



## TVS AND ESD PROTECTION



TRANSZORB® Avalanche TVS  
PAR® Automotive TVS  
Special Function Transient Voltage Suppressors  
ESD Protection Devices  
EMI Filter Devices with ESD Protection



# TRANSIENT VOLTAGE SUPPRESSORS

## TRANSZORB® Avalanche

Vishay's TRANSZORB® Transient Voltage Suppressors (TVS) use state-of-the-art technology to offer the highest voltage range in the industry. Their design enables these avalanche breakdown diode TVS devices to absorb large amounts of energy for short time durations without sustaining damage. Vishay's TRANSZORB TVSs do not exhibit a wear-out mechanism, have extremely fast turn-on times, and provide excellent clamping characteristics.

P <sub>PPM</sub> <sup>(1)</sup> (W)	Device <sup>(2)</sup>	Package		V <sub>WM</sub> Range (V)	V <sub>(BR)</sub> Range <sup>(3)</sup> (V)	V <sub>(BR)</sub> Tolerance (Suffix)
		Family	Type			
100	<a href="#">MSPxx(A)</a>	Surface-Mount	MicroSMP	3.3 - 5.0	4.1 - 6.4	5 % (A)
200	<a href="#">TGL41-nn(A)</a>	Surface-Mount	MELF (DO-213AB)	81 - 171	100 - 200	5 % (A)/10 % (blank)
300	<a href="#">P4KE530 &amp; P4KE550</a>	Plastic Axial	DO-41 (DO-204AL)	477 & 495	530 & 550 <sup>(m)</sup>	N/A
	<a href="#">SMAJ530 &amp; SMAJ550</a>	Surface-Mount	DO-214AC (SMA)	477 & 495	530 & 550 <sup>(m)</sup>	N/A
	<a href="#">P4SMAnnA</a>	Surface-Mount	SMA (DO-214AC)	85.5 - 459	100 - 540	5 %
	<a href="#">P4SMAnnCA</a>	Surface-Mount	SMA (DO-214AC)	85.5 - 185	100 - 220	5 %
	<a href="#">SMAJxx(A), C(A)</a>	Surface-Mount	SMA (DO-214AC)	85 - 188	94.4 - 209	5 % (A)/10 % (blank)
400	<a href="#">BZW04(P)-xx(B)</a>	Plastic Axial	DO-41 (DO-204AL)	5.8 - 376	6.45 - 418	7 % (P)/5 % (blank)
	<a href="#">P4KEnn(A)</a>	Plastic Axial	DO-41 (DO-204AL)	5.5 - 459	6.8 - 540	5 % (A)/10 % (blank)
	<a href="#">P4KEnnC(A)</a>	Plastic Axial	DO-41 (DO-204AL)	5.5 - 376	6.8 - 440	5 % (A)/10 % (blank)
	<a href="#">P4KEnnD</a>	Plastic Axial	DO-41 (DO-204AL)	5.8 - 47.8	6.8 - 56	3.5 % (D)
	<a href="#">P4SMAnnA, CA</a>	Surface-Mount	SMA (DO-214AC)	5.8 - 77.8	6.8 - 91	5 %
	<a href="#">SMAJxx(A), C(A)</a>	Surface-Mount	SMA (DO-214AC)	5.0 - 78	6.4 - 86.7	5 % (A)/10 % (blank)
	<a href="#">SMPxx(A)</a>	Surface-Mount	DO-220AA (SMP)	3.3 - 36	4.10 - 40.0	5 % (A)/10 % (blank)
500	<a href="#">TGL41-nn(A)</a>	Surface-Mount	MELF (DO-213AB)	5.5 - 77.8	6.8 - 91	5 % (A)/10 % (blank)
	<a href="#">SAxx(A), C(A)</a>	Plastic Axial	DO-15 (DO-204AC)	5.0 - 170	6.4 - 189	5 % (A)/10 % (blank)
	<a href="#">SMA5Jxx(A), C(A)</a>	Surface-Mount	SMA (DO-214AC)	5.0 - 40	6.4 - 44.4	5 % (A)/10 % (blank)
600	<a href="#">P6KEnn(A)</a>	Plastic Axial	DO-15 (DO-204AC)	5.5 - 459	6.8 - 540	5 % (A)/10 % (blank)
	<a href="#">P6KEnnC(A)</a>	Plastic Axial	DO-15 (DO-204AC)	5.5 - 376	6.8 - 440	5 % (A)/10 % (blank)
	<a href="#">P6SMBnnA</a>	Surface-Mount	SMB (DO-214AA)	5.8 - 459	6.8 - 540	5 %
	<a href="#">P6SMBnnCA</a>	Surface-Mount	SMB (DO-214AA)	5.8 - 185	6.8 - 220	5 %
	<a href="#">SM6TnnA, CA</a>	Surface-Mount	SMB (DO-214AA)	5.8 - 188	6.8 - 220	5 %
	<a href="#">SMA6JxxA</a>	Surface-Mount	SMA (DO-214AC)	5.0 - 28	6.40 - 34.4	5 %
	<a href="#">SMBGxx(A), C(A)</a>	Surface-Mount	SMB (DO-215AA)	5.0 - 188	6.4 - 209	5 % (A)/10 % (blank)
	<a href="#">SMBJxx(A), C(A)</a>	Surface-Mount	SMB (DO-214AA)	5.0 - 188	6.4 - 209	5 % (A)/10 % (blank)
800	<a href="#">SMBJ3V3</a>	Surface-Mount	SMB (DO-214AA)	3.3	4.1 Minimum	
	<a href="#">SMB8JxxC(A)</a>	Surface-Mount	SMB (DO-214AA)	5.0 - 40	6.4 - 44.4	5 % (A)/10 % (blank)
1000	<a href="#">SMB10Jxx(A)</a>	Surface-Mount	SMB (DO-214AA)	5.0 - 40	6.4 - 44.4	5 % (A)/10 % (blank)
1500	<a href="#">1.5KEnn(A)</a>	Plastic Axial	1.5KE	5.5 - 459	6.8 - 540	5 % (A)/10 % (blank)
	<a href="#">1.5KEnnC(A)</a>	Plastic Axial	1.5KE	5.5 - 376	6.8 - 440	5 % (A)/10 % (blank)
	<a href="#">1N6267 - 1N6303</a>	Plastic Axial	1.5KE	5.5 - 171	6.8 - 200	5 % (A)/10 % (blank)
	<a href="#">1.5SMCnnA</a>	Surface-Mount	SMC (DO-214AB)	5.8 - 459	6.8 - 540	5 %
	<a href="#">1.5SMCnnCA</a>	Surface-Mount	SMC (DO-214AB)	5.8 - 185	6.8 - 220	5 %
	<a href="#">ICTE-xx</a>	Plastic Axial	1.5KE	5.0 - 18	6.0 - 21.2	N/A

