5885848	9	BA521SW	20	BAT54AW	9	BAW56S	19	BCM618	50
1P5885882	14	BA521VD	20	BAT54C	8	BAW56T	19	BCM628	50
2N7002	77	BA521W	20	BAT54CM	9	BAW56W	19	BCM847B5	50
2N70028K	77	BA528	19	BAT54CV	9	BC807 / -16 / -25 / -40	48	BCM847BV	50
2N70028KM	77	BA529	21	BAT54CV	9	BC807D5	49	BCM847D5	50
2N70028KS	79	BA531	21	BAT54H	9	BC807W / -36W / -ZSW / -40W	48	BCM856B5	50
2N70028KT	77	BA5316	19	BAT54J	9	BC817 / -16 / -25 / -40	48	BCM856D5	50
2N70028KV	79	BA5321	20	BAT54L	20	BC817DPN	49	BCM857B5	50
2N70028KW	77	BA532L	18	BAT54S	8	BC817D5	49	BCM857D5	50
2N70028CK	77	BA535	21	BAT54SW	21	BC817W / -36W / -ZSW / -40W	48	BCM857D5	50
2N7002E	77	BA540	8	BAT54T	8	BC846 / A / B	48	BCP51 / -10 / -16	65
2N7002F	77	BA540-04	8	BAT54V	9	BC846BPN	49	BCP53 / -10 / -16	65
2N7002K	77	BA540-04W	9	BAT54W	9	BC846B5	49	BCP53 / -10 / -16	65
2N7002P	77	BA540-05	8	BAT54XY	9	BC846D5	49	BCP54 / -10 / -16	65
2N7002PM	77	BA540-05V	9	BAT720	10	BC846S	49	BCP55 / -10 / -16	65
2N7002PS	79	BA540-05W	9	BAT721	8	BC846T / AT / BT	48	BCP56 / -10 / -16	65
2N7002PT	77	BA540-06	8	BAT721A	8	BC846W / AW / BW	48	BCP68 / -25	65
2N7002PV	79	BA540-06W	9	BAT721C	8	BC847 / A / B / C	48	BCP69 / -16 / -25	65
2N7002PW	77	BA540-07	8	BAT721S	8	BC847AM / BM / CM	48	BCV26	51
2PA1576Q / R / S	48	BA540-07V	9	BAT74	9	BC847BPN	49	BCV27	51
2PA1774Q / R / S	48	BA540H	9	BAT74S	9	BC847B5	49	BCV28	51
2PA1774QM / RM / SM	48	BA540L	9	BAT74V	9	BC847BV	49	BCV29	51
2PB1219AQ / R / S	48	BA540W	9	BAT74X	8	BC847BVN	49	BCV46	51
2PB709ARL	48	BA540XY	9	BAT754A	8	BC847D5	49	BCV47	51
2PB709ART	48	BA5416	21	BAT754C	8	BC847T / AT / BT / CT	48	BCV48	51
2PB709ARW / SW	48	BA545A	21	BAT754L	9	BC847W / AW / BW / CW	48	BCV49	51
2PB709ASL	48	BA545AL	21	BAT754S	8	BC848B	48	BCV61A/B/C	50
2PB710ARL	48	BA5516	19	BAT760	11	BC848W	48	BCV62A/B/C	50
2PB710ASL	48	BA5521	20	BAT85	8	BC849B	51	BCV63 / B	52
2PC4081Q / R / S	48	BA556	21	BAT854AW	9	BC849BW	51	BCV64B	52
2PC4617Q / R	48	BA570	8	BAT854CW	9	BC849CV	51	BCV65 (SOT1438)	53
2PC4617QM / RM	48	BA570-04	8	BAT854SW	9	BC849CW	51	BCV71 / 72	48
2PD1820AR / S	48	BA570-04W	9	BAT854W	9	BC850B	51	BCW29 / 30	48
2PD601ARL	48	BA570-05	8	BAT86	8	BC850BW	51	BCW31 / 32 / 33	48
2PD601ART	48	BA570-05W	9	BAT960	11	BC850C	51	BCW60B / C / D	48

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
BCW68 / C / D	48	BSP32 / 33	65	BZ079 series	16	IP3254C212	36	IP4263CZ14	33
BCW69 / 70	48	BSP41	65	BZ084 series	16	IP3254C216	36	IP4264CZB-20	38
BCW71 / 72	48	BSP43	65	BZ084J series	16	IP3254C28	36	IP4264CZB-40	38
BCW89	48	BSP50	51	BZ084-y10	17	IP3337CX18/LF	36	IP4280CZ10	30
BCK17	48	BSP51	51	BZ084-y11	17	IP3338CX24/LF	36	IP4281CZ10	30
BCK18	48	BSP52	51	BZ084-y12	17	IP4025CX20/LF	32	IP4282CZ6	33
BCK19	48	BSP60	51	BZ084-y13	17	IP4027CX20/LF	32	IP4282CZ6	33
BCKX51 / -10 / -16	65	BSP61	51	BZ084-y15	17	IP4041CX25/LF	36	IP4283CZ10-TB	30
BCKX52 / -10 / -16	65	BSP62	51	BZ084-y16	17	IP4042CX5/LF	37	IP4283CZ10-TT	30
BCKX3 / -10 / -16	65	BSP89	76	BZ084-y18	49	IP4043CX5/LF	37	IP4284CZ10-TT	31
BCKX4 / -10 / -16	65	BSR14	49	BZ084-y20	48	IP4044CX8/LF	38	IP4284CZ10-TT	31
BCKX5 / -10 / -16	65	BSR16	49	BZ084-y22	47	IP4047CX6/LF	32	IP4284CZ6-TBF	31
BCKX6 / -10 / -16	65	BSR30 / 31	65	BZ084-y24	47	IP4048CX5/LF	32	IP4284CZ6-TTY	31
BCK70G / H / J / K	48	BSR33	65	BZ084-y27	17	IP4049CX5/LF	32	IP4284CZ6-TTY	31
