

**1 to 3 Watt DO-41 Surmetic 30  
Zener Voltage Regulator Diodes  
GENERAL DATA APPLICABLE TO ALL SERIES IN  
THIS GROUP**

**1 to 3 Watt Surmetic 30  
Silicon Zener Diodes**

... a complete series of 1 to 3 Watt Zener Diodes with limits and operating characteristics that reflect the superior capabilities of silicon-oxide-passivated junctions. All this in an axial-lead, transfer-molded plastic package offering protection in all common environmental conditions.

**Specification Features:**

- Surge Rating of 98 Watts @ 1 ms
- Maximum Limits Guaranteed On Up To Six Electrical Parameters
- Package No Larger Than the Conventional 1 Watt Package

**Mechanical Characteristics:**

**CASE:** Void-free, transfer-molded, thermosetting plastic

**FINISH:** All external surfaces are corrosion resistant and leads are readily solderable

**POLARITY:** Cathode indicated by color band. When operated in zener mode, cathode will be positive with respect to anode

**MOUNTING POSITION:** Any

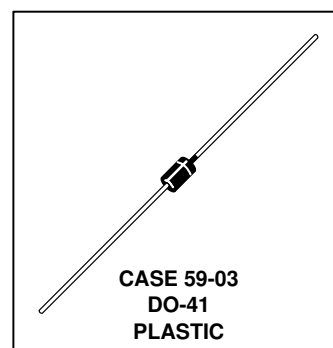
**WEIGHT:** 0.4 gram (approx)

**WAFER FAB LOCATION:** Phoenix, Arizona

**ASSEMBLY/TEST LOCATION:** Seoul, Korea

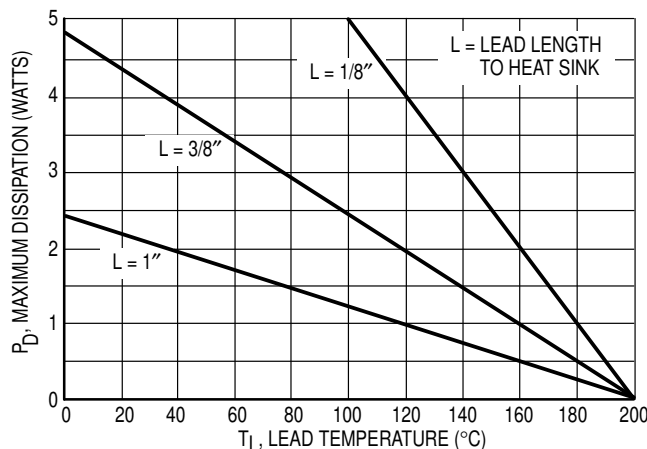
**GENERAL  
DATA  
1-3 WATT  
DO-41  
SURMETIC 30**

**1 TO 3 WATT  
ZENER REGULATOR  
DIODES  
3.3-400 VOLTS**



**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
DC Power Dissipation @ $T_L = 75^\circ\text{C}$ Lead Length = 3/8" Derate above 75°C	$P_D$	3 24	Watts mW/°C
DC Power Dissipation @ $T_A = 50^\circ\text{C}$ Derate above 50°C	$P_D$	1 6.67	Watt mW/°C
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	- 65 to +200	°C



