



ZENER DIODES AND TRANSIENT VOLTAGE SUPPRESSORS

QUARTER 3, 1998

TVS (Transient Voltage Suppressors)

General-Purpose – Axial Leded for Through-Hole Designs

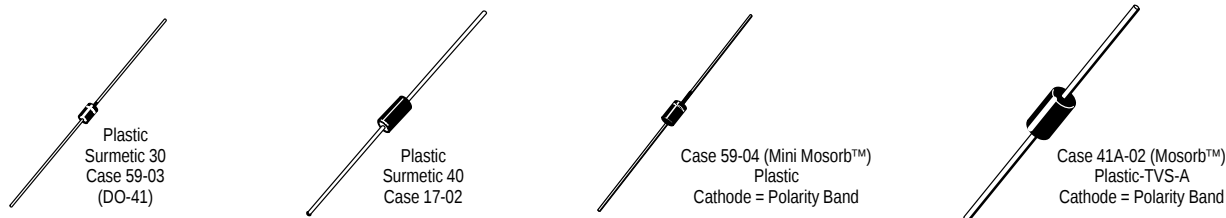


Table 1. Peak Power Dissipation⁽¹⁾ — 500 Watts @ 1 ms Surge Case 59-04 — (Mini Mosorb)

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 35 A Pulse (except bidirectional devices).							
Working Peak Reverse Voltage V _{RWM} (Volts)	Device ⁽²⁾	Breakdown Voltage			Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)
		V _{BR} (Volts)		@ I _T Pulse (mA)			
		Min	Max				
5	SA5.0A	6.4	7	10	600	54.3	9.2
6	SA6.0A	6.67	7.37	10	600	48.5	10.3
12	SA12A	13.3	14.7	1	1	25.1	19.9
13	SA13A	14.4	15.9	1	1	23.2	21.5
15	SA15A	16.7	18.5	1	1	20.6	24.4

See notes at bottom of TVS Table 4.

Table 2. Peak Power Dissipation⁽⁴⁾ — 600 Watts @ 1 ms Surge Case 17-02 — (Surmetic 40)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 50\text{ A Pulse}$ (except bidirectional devices).						
Breakdown Voltage ⁽⁵⁾		Device ^(3,6)	Working Peak Reverse Voltage V_{RWM} (Volts)	Maximum Reverse Leakage @ V_{RWM} I_R (μA)	Maximum Reverse Surge Current I_{RSM} (Amps)	Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts)
V_{BR} (Volts)	@ I_T Pulse (mA)					
Nom						
6.8	10	P6KE6.8A	5.8	1000	57	10.5
13	1	P6KE13A	11.1	5	33	18.2
15	1	P6KE15A	12.8	5	28	21.2
27	1	P6KE27A	23.1	5	16	37.5
33	1	P6KE33A	28.2	5	13.2	45.7
36	1	P6KE36A	30.8	5	12	49.9
62	1	P6KE62A	53	5	7.1	85

See notes at bottom of TVS Table 4.

Table 3. Peak Power Dissipation⁽⁴⁾ — 1500 WATTS @ 1 ms Surge Case 41A-02 — (Mosorb)

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 100 A Pulse (C suffix denotes standard back to back bidirectional versions. Test both polarities)									
Maximum Reverse Stand-Off Voltage V _{RWM} (Volts)	JEDEC ⁽⁷⁾ Device	Device ⁽⁷⁾	Breakdown Voltage		Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)	Clamping Voltage ⁽⁸⁾	
			V _{BR} Volts Min	@ I _T Pulse (mA)				Peak Pulse Current @ I _{pp1} = 1 A V _{C1} (Volts max)	Peak Pulse Current @ I _{pp2} = 10 A V _{C2} (Volts max)
5	1N5908	ICTE-5/MPTE-5	6	1	300	120	8.5	7.6 @ 30 A	8 @ 60 A
5	1N6373		6	1	300	160	9.4	7.1	7.5

See notes at bottom of TVS Table 4.

