

**DIODES**

TVS and ESD Protection



Diodes for TVS and ESD Protection



FEATURED PRODUCTS

TransZorb® Avalanche Transient Voltage Suppressors

PAR® Automotive Transient Voltage Suppressors

Special Function Transient Voltage Suppressors

ESD Protection Devices

EMI Filter Devices with ESD Protection

RESOURCES

- For technical questions contact TVS@vishay.com, ESDProtection@vishay.com
- For more information contact DiodesAmericas@vishay.com, DiodesEurope@vishay.com, DiodesAsia@vishay.com





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 _{PPM} ⁽¹⁾ (W)	Device ⁽²⁾	Package		V _{WM} Range (V)	V _(BR) Range ⁽³⁾ (V)	V _(BR) Tolerance (Suffix)
		Family	Type			
150	MSPxxA ⁽⁵⁾	Surface Mount	MicroSMP	3.3 to 5.0	4.1 to 6.4	5 %
	MSMPxxA ⁽⁵⁾	Surface Mount	MicroSMP	6.0 to 20	6.67 to 24.5	5 %
200	TGL41-nnA ⁽⁶⁾	Surface Mount	DO-213AB (MELF)	81 to 171	100 to 200	5 %
300	P4KE530 and P4KE550 ⁽⁵⁾	Plastic Axial	DO-204AL (DO-41)	477 and 495	530 and 550 ^(m)	N/A
	SMAJ530 and SMAJ550 ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	477 and 495	530 and 550 ^(m)	N/A
	P4SMAnnA ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	85.5 to 459	100 to 540	5 %
	P4SMAnnCA	Surface Mount	DO-214AC (SMA)	85.5 to 185	100 to 220	5 %
	SMAJxxA ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	85 to 188	94.4 to 209	5 %
	SMAJxxCA	Surface Mount	DO-214AC (SMA)	85 to 188	94.4 to 209	5 %
400	BZW04-xx, B	Plastic Axial	DO-204AL (DO-41)	5.8 to 376	6.45 to 418	5 %
	P4KEnnA ⁽⁵⁾	Plastic Axial	DO-204AL (DO-41)	5.5 to 459	6.8 to 540	5 %
	P4KEnnCA	Plastic Axial	DO-204AL (DO-41)	5.5 to 376	6.8 to 440	5 %
	P4SMAnnA ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	5.8 to 77.8	6.8 to 91	5 %
	P4SMAnnCA	Surface Mount	DO-214AC (SMA)	5.8 to 77.8	6.8 to 91	5 %
	SMAJxxA ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	5.0 to 78	6.4 to 86.7	5 %
	SMAJxxCA	Surface Mount	DO-214AC (SMA)	5.0 to 78	6.4 to 86.7	5 %
	SMPxxA	Surface Mount	DO-220AA (SMP)	3.3 to 36	4.10 to 40.0	5 %
	TGL41-nnA ⁽⁵⁾	Surface Mount	DO-213AB (MELF)	5.5 to 77.8	6.8 to 91	5 %
	SAXxA, CA	Plastic Axial	DO-204AC (DO-15)	5.0 to 170	6.4 to 189	5 %
500	SMA5JxxA, CA	Surface Mount	DO-214AC (SMA)	5.0 to 40	6.4 to 44.4	5 %
	P6KEnnA ⁽⁵⁾	Plastic Axial	DO-204AC (DO-15)	5.5 to 459	6.8 to 540	5 %
	P6KEnnCA	Plastic Axial	DO-204AC (DO-15)	5.5 to 376	6.8 to 440	5 %
	P6SMBnnA ⁽⁵⁾	Surface Mount	DO-214AA (SMB)	5.8 to 459	6.8 to 540	5 %
	P6SMBnnCA	Surface Mount	DO-214AA (SMB)	5.8 to 185	6.8 to 220	5 %
	SM6TnnA, CA	Surface Mount	DO-214AA (SMB)	5.8 to 188	6.8 to 220	5 %
	SMA6FxxA ⁽⁵⁾	Surface Mount	DO-220A (SlimSMA)	5.0 to 20	6.40 to 24.5	5 %
	SMA6JxxA ⁽⁵⁾	Surface Mount	DO-214AC (SMA)	5.0 to 28	6.40 to 34.4	5 %
	SMBGxxA, CA	Surface Mount	DO-214AA (SMB)	5.0 to 188	6.4 to 209	5 %
	SMBJxxA, CA	Surface Mount	DO-214AA (SMB)	5.0 to 188	6.4 to 209	5 %
600	SMBJ3V3 ⁽⁵⁾	Surface Mount	DO-214AA (SMB)	3.3	4.1 Minimum	
	SMB8JxxCA	Surface Mount	DO-214AA (SMB)	5.0 to 40	6.4 to 44.4	5 %
	SMB10JxxA ⁽⁵⁾	Surface Mount	DO-214AA (SMB)	5.0 to 40	6.4 to 44.4	5 %
	1.5KEnnA ⁽⁵⁾	Plastic Axial	1.5KE	5.5 to 185	6.8 to 220	5 %
	1.5KEnnCA	Plastic Axial	1.5KE	5.5 to 185	6.8 to 220	5 %
	1N6267 - 1N6303 ⁽⁵⁾	Plastic Axial	1.5KE	5.5 to 171	6.8 to 200	5 %
	1.5SMCnnA ⁽⁵⁾	Surface Mount	DO-214AB (SMC)	5.8 to 459	6.8 to 540	5 %
	1.5SMCnnCA	Surface Mount	DO-214AB (SMC)	5.8 to 185	6.8 to 220	5 %
800	ICTE-xx ⁽⁵⁾	Plastic Axial	1.5KE	5.0 to 18	6.0 to 21.2	N/A

