3EZ6.2D5 Series

3 Watt DO-41 Surmetic™ 30 Zener Voltage Regulators

This is a complete series of 3 Watt Zener diodes with limits and excellent operating characteristics that reflect the superior capabilities of silicon−oxide passivated junctions. All this in an axial−lead, transfer−molded plastic package that offers protection in all common environmental conditions.

Specification Features:

- Zener Voltage Range − 6.2 V to 18 V
- ESD Rating of Class 3 (>16 KV) per Human Body Model
- Surge Rating of 98 W @ 1 ms
- Maximum Limits Guaranteed on up to Six Electrical Parameters
- Package No Larger than the Conventional 1 Watt Package
- These are Pb−Free Devices*

Mechanical Characteristics:

CASE: Void free, transfer−molded, thermosetting plastic
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 260°C, 1/16″ from the case for 10 seconds
POLARITY: Cathode indicated by polarity band
MOUNTING POSITION: Any

MAXIMUM RATINGS

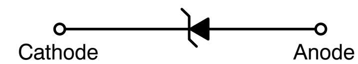
Rating	Symbol	Value	Unit
Max. Steady State Power Dissipation @ T_L = 75°C, Lead Length = 3/8″ Derate above 75°C	P_D	3 24	W mW/°C
Steady State Power Dissipation @ T_A = 50°C Derate above 50°C	P_D	1 6.67	W mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	−65 to +200	°C

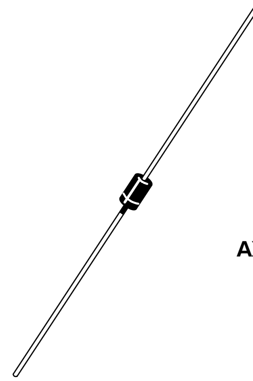
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ON Semiconductor®

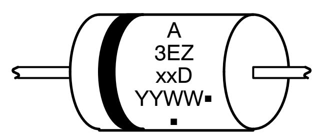
http://onsemi.com





AXIAL LEAD
CASE 59
PLASTIC

MARKING DIAGRAM



A = Assembly Location
3EZxxD = Device Number
YY = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

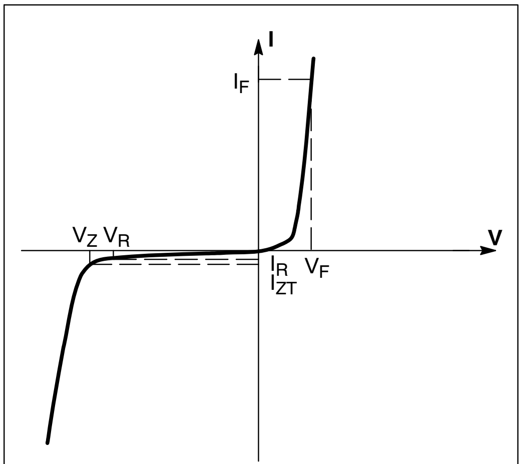
ORDERING INFORMATION

Device	Package	Shipping†
3EZxxD5G	Axial Lead (Pb−Free)	2000 Units / Box
3EZxxD5RLG	Axial Lead (Pb−Free)	6000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.5 V Max @ I_F = 200 mA for all types)

Symbol	Parameter
V_Z	Reverse Zener Voltage @ I_{ZT}
I_{ZT}	Reverse Current
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{ZK}	Reverse Current
Z_{ZK}	Maximum Zener Impedance @ I_{ZK}
I_R	Reverse Leakage Current @ V_R
V_R	Breakdown Voltage
I_F	Forward Current
V_F	Forward Voltage @ I_F
I_{ZM}	Maximum DC Zener Current
I_R	Surge Current @ T_A = 25°C



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.5 V Max @ I_F = 200 mA for all types)

Device† (Note 1)	Device Marking	Zener Voltage (Note 2)				Zener Impedance (Note 3)			Leakage Current		I_{ZM}	I_R (Note 4)
		V_Z (Volts)			@ I_{ZT}	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_R @ V_R			
		Min	Nom	Max	mA	Ω	Ω	mA	μA Max	Volts	mA	mA
3EZ6.2D5RLG	3EZ6.2D	5.89	6.2	6.51	121	1.5	700	1	5	3	435	3.1
3EZ13D5G	3EZ13D	12.35	13	13.65	58	4.5	700	0.25	0.5	9.9	208	1.54
3EZ16D5RLG	3EZ16D	15.2	16	16.8	47	5.5	700	0.25	0.5	12.2	169	1.25
3EZ18D5RLG	3EZ18D	17.1	18	18.9	42	6.0	750	0.25	0.5	13.7	150	1.11