**Figure 1. Power Temperature Derating Curve**

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

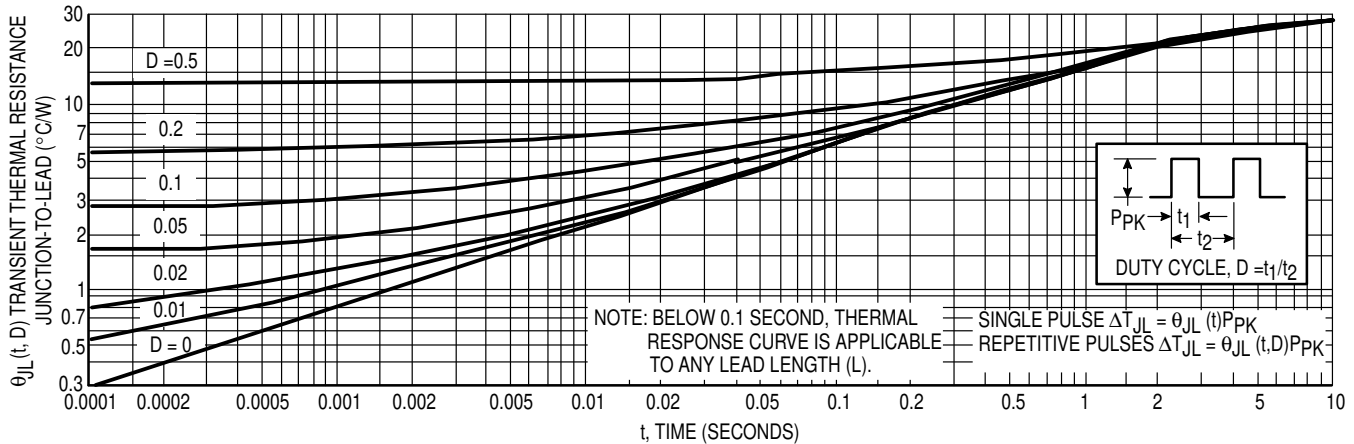


Figure 2. Typical Thermal Response L, Lead Length = 3/8 Inch

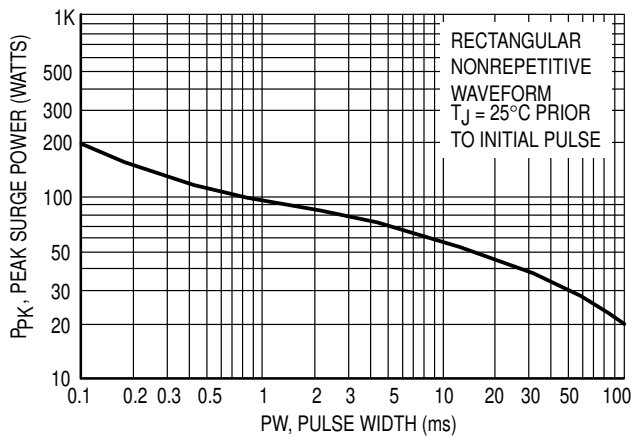


Figure 3. Maximum Surge Power

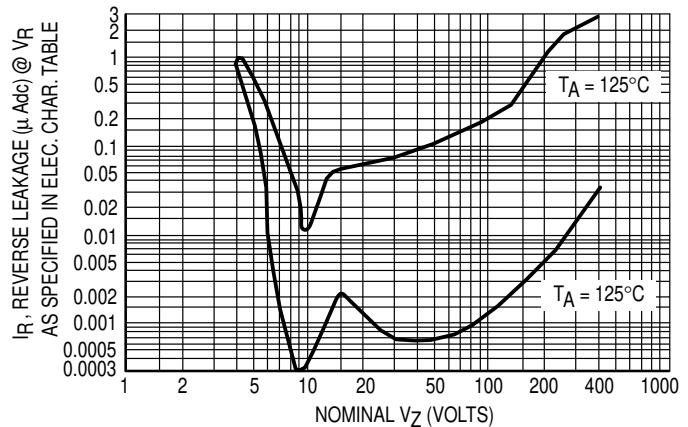


Figure 4. Typical Reverse Leakage

## APPLICATION NOTE

Since the actual voltage available from a given zener diode is temperature dependent, it is necessary to determine junction temperature under any set of operating conditions in order to calculate its value. The following procedure is recommended:

Lead Temperature,  $T_L$ , should be determined from:

$$T_L = \theta_{LA} P_D + T_A$$

$\theta_{LA}$  is the lead-to-ambient thermal resistance ( $^{\circ}\text{C}/\text{W}$ ) and  $P_D$  is the power dissipation. The value for  $\theta_{LA}$  will vary and depends on the device mounting method.  $\theta_{LA}$  is generally  $30\text{--}40^{\circ}\text{C}/\text{W}$  for the various clips and tie points in common use and for printed circuit board wiring.

The temperature of the lead can also be measured using a thermocouple placed on the lead as close as possible to the tie point. The thermal mass connected to the tie point is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of  $T_L$ , the junction temperature may be determined by:

$$T_J = T_L + \Delta T_{JL}$$

$\Delta T_{JL}$  is the increase in junction temperature above the lead temperature and may be found from Figure 2 for a train of power pulses ( $L = 3/8$  inch) or from Figure 10 for dc power.

$$\Delta T_{JL} = \theta_{JL} P_D$$

For worst-case design, using expected limits of  $I_Z$ , limits of  $P_D$  and the extremes of  $T_J$  ( $\Delta T_J$ ) may be estimated. Changes in voltage,  $V_Z$ , can then be found from:

$$\Delta V = \theta_{VZ} \Delta T_J$$

$\theta_{VZ}$ , the zener voltage temperature coefficient, is found from Figures 5 and 6.

Under high power-pulse operation, the zener voltage will vary with time and may also be affected significantly by the zener resistance. For best regulation, keep current excursions as low as possible.

Data of Figure 2 should not be used to compute surge capability. Surge limitations are given in Figure 3. They are lower than would be expected by considering only junction temperature, as current crowding effects cause temperatures to be extremely high in small spots resulting in device degradation should the limits of Figure 3 be exceeded.

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

## TEMPERATURE COEFFICIENT RANGES

(90% of the Units are in the Ranges Indicated)