TVS (Transient Voltage Suppressors) (continued)

General-Purpose – Axial Leaded for Through-Hole Designs

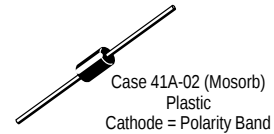


Table 4. Peak Power Dissipation⁽⁴⁾ — 1500 Watts @ 1 ms Surge Case 41A-02

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 100 A Pulse							
Breakdown Voltage ⁽⁵⁾		JEDEC Device	Device ^(9,10)	Working Peak Reverse Voltage V _{RWM} (Volts)	Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)
V _{BR} Volts	@ I _T Pulse (mA)						
Nom							
6.8	10	1N6267A	1.5KE6.8A	5.8	1000	143	10.5
24	1	1N6280A	1.5KE24A	20.5	5	45	33.2
30	1	1N6282A	1.5KE30A	25.6	5	36	41.4
33	1	1N6283A	1.5KE33A	28.2	5	33	45.7
36	1	1N6284A	1.5KE36A	30.8	5	30	49.9
51	1	1N6288A	1.5KE51A	43.6	5	21.4	70.1
62	1	1N6290A	1.5KE62A	53	5	17.7	85

- (1) Steady state power dissipation = 3 watt max rating.
 (2) For bidirectional types use the CA suffix. **SA12CA**, **SA13CA** and **SA15CA** are Motorola preferred devices. Have cathode polarity band on each end. (Consult factory for availability)
 (3) For bidirectional types use the CA suffix. Have cathode polarity band on each end. (Consult factory for availability)
 (4) Steady state power dissipation = 5 watts max rating.
 (5) Breakdown voltage tolerance is ±5% for A suffix.
 (6) UL recognition for classification of protectors (QVGV2) under the UL standard for safety 497B for entire series including CA suffixes.
 (7) 1N6382 thru 1N6389 and C suffix ICTE/MPTE device types are bidirectional. Have cathode polarity band on each end. All other device types are unidirectional
 1N6267-6303A series do not have a CA option since the CA is not included in EIA Registration.
 (8) Clamping voltage peak pulse currents for 1N5908 are 30 Amps and 60 Amps.
 (9) For bidirectional types use the CA suffix on 1.5KE series only. Have cathode polarity band on each end. (Consult factory for availability)
 (10) UL recognition for classification of protectors (QVGV2) under the UL standard for safety 497B for 1.5KE6.8A, CA thru 1.5KE250A, CA.

*Other voltages may be available upon request. Please contact your Motorola representative.

Surface Mount Packages

Table 5. Peak Power Dissipation — 40 Watts @ 1 ms Surge Case 318-08 — Common Cathode MMBZ15VDLT1⁽¹⁾ — SOT-23 Dual Monolithic Common Cathode Bipolar Zener for ESD protection*

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)								
BIDIRECTIONAL (Circuit tied to pins 1 and 2)								
Breakdown Voltage				Working Peak Reverse Voltage V _{RWM} (Volts)	Maximum Reverse Leakage Current I _{RWM} I _R (nA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)	Maximum Temperature Coefficient of V _{BR} (mV/°C)
V _{BR} ⁽²⁾ (Volts)			@ I _T (mA)					
Min	Nom	Max						
14.3	15	15.8	1.0	12.8	100	1.9	21.2	12
25.65	27	28.35	1.0	22	50	1.0	38	26

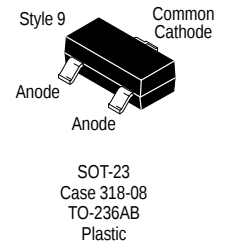
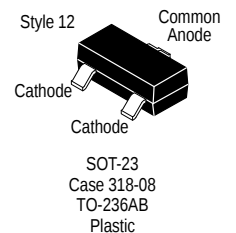