1. **TOLERANCE AND TYPE NUMBER DESIGNATION**
   Tolerance designation – device tolerance of ±5% are indicated by a "5" suffix.
2. **ZENER VOLTAGE (V_Z) MEASUREMENT**
   ON Semiconductor guarantees the zener voltage when measured at 40 ms ±10 ms, 3/8″ from the diode body. And an ambient temperature of 25°C (+8°C, –2°C)
3. **ZENER IMPEDANCE (Z_Z) DERIVATION**
   The zener impedance is derived from 60 seconds 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}.
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 the General Data sheet for Surmetic 30s.

†The "G'' suffix indicates these are Pb–Free packages.

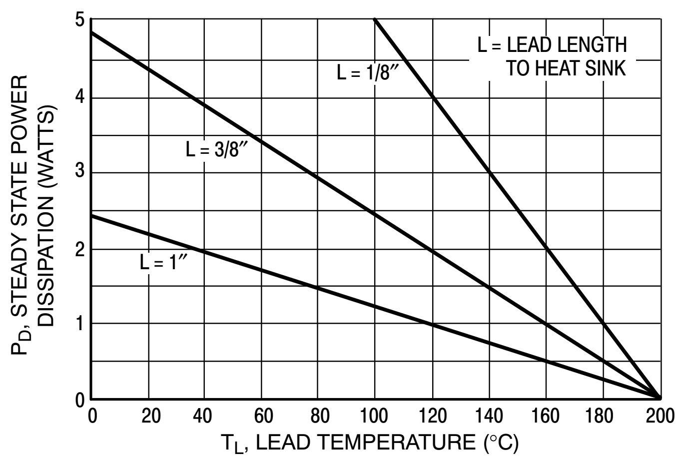


Figure 1. Power Temperature Derating Curve

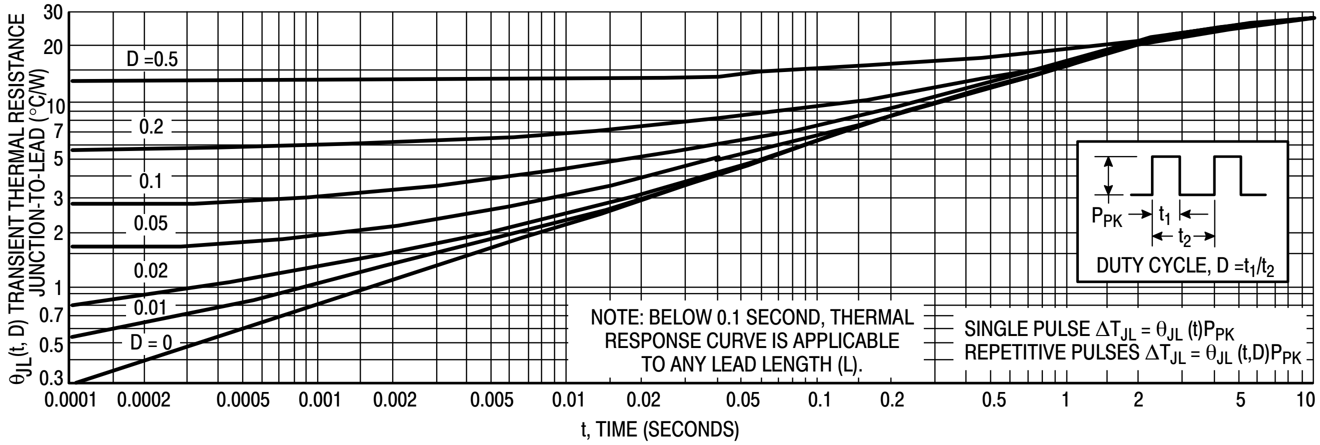


Figure 2. Typical Thermal Response L, Lead Length = 3/8 Inch

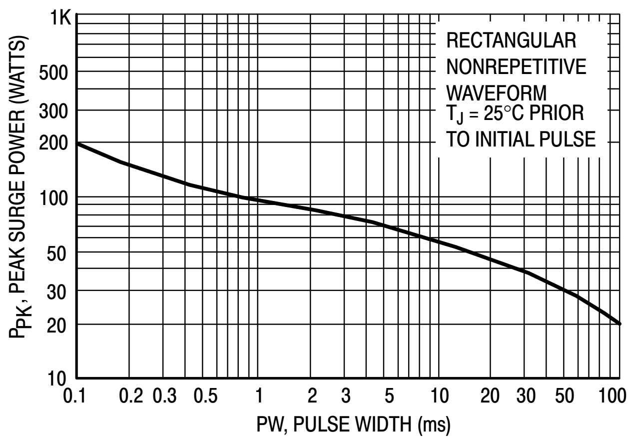


Figure 3. Maximum Surge Power

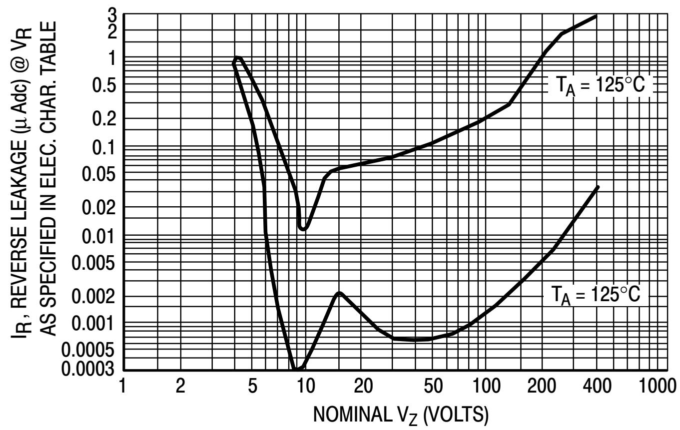


Figure 4. Typical Reverse Leakage