Notes:

- Tested with 10/1000 μ s pulse
- In part numbers, "xx" designates VWM and "nn" designates nominal voltage
- 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 "CA" (BZW04 use suffix "B")

(5) Uni-directional polarity only

(6) 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.

Transient Voltage Suppressors

TRANSZORB® Avalanche (cont'd.)

P _{PPM} (W) ⁽¹⁾	Device ⁽²⁾	Package		V _{WM} Range (V)	V _(BR) Range ⁽³⁾ (V)	V _(BR) Tolerance (Suffix)
		Family	Type			
1500 cont'd	ICTE-xxC	Plastic Axial	1.5KE	8.0 to 18	9.4 to 21.2	N/A
	1N6373 - 1N6378⁽⁵⁾	Plastic Axial	1.5KE	5.0 to 18	6.0 to 21.2	N/A
	1N6382 - 1N6386	Plastic Axial	1.5KE	8.0 to 18	9.4 to 21.2	N/A
	SM15TnnA, CA	Surface Mount	DO-214AB (SMC)	5.8 to 188	6.8 to 220	5 %
	SMCGxxA, CA	Surface Mount	DO-214AB (SMC)	5.0 to 188	6.4 to 209	5 %
	SMCJxxA, CA	Surface Mount	DO-214AB (SMC)	5.0 to 188	6.4 to 209	5 %
	SMPCxxA	Surface Mount	TO-277A (SMPC)	5.0 to 36	6.4 to 40	5 %
3000	SMC3KxxCA	Surface Mount	DO-214AB (SMC)	22 to 78	24.4 to 86.7	5 %
5000	5KPxxA⁽⁵⁾	Plastic Axial	P600	5.0 to 188	6.4 to 209	5 %

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. 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 "CA" (BZW04 use suffix "B")

