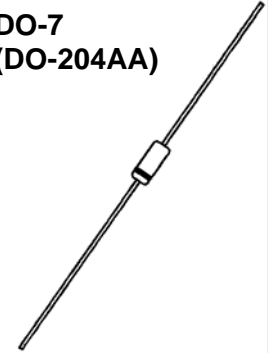


### DESCRIPTION

The popular 1N957B thru 1N992B series of 0.5 watt Zener voltage regulators provides a selection from 6.8 to 200 volts in standard 5% or 10% tolerances as well as tighter tolerances identified by different suffix letters on the part number. The somewhat larger DO-7 packaging option offers a "straight-through" soldered internal connection with a larger active die element than otherwise provided in the smaller DO-35 package when needed. Microsemi also offers numerous other Zener products to meet higher and lower power applications.

### APPEARANCE

#### DO-7 (DO-204AA)



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

### FEATURES

- JEDEC registered 1N957B to 1N992B series
- Internal metallurgical bonding equivalent to "-1" suffix identification on other military DO-7 Zeners
- 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 in DO-213AA also available as MLL957B to MLL992B or with "-1" suffix (consult factory for other surface mount options)
- RoHS Compliant devices available by adding e3 suffix
- Smaller DO-35 glass body axial-leaded Zener equivalents are also available

### APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Extensive selection from 6.8 to 200 V
- Standard voltage tolerances are plus/minus 5% with B suffix, 10 % with A suffix identification
- Tight tolerances available in plus or minus 2% or 1% with C or D suffix respectively
- Flexible axial-lead mounting terminals
- Nonsensitive to ESD
- Capacitance also specified (see Figure 3)
- Inherently radiation hard as described in Microsemi MicroNote 050

### MAXIMUM RATINGS

- Operating and Storage temperature: -65°C to +175°C
- Thermal Resistance: 300 °C/W junction to lead at 3/8 (10 mm) lead length from body, or 360 °C/W junction to ambient when mounted on FR4 PC board (1 oz Cu) with 4 mm<sup>2</sup> copper pads and track width 1 mm, length 25 mm
- Steady-State Power: 0.5 watts at  $T_L \leq 25^\circ\text{C}$  3/8 inch (10 mm) from body or 0.417 W at  $T_A \leq 25^\circ\text{C}$  when mounted on FR4 PC board as described for thermal resistance above (also see Figure1)
- Forward voltage @200 mA: 1.1 volts (maximum) for 1N957B – 1N985B and 1.3 V for 1N985 – 1N992B
- Solder Temperatures: 260 °C for 10 s (max)

### MECHANICAL AND PACKAGING

- CASE: Hermetically sealed axial-lead glass DO-7 (DO-204AA) package
- TERMINALS: 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 for Zener regulation
- MARKING: Part number
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- WEIGHT: 0.2 grams
- See package dimensions on last page

