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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 ≤ 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
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

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) ≥ 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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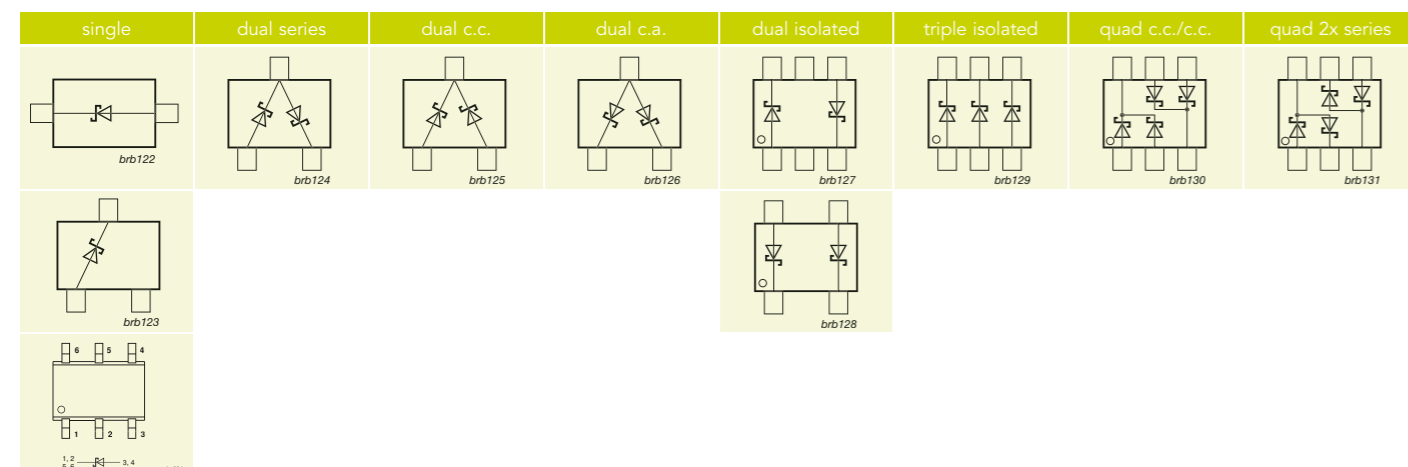
Diodes

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
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 _F max (mV)	@ I _F (mA)	I _R max (μA)	@ V _R (V)	Package	SOD80C (MiniMelf)	SOD68 (DO-34)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	SOD882/SOT883 (SC-101)					
																								
							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	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5				
							P _{tot} (mW)	300	500	250	250	830	250	300	550	400	300	150	500	250				
70	70	750	10	0.1	50	single			BAS70		BAS70H	BAS70W			1PS76SB70			1PS79SB70	BAS70L					
						dual series			BAS70-04			BAS70-04W												
						dual c.c.			BAS70-05			BAS70-05W												
						dual c.a.			BAS70-06			BAS70-06W												
						dual isolated				BAS70-07						BAS70-07S				BAS70-07V				
						triple isolated														BAS70VV				
120	40	500	10	1	30	quad 2x series									BAS70XY									
						single												RB751V40			RB751S40	RB751CS40		
						single			BAS40		BAS40H	BAS40W						1PS76SB40			1PS79SB40	BAS40L		
						dual series			BAS40-04			BAS40-04W												
						dual c.c.			BAS40-05			BAS40-05W									1PS75SB45			
						dual c.a.			BAS40-06			BAS40-06W												
200	30	300	10	30	10	dual isolated				BAS40-07							BAS40-07V							
						quad c.c./c.c.											1PS88SB48	BAS40-05V						
		quad 2x series												BAS40XY										
		single																	1PS79SB31					
		single							BAT754															
		dual series							BAT754S															
		dual c.c.							BAT754C															
		dual c.a.							BAT754A															
		triple isolated												BAT754L										
		single	BAS85	BAT85	BAT54		BAT54H	BAT54W		BAT54J	1PS76SB10		BAT54T	1PS79SB10	BAT54L									
		dual series			BAT54S			BAT54SW																
		dual c.c.			BAT54C			BAT54CW																
		dual c.a.			BAT54A			BAT54AW																
		dual isolated				BAT74				BAT74S				BAT74V										
triple isolated												BAT54VV												
quad c.c./c.c.												BAT54CV												
quad 2x series										BAT54XY														
single																		RB521S30						
single																		RB520S30						
single																								
dual series								BAT721																
dual series								BAT721S																
dual c.c.								BAT721C																
dual c.a.								BAT721A																
single																								
single																								
dual series																								
dual series																								
dual c.c.																								
dual c.c.																								
dual c.a.																								
single							BAS86	BAT86																
single										BAT46WH				BAT46WJ										