- (5) Uni-directional polarity only

- (6) 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 _{PPM} (W) ⁽¹⁾	Device ⁽²⁾	Package		V _{WM} Range (V)	V _(BR) Range ⁽³⁾ (V)	V _(BR) Tolerance (Suffix)
		Family	Type			
250	TPSMPnn(A)	Surface Mount	DO-220AA (SMP)	5.5 to 5.8	6.8	5 %(A)/10 %(blank)
300	TPSMPnn(A)	Surface Mount	DO-220AA (SMP)	6.05 to 10.2	7.5 to 12	5 %(A)/10 %(blank)
400	TPSMPnn(A)	Surface Mount	DO-220AA (SMP)	10.5 to 36.8	13 to 43	5 %(A)/10 %(blank)
	TPSMAnn(A)	Surface Mount	DO-214AC (SMA)	5.5 to 36.8	6.8 to 43	5 %(A)/10 %(blank)
	TMPG06-nn(A)	Plastic Axial	MPG06	8.1 to 36.8	10 to 43	5 %(A)/10 %(blank)
600	P4KAnn(A)	Plastic Axial	DO-204AL (DOto41)	5.5 to 36.8	6.8 to 43	5 %(A)/10 %(blank)
	TPSMBnn(A)	Surface Mount	DO-214AA (SMB)	5.5 to 36.8	6.8 to 43	5 %(A)/10 %(blank)
	P6KAnn(A)	Plastic Axial	DO-204AC (DOto15)	5.5 to 36.8	6.8 to 43	5 %(A)/10 %(blank)
1500	TPCnn(A)	Surface Mount	TO-277A (SMPC)	5.5 to 43.6	6.8 to 51	5 %(A)/10 %(blank)
	TPSMCnn(A)	Surface Mount	DO-214AB (SMC)	5.5 to 40.2	6.8 to 47	5 %(A)/10 %(blank)
	1.5KAnn(A)	Plastic Axial	1.5KA	5.5 to 40.2	6.8 to 47	5 %(A)/10 %(blank)
3000	3KASMCnn(A)	Surface Mount	DO-214AB (SMC)	10 to 43	11.1 to 52.8	5 %(A)/10 %(blank)
3600 ⁽⁴⁾	SM5A27	Surface Mount	DO-218AB	22	27	±3 V
	SM5Sxx(A)	Surface Mount	DO-218AB	10 to 36	11.1 to 40	5 %(A)/10 %(blank)
4600 ⁽⁴⁾	SM6A27	Surface Mount	DO-218AB	22	27	±3 V
	SM6Sxx(A)	Surface Mount	DO-218AB	10 to 36	11.1 to 40	5 %(A)/10 %(blank)
5000	5KASMCxxA	Surface Mount	DO-214AB (SMC)	10 to 43	11.1 to 47.8	5 %
6000	6KA24	Plastic Axial	P600	24	29.7	10 %
	SM8A27	Surface Mount	DO-218AB	22	27	±3 V
6600 ⁽⁴⁾	SM8Sxx(A)	Surface Mount	DO-218AB	10 to 43	11.1 to 47.8	5 %(A)/10 %(blank)

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"
- (4) For 10 µs/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.



DIODES



Special Function Transient Voltage Suppressors

Special Function Transient Voltage Suppressor

Low Capacitance Transient Voltage Suppressors

P _{PPM} ⁽¹⁾ (W)	Device ⁽²⁾	Package		V _{WM} Range (V)	V _(BR) Range ⁽³⁾ (V)	V _(BR) Tolerance (Suffix)
		Family	Type			
500	SACxx	Plastic Axial	DO-204AC (DO-15)	5.0 to 50	7.6 to 55.5	N/A
1500	LCExx(A)	Plastic Axial	1.5KE	6.5 to 28	7.22 to 31.1	5 %(A)/10 %(blank)

Low Forward Voltage Transient Voltage Suppressors

P _{PPM} ⁽¹⁾ (W)	Device ⁽²⁾	Package		V _{WM} (V)	V _(BR) Range ⁽³⁾ (V)	Max I _D @ V _{WM} (μA)
		Family	Type			
600	LVB14A	Surface Mount	DO-214AA (SMB)	12	13.2 to 14.8	5%

