



# Zener diode

## Features

1. DO-34 Glass sealed package  
This diode can be inserted into a PC board with a shorter pitch (5mm)
2. Planar process
3. Vz applied E24 standard



## Applications

Circuits for constant voltage, constant current, waveform clipper, surge absorber, etc.

PDF.Support

## Absolute Maximum Ratings

$T_j=25^{\circ}\text{C}$

| Parameter            | Symbol    | Value    | Unit               |
|----------------------|-----------|----------|--------------------|
| Forward Current      | $I_f$     | 150      | mA                 |
| Power Dissipation    | $P_V$     | 400      | mW                 |
| Surge Reverse Power  | $P_{RSM}$ | 100      | W                  |
| Junction Temperature | $T_j$     | 175      | $^{\circ}\text{C}$ |
| Storage Temperature  | $T_{stg}$ | -65~+175 | $^{\circ}\text{C}$ |

Stresses exceeding maximum ratings may damage the device. Maximum ratings are stress ratings only. Functional operation above the recommended operating conditions is not implied. Extended exposure to stresses above the recommended operating conditions may affect device reliability.



**Electrical Characteristics**

T<sub>j</sub>=25°C

| Type Number | Suffix | Zener voltage      |      |                     | Dynamic Impedance   |                     | Knee Dynamic Impedance |                     | Reverse current     |                    |
|-------------|--------|--------------------|------|---------------------|---------------------|---------------------|------------------------|---------------------|---------------------|--------------------|
|             |        | V <sub>z</sub> (V) |      |                     | Z <sub>zt</sub> (Ω) |                     | Z <sub>zk</sub> (Ω)    |                     | I <sub>R</sub> (μA) |                    |
|             |        | Min.               | Max. | I <sub>z</sub> (mA) | Max.                | I <sub>z</sub> (mA) | Max.                   | I <sub>z</sub> (mA) | Max.                | V <sub>R</sub> (V) |
| RD 2.0ES    | -      | 1.88               | 2.24 | 5                   | 100                 | 5                   | 1000                   | 0.5                 | 120                 | 0.5                |
|             | A      | 1.88               | 2.12 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 2.01               | 2.24 |                     |                     |                     |                        |                     |                     |                    |
| RD 2.2 ES   | -      | 2.11               | 2.44 | 5                   | 100                 | 5                   | 1000                   | 0.5                 | 120                 | 0.7                |
|             | A      | 2.11               | 2.34 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 2.22               | 2.44 |                     |                     |                     |                        |                     |                     |                    |
| RD 2.4 ES   | -      | 2.32               | 2.65 | 5                   | 100                 | 5                   | 1000                   | 0.5                 | 120                 | 1.0                |
|             | A      | 2.32               | 2.54 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 2.41               | 2.65 |                     |                     |                     |                        |                     |                     |                    |
| RD 2.7 ES   | -      | 2.52               | 2.93 | 5                   | 110                 | 5                   | 1000                   | 0.5                 | 100                 | 1.0                |
|             | A      | 2.52               | 2.77 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 2.68               | 2.93 |                     |                     |                     |                        |                     |                     |                    |
| RD 3.0 ES   | -      | 2.84               | 3.24 | 5                   | 120                 | 5                   | 1000                   | 0.5                 | 50                  | 1.0                |
|             | A      | 2.84               | 3.08 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 2.99               | 3.24 |                     |                     |                     |                        |                     |                     |                    |
| RD 3.3 ES   | -      | 3.15               | 3.54 | 5                   | 120                 | 5                   | 1000                   | 0.5                 | 20                  | 1.0                |
