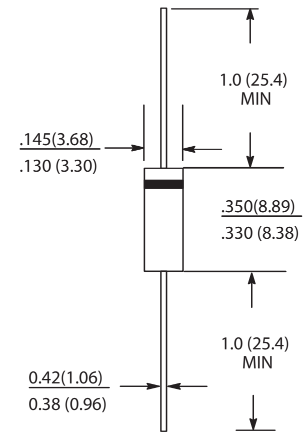
1N5333B

Power Dissipation - 5 Watt
Voltage Range - 3.3 to 200 V

SILICON PLANAR ZENER DIODES

FEATURES

- Low leakage ,low zener impedance at low current
- Maximum power dissipation of 5W is ideally suited for stabilized power supply,etc.
- High temperature soldering guaranted :2600 C/10 seconds at terminals
- Standard zener volatge tolerance available is+20% Suffix "A".
- Indicates +10% tolerance . Suffix "B" indicates +5% tolerance.



Dimensions in inches and (millimeters)

MECHANICAL DATA

- Case:17-02 molded plastic
- Terminals:Plated axial leads, solderable per MIL-STD-750,method 2026
- Polarity:Color band denoted cathode end

ABSOLUTE MAXIMUM RATINGS (T_A=25 °C)

Parameter	Symbol	Value	Units
Zener current see table "Characteristics"			
Power dissipation	Ptot	5	W
Junction temperature	T_J	200	˚C
Storage temperature range	T_{STG}	-65 to +200	˚C
1) Valid provided that a distance of 8mm from case is kept at ambient temperature			

ELECTRICAL CHARACTERISTICS (TA=25 °C)

	Symbols	Min	Typ	Max	Units
Thermal resistance junction to ambient	$R_{\theta JA}$			32[1)]	°C/W
Forward voltage at I_F=200mA	V			1.2	
1) Valid provided that a distance of 8mm from case is kept at ambient temperature					

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SILICON PLANAR ZENER DIODES

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.2 V Max @ I_F = 1.0 A for all types)