Notes:

- (1) Tested with 10/1000  $\mu$ s pulse
- (2) In part numbers, "xx" designates V<sub>WM</sub> and "nn" designates nominal voltage
- (3) Nominal voltages are specified for part numbers with "nn" and minimum voltages are specified for part numbers with "xx" or (m) footnote. Higher voltages are planned (up to 600 V). Contact local sales office for availability
- (4) Types are offered in bi-directional polarity by adding suffix "C" or "CA" (BZW04 use suffix "B")

- (5) Most Vishay TVS products have Underwriters Laboratory Recognition for the classification of protectors (QVGG2) under the UL standard for safety 497B, and file number E136766 for both uni-directional and bi-directional devices. See the individual data sheets for specific information.

## TRANSZORB® Avalanche (cont'd.)

P <sub>PPM</sub> (W) <sup>(1)</sup>	Device <sup>(2)</sup>	Package		V <sub>WM</sub> Range (V)	V <sub>(BR)</sub> Range <sup>(3)</sup> (V)	V <sub>(BR)</sub> Tolerance (Suffix)
		Family	Type			
1500 (cont'd)	<a href="#">ICTE-xxC</a>	Plastic Axial	1.5KE	8.0 - 18	9.4 - 21.2	N/A
	<a href="#">1N6373 - 1N6378</a>	Plastic Axial	1.5KE	5.0 - 18	6.0 - 21.2	N/A
	<a href="#">1N6382 - 1N6386</a>	Plastic Axial	1.5KE	8.0 - 18	9.4 - 21.2	N/A
	<a href="#">SM15TnnA, CA</a>	Surface-Mount	SMC (DO-214AB)	5.8 - 188	6.8 - 220	5 %
	<a href="#">SMCGxx(A), C(A)</a>	Surface-Mount	SMC (DO-215AB)	5.0 - 188	6.4 - 209	5 %(A)/10 %(blank)
	<a href="#">SMCJxx(A), C(A)</a>	Surface-Mount	SMC (DO-214AB)	5.0 - 188	6.4 - 209	5 %(A)/10 %(blank)
	<a href="#">SMPCxx(A)</a>	Surface-Mount	SMPC (TO-277A)	5.0 - 36	6.4 - 40	5 %
5000	<a href="#">5KPxx(A)</a>	Plastic Axial	P600	5.0 - 188	6.4 - 209	5 %(A)/10 %(blank)

Notes:

- (1) Tested with 10/1000  $\mu$ s pulse
- (2) In part numbers, "xx" designates V<sub>WM</sub> and "nn" designates nominal voltage
- (3) Nominal voltages are specified for part numbers with "nn" and minimum voltages are specified for part numbers with "xx" or (m) footnote. Higher voltages are planned (up to 600 V). Contact local sales office for availability
- (4) Types are offered in bi-directional polarity by adding suffix "C" or "CA" (BZW04 use suffix "B")

- (5) Most Vishay TVS products have Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B, and file number E136766 for both uni-directional and bi-directional devices. See the individual data sheets for specific information.

## PAR® Automotive

Vishay's Automotive Transient Voltage Suppressors (TVS) using the patented PAR® process have superior stability and power handling capability over a wider temperature range (up to 185 °C) than other avalanche TVS diodes. The product portfolio includes devices specifically designed for load dump surge protection in both axial and surface-mount packages.