Table 6. Peak Power Dissipation — 24 Watts @ 1 ms Surge Case 318-08 — Common Anode MMBZ5V6ALT1 — SOT-23 Dual Monolithic Common Anode Zener for ESD Protection*

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)											
UNIDIRECTIONAL (Circuit tied to pins 1 and 3 or Pins 2 and 3) (V _F = 0.9 V Max @ I _F = 10 mA)											
Breakdown Voltage			Maximum Reverse Leakage Current		Maximum Zener Impedance ⁽³⁾			Max Reverse Surge Current I _{RSM} (A)	Max Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (V)	Maximum Temperature Coefficient of V _{BR} (mV/°C)	
V _{BR} ⁽²⁾ (V)			@ I _T (mA)	I _R @ V _R (uA)	V _R (V)	Z _{ZT} @ I _{ZT} (Ω)					Z _{ZK} @ I _{ZK} (Ω)
Min	Nom	Max									
5.32	5.6	5.88	20	5.0	3.0	11	1600	0.25	3.0	8.0	1.26
5.89	6.2	6.51	1.0	0.5	3.0	—	—	—	2.76	8.7	2.80



- (1) T1 suffix designates tape and reel of 3000 units.
 (2) V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.
 (3) Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are I_{Z(AC)} = 0.1 I_{Z(DC)}, with AC frequency = 1 kHz.

*Other voltages may be available upon request. Please contact your Motorola representative.

Surface Mount Packages (continued)

Table 6. Peak Power Dissipation — 24 Watts @ 1 ms Surge Case 318-08 — Common Anode
MMBZ5V6ALT1 — SOT-23 Dual Monolithic Common Anode Zener for ESD Protection* (continued)

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)								
UNIDIRECTIONAL (Circuit tied to pins 1 and 3 or Pins 2 and 3) (V _F = 1.1 V Max @ I _F = 200 mA)								
Breakdown Voltage				Reverse Voltage Working Peak V _{RWM} (V)	Max Reverse Leakage Current I _{RWM} I _R (nA)	Max Reverse Surge Current I _{RSM} ⁽⁴⁾ (A)	Max Reverse Voltage @ I _{RSM} ⁽²⁾ (Clamping Voltage) V _{RSM} (V)	Maximum Temperature Coefficient of V _{BR} (mV/°C)
V _{BR} ⁽¹⁾ (V)			@ I _T (mA)					
Min	Nom	Max						
14.25	15	15.75	1.0	12.0	50	1.9	21	12.3
19.0	20	21.0	1.0	17.0	50	1.4	28	17.2

(1) V_Z/V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

(2) Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.

*Other voltages may be available upon request. Please contact your Motorola representative.

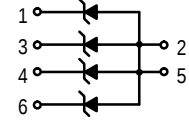
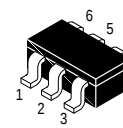
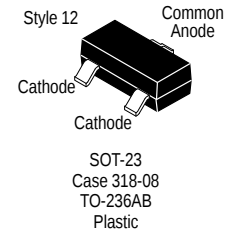


Table 7. Peak Power Dissipation — 24 Watts — SC-59 Quad Transient Voltage Suppressor (ESD Protection) — Monolithic 4-Function Device