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:

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

θ_{LA} is the lead-to-ambient thermal resistance (°C/W) and P_D is the power dissipation. The value for θ_{LA} will vary and depends on the device mounting method. θ_{LA} is generally 30–40°C/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:

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

ΔT_{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 (ΔT_J) may be estimated. Changes in voltage, V_Z, can then be found from:

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

θ_{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.

TEMPERATURE COEFFICIENT RANGES

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

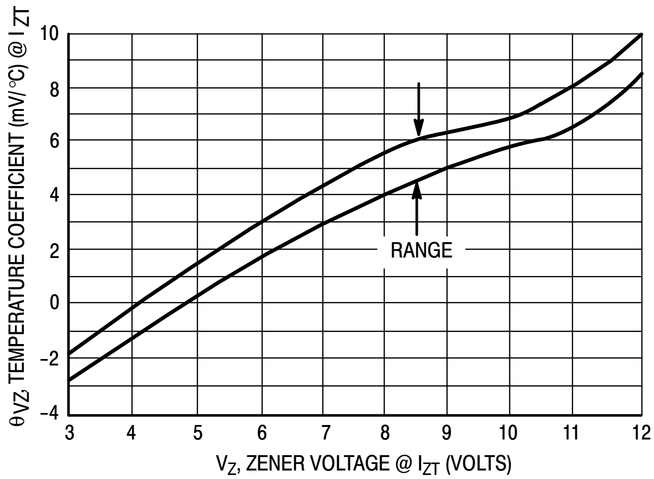


Figure 5. Units to 12 Volts

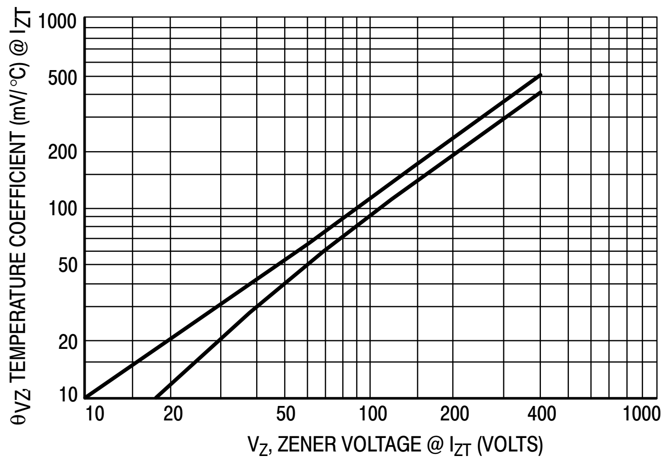


Figure 6. Units 10 to 400 Volts

ZENER VOLTAGE versus ZENER CURRENT

(Figures 7, 8 and 9)

