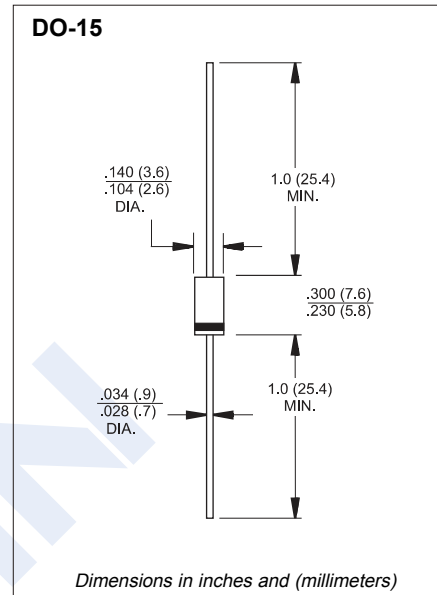
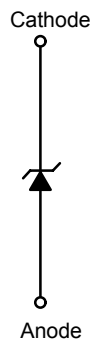


Zener Diodes

1N5333B-1N5388B

■ Features

- Zener Voltage Range 3.3 V to 200 V
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Surge Rating of up to 180 W @ 8.3 ms
- 5 Watt Surmetic™ 40



■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Power Dissipation@ $T_L = 75^\circ\text{C}$, Lead Length = 3/8 in Derate above 75°C	P_d	5	W
		40	mW/ $^\circ\text{C}$
Junction Temperature	T_J	200	$^\circ\text{C}$
Storage temperature range	T_{stg}	-65 to 200	

Zener Diodes

1N5333B-1N5388B

■ Electrical Characteristics

(TA = 25°C unless otherwise noted, VF = 1.2 V Max @ IF = 1.0 A for all types)

Device (Note 1)	Device Marking	Zener Voltage (Note 2)				Zener Impedance (Note 2)			Leakage Current		IR (Note 3)	ΔVZ (Note 4)	IZM (Note 5)
		VZ (Volts)			@ IZT	ZZT @ IZT	ZZK @ IZK	IZK	IR @ VR				
		Min	Nom	Max	mA	Ω	Ω	mA	μA Max	Volts			
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

Devices listed in **bold, italic** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

1. TOLERANCE AND TYPE NUMBER DESIGNATION

The JEDEC type numbers shown indicate a tolerance of ±5%.

2. ZENER VOLTAGE (VZ) and IMPEDANCE (IZT and IZK)

Test conditions for zener voltage and impedance are as follows: IZ 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 (TA = 25°C +8°C, -2°C).

3. SURGE CURRENT (IR)

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 (TA = 25°C +8°C, -2°C).

4. VOLTAGE REGULATION (ΔVZ)

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

5. MAXIMUM REGULATOR CURRENT (IZM)

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.

Zener Diodes

1N5333B-1N5388B

■ Electrical Characteristics

($T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 1.2\text{ V Max @ } I_F = 1.0\text{ A}$ for all types)

Device (Note 6)	Device Marking	Zener Voltage (Note 7)			Zener Impedance (Note 7)				Leakage Current		I_R (Note 8)	ΔV_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	Ω	Ω	mA	$\mu\text{A Max}$	Volts			
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
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

Devices listed in **bold, italic** are ON Semiconductor Preferred devices. Preferred devices are recommended choices for future use and best overall value.

6. TOLERANCE AND TYPE NUMBER DESIGNATION

The JEDEC type numbers shown indicate a tolerance of $\pm 5\%$.

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 ($T_A = 25^\circ\text{C} + 8^\circ\text{C}, -2^\circ\text{C}$).

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 ($T_A = 25^\circ\text{C} + 8^\circ\text{C}, -2^\circ\text{C}$).

9. VOLTAGE REGULATION (ΔV_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 7 ($T_A = 25^\circ\text{C} + 8^\circ\text{C}, -2^\circ\text{C}$).

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 I_{ZM} for any device may not exceed the value of 5 watts divided by the actual V_Z of the device. $T_L = 75^\circ\text{C}$ at 3/8" maximum from the device body.