P <sub>PPM</sub> (W) <sup>(1)</sup>	Device <sup>(2)</sup>	Package		V <sub>WM</sub> Range (V)	V <sub>(BR)</sub> Range <sup>(3)</sup> (V)	V <sub>(BR)</sub> Tolerance (Suffix)
		Family	Type			
250	<a href="#">TPSMPnn(A)</a>	Surface-Mount	DO-220AA (SMP)	5.5 - 5.8	6.8	5 %(A)/10 %(blank)
300	<a href="#">TPSMPnn(A)</a>	Surface-Mount	DO-220AA (SMP)	6.05 - 10.2	7.5 - 12	5 %(A)/10 %(blank)
	<a href="#">TMPG06-nn(A)</a>	Plastic Axial	MPG06	5.5 - 7.78	6.8 - 9.1	5 %(A)/10 %(blank)
400	<a href="#">TPSMPnn(A)</a>	Surface-Mount	DO-220AA (SMP)	10.5 - 36.8	13 - 43	5 %(A)/10 %(blank)
	<a href="#">TPSMAnn(A)</a>	Surface-Mount	SMA (DO-214AC)	5.5 - 36.8	6.8 - 43	5 %(A)/10 %(blank)
	<a href="#">TMPG06-nn(A)</a>	Plastic Axial	MPG06	8.1 - 36.8	10 - 43	5 %(A)/10 %(blank)
	<a href="#">P4KAnn(A)</a>	Plastic Axial	DO-41 (DO-204AL)	5.5 - 36.8	6.8 - 43	5 %(A)/10 %(blank)
600	<a href="#">TPSMBnn(A)</a>	Surface-Mount	SMB (DO-214AA)	5.5 - 36.8	6.8 - 43	5 %(A)/10 %(blank)
	<a href="#">P6KAnn(A)</a>	Plastic Axial	DO-15 (DO-204AC)	5.5 - 36.8	6.8 - 43	5 %(A)/10 %(blank)
1500	<a href="#">TPCnn(A)</a>	Surface-Mount	SMPC (TO-277A)	5.5 - 36.8	6.8 - 43	5 %(A)/10 %(blank)
	<a href="#">TPSMCnn(A)</a>	Surface-Mount	SMC (DO-214AB)	5.5 - 40.2	6.8 - 47	5 %(A)/10 %(blank)
	<a href="#">1.5KAnn(A)</a>	Plastic Axial	1.5KA	5.5 - 40.2	6.8 - 47	5 %(A)/10 %(blank)
3000	<a href="#">3KASMCnn(A)</a>	Surface-Mount	SMC (DO-214AB)	10 - 43	11.1 - 52.8	5 %(A)/10 %(blank)
3600 <sup>(4)</sup>	<a href="#">SM5A27</a>	Surface-Mount	DO-218AB	22	27	$\pm$ 3 V
	<a href="#">SM5Sxx(A)</a>	Surface-Mount	DO-218AB	10 - 36	11.1 - 40	5 %(A)/10 %(blank)
4600 <sup>(4)</sup>	<a href="#">SM6A27</a>	Surface-Mount	DO-218AB	22	27	$\pm$ 3 V
	<a href="#">SM6Sxx(A)</a>	Surface-Mount	DO-218AB	10 - 36	11.1 - 40	5 %(A)/10 %(blank)
6000	<a href="#">6KA24</a>	Plastic Axial	P600	24	29.7	10 %
6600 <sup>(4)</sup>	<a href="#">SM8A27</a>	Surface-Mount	DO-218AB	22	27	$\pm$ 3 V
	<a href="#">SM8Sxx(A)</a>	Surface-Mount	DO-218AB	10 - 43	11.1 - 47.8	5 %(A)/10 %(blank)

Notes:

- (1) Tested with 10/1000  $\mu$ s pulse
- (2) In part numbers, "xx" designates V<sub>WM</sub> and "nn" designates nominal voltage
- (3) Nominal voltages are specified for part numbers with "nn" and minimum voltages are specified for part numbers with "xx"
- (4) For 10  $\mu$ s/10 ms load-dump pulse rating, see datasheet

- (5) All automotive TVS are uni-directional polarity only
- (6) All automotive TVS use the patented PAR process for superior high-temperature performance
- (7) Most Vishay TVS products have Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B, and file number E136766 for both uni-directional and bi-directional devices. See the individual data sheets for specific information.



# SPECIAL FUNCTION TRANSIENT VOLTAGE SUPPRESSORS

## Low Capacitance Transient Voltage Suppressors

P <sub>PPM</sub> <sup>(1)</sup> (W)	Device <sup>(2)</sup>	Package		V <sub>WM</sub> Range (V)	V <sub>(BR)</sub> Range <sup>(3)</sup> (V)	V <sub>(BR)</sub> Tolerance (Suffix)
		Family	Type			
500	<a href="#">SACxx</a>	Plastic Axial	DO-15 (DO-204AC)	5.0 - 50	7.6 - 55.5	N/A
1500	<a href="#">LCExx(A)</a>	Plastic Axial	1.5KE	6.5 - 28	7.22 - 31.1	5 %(A)/10 %(blank)

## Low Forward Voltage Transient Voltage Suppressors

P <sub>PPM</sub> <sup>(1)</sup> (W)	Device	Package		V <sub>WM</sub> (V)	V <sub>(BR)</sub> Range (V)	Max I <sub>D</sub> @ V <sub>WM</sub> (μA)
		Family	Type			
600	<a href="#">LVB14A</a>	Surface-Mount	SMB (DO-214AA)	12	13.2 - 14.8	100

Notes:

- (1) Tested with 10/1000 μs pulse
- (2) In part numbers "xx" designates VWM and "nn" designates nominal voltage
- (3) Nominal voltages are specified for part numbers with "nn" and minimum voltages are specified for part numbers with "xx" or (m) footnote

## TVS Package Dimensions

Surface-Mount	Length	Width	Height
DO-218AB	13.5	8.5	4.85
DO-214AA (SMB J)	4.3	3.6	2.3
DO-214AB (SMC J)	6.8	5.9	2.3
DO-214AC (SMA)	4.2	2.6	2.14
DO-215AA (SMB G)	4.3	3.6	2.3
DO-215AB (SMC G)	6.8	5.9	2.3
Micro SMP	2.2	1.3	0.65
DO-220AA (SMP)	3.4	2	1
TO-277A (SMPC)	6.1	4.3	1.1

Axial	Body Length	Body Diameter	Lead Length	Lead Diameter
MPG06	3.1	2.4	25.4	0.61
DO-204AL (DO-41)	4.6	2.4	25.4	0.79
DO-204AC (DO-15)	6.7	3.1	25.4	0.79
1.5KE	8.4	5.1	25.4	1.02
P600	8.8	8.8	25.4	1.27

