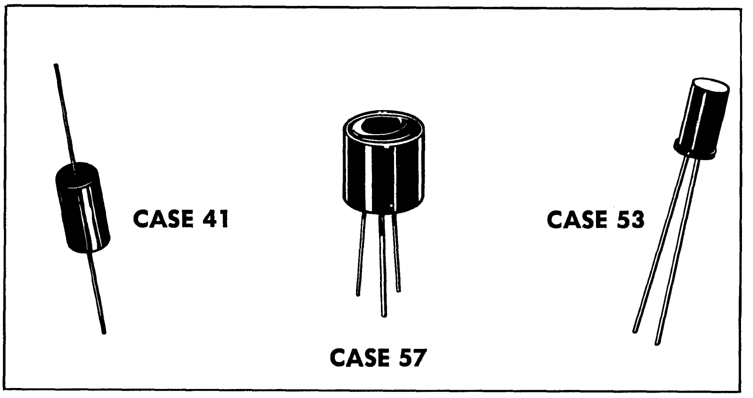
1N429

1N1530 series

1N1735 series

1N4057 series

Temperature compensated zener reference diodes designed for reference sources utilizing an oxide-passivated junction for long-term voltage stability, high uniformity and reliable operation.



MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Operating Junction Temperature Range	T_J	-55 to +175	°C
Storage Temperature Range	T_{stg}	-65 to +175	°C
Power Dissipation*	P_D	See Tables 1 & 2*	W

*The devices are designed for operation at the specified I_{ZT}. Operation above or below this current is not recommended, since the temperature coefficient is no longer valid. See Note 2 and Figure 4.

MECHANICAL CHARACTERISTICS

Case:	Discrete glass package devices encapsulated in a transfer molded plastic package
Polarity:	Indicated by diode symbol except 1N429, 1N1530, 1N1530A where cathode indicated by polarity dot of contrasting color
Weight:	Varies according to device 0.5 grams (min) 12 grams (max)
Finish:	All external surfaces corrosion resistant and leads readily solderable.

TABLE 1 – ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

TYPE	CASE	Zener Voltage ±5% V_Z Volts	@ I_{ZT} mA	Z_{ZT} Ohms (Note 3)	Temperature Coefficient %/°C (Note 2)	ΔV_Z @ I_{ZT} (+25 to +100°C) Volts (Note 2)	ΔV_Z (−55 to +25°C) Volts (Note 2)	P_D* T_A = 25°C W
1N4057	41-8	12.4	10	25	0.005	0.047	0.050	1.5
1N4057A		12.4		25	0.002	0.019	0.020	
1N4058		14.6		30	0.005	0.055	0.058	
1N4058A		14.6			0.002	0.022	0.023	
1N4059		16.8			0.005	0.063	0.067	
1N4059A		16.8			0.002	0.025	0.027	
1N4060		18.5			0.005	0.069	0.074	
1N4060A		18.5			0.002	0.028	0.030	
1N4061		21		35	0.005	0.079	0.084	
1N4061A		21		35	0.002	0.032	0.034	
1N4062		23		40	0.005	0.086	0.092	
1N4062A		23		40	0.002	0.035	0.037	
1N4063		27		45	0.005	0.101	0.108	
1N4063A		27		45	0.002	0.041	0.043	
1N4064		30		50	0.005	0.113	0.120	
1N4064A		30		50	0.002	0.045	0.048	
1N4065		33		55	0.005	0.124	0.132	
1N4065A		33		55	0.002	0.050	0.053	
1N4066		37	7.5	80	0.005	0.139	0.148	
1N4066A		37		80	0.002	0.056	0.059	
1N4067		43		90	0.005	0.161	0.172	
1N4067A		43		90	0.002	0.065	0.069	
1N4068		47		100	0.005	0.176	0.188	
1N4068A		47		100	0.002	0.071	0.075	
1N4069	41-9	51		110	0.005	0.191	0.204	2.0
1N4069A		51		110	0.002	0.077	0.082	
1N4070		56		120	0.005	0.210	0.224	
1N4070A		56		120	0.002	0.084	0.090	
1N4071		62		135	0.005	0.232	0.248	
1N4071A		62		135	0.002	0.093	0.099	
1N4072		68	5.0	230	0.005	0.255	0.272	
1N4072A		68		230	0.002	0.102	0.109	
1N4073		75		250	0.005	0.281	0.300	
1N4073A		75		250	0.002	0.113	0.120	
1N4074		82		270	0.005	0.307	0.328	
1N4074A		82		270	0.002	0.123	0.131	
1N4075		87		290	0.005	0.326	0.348	
1N4075A		87		290	0.002	0.131	0.139	
1N4076		91		310	0.005	0.341	0.364	
1N4076A		91		310	0.002	0.137	0.146	
1N4077		100		340	0.005	0.375	0.400	
1N4077A		100		340	0.002	0.150	0.160	
1N4078		105	2.5	700	0.005	0.394	0.420	
1N4078A		105		700	0.002	0.158	0.168	
1N4079		110		740	0.005	0.413	0.440	
1N4079A		110		740	0.002	0.165	0.176	
1N4080		120		800	0.005	0.450	0.480	
1N4080A		120		800	0.002	0.180	0.192	
1N4081	41-10	130		840	0.005	0.488	0.520	2.5
1N4081A		130		840	0.002	0.195	0.208	
1N4082		140		960	0.005	0.525	0.560	
1N4082A		140		960	0.002	0.210	0.224	
1N4083		150		1020	0.005	0.563	0.600	
1N4083A		150		1020	0.002	0.225	0.240	
1N4084		175		1150	0.005	0.656	0.700	
1N4084A		175		1150	0.002	0.263	0.280	
1N4085		200		1350	0.005	0.750	0.800	
1N4085A		200		1350	0.002	0.300	0.320	