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



DIODES



ESD Protection Devices and EMI Filters

ESD Protection Devices

Part Number	Package Name	V _{RWM} Working Range	I _R Reverse Leakage Current @ V _{RWM}	V _{BR min} Break Down Voltage	V _C Clamping Voltage @ I _{PPM}	I _{PPM} Peak Pulse Current IEC 61000-4-5@8/20µs (*) = @ 10/1000	P _{PP} Peak Pulse Power IEC 61000-4-5 @ 8/20µs (*) = @ 10/1000	C _D Load Capacitance @ V _R = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines		
										1)	BiAs	BiSy
		(V)	(µA)	(V)	(V)	[A]	(W)	(pF)	(kV)			
BZG04-8V2	DO214AC (SMA)	8.2	20	9	14.8	20.3 (*)	300 (*)	1200	30	1		
BZG04-9V1	DO214AC (SMA)	9.1	5	10	15.7	19.1 (*)	300 (*)	1100	30	1		
BZG04-10	DO214AC (SMA)	10	5	11	17	17.7 (*)	300 (*)	1000	30	1		
BZG04-11	DO214AC (SMA)	11	5	12	18.9	15.9 (*)	300 (*)	850	30	1		
BZG04-12	DO214AC (SMA)	12	5	14	20.9	14.4 (*)	300 (*)	815	30	1		
BZG04-13	DO214AC (SMA)	13	5	15	22.9	13.1 (*)	300 (*)	785	30	1		
BZG04-15	DO214AC (SMA)	15	5	17	25.6	11.7 (*)	300 (*)	710	30	1		
BZG04-16	DO214AC (SMA)	16	5	19	28.4	10.6 (*)	300 (*)	655	30	1		
BZG04-18	DO214AC (SMA)	18	5	21	31	9.7 (*)	300 (*)	610	30	1		
BZG04-20	DO214AC (SMA)	20	5	23	33.8	8.9 (*)	300 (*)	570	30	1		
BZG04-22	DO214AC (SMA)	22	5	25	38.1	7.9 (*)	300 (*)	545	30	1		
BZG04-24	DO214AC (SMA)	24	5	28	42.2	7.1 (*)	300 (*)	505	30	1		
BZG04-27	DO214AC (SMA)	27	5	31	46.2	6.5 (*)	300 (*)	475	30	1		
BZG04-30	DO214AC (SMA)	30	5	34	50.1	6 (*)	300 (*)	450	30	1		
BZG04-33	DO214AC (SMA)	33	5	37	54.1	5.5 (*)	300 (*)	420	30	1		
BZG04-36	DO214AC (SMA)	36	5	40	60.7	4.9 (*)	300 (*)	390	30	1		
BZG04-39	DO214AC (SMA)	39	5	44	65.5	4.6 (*)	300 (*)	370	30	1		
BZG04-43	DO214AC (SMA)	43	5	48	70.8	4.2 (*)	300 (*)	350	30	1		
BZG04-47	DO214AC (SMA)	47	5	52	78.6	3.8 (*)	300 (*)	330	30	1		
BZG04-51	DO214AC (SMA)	51	5	58	86.5	3.5 (*)	300 (*)	310	30	1		
BZG04-56	DO214AC (SMA)	56	5	64	94.4	3.2 (*)	300 (*)	291	30	1		
BZG04-62	DO214AC (SMA)	62	5	70	103.5	2.9 (*)	300 (*)	280	30	1		
BZG04-68	DO214AC (SMA)	68	5	77	114	2.6 (*)	300 (*)	275	30	1		
BZG04-75	DO214AC (SMA)	75	5	85	126	2.4 (*)	300 (*)	260	30	1		
BZG04-82	DO214AC (SMA)	82	5	94	139	2.2 (*)	300 (*)	250	30	1		
BZG04-91	DO214AC (SMA)	91	5	104	152	2 (*)	300 (*)	243	30	1		
BZG04-100	DO214AC (SMA)	100	5	114	167	1.8 (*)	300 (*)	170	30	1		
BZG04-110	DO214AC (SMA)	110	5	124	185	1.6 (*)	300 (*)	153	30	1		
BZG04-120	DO214AC (SMA)	120	5	138	204	1.5 (*)	300 (*)	150	30	1		
BZG04-130	DO214AC (SMA)	130	5	153	224	1.3 (*)	300 (*)	145	30	1		
BZG04-150	DO214AC (SMA)	150	5	168	249	1.2 (*)	300 (*)	140	30	1		
BZG04-160	DO214AC (SMA)	160	5	188	276	1.1 (*)	300 (*)	135	30	1		
BZG04-180	DO214AC (SMA)	180	5	208	305	1 (*)	300 (*)	131	30	1		
BZG04-200	DO214AC (SMA)	200	5	228	336	0.9 (*)	300 (*)	122	30	1		
BZG04-220	DO214AC (SMA)	220	5	251	380	0.8 (*)	300 (*)	120	30	1		
GL05T	SOT-23	5	20	6	-	17	300	5	25			1
GL12T	SOT-23	12	1	13	-	12	300	5	25			1
GL15T	SOT-23	15	1	17	-	10	300	5	25			1
GL24T	SOT-23	24	1	27	55	5	300	5	25			1
GMF05C-HS3	LLP75-6A	5	1	6	12.5	12	200	150	30	5	4	
GMF05C-HSF	LLP75-6L	5	1	6	12.5	12	200	150	30	5	4	
GMF05LC-HS3	LLP75-6A	5	0.1	6	12.5	5	70	50	30	5	4	
GMF05LC-HSF	LLP75-6L	5	0.1	6	12.5	5	70	50	30	5	4	
GSOT03	SOT-23	3.3	100	4	12.3	30	369	600	30	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



DIODES



ESD Protection Devices and EMI Filters

ESD Protection Devices, (cont'd.)