|             | A      | 3.15               | 3.39 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 3.31               | 3.54 |                     |                     |                     |                        |                     |                     |                    |
| RD 3.6 ES   | -      | 3.46               | 3.84 | 5                   | 120                 | 5                   | 1100                   | 0.5                 | 10                  | 1.0                |
|             | A      | 3.46               | 3.69 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 3.60               | 3.84 |                     |                     |                     |                        |                     |                     |                    |
| RD 3.9 ES   | -      | 3.74               | 4.16 | 5                   | 120                 | 5                   | 1200                   | 0.5                 | 5                   | 1.0                |
|             | A      | 3.74               | 4.01 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 3.89               | 4.16 |                     |                     |                     |                        |                     |                     |                    |
| RD 4.3 ES   | -      | 4.04               | 4.57 | 5                   | 120                 | 5                   | 1200                   | 0.5                 | 5                   | 1.0                |
|             | A      | 4.04               | 4.29 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 4.17               | 4.43 |                     |                     |                     |                        |                     |                     |                    |
|             | C      | 4.30               | 4.57 |                     |                     |                     |                        |                     |                     |                    |
| RD 4.7 ES   | -      | 4.44               | 4.93 | 5                   | 100                 | 5                   | 1200                   | 0.5                 | 5                   | 1.0                |
|             | A      | 4.44               | 4.68 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 4.55               | 4.80 |                     |                     |                     |                        |                     |                     |                    |
|             | C      | 4.68               | 4.93 |                     |                     |                     |                        |                     |                     |                    |
| RD 5.1 ES   | -      | 4.81               | 5.37 | 5                   | 70                  | 5                   | 1200                   | 0.5                 | 5                   | 1.5                |
|             | A      | 4.81               | 5.07 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 4.94               | 5.20 |                     |                     |                     |                        |                     |                     |                    |
|             | C      | 5.09               | 5.37 |                     |                     |                     |                        |                     |                     |                    |
| RD 5.6 ES   | -      | 5.28               | 5.91 | 5                   | 40                  | 5                   | 900                    | 0.5                 | 5                   | 2.5                |
|             | A      | 5.28               | 5.55 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 5.45               | 5.73 |                     |                     |                     |                        |                     |                     |                    |
|             | C      | 5.61               | 5.91 |                     |                     |                     |                        |                     |                     |                    |
| RD 6.2 ES   | -      | 5.78               | 6.44 | 5                   | 30                  | 5                   | 500                    | 0.5                 | 5                   | 3.0                |
|             | A      | 5.78               | 6.09 |                     |                     |                     |                        |                     |                     |                    |
|             | B      | 5.96               | 6.27 |                     |                     |                     |                        |                     |                     |                    |
|             | C      | 6.12               | 6.44 |                     |                     |                     |                        |                     |                     |                    |