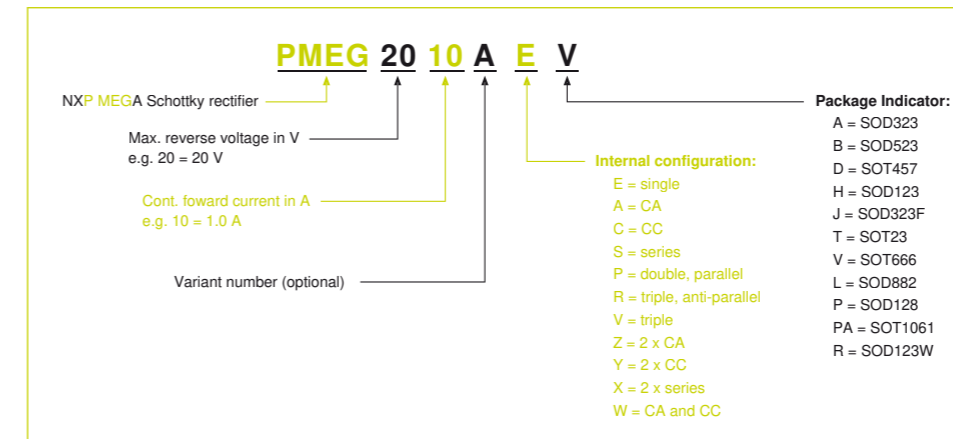


Medium power low V_F Schottky rectifiers dual ≥ 200 mA

types in **bold** represent new products

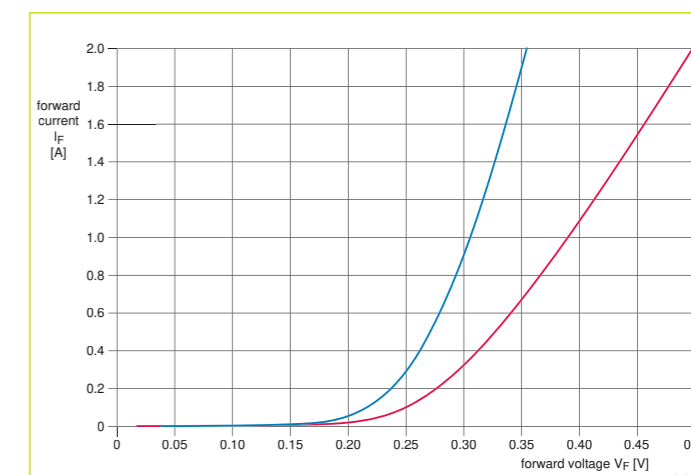
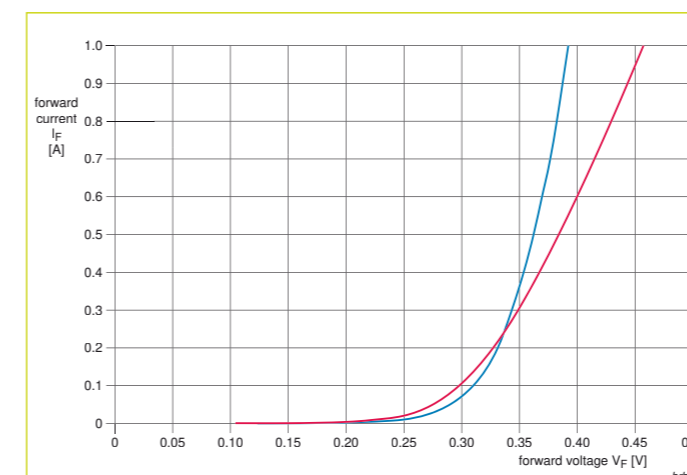
I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_F max (mA) @ V_R max	Optimization	Package	SOT223 (SC-73)	SOT23	SOT1061	SOT666	
						Size (mm)	6.5 x 3.5 x 1.65	2.9 x 1.3 x 1.0	2.0 x 2.0 x 0.65	1.6 x 1.2 x 0.55
						P_{tot} (mW)	1500	250	1000	300
0.2	30	480	0.03	low V_F	dual isolated				PMEG3002TV	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

Nomenclature of low V_F (MEGA) Schottky rectifiers



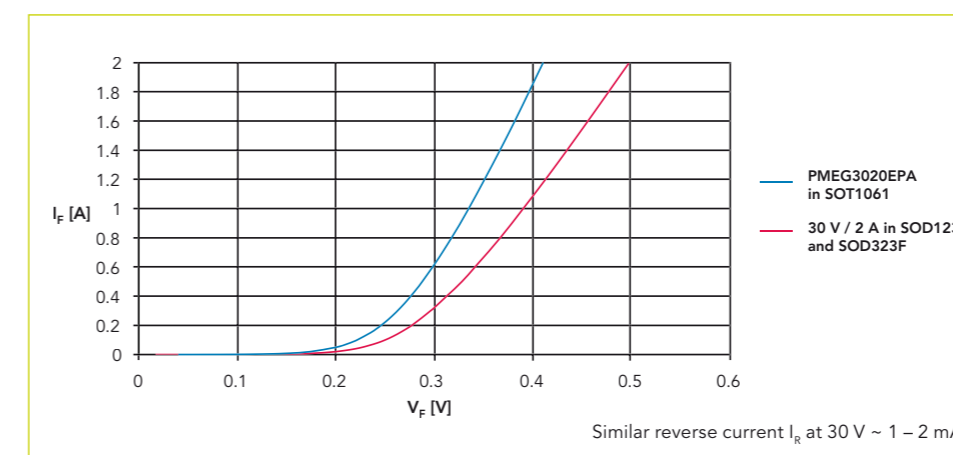
Improved forward characteristics of (MEGA) Schottky rectifiers in new packages

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










— PMEG2010BER in SOD123W with clip-bond technology
 — Equivalent type 20-V/1-A with wire-bond technology

— PMEG3020ER in SOD123W with clip-bond technology
 — Equivalent type 30-V/2-A with wire-bond technology










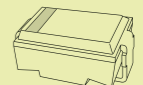
Low capacitance Schottky diodes

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

¹⁾ diodes have matched capacitance

PN rectifiers in SMA, SMB, SMC

types in **bold** represent new products

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

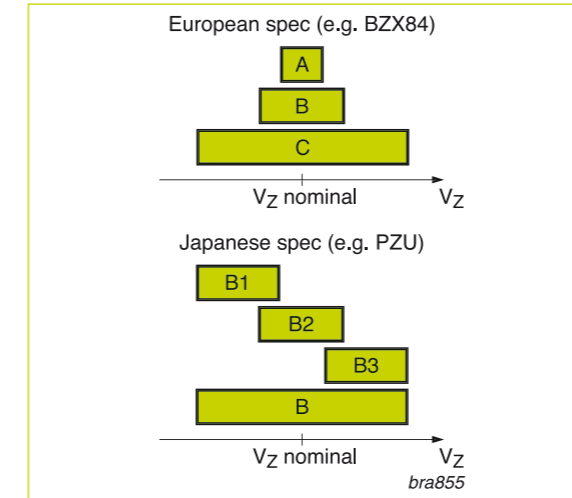
General purpose Zener diodes

types in **bold** represent new products

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

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

Differences in Zener specification



PZU-series in SOD323F, Japanese spec

y =	B-series ± 5 %	B1-series ± 2 %	B2-series ± 2 %	B3-series ± 2 %
V_z (V)	V_z (V)	V_z (V)	V_z (V)	V_z (V)
PZU2.4y	2.3 - 2.6	-	-	-
PZU2.7y	2.5 - 2.9	2.5 - 2.75	2.65 - 2.9	-
PZU3.0y	2.8 - 3.2	2.8 - 3.05	2.95 - 3.2	-
PZU3.3y	3.1 - 3.5	3.1 - 3.35	3.25 - 3.5	-
PZU3.6y	3.4 - 3.8	3.4 - 3.65	3.55 - 3.8	-
PZU3.9y	3.7 - 4.1	3.7 - 3.97	3.87 - 4.1	-
PZU4.3y	4.01 - 4.48	4.01 - 4.21	4.15 - 4.34	4.28 - 4.48
PZU4.7y	4.42 - 4.9	4.42 - 4.61	4.55 - 4.75	4.69 - 4.9
PZU5.1y	4.84 - 5.37	4.84 - 5.04	4.98 - 5.2	5.14 - 5.37
PZU5.6y	5.31 - 5.92	5.31 - 5.55	5.49 - 5.73	5.67 - 5.92
PZU6.2y	5.86 - 6.53	5.86 - 6.12	6.06 - 6.33	6.26 - 6.53
PZU6.8y	6.47 - 7.14	6.47 - 6.73	6.65 - 6.93	6.86 - 7.14
PZU7.5y	7.06 - 7.84	7.06 - 7.36	7.28 - 7.6	7.52 - 7.84
PZU8.2y	7.76 - 8.64	7.76 - 8.1	8.02 - 8.36	8.28 - 8.64
PZU9.1y	8.56 - 9.55	8.56 - 8.93	8.85 - 9.23	9.15 - 9.55
PZU10y	9.45 - 10.55	9.45 - 9.87	9.77 - 10.21	10.11 - 10.55
PZU11y	10.44 - 11.56	10.44 - 10.88	10.76 - 11.22	11.14 - 11.56
PZU12y	11.42 - 12.6	11.42 - 11.9	11.74 - 12.24	12.08 - 12.6
PZU13y	12.47 - 13.96	12.47 - 13.03	12.91 - 13.49	13.37 - 13.96
PZU14y	-	-	13.7 - 14.3	-
PZU15y	13.84 - 15.52	13.84 - 14.46	14.34 - 14.98	14.85 - 15.52
PZU16y	15.37 - 17.09	15.37 - 16.01	15.85 - 16.51	16.35 - 17.09
PZU18y	16.94 - 19.03	16.94 - 17.7	17.56 - 18.35	18.21 - 19.03
PZU20y	18.86 - 21.08	18.86 - 19.7	19.52 - 20.39	20.21 - 21.08
PZU22y	20.88 - 23.17	20.88 - 21.77	21.54 - 22.47	22.23 - 23.17
PZU24y	22.93 - 25.57	22.93 - 23.96	23.72 - 24.78	24.54 - 25.57
PZU27y	25.1 - 28.9	-	-	-
PZU30y	28 - 32	-	-	-
PZU33y	31 - 35	-	-	-
PZU36y	34 - 38	-	-	-