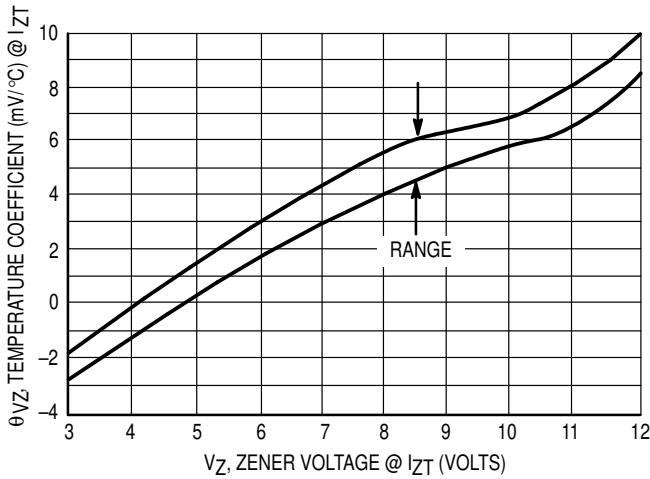


Figure 5. Units To 12 Volts

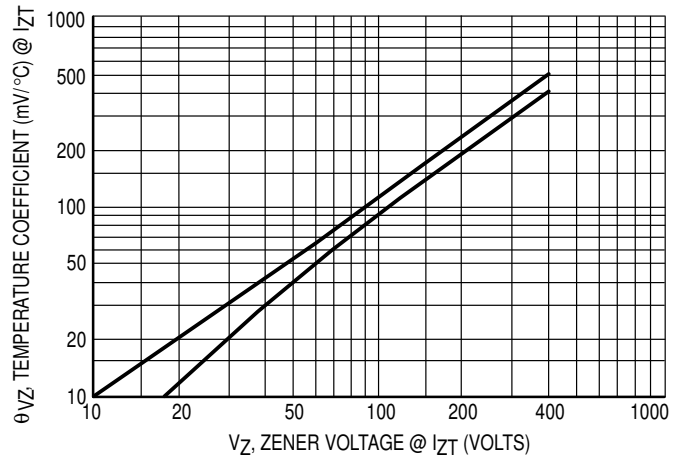


Figure 6. Units 10 To 400 Volts

## ZENER VOLTAGE versus ZENER CURRENT

(Figures 7, 8 and 9)

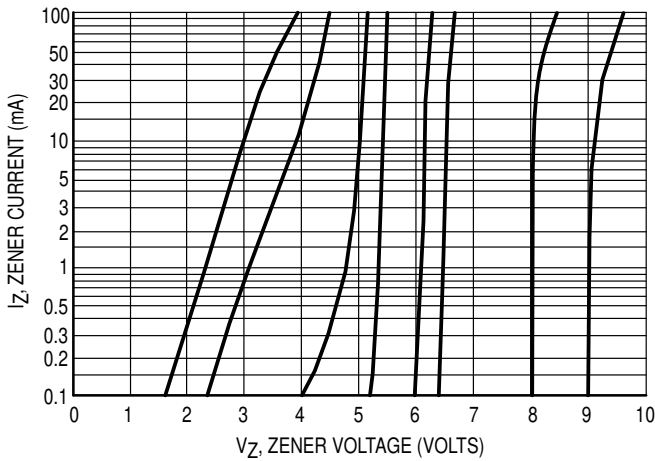


Figure 7.  $V_Z = 3.3$  thru 10 Volts

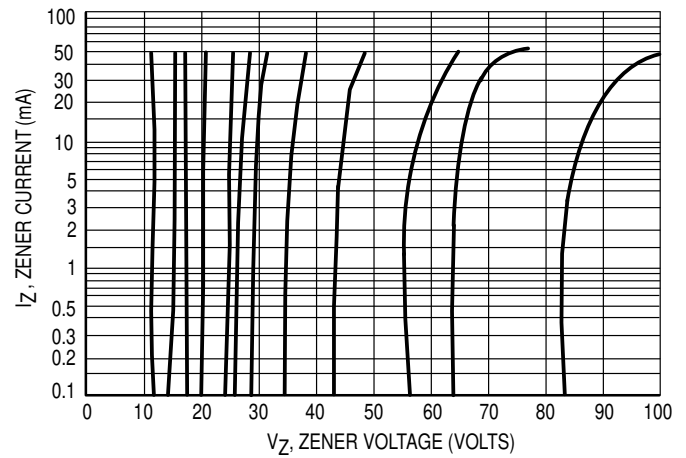


Figure 8.  $V_Z = 12$  thru 82 Volts

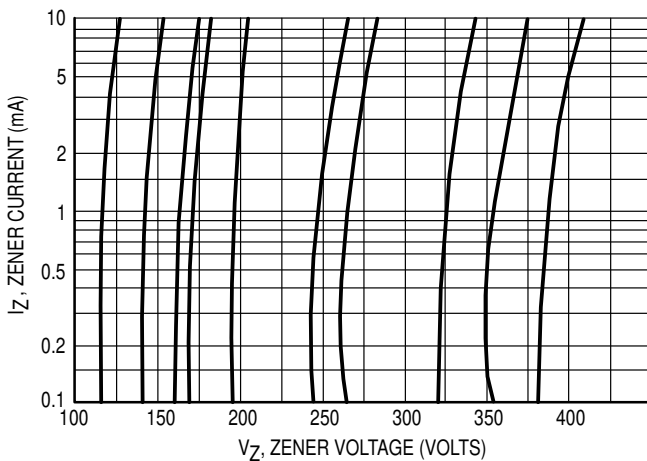


Figure 9.  $V_Z = 100$  thru 400 Volts

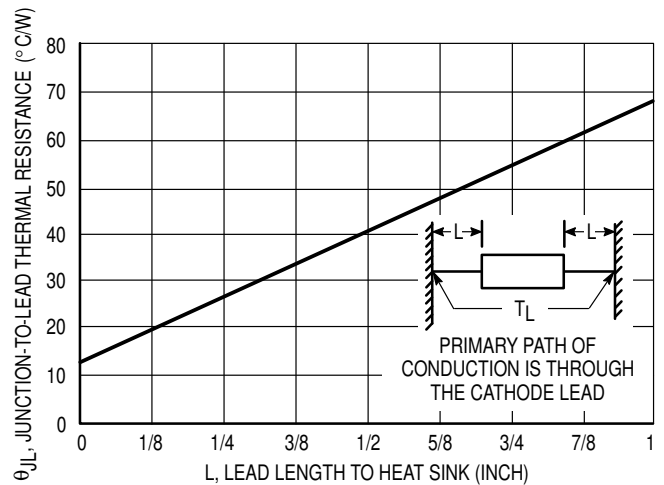


Figure 10. Typical Thermal Resistance

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

## \*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
DC Power Dissipation @ $T_L = 75^\circ\text{C}$ , Lead Length = 3/8" Derate above $75^\circ\text{C}$	$P_D$	1.5 12	Watts $\text{mW}/^\circ\text{C}$