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

Diodes - Protect Against Transient Voltage Surge and ESD

ESD Protection Devices, (cont'd.)

Part Number	Package Name	V _{RWM} Working Range	I _R Reverse Leakage Current @ V _{RWM}	V _{BR min} Break Down Voltage	V _C Clamping Voltage @ I _{PPM}	I _{PPM} Peak Pulse Current IEC 61000-4-5@8/20µs (*) = @ 10/1000	P _{PP} Peak Pulse Power IEC 61000-4-5 @ 8/20µs (*) = @ 10/1000	C _D Load Capacitance @ V _R = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines		
										1)	BiAs	BiSy
		(V)	(µA)	(V)	(V)	[A]	(W)	(pF)	(kV)			
SMF36A	SMF (DO-219AB)	36	1	40	58.1	3.4 (*)	1000	180	30	1		
SMF40A	SMF (DO-219AB)	40	1	44	64.5	3.1 (*)	1000	165	30	1		
SMF43A	SMF (DO-219AB)	43	1	48	69.4	2.9 (*)	1000	160	30	1		
SMF45A	SMF (DO-219AB)	45	1	50	72.7	2.8 (*)	1000	155	30	1		
SMF48A	SMF (DO-219AB)	48	1	53	77.4	2.6 (*)	1000	150	30	1		
SMF51A	SMF (DO-219AB)	51	1	57	82.4	2.4 (*)	1000	145	30	1		
VBUS051BD-HD1	LLP1006-2L	5	0.1	7	16	3	45	1.3	15	1		
VBUS051CD-HD1	LLP1006-2L	5.5	0.1	7	14	2	28	0.8	9	1		
VBUS052BD-HTF	LLP75-4L	5	0.1	7	16	3	45	2.5	15	2		
VBUS052CD-FAH	LLP1713-7L	5	0.1	7	18	3.5	63	1	15	2		
VBUS053AZ-HAF (Pin 1,2,3 to 7)	LLP75-7L	5.5	0.1	7	18	3	36	1	15	3		
VBUS053AZ-HAF (Pin 6 to 7)	LLP75-7L	12	0.1	15	30	8	240	80	30	1		
VBUS052BD-HTF	LLP75-4L	5	0.1	6.9	16	3	45	2.5	15	2		
VBUS054DD-HF4	LLP1010-5L	5	0.1	6.9	19	3	57	1	15	4		
VBUS54ED-FBL	LLP2510-10L	5.5	0.1	6.9	12.5	2	25	0.8	15	4		
VCUT05D1-SD0	CLP0603	5.5	0.1	6	13	6	78	13	30		1	
VBUS053BZ-HNH (Pin 1-3 to 9)	LLP1713-9L	5.5	1	7	18	3	36	1	12	3		
VBUS053BZ-HNH (Pin 4 to 9)	LLP1713-9L	12	0.1	15	30	8	240	85	30	1		
VBUS053CZ-HAF (Pin 1,2,3 to 7)	LLP75-7L	5.5	1	7	18	3	36	1	15	3		
VBUS053CZ-HAF (Pin 6 to 7)	LLP75-7L	28	0.1	32	60	3	180	50	8	1		
VBUS054B-HS3	LLP75-6A	5	0.1	6	15	3	45	1	15	4		
VBUS054B-HSE	LLP75-6L	5	0.1	6	15	3	45	1	15	4		
VBUS054CD-FHI	LLP2513-11L	5	0.1	7	18	3.5	63	1	15	4		
VBUS054CV-HS3	LLP75-6A	5	0.1	6	22	11	242	2.5	30	4		
VBUS054DD-HF4	LLP1010-5L	5	0.1	7	19	3	57	1	15	4		
VBUS05L1-DD1	LLP1006-2M	5.5	0.05	7	17	2	34	0.4	9		1	
VCUT03B1-DD1	LLP1006-2M	3.5	0.1	6	11.5	3.5	40	15	18		1	
VCUT0505B-HD1	LLP1006-2L	5	0.1	7	16	3.5	56	20	20		1	
VCUT05B1-DD1	LLP1006-2M	5.5	0.1	6	12.5	3	38	13	30		1	
VCUT0714A-HD1	LLP1006-2L	14	0.1	15	30	2	54	8.5	25	1	1	
VESD01-02V	SOD-523	1	100	2	9	7	63	180	8	1		
VESD03-02V	SOD-523	3	20	4	12	9	108	110	8	1		
VESD03A1B-HD1	LLP1006-2L	3.3	0.5	5	9	3.5	31	28	30	1		
VESD03A1C-HD1	LLP1006-2L	3.3	1	5	10	9.5	95	90	30	1		
VESD05-02V	SOD-523	5	0.1	7	20	6	120	55	8	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