Unit: Millimeter

## ESD Protection Devices

Part Number	Package Name	V <sub>RWM</sub> Working Range	I <sub>R</sub> Reverse Leakage Current @ V <sub>RWM</sub>	V <sub>BR</sub> min Break Down Voltage	V <sub>C</sub> Clamping Voltage @ I <sub>PPM</sub>	I <sub>PPM</sub> Peak Pulse Current IEC 61000-4-5@8/20µs (*) = @ 10/1000	P <sub>PP</sub> Peak Pulse Power IEC 61000-4-5 @ 8/20µs (*) = @ 10/1000	C <sub>D</sub> Load Capacitance @ V <sub>R</sub> = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines		
										1)	BiAs	BiSy
		(V)	(µA)	(V)	(V)	[A]	(W)	(pF)	(kV)			
<a href="#">BZG04-8V2</a>	DO214AC (SMA)	8.2	20	9	14.8	20.3 (*)	300 (*)	1200	30	1		
<a href="#">BZG04-9V1</a>	DO214AC (SMA)	9.1	5	10	15.7	19.1 (*)	300 (*)	1100	30	1		
<a href="#">BZG04-10</a>	DO214AC (SMA)	10	5	11	17	17.7 (*)	300 (*)	1000	30	1		
<a href="#">BZG04-11</a>	DO214AC (SMA)	11	5	12	18.9	15.9 (*)	300 (*)	850	30	1		
<a href="#">BZG04-12</a>	DO214AC (SMA)	12	5	14	20.9	14.4 (*)	300 (*)	815	30	1		
<a href="#">BZG04-13</a>	DO214AC (SMA)	13	5	15	22.9	13.1 (*)	300 (*)	785	30	1		
<a href="#">BZG04-15</a>	DO214AC (SMA)	15	5	17	25.6	11.7 (*)	300 (*)	710	30	1		
<a href="#">BZG04-16</a>	DO214AC (SMA)	16	5	19	28.4	10.6 (*)	300 (*)	655	30	1		
<a href="#">BZG04-18</a>	DO214AC (SMA)	18	5	21	31	9.7 (*)	300 (*)	610	30	1		
<a href="#">BZG04-20</a>	DO214AC (SMA)	20	5	23	33.8	8.9 (*)	300 (*)	570	30	1		
<a href="#">BZG04-22</a>	DO214AC (SMA)	22	5	25	38.1	7.9 (*)	300 (*)	545	30	1		
<a href="#">BZG04-24</a>	DO214AC (SMA)	24	5	28	42.2	7.1 (*)	300 (*)	505	30	1		
<a href="#">BZG04-27</a>	DO214AC (SMA)	27	5	31	46.2	6.5 (*)	300 (*)	475	30	1		
<a href="#">BZG04-30</a>	DO214AC (SMA)	30	5	34	50.1	6 (*)	300 (*)	450	30	1		
<a href="#">BZG04-33</a>	DO214AC (SMA)	33	5	37	54.1	5.5 (*)	300 (*)	420	30	1		
<a href="#">BZG04-36</a>	DO214AC (SMA)	36	5	40	60.7	4.9 (*)	300 (*)	390	30	1		
<a href="#">BZG04-39</a>	DO214AC (SMA)	39	5	44	65.5	4.6 (*)	300 (*)	370	30	1		
<a href="#">BZG04-43</a>	DO214AC (SMA)	43	5	48	70.8	4.2 (*)	300 (*)	350	30	1		
<a href="#">BZG04-47</a>	DO214AC (SMA)	47	5	52	78.6	3.8 (*)	300 (*)	330	30	1		
<a href="#">BZG04-51</a>	DO214AC (SMA)	51	5	58	86.5	3.5 (*)	300 (*)	310	30	1		
<a href="#">BZG04-56</a>	DO214AC (SMA)	56	5	64	94.4	3.2 (*)	300 (*)	291	30	1		
<a href="#">BZG04-62</a>	DO214AC (SMA)	62	5	70	103.5	2.9 (*)	300 (*)	280	30	1		
<a href="#">BZG04-68</a>	DO214AC (SMA)	68	5	77	114	2.6 (*)	300 (*)	275	30	1		
<a href="#">BZG04-75</a>	DO214AC (SMA)	75	5	85	126	2.4 (*)	300 (*)	260	30	1		
<a href="#">BZG04-82</a>	DO214AC (SMA)	82	5	94	139	2.2 (*)	300 (*)	250	30	1		
<a href="#">BZG04-91</a>	DO214AC (SMA)	91	5	104	152	2 (*)	300 (*)	243	30	1		
<a href="#">BZG04-100</a>	DO214AC (SMA)	100	5	114	167	1.8 (*)	300 (*)	170	30	1		
<a href="#">BZG04-110</a>	DO214AC (SMA)	110	5	124	185	1.6 (*)	300 (*)	153	30	1		
<a href="#">BZG04-120</a>	DO214AC (SMA)	120	5	138	204	1.5 (*)	300 (*)	150	30	1		
<a href="#">BZG04-130</a>	DO214AC (SMA)	130	5	153	224	1.3 (*)	300 (*)	145	30	1		
<a href="#">BZG04-150</a>	DO214AC (SMA)	150	5	168	249	1.2 (*)	300 (*)	140	30	1		
<a href="#">BZG04-160</a>	DO214AC (SMA)	160	5	188	276	1.1 (*)	300 (*)	135	30	1		
<a href="#">BZG04-180</a>	DO214AC (SMA)	180	5	208	305	1 (*)	300 (*)	131	30	1		
<a href="#">BZG04-200</a>	DO214AC (SMA)	200	5	228	336	0.9 (*)	300 (*)	122	30	1		
<a href="#">BZG04-220</a>	DO214AC (SMA)	220	5	251	380	0.8 (*)	300 (*)	120	30	1		
<a href="#">GL05T</a>	SOT-23	5	20	6	-	17	300	5	25			1
<a href="#">GL12T</a>	SOT-23	12	1	13	-	12	300	5	25			1
<a href="#">GL15T</a>	SOT-23	15	1	17	-	10	300	5	25			1
<a href="#">GL24T</a>	SOT-23	24	1	27	55	5	300	5	25			1
<a href="#">GMF05C-HS3</a>	LLP75-6A	5	1	6	12.5	12	200	150	30	5	4	
<a href="#">GMF05C-HSF</a>	LLP75-6L	5	1	6	12.5	12	200	150	30	5	4	
<a href="#">GMF05LC-HS3</a>	LLP75-6A	5	0.1	6	12.5	5	70	50	30	5	4	
<a href="#">GMF05LC-HSF</a>	LLP75-6L	5	0.1	6	12.5	5	70	50	30	5	4	