## \*ELECTRICAL CHARACTERISTICS ( $T_L = 30^\circ\text{C}$ unless otherwise noted. $V_F = 1.5$ Volts Max @ $I_F = 200$ mAdc for all types.)

Motorola Type Number (Note 1)	Nominal Zener Voltage $V_Z$ @ $I_{ZT}$ Volts (Note 2 and 3)	Test Current $I_{ZT}$ mA	Max. Zener Impedance (Note 4)			Max. Reverse Leakage Current		Maximum DC Zener Current $I_{ZM}$ mAdc
			$Z_{ZT}$ @ $I_{ZT}$ Ohms	$Z_{ZK}$ Ohms @	$I_{ZK}$ mA	$I_R$ @ $V_R$ $\mu\text{A}$ Volts		
1N5913B	3.3	113.6	10	500	1	100	1	454
1N5914B	3.6	104.2	9	500	1	75	1	416
1N5915B	3.9	96.1	7.5	500	1	25	1	384
1N5916B	4.3	87.2	6	500	1	5	1	348
1N5917B	4.7	79.8	5	500	1	5	1.5	319
<b>1N5918B</b>	<b>5.1</b>	<b>73.5</b>	<b>4</b>	<b>350</b>	<b>1</b>	<b>5</b>	<b>2</b>	<b>294</b>
1N5919B	5.6	66.9	2	250	1	5	3	267
<b>1N5920B</b>	<b>6.2</b>	<b>60.5</b>	<b>2</b>	<b>200</b>	<b>1</b>	<b>5</b>	<b>4</b>	<b>241</b>
1N5921B	6.8	55.1	2.5	200	1	5	5.2	220
1N5922B	7.5	50	3	400	0.5	5	6	200
1N5923B	8.2	45.7	3.5	400	0.5	5	6.5	182
1N5924B	9.1	41.2	4	500	0.5	5	7	164
1N5925B	10	37.5	4.5	500	0.25	5	8	150
1N5926B	11	34.1	5.5	550	0.25	1	8.4	136
1N5927B	12	31.2	6.5	550	0.25	1	9.1	125
1N5928B	13	28.8	7	550	0.25	1	9.9	115
<b>1N5929B</b>	<b>15</b>	<b>25</b>	<b>9</b>	<b>600</b>	<b>0.25</b>	<b>1</b>	<b>11.4</b>	<b>100</b>
1N5930B	16	23.4	10	600	0.25	1	12.2	93
1N5931B	18	20.8	12	650	0.25	1	13.7	83
1N5932B	20	18.7	14	650	0.25	1	15.2	75
1N5933B	22	17	17.5	650	0.25	1	16.7	68
1N5934B	24	15.6	19	700	0.25	1	18.2	62
1N5935B	27	13.9	23	700	0.25	1	20.6	55
<b>1N5936B</b>	<b>30</b>	<b>12.5</b>	<b>26</b>	<b>750</b>	<b>0.25</b>	<b>1</b>	<b>22.8</b>	<b>50</b>
1N5937B	33	11.4	33	800	0.25	1	25.1	45
1N5938B	36	10.4	38	850	0.25	1	27.4	41
1N5939B	39	9.6	45	900	0.25	1	29.7	38
1N5940B	43	8.7	53	950	0.25	1	32.7	34
1N5941B	47	8	67	1000	0.25	1	35.8	31
1N5942B	51	7.3	70	1100	0.25	1	38.8	29
1N5943B	56	6.7	86	1300	0.25	1	42.6	26
1N5944B	62	6	100	1500	0.25	1	47.1	24
1N5945B	68	5.5	120	1700	0.25	1	51.7	22
1N5946B	75	5	140	2000	0.25	1	56	20
1N5947B	82	4.6	160	2500	0.25	1	62.2	18

(continued)

\*Indicates JEDEC Registered Data.

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

**\*ELECTRICAL CHARACTERISTICS — continued** ( $T_L = 30^\circ\text{C}$  unless otherwise noted.  $V_F = 1.5$  Volts Max @  $I_F = 200$  mAdc for all types.)

