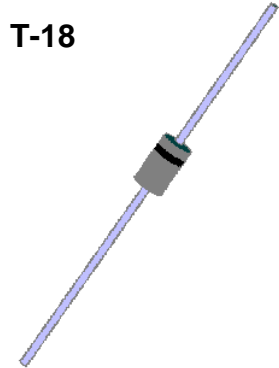


### DESCRIPTION

The 1N5333-5388B JEDEC registered series of axial-leaded 5.0 watt Zeners provides voltage regulation in a selection from 3.3 to 200 volts with different tolerances as identified by specific suffix letter on the part number. These plastic encapsulated Zeners have moisture classification of Level 1 with no dry pack required and are also available in various military equivalent screening levels by adding a prefix identifier as also described in the Features section. They may be operated at high maximum dc currents with adequate heat sinking with their comparatively low thermal resistance design. Microsemi also offers numerous other Zener products to meet higher and lower power applications.

### APPEARANCE

T-18



**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

### FEATURES

- JEDEC registered 1N5333 to 1N5388B
- Zener voltage available 3.3V to 200V
- Standard voltage tolerances are plus/minus 5% with B suffix and 10 % with A suffix identification
- Tight tolerances available in plus or minus 2% or 1% with C or D suffix respectively
- Options for screening in accordance with MIL-PRF-19500 for JAN, JANTX, and JANTXV are available by adding MQ, MX, or MV prefixes respectively to part numbers.
- Surface mount equivalents available as SMBJ5333 to SMBJ5388B, or SMBG5333B to SMBG5388B
- RoHS Compliant devices available by adding e3 suffix

### APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Wide selection from 3.3 to 200 V
- Flexible axial-lead mounting terminals
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- Withstands high surge stresses
- Minimal changes of voltage versus current as specified by voltage regulation ( $\Delta V_z$ )
- High specified maximum current ( $I_{zM}$ ) when adequately heat sunk
- Moisture classification is Level 1 per IPC/JEDEC J-STD-020B with no dry pack required

### MAXIMUM RATINGS

- Power dissipation at 25°C: 5.0 watts (also see derating in Figure 1).
- Operating and Storage temperature: -65°C to +150°C
- Thermal Resistance: 25°C/W junction to lead at 3/8 (10 mm) lead length from body, or 85°C/W junction to ambient when mounted on FR4 PC board (1oz Cu) with 4 mm<sup>2</sup> copper pads and track width 1 mm, length 25 mm
- Steady-State Power: 5 watts at  $T_L \leq 25^\circ\text{C}$  3/8 inch (10 mm) from body, or 1.47 watts at  $T_A = 25^\circ\text{C}$  when mounted on FR4 PC described for thermal resistance (also see Figure 1)
- Forward voltage @1.0 A: 1.2 volts (maximum)
- Solder Temperatures: 260°C for 10 s (max)

### MECHANICAL AND PACKAGING

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- TERMINALS: Leads, Tin-Lead or RoHS Compliant annealed matte-Tin plating solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band. Diode to be operated with the banded end positive with respect to the opposite end.
- MARKING: Part number
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- WEIGHT: 0.7 grams
- See package dimensions on last page