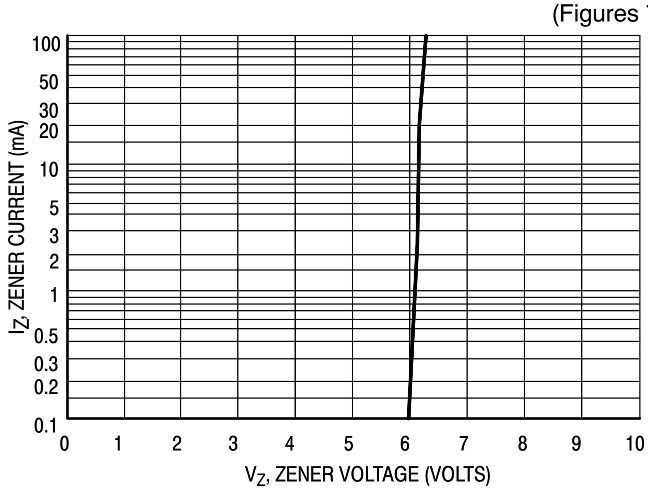


Figure 7. V_Z = 3.3 thru 10 Volts

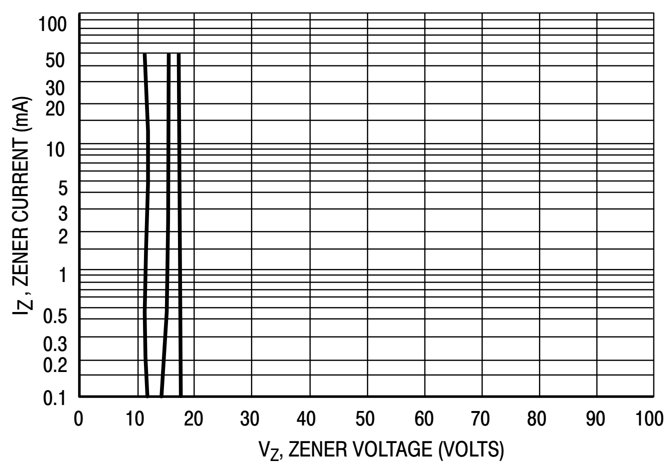


Figure 8. V_Z = 12 thru 82 Volts

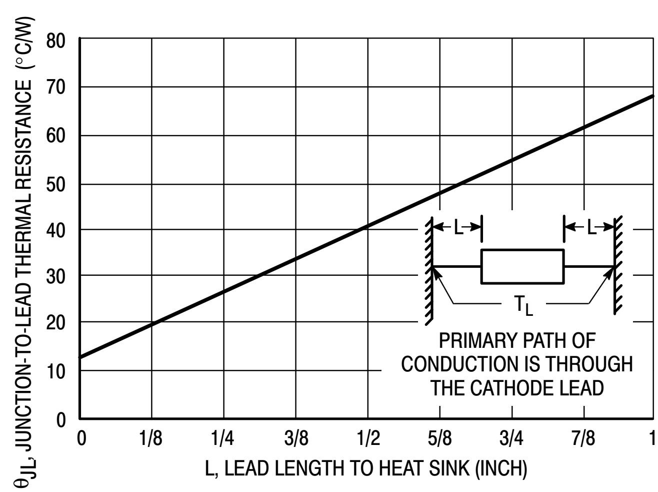
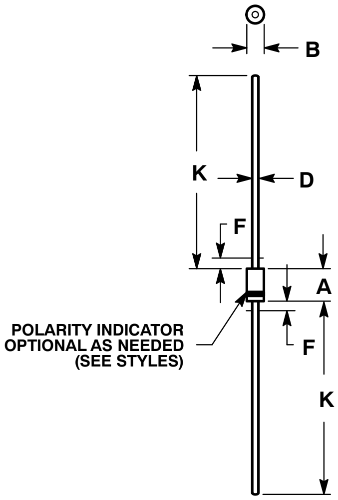


Figure 9. Typical Thermal Resistance

PACKAGE DIMENSIONS

AXIAL LEAD
CASE 59-01
ISSUE U



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY
4. POLARITY DENOTED BY CATHODE BAND.
5. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.161	0.205	4.10	5.20
B	0.079	0.106	2.00	2.70
D	0.028	0.034	0.71	0.86
F	---	0.050	---	1.27
K	1.000	---	25.40	---

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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