Motorola Type Number (Note 1)	Nominal Zener Voltage $V_Z$ @ $I_{ZT}$ Volts (Note 2 and 3)	Test Current $I_{ZT}$ mA	Max. Zener Impedance (Note 4)			Max. Reverse Leakage Current		Maximum DC Zener Current $I_{ZM}$ mAdc
			$Z_{ZT}$ @ $I_{ZT}$ Ohms	$Z_{ZK}$ Ohms @	$I_{ZK}$ mA	$I_R$ @ $V_R$ $\mu\text{A}$ Volts		
1N5948B	91	4.1	200	3000	0.25	1	69.2	16
1N5949B	100	3.7	250	3100	0.25	1	76	15
1N5950B	110	3.4	300	4000	0.25	1	83.6	13
1N5951B	120	3.1	380	4500	0.25	1	91.2	12
1N5952B	130	2.9	450	5000	0.25	1	98.8	11
1N5953B	150	2.5	600	6000	0.25	1	114	10
1N5954B	160	2.3	700	6500	0.25	1	121.6	9
<b>1N5955B</b>	<b>180</b>	<b>2.1</b>	<b>900</b>	<b>7000</b>	<b>0.25</b>	<b>1</b>	<b>136.8</b>	<b>8</b>
1N5956B	200	1.9	1200	8000	0.25	1	152	7

\*Indicates JEDEC Registered Data.

**NOTE 1. TOLERANCE AND VOLTAGE DESIGNATION**

Tolerance designation — Device tolerances of  $\pm 5\%$  are indicated by a "B" suffix.

Nominal zener voltages between those shown and  $\pm 1\%$  and  $\pm 2\%$  tight voltage tolerances. Consult factory.

**NOTE 2. SPECIAL SELECTIONS AVAILABLE INCLUDE:**

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)  $V_F = 1.5\text{ V Max}$ ,  $I_F = 200\text{ mA}$  for all types)

Motorola Type No. (Note 1)	Nominal Zener Voltage $V_Z @ I_{ZT}$ Volts (Note 2)	Test Current $I_{ZT}$ mA	Max Zener Impedance (Note 3)			Leakage Current		Maximum Zener Current $I_{ZM}$ mA	Surge Current @ $T_A = 25^\circ\text{C}$ $I_r - \text{mA}$ (Note 4)
			$Z_{ZT} @ I_{ZT}$ Ohms	$Z_{ZK} @ I_{ZK}$ Ohms	$I_{ZK}$ mA	$I_R @ V_R$ $\mu\text{A Max}$ Volts			
3EZ3.9D5 <b>3EZ4.3D5</b>	3.9 <b>4.3</b>	192 <b>174</b>	4.5 <b>4.5</b>	400 <b>400</b>	1 <b>1</b>	80 <b>30</b>	1 <b>1</b>	630 <b>590</b>	4.4 <b>4.1</b>
3EZ4.7D5	4.7	160	4	500	1	20	1	550	3.8
3EZ5.1D5	5.1	147	3.5	550	1	5	1	520	3.5
3EZ5.6D5	5.6	134	2.5	600	1	5	2	480	3.3
3EZ6.2D5	6.2	121	1.5	700	1	5	3	435	3.1
3EZ6.8D5	6.8	110	2	700	1	5	4	393	2.9
3EZ7.5D5	7.5	100	2	700	0.5	5	5	360	2.66
3EZ8.2D5	8.2	91	2.3	700	0.5	5	6	330	2.44
3EZ9.1D5	9.1	82	2.5	700	0.5	3	7	297	2.2
3EZ10D5	10	75	3.5	700	0.25	3	7.6	270	2
3EZ11D5	11	68	4	700	0.25	1	8.4	245	1.82
3EZ12D5	12	63	4.5	700	0.25	1	9.1	225	1.66
3EZ13D5	13	58	4.5	700	0.25	0.5	9.9	208	1.54
3EZ14D5	14	53	5	700	0.25	0.5	10.6	193	1.43
3EZ15D5	15	50	5.5	700	0.25	0.5	11.4	180	1.33
3EZ16D5	16	47	5.5	700	0.25	0.5	12.2	169	1.25
3EZ17D5	17	44	6	750	0.25	0.5	13	159	1.18
3EZ18D5	18	42	6	750	0.25	0.5	13.7	150	1.11
3EZ19D5	19	40	7	750	0.25	0.5	14.4	142	1.05
3EZ20D5	20	37	7	750	0.25	0.5	15.2	135	1
3EZ22D5	22	34	8	750	0.25	0.5	16.7	123	0.91
3EZ24D5	24	31	9	750	0.25	0.5	18.2	112	0.83
3EZ27D5	27	28	10	750	0.25	0.5	20.6	100	0.74
3EZ28D5	28	27	12	750	0.25	0.5	21	96	0.71
3EZ30D5	30	25	16	1000	0.25	0.5	22.5	90	0.67
3EZ33D5	33	23	20	1000	0.25	0.5	25.1	82	0.61
3EZ36D5	36	21	22	1000	0.25	0.5	27.4	75	0.56
3EZ39D5	39	19	28	1000	0.25	0.5	29.7	69	0.51
3EZ43D5	43	17	33	1500	0.25	0.5	32.7	63	0.45
3EZ47D5	47	16	38	1500	0.25	0.5	35.6	57	0.42
3EZ51D5	51	15	45	1500	0.25	0.5	38.8	53	0.39
3EZ56D5	56	13	50	2000	0.25	0.5	42.6	48	0.36
3EZ62D5	62	12	55	2000	0.25	0.5	47.1	44	0.32
3EZ68D5	68	11	70	2000	0.25	0.5	51.7	40	0.29
3EZ75D5	75	10	85	2000	0.25	0.5	56	36	0.27
3EZ82D5	82	9.1	95	3000	0.25	0.5	62.2	33	0.24
3EZ91D5	91	8.2	115	3000	0.25	0.5	69.2	30	0.22
3EZ100D5	100	7.5	160	3000	0.25	0.5	76	27	0.2
3EZ110D5	110	6.8	225	4000	0.25	0.5	83.6	25	0.18
3EZ120D5	120	6.3	300	4500	0.25	0.5	91.2	22	0.16
3EZ130D5	130	5.8	375	5000	0.25	0.5	98.8	21	0.15
3EZ140D5	140	5.3	475	5000	0.25	0.5	106.4	19	0.14
3EZ150D5	150	5	550	6000	0.25	0.5	114	18	0.13
3EZ160D5	160	4.7	625	6500	0.25	0.5	121.6	17	0.12
3EZ170D5	170	4.4	650	7000	0.25	0.5	130.4	16	0.12
3EZ180D5	180	4.2	700	7000	0.25	0.5	136.8	15	0.11
3EZ190D5	190	4	800	8000	0.25	0.5	144.8	14	0.1