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)										
UNIDIRECTIONAL (Circuit tied to pins 1, 2, and 5; Pins 2, 3, and 5; Pins 2, 4, and 5; or Pins 2, 5, and 6) (V _F = 0.9 V Max @ I _F = 10 mA)										
	Breakdown Voltage				Max Reverse Leakage Current		Max Zener Impedance (3)	Max Reverse Surge Current	Max Reverse Voltage @ I _{RSM} (2) (Clamping Voltage)	Maximum Temperature Coefficient of V _Z
		V _{ZT} (1) (V)		@ I _{ZT}	I _R	V _R				
Device	Min	Nom	Max	(mA)	(nA)	(V)	Z _{ZT} @ I _{ZT} (Ω) (mA)	I _{RSM} (4) (A)	V _{RSM} (V)	(mV/°C)
MMQA5V6T1,T3	5.32	5.6	5.88	1.0	2000	3.0	400	3.0	8.0	1.26
MMQA6V2T1,T3	5.89	6.2	6.51	1.0	700	4.0	300	2.66	9.0	10.6
MMQA6V8T1,T3	6.46	6.8	7.14	1.0	500	4.3	300	2.45	9.8	10.9
MMQA12VT1,T3	11.4	12	12.6	1.0	75	9.1	80	1.39	17.3	14
MMQA13VT1,T3	12.4	13	13.7	1.0	75	9.8	80	1.29	18.6	15
MMQA15VT1,T3	14.3	15	15.8	1.0	75	11	80	1.1	21.7	16
MMQA18VT1,T3	17.1	18	18.9	1.0	75	14	80	0.923	26	19
MMQA20VT1,T3	19	20	21	1.0	75	15	80	0.84	28.6	20.1
MMQA21VT1,T3	20	21	22.1	1.0	75	16	80	0.792	30.3	21
MMQA22VT1,T3	20.9	22	23.1	1.0	75	17	80	0.758	31.7	22
MMQA24VT1,T3	22.8	24	25.2	1.0	75	18	100	0.694	34.6	25
MMQA27VT1,T3	25.7	27	28.4	1.0	75	21	125	0.615	39	28
MMQA30VT1,T3	28.5	30	31.5	1.0	75	23	150	0.554	43.3	32
MMQA33VT1,T3	31.4	33	34.7	1.0	75	25	200	0.504	48.6	37

(1) V_Z measured at pulse test current I_T at an ambient temperature of 25°C .

(2) Surge current waveform per Figure 5 and derate per Figure 4.

(3) Z_{ZT} is measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.

(4) Alumina = $0.4 \times 0.3 \times 0.024$ inches. 99.5% alumina.

Surface Mount Packages (continued)

Table 8. 1.5 W — Peak Power Dissipation — 200 Watts (10/1000 μ s) — SMA (Case 403B-01)