1) BiAs = Bidirectional and Asymmetrical clamping performance - protects in both directions but with different clamping levels  
 BiSy = Bidirectional and Symmetrical Clamping performance - protects in both directions with the same clamping level  
 Uni = Unidirectional clamping performance - protects only in one direction



# ESD PROTECTION DEVICES AND EMI FILTERS

## ESD Protection Devices, (cont'd.)

Part Number	Package Name	V <sub>RWM</sub> Working Range	I <sub>R</sub> Reverse Leakage Current @ V <sub>RWM</sub>	V <sub>BR</sub> min Break Down Voltage	V <sub>C</sub> Clamping Voltage @ I <sub>PPM</sub>	I <sub>PPM</sub> Peak Pulse Current IEC 61000-4-5@8/20μs (*) = @ 10/1000	P <sub>PP</sub> Peak Pulse Power IEC 61000-4-5 @ 8/20μs (*) = @ 10/1000	C <sub>D</sub> Load Capacitance @ V <sub>R</sub> = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines 1)		
										(V)	(μA)	(V)
<a href="#">GSOT03</a>	SOT-23	3.3	100	4	12.3	30	369	600	30	1		
<a href="#">GSOT03C</a>	SOT-23	3.3	100	4	12.3	30	369	600	30	2	1	
<a href="#">GSOT04</a>	SOT-23	4	20	5	14.3	30	429	450	30	1		
<a href="#">GSOT04C</a>	SOT-23	4	20	5	14.3	30	429	450	30	2	1	
<a href="#">GSOT05</a>	SOT-23	5	10	6	16	30	480	350	30	1		
<a href="#">GSOT05C</a>	SOT-23	5	10	6	16	30	480	350	30	2	1	
<a href="#">GSOT05CL</a>	SOT-23	5.5	1	6	12	13	156	120	30	2	1	
<a href="#">GSOT05L</a>	SOT-23	5.5	1	6	12	13	156	115	30	1		
<a href="#">GSOT08</a>	SOT-23	8	5	9	19.2	18	345	250	30	1		
<a href="#">GSOT08C</a>	SOT-23	8	5	9	19.2	18	345	250	30	2	1	
<a href="#">GSOT12</a>	SOT-23	12	1	14	26	12	312	150	30	1		
<a href="#">GSOT12C</a>	SOT-23	12	1	14	26	12	312	150	30	2	1	
<a href="#">GSOT15</a>	SOT-23	15	1	17	28.8	8	230	120	30	1		
<a href="#">GSOT15C</a>	SOT-23	15	1	17	28.8	8	230	120	30	2	1	
<a href="#">GSOT24</a>	SOT-23	24	1	27	47	5	235	80	30	1		
<a href="#">GSOT24C</a>	SOT-23	24	1	27	47	5	235	80	30	2	1	
<a href="#">GSOT36</a>	SOT-23	36	1	39	71	3.5	248	65	30	1		
<a href="#">GSOT36C</a>	SOT-23	36	1	39	71	3.5	248	65	30	2	1	
<a href="#">SMF5V0A</a>	SMF (DO-219AB)	5	400	6	9.2	21.7 (*)	1000	1030	30	1		
<a href="#">SMF6V0A</a>	SMF (DO-219AB)	6	400	7	10.3	19.4 (*)	1000	1010	30	1		
<a href="#">SMF6V5A</a>	SMF (DO-219AB)	6.5	250	7	11.2	17.9 (*)	1000	850	30	1		
<a href="#">SMF7V0A</a>	SMF (DO-219AB)	7	100	8	12	16.7 (*)	1000	750	30	1		
<a href="#">SMF7V5A</a>	SMF (DO-219AB)	7.5	50	8	12.9	15.5 (*)	1000	730	30	1		
<a href="#">SMF8V0A</a>	SMF (DO-219AB)	8	25	9	13.6	14.7 (*)	1000	670	30	1		
<a href="#">SMF8V5A</a>	SMF (DO-219AB)	8.5	10	9	14.4	13.9 (*)	1000	660	30	1		
<a href="#">SMF9V0A</a>	SMF (DO-219AB)	9	5	10	15.4	13.5 (*)	1000	620	30	1		
<a href="#">SMF10A</a>	SMF (DO-219AB)	10	2.5	11	17	11.8 (*)	1000	570	30	1		
<a href="#">SMF11A</a>	SMF (DO-219AB)	11	2.5	12	18.2	11 (*)	1000	460	30	1		
<a href="#">SMF12A</a>	SMF (DO-219AB)	12	2.5	13	19.9	10.1 (*)	1000	440	30	1		
<a href="#">SMF13A</a>	SMF (DO-219AB)	13	1	14	21.5	9.3 (*)	1000	420	30	1		
<a href="#">SMF14A</a>	SMF (DO-219AB)	14	1	16	23.2	8.6 (*)	1000	370	30	1		
<a href="#">SMF15A</a>	SMF (DO-219AB)	15	1	17	24.4	8.2 (*)	1000	350	30	1		
<a href="#">SMF16A</a>	SMF (DO-219AB)	16	1	18	26	7.7 (*)	1000	340	30	1		
<a href="#">SMF17A</a>	SMF (DO-219AB)	17	1	19	27.6	7.2 (*)	1000	310	30	1		
<a href="#">SMF18A</a>	SMF (DO-219AB)	18	1	20	29.2	5.8 (*)	1000	305	30	1		
<a href="#">SMF20A</a>	SMF (DO-219AB)	20	1	22	32.4	6.2 (*)	1000	270	30	1		
<a href="#">SMF22A</a>	SMF (DO-219AB)	22	1	24	35.5	5.6 (*)	1000	265	30	1		
<a href="#">SMF24A</a>	SMF (DO-219AB)	24	1	27	38.9	5.1 (*)	1000	240	30	1		
<a href="#">SMF26A</a>	SMF (DO-219AB)	26	1	29	42.1	4.8 (*)	1000	225	30	1		
<a href="#">SMF28A</a>	SMF (DO-219AB)	28	1	31	45.4	4.4 (*)	1000	210	30	1		
<a href="#">SMF30A</a>	SMF (DO-219AB)	30	1	33	48.4	4.1 (*)	1000	205	30	1		
<a href="#">SMF33A</a>	SMF (DO-219AB)	33	1	37	53.3	3.8 (*)	1000	190	30	1		
<a href="#">SMF36A</a>	SMF (DO-219AB)	36	1	40	58.1	3.4 (*)	1000	180	30	1		

