3EZ4.3D5 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 – 4.3 V to 330 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

Mechanical Characteristics:

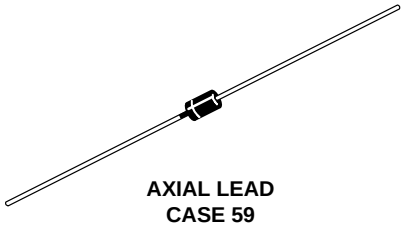
CASE: Void free, transfer–molded, thermosetting plastic
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 230°C, 1/16″ from the case for 10 seconds
POLARITY: Cathode indicated by polarity band
MOUNTING POSITION: Any

MAXIMUM RATINGS

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

ON Semiconductor™

http://onsemi.com



AXIAL LEAD
CASE 59
PLASTIC

MARKING DIAGRAM

L = Assembly Location
3EZxxxD5 = Device Code (See Table Next Page)
YY = Year
WW = Work Week

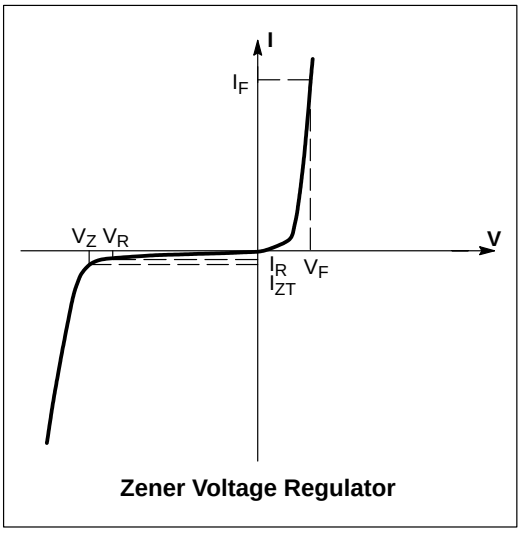
ORDERING INFORMATION

Device	Package	Shipping
3EZxxxD5	Axial Lead	2000 Units/Box
3EZxxxD5RL	Axial Lead	6000/Tape & Reel
3EZxxxD5RR1 †	Axial Lead	2000/Tape & Reel
3EZxxxD5RR2 ‡	Axial Lead	2000/Tape & Reel

† Polarity band **up** with cathode lead off first
‡ Polarity band **down** with cathode lead off first

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
3EZ4.3D5	3EZ4.3D5	4.09	4.3	4.52	174	4.5	400	1	30	1	590	4.1
3EZ6.2D5	3EZ6.2D5	5.89	6.2	6.51	121	1.5	700	1	5	3	435	3.1
3EZ8.2D5	3EZ8.2D5	7.79	8.2	8.61	91	2.3	700	0.5	5	6	330	2.44
3EZ10D5	3EZ10D5	9.50	10	10.5	75	3.5	700	0.25	3	7.6	270	2.0
3EZ13D5	3EZ13D5	12.35	13	13.65	58	4.5	700	0.25	0.5	9.9	208	1.54
3EZ15D5	3EZ15D5	14.25	15	15.75	50	5.5	700	0.25	0.5	11.4	180	1.33
3EZ16D5	3EZ16D5	15.2	16	16.8	47	5.5	700	0.25	0.5	12.2	169	1.25
3EZ18D5	3EZ18D5	17.1	18	18.9	42	6.0	750	0.25	0.5	13.7	150	1.11
3EZ24D5	3EZ24D5	22.8	24	25.2	31	9.0	750	0.25	0.5	18.2	112	0.83
3EZ36D5	3EZ36D5	34.2	36	37.8	21	22	1000	0.25	0.5	27.4	75	0.56
3EZ39D5	3EZ39D5	37.05	39	40.95	19	28	1000	0.25	0.5	29.7	69	0.51
3EZ220D5	3EZ220D5	209	220	231	3.4	1600	9000	0.25	1	167	12	0.09
3EZ240D5	3EZ240D5	228	240	252	3.1	1700	9000	0.25	1	182	11	0.09
3EZ330D5	3EZ330D5	313.5	330	346.5	2.3	2200	9000	0.25	1	251	8	0.06

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.