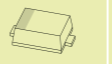






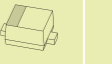






















BZX-series, European spec

y =	C-series ± 5 %	B-series ± 2 %	A-series ± 1 %
V_z (V)	V_z (V)	V_z (V)	V_z (V)
BZX84-y2V4	2.2 - 2.6	2.35 - 2.45	2.37 - 2.43
BZX84-y2V7	2.5 - 2.9	2.65 - 2.75	2.67 - 2.73
BZX84-y3V0	2.8 - 3.2	2.94 - 3.06	2.97 - 3.03
BZX84-y3V3	3.1 - 3.5	3.23 - 3.37	3.26 - 3.34
BZX84-y3V6	3.4 - 3.8	3.53 - 3.67	3.56 - 3.64
BZX84-y3V9	3.7 - 4.1	3.82 - 3.98	3.86 - 3.94
BZX84-y4V3	4 - 4.6	4.21 - 4.39	4.25 - 4.35
BZX84-y4V7	4.4 - 5	4.61 - 4.79	4.65 - 4.75
BZX84-y5V1	4.8 - 5.4	5 - 5.2	5.04 - 5.16
BZX84-y5V6	5.2 - 6	5.49 - 5.71	5.54 - 5.66
BZX84-y6V2	5.8 - 6.6	6.08 - 6.32	6.13 - 6.27
BZX84-y6V8	6.4 - 7.2	6.66 - 6.94	6.73 - 6.87
BZX84-y7V5	7 - 7.9	7.35 - 7.65	7.42 - 7.58
BZX84-y8V2	7.7 - 8.7	8.04 - 8.36	8.11 - 8.29
BZX84-y9V1	8.5 - 9.6	8.92 - 9.28	9 - 9.2
BZX84-y10	9.4 - 10.6	9.8 - 10.2	9.9 - 10.1
BZX84-y11	10.4 - 11.6	10.8 - 11.2	10.8 - 11.11
BZX84-y12	11.4 - 12.7	11.8 - 12.2	11.88 - 12.12
BZX84-y13	12.4 - 14.1	12.7 - 13.3	12.87 - 13.13
BZX84-y15	13.8 - 15.6	14.7 - 15.3	14.85 - 15.15
BZX84-y16	15.3 - 17.1	15.7 - 16.3	-
BZX84-y18	16.8 - 19.1	17.6 - 18.4	-
BZX84-y20	18.8 - 21.2	19.6 - 20.4	19.8 - 20.2
BZX84-y22	20.8 - 23.3	21.6 - 22.4	-
BZX84-y24	22.8 - 25.6	23.5 - 24.5	-
BZX84-y27	25.1 - 28.9	26.5 - 27.5	26.73 - 27.27
BZX84-y30	28 - 32	29.4 - 30.6	-
BZX84-y33	31 - 35	32.3 - 33.7	-
BZX84-y36	34 - 38	35.3 - 36.7	35.64 - 36.36
BZX84-y39	37 - 41	38.2 - 39.8	38.61 - 39.39
BZX84-y43	40 - 46	42.1 - 43.9	42.57 - 43.43
BZX84-y47	44 - 50	46.1 - 47.9	-
BZX84-y51	48 - 54	50 - 52	50.49 - 51.51
BZX84-y56	52 - 60	54.9 - 57.1	-
BZX84-y62	58 - 66	60.8 - 63.2	-
BZX84-y68	64 - 72	66.6 - 69.4	-
BZX84-y75	70 - 79	73.5 - 76.5	74.25 - 75.75