ELECTRICAL CHARACTERISTICS\* @ 25°C

| JEDEC TYPE NUMBER (Note 1) | NOMINAL ZENER VOLTAGE (Note 2) | ZENER TEST CURRENT | MAX. ZENER IMPEDANCE (Note 3) |                   |          | MAX. DC ZENER CURRENT (Note 4) | MAX. SURGE CURRENT (Note 5) | MAX. REVERSE LEAKAGE CURRENT |       | MAX. TEMP. COEFFICIENT |
|----------------------------|--------------------------------|--------------------|-------------------------------|-------------------|----------|--------------------------------|-----------------------------|------------------------------|-------|------------------------|
|                            | $V_Z$                          | $I_{ZT}$           | $Z_{ZT} @ I_{ZT}$             | $Z_{ZK} @ I_{ZK}$ | $I_{ZM}$ | $I_{ZSM}$                      | $I_R @ V_R$                 | $\alpha_{VZ}$                |       |                        |
|                            | VOLTS                          | mA                 | OHMS                          | OHMS              | mA       | mA                             | mA                          | $\mu A$                      | VOLTS | %/°C                   |
| 1N957B                     | 6.8                            | 18.5               | 4.5                           | 700               | 1.0      | 55                             | 300                         | 150                          | 5.2   | +0.05                  |
| 1N958B                     | 7.5                            | 16.5               | 5.5                           | 700               | .5       | 50                             | 275                         | 75                           | 5.7   | +0.058                 |
| 1N959B                     | 8.2                            | 15.0               | 6.5                           | 700               | .5       | 45                             | 250                         | 50                           | 6.2   | +0.065                 |
| 1N960B                     | 9.1                            | 14.0               | 7.5                           | 700               | .5       | 41                             | 225                         | 25                           | 6.9   | +0.068                 |
| 1N961B                     | 10                             | 12.5               | 8.5                           | 700               | .25      | 38                             | 200                         | 10                           | 7.6   | +0.075                 |
| 1N962B                     | 11                             | 11.5               | 9.5                           | 700               | .25      | 32                             | 175                         | 5                            | 8.4   | +0.076                 |
| 1N963B                     | 12                             | 10.5               | 11.5                          | 700               | .25      | 31                             | 160                         | 5                            | 9.1   | +0.077                 |
| 1N964B                     | 13                             | 9.5                | 13.0                          | 700               | .25      | 28                             | 150                         | 5                            | 9.9   | +0.079                 |
| 1N965B                     | 15                             | 8.5                | 16                            | 700               | .25      | 25                             | 130                         | 5                            | 11.4  | +0.082                 |
| 1N966B                     | 16                             | 7.8                | 17                            | 700               | .25      | 24                             | 120                         | 5                            | 12.2  | +0.083                 |
| 1N967B                     | 18                             | 7.0                | 21                            | 750               | .25      | 20                             | 110                         | 5                            | 13.7  | +0.085                 |
| 1N968B                     | 20                             | 6.2                | 25                            | 750               | .25      | 18                             | 100                         | 5                            | 15.2  | +0.086                 |
| 1N969B                     | 22                             | 5.6                | 29                            | 750               | .25      | 16                             | 90                          | 5                            | 16.7  | +0.087                 |
| 1N970B                     | 24                             | 5.2                | 33                            | 750               | .25      | 15                             | 80                          | 5                            | 18.2  | +0.088                 |
| 1N971B                     | 27                             | 4.6                | 41                            | 750               | .25      | 13                             | 70                          | 5                            | 20.6  | +0.090                 |
| 1N972B                     | 30                             | 4.2                | 49                            | 1000              | .25      | 12                             | 65                          | 5                            | 22.8  | +0.091                 |
| 1N973B                     | 33                             | 3.8                | 58                            | 1000              | .25      | 11                             | 60                          | 5                            | 25.1  | +0.092                 |
| 1N974B                     | 36                             | 3.4                | 70                            | 1000              | .25      | 10                             | 55                          | 5                            | 27.4  | +0.093                 |
| 1N975B                     | 39                             | 3.2                | 80                            | 1000              | .25      | 9.5                            | 46                          | 5                            | 29.7  | +0.094                 |
| 1N976B                     | 43                             | 3.0                | 93                            | 1500              | .25      | 8.8                            | 44                          | 5                            | 32.7  | +0.095                 |
| 1N977B                     | 47                             | 2.7                | 105                           | 1500              | .25      | 7.9                            | 40                          | 5                            | 35.8  | +0.095                 |
| 1N978B                     | 51                             | 2.5                | 125                           | 1500              | .25      | 7.4                            | 37                          | 5                            | 38.8  | +0.096                 |
| 1N979B                     | 56                             | 2.2                | 150                           | 2000              | .25      | 6.8                            | 35                          | 5                            | 42.6  | +0.096                 |
| 1N980B                     | 62                             | 2.0                | 185                           | 2000              | .25      | 6.0                            | 30                          | 5                            | 47.1  | +0.097                 |
| 1N981B                     | 68                             | 1.8                | 230                           | 2000              | .25      | 5.5                            | 28                          | 5                            | 51.7  | +0.097                 |
| 1N982B                     | 75                             | 1.7                | 270                           | 2000              | .25      | 5.0                            | 26                          | 5                            | 56.0  | +0.098                 |
| 1N983B                     | 82                             | 1.5                | 330                           | 3000              | .25      | 4.6                            | 23                          | 5                            | 62.2  | +0.098                 |
| 1N984B                     | 91                             | 1.4                | 400                           | 3000              | .25      | 4.1                            | 21                          | 5                            | 69.2  | +0.099                 |
| 1N985B                     | 100                            | 1.3                | 500                           | 3000              | .25      | 3.7                            | 18                          | 5                            | 76.0  | +0.11                  |
| 1N986B                     | 110                            | 1.1                | 750                           | 4000              | .25      | 3.3                            | 16                          | 5                            | 83.6  | +0.11                  |
| 1N987B                     | 120                            | 1.0                | 900                           | 4500              | .25      | 3.1                            | 15                          | 5                            | 91.2  | +0.11                  |
| 1N988B                     | 130                            | 0.95               | 1100                          | 5000              | .25      | 2.7                            | 13                          | 5                            | 98.8  | +0.11                  |
| 1N989B                     | 150                            | 0.85               | 1500                          | 6000              | .25      | 2.4                            | 12                          | 5                            | 114.0 | +0.11                  |
| 1N990B                     | 160                            | 0.80               | 1700                          | 6500              | .25      | 2.2                            | 11                          | 5                            | 121.6 | +0.11                  |
| 1N991B                     | 180                            | 0.68               | 2200                          | 7100              | .25      | 2.0                            | 10                          | 5                            | 136.8 | +0.11                  |
| 1N992B                     | 200                            | 0.65               | 2500                          | 8000              | .25      | 1.8                            | 9                           | 5                            | 152.0 | +0.11                  |

\* JEDEC Registered Data

**NOTE 1:** The JEDEC type numbers shown (B suffix) have a +/-5% tolerance on nominal Zener voltage. The suffix A is used to identify +/-10% tolerance; suffix C is used to identify +/-2%; and suffix D is used to identify +/-1% tolerance; no suffix indicates +/-20% tolerance.