BCK71H / J / K	48	BSR41	65	BZ084-y2V4	17	IP4051CX11/LF	38	IP4303CX4/LF	37
BF550	52	BSR42 / 43	65	BZ084-y2V7	17	IP4052CX20/LF	38	IP4305CX4/LF	37
BF570	52	BS5123	77	BZ084-y30	36	IP4053CX15/LF	36	IP4306CX2/LF	37
BF620	51	BS5192	79	BZ084-y33	17	IP4054CX15/LF	36	IP4307CX4/LF	36
BF621	51	BS563	48	BZ084-y36	17	IP4055CX6/LF	32	IP4309CX9	31
BF622	51	BS564	48	BZ084-y39	17	IP4056CX8	39	IP4310CX8	31
BF623	51	BS584	79	BZ084-y3V0	17	IP4057CX10	39	IP4323CX5/LF	36
BF720	51	BS587	77	BZ084-y3V3	17	IP4058CX8	39	IP4337CX18/LF/E	37
BF722	51	BS739	51	BZ084-y3V6	17	IP4059CX5	39	IP4338CX24/LF	36
BF723	51	BS750	51	BZ084-y3V9	17	IP4060CX1/LF	38	IP4338CX24/LF	37
BF820	51	BS751	51	BZ084-y43	17	IP4064CX8/LF/S	38	IP4342CX5/LF	37
BF820W	51	BS752	51	BZ084-y47	17	IP4065CX11	38	IP4350CX24/LF	38
BF821	51	BS760	51	BZ084-y4V3	17	IP4067CX9/LF	38	IP4352CX2/LF	36
BF822	51	BS761	51	BZ084-y4V7	17	IP4067CX6	36	IP4353CX15/LF	38
BF823	51	BS762	51	BZ084-y51	17	IP4085CX4	38	IP4355CX6/LF	32
BF824	51	BS782	77	BZ084-y56	17	IP4088CX20/LF	36	IP4358CX6	31
BF824W	52	BSV52	49	BZ084-y5V1	17	IP4110CX20/LF	32	IP4359CX4	39
BF840	52	BZA100	25	BZ084-y5V6	17	IP4125CX20/LF	32	IP4359CX4	39
BF519	52	BZA408B	25	BZ084-y62	17	IP4142CX5/LF	37	IP4361CX4/LF	37
BF520	52	BZA418A	25	BZ084-y68	17	IP4153CX15/LF	36	IP4364CX8/LF	32
BF520W	52	BZA420A	25	BZ084-y6V2	17	IP4158CX8	39	IP4364CX8/LF	38
BSH103	75	BZA456A	25	BZ084-y6V8	17	IP4220C26	43	IP4365CX11	38
BSH105	75	BZA462A	25	BZ084-y75	25	IP4220C26	40	IP4365CX11	38
BSH108	75	BZA820A	25	BZ084-y7V5	17	IP4220C26	38	IP4365CX4	38
BSH111	77	BZAB56A	25	BZ084-y8V1	17	IP4221C26-S	30	IP4366CX4	38
BSH112	77	BZAB56AL	25	BZ084-y9V1	17	IP4221C26-XS	30	IP4367CX4	38
BSH114	77	BZAB62A	25	BZ084 series	16	IP4224C26	42	IP4769CZ14	35
BSH121	77	BZAB62AL	25	E51A	15	IP4225C210	40	IP4770CZ16	35
BSH201	79	BZAB68A	25	E51B	15	IP4231C26	36	IP4771CZ16	35
BSH202	79	BZAB68AL	25	E52	15	IP4232C26	29	IP4772CZ16	35
BSH203	79	BZAB96A	25	E51G	15	IP4251C212-6	36	IP4773CZ14	35
BSH205	79	BZAB96A	25	E52A	15	IP4251C216-8	36	IP4774CZ14	35
BSH207	79	BZAB98A	25	E52B	15	IP4251C28-4	36	IP4776CZ38	34
BSN20	77	BZB100A	16	ES2D	15	IP4252C212-6	36	IP4777CZ38	34
BSP030	74	BZB784 series	16	ES2G	15	IP4252C212-6	36	IP4777CZ38	34
BSP100	74	BZB84 series	16	ES3A	15	IP4252C28-4	36	IP4790CZ38	31
BSP122	76	BZB984 series	16	ES3B	15	IP4253C212-6	36	IP4852CX25/LF	38
BSP126	76	BZT52H series	16	ES3D	15	IP4253C216-8	36	IP4853CX24/LF	38
BSP130	76	BZV49 series	16	ES3G	15	IP4253C28-4	36	IP5002CX1/LF	32
BSP139	51	BZV55 series	16	IP3047CX6	32	IP4254C212-6	36	IP5006CX11/LF	32
BSP220	79	BZV85 series	16	IP3048CX5	32	IP4254C216-8	36	IP5006CX11/LF	32
BSP225	79	BZV90 series	16	IP3219CX26	29	IP4254C28-4	36	IP5040CX11/LF	32
BSP230	79	BZX100A	16	IP3253CZ12	36	IP4254C28-F	36	IP5306CX8	32
BSP250	79	BZX384 series	16	IP3253CZ16	36	IP4254C25-W	36	IP5311CX5/LF	32
BSP31	65	BZX585 series	16	IP3253CZ28	36	IP4254C26-F	36	MMB7222A	49

Index

Type Number	Page Number								
MMBT3904	49	NZK13C	17	NZK4V3D	17	PBL2001D	61	PBSS302PX	58
MMBT3906	49	NZK14A	17	NZK4V7A	17	PBL2001S	61	PBSS302PZ	58
MMBZ10VAL	44	NZK14B	17	NZK4V7B	17	PBL2002D	61	PBSS303ND	56
MMBZ12VAL	44	NZK14C	17	NZK4V7C	17	PBL2002S	61	PBSS303NX	56
MMBZ12VOL	44	NZK15A	17	NZK4V7D	17	PBL2003D	61	PBSS303NZ	56
MMBZ15VAL	44	NZK15B	17	NZK5V1A	17	PBL2003S	61	PBSS303PD	58
MMBZ15VOL	44	NZK15C	17	NZK5V1B	17	PBL2004D	61	PBSS303PX	58