**Excel Semiconductor**



| Type Number | Suffix | Zener voltage |       |         | Dynamic Impedance |         | Knee Dynamic Impedance |         | Reverse current |        |
|-------------|--------|---------------|-------|---------|-------------------|---------|------------------------|---------|-----------------|--------|
|             |        | Vz (V)        |       | Iz (mA) | Zzt (Ω)           |         | Zzk (Ω)                |         | IR (μA)         |        |
|             |        | Min.          | Max.  | Iz (mA) | Max.              | Iz (mA) | Max.                   | Iz (mA) | Max.            | VR (V) |
| RD 6.8 ES   | -      | 6.29          | 7.01  | 5       | 25                | 5       | 150                    | 0.5     | 2               | 3.5    |
|             | A      | 6.29          | 6.63  |         |                   |         |                        |         |                 |        |
|             | B      | 6.49          | 6.83  |         |                   |         |                        |         |                 |        |
|             | C      | 6.66          | 7.01  |         |                   |         |                        |         |                 |        |
| RD 7.5 ES   | -      | 6.85          | 7.67  | 5       | 25                | 5       | 120                    | 0.5     | 0.5             | 4.0    |
|             | A      | 6.85          | 7.22  |         |                   |         |                        |         |                 |        |
|             | B      | 7.07          | 7.45  |         |                   |         |                        |         |                 |        |
|             | C      | 7.29          | 7.67  |         |                   |         |                        |         |                 |        |
| RD 8.2 ES   | -      | 7.53          | 8.45  | 5       | 20                | 5       | 120                    | 0.5     | 0.5             | 5.0    |
|             | A      | 7.53          | 7.92  |         |                   |         |                        |         |                 |        |
|             | B      | 7.78          | 8.19  |         |                   |         |                        |         |                 |        |
|             | C      | 8.03          | 8.45  |         |                   |         |                        |         |                 |        |
| RD 9.1 ES   | -      | 8.29          | 9.30  | 5       | 20                | 5       | 120                    | 0.5     | 0.5             | 6.0    |
|             | A      | 8.29          | 8.73  |         |                   |         |                        |         |                 |        |
|             | B      | 8.57          | 9.01  |         |                   |         |                        |         |                 |        |
|             | C      | 8.83          | 9.30  |         |                   |         |                        |         |                 |        |
| RD 10 ES    | -      | 9.12          | 10.39 | 5       | 20                | 5       | 120                    | 0.5     | 0.2             | 7.0    |
|             | A      | 9.12          | 9.65  |         |                   |         |                        |         |                 |        |
|             | B      | 9.46          | 10.02 |         |                   |         |                        |         |                 |        |
|             | C      | 9.82          | 10.39 |         |                   |         |                        |         |                 |        |
| RD 11 ES    | -      | 10.18         | 11.38 | 5       | 20                | 5       | 120                    | 0.5     | 0.2             | 8.0    |
|             | A      | 10.18         | 10.71 |         |                   |         |                        |         |                 |        |
|             | B      | 10.50         | 11.05 |         |                   |         |                        |         |                 |        |
|             | C      | 10.82         | 11.38 |         |                   |         |                        |         |                 |        |
| RD 12 ES    | -      | 11.13         | 12.35 | 5       | 25                | 5       | 110                    | 0.5     | 0.2             | 9.0    |
|             | A      | 11.13         | 11.71 |         |                   |         |                        |         |                 |        |
|             | B      | 11.44         | 12.03 |         |                   |         |                        |         |                 |        |
|             | C      | 11.74         | 12.35 |         |                   |         |                        |         |                 |        |
| RD 13 ES    | -      | 12.11         | 13.66 | 5       | 25                | 5       | 110                    | 0.5     | 0.2             | 10     |
|             | A      | 12.11         | 12.75 |         |                   |         |                        |         |                 |        |
|             | B      | 12.55         | 13.21 |         |                   |         |                        |         |                 |        |
|             | C      | 12.99         | 13.66 |         |                   |         |                        |         |                 |        |
| RD 15 ES    | -      | 13.44         | 15.09 | 5       | 25                | 5       | 110                    | 0.5     | 0.2             | 11     |
|             | A      | 13.44         | 14.13 |         |                   |         |                        |         |                 |        |
|             | B      | 13.89         | 14.62 |         |                   |         |                        |         |                 |        |
|             | C      | 14.35         | 15.09 |         |                   |         |                        |         |                 |        |
| RD 16 ES    | -      | 14.80         | 16.51 | 5       | 25                | 5       | 150                    | 0.5     | 0.2             | 12     |
|             | A      | 14.80         | 15.57 |         |                   |         |                        |         |                 |        |
|             | B      | 15.25         | 16.04 |         |                   |         |                        |         |                 |        |
|             | C      | 15.69         | 16.51 |         |                   |         |                        |         |                 |        |
| RD 18 ES    | -      | 16.22         | 18.33 | 5       | 30                | 5       | 150                    | 0.5     | 0.2             | 13     |
|             | A      | 16.22         | 17.06 |         |                   |         |                        |         |                 |        |
|             | B      | 16.82         | 17.70 |         |                   |         |                        |         |                 |        |
|             | C      | 17.42         | 18.33 |         |                   |         |                        |         |                 |        |