\*ELECTRICAL CHARACTERISTICS @ 25°C

| TYPE NUMBER | REGULATOR VOLTAGE (V <sub>Z</sub> ) | TEST CURRENT (I <sub>ZT</sub> ) | MAXIMUM DYNAMIC IMPEDANCE (Z <sub>Z</sub> ) (A&B Suffix) | MAXIMUM REVERSE CURRENT (I <sub>R</sub> ) | I <sub>R</sub> TEST VOLTAGE (V <sub>R</sub> ) (Non-Suffix & A Suffix) | I <sub>R</sub> TEST VOLTAGE (V <sub>R</sub> ) (B,C,D Suffix) | MAXIMUM REGULATOR CURRENT (I <sub>ZM</sub> ) (B,C,D Suffix) | MAXIMUM DYNAMIC KNEE IMPEDANCE Z <sub>ZK</sub> @ 1.0 mA (A,B,C,D Suffix) | MAXIMUM SURGE CURRENT (I <sub>ZSM</sub> ) | MAXIMUM VOLTAGE REGULATION (ΔV <sub>Z</sub> ) (A,B,C,D Suffix) |
|-------------|-------------------------------------|---------------------------------|--|---|---|--|---|--|---|--|
|             | V                                   | mA dc                           | OHMS   | μA  | V   | V  | mA  | OHMS   | AMPS                                      | VOLTS  |
| 1N5333B     | 3.3                                 | 380                             | 3.0  | 300                                       | 1.0   | 1.0  | 1440  | 400  | 20  | 0.85   |
| 1N5334B     | 3.6                                 | 350                             | 2.5  | 150                                       | 1.0   | 1.0  | 1320  | 500  | 18.7                                      | 0.80   |
| 1N5335B     | 3.9                                 | 320                             | 2.0  | 50  | 1.0   | 1.0  | 1220  | 500  | 17.6                                      | 0.54   |
| 1N5336B     | 4.3                                 | 290                             | 2.0  | 10  | 1.0   | 1.0  | 1100  | 500  | 16.4                                      | 0.49   |
| 1N5337B     | 4.7                                 | 260                             | 2.0  | 5.0                                       | 1.0   | 1.0  | 1010  | 450  | 15.3                                      | 0.44   |
| 1N5338B     | 5.1                                 | 240                             | 1.5  | 1.0                                       | 1.0   | 1.0  | 930   | 400  | 14.4                                      | 0.39   |
| 1N5339B     | 5.6                                 | 220                             | 1.0  | 1.0                                       | 2.0   | 2.0  | 865   | 400  | 13.4                                      | 0.25   |
| 1N5340B     | 6.0                                 | 200                             | 1.0  | 1.0                                       | 3.0   | 3.0  | 790   | 300  | 12.7                                      | 0.19   |
| 1N5341B     | 6.2                                 | 200                             | 1.0  | 1.0                                       | 3.0   | 3.0  | 765   | 200  | 12.4                                      | 0.10   |
| 1N5342B     | 6.8                                 | 175                             | 1.0  | 1.0                                       | 4.9   | 5.2  | 700   | 200  | 11.5                                      | 0.15   |
| 1N5343B     | 7.5                                 | 175                             | 1.5  | 10  | 5.4   | 5.7  | 630   | 200  | 10.7                                      | 0.15   |
| 1N5344B     | 8.2                                 | 150                             | 1.5  | 10  | 5.9   | 6.2  | 580   | 200  | 10  | 0.20   |
| 1N5345B     | 8.7                                 | 150                             | 2.0  | 10  | 6.25  | 6.6  | 545   | 200  | 9.5                                       | 0.20   |
| 1N5346B     | 9.1                                 | 150                             | 2.0  | 7.5                                       | 6.6   | 6.9  | 520   | 150  | 9.2                                       | 0.22   |
| 1N5347B     | 10                                  | 125                             | 2.0  | 5.0                                       | 7.2   | 7.6  | 475   | 125  | 8.6                                       | 0.22   |
| 1N5348B     | 11                                  | 125                             | 2.5  | 5.0                                       | 8.0   | 8.4  | 430   | 125  | 8.0                                       | 0.25   |
| 1N5349B     | 12                                  | 100                             | 2.5  | 2.0                                       | 8.6   | 9.1  | 395   | 125  | 7.5                                       | 0.25   |
| 1N5350B     | 13                                  | 100                             | 2.5  | 1.0                                       | 9.4   | 9.9  | 365   | 100  | 7.0                                       | 0.25   |
| 1N5351B     | 14                                  | 100                             | 2.5  | 1.0                                       | 10.1  | 10.6   | 340   | 75   | 6.7                                       | 0.25   |
| 1N5352B     | 15                                  | 75                              | 2.5  | 1.0                                       | 10.8  | 11.5   | 315   | 75   | 6.3                                       | 0.25   |
| 1N5353B     | 16                                  | 75                              | 2.5  | 1.0                                       | 11.5  | 12.2   | 295   | 75   | 6.0                                       | 0.30   |
| 1N5354B     | 17                                  | 70                              | 2.5  | 0.5                                       | 12.2  | 12.9   | 280   | 75   | 5.8                                       | 0.35   |
| 1N5355B     | 18                                  | 65                              | 2.5  | 0.5                                       | 13  | 13.7   | 264   | 75   | 5.5                                       | 0.40   |
| 1N5356B     | 19                                  | 65                              | 3.0  | 0.5                                       | 13.7  | 14.4   | 250   | 75   | 5.3                                       | 0.40   |
| 1N5357B     | 20                                  | 65                              | 3.0  | 0.5                                       | 14.4  | 15.2   | 237   | 75   | 5.1                                       | 0.40   |
| 1N5358B     | 22                                  | 50                              | 3.5  | 0.5                                       | 15.8  | 16.7   | 216   | 75   | 4.7                                       | 0.45   |
| 1N5359B     | 24                                  | 50                              | 3.5  | 0.5                                       | 17.3  | 18.2   | 198   | 100  | 4.4                                       | 0.55   |
