



MOTOROLA

ZENER DIODES

Units are available with anode-to-case and cathode-to-case connections (standard and reverse polarity). For reverse polarity, add suffix "R" to type number.

1N2804 thru 1N2846

6.8V thru 200V (Case 54)

1N3305 thru 1N3350

6.8V thru 200V (Case 58)

1N4549 thru 1N4556

3.9V thru 7.5V (Case 58)

1N4557 thru 1N4564

3.9V thru 7.5V (Case 54)

**50 WATTS
ZENER DIODES**

MAXIMUM RATINGS

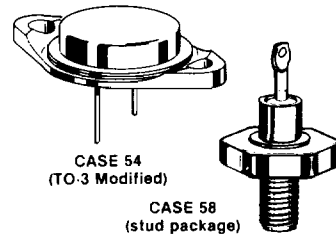
Junction and Storage Temperature: -65°C to +175°C.

DC Power Dissipation: 50 Watts. (Derate 0.5 W/°C above 75°C)

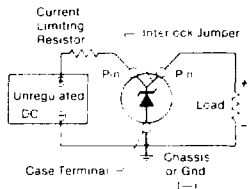
TOLERANCE DESIGNATION: The type numbers shown have a standard tolerance of $\pm 20\%$ on the nominal zener voltage. Add suffix "A" for $\pm 10\%$ units or "B" for $\pm 5\%$ units. (2% and 1% tolerance also available.)

CASE 54 APPLICATIONS INFORMATION: If these units are used with a socket, the unregulated line should be connected to one pin through a suitable current limiting resistor and the load should be connected to the other pin. The load will now be disconnected from the line if the unit is removed from the socket.

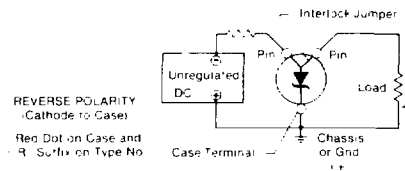
Typical circuit connections for anode-to-case and cathode-to-case polarities (standard and reverse polarities, respectively) are shown below.



CIRCUIT CONNECTIONS



STANDARD POLARITY
(Anode to Case)



REVERSE POLARITY
(Cathode to Case)
Red Dot on Case and
"R" Suffix on Type No.

(A) **NOMINAL ZENER VOLTAGES BETWEEN THE VOLTAGES SHOWN AND TIGHTER VOLTAGE TOLERANCES.**
To designate units with zener voltages other than those assigned JEDEC numbers and/or tight voltage tolerances ($\pm 3\%$, $\pm 2\%$, $\pm 1\%$), the Motorola type number should be used.

| | | | | | |
|--------------------|----------|-----------------|------|-------------|------------------------|
| 50 | M | 90 | S | Z | 3 |
| Device Description | Motorola | Nominal Voltage | Stud | Zener Diode | Tolerance ($\pm \%$) |
| Example 50M90ZS3 | | | | | |

| | | | | | | | |
|---|----------|------------------------|------|--------------|--|--|--------------------|
| 50 | M | 51 | S | Z | 5 | B | 1 |
| Device Description | Motorola | 51 volts (each device) | Stud | Zener Diodes | Tolerance per device ($\pm 5\%$) (omit for $\pm 20\%$ units) | Overall Tolerance of set ($\pm 1\%$) | Code* (A-Not used) |
| *Code B - Two devices in series C - Three devices in series D - Four devices in series | | | | | | | |
| Example 50M51S25B1 | | | | | | | |

(B) **MATCHED SETS:** (Standard Tolerances are $\pm 5.0\%$, $\pm 2.0\%$, $\pm 1.0\%$).

Zener diodes can be obtained in sets consisting of two or more matched devices. The method for specifying such matched sets similar to the one described in (A) for specifying units with a special voltage and/or tolerance except that two extra suffixes are added to the code number described.

These units are marked with code letters to identify the matched sets and, in addition, each unit in a set is marked with the same serial number which is different for each set being ordered.