MMBZ18VAL	44	NZK15X	17	NZK5V1C	17	PBL2021D	61	PBSS303PZ	58
MMBZ18VCL	44	NZK16A	17	NZK5V1D	17	PBL2022D	61	PBSS304ND	56
MMBZ20VAL	44	NZK16B	17	NZK5V6A	17	PBL2023D	61	PBSS304NX	56
MMBZ20VCL	44	NZK16C	17	NZK5V6B	17	PBL2024D	61	PBSS304NZ	56
MMBZ27VAL	44	NZK18A	17	NZK5V6C	17	PBL24001D	61	PBSS304PD	58
MMBZ27VCL	44	NZK18B	17	NZK5V6D	17	PBL44001V	61	PBSS304PX	58
MMBZ33VAL	44	NZK18C	17	NZK5V6E	17	PBL44001Y	61	PBSS304PZ	58
MMBZ33VCL	44	NZK20A	17	NZK6V2A	17	PBL44002D	61	PBSS305ND	56
MMBZ56VAL	44	NZK20B	17	NZK6V2B	17	PBL44002V	61	PBSS305NX	56
MMBZ62VAL	44	NZK20C	17	NZK6V2C	17	PBL44002Y	61	PBSS305NZ	56
MMBZ68VAL	44	NZK22A	17	NZK6V2D	17	PBL44003D	61	PBSS305PD	58
MMBZ9V1AL	44	NZK22B	17	NZK6V2E	17	PBL44003V	61	PBSS305PX	58
NUP1301	29	NZK22C	17	NZK6V8A	17	PBL44003Y	61	PBSS305PZ	58
NX117C120Z	69	NZK24A	17	NZK6V8B	17	PBL44004D	61	PBSS306NX	56
NX117C12Z	69	NZK24B	17	NZK6V8C	17	PBL44004V	61	PBSS306NZ	56
NX117C15Z	69	NZK24C	17	NZK6V8D	17	PBL44004Y	61	PBSS306PX	56
NX117C18Z	69	NZK24X	17	NZK6V8E	17	PBL44005D	61	PBSS306PZ	58
NX117C19Z	69	NZK27A	17	NZK7V5B	17	PBL44005V	61	PBSS315SE	59
NX117C20Z	69	NZK27B	17	NZK7V5C	17	PBL44005Y	61	PBSS315SM	59
NX117C25Z	69	NZK27C	17	NZK7V5D	17	PBL44001D	61	PBSS315SV5	60
NX117C285Z	69	NZK27X	17	NZK7V5X	17	PBL44002D	61	PBSS3350E	59
NX117C33Z	69	NZK24VA	17	NZK8V2A	17	PBL44003D	61	PBSS3350M	59
NX117C50Z	69	NZK24VB	17	NZK8V2B	17	PBL44004D	61	PBSS3402INT	57
NX117CADJZ	69	NZK27VA	17	NZK8V2C	17	PBL44005D	61	PBSS4021NX	56
NX117I120Z	69	NZK27VB	17	NZK8V2D	17	PBL44021D	61	PBSS4021NZ	56
NX117I12Z	69	NZK27VC	17	NZK9V1A	17	PBL44022D	61	PBSS4021PT	59
NX117I15Z	69	NZK30A	17	NZK9V1B	17	PBL44023D	61	PBSS4021PX	58
NX117I18Z	69	NZK30B	17	NZK9V1C	17	PBL44024D	61	PBSS4021PZ	58
NX117I19Z	69	NZK30C	17	NZK9V1D	17	PBL44024E	61	PBSS4021SN	60
NX117I20Z	69	NZK30X	17	NZK9V1E	17	PBRN113ET	55	PBSS4021SP	60
NX117I25Z	69	NZK33A	17	PBH8115T	62	PBRN113ET	55	PBSS4021SPN	60
NX117I285Z	69	NZK33B	17	PBH8115Z	62	PBRN123ET	55	PBSS4032ND	56
NX117I33Z	69	NZK33C	17	PBH8140Z	62	PBRP113ET	55	PBSS4032NT	57
NX117I50Z	69	NZK36A	17	PBH8215Z	62	PBRP113ET	55	PBSS4032NX	56
NX117IADJZ	69	NZK36B	17	PBH8540T	62	PBRP123ET	55	PBSS4032NZ	56
NZH series	16	NZK36C	17	PBH8540Z	62	PBRP123YT	55	PBSS4032PD	58
NZX series	16	NZK36X	17	PBH8550Z	62	PBS2515E	62	PBSS4032PD	65
NZX10A	17	NZK39VA	17	PBH9040T	62	PBS2515M	57	PBSS4032PT	59
NZX10B	17	NZK39VB	17	PBH9040Z	62	PBS2515VFN	60	PBSS4032PX	58
NZX10C	17	NZK39VC	17	PBH9050T	62	PBS2515V5	60	PBSS4032PZ	58
NZX10D	17	NZK39VA	17	PBH9050Z	62	PBS2540E	57	PBSS4032PZ	65
NZX11A	17	NZK39VB	17	PBH9115T	62	PBS2540M	57	PBSS4032SN	60
NZX11B	17	NZK39VC	17	PBH9115X	62	PBS3301ND	56	PBSS4032SPN	60
NZX11C	17	NZK39VA	17	PBH9115Z	62	PBS3301NX	56	PBSS4032SPN	60
NZX11D	17	NZK39VB	17	PBH9215Z	62	PBS3301NZ	56	PBSS4041INT	57
NZX12A	17	NZK39VC	17	PBL1501Y	61	PBS3301PD	58	PBSS4041NX	56
NZX12B	17	NZK39VA	17	PBL1502V	61	PBS3301PX	58	PBSS4041NZ	56
NZX12C	17	NZK39VB	17	PBL1502Y	61	PBS3301PZ	58	PBSS4041PT	59
NZX12D	17	NZK39VC	17	PBL1503V	61	PBS3302ND	56	PBSS4041PX	58
NZX12X	17	NZK4VA	17	PBL1503Y	61	PBS3302NX	56	PBSS4041PZ	58
NZX13A	17	NZK4VB	17	PBL1504V	61	PBS3302NZ	56	PBSS4041SN	60
NZX13B	17	NZK4VC	17	PBL1504Y	61	PBS3302PD	58	PBSS4041SP	60

Index

Type Number	Page Number	Type Number	Page Number						
PBSS4041SPN	60	PBSS5330X	58	PDTA123JE	54	PDTC114EE	54	PDTC143XU	54
