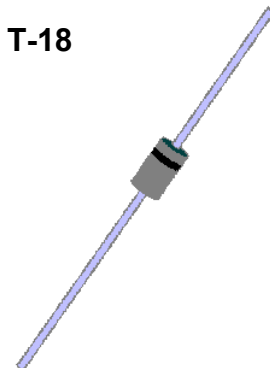


## DESCRIPTION

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, JANTXV, and JANS are available by adding MQ, MX, MV, or MSP prefixes respectively to part numbers.
- Surface mount equivalents available as SMBJ5333 to SMBJ5388B, or SMBG5333B to SMBG5388B

## 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 plated 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<br>NUMBER | REGULATOR<br>VOLTAGE<br>(V <sub>Z</sub> ) | TEST<br>CURRENT<br>(I <sub>ZT</sub> ) | MAXIMUM<br>DYNAMIC<br>IMPEDANCE<br>(Z <sub>Z</sub> )<br>(A&B Suffix) | MAXIMUM<br>REVERSE<br>CURRENT<br>(I <sub>R</sub> ) | I <sub>R</sub> TEST<br>VOLTAGE<br>(V <sub>R</sub> )<br>(Non-Suffix &<br>A Suffix) | I <sub>R</sub> TEST<br>VOLTAGE<br>(V <sub>R</sub> )<br>(B,C,D Suffix) | MAXIMUM<br>REGULATOR<br>CURRENT<br>(I <sub>ZM</sub> )<br>(B,C,D Suffix) | MAXIMUM<br>DYNAMIC KNEE<br>IMPEDANCE<br>Z <sub>ZK</sub> @ 1.0 mA<br>(A,B,C,D Suffix) | MAXIMUM<br>SURGE<br>CURRENT<br>(I <sub>ZSM</sub> ) | MAXIMUM<br>VOLTAGE<br>REGULATION<br>(ΔV <sub>Z</sub> )<br>(A,B,C,D<br>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                                                                  | 10                                                 | 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.

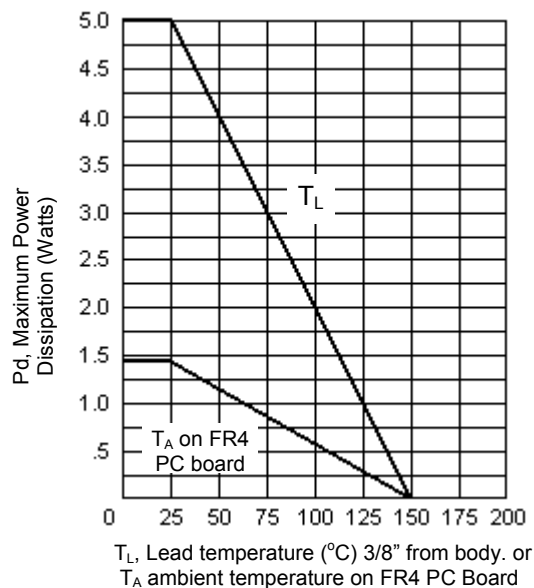
**NOTE 3:** The zener impedance is derived from 1 kHz ac voltage resulting from an ac current modulation having an rms value equal to 10% of the dc zener current (I<sub>ZT</sub> or I<sub>ZK</sub>) superimposed on I<sub>ZT</sub> or I<sub>ZK</sub>. See Micro Note 202 for zener impedance variation with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

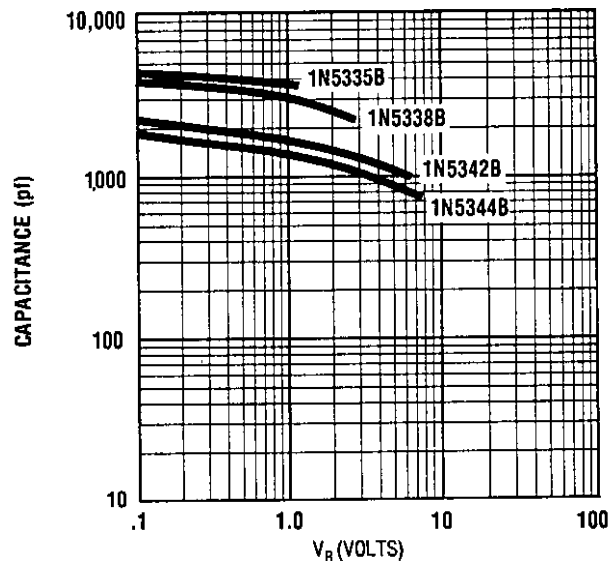
**NOTE 5:** The surge current (I<sub>ZSM</sub>) is specified as the maximum peak of a non-recurrent half-sine wave of 8.3 ms duration.

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

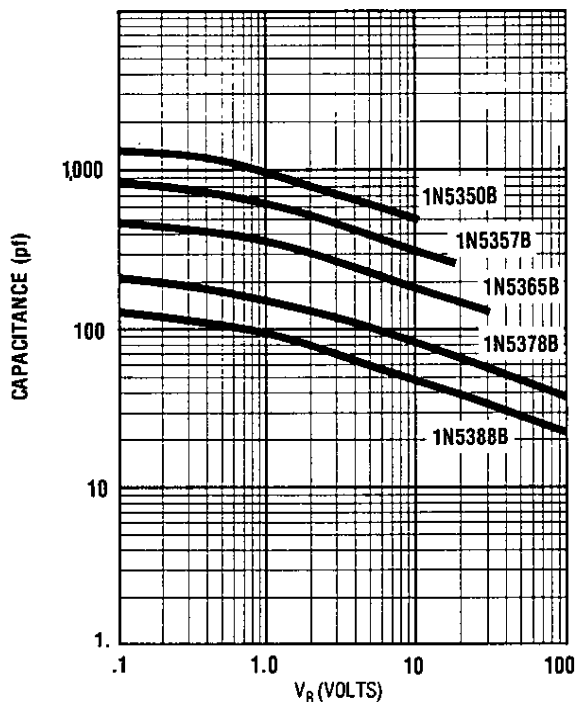
**OUTLINE AND CIRCUIT**



**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**