*Derate linearly from 25°C to 175°C.

TABLE 2 – ELECTRICAL CHARACTERISTICS (I_{ZT} = 7.5 mA, T_A = 25°C unless otherwise noted)

Type Number	Zener Voltage V_Z ± 5% (Volts)	Max Voltage Change @ –55, +25, +100°C ΔV_Z (Volts) (Note 2)	Max Dynamic Impedance (Note 3) Z_{ZT} (Ohms)	Temperature Coefficient (Note 2) (%/°C)	Power* Dissipation P_D (mW)	Case Number	Figure Number
1N429 ①	6.2	0.050	20	0.01	200	53	1
1N1735	6.2	0.050	20	0.01	200	41-6	2
1N1530** 1N1530A** ②	8.4	0.014 0.007	15	0.002 0.001	250	57	3
1N1736 1N1736A	12.4	0.100 0.050	40	0.01 0.005	400	41-3	2
1N1737 1N1737A	18.6	0.150 0.075	60	0.01 0.005	600	41-5	2
1N1738 1N1738A	24.8	0.200 0.100	80	0.01 0.005	800	41-5	2
1N1739 1N1739A	31.0	0.250 0.125	100	0.01 0.005	1000	41-4	2
1N1740 1N1740A	37.2	0.300 0.150	120	0.01 0.005	1200	41-4	2
1N1741 1N1741A	43.4	0.350 0.175	140	0.01 0.005	1400	41-4	2
1N1742 ③ 1N1742A	49.6	0.400 0.200	180	0.01 0.005	1600	41-4	2

*Derate linearly from 25°C to 175°C
**I_{ZT} = 10 mA

① Available to MIL-S-19500/299 Specifications.
② Available to MIL-S-19500/320 Specifications.
③ Available to MIL-S-19500/298 Specifications.