PBSS4120T	57	PBSS5350D	58	PDTA123JM	54	PDTC114EM	54	PDTC143ZE	54
PBSS4130T	57	PBSS5350S	60	PDTA123JT	54	PDTC114ET	54	PDTC143ZM	54
PBSS4140DFN	60	PBSS5350T	59	PDTA123JU	54	PDTC114EU	54	PDTC143ZT	54
PBSS4140T	57	PBSS5350X	58	PDTA123TE	54	PDTC114TE	54	PDTC143ZU	54
PBSS4140U	57	PBSS5350Z	58	PDTA123TM	54	PDTC114TM	54	PDTC144EE	54
PBSS4140V	57	PBSS5480X	58	PDTA123TT	54	PDTC114TT	54	PDTC144EM	54
PBSS4160DFN	60	PBSS5520X	58	PDTA123TU	54	PDTC114TU	54	PDTC144ET	54
PBSS4160DS	60	PBSS5540X	58	PDTA123TV	54	PDTC114TV	54	PDTC144EU	54
PBSS4160T	57	PBSS5540Z	58	PDTA123TY	54	PDTC114TY	54	PDTC144EY	54
PBSS4160U	57	PBSS5560PA	59	PDTA123YU	54	PDTC114YU	54	PDTC144TT	54
PBSS4160V	57	PBSS5580PA	59	PDTA123YV	54	PDTC114YV	54	PDTC144TU	54
PBSS4220V	57	PBSS5612PA	59	PDTA124EE	54	PDTC115EE	54	PDTC144TV	54
PBSS4230T	57	PBSS5620PA	59	PDTA124EM	54	PDTC115EM	54	PDTC144VE	54
PBSS4240DFN	60	PBSS5630PA	59	PDTA124ET	54	PDTC115ET	54	PDTC144VM	54
PBSS4240T	57	PBSS58110D	56	PDTA124EU	54	PDTC115EU	54	PDTC144VT	54
PBSS4240V	57	PBSS58110T	57	PDTA124TE	54	PDTC115TE	54	PDTC144VU	54
PBSS4240Y	57	PBSS58110X	56	PDTA124TM	54	PDTC115TM	54	PDTC144WE	54
PBSS4250X	56	PBSS58110Y	57	PDTA124TU	54	PDTC115TU	54	PDTC144WU	54
PBSS4320T	57	PBSS58110Z	56	PDTA124TV	54	PDTC115TV	54	PDTC144WT	54
PBSS4330PA	56	PBSS58510PA	57	PDTA124XE	54	PDTC123EE	54	PDTC144XU	54
PBSS4320X	56	PBSS59110D	54	PDTA124XM	54	PDTC123EM	54	PDTC113ET	55
PBSS4330X	56	PBSS59110T	59	PDTA124XT	54	PDTC123ET	54	PDTC113ZT	55
PBSS4350DFN	56	PBSS59110X	58	PDTA124XU	54	PDTC123EU	54	PDTC123ET	55
PBSS4350DFN	60	PBSS59110Y	59	PDTA143EE	54	PDTC123EE	54	PDTC123TT	55
PBSS4350S	57	PBSS59110Z	58	PDTA143EM	54	PDTC123EM	54	PDTC123YT	55
PBSS4350T	57	PBSS9410PA	59	PDTA143ET	54	PDTC123JT	54	PDZ-8 series	16
PBSS4350X	56	PDTA113EE	54	PDTA143EU	54	PDTC123JU	54	PEMB1	55
PBSS4350Z	56	PDTA113EM	54	PDTA143TE	54	PDTC123TE	54	PEMB10	55
PBSS4480X	56	PDTA113ET	54	PDTA143TM	54	PDTC123TM	54	PEMB11	55
PBSS4520X	56	PDTA113EU	54	PDTA143TU	54	PDTC123TT	54	PEMB13	55
PBSS4540X	56	PDTA113ZE	54	PDTA143TU	54	PDTC123TU	54	PEMB14	55
PBSS4540Z	56	PDTA113ZM	54	PDTA143XE	54	PDTC123YE	54	PEMB15	55
PBSS4560PA	57	PDTA113ZT	54	PDTA143XM	54	PDTC123YM	54	PEMB16	55
PBSS4580PA	57	PDTA113ZU	54	PDTA143XT	54	PDTC123YT	54	PEMB17	55
PBSS4612PA	57	PDTA114EE	54	PDTA143XU	54	PDTC123YU	54	PEMB18	55
PBSS4620PA	57	PDTA114EM	54	PDTA143ZE	54	PDTC124EE	54	PEMB19	55
PBSS4630PA	57	PDTA114ET	54	PDTA143ZM	54	PDTC124EM	54	PEMB2	55
PBSS5120T	59	PDTA114EU	54	PDTA143ZT	54	PDTC124ET	54	PEMB20	55
PBSS5130T	59	PDTA114TE	54	PDTA143ZU	54	PDTC124EU	54	PEMB24	55
PBSS5140T	59	PDTA114TM	54	PDTA144EE	54	PDTC124TE	54	PEMB3	55
PBSS5140U	59	PDTA114TT	54	PDTA144EM	54	PDTC124TM	54	PEMB30	55
PBSS5140V	59	PDTA114TU	54	PDTA144ET	54	PDTC124TU	54	PEMB4	55
PBSS5160DS	60	PDTA114YE	54	PDTA144EU	54	PDTC124YU	54	PEMB9	55
PBSS5160T	59	PDTA114YM	54	PDTA144TE	54	PDTC124YE	54	PEMD10	55
PBSS5160U	59	PDTA114YT	54	PDTA144TM	54	PDTC124TM	54	PEMD12	55
PBSS5160V	59	PDTA114YU	54	PDTA144TU	54	PDTC124TU	54	PEMD13	55
PBSS5220T	59	PDTA115EE	54	PDTA144TV	54	PDTC124TV	54	PEMD14	55
PBSS5220V	59	PDTA115EM	54	PDTA144TE	54	PDTC143EE	54	PEMD15	55
PBSS5230T	59	PDTA115ET	54	PDTA144TM	54	PDTC143EM	54	PEMD16	55
PBSS5240T	59	PDTA115EU	54	PDTA144TV	54	PDTC143ET	54	PEMD17	55
PBSS5240V	59	PDTA115TE	54	PDTA144VU	54	PDTC143EU	54	PEMD18	55