Device (Note 1)	Device Marking	Zener Voltage (Note 2) V_Z (Volts)			@ I_{ZT}	Zener Impedance (Note 2) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}	I_{ZK}	Leakage Current I_R @ V_R		I_R (Note 3)	V_Z (Note 4)	I_{ZM} (Note 5)
		Min	Nom	Max	mA			mA	µA Max	Volts	A	Volts	mA
1N5333B	1N5333B	3.14	3.3	3.47	380	3	400	1	300	1	20	0.85	1440
1N5334B	1N5334B	3.42	3.6	3.78	350	2.5	500	1	150	1	18.7	0.8	1320
1N5335B	1N5335B	3.71	3.9	4.10	320	2	500	1	50	1	17.6	0.54	1220
1N5336B	1N5336B	4.09	4.3	4.52	290	2	500	1	10	1	16.4	0.49	1100
1N5337B	1N5337B	4.47	4.7	4.94	260	2	450	1	5	1	15.3	0.44	1010
1N5338B	1N5338B	4.85	5.1	5.36	240	1.5	400	1	1	1	14.4	0.39	930
1N5339B	1N5339B	5.32	5.6	5.88	220	1	400	1	1	2	13.4	0.25	865
1N5340B	1N5340B	5.70	6.0	6.30	200	1	300	1	1	3	12.7	0.19	790
1N5341B	1N5341B	5.89	6.2	6.51	200	1	200	1	1	3	12.4	0.1	765
1N5342B	1N5342B	6.46	6.8	7.14	175	1	200	1	10	5.2	11.5	0.15	700
1N5343B	1N5343B	7.13	7.5	7.88	175	1.5	200	1	10	5.7	10.7	0.15	630
1N5344B	1N5344B	7.79	8.2	8.61	150	1.5	200	1	10	6.2	10	0.2	580
1N5345B	1N5345B	8.27	8.7	9.14	150	2	200	1	10	6.6	9.5	0.2	545
1N5346B	1N5346B	8.65	9.1	9.56	150	2	150	1	7.5	6.9	9.2	0.22	520
1N5347B	1N5347B	9.50	10	10.5	125	2	125	1	5	7.6	8.6	0.22	475
1N5348B	1N5348B	10.45	11	11.55	125	2.5	125	1	5	8.4	8.0	0.25	430
1N5349B	1N5349B	11.4	12	12.6	100	2.5	125	1	2	9.1	7.5	0.25	395
1N5350B	1N5350B	12.35	13	13.65	100	2.5	100	1	1	9.9	7.0	0.25	365
1N5351B	1N5351B	13.3	14	14.7	100	2.5	75	1	1	10.6	6.7	0.25	340
1N5352B	1N5352B	14.25	15	15.75	75	2.5	75	1	1	11.5	6.3	0.25	315
1N5353B	1N5353B	15.2	16	16.8	75	2.5	75	1	1	12.2	6.0	0.3	295
1N5354B	1N5354B	16.15	17	17.85	70	2.5	75	1	0.5	12.9	5.8	0.35	280
1N5355B	1N5355B	17.1	18	18.9	65	2.5	75	1	0.5	13.7	5.5	0.4	264
1N5356B	1N5356B	18.05	19	19.95	65	3	75	1	0.5	14.4	5.3	0.4	250
1N5357B	1N5357B	19	20	21	65	3	75	1	0.5	15.2	5.1	0.4	237
1N5358B	1N5358B	20.9	22	23.1	50	3.5	75	1	0.5	16.7	4.7	0.45	216
1N5359B	1N5359B	22.8	24	25.2	50	3.5	100	1	0.5	18.2	4.4	0.55	198
1N5360B	1N5360B	23.75	25	26.25	50	4	110	1	0.5	19	4.3	0.55	190
1N5361B*	1N5361B	25.65	27	28.35	50	5	120	1	0.5	20.6	4.1	0.6	176
1N5362B	1N5362B	26.6	28	29.4	50	6	130	1	0.5	21.2	3.9	0.6	170
1N5363B	1N5363B	28.5	30	31.5	40	8	140	1	0.5	22.8	3.7	0.6	158
1N5364B	1N5364B	31.35	33	34.65	40	10	150	1	0.5	25.1	3.5	0.6	144
1N5365B	1N5365B	34.2	36	37.8	30	11	160	1	0.5	27.4	3.5	0.65	132
1N5366B	1N5366B	37.05	39	40.95	30	14	170	1	0.5	29.7	3.1	0.65	122
1N5367B	1N5367B	40.85	43	45.15	30	20	190	1	0.5	32.7	2.8	0.7	110
1N5368B	1N5368B	44.65	47	49.35	25	25	210	1	0.5	35.8	2.7	0.8	100
1N5369B	1N5369B	48.45	51	53.55	25	27	230	1	0.5	38.8	2.5	0.9	93
1N5370B	1N5370B	53.2	56	58.8	20	35	280	1	0.5	42.6	2.3	1.0	86
1N5371B	1N5371B	57	60	63	20	40	350	1	0.5	45.5	2.2	1.2	79
1N5372B	1N5372B	58.9	62	65.1	20	42	400	1	0.5	47.1	2.1	1.35	76
1N5373B	1N5373B	64.6	68	71.4	20	44	500	1	0.5	51.7	2.0	1.52	70
1N5374B	1N5374B	71.25	75	78.75	20	45	620	1	0.5	56	1.9	1.6	63
1N5375B	1N5375B	77.9	82	86.1	15	65	720	1	0.5	62.2	1.8	1.8	58
1N5376B	1N5376B	82.65	87	91.35	15	75	760	1	0.5	66	1.7	2.0	54.5
1N5377B	1N5377B	86.45	91	95.55	15	75	760	1	0.5	69.2	1.6	2.2	52.5

SILICON PLANAR ZENER DIODES

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.2 V Max @ I_F = 1.0 A for all types)

