

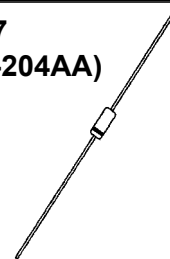


## DESCRIPTION

The 1N4678 thru 1N4717 series of 0.5 watt Zener Voltage Regulators provides a selection from 1.8 to 43 volts in standard 5% tolerances as well as tighter tolerances identified by different suffix letters on the part number. These glass axial-leaded DO-7 Zeners also have an internal-metallurgical-bond similar to other military requirements for these packages. 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 1N4678 thru 1N4717
- Internally solder bonded
- 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 as well as "-1" suffix
- Surface Mount available in DO-213AA package outline by adding a UR or UR-1 (see separate data sheet for 1N4678UR thru 1N4717UR-1)
- DO-35 glass body axial-leaded Zener equivalents are also available (see separate data sheet)

## APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Guaranteed maximum voltage regulation 10  $\mu$ A to 100  $\mu$ A
- Voltage selection from 1.8 to 43 V
- Standard voltage tolerances are plus/minus 5% with no suffix
- Tight tolerances available in plus or minus 2% or 1% with C or D suffix respectively
- Flexible axial-lead mounting terminals
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- 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 (see Figure 2 for derating)
- Forward voltage @200 mA: 1.1 volts (maximum)
- Solder Temperatures: 260°C for 10 s (max)

## MECHANICAL AND PACKAGING

- CASE: Hermetically sealed axial-lead glass DO-7 (DO-204AA) package
- TERMINALS: Leads, tin-lead plated solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band where diode is 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

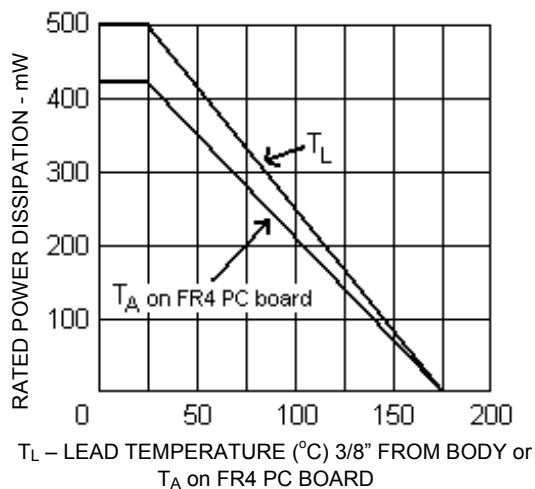
**\* ELECTRICAL CHARACTERISTICS @ 25°C**