(C) **ZENER CLIPPERS:** (Standard Tolerance $\pm 10\%$ and $\pm 5\%$).

Special clipper diodes with opposing Zener junctions built into the device are available by using the following nomenclature

| | | | | | | |
|---------------------|----------|-----------------|------|--------------|---------|---|
| 50 | M | 20 | S | Z | Z | 10 |
| Device Description | Motorola | Nominal Voltage | Stud | Zener Diodes | Clipper | Tolerance for each of the two Zener voltages (not a matching requirement) |
| Example: 50M20SZZ10 | | | | | | |

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1N2804 thru 1N2846, 1N3305 thru 1N3350, 1N4549 thru 1N4564

ELECTRICAL CHARACTERISTICS ($T_C = 30^\circ\text{C}$ unless otherwise specified, $V_F = 1.5\text{ V max @ } 10\text{ A}$ on all types.)

| 50 Watt Case 54 | 50 Watt Case 58 | Nominal Zener Voltage @ I_{ZT} (V_Z) Volts | Test Current (I_{ZT}) mA | Max Zener Impedance | | Max DC Zener Current 75°C Case Temp (I_{ZM})mA | Reverse* Leakage Current | | | Typical Zener Voltage Temp. Coeff. %/°C |
|-----------------|-----------------|--|------------------------------|--------------------------|--|--|-------------------------------------|----------|----------|---|
| | | | | Z_{ZT} @ I_{ZT} ohms | Z_{ZK} @ $I_{ZK} = 5\text{ mA}$ ohms | | $I_{R\text{Max}}$ (μA) | V_{R1} | V_{R2} | |
| 1N4557 | 1N4549 | 3.9 | 3200 | 0.16 | 400 | 11900 | 150 | 0.5 | 0.5 | - .025 |
| 1N4558 | 1N4550 | 4.3 | 2900 | 0.16 | 500 | 10650 | 150 | 0.5 | 0.5 | - .025 |
| 1N4559 | 1N4551 | 4.7 | 2650 | 0.12 | 600 | 9700 | 100 | 1.0 | 1.0 | .010 |
| 1N4560 | 1N4552 | 5.1 | 2450 | 0.12 | 650 | 8900 | 20 | 1.0 | 1.0 | .015 |
| 1N4561 | 1N4553 | 5.6 | 2250 | 0.12 | 900 | 8100 | 20 | 1.0 | 1.0 | .030 |
| 1N4562 | 1N4554 | 6.2 | 2000 | 0.14 | 1000 | 7300 | 20 | 2.0 | 2.0 | .040 |
| 1N2804 | 1N3305 | 6.8 | 1850 | 0.2 | 70 | 6600 | 150 | 4.5 | 4.3 | .040 |
| 1N4563 | 1N4555 | 6.8 | 1850 | 0.16 | 200 | 6650 | 10 | 2.0 | 2.0 | .045 |
| 1N2805 | 1N3306 | 7.5 | 1700 | 0.3 | 70 | 5900 | 75 | 5.0 | 4.7 | .045 |
| 1N4564 | 1N4556 | 7.5 | 1650 | 0.24 | 100 | 6050 | 10 | 3.0 | 3.0 | .053 |
| 1N2806 | 1N3307 | 8.2 | 1500 | 0.4 | 70 | 5200 | 50 | 5.4 | 5.2 | .048 |
| 1N2807 | 1N3308 | 9.1 | 1370 | 0.5 | 70 | 4800 | 25 | 6.1 | 5.7 | .051 |
| 1N2808 | 1N3309 | 10 | 1200 | 0.6 | 80 | 4300 | 10 | 6.7 | 6.3 | .055 |
| 1N2809 | 1N3310 | 11 | 1100 | 0.8 | 80 | 3900 | 5 | 8.4 | 8.0 | .060 |
| 1N2810 | 1N3311 | 12 | 1000 | 1.0 | 80 | 3600 | 5 | 9.1 | 8.6 | .065 |
| 1N2811 | 1N3312 | 13 | 960 | 1.1 | 80 | 3300 | 5 | 9.9 | 9.4 | .065 |
| 1N2812 | 1N3313 | 14 | 890 | 1.2 | 80 | 3000 | 5 | 10.6 | 10.1 | .070 |
| 1N2813 | 1N3314 | 15 | 830 | 1.4 | 80 | 2800 | 5 | 11.4 | 10.8 | .070 |