ELECTRICAL CHARACTERISTICS ($V_F = 1.5$ V @ $I_F = 200$ mA for all types)									
Device	Nominal Zener Voltage V_Z @ I_{ZT} Volts	Test Current I_{ZT} mA	Max Zener Impedance			Max Reverse Leakage Current			Device Marking
			Z_{ZT} @ I_{ZT} Ohms	Z_{ZK} Ohms	I_{ZK} mA	I_R μ A	V_R Volts	Max DC Zener Current I_{ZM} mAdc	
1SMA5913BT3	3.3	113.6	10	500	1.0	50	1.0	455	813B
1SMA5914BT3	3.6	104.2	9.0	500	1.0	35.5	1.0	417	814B
1SMA5915BT3	3.9	96.1	7.5	500	1.0	12.5	1.0	385	815B
1SMA5916BT3	4.3	87.2	6.0	500	1.0	2.5	1.0	349	816B
1SMA5917BT3	4.7	79.8	5.0	500	1.0	2.5	1.5	319	817B
1SMA5918BT3	5.1	73.5	4.0	350	1.0	2.5	2.0	294	818B
1SMA5919BT3	5.6	66.9	2.0	250	1.0	2.5	3.0	268	819B
1SMA5920BT3	6.2	60.5	2.0	200	1.0	2.5	4.0	242	820B
1SMA5921BT3	6.8	55.1	2.5	200	1.0	2.5	5.2	221	821B
1SMA5922BT3	7.5	50	3.0	400	0.5	2.5	6.5	200	822B
1SMA5923BT3	8.2	45.7	3.5	400	0.5	2.5	6.8	183	823B
1SMA5924BT3	9.1	41.2	4.0	500	0.5	2.5	7.0	165	824B
1SMA5925BT3	10	37.5	4.5	500	0.25	0.5	8.0	150	825B
1SMA5926BT3	11	34.1	5.5	550	0.25	0.5	8.4	136	826B
1SMA5927BT3	12	31.2	6.5	550	0.25	0.5	9.1	125	827B
1SMA5928BT3	13	28.8	7.0	550	0.25	0.5	9.9	115	828B
1SMA5929BT3	15	25	9.0	600	0.25	0.5	11.4	100	829B
1SMA5930BT3	16	23.4	10	600	0.25	0.5	12.2	94	830B
1SMA5931BT3	18	20.8	12	650	0.25	0.5	13.7	83	831B
1SMA5932BT3	20	18.7	14	650	0.25	0.5	15.2	75	832B
1SMA5933BT3	22	17	17.5	650	0.25	0.5	16.7	68	833B
1SMA5934BT3	24	15.6	19	700	0.25	0.5	18.2	63	834B
1SMA5935BT3	27	13.9	23	700	0.25	0.5	20.6	56	835B
1SMA5936BT3	30	12.5	26	750	0.25	0.5	22.8	50	836B
1SMA5937BT3	33	11.4	33	800	0.25	0.5	25.1	45	837B
1SMA5938BT3	36	10.4	38	850	0.25	0.5	27.4	42	838B
1SMA5939BT3	39	9.6	45	900	0.25	0.5	29.7	38	839B
1SMA5940BT3	43	8.7	53	950	0.25	0.5	32.7	35	840B
1SMA5941BT3	47	8.0	67	1000	0.25	0.5	35.8	32	841B
1SMA5942BT3	51	7.3	70	1100	0.25	0.5	38.8	29	842B
1SMA5943BT3	56	6.7	86	1300	0.25	0.5	42.6	27	843B
1SMA5944BT3	62	6.0	100	1500	0.25	0.5	47.1	24	844B
1SMA5945BT3	68	5.5	120	1700	0.25	0.5	51.7	22	845B

NOTE: Tolerance and Voltage Designation Tolerance designation — The type number listed indicates a tolerance of $\pm 5\%$.



SMA
Case 403B-01
Plastic



SMB
Case 403A-03
Plastic
Cathode = Notch

Table 9. Peak Power Dissipation — 600 WATTS @ 1 ms Surge — SMB Case 403A-03

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 50 A Pulse.							
Breakdown Voltage ⁽⁶⁾		Device ⁽⁴⁾	Working Peak Reverse Voltage V _{RWM} Volts	Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)	Device Marking
V _{BR} @ I _T Pulse ⁽¹⁾ Volts							
Nom	mA						
13	1	P6SMB13AT3	11.1	5	33	18.2	13A
15	1	P6SMB15AT3	12.8	5	28	21.2	15A
27	1	P6SMB27AT3	23.1	5	16	37.5	27A
30	1	P6SMB30AT3	25.6	5	14.4	41.4	30A
33	1	P6SMB33AT3	28.2	5	13.2	45.7	33A
36	1	P6SMB36AT3	30.8	5	12	49.9	36A
51	1	P6SMB51AT3	43.6	5	8.6	70.1	51A
62	1	P6SMB62AT3	53	5	7.1	85	62A

See notes at bottom of TVS Table 11.

Surface Mount Packages (continued)

Table 10. Peak Power Dissipation — 600 Watts @ 1 ms Surge — SMB Case 403A-03

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)							
Reverse Stand-Off V _R Volts ⁽³⁾	Device ^(4,5)	Breakdown Voltage		Maximum Clamping Voltage V _C @ I _{pp} Volts	Peak Pulse Current I _{pp} Amps	Maximum Reverse Leakage @ V _R I _R μA	Device Marking
		V _{BR} @ I _T					
		Volts Min	Pulse mA				
13	1SMB13AT3	14.4	1	21.5	27.9	5	LG
15	1SMB15AT3	16.7	1	24.4	24	5	LM
30	1SMB30AT3	33.3	1	48.4	12.4	5	MK
33	1SMB33AT3	36.7	1	53.3	11.3	5	MM
36	1SMB36AT3	40	1	58.1	10.3	5	MP

See notes at bottom of TVS Table 11.