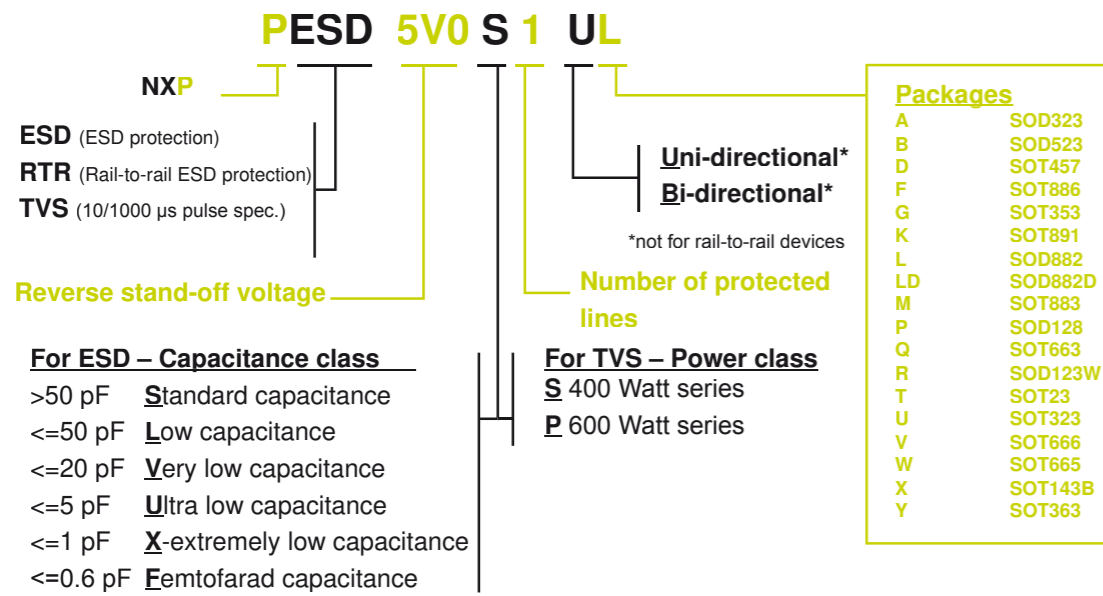
NZX-series in SOD27

	V_z (V)		V_z (V)		V_z (V)
NZX2V4A	2.3 - 2.5	NZX6V2D	6.1 - 6.4	NZX14B	13.5 - 14
NZX2V4B	2.4 - 2.6	NZX6V2E	6.3 - 6.6	NZX14C	13.8 - 14.3
NZX2V7A	2.5 - 2.7	NZX6V8A	6.4 - 6.7	NZX15A	14.1 - 14.7
NZX2V7B	2.6 - 2.8	NZX6V8B	6.6 - 6.9	NZX15B	14.5 - 15.1
NZX2V7C	2.7 - 2.9	NZX6V8C	6.7 - 7	NZX15C	14.9 - 15.5
NZX3V0A	2.8 - 3	NZX6V8D	6.9 - 7.2	NZX15X	14.35 - 15.09
NZX3V0B	2.9 - 3.1	NZX7V5A	7 - 7.3	NZX16A	15.3 - 15.9
NZX3V0C	3 - 3.2	NZX7V5B	7.2 - 7.6	NZX16B	15.7 - 16.5
NZX3V3A	3.1 - 3.3	NZX7V5C	7.3 - 7.7	NZX16C	16.3 - 17.1
NZX3V3B	3.2 - 3.4	NZX7V5D	7.5 - 7.9	NZX18A	16.9 - 17.7
NZX3V3C	3.3 - 3.5	NZX7V5X	7.07 - 7.45	NZX18B	17.5 - 18.3
NZX3V6A	3.4 - 3.6	NZX8V2A	7.7 - 8.1	NZX18C	18.1 - 19
NZX3V6B	3.5 - 3.7	NZX8V2B	7.9 - 8.3	NZX20A	18.8 - 19.7
NZX3V6C	3.6 - 3.8	NZX8V2C	8.1 - 8.5	NZX20B	19.5 - 20.4
NZX3V9A	3.7 - 3.9	NZX8V2D	8.3 - 8.7	NZX20C	20.2 - 21.2
NZX3V9B	3.8 - 4	NZX9V1A	8.5 - 8.9	NZX22A	20.9 - 21.9
NZX3V9C	3.9 - 4.1	NZX9V1B	8.7 - 9.1	NZX22B	21.6 - 22.6
NZX4V3A	4 - 4.2	NZX9V1C	8.9 - 9.3	NZX22C	22.3 - 23.3
NZX4V3B	4.1 - 4.3	NZX9V1D	9.1 - 9.5	NZX24A	22.9 - 24
NZX4V3C	4.2 - 4.4	NZX9V1E	9.3 - 9.7	NZX24B	23.6 - 24.7
NZX4V3D	4.3 - 4.5	NZX10A	9.5 - 9.9	NZX24C	24.3 - 25.5
NZX4V7A	4.4 - 4.6	NZX10B	9.7 - 10.1	NZX24X	22.61 - 23.77
NZX4V7B	4.5 - 4.7	NZX10C	9.9 - 10.3	NZX27A	25.2 - 26.6
NZX4V7C	4.6 - 4.8	NZX10D	10.2 - 10.6	NZX27B	26.2 - 27.6
NZX4V7D	4.7 - 4.9	NZX11A	10.4 - 10.8	NZX27C	27.2 - 28.6
NZX5V1A	4.8 - 5	NZX11B	10.7 - 11.1	NZX27X	26.99 - 28.39
NZX5V1B	4.9 - 5.1	NZX11C	10.9 - 11.3	NZX30A	28.2 - 29.6
NZX5V1C	5 - 5.2	NZX11D	11.1 - 11.6	NZX30B	29.2 - 30.6
NZX5V1D	5.1 - 5.3	NZX12A	11.4 - 11.9	NZX30C	30.2 - 31.6
NZX5V6A	5.2 - 5.5	NZX12B	11.6 - 12.1	NZX30X	29.02 - 30.51
NZX5V6B	5.3 - 5.6	NZX12C	11.9 - 12.4	NZX33A	31.2 - 32.6
NZX5V6C	5.4 - 5.7	NZX12D	12.2 - 12.7	NZX33B	32.2 - 33.6
NZX5V6D	5.5 - 5.8	NZX12X	11.44 - 12.03	NZX33C	33.2 - 34.5
NZX5V6E	5.6 - 5.9	NZX13A	12.4 - 12.9	NZX36A	34.2 - 35.7
NZX6V2A	5.7 - 6	NZX13B	12.6 - 13.1	NZX36B	35.3 - 36.8
NZX6V2B	5.8 - 6.1	NZX13C	12.9 - 13.4	NZX36C	36.4 - 38
NZX6V2C	6 - 6.3	NZX14A	13.2 - 13.7	NZX36X	35.36 - 37.19

General purpose switching diodes ≤ 100V

V _r max (V)	V _f max (V)	I _f (mA)	I _r max (mA)	@ V _r (V)	t _r max (ns)	Package	SOD27 (DO-35)	SOD68 (DO-34)	SOD80C (MiniMelf)	SOT23	SOT143B	SOD123F	SOT323 (SC-70)	SOT363 (SC-88)	SOD323 (SC-76)	SOD323F (SC-90)	SOT666	SOT416 (SC-75)	SOD523 (SC-79)	SOD882	SOT883 (SC-101)						
																											
							4.25 x 1.85 x 0.56	3.04 x 1.6 x 0.55	3.5 x 1.5 x 1.5	2.9 x 1.3 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.6 x 1.1	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.6 x 1.2 x 0.55	1.6 x 0.8 x 0.77	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.5						
						500	500	500	250	250	830	200	300	400	550	180	170	500	250	250							
50	1	50	100	50	4					BAL74																	
70	1	50	1000	70	4					BAL99																	
75	1	10	25	20	4			1N4531																			
		50	1000	75	4					BAS28																	
		100	5000	75	4				BAS32L																		
90	1	50	500	80	4					BAW56																	
																											
																											
100	1	50	500	80	4		1N4148																				
																											
																											
																											
																											
																											
																											
																											
																											
																											
																											
																											

Protection and signal conditioning nomenclature



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



xx:	
30:	passive ESD protection/EMI filter with integrated coils in 0.5 mm pitch CSP
32:	passive ESD protection/EMI filter with integrated coils in plastic package
33:	passive ESD protection/EMI filter with integrated coils in 0.4 mm pitch CSP
40, 41:	passive ESD protection/EMI filter in 0.5 mm pitch CSP
42:	passive ESD protection/EMI filter in plastic package
43:	passive ESD protection/EMI filter in 0.4 mm pitch CSP
47:	active device in plastic package with ESD protection/EMI filter
48:	active ESD protection/EMI filter in 0.4 mm pitch CSP
50:	passive ESD protection/EMI filter with high density capacitors in 0.5 mm pitch CSP
53:	passive ESD protection/EMI filter with high density capacitors in 0.4 mm pitch CSP



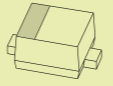

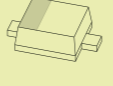
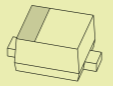