PBSS5240Y	59	PDTA115TM	54	PDTA144VU	54	PDTC143TE	54	PEMD19	55
PBSS5250T	59	PDTA115TT	54	PDTA144WU	54	PDTC143TM	54	PEMD2	55
PBSS5250X	58	PDTA115TU	54	PDTB113ET	55	PDTC143TT	55	PEMD20	55
PBSS5320D	58	PDTA123EE	54	PDTB113ZT	55	PDTC143TU	54	PEMD24	55
PBSS5320T	59	PDTA123EM	54	PDTB123ET	55	PDTC143XE	55	PEDM3	55
PBSS5320X	58	PDTA123ET	54	PDTB123TT	55	PDTC143XM	54	PEDM30	55
PBSS5330PA	59	PDTA123EU	54	PDTB123YT	55	PDTC143XT	54	PEMB4	55

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
PEMD48	55	PESD24V55UD	25	PESD5V051UB	24	PH4830L	82	PHKD3NQ10T	85
PEMD6	55	PESD24V1U1UT	43	PESD5V051UJ	24	PH48405	83	PHKD6NQ2LT	81
PEMD9	55	PESD2CAN	43	PESD5V051UL	24	PH5330E	82	PHN203	83
PEMH1	55	PESD36V52UT	25	PESD5V051ULD	24	PH5525L	80	PHN210	83
PEMH10	55	PESD3V3L1BA	26	PESD5V052BT	27	PH6303L	82	PHN210T	83
PEMH11	55	PESD3V3L1UA	26	PESD5V052UAT	25	PH6325L	80	PHP101NQ03LT	82
PEMH13	55	PESD3V3L1UB	26	PESD5V052UJ	25	PH7030L	82	PHP101NQ04T	83
PEMH14	55	PESD3V3L1UL	26	PESD5V054UD	25	PH8030L	82	PHP110NQ04LT	83
PEMH15	55	PESD3V3L2BT	27	PESD5V054UF	25	PH8230E	82	PHP110NQ08T	84
PEMH16	55	PESD3V3L2UM	27	PESD5V055UD	25	PH9025L	80	PHP119NQ06T	83
PEMH17	55	PESD3V3L4UF	27	PESD5V051BA	26	PH9030L	82	PHP143NQ04T	83
PEMH18	55	PESD3V3L4UG	27	PESD5V051BB	26	PH955L	83	PHP160NQ08T	84
PEMH19	55	PESD3V3L4UW	27	PESD5V051BL	26	PH9930L	82	PHP165NQ08T	84
PEMH2	55	PESD3V3L5UF	28	PESD5V051UA	26	PHB101NQ04T	83	PHP176NQ04T	83
PEMH20	55	PESD3V3L5UK	28	PESD5V051UB	26	PHB110NQ06LT	83	PHP18NQ10T	85
PEMH24	55	PESD3V3L5UV	28	PESD5V051UL	26	PHB110NQ08T	84	PHP18NQ11T	85
PEMH30	55	PESD3V3L5UW	28	PESD5V051UT	43	PHB119NQ06T	83	PHP191NQ04LT	83
PEMH4	55	PESD3V3S1UB	24	PESD5V052BM	27	PHB160NQ08T	84	PHP20N06T	83
PEMH7	55	PESD3V3S1UL	24	PESD5V052BT	27	PHB18NQ10T	85	PHP20NQ20T	86
PEMH9	55	PESD3V3S2UAT	25	PESD5V054BF	28	PHB191NQ06LT	83	PHP21N06LT	83
PEMT1	49	PESD3V3S2UJ	25	PESD5V054BF	28	PHB20N06T	83	PHP21N06T	83
PEMX1	49	PESD3V3S2UT	25	PESD5V058FF	28	PHB20NQ20T	86	PHP225	87
PEMZ1	49	PESD3V3S4UD	25	PESD5V058V	28	PHB21N06LT	83	PHP23NQ11T	85
PEMZ2	49	PESD3V3S4UF	25	PESD5V058F	26	PHB27NQ10T	85	PHP27NQ11T	85
PESD12V1LBA	26	PESD3V3S5UD	25	PESD5V051BB	26	PHB29N08T	84	PHP28NQ15T	86
PESD12V1L2BT	27	PESD3V3L1UA	26	PESD5V051BL	26	PHB32N06LT	84	PHP29N08T	84
PESD12V1LUA	24	PESD3V3U1UB	26	PESD5V054UF	27	PHB33NQ20T	86	PHP3055E	84
PESD12V1LUB	24	PESD3V3U1UL	26	PESD5V054UG	27	PHB45NQ10T	85	PHP30NQ15T	86
PESD12V1LUJ	24	PESD3V3U1UT	43	PESD5V054UK	27	PHB45NQ15T	86	PHP32N06LT	84
PESD12V1S1UL	24	PESD3V3V4UF	27	PESD5V054UW	27	PHB47NQ10T	85	PHP33NQ20T	86
PESD12V1S2UAT	25	PESD3V3V4UG	27	PESD5V051BL	29	PHB48NQ03LT	80	PHP34NQ11T	85
PESD12V1S2UJ	25	PESD3V3V4UK	27	PESD5V051BQ	29	PHC21025	87	PHP36NQ3LT	83
PESD12V1S2UT	25	PESD3V3V4UW	27	PESD5V051BT	29	PHC2300	87	PHP45NQ10T	85
PESD12V1S4UD	25	PESD3V3X1BL	29	PESD5V051UAB	29	PHD101NQ03LT	82	PHP45NQ10TA	85
PESD12V1S5UD	25	PESD5V0F1BL	29	PESD5V051UB	29	PHD108NQ03LT	80	PHP45NQ11T	85
PESD12V1U1UT	43	PESD5V0F5BK	31	PESD5V2S2UT	25	PHD18NQ10T	85	PHP52N06T	84
PESD15V1LBA	26	PESD5V0L1BA	26	PESD5Z12	24	PHD20N06T	83	PHP54N06T	83
PESD15V1L2BT	27	PESD5V0L1UA	26	PESD5Z2.5	24	PHD21N06LT	84	PHP75NQ08T	84
PESD15V1LUB	24	PESD5V0L1UB	26	PESD5Z3.3	24	PHD3055E	84	PHP78NQ03LT	80
PESD15V1LUL	24	PESD5V0L1UL	26	PESD5Z5.0	24	PHD34NQ10T	85	PHP79NQ08LT	84
PESD15V1S2UAT	25	PESD5V0L2BT	27	PESD5Z6.0	24	PHD34NQ03LT	83	PHP9NQ20T	86