| 1N2814 | 1N3315 | 16 | 780 | 1.6 | 80 | 2650 | 5 | 12.2 | 11.5 | .070 |
| 1N2815 | 1N3316 | 17 | 740 | 1.8 | 80 | 2500 | 5 | 13.0 | 12.2 | .075 |
| 1N2816 | 1N3317 | 18 | 700 | 2.0 | 80 | 2300 | 5 | 13.7 | 13.0 | .075 |
| 1N2817 | 1N3318 | 19 | 660 | 2.2 | 80 | 2200 | 5 | 14.4 | 13.7 | .075 |
| 1N2818 | 1N3319 | 20 | 630 | 2.4 | 80 | 2100 | 5 | 15.2 | 14.4 | .075 |
| 1N2819 | 1N3320 | 22 | 570 | 2.5 | 80 | 1900 | 5 | 16.7 | 15.8 | .080 |
| 1N2820 | 1N3321 | 24 | 520 | 2.6 | 80 | 1750 | 5 | 18.2 | 17.3 | .080 |
| 1N2821 | 1N3322 | 25 | 500 | 2.7 | 90 | 1550 | 5 | 19.0 | 18.0 | .080 |
| 1N2822 | 1N3323 | 27 | 460 | 2.8 | 90 | 1500 | 5 | 20.6 | 19.4 | .085 |
| 1N2823 | 1N3324 | 30 | 420 | 3.0 | 90 | 1400 | 5 | 22.8 | 21.6 | .085 |
| 1N2824 | 1N3325 | 33 | 380 | 3.2 | 90 | 1300 | 5 | 25.1 | 23.8 | .085 |
| 1N2825 | 1N3326 | 36 | 350 | 3.5 | 90 | 1150 | 5 | 27.4 | 25.9 | .085 |
| 1N2826 | 1N3327 | 39 | 320 | 4.0 | 90 | 1050 | 5 | 29.7 | 28.1 | .090 |
| 1N2827 | 1N3328 | 43 | 290 | 4.5 | 90 | 975 | 5 | 32.7 | 31.0 | .090 |
| 1N2828 | 1N3329 | 45 | 280 | 4.5 | 100 | 930 | 5 | 34.2 | 32.4 | .090 |
| 1N2829 | 1N3330 | 47 | 270 | 5.0 | 100 | 880 | 5 | 35.8 | 33.8 | .090 |
| 1N2830 | 1N3331 | 50 | 250 | 5.0 | 100 | 830 | 5 | 38.0 | 36.0 | .090 |
| 1N2831 | 1N3332 | 51 | 245 | 5.2 | 100 | 810 | 5 | 38.8 | 36.7 | .090 |
| — | 1N3333 | 52 | 240 | 5.5 | 100 | 790 | 5 | 39.5 | 37.4 | .090 |
| 1N2832 | 1N3334 | 56 | 220 | 6 | 110 | 740 | 5 | 42.6 | 40.3 | .090 |
| 1N2833 | 1N3335 | 62 | 200 | 7 | 120 | 660 | 5 | 47.1 | 44.6 | .090 |
| 1N2834 | 1N3336 | 68 | 180 | 8 | 140 | 600 | 5 | 51.7 | 49.0 | .090 |
| 1N2835 | 1N3337 | 75 | 170 | 9 | 150 | 540 | 5 | 56.0 | 54.0 | .090 |
| 1N2836 | 1N3338 | 82 | 150 | 11 | 160 | 490 | 5 | 62.2 | 59.0 | .090 |
| 1N2837 | 1N3339 | 91 | 140 | 15 | 180 | 420 | 5 | 69.2 | 65.5 | .090 |
| 1N2838 | 1N3340 | 100 | 120 | 20 | 200 | 400 | 5 | 76.0 | 72.0 | .090 |
| 1N2839 | 1N3341 | 105 | 120 | 25 | 210 | 380 | 5 | 79.8 | 75.6 | .095 |
| 1N2840 | 1N3342 | 110 | 110 | 30 | 220 | 365 | 5 | 83.6 | 79.2 | .095 |
| 1N2841 | 1N3343 | 120 | 100 | 40 | 240 | 335 | 5 | 91.2 | 86.4 | .095 |
| 1N2842 | 1N3344 | 130 | 95 | 50 | 275 | 310 | 5 | 98.8 | 93.6 | .095 |
| — | 1N3345 | 140 | 90 | 60 | 325 | 290 | 5 | 106.4 | 100.8 | .095 |
| 1N2843 | 1N3346 | 150 | 85 | 75 | 400 | 270 | 5 | 114.0 | 108.0 | .095 |
| 1N2844 | 1N3347 | 160 | 80 | 80 | 450 | 250 | 5 | 121.6 | 115.2 | .095 |
| — | 1N3348 | 175 | 70 | 85 | 500 | 230 | 5 | 133.0 | 126.0 | .095 |
| 1N2845 | 1N3349 | 180 | 66 | 90 | 525 | 220 | 5 | 136.8 | 129.6 | .095 |
| 1N2846 | 1N3350 | 200 | 65 | 100 | 600 | 200 | 5 | 152.0 | 144.0 | .100 |