Protection and signal conditioning

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
















types in **bold** represent new products

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

^[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

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




















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

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

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

Low capacitance ESD protection devices

types in **bold** represent new products

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

types in **bold** represent new products

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

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

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

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

types in **bold** represent new products

Number of protected lines		V_{RWM} (V)	C_{in} typ (pF)	C_{in} max (pF)	ESD rating ^[2] max (kV)	I_R max (μA) @ V_{RWM}	Configuration	Type	Package	Size (mm)
Unidirectional	Bidirectional									
1	0	5	0.9	1	8	0.2		PESD5V0X1UB	SOD523 (SC-79)	1.2 x 0.8 x 0.6
		5	1.8	2	15	0.2		PESD5V0X1UAB	SOD523 (SC-79)	
		16	0.83	0.95	8	0.1		PESD16VX1UL	SOD882	1.0 x 0.6 x 0.5
1	0	5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U1T	SOT23	2.9 x 1.3 x 1.0
		5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U1T	SOT23	2.9 x 1.3 x 1.0
0	1	5.5	0.4	0.55	10	0.1		PESD5V0F1BL	SOD882	1.0 x 0.6 x 0.5
		16	0.5	0.65	8	0.1		PESD16VF1BL		
		3.3	1.3	1.6	9	0.1		PESD3V3X1BL		
		5	0.9	1.3	9	0.1		PESD5V0X1BL		
1	1	5	0.9	1.3	9	0.1		PESD5V0X1BQ	SOT663	1.6 x 1.2 x 0.55
		5	0.9	1.3	9	0.1		PESD5V0X1BT	SOT23	
		80	0.6	0.75	30	0.1	NUP1301	SOT23		
		5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2X	SOT143B	2.9 x 1.3 x 1.0
		5.5	1.8		12	0.1 (@ 3 V)		PRTR5V0U2AX		
		2	1	5.5	1	1.5	8	0.1 (@ 3 V)		PRTR5V0U2K
5.5	1			1.5	8	0.1 (@ 3 V)	PRTR5V0U2K	SOT891 (XSON6)		
5.5	1			1.5	8	0.1 (@ 3 V)		PRTR5V0U2D	SOT457 (SC-74)	2.9 x 1.5 x 1.0
5.5	1			1.5	8	0.1 (@ 3 V)		PRTR5V0U2D	SOT457 (SC-74)	
5.5	1			1.5	8	0.1 (@ 3 V)		PRTR5V0U2F	SOT886 (XSON6)	1.45 x 1.0 x 0.5
5.5	1			1.5	8	0.1 (@ 3 V)		PRTR5V0U2F	SOT886 (XSON6)	
0	7	5.5	2	-	15	-		IP4234CZ6	SOT457 (SC-74)	2.9 x 1.5 x 1.0
		5.5	1.5	-	8	-		IP3219CZ6	SOT1082-1 (VSON6U)	2.3 x 3.5 x 0.85

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

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

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

types in **bold** represent new products

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

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

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

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

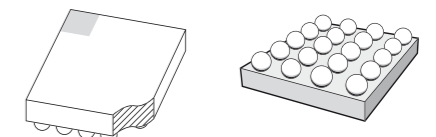
types in **bold** represent new products

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

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

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

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



Audio interfaces

types in **bold** represent new products

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


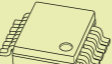



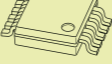

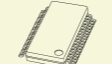
Video interfaces

types in **bold** represent new products

Baseband interface	Number of protected lines	Buffer	Level shifter	C _{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	
		-	-	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 for display port	IP4790CZ38	SOT510 (TSSOP38)	9.7 x 4.4 x 1.1
	LVDS	10	-	-	5	100	100 Ω termination	IP4263CZ14	SOT108 (SO14)	8.65 x 3.9 x 1.75
	HDMI	2	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4282CZ6	SOT886 (XSON6)	1.45 x 1.0 x 0.5
		4	-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4280CZ10	SOT552 (TSSOP10)	3.0 x 3.0 x 1.1
			-	-	0.7	-	ESD protection for ultra high speed interfaces	IP4281CZ10	SOT1059 (XSON10U)	1.0 x 2.5 x 0.5







Video interfaces

types in **bold** represent new products

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

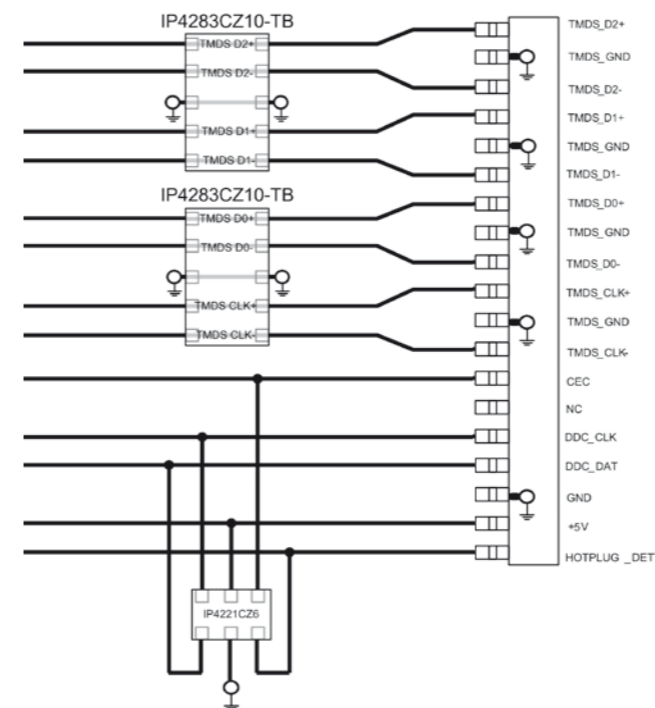
Video interfaces

types in **bold** represent new products

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




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

HDMI ESD protection using IP4283CZ10-TB and IP4221CZ6-S



Multichannel EMI filter, ESD protection for LCD and camera

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)	
		R _{line}	C _{line} (pF)						
LCD display, camera, keypad	1	75 Ω	36	~40	EMI filter, ESD protection with common ground	IP4307CX4/LF	4 ball CSP	0.76 x 0.76 x 0.61	
		100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ3-M	SOT883 (SC-101)	1.0 x 0.6 x 0.5	
	2	100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ5-W	SOT665	1.6 x 1.2 x 0.5	
		100 Ω	30	~40	EMI filter, ESD protection	IP4256CZ6-F	SOT886 (XSON6)	1.45 x 1.0 x 0.5	
	4	100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ8-4	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5	
		40 Ω	18	~70	EMI filter, ESD protection	IP4252CZ8-4		1.7 x 1.35 x 0.5	
		100 Ω	45	~30	EMI filter, ESD protection	IP4254CZ8-4		1.7 x 1.35 x 0.5	
		200 Ω	45	~30	EMI filter, ESD protection	IP4253CZ8-4		1.7 x 1.35 x 0.5	
	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		15 ball CSP	2.96 x 1.32 x 0.65
		100 Ω	30	~40	EMI filter, ESD protection	IP4153CX15/LF		15 ball CSP	2.91 x 1.28 x 0.65
	100 Ω	60	~20	EMI filter, ESD protection	IP4353CX15/LF	15 ball CSP		2.38 x 1.05 x 0.61	
	7	70 Ω	25	~40	EMI filter, ESD protection, extremely small size	IP4337CX18/LF/E	18 ball CSP	1.96 x 1.61 x 0.61	
		125 Ω	25	~60	60 nH coils RLC filter	IP3337CX18/LF		2.11 x 1.81 x 0.61	
	8	100 Ω	15	~50	EMI filter, ESD protection	IP4251CZ16-8	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5	
		40 Ω	18	~70	EMI filter, ESD protection	IP4252CZ16-8		3.3 x 1.35 x 0.5	
		100 Ω	45	~30	EMI filter, ESD protection	IP4254CZ16-8		3.3 x 1.35 x 0.5	
		200 Ω	45	~20	EMI filter, ESD protection	IP4253CZ16-8		3.3 x 1.35 x 0.5	
		100 Ω	50	~25	EMI filter, ESD protection	IP4088CX20/LF		20 ball CSP	3.91 x 1.28 x 0.65
	125 Ω	25	~60	60 nH coils RLC filter	IP3338CX24/LF			2.11 x 2.11 x 0.61	
	10	70 Ω	25	~40	EMI filter, ESD protection, extremely small size	IP4338CX24/LF	24 ball CSP	1.96 x 2.01 x 0.61	
		200 Ω	50	~20	EMI filter, ESD protection	IP4041CX25/LF	25 ball CSP	2.41 x 2.41 x 0.65	
	4	-	25	~175	LC low-pass filter	IP3253CZ8	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5	
	6	-	25	~175	LC low-pass filter	IP3253CZ12	SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5	
	8	-	25	~175	LC low-pass filter	IP3253CZ16	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5	
	4	-	25	~175	LC low-pass filter	IP3254CZ8	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5	
	6	-	25	~175	LC low-pass filter	IP3254CZ12	SOT984 (12 pin QFN)	2.5 x 1.35 x 0.5	
	8	-	25	~175	LC low-pass filter	IP3254CZ16	SOT985 (16 pin QFN)	3.3 x 1.35 x 0.5	