Device (Note 6)	Device Marking	Zener Voltage (Note 7)				Zener Impedance (Note 7)			Leakage Current		I_R (Note 8)	V_Z □□ (Note 9)	I_{ZM} (Note 10)
		V_Z (Volts)			@ I_{ZT}	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}	I_{ZK}	I_R @ V_R				
		Min	Nom	Max	mA			mA	µA Max	Volts	A	Volts	mA
1N5378B	1N5378B	95	100	105	12	90	800	1	0.5	76	1.5	2.5	47.5
1N5379B	1N5379B	104.5	110	115.5	12	125	1000	1	0.5	83.6	1.4	2.5	43
1N5380B	1N5380B	114	120	126	10	170	1150	1	0.5	91.2	1.3	2.5	39.5
1N5381B	1N5381B	123.5	130	136.5	10	190	1250	1	0.5	98.8	1.2	2.5	36.6
1N5382B	1N5382B	133	140	147	8	230	1500	1	0.5	106	1.2	2.5	34
1N5383B	1N5383B	142.5	150	157.5	8	330	1500	1	0.5	114	1.1	3.0	31.6
1N5384B	1N5384B	152	160	168	8	350	1650	1	0.5	122	1.1	3.0	29.4
1N5385B	1N5385B	161.5	170	178.5	8	380	1750	1	0.5	129	1.0	3.0	28
1N5386B	1N5386B	171	180	189	5	430	1750	1	0.5	137	1.0	4.0	26.4
1N5387B	1N5387B	180.5	190	199.5	5	450	1850	1	0.5	144	0.9	5.0	25
1N5388B	1N5388B	190	200	210	5	480	1850	1	0.5	152	0.9	5.0	23.6

1. **TOLERANCE AND TYPE NUMBER DESIGNATION**
   The JEDEC type numbers shown indicate a tolerance of ±5%.
2. **ZENER VOLTAGE (V_Z) and IMPEDANCE (I_{ZT} and I_{ZK})**
   Test conditions for zener voltage and impedance are as follows: I_Z is applied 40 ±10 ms prior to reading. Mounting contacts are located 3/8″to 1/2″ from the inside edge of mounting clips to the body of the diode (T_A = 25°C +8°C, −2°C).
3. **SURGE CURRENT (I_R)**
   Surge current is specified as the maximum allowable peak, non−recurrent square−wave current with a pulse width, PW, of 8.3 ms. The data given in Figure 5 may be used to find the maximum surge current for a square wave of any pulse width between 1 ms and 1000 ms by plotting the applicable points on logarithmic paper. Examples of this, using the 3.3 V and 200 V zener are shown in Figure 6. Mounting contact located as specified in Note 2 (T_A = 25°C +8°C, −2°C).
4. **VOLTAGE REGULATION (V_Z)**
   The conditions for voltage regulation are as follows: V_Z measurements are made at 10% and then at 50% of the I_Z max value listed in the electrical characteristics table. The test current time duration for each V_Z measurement is 40 ±10 ms. Mounting contact located as specified in Note 2 (T_A = 25°C +8°C, −2°C).
5. **MAXIMUM REGULATOR CURRENT (I_{ZM})**
   The maximum current shown is based on the maximum voltage of a 5% type unit, therefore, it applies only to the B−suffix device. The actual IZM for any device may not exceed the value of 5 watts divided by the actual VZ of the device. TL = 75°C at 3/8″ maximum from the device body.

   * Not Available in the 2000/Ammo Pack.

6. **TOLERANCE AND TYPE NUMBER DESIGNATION**
   The JEDEC type numbers shown indicate a tolerance of ±5%.
7. **ZENER VOLTAGE (V_Z) and IMPEDANCE (I_{ZT} and I_{ZK})**
   Test conditions for zener voltage and impedance are as follows: I_Z is applied 40 ±10 ms prior to reading. Mounting contacts are located 3/8″to 1/2″ from the inside edge of mounting clips to the body of the diode (T_A = 25°C +8°C, −2°C).
8. **SURGE CURRENT (I_R)**
   Surge current is specified as the maximum allowable peak, non−recurrent square−wave current with a pulse width, PW, of 8.3 ms. The data given in Figure 5 may be used to find the maximum surge current for a square wave of any pulse width between 1 ms and 1000 ms by plotting the applicable points on logarithmic paper. Examples of this, using the 3.3 V and 200 V zener are shown in Figure 6. Mounting contact located as specified in Note 7 (T_A = 25°C +8°C, −2°C).