SMC
Case 403-03
Plastic
Cathode = Notch

Table 11. Peak Power Dissipation — 1500 Watts @ 1 ms Surge — SMC Case 403-03

ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 100 A Pulse.							
Breakdown Voltage ⁽⁶⁾		Device ⁽⁴⁾	Working Peak Reverse Voltage V _{RWM} Volts	Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)	Device Marking
V _{BR} @ I _T Pulse ⁽¹⁾ Volts							
Nom	mA						
36	1	1.5SMC36AT3	30.8	5	30	49.9	36A
56	1	1.5SMC56AT3	47.8	5	19.5	77	56A

(1) V_{BR} and V_Z are measured at pulse test current I_T at an ambient temperature of 25°C .

(2) Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.

(3) A transient suppressor is normally selected according to the reverse "Stand Off Voltage" (V_R) which should be equal to or greater than the DC or continuous peak operating voltage level.

(4) T3 suffix designates tape and reel of 2500 units.

(5) Bidirectional version available for 1SMB10AT3 thru 1SMB78AT3, electrical characteristics apply in both directions except for V_F . Use CAT3 suffix.

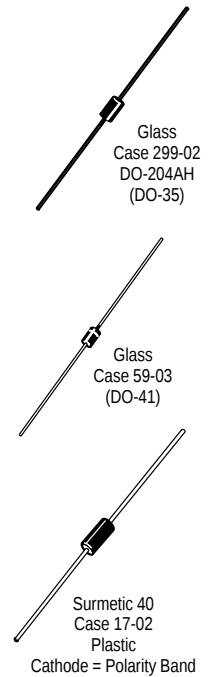
(6) Breakdown voltage tolerance is $\pm 5\%$ for A suffix.

***Other voltages may be available upon request. Please contact your Motorola representative.**

Zener Voltage Regulator Diodes

Table 12. Axial Leaded for Through-hole Designs

Nominal Zener Breakdown Voltage	500 mW Cathode = Polarity Band	Nominal Zener Breakdown Voltage	1 Watt Cathode = Polarity Band	1.5 Watt Cathode = Polarity Band	5 Watt Cathode = Polarity Band
(*Note 1)	(*Note 2)	(*Note 1)	(*Note 3)	(*Note 4)	(*Note 5)
Volts	Case 299-02	Volts	Case 59-03		Case 17-02
2.4	1N5221B	3.3	1N4728A		1N5333B
3.3	1N5226B	4.3	1N4731A		
4.3	1N5229B	5.1	1N4733A	1N5918B	1N5338B
5.1	1N5231B	5.6	1N4734A		1N5339B
5.6	1N5232B	6.2	1N4735A	1N5920B	
6.2	1N5234B	12	1N4742A		1N5349B
8.2	1N5237B	13	1N4743A		1N5350B
10	1N5240B	15	1N4744A	1N5929B	1N5352B
12	1N5242B	18	1N4746A		1N5355B
13	1N5243B	20	1N4747A		1N5357B
20	1N5250B	24	1N4749A	1N5934B	1N5359B
24	1N5252B	27	1N4750A		1N5361B
30	1N5256B	30	1N4751A	1N5936B	1N5363B
36	1N5258B	36			1N5365B



NOTES — AXIAL LEADED CHART

- Zener Voltage* is the key parameter for each device type. It is specified at a particular test current applied at either thermal equilibrium (T.E.) or pulse test condition. The voltage tolerance for the device types listed is, in general, $\pm 5\%$; however, for some series, the voltage tolerance varies from device type to device type over a range of $\pm (5 \text{ to } 8.5)\%$. Consult the complete data sheet to determine the exact test conditions and minimum/maximum limits for the zener voltage. Consult Application Note AN924 regarding measurement of Zener Voltage (pulse versus thermal equilibrium).

