



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.

MAXIMUM RATINGS

Junction and Storage Temperature: -65°C to $+175^{\circ}\text{C}$.

DC Power Dissipation: 50 Watts. (Derate 0.5 W/ $^{\circ}\text{C}$ 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.

1N2804 thru 1N2846

6.8V thru 200V (Case 54)

1N3305 thru 1N3350

6.8V thru 200V (Case 58)

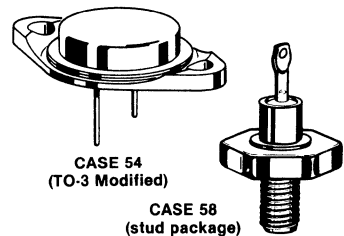
1N4549 thru 1N4556

3.9V thru 7.5V (Case 58)

1N4557 thru 1N4564

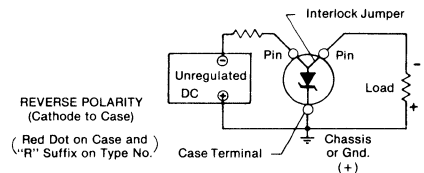
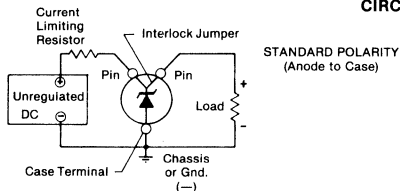
3.9V thru 7.5V (Case 54)

50 WATTS ZENER DIODES



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CIRCUIT CONNECTIONS



- (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)	Code* (A-Not used)	Overall Tolerance of set ($\pm 1\%$)

*Code:
B — Two devices in series
C — Three devices in series
D — Four devices in series

Example: 50M51SZ5B1

- (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

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_Z (V_Z) Volts	Test Current (I_Z) 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_Z 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	68	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

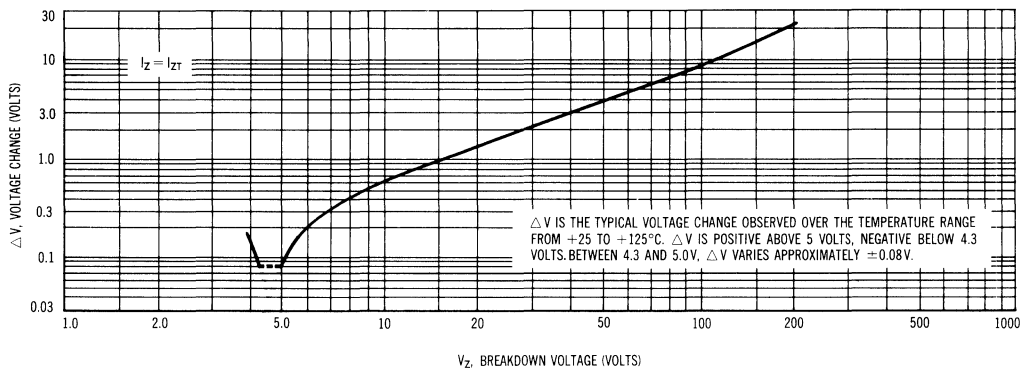


FIGURE 2 — POWER-TEMPERATURE DERATING CURVE

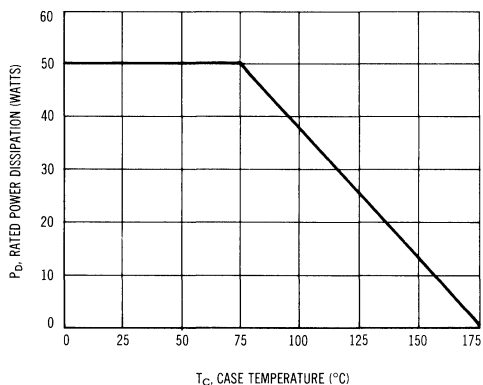


FIGURE 3 — LEAKAGE CURRENT

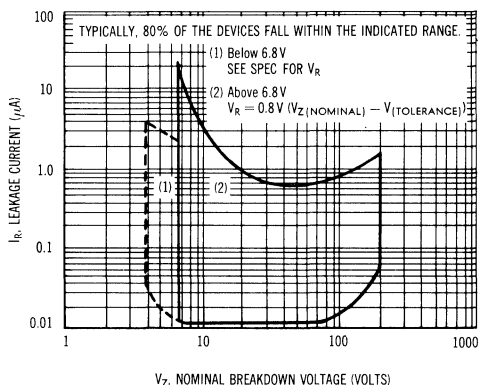
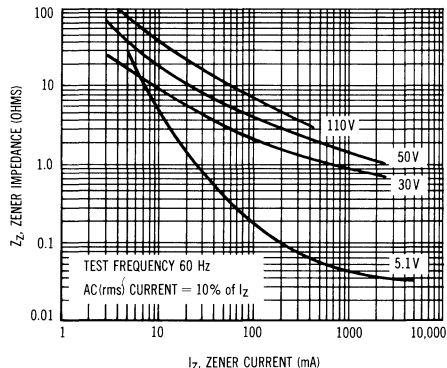
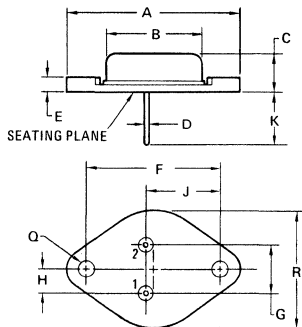


FIGURE 4 — ZENER IMPEDANCE versus ZENER CURRENT



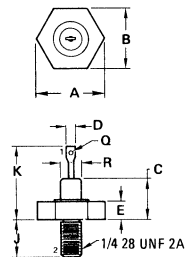


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	39.12	—	1.540
B	—	20.70	—	0.815
C	—	7.92	—	0.312
D	1.22	1.30	0.048	0.051
E	2.84	3.05	0.112	0.120
F	29.90	30.40	1.177	1.197
G	10.67	11.18	0.420	0.440
H	5.33	5.59	0.210	0.220
J	16.54	16.79	0.651	0.661
K	8.13	10.67	0.320	0.420
Q	3.84	4.09	0.151	0.161
R	—	26.16	—	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	—	11.94	—	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	1.78	NOM	0.070	NOM
R	—	7.11	—	0.280

CASE 58
(stud package)