SPECIAL SELECTIONS AVAILABLE INCLUDE: (See Selector Guide for details)

* V_{R1} — Test Voltage for 5% Tolerance Device

V_{R2} — Test Voltage for 10% Tolerance Device

No Leakage Specified as 20% Tolerance Device

1N2804 thru 1N2846, 1N3305 thru 1N3350, 1N4549 thru 1N4564

FIGURE 1 — TEMPERATURE CHARACTERISTICS

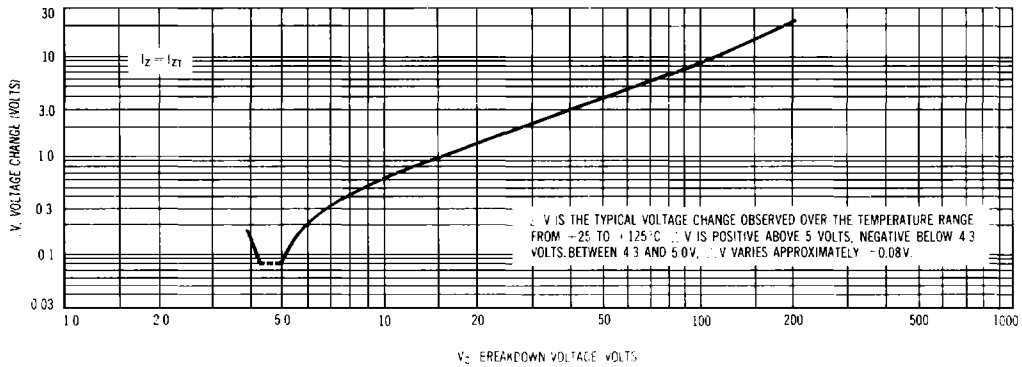


FIGURE 2 — POWER-TEMPERATURE DERATING CURVE

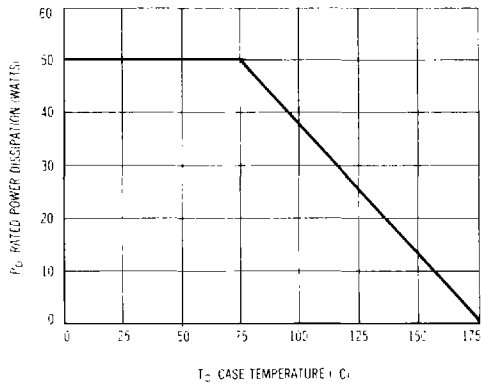


FIGURE 3 — LEAKAGE CURRENT

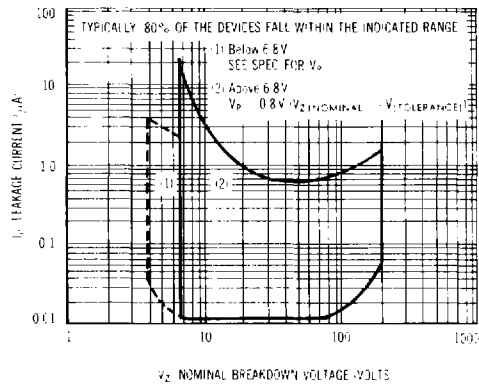
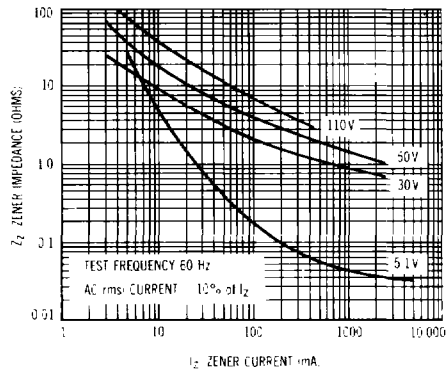
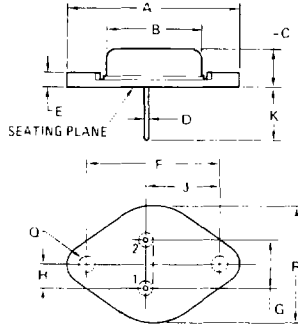


FIGURE 4 — ZENER IMPEDANCE versus ZENER CURRENT



1N2804 thru 1N2846, 1N3305 thru 1N3350, 1N4549 thru 1N4564

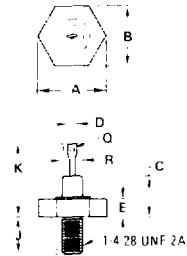


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | - | 39.12 | - | 1.540 |
| B | - | 20.70 | - | 0.815 |
| C | - | 7.92 | - | 0.312 |