Multichannel EMI filter, ESD protection for LCD and camera

types in **bold** represent new products

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

SD-, SIM-card and MMC

types in **bold** represent new products

Baseband interface	Number of protected lines	Line small-signal equivalents		Digital interface clock speed (MHz)	Remark	Type	Package	Size (mm)
		R _{line}	C _{line} (pF)					
SIM card	3 + 2	47 Ω / 100 Ω	10	~20	Integrated low capacitance SIM-card passive filter array & USB ESD protection	IP4365CX11	11 ball CSP	1.16 x 1.56 x 0.61
	3	47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4044CX8/LF	8 ball CSP	1.46 x 1.49 x 0.65
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4064CX8/LF/S		1.41 x 1.41 x 0.65
		47 Ω / 100 Ω	20	~20	Smaller size, integrated SIM-card EMI filter and ESD protection	IP4364CX8/LF		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	10	~20	Smaller size, low capacitance integrated SIM-card EMI filter and ESD protection	IP4366CX8/LF		1.16 x 1.16 x 0.61
		47 Ω / 100 Ω	40	~12	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-40	SOT983 (8 pin QFN)	1.7 x 1.35 x 0.5
		47 Ω / 100 Ω	20	~20	Integrated SIM-card EMI filter and ESD protection	IP4264CZ8-20		1.7 x 1.35 x 0.5
		-	1	~240	Quad channel low capacitance ESD protection	IP4221CZ6-S	SOT886 (XSON6)	
SD-card / MMC	4	47 Ω / 13 k Ω / 56 k Ω	25	~30	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP	1.44 x 1.96 x 0.65
		50 Ω / 75 k Ω / 7 k Ω	18	~50	High-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	16 ball CSP	1.96 x 1.97 x 0.65
	7	40 Ω / 50 k Ω / 25 k Ω	18	~20	(Mini) SD/trans flash card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	20 ball CSP	2.54 x 1.96 x 0.65
		-	5	~24	Memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP	1.46 x 1.52 x 0.65
	6 (+3)	15 Ω / 50 k Ω / 15 k Ω	8	> 52	Very low capacitance, low channel resistance (mini) SD card/trans flash ESD protection EMI filter, pull-up resistor	IP4350CX24/LF	24 ball CSP	1.95 x 2.11 x 0.61
		40 Ω / 50 k Ω / 15 k Ω	20	> 52	(Mini) SD card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF		2.02 x 2.01 x 0.61
		-	-	> 52	(Mini) SD/SDIO memory card level shifter, can be combined with IP4352CX24/LF	IP4852CX25/LF	25 ball CSP	2.01 x 2.01 x 0.61
		40 Ω / 50 k Ω / 15 k Ω	-	> 52	(Mini) SD/SDIO memory card level shifter, and voltage regular, incl. ESD and EMI filter	IP4853CX24/LF	24 ball CSP	2.01 x 2.01 x 0.61

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





Battery and charger protection

types in **bold** represent new products

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

USB, LVDS, SATA, LAN









types in **bold** represent new products

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

Protection and signal conditioning











USB, LVDS, SATA, LAN

types in **bold** represent new products

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

USB, LVDS, SATA, LAN











types in **bold** represent new products

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

Protection and signal conditioning




USB, LVDS, SATA, LAN

types in **bold** represent new products

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

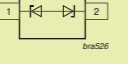
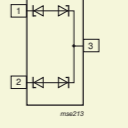
USB, LVDS, SATA, LAN

types in **bold** represent new products

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

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

Automotive LIN/CAN/FlexRay

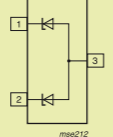

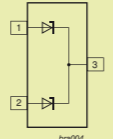
Number of protected lines bidirectional	V_{RWM} (V)	C_{line} typ (pF)	C_{line} max (pF)	$P_{PP}^{(1)}$ max (W)	ESD rating ⁽²⁾ max (kV)	I_p max [μ A] @ V_{RWM}	Configuration	Type	Package	Size (mm)
1	15 (diode 1) 24 (diode 2)	13	17	160	23	0.05		PESD1LIN	SOD323 (SC-76) 	1.7 x 1.25 x 0.95
2	24	11	17	200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

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

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

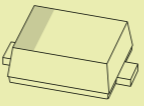
TVS diodes, 24 W / 40 W

types in **bold** represent new products

Power (W) (10/1000 μ s waveform) ^[1]	V_{Rmax} (V)	V_{Rmin} (V) @ I_R	V_{Rtyp} (V) @ I_R	V_{Rmax} (V) @ I_R	I_R (mA)	ESD rating ^[2] max (kV)	C_{int} typ (pF)	V_{Cl} max (V) @ I_{pp}	I_{pp} (A)	I_{Rmax} (A) @ V_{Rmax}	Configuration	Type	Package	Size (mm)
24	3	5.32	5.6	5.88	20	30	210	8	3	5		MMBZ5V6AL		2.9 x 1.3 x 1.0
	3	5.89	6.2	6.51	1	30	175	8.7	2.76	0.2		MMBZ6V2AL		
	4.5	6.48	6.8	7.14	1	30	150	9.6	2.5	0.3		MMBZ6V8AL		
	6	8.65	9.1	9.56	1	30	155	14	1.7	0.1		MMBZ9V1AL		
	6.5	9.5	10	10.5	1	30	130	14.2	1.7	0.02		MMBZ10VAL		
40	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VAL		
	12	14.25	15	15.75	1	30	85	21	1.9	0.005		MMBZ15VAL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VAL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VAL		
	22	25.65	27	28.35	1	30	48	40	1	0.005		MMBZ27VAL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VAL		
	8.5	11.4	12	12.6	1	30	110	17	2.35	0.005		MMBZ12VDL		
	12.8	14.3	15	15.8	1	30	85	21.2	1.9	0.005		MMBZ15VDL		
	14.5	17.1	18	18.9	1	30	70	25	1.6	0.005		MMBZ18VCL		
	17	19	20	21	1	30	65	28	1.4	0.005		MMBZ20VCL		
	22	25.65	27	28.35	1	30	48	38	1	0.005		MMBZ27VCL		
	26	31.35	33	34.65	1	30	45	46	0.87	0.005		MMBZ33VCL		