PESD15V1S2UJ	25	PESD5V0L2UM	27	PESD5Z7.0	24	PHD38NQ02LT	80	PHT11N06LT	76
PESD15V1S2UT	25	PESD5V0L2UJ	27	PESD4V0L2UJ	27	PHD43NQ03LT	83	PHT4NQ10LT	76
PESD15V1S4UD	25	PESD5V0L4UF	27	PESD9V0V4UK	27	PHD46NQ03LT	80	PHT4NQ10T	76
PESD15V1S5UD	25	PESD5V0L4UG	27	PH1875L	84	PHD71NQ03LT	83	PHT4N06LT	76
PESD15V1U1UT	43	PESD5V0L4UW	27	PH1955L	83	PHD77NQ03T	80	PHT4N06T	76
PESD16V1F1BL	29	PESD5V0L5UF	28	PH201005	85	PHD78NQ03LT	80	PHT4NQ10T	76
PESD16V1X1UL	29	PESD5V0L5UK	28	PH2520U	80	PHD96NQ03LT	80	PHT8N06LT	76
PESD1CAN	43	PESD5V0L5UJ	28	PH2525L	80	PHD97NQ03LT	80	PHU101NQ03LT	82
PESD1FLEX	43	PESD5V0L5UW	28	PH2625L	80	PHD99NQ20T	86	PHU77NQ03T	81
PESD1LIJ	43	PESD5V0L6UAS	28	PH2925U	80	PHK04P02T	86	PHU78NQ03LT	81
PESD24V1LBA	26	PESD5V0L6UJ	28	PH3075L	84	PHK12NQ03LT	83	PHU97NQ03LT	81
PESD24V1L2BT	27	PESD5V0L7BAS	28	PH3120L	80	PHK12NQ10T	85	PHM31	55
PESD24V1LUB	24	PESD5V0L7BS	28	PH32305	82	PHK13NQ03LT	83	PHM02	55
PESD24V1LUL	24	PESD5V0S1BA	24	PH3330L	82	PHK18NQ03LT	82	PHM03	55
PESD24V1S2UAT	25	PESD5V0S1BB	24	PH3830L	82	PHK28NQ03LT	82	PHM09	55
PESD24V1S2UJ	25	PESD5V0S1BL	24	PH3855L	83	PHK31NQ03LT	82	PHM0N1	55
PESD24V1S2UT	25	PESD5V0S1BLD	24	PH4025L	80	PHK5NQ15T	87	PHM1T	49
PESD24V1S4UD	25	PESD5V0S1UA	24	PH4330L	82	PHKD13NQ03LT	83	PHM22	49

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
PLVA2600A series	16	PMEG2005EL	11	PMEG3020EP	10	PMF86532UP	79	PMST6429	48
PLVA600A series	16	PMEG2005ET	10	PMEG3020EPA	11	PMF86545SUP	79	PMST6429	48
PMBD353	14	PMEG2010AEB	11	PMEG3020EB	10	PMG3700N	75	PMST6429	48
PMBD354	14	PMEG2010AEH	11	PMEG3030EP	10	PMGD2800UN	79	PMST6429	48
PMBF170	77	PMEG2010AEJ	11	PMEG3030EP	10	PMGD2900N	79	PMST6429	48
PMB33904	49	PMEG2010AET	10	PMEG3050EP	10	PMGD3700N	79	PMST6429	48
PMB33906	49	PMEG2010BEA	11	PMEG3050EP	10	PMGD4000UN	79	PMST6429	48
PMBT2222	49	PMEG2010BER	10	PMEG4002EB	11	PMGD7805N	79	PMW117EN	75
PMBT222A	49	PMEG2010BEV	11	PMEG4002EL	11	PMGD8000LN	79	PMW2135N	77
PMBT2349	49	PMEG2010EA	11	PMEG4002EJ	11	PMK30EP	86	PMW30UN	75
PMBT2907	49	PMEG2010EH	11	PMEG4002EA	11	PMK35EP	86	PMW31XN	75
PMBT2907A	49	PMEG2010EJ	11	PMEG4005AEV	11	PMK50XP	86	PMW40UN	75
PMBT3904	49	PMEG2010EPA	11	PMEG4005EH	12	PML2605N	77	PMW45EN	75
PMBT3904M	49	PMEG2010ER	10	PMEG4005EJ	11	PML3405N	77	PMW56XN	75
PMBT3904VS	49	PMEG2010ET	10	PMEG4005EJ	11	PMT1491A	57	PMW60EN	75
PMBT3904YS	49	PMEG2010EV	11	PMEG4005ET	10	PMT1591A	59	PMW65XP	79
PMBT3906	49	PMEG2010EA	11	PMEG4010BEA	11	PMNG2UN	75	PMZ250UN	75
PMBT3906M	49	PMEG2010EH	11	PMEG4010BEV	11	PMNG3UN	75	PMZ270XN	75
PMBT3906VS	49	PMEG2010EJ	11	PMEG4010CEH	11	PMNG8UN	75	PMZ350XN	75
PMBT3906YS	49	PMEG2010EV	11	PMEG4010CEJ	11	PMNG4LN	75	PMZ390UN	75
PMBT3946YFN	49	PMEG2020A	11	PMEG4010CEH	12	PMN34UN	75	PMZ390UN	75
PMBT3946YFN	49	PMEG2020CPA	12	PMEG4010CEJ	11	PMN38EN	75	PRLL5817	10
PMBT4401	49	PMEG2020EH	11	PMEG4010EJ	11	PMN40LN	75	PRLL5818	10
PMBT4403	49	PMEG2020EJ	11	PMEG4010EP	11	PMN45EN	75	PRLL5819	10
PMBT5550	51	PMEG2020EPA	11	PMEG4010ER	10	PMN49EN	75	PRTR5V02AX	29
PMBT5551/BSR19A	51	PMEG3002AEB	11	PMEG4010ET	10	PMN50XP	79	PRTR5V02UJ	29
PMBT6428	48	PMEG3002AEL	11	PMEG4020EP	10	PMN55LN	75	PRTR5V02Z	29
PMBT6429	48	PMEG3002EJ	11	PMEG4020EPA	11	PMN520G	50	PRTR5V02Z	29
PMBT6A06	48	PMEG3002TV	12	PMEG4020EP	10	PMN520V	50	PRTR5V02Z	29