| Type Number | Suffix | Zener voltage |       |         | Dynamic Impedance |         | Knee Dynamic Impedance |         | Reverse current |        |
|-------------|--------|---------------|-------|---------|-------------------|---------|------------------------|---------|-----------------|--------|
|             |        | Vz (V)        |       | Iz (mA) | Zzt (Ω)           |         | Zzk (Ω)                |         | IR (μA)         |        |
|             |        | Min.          | Max.  | Iz (mA) | Max.              | Iz (mA) | Max.                   | Iz (mA) | Max.            | VR (V) |
| RD 20 ES    | -      | 18.14         | 20.45 | 5       | 30                | 5       | 200                    | 0.5     | 0.2             | 15     |
|             | A      | 18.14         | 19.07 |         |                   |         |                        |         |                 |        |
|             | B      | 18.80         | 19.76 |         |                   |         |                        |         |                 |        |
|             | C      | 19.45         | 20.45 |         |                   |         |                        |         |                 |        |
| RD 22 ES    | -      | 20.15         | 22.63 | 5       | 30                | 5       | 200                    | 0.5     | 0.2             | 17     |
|             | A      | 20.15         | 21.20 |         |                   |         |                        |         |                 |        |
|             | B      | 20.64         | 21.71 |         |                   |         |                        |         |                 |        |
|             | C      | 21.08         | 22.17 |         |                   |         |                        |         |                 |        |
| RD 24 ES    | -      | 22.05         | 24.85 | 5       | 35                | 5       | 200                    | 0.5     | 0.2             | 19     |
|             | A      | 22.05         | 23.18 |         |                   |         |                        |         |                 |        |
|             | B      | 22.61         | 23.77 |         |                   |         |                        |         |                 |        |
|             | C      | 23.12         | 24.13 |         |                   |         |                        |         |                 |        |
| RD 27 ES    | -      | 24.26         | 27.64 | 5       | 45                | 5       | 250                    | 0.5     | 0.2             | 21     |
|             | A      | 24.26         | 25.52 |         |                   |         |                        |         |                 |        |
|             | B      | 24.97         | 26.26 |         |                   |         |                        |         |                 |        |
|             | C      | 25.63         | 26.95 |         |                   |         |                        |         |                 |        |
| RD 30 ES    | -      | 26.99         | 30.51 | 5       | 55                | 5       | 250                    | 0.5     | 0.2             | 23     |
|             | A      | 26.99         | 28.39 |         |                   |         |                        |         |                 |        |
|             | B      | 27.70         | 29.13 |         |                   |         |                        |         |                 |        |
|             | C      | 28.36         | 29.82 |         |                   |         |                        |         |                 |        |
| RD 33 ES    | -      | 29.68         | 33.11 | 5       | 65                | 5       | 250                    | 0.5     | 0.2             | 25     |
|             | A      | 29.68         | 31.22 |         |                   |         |                        |         |                 |        |
|             | B      | 30.32         | 31.88 |         |                   |         |                        |         |                 |        |
|             | C      | 30.90         | 32.50 |         |                   |         |                        |         |                 |        |
| RD 36 ES    | -      | 32.14         | 35.77 | 5       | 75                | 5       | 250                    | 0.5     | 0.2             | 27     |
|             | A      | 32.14         | 33.79 |         |                   |         |                        |         |                 |        |
|             | B      | 32.79         | 34.49 |         |                   |         |                        |         |                 |        |
|             | C      | 33.40         | 35.13 |         |                   |         |                        |         |                 |        |
| RD 39 ES    | -      | 34.68         | 38.52 | 5       | 85                | 5       | 250                    | 0.5     | 0.2             | 30     |
|             | A      | 34.68         | 36.47 |         |                   |         |                        |         |                 |        |
|             | B      | 35.36         | 37.19 |         |                   |         |                        |         |                 |        |
|             | C      | 36.00         | 37.85 |         |                   |         |                        |         |                 |        |
|             | D      | 36.63         | 38.52 |         |                   |         |                        |         |                 |        |