| JEDEC<br>TYPE<br>NUMBER<br><br>(Note 1) | NOMINAL<br>ZENER<br>VOLTAGE<br>(Note 3) | ZENER<br>TEST<br>CURRENT | MAXIMUM<br>VOLTAGE<br>REGULATION<br>(Note 2 & 3) | MAXIMUM REVERSE<br>LEAKAGE CURRENT |       | MAXIMUM<br>DC ZENER<br>CURRENT* |
|-----------------------------------------|-----------------------------------------|--------------------------|--------------------------------------------------|------------------------------------|-------|---------------------------------|
|                                         | $V_Z$                                   | $I_{ZT}$                 | $\Delta V_Z$                                     | $I_R$ @ $V_R$                      |       | $I_{ZM}$                        |
|                                         | VOLTS                                   | $\mu A$                  | VOLTS                                            | $\mu A$                            | VOLTS | mA                              |
| 1N4678                                  | 1.8                                     | 50                       | 0.70                                             | 7.5                                | 1.0   | 240                             |
| 1N4679                                  | 2.0                                     | 50                       | 0.70                                             | 5.0                                | 1.0   | 220                             |
| 1N4680                                  | 2.2                                     | 50                       | 0.75                                             | 4.0                                | 1.0   | 200                             |
| 1N4681                                  | 2.4                                     | 50                       | 0.80                                             | 2.0                                | 1.0   | 190                             |
| 1N4682                                  | 2.7                                     | 50                       | 0.85                                             | 1.0                                | 1.0   | 180                             |
| 1N4683                                  | 3.0                                     | 50                       | 0.90                                             | 0.8                                | 1.0   | 170                             |
| 1N4684                                  | 3.3                                     | 50                       | 0.95                                             | 7.5                                | 1.5   | 160                             |
| 1N4685                                  | 3.6                                     | 50                       | 0.95                                             | 7.5                                | 2.0   | 150                             |
| 1N4686                                  | 3.9                                     | 50                       | 0.97                                             | 5.0                                | 2.0   | 140                             |
| 1N4687                                  | 4.3                                     | 50                       | 0.99                                             | 4.0                                | 2.0   | 130                             |
| 1N4688                                  | 4.7                                     | 50                       | 0.99                                             | 10.0                               | 3.0   | 120                             |
| 1N4689                                  | 5.1                                     | 50                       | 0.97                                             | 10.0                               | 3.0   | 110                             |
| 1N4690                                  | 5.6                                     | 50                       | 0.96                                             | 10.0                               | 4.0   | 100                             |
| 1N4691                                  | 6.2                                     | 50                       | 0.95                                             | 10.0                               | 5.0   | 90                              |
| 1N4692                                  | 6.8                                     | 50                       | 0.90                                             | 10.0                               | 5.1   | 70                              |
| 1N4693                                  | 7.5                                     | 50                       | 0.75                                             | 10.0                               | 5.7   | 63.6                            |
| 1N4694                                  | 8.2                                     | 50                       | 0.50                                             | 1.0                                | 6.2   | 58.0                            |
| 1N4695                                  | 8.7                                     | 50                       | 0.10                                             | 1.0                                | 6.6   | 54.8                            |
| 1N4696                                  | 9.1                                     | 50                       | 0.08                                             | 1.0                                | 6.9   | 52.4                            |
| 1N4697                                  | 10.0                                    | 50                       | 0.10                                             | 1.0                                | 7.6   | 49.6                            |
| 1N4698                                  | 11.0                                    | 50                       | 0.11                                             | 0.05                               | 8.4   | 43.2                            |
| 1N4699                                  | 12.0                                    | 50                       | 0.12                                             | 0.05                               | 9.1   | 40.8                            |
| 1N4700                                  | 13.0                                    | 50                       | 0.13                                             | 0.05                               | 9.8   | 38.0                            |
| 1N4701                                  | 14.0                                    | 50                       | 0.14                                             | 0.05                               | 10.6  | 35.0                            |
| 1N4702                                  | 15.0                                    | 50                       | 0.15                                             | 0.05                               | 11.4  | 32.6                            |
| 1N4703                                  | 16.0                                    | 50                       | 0.16                                             | 0.05                               | 12.1  | 30.8                            |
| 1N4704                                  | 17.0                                    | 50                       | 0.17                                             | 0.05                               | 12.9  | 29.0                            |
| 1N4705                                  | 18.0                                    | 50                       | 0.18                                             | 0.05                               | 13.6  | 26.4                            |
| 1N4706                                  | 19.0                                    | 50                       | 0.19                                             | 0.05                               | 14.4  | 25.0                            |
| 1N4707                                  | 20.0                                    | 50                       | 0.20                                             | 0.01                               | 15.2  | 23.8                            |
| 1N4708                                  | 22.0                                    | 50                       | 0.22                                             | 0.01                               | 16.7  | 21.6                            |
| 1N4709                                  | 24.0                                    | 50                       | 0.24                                             | 0.01                               | 18.2  | 19.8                            |
| 1N4710                                  | 25.0                                    | 50                       | 0.25                                             | 0.01                               | 19.0  | 19.0                            |
| 1N4711                                  | 27.0                                    | 50                       | 0.27                                             | 0.01                               | 20.4  | 17.6                            |
| 1N4712                                  | 28.0                                    | 50                       | 0.28                                             | 0.01                               | 21.2  | 17.0                            |
| 1N4713                                  | 30.0                                    | 50                       | 0.30                                             | 0.01                               | 22.8  | 15.8                            |
| 1N4714                                  | 33.0                                    | 50                       | 0.33                                             | 0.01                               | 25.0  | 14.4                            |
| 1N4715                                  | 36.0                                    | 50                       | 0.36                                             | 0.01                               | 27.3  | 13.2                            |
| 1N4716                                  | 39.0                                    | 50                       | 0.39                                             | 0.01                               | 29.6  | 12.2                            |
| 1N4717                                  | 43.0                                    | 50                       | 0.43                                             | 0.01                               | 32.6  | 11.0                            |

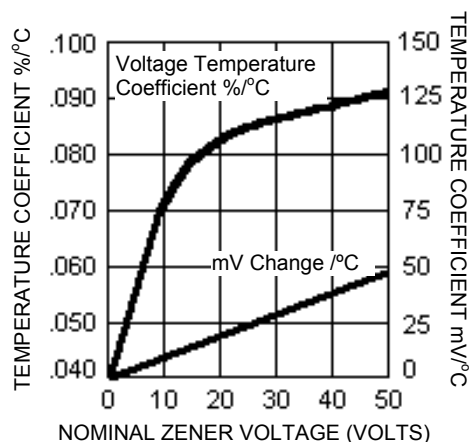
\* JEDEC registered data except  $I_{ZM}$  has been increased (doubled) for 500 mW power dissipation capabilities

- NOTES:**
1. All types as shown are +/-5% tolerance. Also available in 2% and 1% tolerance by adding suffix C and D respectively.
  2.  $\Delta V_Z$  @ 100 $\mu A$  minus  $V_Z$  @ 10 $\mu A$ .
  3. The electrical characteristics are measured after allowing the device to stabilize for 20 seconds when mounted with 3/8" minimum lead length from the base.

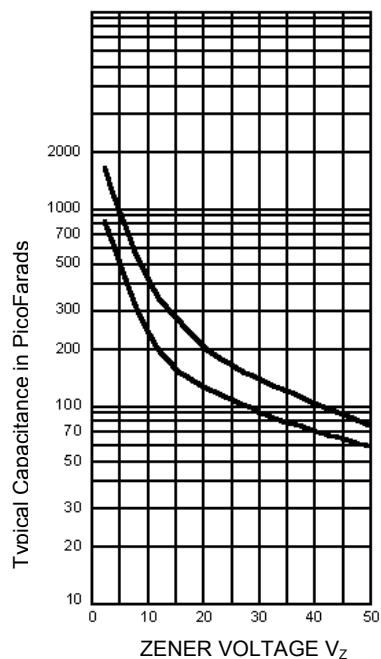
## GRAPHS



**FIGURE 1**  
POWER DERATING CURVE



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



**FIGURE 3**  
CAPACITANCE vs.  $V_Z$  CURVE

## DO-7 PACKAGE DIMENSIONS