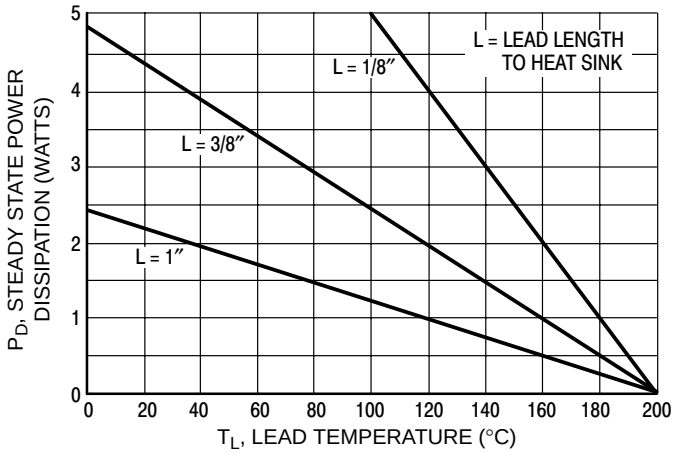


Figure 1. Power Temperature Derating Curve

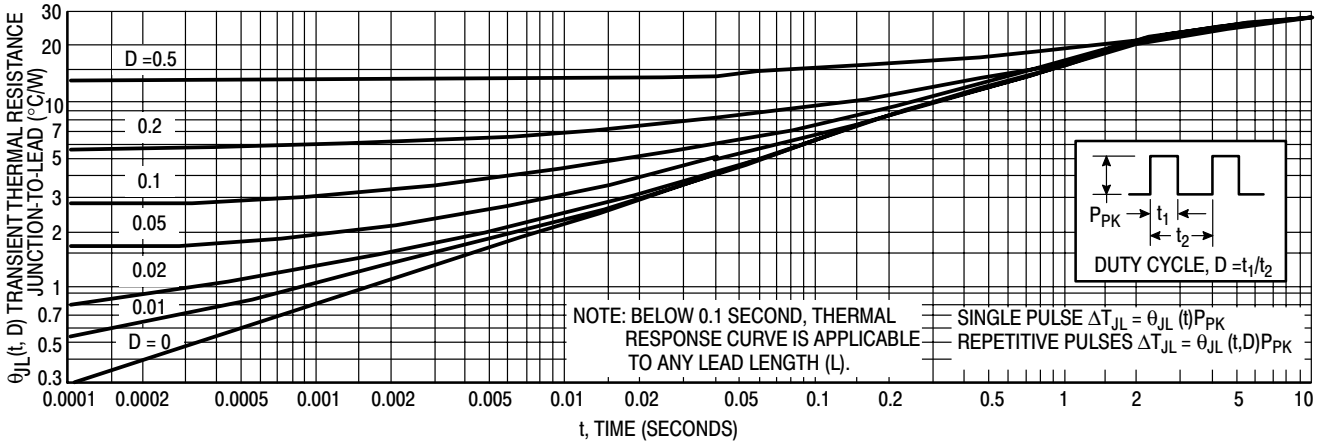


Figure 2. Typical Thermal Response L, Lead Length = 3/8 Inch

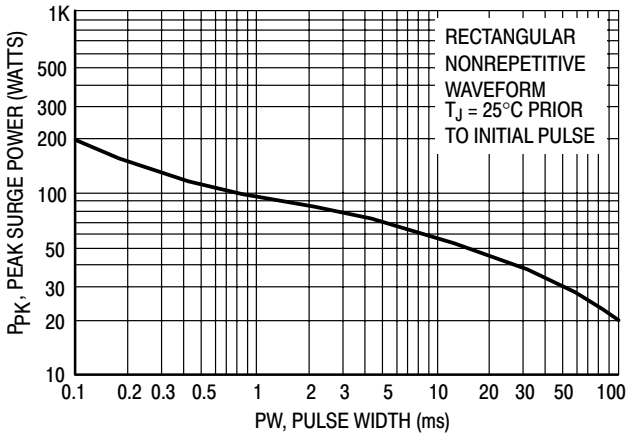


Figure 3. Maximum Surge Power

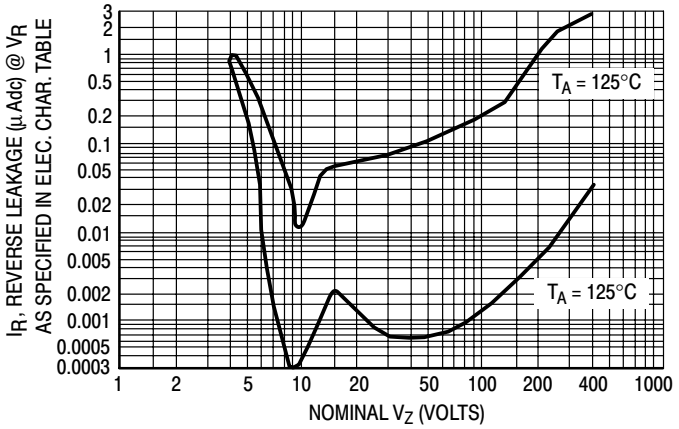