PMBTA13	51	PMEG3005AEA	11	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA14	51	PMEG3005AEB	11	PMEG4030ER	10	PMN520Y	50	PRTR5V02Z	29
PMBTA42	51	PMEG3005CT	12	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA42D5	51	PMEG3005EB	11	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA44	51	PMEG3005EH	11	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA45	62	PMEG3005EJ	11	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA56	48	PMEG3005EL	11	PMEG4030EP	10	PMN520Y	50	PRTR5V02Z	29
PMBTA64	51	PMEG3005ET	10	PMEG6010CEH	11	PMN5501G	50	PSMN005-25D	84
PMBTA92	51	PMEG3010BEA	11	PMEG6010CEJ	11	PMN5501Y	50	PSMN005-26B	80
PMD2001D	53	PMEG3010BER	10	PMEG6010CEJ	11	PMN5501Y	50	PSMN005-30K	82
PMD3001D	53	PMEG3010BER	10	PMEG6010CEJ	11	PMN5501Y	50	PSMN005-30K	82
PMD9001D	53	PMEG3010BEV	11	PMEG6010CEJ	11	PMN5501Y	50	PSMN005-30K	82
PMD9002D	53	PMEG3010CEH	11	PMEG6010CEJ	11	PMN5501Y	50	PSMN005-30K	82
PMD9003D	53	PMEG3010CEJ	11	PMEG6020EPA	11	PMR2900N	75	PSMN005-55P	83
PMD9010D	53	PMEG3010EB	11	PMEG6020EP	10	PMR3700N	75	PSMN005-75B	84
PMD9050D	53	PMEG3010EH	11	PMEG6020EP	10	PMR4000UN	77	PSMN005-75P	84
PMD9650D	79	PMEG3010EJ	11	PMEG6020EP	10	PMR7805N	75	PSMN006-20K	81
PMEG1020EA	11	PMEG3010EP	10	PMEM1505NG	62	PMSS3904	49	PSMN006-75P	84
PMEG1020EH	11	PMEG3010ER	10	PMEM1505NG	62	PMSS3906	49	PSMN008-75P	84
PMEG1020EJ	11	PMEG3010ET	10	PMEM4010ND	62	PMST2222	49	PSMN009-100B	85
PMEG1020EV	11	PMEG3010EH	11	PMEM4010ND	62	PMST2222A	49	PSMN009-100P	85
PMEG1030EJ	11	PMEG3010EJ	11	PMEM4020APD	62	PMST2369	49	PSMN010-55D	83
PMEG1030EH	11	PMEG3010EV	11	PMEM4020APD	62	PMST2907A	49	PSMN011-80YS	84
PMEG2005AEA	11	PMEG3020BER	10	PMEM4020APD	62	PMST3906	49	PSMN012-80PS	84
PMEG2005AEB	11	PMEG3020BER	10	PMEM4020APD	62	PMST4401	49	PSMN013-40YS	83
PMEG2005AEL	11	PMEG3020CEP	12	PMF280UN	75	PMST4403	49	PSMN014-40YS	83
PMEG2005AET	11	PMEG3020CEP	12	PMF370XN	75	PMST5088	48	PSMN015-100P	85
PMEG2005AEB	11	PMEG3020CEP	12	PMF370XN	75	PMST5089	48	PSMN015-110P	85
PMEG2005EJ	11	PMEG3020DEH	11	PMF3800SN	77	PMST5550	51	PSMN017-80PS	84
PMEG2005EH	11	PMEG3020EH	11	PMF400UN	75	PMST5551	51	PSMN018-80YS	84
PMEG2005EJ	11	PMEG3020EJ	11	PMF7805N	77	PMST6428	48	PSMN022-30PL	83

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
PSMN025-100D	85	PTVS12VP1UP	45	PTVS7V551UR	44	PUMT1	49	PZU9_1y	17
PSMN026-80YS	84	PTVS12V51UR	44	PTVS8V0P1UP	45	PUMX1	49	PZUx8 series	16
PSMN030-150B	86	PTVS13VP1UP	45	PTVS8V051UR	44	PUMX2	49	PZUx8A series	16
PSMN030-150P	86	PTVS13V51UR	44	PTVS8V5P1UP	45	PUMZ1	49	PZUx8L series	16
PSMN035-150B	86	PTVS14VP1UP	45	PTVS8V551UR	44	PUMZ2	49	PZUx8L2 series	16
PSMN035-150P	86	PTVS14V51UR	44	PTVS9V0P1UP	45	PVR100AD-B12V	69	RBS20530	9
PSMN038-100K	85	PTVS15VP1UP	45	PTVS9V051UR	44	PVR100AD-B2V5	69	RBS21530	9
PSMN045-80YS	84	PTVS15V51UR	44	PUMB1	55	PVR100AD-B3V0	69	RB751C540	9
PSMN050-80PS	84	PTVS16VP1UP	45	PUMB10	55	PVR100AD-B3V3	69	RB751S40	9
PSMN057-200B	86	PTVS16V51UR	44	PUMB11	55	PVR100AD-B5V0	69	RB751V40	9
PSMN057-200P	86	PTVS17VP1UP	45	PUMB13	55	PVR100AZ-B12V	69	RS1A	15
PSMN059-150Y	86	PTVS17V51UR	44	PUMB14	55	PVR100AZ-B2V5	69	RS1B	15
PSMN063-150D	86	PTVS18VP1UP	45	PUMB15	55	PVR100AZ-B3V0	69	RS1D	15
PSMN070-200B	86	PTVS18V51UR	44	PUMB16	55	PVR100AZ-B3V3	69	RS1G	15
PSMN070-200P	86	PTVS20VP1UP	45	PUMB17	55	PVR100AZ-B5V0	69	RS1J	15
PSMN085-150K	87	PTVS20V51UR	44	PUMB18	55	PXT2222A	49	RS1K	15