SILICON PLANAR ZENER DIODES

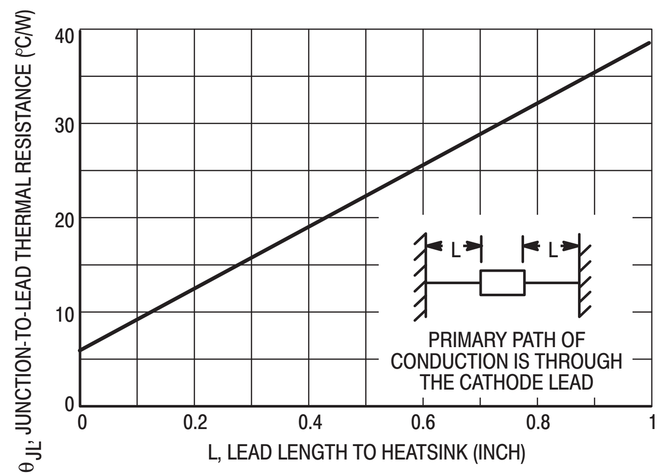
VOLTAGE REGULATION (V_Z)

9. The conditions for voltage regulation are as follows: V_Z measurements are made at 10% and then at 50% of the I_Z max value listed in the electrical characteristics table. The test current time duration for each V_Z measurement is 40 ±10 ms. Mounting contact located as specified in Note 7 (T_A = 25°C +8°C, −2°C).

10. **MAXIMUM REGULATOR CURRENT (I_{ZM})**
The maximum current shown is based on the maximum voltage of a 5% type unit, therefore, it applies only to the B−suffix device. The actual IZM for any device may not exceed the value of 5 watts divided by the actual VZ of the device. TL = 75°C at 3/8″ maximum from the device body.

Typical Characteristics

Figure 1. Typical Thermal Resistance



TEMPERATURE COEFFICIENTS

Figure 2. Temperature Coefficient-Range for Units 3 to 10 Volts

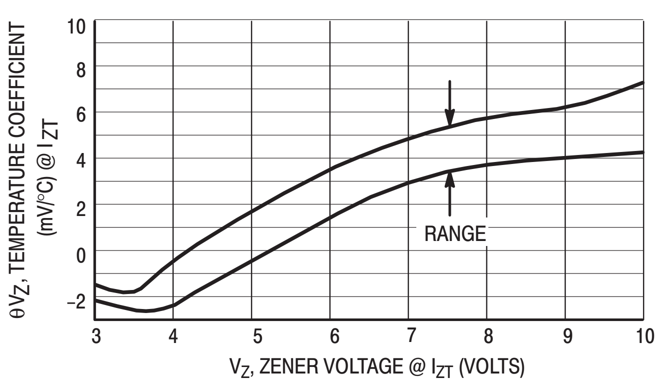
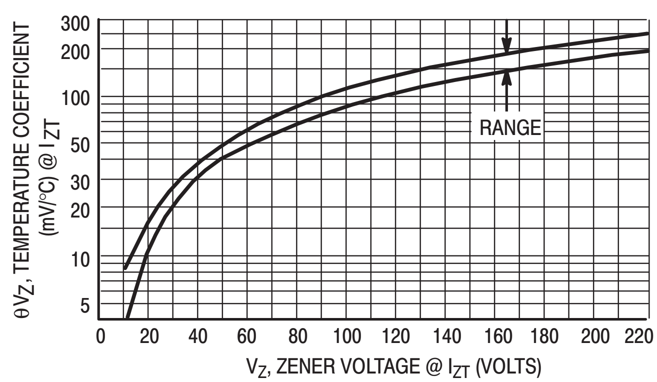