Figure 4. Typical Reverse Leakage

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)

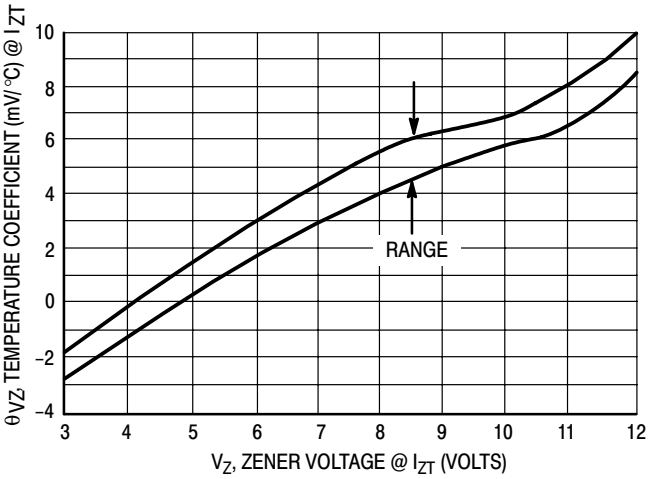


Figure 5. Units To 12 Volts

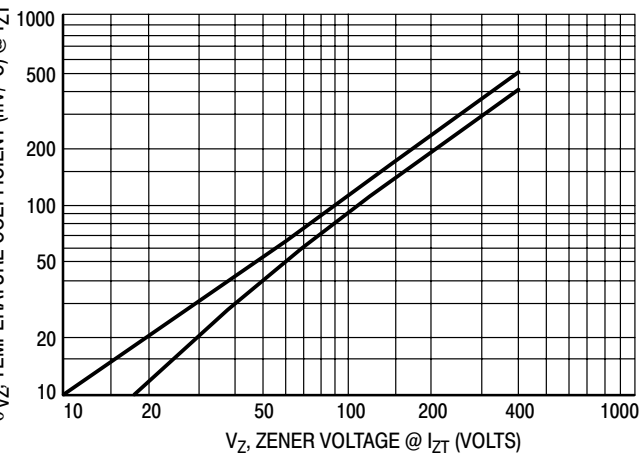


Figure 6. Units 10 To 400 Volts

ZENER VOLTAGE versus ZENER CURRENT

(Figures 7, 8 and 9)