PSMN102-200Y	86	PTVS22VP1UP	45	PUMB19	55	PXT2907A	49	RS1M	15
PSMN130-200D	86	PTVS22V51UR	44	PUMB2	55	PXT4401	49	RS2A	15
PSMN145-200K	87	PTVS24VP1UP	45	PUMB20	55	PXT4403	49	RS2AA	15
PSMN1R2-251L	80	PTVS24V51UR	44	PUMB24	55	PXTA14	51	RS2B	15
PSMN1R3-301L	82	PTVS26VP1UP	45	PUMB3	55	PXTA42	51	RS2BA	15
PSMN1R5-251L	80	PTVS26V51UR	44	PUMB30	55	PXTA92	51	RS2D	15
PSMN1R6-301L	82	PTVS28VP1UP	45	PUMB4	55	PZT2222A	49	RS2DA	15
PSMN1R7-301L	82	PTVS28V51UR	44	PUMB9	55	PZT2907A	49	RS2G	15
PSMN1R8-301L	82	PTVS30VP1UP	45	PUMD10	55	PZT4401	49	RS2GA	15
PSMN2R0-301L	82	PTVS30V51UR	44	PUMD12	55	PZT4403	49	RS2J	15
PSMN2R0-301L	82	PTVS33VP1UP	45	PUMD13	55	PZTA14	51	RS2JA	15
PSMN2R0-40YS	83	PTVS33V51UR	44	PUMD14	55	PZTA42	51	RS2K	15
PSMN2R2-40PS	83	PTVS36VP1UP	45	PUMD15	55	PZTA44	51	RS2KA	15
PSMN2R5-301L	82	PTVS36V51UR	44	PUMD16	55	PZTA92	51	RS2M	15
PSMN2R6-40YS	83	PTVS37VP1UP	45	PUMD17	55	PZU10y	17	RS2MA	15
PSMN2R7-301L	82	PTVS37V51UR	44	PUMD18	55	PZU11y	17	RS3A	15
PSMN2R8-40PS	83	PTVS40VP1UP	45	PUMD19	55	PZU12y	17	RS3B	15
PSMN3R0-301L	82	PTVS40V51UR	44	PUMD2	55	PZU13y	17	RS3D	15
PSMN3R3-40YS	83	PTVS43VP1UP	45	PUMD20	55	PZU14y	17	RS3G	15
PSMN3R4-301L	82	PTVS43V51UR	44	PUMD24	55	PZU15y	17	RS3J	15
PSMN3R5-301L	82	PTVS45VP1UP	45	PUMD3	55	PZU16y	17	RS3K	15
PSMN4R0-301L	82	PTVS45V51UR	44	PUMD30	55	PZU18y	17	RS3M	15
PSMN4R0-40YS	83	PTVS48VP1UP	45	PUMD4	55	PZU2_4y	17	S1A	15
PSMN4R3-301L	82	PTVS48V51UR	44	PUMD48	55	PZU2_7y	17	S1B	15
PSMN4R4-80PS	84	PTVS1VP1UP	45	PUMD6	55	PZU20y	17	S1D	15
PSMN4R5-40PS	83	PTVS1V51UR	44	PUMD9	55	PZU22y	17	S1G	15
PSMN5R0-301L	82	PTVS4VP1UP	45	PUMH1	55	PZU24y	17	S1J	15
PSMN5R0-80PS	84	PTVS4V51UR	44	PUMH10	55	PZU27y	17	S1K	15
PSMN5R8-40YS	83	PTVS8VP1UP	45	PUMH11	55	PZU3_0y	17	S1M	15
PSMN6R0-301L	82	PTVS8V51UR	44	PUMH13	55	PZU3_3y	17	S2A	15
PSMN6R0-80YS	84	PTVS9VP1UP	45	PUMH14	55	PZU3_6y	17	S2B	15
PSMN6R5-80PS	84	PTVS9V51UR	44	PUMH15	55	PZU3_9y	17	S2D	15
PSMN7R0-301L	82	PTVS60VP1UP	45	PUMH16	55	PZU30y	17	S2DA	15
PSMN8R0-40PS	83	PTVS60V51UR	44	PUMH17	55	PZU33y	17	S2G	15
PSMN8R2-80YS	84	PTVS64VP1UP	45	PUMH18	55	PZU36y	17	S2GA	15
PSMN8R3-40YS	83	PTVS64V51UR	44	PUMH19	55	PZU4_3y	17	S2J	15
PSMN8R7-80PS	84	PTVS64VP1UP	45	PUMH2	55	PZU4_7y	17	S2JA	15
PSMN9R0-301L	82	PTVS64V51UR	44	PUMH20	55	PZU5_1y	17	S2K	15
PSS2021SAY	70	PTVS64V5P1UP	45	PUMH24	55	PZU5_6y	17	S2KA	15
PTVS10VP1UP	45	PTVS64V551UR	44	PUMH30	55	PZU6_2y	17	S2M	15
PTVS10V51UR	44	PTVS7V0P1UP	45	PUMH4	55	PZU6_8y	17	S2MA	15
PTVS11VP1UP	45	PTVS7V051UR	44	PUMH7	55	PZU7_5y	17	S3A	15
PTVS11V51UR	44	PTVS7V5P1UP	45	PUMH9	55	PZU8_2y	17	S3B	15

Index

Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number	Type Number	Page Number
S3D	15	TL431AQR2R	68	TL431SDT	68	TLVH431MQDB2R	68	US2JA	15
S3G	15	TL431ASDT	68	TLVH431ACDB2R	68	TLVH431QDB2R	68	US3A	15
S3J	15	TL431BCDB2R	68	TLVH431AIDB2R	68	US1A	15	US3B	15
S3K	15	TL431BIDB2R	68	TLVH431AQMDB2R	68	US1B	15	US3D	15
S3M	15	TL431BMSDT	68	TLVH431AQQDB2R	68	US1D	15	US3G	15
SI2302D5	75	TL431BQDB2R	68	TLVH431BCDB2R	68	US1G	15	US3J	15
SI2304D5	75	TL431BQDB2R	68	TLVH431BIDB2R	68	US1J	15	US3K	15
SI4410D5	83	TL431CDB2R	68	TLVH431BQDB2R	68	US1K	15	US3M	15
TL431ACDB2R	68	TL431IDB2R	68	TLVH431QQDB2R	68	US1M	15		
TL431AIDB2R	68	TL431MSDT	68	TLVH431CDB2R	68	US2DA	15		
TL431AMSDT	68	TL431QDB2R	68	TLVH431IDB2R	68	US2GA	15		



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