| D | 1.22 | 1.30 | 0.048 | 0.051 |
| E | 2.84 | 3.05 | 0.112 | 0.120 |
| F | 29.90 | 30.40 | 1.177 | 1.197 |
| G | 10.67 | 11.18 | 0.420 | 0.440 |
| H | 5.33 | 5.53 | 0.210 | 0.220 |
| J | 16.54 | 16.79 | 0.651 | 0.661 |
| K | 8.13 | 10.67 | 0.320 | 0.420 |
| Q | 3.84 | 4.09 | 0.151 | 0.161 |
| R | - | 26.16 | - | 1.030 |

CASE 54
(TO-3 Modified)

STYLE 3.
PIN 1 CATHODE
2 CATHODE
CASE: ANODE

STYLE 4
PIN 1 ANODE
2 ANODE
CASE CATHODE



STYLE 1
TERM 1 CATHODE
2 ANODE

STYLE 2
TERM 1 ANODE
2 CATHODE

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 18.92 | 19.18 | 0.745 | 0.755 |
| B | 16.94 | 17.45 | 0.667 | 0.687 |
| C | - | 11.34 | - | 0.470 |
| D | 3.18 | NOM | 0.125 | NOM |
| E | 2.92 | 5.08 | 0.115 | 0.200 |
| J | 10.72 | 11.51 | 0.422 | 0.453 |
| K | - | 21.34 | - | 0.840 |
| Q | 1.76 | NOM | 0.070 | NOM |
| R | - | 7.11 | - | 0.280 |

CASE 58
(stud package)