Figure 3. Temperature Coefficient-Range for Units 10 to 220 Volts



SILICON PLANAR ZENER DIODES

Figure 4. Typical Thermal Response
L, Lead Length = 3/8 Inch

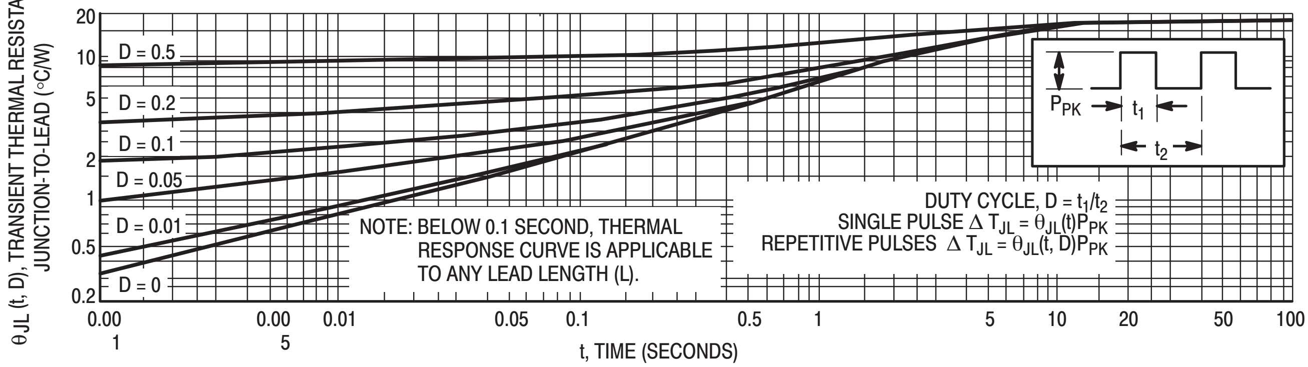


Figure 5. Maximum Non-Repetitive Surge Current versus Nominal Zener Voltage (See Note 3)

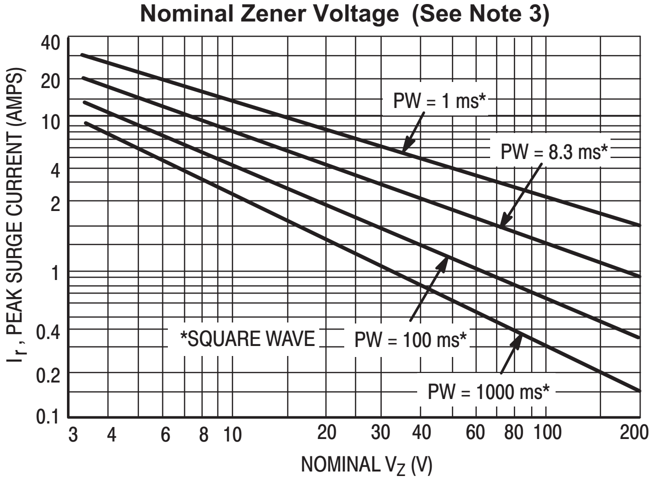


Figure 6. Peak Surge Current versus Pulse Width (See Note 3)