### Characteristics

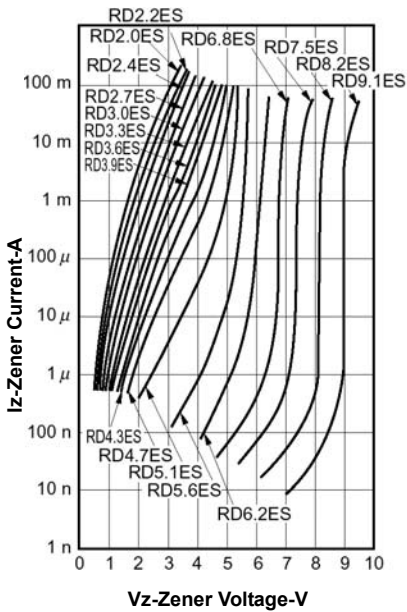


Figure 1. Zener current vs. zener voltage

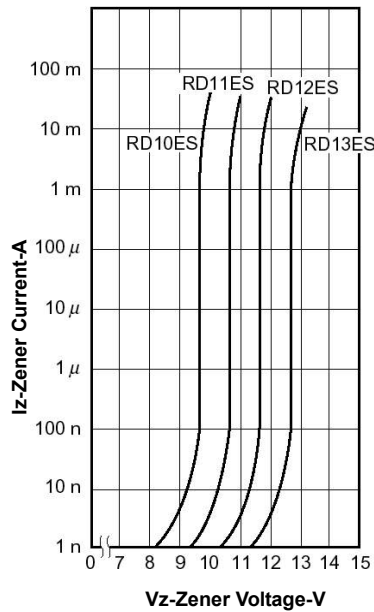


Figure 2. Zener current vs. zener voltage

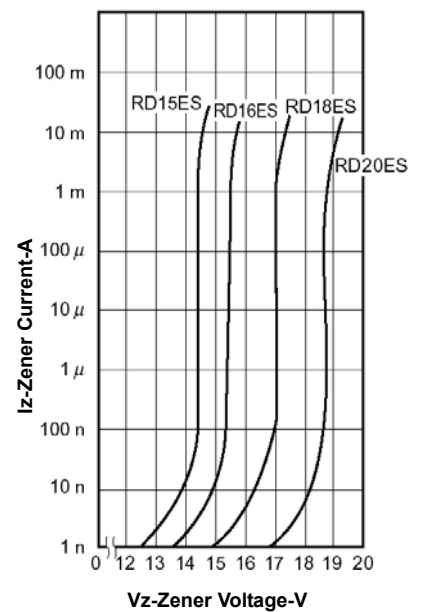


Figure 3. Zener current vs. zener voltage

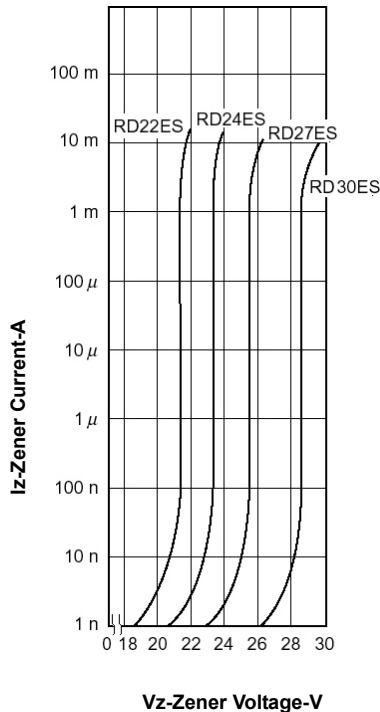


Figure 4. Zener current vs. zener voltage