(continued)

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

**ELECTRICAL CHARACTERISTICS — continued** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)  $V_F = 1.5\text{ V Max}$ ,  $I_F = 200\text{ mA}$  for all types)

Motorola Type No. (Note 1)	Nominal Zener Voltage $V_Z$ @ $I_{ZT}$ Volts (Note 2)	Test Current $I_{ZT}$ mA	Max Zener Impedance (Note 3)			Leakage Current		Maximum Zener Current $I_{ZM}$ mA	Surge Current @ $T_A = 25^\circ\text{C}$ $I_r$ - mA (Note 4)
			$Z_{ZT}$ @ $I_{ZT}$ Ohms	$Z_{ZK}$ @ $I_{ZK}$ Ohms	$I_{ZK}$ mA	$I_R$ @ $V_R$ $\mu\text{A Max}$	Volts		
3EZ200D5	200	3.7	875	8000	0.25	0.5	152	13	0.1
3EZ220D5	220	3.4	1600	9000	0.25	1	167	12	0.09
3EZ240D5	240	3.1	1700	9000	0.25	1	182	11	0.09
3EZ270D5	270	2.8	1800	9000	0.25	1	205	10	0.08
3EZ300D5	300	2.5	1900	9000	0.25	1	228	9	0.07
3EZ330D5	330	2.3	2200	9000	0.25	1	251	8	0.06
3EZ360D5	360	2.1	2700	9000	0.25	1	274	8	0.06
3EZ400D5	400	1.9	3500	9000	0.25	1	304	7	0.06

**NOTE 1. TOLERANCES**

Suffix 5 indicates 5% tolerance. Any other tolerance will be considered as a special device.

**NOTE 2. ZENER VOLTAGE ( $V_Z$ ) MEASUREMENT**

Motorola guarantees the zener voltage when measured at 40 ms  $\pm$  10 ms 3/8" from the diode body, and an ambient temperature of 25°C (+8°C, -2°C)

**NOTE 3. ZENER IMPEDANCE ( $Z_Z$ ) DERIVATION**

The zener impedance is derived from the 60 cycle ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current ( $I_{ZT}$  or  $I_{ZK}$ ) is superimposed on  $I_{ZT}$  or  $I_{ZK}$ .

**NOTE 4. SURGE CURRENT ( $I_r$ ) NON-REPETITIVE**

The rating listed in the electrical characteristics table is maximum peak, non-repetitive, reverse surge current of 1/2 square wave or equivalent sine wave pulse of 1/120 second duration superimposed on the test current,  $I_{ZT}$ , per JEDEC standards, however, actual device capability is as described in Figure 3 of General Data sheet for Surmetic 30s.

**NOTE 5. SPECIAL SELECTIONS AVAILABLE INCLUDE:**

Nominal zener voltages between those shown. Tight voltage tolerances such as  $\pm$ 1% and  $\pm$ 2%. Consult factory.

**NOTE 3. ZENER VOLTAGE ( $V_Z$ ) MEASUREMENT**

Motorola guarantees the zener voltage when measured at 90 seconds while maintaining the lead temperature ( $T_L$ ) at 30°C  $\pm$  1°C, 3/8" from the diode body.

**NOTE 4. ZENER IMPEDANCE ( $Z_Z$ ) DERIVATION**

The zener impedance is derived from the 60 cycle ac voltage, which results when an ac current having an rms value equal to 10% of the dc zener current ( $I_{ZT}$  or  $I_{ZK}$ ) is superimposed on  $I_{ZT}$  or  $I_{ZK}$ .

# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted.)  $V_F = 1.5\text{ V Max}$ ,  $I_F = 200\text{ mA}$  for all types.