| 1N5360B     | 25                                  | 50                              | 4.0  | 0.5                                       | 18  | 19   | 190   | 110  | 4.3                                       | 0.55   |
| 1N5361B     | 27                                  | 50                              | 5.0  | 0.5                                       | 19.4  | 20.6   | 176   | 120  | 4.1                                       | 0.60   |
| 1N5362B     | 28                                  | 50                              | 6.0  | 0.5                                       | 20.1  | 21.2   | 170   | 130  | 3.9                                       | 0.60   |
| 1N5363B     | 30                                  | 40                              | 8.0  | 0.5                                       | 21.6  | 22.8   | 158   | 140  | 3.7                                       | 0.60   |
| 1N5364B     | 33                                  | 40                              | 10   | 0.5                                       | 23.8  | 25.1   | 144   | 150  | 3.5                                       | 0.60   |
| 1N5365B     | 36                                  | 30                              | 11   | 0.5                                       | 25.9  | 27.4   | 132   | 160  | 3.3                                       | 0.65   |
| 1N5366B     | 39                                  | 30                              | 14   | 0.5                                       | 28.1  | 29.7   | 122   | 170  | 3.1                                       | 0.65   |
| 1N5367B     | 43                                  | 30                              | 20   | 0.5                                       | 31  | 32.7   | 110   | 190  | 2.8                                       | 0.70   |
| 1N5368B     | 47                                  | 25                              | 25   | 0.5                                       | 33.8  | 35.8   | 100   | 210  | 2.7                                       | 0.80   |
| 1N5369B     | 51                                  | 25                              | 27   | 0.5                                       | 36.7  | 38.8   | 93  | 230  | 2.5                                       | 0.90   |
| 1N5370B     | 56                                  | 20                              | 35   | 0.5                                       | 40.3  | 42.6   | 86  | 280  | 2.3                                       | 1.00   |
| 1N5371B     | 60                                  | 20                              | 40   | 0.5                                       | 43  | 45.5   | 79  | 350  | 2.2                                       | 1.20   |
| 1N5372B     | 62                                  | 20                              | 42   | 0.5                                       | 44.6  | 47.1   | 76  | 400  | 2.1                                       | 1.35   |
| 1N5373B     | 68                                  | 20                              | 44   | 0.5                                       | 49  | 51.7   | 70  | 500  | 2.0                                       | 1.50   |
| 1N5374B     | 75                                  | 20                              | 45   | 0.5                                       | 54  | 56   | 63  | 620  | 1.9                                       | 1.60   |
| 1N5375B     | 82                                  | 15                              | 65   | 0.5                                       | 59  | 62.2   | 58  | 720  | 1.8                                       | 1.80   |
| 1N5376B     | 87                                  | 15                              | 75   | 0.5                                       | 63  | 66   | 54.5  | 760  | 1.7                                       | 2.00   |
| 1N5377B     | 91                                  | 15                              | 75   | 0.5                                       | 65.5  | 69.2   | 52.5  | 760  | 1.6                                       | 2.20   |
| 1N5378B     | 100                                 | 12                              | 90   | 0.5                                       | 72  | 76   | 47.5  | 800  | 1.5                                       | 2.30   |
| 1N5379B     | 110                                 | 12                              | 125  | 0.5                                       | 79.2  | 83.6   | 43  | 1000   | 1.4                                       | 2.50   |
| 1N5380B     | 120                                 | 10                              | 170  | 0.5                                       | 86.4  | 91.2   | 39.5  | 1150   | 1.3                                       | 2.50   |
| 1N5381B     | 130                                 | 10                              | 190  | 0.5                                       | 93.6  | 98.8   | 36.6  | 1250   | 1.2                                       | 2.50   |
| 1N5382B     | 140                                 | 8.0                             | 230  | 0.5                                       | 101   | 106  | 34  | 1500   | 1.2                                       | 2.50   |
| 1N5383B     | 150                                 | 8.0                             | 330  | 0.5                                       | 108   | 114  | 31.6  | 1500   | 1.1                                       | 3.00   |
| 1N5384B     | 160                                 | 8.0                             | 350  | 0.5                                       | 115   | 122  | 29.4  | 1650   | 1.1                                       | 3.00   |
| 1N5385B     | 170                                 | 8.0                             | 380  | 0.5                                       | 122   | 129  | 28  | 1750   | 1.0                                       | 3.00   |
| 1N5386B     | 180                                 | 5.0                             | 430  | 0.5                                       | 130   | 137  | 26.4  | 1750   | 1.0                                       | 4.00   |
| 1N5387B     | 190                                 | 5.0                             | 450  | 0.5                                       | 137   | 144  | 25  | 1850   | 0.9                                       | 5.00   |
| 1N5388B     | 200                                 | 5.0                             | 480  | 0.5                                       | 144   | 152  | 23.6  | 1850   | 0.9                                       | 5.00   |