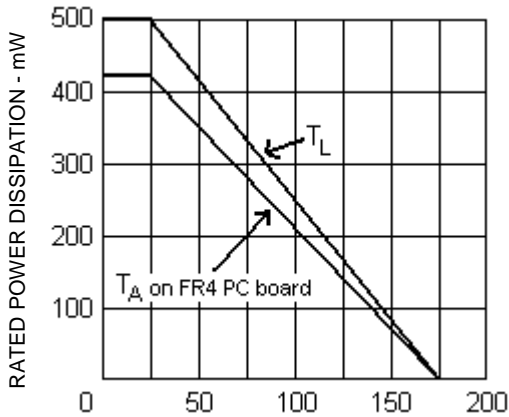
**NOTE 2:** Zener voltage ( $V_Z$ ) is measured after the test current has been applied for 20 +/- 5 seconds. The device shall be suspended by its leads with the inside edge of the mounting clips between .375" and .500" from the body. Mounting clips shall be maintained at a temperature of 25 +/- 2°C.

**NOTE 3:** The zener impedance is derived when a 60 cycle ac current having an rms value equal to 10% of the dc zener current ( $I_{ZT}$  or  $I_{ZK}$ ) is superimposed on  $I_{ZT}$  or  $I_{ZK}$ . Zener impedance is measured at 2 points to ensure a sharp knee on the breakdown curve and to eliminate unstable units. See MicroNote 202 for variation in dynamic impedance with different zener currents.

**NOTE 4:** The values of  $I_{ZM}$  are calculated for a +/- 5% tolerance on nominal zener voltage. Allowance has been made for the rise in zener voltage above  $V_{ZT}$  which results from zener impedance and the increase in junction temperature as power dissipation approaches 400 mW. In the case of individual diodes  $I_{ZM}$  is that value of current which results in a dissipation of 400 mW at 75°C lead temperature at 3/8" from body.

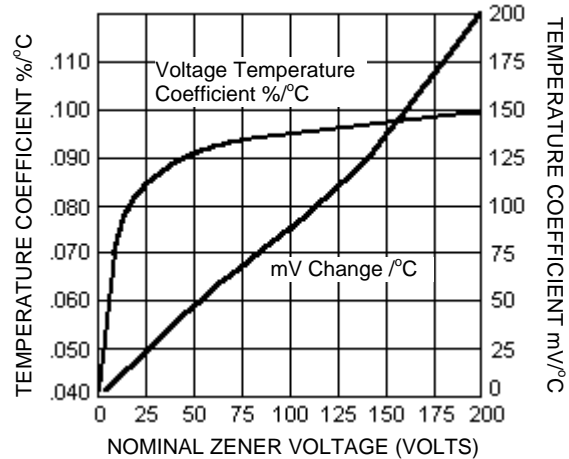
**NOTE 5:** The surge for  $I_{ZSM}$  is a square wave or equivalent half-sine wave pulse of 1/120 sec. duration.

GRAPHS

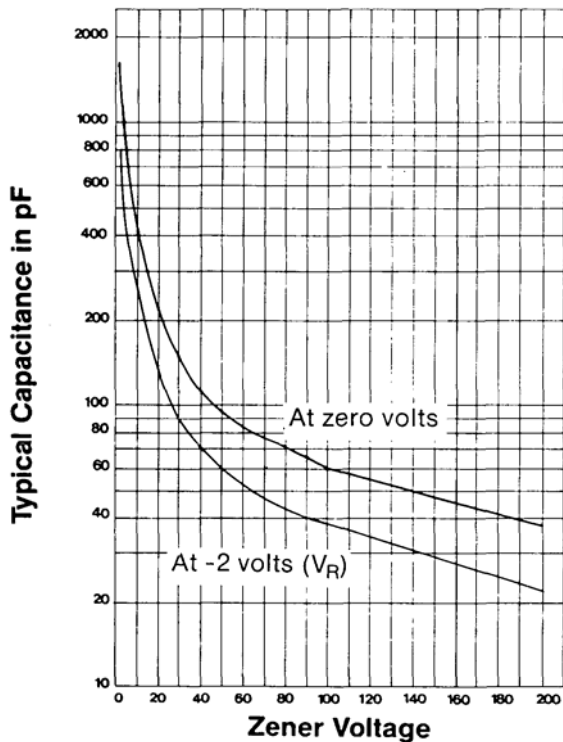


$T_L$  - LEAD TEMPERATURE ( $^{\circ}\text{C}$ ) 3/8" FROM BODY  
or  $T_A$  on FR4 PC BOARD

**FIGURE 1**  
POWER DERATING CURVE



**FIGURE 2**  
ZENER VOLTAGE TEMPERATURE  
COEFFICIENT vs. ZENER VOLTAGE



**FIGURE 3**  
CAPACITANCE vs. ZENER VOLTAGE  
(TYPICAL)

PACKAGE DIMENSIONS