Type No. (Note 1)	Zener Voltage (Note 2)		Test Current $I_{ZT}$ mA	Zener Impedance at $I_{ZT}$ $f = 1000\text{ Hz (Ohm)}$		Blocking Voltage $I_R = 1\ \mu\text{A}$	Typical $T_C$ %/°C	Surge Current @ $T_L = 25^\circ\text{C}$ $i_r - \text{mA}$ (Note 3)
	Min	Max		Typ	Max			
MZD3.9	3.7	4.1	100	3.8	7	—	-0.06	1380
MZD4.3	4	4.6	100	3.8	7	—	0.055	1260
MZD4.7	4.4	5	100	3.8	7	—	0.03	1190
MZD5.1	4.8	5.4	100	2	5	—	0.03	1070
MZD5.6	5.2	6	100	1	2	1.5	+0.038	970
MZD6.2	5.8	6.6	100	1	2	1.5	+0.045	890
MZD6.8	6.4	7.2	100	1	2	2	+0.05	810
MZD7.5	7	7.9	100	1	2	2	+0.058	730
MZD8.2	7.7	8.7	100	1	2	3.5	+0.062	660
MZD9.1	8.5	9.6	50	2	4	3.5	+0.068	605
MZD10	9.4	10.6	50	2	4	5	+0.075	550
MZD11	10.4	11.6	50	4	7	5	+0.076	500
MZD12	11.4	12.7	50	4	7	7	+0.077	454
MZD13	12.4	14.1	50	5	10	7	+0.079	414
MZD15	13.8	15.8	50	5	10	10	+0.082	380
MZD16	15.3	17.1	25	6	15	10	+0.083	344
<b>MZD18</b>	<b>16.8</b>	<b>19.1</b>	<b>25</b>	<b>6</b>	<b>15</b>	<b>10</b>	<b>+0.085</b>	<b>304</b>
MZD20	18.8	21.2	25	6	15	10	+0.086	285
MZD22	20.8	23.3	25	6	15	12	+0.087	250
MZD24	22.8	25.6	25	7	15	12	+0.088	225
MZD27	25.1	28.9	25	7	15	14	+0.09	205
MZD30	28	32	25	8	15	14	+0.091	190
MZD33	31	35	25	8	15	17	+0.092	170
MZD36	34	38	10	21	40	17	+0.093	150
MZD39	37	41	10	21	40	20	+0.094	135
MZD43	40	46	10	24	45	20	+0.095	125
MZD47	44	50	10	24	45	24	+0.095	115
MZD51	48	54	10	25	60	24	+0.096	110
MZD56	52	60	10	25	60	28	+0.096	95
MZD62	58	66	10	25	80	28	+0.097	90
MZD68	64	72	10	25	80	34	+0.097	80
MZD75	70	79	10	30	100	34	+0.098	70
MZD82	77	88	10	30	100	41	+0.098	65
MZD91	85	96	5	60	200	41	+0.099	60
MZD100	94	106	5	60	200	50	+0.11	55
MZD110	104	116	5	80	250	50	+0.11	50
MZD120	114	127	5	80	250	60	+0.11	45
MZD130	124	141	5	110	300	60	+0.11	—
MZD150	138	156	5	110	300	75	+0.11	—
MZD160	153	171	5	150	350	75	+0.11	—
MZD180	168	191	5	150	350	90	+0.11	—
MZD200	188	212	5	150	350	90	+0.11	—

**NOTE 1. TOLERANCE AND TYPE NUMBER DESIGNATION**

The type numbers listed have zener voltage min/max limits as shown.

**NOTE 2. ZENER VOLTAGE ( $V_Z$ ) MEASUREMENT**

The zener voltage is measured after the test current ( $I_{ZT}$ ) has been applied for  $40 \pm 10$  milliseconds, while maintaining a lead temperature ( $T_L$ ) of  $30^\circ\text{C}$  at a point of 10 mm from the diode body.

**NOTE 3. ( $i_r$ ) NON-REPETITIVE SURGE CURRENT**

Maximum peak, non-repetitive reverse surge current of half square wave or equivalent sine wave pulse of 50 ms duration, superimposed on the test current ( $I_{ZT}$ ).

**NOTE 4. SPECIAL SELECTIONS AVAILABLE INCLUDE:**

Nominal zener voltages between those shown. Tight voltage tolerances such as  $\pm 1\%$  and  $\pm 2\%$ . Consult factory.



# GENERAL DATA — 1-3 WATT DO-41 SURMETIC 30

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)  $V_F = 1.5\text{ V Max}$ ,  $I_F = 200\text{ mA}$  for all types