1) **BiAs** = **B**idirectional and **A**symmetrical clamping performance - protects in both directions but with different clamping levels  
**BiSy** = **B**idirectional and **S**ymmetrical Clamping performance - protects in both directions with the same clamping level  
**Uni** = **U**nidirectional clamping performance - protects only in one direction!



## ESD Protection Devices, (cont'd.)

Part Number	Package Name	V <sub>RWM</sub> Working Range	I <sub>R</sub> Reverse Leakage Current @ V <sub>RWM</sub>	V <sub>BR min</sub> Break Down Voltage	V <sub>C</sub> Clamping Voltage @ I <sub>PPM</sub>	I <sub>PPM</sub> Peak Pulse Current IEC 61000-4-5@8/20µs (*) = @ 10/1000	P <sub>PP</sub> Peak Pulse Power IEC 61000-4-5 @ 8/20µs (*) = @ 10/1000	C <sub>D</sub> Load Capacitance @ V <sub>R</sub> = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines 1)		
										(V)	(µA)	(V)
<a href="#">SMF40A</a>	SMF (DO-219AB)	40	1	44	64.5	3.1 (*)	1000	165	30	1		
<a href="#">SMF43A</a>	SMF (DO-219AB)	43	1	48	69.4	2.9 (*)	1000	160	30	1		
<a href="#">SMF45A</a>	SMF (DO-219AB)	45	1	50	72.7	2.8 (*)	1000	155	30	1		
<a href="#">SMF48A</a>	SMF (DO-219AB)	48	1	53	77.4	2.6 (*)	1000	150	30	1		
<a href="#">SMF51A</a>	SMF (DO-219AB)	51	1	57	82.4	2.4 (*)	1000	145	30	1		
<a href="#">VBUS051BD-HD1</a>	LLP1006-2L	5	0.1	7	16	3	45	1.3	15	1		
<a href="#">VBUS051CD-HD1</a>	LLP1006-2L	5.5	0.1	7	14	2	28	0.8	9	1		
<a href="#">VBUS052BD-HTF</a>	LLP75-4L	5	0.1	7	16	3	45	2.5	15	2		
<a href="#">VBUS052CD-FAH</a>	LLP1713-7L	5	0.1	7	18	3.5	63	1	15	2		
<a href="#">VBUS053AZ-HAF</a> (Pin 1,2,3 to 7)	LLP75-7L	5.5	0.1	7	18	3	36	1	15	3		
<a href="#">VBUS053AZ-HAF</a> (Pin 6 to 7)	LLP75-7L	12	0.1	15	30	8	240	80	30	1		
<a href="#">VBUS053BZ-HNH</a> (Pin 1-3 to 9)	LLP1713-9L	5.5	1	7	18	3	36	1	12	3		
<a href="#">VBUS053BZ-HNH</a> (Pin 4 to 9)	LLP1713-9L	12	0.1	15	30	8	240	85	30	1		
<a href="#">VBUS053CZ-HAF</a> (Pin 1,2,3 to 7)	LLP75-7L	5.5	1	7	18	3	36	1	15	3		
<a href="#">VBUS053CZ-HAF</a> (Pin 6 to 7)	LLP75-7L	28	0.1	32	60	3	180	50	8	1		
<a href="#">VBUS054B-HS3</a>	LLP75-6A	5	0.1	6	15	3	45	1	15	4		
<a href="#">VBUS054B-HSF</a>	LLP75-6L	5	0.1	6	15	3	45	1	15	4		
<a href="#">VBUS054CD-FHI</a>	LLP2513-11L	5	0.1	7	18	3.5	63	1	15	4		
<a href="#">VBUS054CV-06S</a>	SOT-23-6L	28	0.1	7	22	11	242	2.5	30	4		
<a href="#">VBUS054CV-HS3</a>	LLP75-6A	5	0.1	6	22	11	242	2.5	30	4		
<a href="#">VBUS054DD-HF4</a>	LLP1010-5L	5	0.1	7	19	3	45	1	15	4		
<a href="#">VBUS05L1-DD1</a>	LLP1006-2M	5.5	0.05	7	17	2	34	0.4	9		1	
<a href="#">VCUT03B1-DD1</a>	LLP1006-2M	3.5	0.1	6	11.5	3.5	40	15	18		1	
<a href="#">VCUT0505B-HD1</a>	LLP1006-2L	5	0.1	7	16	3.5	56	20	20		1	
<a href="#">VCUT05A4-05S</a>	SOT-23-5L	5.5	0.1	7	16	3.5	56	20	20		4	
<a href="#">VCUT05B1-DD1</a>	LLP1006-2M	5.5	0.1	6	12.5	3	38	13	30		1	
<a href="#">VCUT0714A-02Z</a>	SOD-923	14	0.1	15	30	2	54	8.5	25	1	1	
<a href="#">VCUT0714A-HD1</a>	LLP1006-2L	14	0.1	15	30	2	54	8.5	25	1	1	
<a href="#">VESD01-02V</a>	SOD-523	1	100	2	9	7	63	180	8	1		
<a href="#">VESD03-02V</a>	SOD-523	3	20	4	12	9	108	110	8	1		
<a href="#">VESD03A1B-HD1</a>	LLP1006-2L	3.3	0.5	5	9	3.5	31	28	30	1		
<a href="#">VESD03A1C-02Z</a>	SOD-923	3.3	1	5	10	9.5	95	85	30	1		
<a href="#">VESD03A1C-HD1</a>	LLP1006-2L	3.3	1	5	10	9.5	95	90	30	1		
<a href="#">VESD05-02V</a>	SOD-523	5	0.1	7	20	6	120	55	8	1		
<a href="#">VESD05A1-02V</a>	SOD-523	5	1	6	12	16	192	150	30	1		
<a href="#">VESD05A1A-HD1</a>	LLP1006-2L	5	1	6	12	16	192	150	30	1		
<a href="#">VESD05A1B-02V</a>	SOD-523	5	0.1	6	11	3	33	23	20	1		
<a href="#">VESD05A1B-02Z</a>	SOD-923	5	0.1	6	11	3	33	23	20	1		