Zener Diodes

1N5333B-1N5388B

■ Typical Characteristics

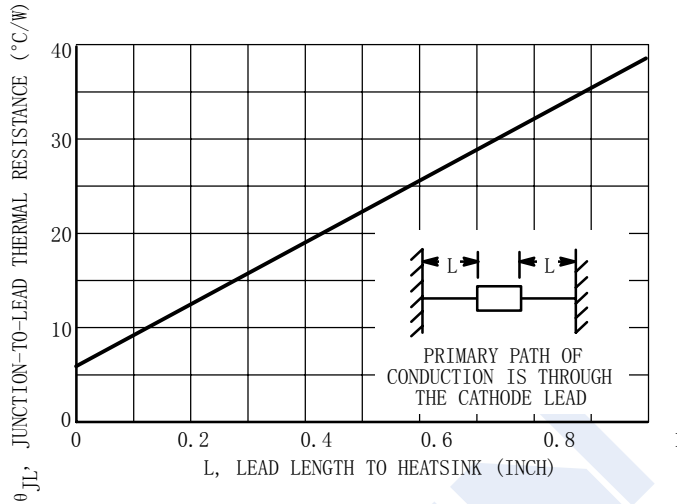


Figure 1. Typical Thermal Resistance
TEMPERATURE COEFFICIENTS

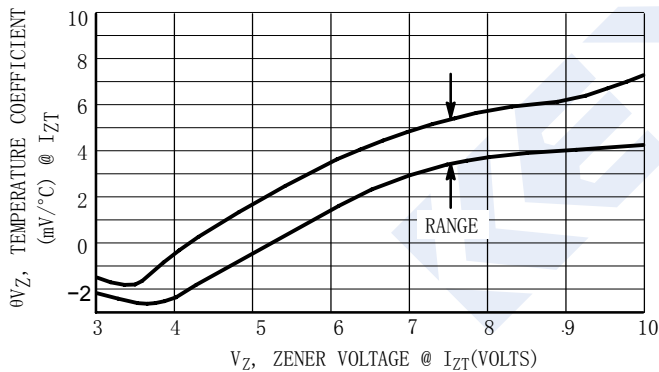


Figure 2. Temperature Coefficient-Range for Units 3 to 10 Volts

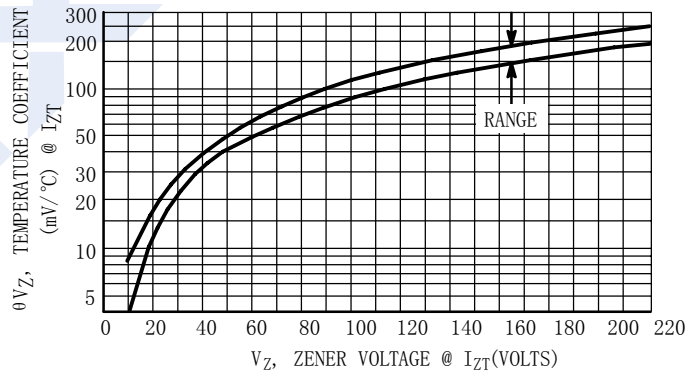


Figure 3. Temperature Coefficient-Range for Units 10 to 220 Volts

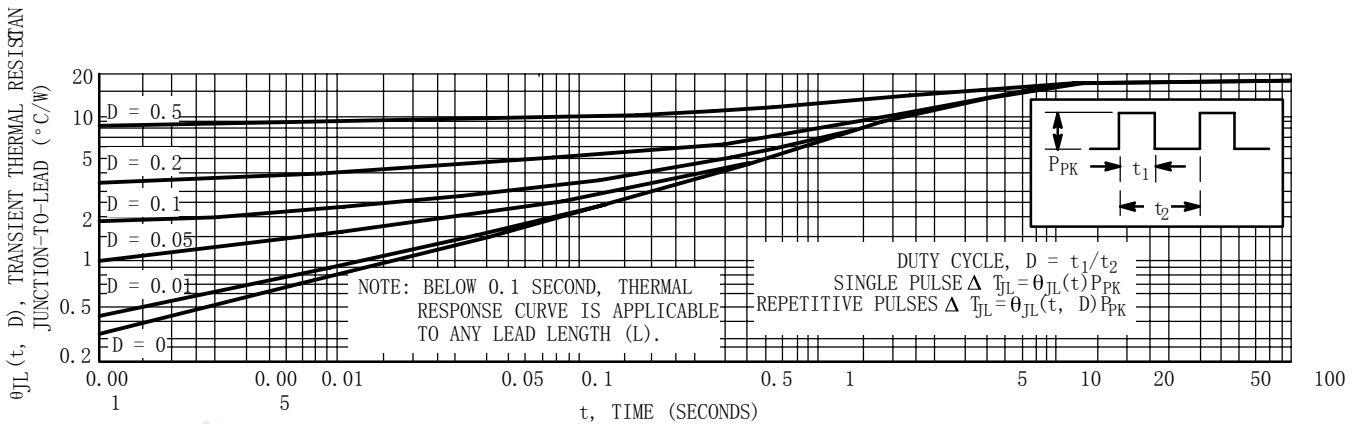


Figure 4. Typical Thermal Response
L, Lead Length = 3/8 Inch

Zener Diodes

1N5333B-1N5388B

■ Typical Characteristics

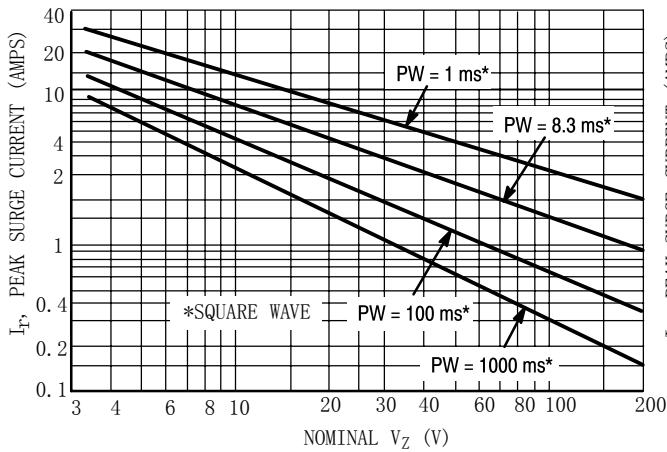


Figure 5. Maximum Non-Repetitive Surge Current versus Nominal Zener Voltage (See Note 3)