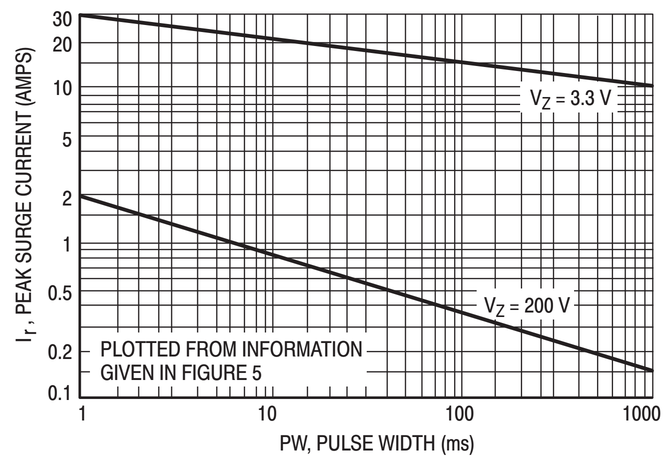


Figure 7. Zener Voltage versus Zener Current
V_Z = 3.3 thru 10 Volts

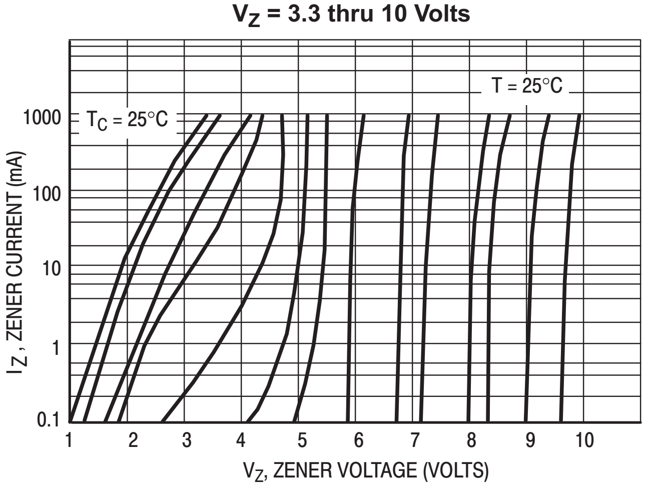
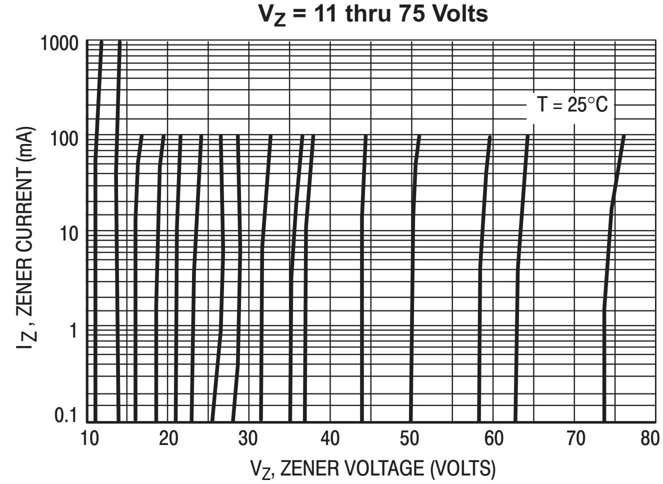
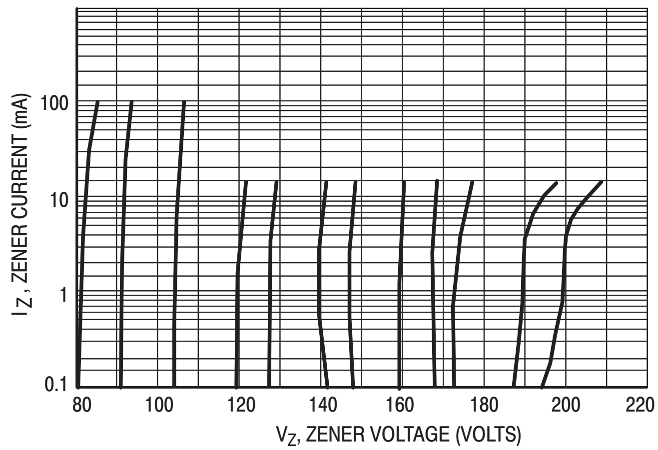


Figure 8. Zener Voltage versus Zener Current
V_Z = 11 thru 75 Volts



SILICON PLANAR ZENER DIODES

Figure 9. Zener Voltage versus Zener Current
V_Z = 82 thru 200 Volts



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 and P_D is the power dissipation.

Junction Temperature, T_J, may be found from:

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

ΔT_{JL} is the increase in junction temperature above the lead temperature and may be found from Figure 4 for a train of power pulses or from Figure 1 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 2 and 3.

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 4 should not be used to compute surge capability. Surge limitations are given in Figure 5. 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 5 be exceeded.