1) **BiAs** = Bidirectional and Asymmetrical clamping performance - protects in both directions but with different clamping levels  
**BiSy** = Bidirectional and Symmetrical Clamping performance - protects in both directions with the same clamping level  
**Uni** = Unidirectional clamping performance - protects only in one direction!



# ESD PROTECTION DEVICES AND EMI FILTERS

## ESD Protection Devices, (cont'd.)

Part Number	Package Name	V <sub>RWM</sub> Working Range	I <sub>R</sub> Reverse Leakage Current @ V <sub>RWM</sub>	V <sub>BR</sub> min Break Down Voltage	V <sub>C</sub> Clamping Voltage @ I <sub>PPM</sub>	I <sub>PPM</sub> Peak Pulse Current IEC 61000-4-5@8/20μs (*) = @ 10/1000	P <sub>PP</sub> Peak Pulse Power IEC 61000-4-5 @ 8/20μs (*) = @ 10/1000	C <sub>D</sub> Load Capacitance @ V <sub>R</sub> = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines		
										1)	BiAs	BiSy
		(V)	(μA)	(V)	(V)	[A]	(W)	(pF)	(kV)			
<a href="#">VESD05A1B-HD1</a>	LLP1006-2L	5	0.1	6	11	3	33	23	20	1		
<a href="#">VESD05A1C-02Z</a>	SOD-923	5	1	6	10	8	80	63	30	1		
<a href="#">VESD05A1C-HD1</a>	LLP1006-2L	5	0.2	6	10	8	80	63	30	1		
<a href="#">VESD05A4A-HS4</a>	LLP1010-6L	5	0.1	6	12	2.5	30	15	15	4	3	
<a href="#">VESD05A5A-HS3</a>	LLP75-6A	5	0.1	6	13	2.5	33	15	15	5	4	
<a href="#">VESD05A5A-HSF</a>	LLP75-6L	5	0.1	6	13	2.5	33	15	15	5	4	
<a href="#">VESD05A6A-HAF</a>	LLP75-7L	5	0.1	6	13	2.5	33	15	15	6	5	
<a href="#">VESD05A6-HAF</a>	LLP75-7L	5	1	6	12	5	60	50	30	6	5	
<a href="#">VESD05A8A-HNH</a>	LLP1713-9L	5	1	6	13	5	65	35	25	8	7	
<a href="#">VESD05A8B-HNH</a>	LLP1713-9L	5	0.5	6	13	4	52	23	17	8	7	
<a href="#">VESD05A8C-HNH</a>	LLP1713-9L	5	0.1	6	13	2.5	33	13	8	8	7	
<a href="#">VESD08-02V</a>	SOD-523	8	0.1	9	30	4	120	35	8	1		
<a href="#">VESD09A4A-HS4</a>	LLP1010-6L	9	0.1	11	23	1.5	30	10	8	4		
<a href="#">VESD09A4A-HSF</a>	LLP75-6L	9	0.1	11	23	1.5	30	10	8	4		
<a href="#">VESD12-02V</a>	SOD-523	12	0.1	14	25	2	50	30	8	1		
<a href="#">VESD12A1A-HD1</a>	LLP1006-2L	12	0.1	14	24	8	200	65	30	1		
<a href="#">VESD12A1C-02Z</a>	SOD-923	12	0.1	14	23	4	92	36	30	1		
<a href="#">VESD12A1C-HD1</a>	LLP1006-2L	12	0.1	14	23	4	92	36	30	1		

- 1) **BiAs** = Bidirectional and **A**symmetrical clamping performance - protects in both directions but with different clamping levels  
**BiSy** = Bidirectional and **S**ymmetrical Clamping performance - protects in both directions with the same clamping level  
**Uni** = **U**nidirectional clamping performance - protects only in one direction!