Diodes - Protect Against Transient Voltage Surge and ESD

ESD Protection Devices, (cont'd.)

Part Number	Package Name	V _{RWM} Working Range	I _R Reverse Leakage Current @ V _{RWM}	V _{BR min} Break Down Voltage	V _C Clamping Voltage @ I _{PPM}	I _{PPM} Peak Pulse Current IEC 61000-4-5@8/20µs (*) = @ 10/1000	P _{PP} Peak Pulse Power IEC 61000-4-5 @ 8/20µs (*) = @ 10/1000	C _D Load Capacitance @ V _R = 0 V	ESD Immunity IEC 61000-4-2	Number of Protected Lines 1)		
										(V)	(µA)	(V)
VESD05A1-02V	SOD-523	5	1	6	12	16	192	150	30	1		
VESD05A1A-HD1	LLP1006-2L	5	1	6	12	16	192	150	30	1		
VESD05A1B-02V	SOD-523	5	0.1	6	11	3	33	23	20	1		
VESD05A1B-HD1	LLP1006-2L	5	0.1	6	11	3	33	23	20	1		
VESD05A1C-HD1	LLP1006-2L	5	0.2	6	10	8	80	63	30	1		
VESD05A4A-HS4	LLP1010-6L	5	0.1	6	12	2.5	30	15	15	4	3	
VESD05A5A-HS3	LLP75-6A	5	0.1	6	13	2.5	33	15	15	5	4	
VESD05A5A-HSF	LLP75-6L	5	0.1	6	13	2.5	33	15	15	5	4	
VESD05A6A-HAF	LLP75-7L	5	0.1	6	13	2.5	33	15	15	6	5	
VESD05A6-HAF	LLP75-7L	5	1	6	12	5	60	50	30	6	5	
VESD05A8A-HNH	LLP1713-9L	5	1	6	13	5	65	35	25	8	7	
VESD05A8B-HNH	LLP1713-9L	5	0.5	6	13	4	52	23	17	8	7	
VESD05A8C-HNH	LLP1713-9L	5	0.1	6	13	2.5	33	13	8	8	7	
VESD08-02V	SOD-523	8	0.1	9	30	4	120	35	8	1		
VESD09A4A-HS4	LLP1010-6L	9	0.1	11	23	1.5	30	10	8	4		
VESD09A4A-HSF	LLP75-6L	9	0.1	11	23	1.5	30	10	8	4		
VESD12-02V	SOD-523	12	0.1	14	25	2	50	30	8	1		
VESD12A1A-HD1	LLP1006-2L	12	0.1	14	24	8	200	65	30	1		
VESD12A1C-HD1	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!