\*JEDEC Registered Data.

**NOTE 1:** Devices listed above with B suffix have ±5% tolerance, A suffix designates ±10% tolerance, C suffix designates ±2% tolerance, and D suffix designates ±1% tolerance. No suffix designates ±20%.

**NOTE 2:** Zener voltage (V<sub>Z</sub>) is measured at T<sub>L</sub> = 25°C (+8, -2°C). Voltage measurement performed at 40 ±10 milliseconds after application of dc current.

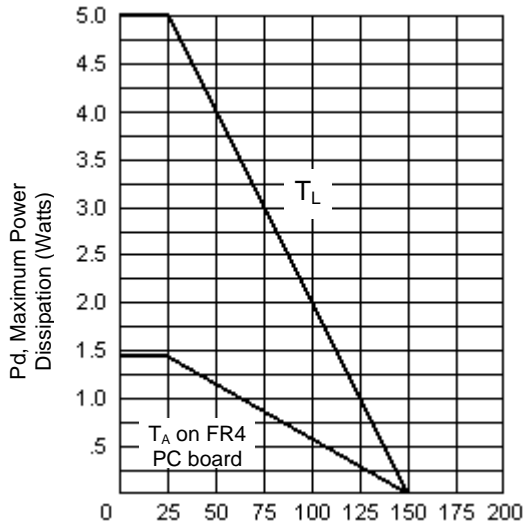
**NOTE 3:** The zener impedance is derived from 1 kHz ac voltage resulting from an ac current modulation having an rms value equal to 10% of the dc zener current (I<sub>ZT</sub> or I<sub>ZK</sub>) superimposed on I<sub>ZT</sub> or I<sub>ZK</sub>. See Micro Note 202 for zener impedance variation with different operating currents.

**NOTE 4:** The maximum current (I<sub>ZM</sub>) shown is for a ±5% tolerance devices. The I<sub>ZM</sub> for other tolerances can be calculated using the formula: I<sub>ZM</sub> = P/V<sub>ZM</sub> where V<sub>ZM</sub> is the V<sub>Z</sub> at the high end of the voltage tolerance specified and P is the rated power for the method of mounting.

**NOTE 5:** The surge current (I<sub>ZSM</sub>) is specified as the maximum peak of a non-recurrent half-sine wave of 8.3 ms duration.

**NOTE 6:** Voltage regulation (ΔV<sub>Z</sub>) is the difference between the voltage measured at 10% and 50% of I<sub>ZM</sub>.

OUTLINE AND CIRCUIT



$T_L$ , Lead temperature ( $^{\circ}\text{C}$ ) 3/8" from body, or  
 $T_A$  ambient temperature on FR4 PC Board

**FIGURE 1**  
Power Derating Curve

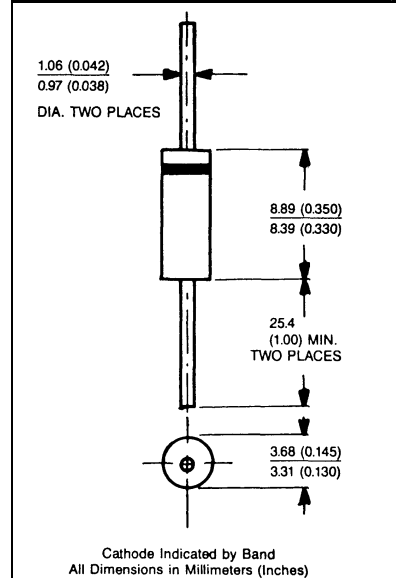


**FIGURE 2**  
Typical Capacitance vs.  
Reverse Voltage for 5 Watt Zeners



**FIGURE 3**  
Typical Capacitance vs.  
Reverse Voltage for 5 Watt Zeners

PACKAGE DIMENSIONS



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| Description  | Value                             |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Package   | 2Case T-18                        |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Configuration   | Single                            |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Nominal Zener Voltage   | 3.3 V                             |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Zener Voltage Tolerance   | 5 %                               |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Maximum Zener Impedance   | 3 Ohm                             |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Maximum Regulator Current   | 1440 mA                           |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Maximum Reverse Leakage Current   | 300 uA                            |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |
| <input type="checkbox"/> Type  | Voltage Regulator                 |  |   |              |  |             |       |                                  |            |  |        |  |       |  |     |  |       |  |         |  |        |                               |                   |