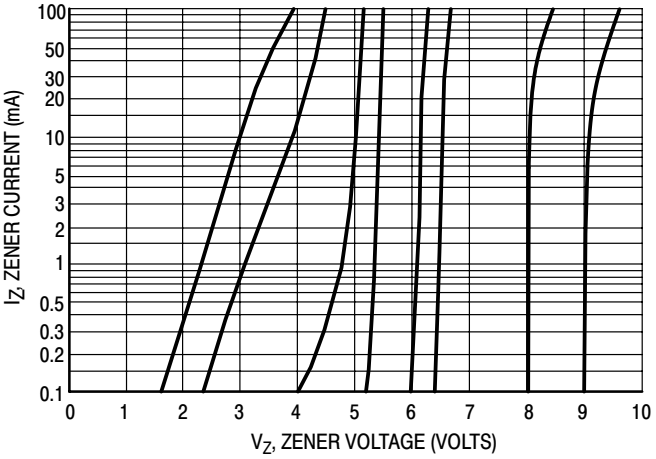


Figure 7. V_Z = 3.3 thru 10 Volts

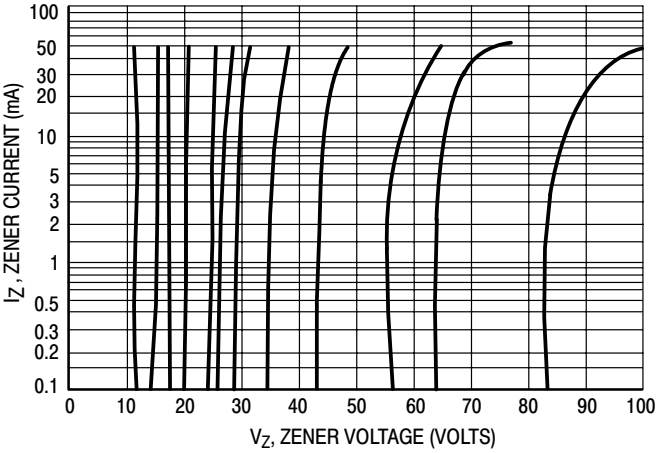


Figure 8. V_Z = 12 thru 82 Volts

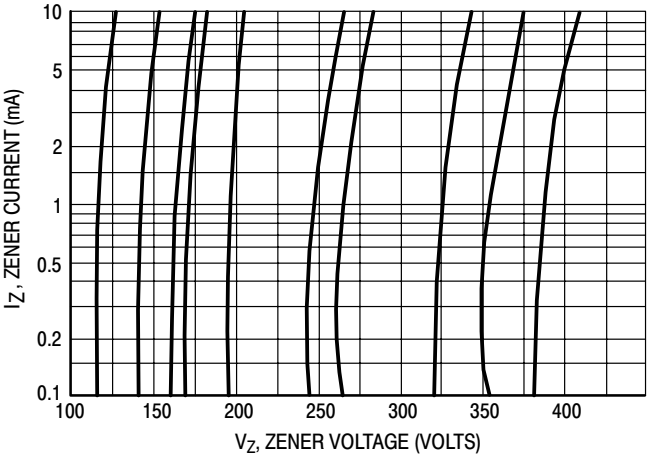


Figure 9. V_Z = 100 thru 400 Volts

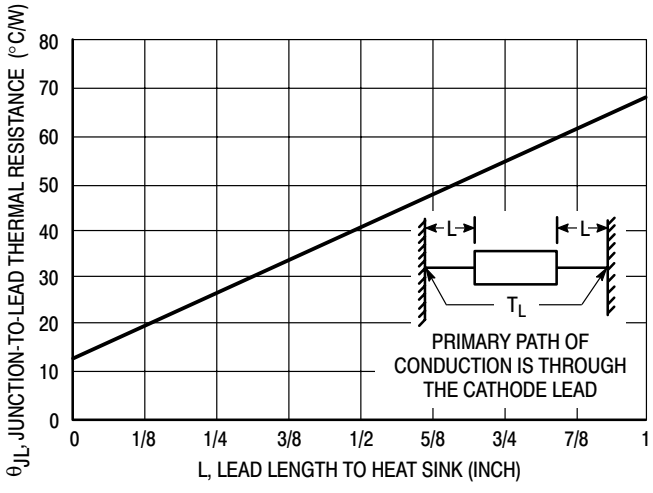


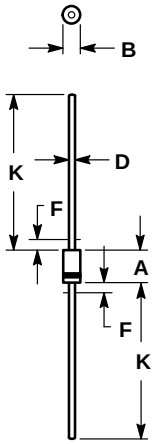
Figure 10. Typical Thermal Resistance

OUTLINE DIMENSIONS

Zener Voltage Regulators – Axial Leaded

3 Watt DO–41 Surmetic™ 30

PLASTIC DO–41
CASE 59–03
ISSUE M



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.

	MILLIMETERS		INCHES	
DIM	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	---

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