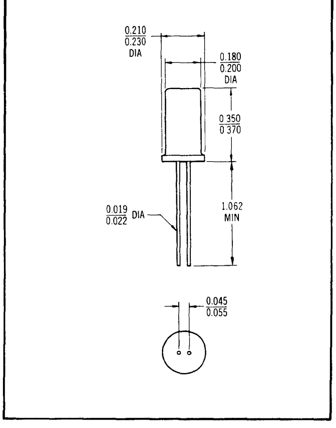
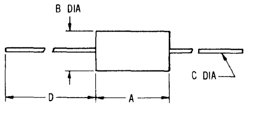


FIGURE 1
CASE 53



PKG.	OUTLINE DIMENSIONS (INCHES) A MAX	B MAX	C ·0.002	D MIN
41-1	1.00	0.500	0.032	1.25
41-2	0.500	0.375	0.032	1.25
41-3	1.030	0.378	0.032	1.25
41-4	1.220	0.641	0.032	1.75
41-5	0.655	0.641	0.032	1.25
41-6	0.520	0.275	0.020	1.25
41-7	1.000	0.375	0.032	1.25
41-8	0.520	0.260	0.030	1.00
41-9	0.780	0.260	0.030	1.00
41-10	1.155	0.323	0.030	1.00

FIGURE 2
CASE 41

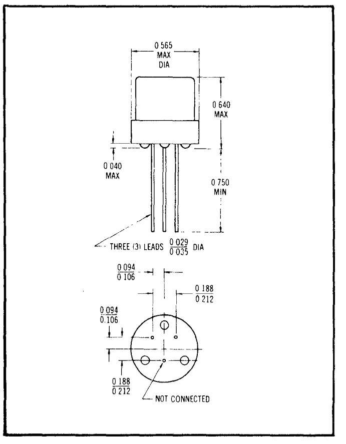


FIGURE 3
CASE 57

TEMPERATURE-COMPENSATED REFERENCE DIODES

Temperature compensated reference diodes are made possible by taking advantage of the differing thermal characteristics of forward and reverse biased silicon PN junctions. A forward biased junction has a negative temperature coefficient of approximately 2.0 millivolts/°C. Reverse biased junctions above 5.0 volts have a positive temperature coefficient and therefore it is possible by judicious selection of combinations of forward and reverse biased junctions to obtain a device which shows a very low temperature coefficient due to cancellation. Because of the differing impedance versus temperature characteristics of the junctions involved, optimum temperature stability is obtained by operating in the zener current range at which the temperature coefficient is a minimum (Figure 4)

Further information, including a method of effective impedance cancellation in a bridge circuit for ultra-stable reference supplies, is contained in the Zener Diode Handbook. The handbook, containing valuable theory, design, and application information, is available from your distributor.

NOTE 1 — Voltage-Current Characteristics

Figure 4 shows the voltage-current characteristics of a typical temperature compensated unit at three different temperatures. The exploded view illustrates the cross-over area (optimum temperature stability point), the non-linearity of the temperature-voltage relationship, and the maximum voltage variation (ΔV_Z) for the three temperatures shown.

Because of device impedance, the reference voltage will vary with changes in zener current. These variations can be minimized by driving the device from a constant current source.

NOTE 2 — Voltage Variation (ΔV_Z) and Temperature Coefficient

All reference diodes are characterized by the "box" method. This method provides for a guaranteed maximum voltage variation (ΔV_Z in mV) over a specified temperature range at the specified I_{ZT} verified by tests at several points within the range. (Maximum voltage variations over the specified temperature ranges are given in Tables 1 and 2.) The design engineer now has a number (without any calculations) telling him the stability of the voltage over the temperature range of interest thus giving him the maximum flexibility as well as economy in selecting the temperature stability required. The referenced military specifications use this approach to characterize these devices.

Since reference diodes have a non-linear voltage-temperature relationship (illustrated in exploded view, Figure 4) the temperature coefficients in %/°C are tabulated primarily for reference purposes and are guaranteed only at the end points of the temperature range.

NOTE 3 — Zener Impedance Derivation

The dynamic zener impedance, Z_{ZT}, is derived from the 60 Hz ac voltage which results when an ac current with an rms value equal to 10% of the dc zener current, I_{ZT}, is superimposed on I_{ZT}. A cathode-ray tube curve trace test on a sample basis is used to ensure that each zener characteristic has a sharp and stable knee region.

FIGURE 4 — TYPICAL OPERATING CHARACTERISTICS