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

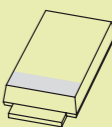
TVS diodes, 400 W

Power (W) (10/1000 μ s waveform) ^[1]	V_{Rmax} (V)	V_{Rmin} (V) @ I_R	V_{Rtyp} (V) @ I_R	V_{Rmax} (V) @ I_R	I_R (mA)	V_{Cl} max (V) @ I_{pp}	I_{pp} (A)	I_{Rmax} (A) @ V_{Rmax}	I_{Rmax} (A) @ V_{Rmax}	Type	Package	Size (mm)
350	3.5	5.20	5.60	6.00	10	8.0	43.8	5	600	PTVS3V3S1UR		2.6 x 1.7 x 1.0
400	5.0	6.40	6.70	7.00	10	9.2	43.5	5	400	PTVS5V0S1UR		
	6.0	6.67	7.02	7.37	10	10.3	38.8	5	400	PTVS6V0S1UR		
	6.5	7.22	7.60	7.98	10	11.2	35.7	5	250	PTVS6V5S1UR		
	7.0	7.78	8.20	8.60	10	12.0	33.3	3	100	PTVS7V0S1UR		
	7.5	8.33	8.77	9.21	1	12.9	31.0	0.2	50	PTVS7V5S1UR		
	8.0	8.89	9.36	9.83	1	13.6	29.4	0.03	25	PTVS8V0S1UR		
	8.5	9.44	9.92	10.40	1	14.4	27.8	0.01	10	PTVS8V5S1UR		
	9.0	10.00	10.55	11.10	1	15.4	26.0	0.005	5	PTVS9V0S1UR		
	10	11.10	11.70	12.30	1	17.0	23.5	0.005	2.5	PTVS10VS1UR		
	11	12.20	12.85	13.50	1	18.2	22.0	0.005	2.5	PTVS11VS1UR		
	12	13.30	14.00	14.70	1	19.9	20.1	0.005	2.5	PTVS12VS1UR		
	13	14.40	15.15	15.90	1	21.5	18.6	0.001	0.1	PTVS13VS1UR		
	14	15.60	16.40	17.20	1	23.2	17.2	0.001	0.1	PTVS14VS1UR		
	15	16.70	17.60	18.50	1	24.4	16.4	0.001	0.1	PTVS15VS1UR		
	16	17.80	18.75	19.70	1	26.0	15.4	0.001	0.1	PTVS16VS1UR		
	17	18.90	19.90	20.90	1	27.6	14.5	0.001	0.1	PTVS17VS1UR		
	18	20.00	21.00	22.10	1	29.2	13.7	0.001	0.1	PTVS18VS1UR		
	20	22.20	23.35	24.50	1	32.4	12.3	0.001	0.1	PTVS20VS1UR		
	22	24.40	25.60	26.90	1	35.5	11.3	0.001	0.1	PTVS22VS1UR		
	24	26.70	28.10	29.50	1	38.9	10.3	0.001	0.1	PTVS24VS1UR		
	26	28.90	30.40	31.90	1	42.1	9.5	0.001	0.1	PTVS26VS1UR		
	28	31.10	32.80	34.40	1	45.4	8.8	0.001	0.1	PTVS28VS1UR		
	30	33.30	35.10	36.80	1	48.4	8.3	0.001	0.1	PTVS30VS1UR		
33	36.70	38.70	40.60	1	53.3	7.5	0.001	0.1	PTVS33VS1UR			
36	40.00	42.10	44.20	1	58.1	6.9	0.001	0.1	PTVS36VS1UR			
40	44.40	46.80	49.10	1	64.5	6.2	0.001	0.1	PTVS40VS1UR			
43	47.80	50.30	52.80	1	69.4	5.8	0.001	0.1	PTVS43VS1UR			
45	50.00	52.65	55.30	1	72.7	5.5	0.001	0.1	PTVS45VS1UR			
48	53.30	56.10	58.90	1	77.4	5.2	0.001	0.1	PTVS48VS1UR			
51	56.70	59.70	62.70	1	82.4	4.9	0.001	0.1	PTVS51VS1UR			
54	60.00	63.15	66.30	1	87.1	4.6	0.001	0.1	PTVS54VS1UR			
58	64.40	67.80	71.20	1	93.6	4.3	0.001	0.1	PTVS58VS1UR			
60	66.70	70.20	73.70	1	96.8	4.1	0.001	0.1	PTVS60VS1UR			
64	71.10	74.85	78.60	1	103.0	3.9	0.001	0.1	PTVS64VS1UR			

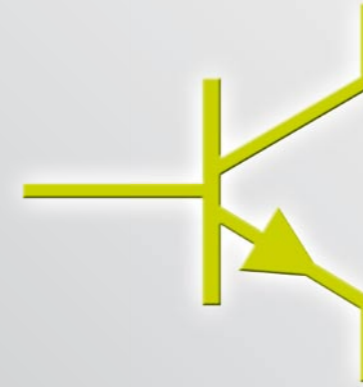
^[1] 10/1000 μ s acc. to IEC 61643-321

TVS diodes, 600 W

types in **bold** represent new products

Power (W) (10/1000 μ s waveform) ^[1]	V_{Rmax} (V)	V_{Rmin} (V) @ I_R	V_{Rtyp} (V) @ I_R	V_{Rmax} (V) @ I_R	I_R (mA)	V_{Cl} max (V) @ I_{pp}	I_{pp} (A)	I_{Rmax} (A) @ V_{Rmax}	I_{Rmax} (A) @ V_{Rmax}	Type	Package	Size (mm)
600	3.5	5.20	5.60	6.00	10	8	75	5	600	PTVS3V3P1UP		3.8 x 2.6 x 1.0
	5	6.40	6.70	7.00	10	9.2	65.2	5	400	PTVS5V0P1UP		
	6	6.67	7.02	7.37	10	10.3	58.3	5	400	PTVS6V0P1UP		
	6.5	7.22	7.60	7.98	10	11.2	53.6	5	250	PTVS6V5P1UP		
	7	7.78	8.20	8.60	10	12	50	3	100	PTVS7V0P1UP		
	7.5	8.33	8.77	9.21	1	12.9	46.5	0.2	50	PTVS7V5P1UP		
	8	8.89	9.36	9.83	1	13.6	44.1	0.03	25	PTVS8V0P1UP		
	8.5	9.44	9.92	10.40	1	14.4	41.7	0.01	10	PTVS8V5P1UP		
	9	10.00	10.55	11.10	1	15.4	39	0.005	5	PTVS9V0P1UP		
	10	11.10	11.70	12.30	1	17	35.3	0.005	2.5	PTVS10VP1UP		
	11	12.20	12.85	13.50	1	18.2	33	0.005	2.5	PTVS11VP1UP		
	12	13.30	14.00	14.70	1	19.9	30.2	0.005	2.5	PTVS12VP1UP		
	13	14.40	15.15	15.90	1	21.5	27.9	0.001	0.1	PTVS13VP1UP		
	14	15.60	16.40	17.20	1	23.2	25.9	0.001	0.1	PTVS14VP1UP		
	15	16.70	17.60	18.50	1	24.4	24.6	0.001	0.1	PTVS15VP1UP		
	16	17.80	18.75	19.70	1	26	23.1	0.001	0.1	PTVS16VP1UP		
	17	18.90	19.90	20.90	1	27.6	21.7	0.001	0.1	PTVS17VP1UP		
	18	20.00	21.00	22.10	1	29.2	20.5	0.001	0.1	PTVS18VP1UP		
	20	22.20	23.35	24.50	1	32.4	18.5	0.001	0.1	PTVS20VP1UP		
	22	24.40	25.60	26.90	1	35.5	16.9	0.001	0.1	PTVS22VP1UP		
	24	26.70	28.10	29.50	1	38.9	15.4	0.001	0.1	PTVS24VP1UP		
	26	28.90	30.40	31.90	1	42.1	14.2	0.001	0.1	PTVS26VP1UP		
	28	31.10	32.80	34.40	1	45.4	13.2	0.001	0.1	PTVS28VP1UP		
	30	33.30	35.10	36.80	1	48.4	12.4	0.001	0.1	PTVS30VP1UP		
	33	36.70	38.70	40.60	1	53.3	11.3	0.001	0.1	PTVS33VP1UP		
	36	40.00	42.10	44.20	1	58.1	10.3	0.001	0.1	PTVS36VP1UP		
	40	44.40	46.80	49.10	1	64.5	9.3	0.001	0.1	PTVS40VP1UP		
	43	47.80	50.30	52.80	1	69.4	8.6	0.001	0.1	PTVS43VP1UP		
	45	50.00	52.65	55.30	1	72.7	8.3	0.001	0.1	PTVS45VP1UP		
	48	53.30	56.10	58.90	1	77.4	7.8	0.001	0.1	PTVS48VP1UP		
	51	56.70	59.70	62.70	1	82.4	7.3	0.001	0.1	PTVS51VP1UP		
	54	60.00	63.15	66.30	1	87.1	6.9	0.001	0.1	PTVS54VP1UP		
	58	64.40	67.80	71.20	1	93.6	6.4	0.001	0.1	PTVS58VP1UP		
60	66.70	70.20	73.70	1	96.8	6.2	0.001	0.1	PTVS60VP1UP			
64	71.10	74.85	78.60	1	103	5.8	0.001	0.1	PTVS64VP1UP			