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Part Number	Package Name	V <sub>RWM</sub> Working Range	I <sub>R</sub> Reverse Leakage Current @ V <sub>RWM</sub>	V <sub>BR</sub> min Break Down Voltage @ 1mA	V <sub>C</sub> Clamping Voltage @ I <sub>PPM</sub>	I <sub>PPM</sub> Peak Pulse Current acc. IEC 61000-4-5 @ 8/20 μs	C <sub>D</sub> Load Capacitance @ V <sub>R</sub> = 0 V	ESD-Immunity acc. IEC 61000-4-2	R <sub>S</sub> Series Resistance	Line Inductance L <sub>s</sub>	3dB Cut Off Frequency	Number of Protected Lines 2)
		(V)	(μA)	(V)	(V)	(A)	(pF)	(kV)	(Ohm)	(nH)	(MHz)	BiAs
<a href="#">VEMI255A-HS3</a>	LLP75-6A	5	1	6	8	4	60	30	50		100	2
<a href="#">VEMI353A-HAF</a>	LLP75-7L	5	1	6	8	4	60	30	30		100	3
<a href="#">VEMI355A-HAF</a>	LLP75-7L	5	1	6	8	4	60	30	50		100	3
<a href="#">VEMI35AA-HAF</a>	LLP75-7L	5	1	6	8	4	60	30	100		100	3
<a href="#">VEMI45AA-HNH</a>	LLP1713-9L	5	1	6	8	4	60	30	100		100	4
<a href="#">VEMI45AB-HNH</a>	LLP1713-9L	5	1	6	8	4	40	18	100		130	4
<a href="#">VEMI45AC-HNH</a>	LLP1713-9L	5	1	6	8	2	20	10	100		240	4
<a href="#">VEMI45LA-HNH</a>	LLP1713-9L	5	1	6	8	4	53	25	12	10	150	4
<a href="#">VEMI65AA-HCI</a>	LLP2513-13L	5	1	6	8	4	60	30	100		100	6
<a href="#">VEMI65AB-HCI</a>	LLP2513-13L	5	1	6	8	4	40	18	100		130	6
<a href="#">VEMI65AC-HCI</a>	LLP2513-13L	5	1	6	8	2	20	10	100		240	6
<a href="#">VEMI85AA-HGK</a>	LLP3313-17L	5	1	6	8	4	60	30	100		100	8
<a href="#">VEMI85AB-HGK</a>	LLP3313-17L	5	1	6	8	4	40	18	100		130	8
<a href="#">VEMI85AC-HGK</a>	LLP3313-17L	5	1	6	8	2	20	10	100		240	8
<a href="#">VEMI85LA-HGK</a>	LLP3313-17L	5	1	6	8	4	53	25	12	10	150	8

2) BiAs = Bidirectional and Asymmetrical clamping performance - protects in both directions but with different clamping levels

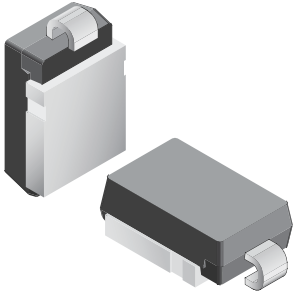
## ESD Package Dimensions

Surface-Mount	Length	Width	Height
SOD-923	1.0	0.6	0.38
SOD-523	1.6	0.8	0.6
SMF	3.7	1.8	0.98
LLP75-4L	1.6	1.6	0.57
LLP75-6A	1.6	1.6	0.75
LLP75-6L	1.6	1.6	0.57
LLP75-7L	1.6	1.6	0.57
LLP1006-2L/LLP1006-2M	1.0	0.6	0.38
LLP1010-6L	1.0	1.0	0.38
LLP1713-9L	1.7	1.35	0.55
LLP2513-13L	2.5	1.35	0.55
LLP3313-17L	3.3	1.35	0.55
LLP1010-5L	1.0	1.0	0.38
LLP1713-7L	1.7	1.35	0.55
LLP2513-11L	2.5	1.35	0.55
SOT-23	2.85	2.50	1.0
SOT-23-5L	2.9	2.8	1.0
SOT-23-6L	2.9	2.8	1.0

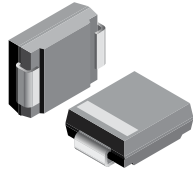


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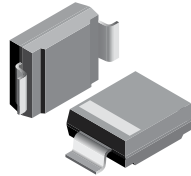
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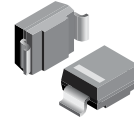
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DO-215AB (SMC G)



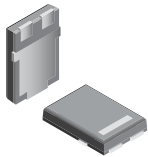
DO-215AA (SMB G)



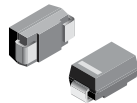
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TO-277A (SMPC)



DO-214AC (SMA)



MPG06



DO-204AL (DO-41)



DO-204AC (DO-15)



DO-220AA (SMP)



Micro SMP



1.5KE



P600



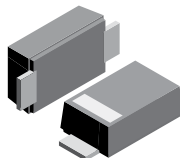
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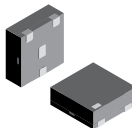
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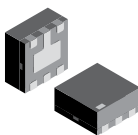
SMF



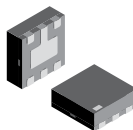
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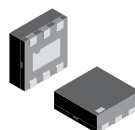
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LLP75-6L



LLP75-7L



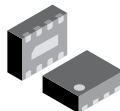
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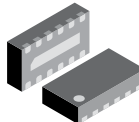
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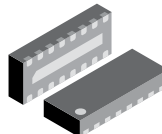
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LLP2513-13L



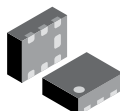
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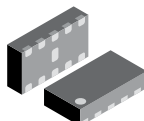
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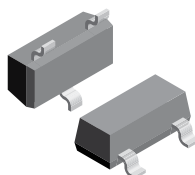
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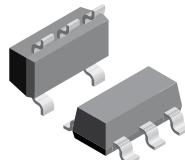
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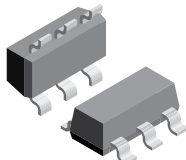
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