Power Ratings represent the capability of the case size listed as supplied by Motorola. These ratings may be higher than the JEDEC registration and/or the same device types supplied by other manufacturers.

V_Z TEST CONDITIONS AND TOLERANCES

- 1N5221B-42B $I_{ZT} = 20 \text{ mA (T.E.)}$.
1N5243B-81B I_{ZT} @ approximately 125 mW point (T.E.).
B suffix = $\pm 5\%$.
C suffix = $\pm 2\%$.
- 1N4728A-64A I_{ZT} @ approximately 250 mW point (T.E.).
A suffix = $\pm 5\%$.
C suffix = $\pm 2\%$.
- 1N5913B-56B I_{ZT} @ approximately 375 mW point (T.E.).
B suffix = $\pm 5\%$.
- 1N5333B-88B I_{ZT} varies from 0.9 to 1.5 W point depending on type number (pulse).
B suffix = $\pm 5\%$.
Also has delta V_Z parameter and limit.

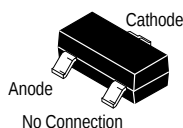
All devices listed are Motorola's "Preferred" devices. A larger range of specifications are available. 1-(602) 244-4628 for details.

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Zener Voltage Regulator Diodes (continued)



SOT-23
Case 318-08, Style 9
TO-236AB
Plastic



SOD-123
Plastic
Case 425-04, Style 1



SMA
Case 403B-01
Plastic



SMB
Case 403A-03
Plastic
Cathode = Notch

Table 13. Surface Mount Packages

Nominal Zener Breakdown Voltage	225 mW Surface Mount SOT-23		500 mW Surface Mount SOD-123	500 mW Low Level Surface Mount SOD-123	500 mW Surface Mount SOD-123	1.5 Watt Surface Mount SMA	3 Watt Surface Mount SMB
(*Note 1)	(*Note 2)	(*Note 3) Case 318-07	(*Note 4)	(*Note 5) Case 425-04	(*Note 6)	(*Note 6)	(*Note 7) Case 403A-03
3.3		MMBZ5226BLT1	MMSZ3V3T1	MMSZ4684T1	MMSZ5226BT1	1SMA5913BT3	
4.3		MMBZ5229BLT1	MMSZ4V3T1	MMSZ4687T1	MMSZ5229BT1	1SMA5916BT3	
4.7	BZX84C4V7LT1	MMBZ5230BLT1	MMSZ4V7T1	MMSZ4688T1	MMSZ5230BT1	1SMA5917BT3	
5.1	BZX84C5V1LT1	MMBZ5231BLT1	MMSZ5V1T1	MMSZ4689T1	MMSZ5231BT1	1SMA5918BT3	1SMB5918BT3
5.6	BZX84C5V6LT1	MMBZ5232BLT1	MMSZ5V6T1	MMSZ4690T1	MMSZ5232BT1	1SMA5919BT3	
6.0					MMSZ5233BT1		
6.2	BZX84C6V2LT1	MMBZ5234BLT1	MMSZ6V2T1	MMSZ4691T1	MMSZ5234BT1	1SMA5920BT3	1SMB5920BT3
6.8	BZX84C6V8LT1	MMBZ5235BLT1	MMSZ6V8T1	MMSZ4692T1	MMSZ5235BT1	1SMA5921BT3	
7.5		MMBZ5236BLT1	MMSZ7V5T1	MMSZ4693T1	MMSZ5236BT1	1SMA5922BT3	
8.2	BZX84C8V2LT1	MMBZ5237BLT1	MMSZ8V2T1	MMSZ4694T1	MMSZ5237BT1	1SMA5923BT3	
9.1	BZX84C9V1LT1	MMBZ5239BLT1	MMSZ9V1T1	MMSZ4696T1	MMSZ5239BT1	1SMA5924BT3	
10	BZX84C10LT1	MMBZ5240BLT1	MMSZ10T1	MMSZ4697T1	MMSZ5240BT1	1SMA5925BT3	1SMB5925BT3
12	BZX84C12LT1	MMBZ5242BLT1	MMSZ12T1	MMSZ4699T1	MMSZ5242BT1	1SMA5927BT3	1SMB5927BT3
14				MMSZ4701T1	MMSZ5244BT1		
15	BZX84C15LT1	MMBZ5245BLT1	MMSZ15T1	MMSZ4702T1	MMSZ5245BT1	1SMA5929BT3	1SMB5929BT3
18			MMSZ18T1	MMSZ4705T1	MMSZ5248BT1	1SMA5931BT3	1SMB5931BT3
24			MMSZ24T1	MMSZ4709T1	MMSZ5252BT1	1SMA5934BT3	1SMB5934BT3
27		MMBZ5254BLT1	MMSZ27T1	MMSZ4711T1	MMSZ5254BT1	1SMA5935BT3	
28		MMBZ5255BLT1		MMSZ4712T1	MMSZ5255BT1		
30	BZX84C30LT1		MMSZ30T1	MMSZ4713T1	MMSZ5256BT1	1SMA5936BT3	1SMB5936BT3
60					MMSZ5264BT1		
75			MMSZ75T1		MMSZ5267BT1		
91					MMSZ5270BT1		