Motorola Type No. (Note 1)	Nominal Zener Voltage $V_Z @ I_{ZT}$ Volts (Note 2)	Test Current $I_{ZT}$ mA	Max Zener Impedance (Note 3)			Leakage Current		Surge Current @ $T_A = 25^\circ\text{C}$ $i_r - \text{mA}$ (Note 4)
			$Z_{ZT} @ I_{ZT}$ Ohms	$Z_{ZK} @ I_{ZK}$ Ohms	$I_{ZK}$ mA	$I_R @ V_R$ $\mu\text{A Max}$ Volts		
MZP4728A	3.3	76	10	400	1	100	1	1380
MZP4729A	3.6	69	10	400	1	100	1	1260
MZP4730A	3.9	64	9	400	1	50	1	1190
MZP4731A	4.3	58	9	400	1	10	1	1070
MZP4732A	4.7	53	8	500	1	10	1	970
MZP4733A	5.1	49	7	550	1	10	1	890
MZP4734A	5.6	45	5	600	1	10	2	810
MZP4735A	6.2	41	2	700	1	10	3	730
MZP4736A	6.8	37	3.5	700	1	10	4	660
MZP4737A	7.5	34	4	700	0.5	10	5	605
MZP4738A	8.2	31	4.5	700	0.5	10	6	550
MZP4739A	9.1	28	5	700	0.5	10	7	500
MZP4740A	10	25	7	700	0.25	10	7.6	454
MZP4741A	11	23	8	700	0.25	5	8.4	414
MZP4742A	12	21	9	700	0.25	5	9.1	380
MZP4743A	13	19	10	700	0.25	5	9.9	344
MZP4744A	15	17	14	700	0.25	5	11.4	304
MZP4745A	16	15.5	16	700	0.25	5	12.2	285
<b>MZP4746A</b>	<b>18</b>	<b>14</b>	<b>20</b>	<b>750</b>	<b>0.25</b>	<b>5</b>	<b>13.7</b>	<b>250</b>
MZP4747A	20	12.5	22	750	0.25	5	15.2	225
MZP4748A	22	11.5	23	750	0.25	5	16.7	205
<b>MZP4749A</b>	<b>24</b>	<b>10.5</b>	<b>25</b>	<b>750</b>	<b>0.25</b>	<b>5</b>	<b>18.2</b>	<b>190</b>
MZP4750A	27	9.5	35	750	0.25	5	20.6	170
<b>MZP4751A</b>	<b>30</b>	<b>8.5</b>	<b>40</b>	<b>1000</b>	<b>0.25</b>	<b>5</b>	<b>22.8</b>	<b>150</b>
MZP4752A	33	7.5	45	1000	0.25	5	25.1	135
MZP4753A	36	7	50	1000	0.25	5	27.4	125
MZP4754A	39	6.5	60	1000	0.25	5	29.7	115
MZP4755A	43	6	70	1500	0.25	5	32.7	110
MZP4756A	47	5.5	80	1500	0.25	5	35.8	95
MZP4757A	51	5	95	1500	0.25	5	38.8	90
MZP4758A	56	4.5	110	2000	0.25	5	42.6	80
MZP4759A	62	4	125	2000	0.25	5	47.1	70
MZP4760A	68	3.7	150	2000	0.25	5	51.7	65
MZP4761A	75	3.3	175	2000	0.25	5	56	60
MZP4762A	82	3	200	3000	0.25	5	62.2	55
MZP4763A	91	2.8	250	3000	0.25	5	69.2	50
MZP4764A	100	2.5	350	3000	0.25	5	76	45
1M110ZS5	110	2.3	450	4000	0.25	5	83.6	—
1M120ZS5	120	2	550	4500	0.25	5	91.2	—
1M130ZS5	130	1.9	700	5000	0.25	5	98.8	—
1M150ZS5	150	1.7	1000	6000	0.25	5	114	—
1M160ZS5	160	1.6	1100	6500	0.25	5	121.6	—
1M180ZS5	180	1.4	1200	7000	0.25	5	136.8	—
1M200ZS5	200	1.2	1500	8000	0.25	5	152	—

**NOTE 1. TOLERANCE AND TYPE NUMBER DESIGNATION**

The type numbers listed have a standard tolerance on the nominal zener voltage of  $\pm 5\%$ . The tolerance on the 1M type numbers is indicated by the digits following ZS in the part number. "5" indicates a  $\pm 5\%$   $V_Z$  tolerance.

**NOTE 2. ZENER VOLTAGE ( $V_Z$ ) MEASUREMENT**

Motorola guarantees the zener voltage when measured at 90 seconds while maintaining the lead temperature ( $T_L$ ) at  $30^\circ\text{C} \pm 1^\circ\text{C}$ ,  $3/8"$  from the diode body.

**NOTE 3. ZENER IMPEDANCE ( $Z_Z$ ) DERIVATION**

The zener impedance is derived from the 60 cycle ac voltage, which results when an ac

current having an rms value equal to 10% of the dc zener current ( $I_{ZT}$  or  $I_{ZK}$ ) is superimposed on  $I_{ZT}$  or  $I_{ZK}$ .

**NOTE 4. SURGE CURRENT ( $i_r$ ) NON-REPETITIVE**

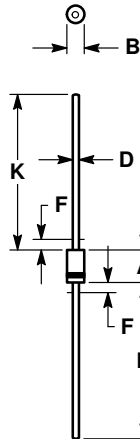
The rating listed in the electrical characteristics table is maximum peak, non-repetitive, reverse surge current of 1/2 square wave or equivalent sine wave pulse of 1/120 second duration superimposed on the test current,  $I_{ZT}$ , however, actual device capability is as described in Figure 3 of General Data — Surmetic 30.

**NOTE 5. SPECIAL SELECTIONS AVAILABLE INCLUDE:**

Nominal zener voltages between those shown. Tight voltage tolerances such as  $\pm 1\%$  and  $\pm 2\%$ . Consult factory.

# Zener Voltage Regulator Diodes — Axial Leded

## 1–3 Watt DO-41 Surmetic 30



- NOTES:
1. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
  2. POLARITY DENOTED BY CATHODE BAND.
  3. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.07	5.20	0.160	0.205
B	2.04	2.71	0.080	0.107
D	0.71	0.86	0.028	0.034
F	—	1.27	—	0.050
K	27.94	—	1.100	—

**CASE 59-03  
DO-41  
PLASTIC**

(Refer to Section 10 for Surface Mount, Thermal Data and Footprint Information.)

### MULTIPLE PACKAGE QUANTITY (MPQ) REQUIREMENTS

Package Option	Type No. Suffix	MPQ (Units)
Tape and Reel	RL	6K
Tape and Ammo	TA	4K

(Refer to Section 10 for more information on Packaging Specifications.)

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