^[1] 10/1000 μ s 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_{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

Single transistors

Package						SOT23	SOT323 (SC-70)	SOT416 (SC-75)	SOT883 (SC-101)	
Size (mm)						2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	1.6 x 0.8 x 0.77	1.0 x 0.6 x 0.5	
P _{tot} (mW)						250	200	150	250	
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)					
NPN	25	100	450	1200	100		PMST5089			
	30	100	110 - 200	450 - 800	100	BC848B	BC848W			
			350	900	100		PMST5088			
	32	100	110 - 420	220 - 800	100	BCW31 / 32 / 33				
			180 - 380	310 - 630	250	BCW60B / C / D				
	40	100	120 - 270	270 - 560	100				2PC4617QM / RM	
	45	100	110 - 420	220 - 800	100	BC847 / A / B / C	BC847W / AW / BW / CW	BC847T / AT / BT / CT	BC847AM / BM / CM	
			120 - 380	220 - 630	100	BCX70G / H / J / K				
			110 - 200	220 - 450	100	BCW71 / 72				
	50	100	210 - 290	340 - 460	100 - 150	2PD601ART 2PD601ARL 2PD601ASL	2PD601ARW / SW			
			250	650	100	PMBT6428	PMST6428			
	60	100	110 - 200	220 - 450	100	BCV71 / 72				
	65	100	110 - 200	220 - 450	100	BC846 / A / B	BC846W / AW / BW	BC846T / AT / BT		
	80	100	20	80	60	BSS64				
	50	150	120 - 270	270 - 560	100		2PC4081Q / R / S	2PC4617Q / R		
	45	500	100 - 250	250 - 600	100	BC817 / -16 / -25 / -40	BC817W / -16W / -25W / -40W			
			100	600	100	BCX19				
	50	500	85 - 170	170 - 340	140 - 180	2PD602AQL 2PD602ARL 2PD602ASL	2PD1820AR / S			
	60	500	50	-	100		PMSTA05			
	80	500	100	-	100	PMBTA06	PMSTA06			
PNP	30	100	125 - 220	500 - 800	100	BC858B	BC858W			
	32	100	120 - 215	260 - 500	100	BCW29 / 30				
			180 - 380	310 - 630	100	BCW61B / C / D				
	40	100	120 - 270	270 - 560	100				2PA1774QM / RM / SM	
	45	100	210 - 290	340 - 460	70 - 80	2PB709ART 2PB709ARL 2PB709ASL	2PB709ARW / SW			
			180 - 380	310 - 630	100	BCX71H / J / K				
			120 - 215	260 - 500	100	BCW69 / 70				
	45	100	125 - 420	250 - 800	100	BC857 / A / B / C	BC857W / AW / BW / CW	BC857T / AT / BT / CT	BC857AM / BM / CM	
			120	260	150	BCW89				
	65	100	125 - 200	250 - 475	100	BC856 / A / B	BC856W / AW / BW	BC856T / AT / BT		
	100	100	30	-	50	BSS63				
	50	150	120 - 270	270 - 560	100		2PA1576Q / R / S	2PA1774Q / R / S		
	25	500	100	600	80	BCX18				
	45	500	100 - 250	250 - 600	80	BC807 / -16 / -25 / -40	BC807W / -16W / -25W / -40W			
			100	600	80	BCX17				
50	500	85 - 170	170 - 340	100 - 140	2PB710ARL 2PB710ASL	2PB1219AQ / R / S				
60	500	100	-	50		PMSTA55				
80	500	100	-	50	PMBTA56	PMSTA56				

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 _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)			
NPN	40	100	120	450	100		PUMX1	PEMX1
	45	100	200	450	100	BC847DS	BC847BS	BC847BV
	65	100	110	-	100		BC846S	
			200	450	100	BC846DS	BC846BS	
	50	150	120	560	100		PUMX2	
PNP	45	500	160	400	80	BC817DS		
	40	100	120	450	100	PIMT1	PUMT1	PEMT1
	45	100	200	450	100		BC857BS	BC857BV
NPN/PNP	65	100	110	-	100		BC856S	
	45	500	200	450	100		BC856BS	
			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)	SOT89 (SC-62)	SOT23	SOT323 (SC-70)	SOT363 (SC-88)	SOT666	SOT883 (SC-101)	
Size (mm)							6.5 x 3.5 x 1.65	4.5 x 2.5 x 1.5	2.9 x 1.3 x 1.0	2.0 x 1.25 x 0.95	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.0 x 0.6 x 0.5	
P _{tot} (mW)							1700	1300	250	200	300	300	250	
Configuration							single	single	single	single	double	double	single	
Polarity	V _{CEO} (V)	I _C (mA)	h _{FE} min	h _{FE} max	f _T min (MHz)	t _{off} (ns)								
NPN	12	100	40	120	400	20			BSV52					
	40	100	100	300	180	20			PMBS3904	PMSS3904				
					300	250		PXT2222A						
	15	200	40	120	500	20			PMBT2369	PMST2369				
	40	200	100	300	300	250			MMBT3904					
	30	600	100	300	250	250	250			PMBT3904	PMST3904	PMBT3904YS	PMBT3904VS	PMBT3904M
										PMBT2222	PMST2222			
	40	600	100	300	250	250	250	PZT4401	PXT4401	PMBT4401	PMST4401			
	40	600	100	300	300	300	250			MMBT2222A				
								PZT2222A		PMBT2222A	PMST2222A			
40	800	100	300	300	250			BSR14						
PNP	40	100	100	300	150	700			PMBS3906	PMSS3906				
	40	200	100	300	250	300			MMBT3906					
									PMBT3906	PMST3906	PMBT3906YS	PMBT3906VS	PMBT3906M	
	40	600	100	300	200	350	365	PZT4403	PXT4403	PMBT4403	PMST4403			
										PMBT2907				
	60	600	100	300	200	300	365				PMST2907A			
PZT2907A								PXT2907A	PMBT2907A					
NPN/PNP	40	200	100	300	300/250	250/300					PMBT3946YPN	PMBT3946VFN		