DIODES



EMI Filter devices with ESD Protection

Diodes - Protect Against Transient Voltage Surge and ESD

Part Number	Package Name	V _{RWM} Working Range	I _R Reverse Leakage Current @ V _{RWM}	V _{BR} min Break Down Voltage @ 1mA	V _C Clamping Voltage @ I _{PPM}	I _{PPM} Peak Pulse Current acc. IEC 61000-4-5 @ 8/20 μs	C _D Load Capacitance @ V _R = 0 V	ESD-Immunity acc. IEC 61000-4-2	R _S Series Resistance	Line Inductance L _s	3dB Cut Off Frequency	Number of Protected Lines (2)
		(V)	(μA)	(V)	(V)	(A)	(pF)	(kV)	(Ohm)	(nH)	(MHz)	BiAs
VEMI255A-HS3	LLP75-6A	5	1	6	8	4	60	30	50		100	2
VEMI353A-HAF	LLP75-7L	5	1	6	8	4	60	30	30		100	3
VEMI355A-HAF	LLP75-7L	5	1	6	8	4	60	30	50		100	3
VEMI35AA-HAF	LLP75-7L	5	1	6	8	4	60	30	100		100	3
VEMI45AA-HNH	LLP1713-9L	5	1	6	8	4	60	30	100		100	4
VEMI45AB-HNH	LLP1713-9L	5	1	6	8	4	40	18	100		130	4
VEMI45AC-HNH	LLP1713-9L	5	1	6	8	2	20	10	100		240	4
VEMI45LA-HNH	LLP1713-9L	5	1	6	8	4	53	25	12	10	150	4
VEMI65AA-HCI	LLP2513-13L	5	1	6	8	4	60	30	100		100	6
VEMI65AB-HCI	LLP2513-13L	5	1	6	8	4	40	18	100		130	6
VEMI65AC-HCI	LLP2513-13L	5	1	6	8	2	20	10	100		240	6
VEMI85AA-HGK	LLP3313-17L	5	1	6	8	4	60	30	100		100	8
VEMI85AB-HGK	LLP3313-17L	5	1	6	8	4	40	18	100		130	8
VEMI85AC-HGK	LLP3313-17L	5	1	6	8	2	20	10	100		240	8
VEMI85LA-HGK	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
CLP0603	0.6	0.3	0.27
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
LLP2510	2.5	1.35	0.55
LLP2513-11L	2.5	1.35	0.55
SOT-23	2.85	2.50	1.0

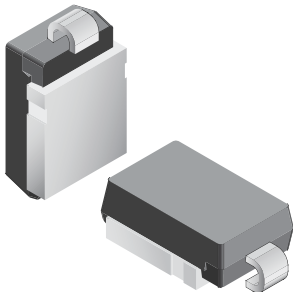


DIODES Packages

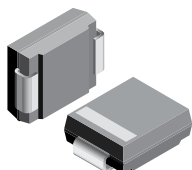


Diodes - Protect Against Transient Voltage Surge and ESD

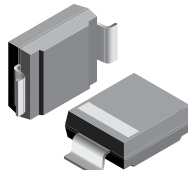
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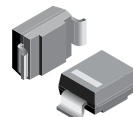
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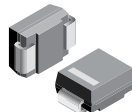
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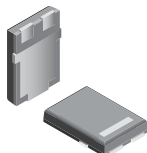
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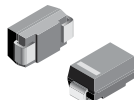
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TO-277A (SMPC)



DO-214AC (SMA)



MPG06



DO-204AL (DO-41)



DO-204AC (DO-15)



DO-220AA (SMP)



Micro SMP



1.5KE



P600





DIODES Packages



Diodes - Protect Against Transient Voltage Surge and ESD

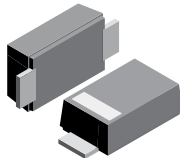
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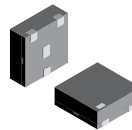
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SMF



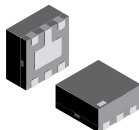
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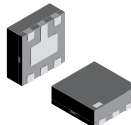
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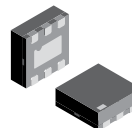
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LLP75-6L



LLP75-7L



LLP1006-2L
LLP1006-2M



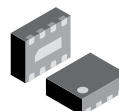
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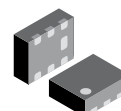
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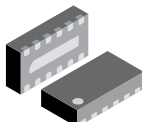
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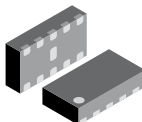
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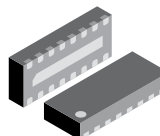
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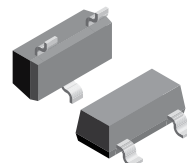
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LLP3313-17L



SOT-23



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