NOTES — SURFACE MOUNT CHART

1. Zener Voltage is the key parameter for each device type. It is specified at a particular test current applied at either thermal equilibrium (T.E.) or pulse test condition. The voltage tolerance for the device types listed is, in general $\pm 5\%$; however, for some series, the voltage tolerance varies from device type to device type over a range of $\pm (5 \text{ to } 8.5)\%$. Consult the complete data sheet to determine the exact test conditions and minimum/maximum limits for the zener voltage.

Power Ratings represent the capability of the case size listed as supplied by Motorola. These ratings may be higher than the same device types supplied by other manufacturers.

V_Z TEST CONDITIONS AND TOLERANCES

- BZX84C2V4L-C24LT1 $I_{ZT} = 5 \text{ mA}$ (pulse).
BZX84C27L-C75LT1 $I_{ZT} = 2 \text{ mA}$ (pulse).
Tolerance is $\pm (5 \text{ to } 8.5)\%$ depending on type number. Each device type also has other V_Z min/max limits at two other I_{ZT} pulse current values.
- MMBZ5221BL-42BLT1 $I_{ZT} = 20 \text{ mA}$ (pulse).
MMBZ5243BL-70BLT1 I_{ZT} @ approximately 125 mW point (pulse).
BL suffix = $\pm 5\%$.
- MMSZ2V4T1-24T1 $I_{ZT} = 5 \text{ mA}$ (pulse).
MMSZ27T1-C75T1 $I_{ZT} = 2 \text{ mA}$ (pulse).
Tolerance is $\pm (5 \text{ to } 8.5)\%$ depending on type number. Each device type also has other V_Z min/max limits at two other I_{ZT} pulse current values.
- MMSZ4678T1 Series $I_{ZT} = 50 \mu\text{A}$ (T.E.).
No suffix = $\pm 5\%$.
- MMSZ5221B-42BT1 $I_{ZT} = 20 \text{ mA}$ (T.E.).
MMSZ5243B-70BT1 I_{ZT} @ approximately 125 mW point (T.E.).
B suffix = $\pm 5\%$.
 I_{ZT} @ approximately 375 mW point (T.E.).
- 1SMB5913BT3 Series
BT3 suffix = $\pm 5\%$.
T3 suffix designates tape and reel of 2500 units.

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