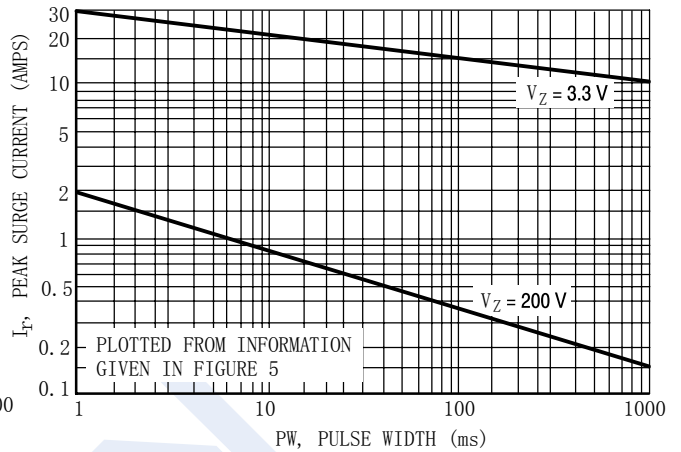


Figure 6. Peak Surge Current versus Pulse Width (See Note 3)

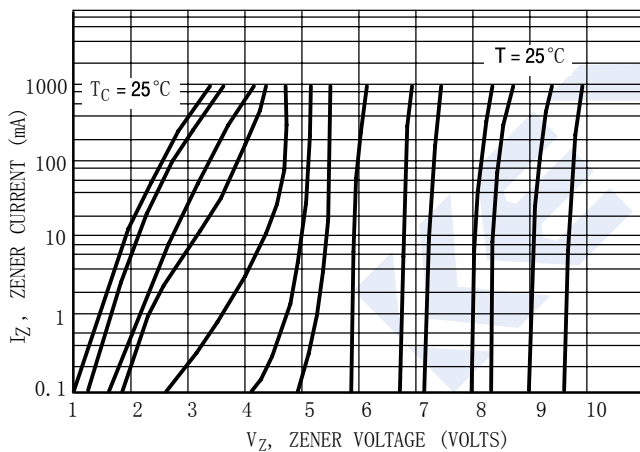


Figure 7. Zener Voltage versus Zener Current Vz = 3.3 thru 10 Volts

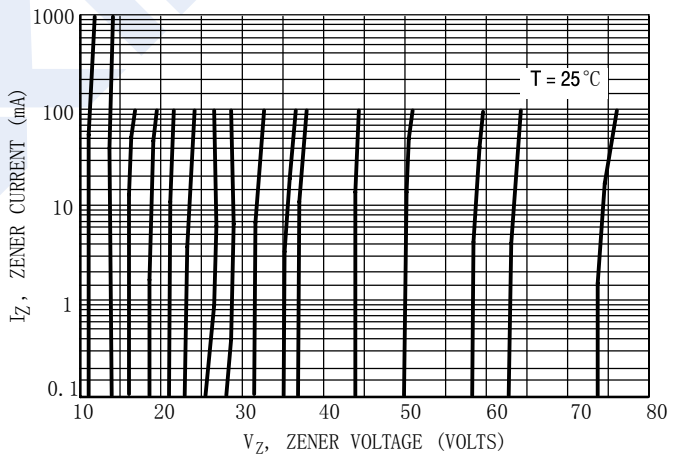


Figure 8. Zener Voltage versus Zener Current Vz = 11 thru 75 Volts

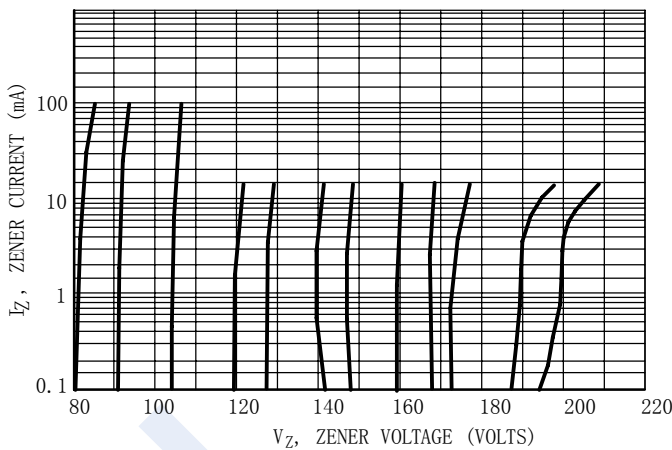


Figure 9. Zener Voltage versus Zener Current Vz = 82 thru 200 Volts