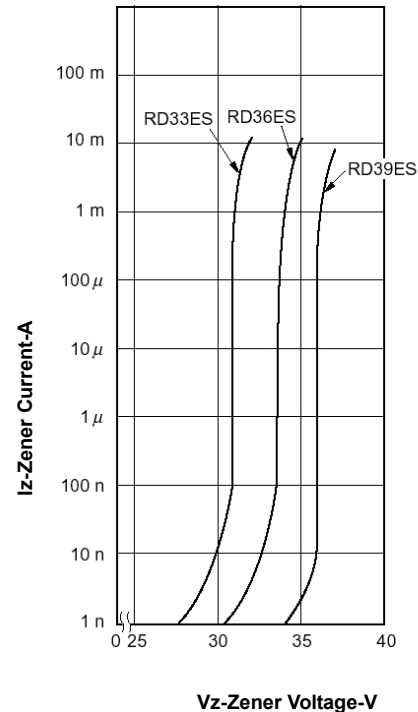


Figure 5. Zener current vs. zener voltage

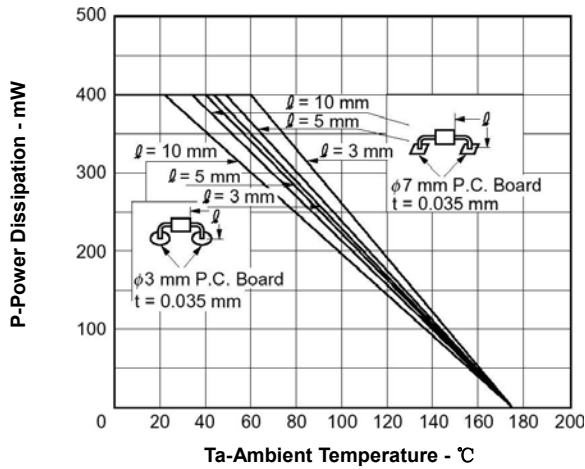


Figure 6. Power dissipation vs. ambient temperature

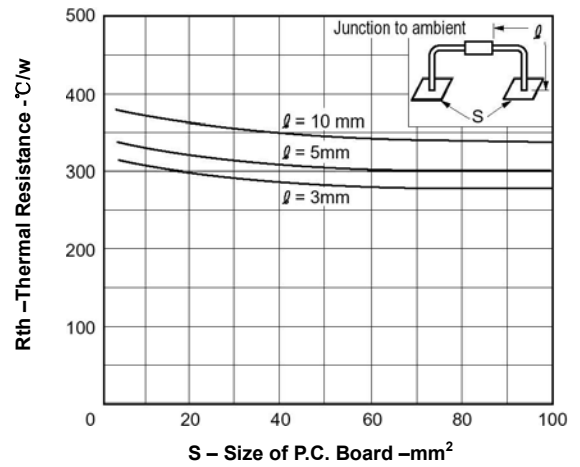


Figure 7. Thermal resistance vs. size of P.C BOARD

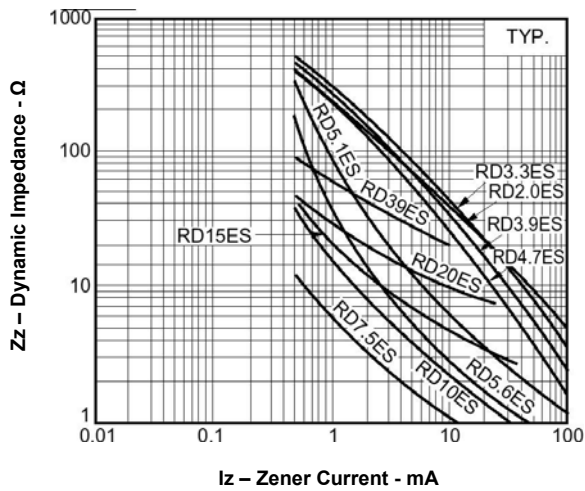


Figure 8. Dynamic impedance vs. zener current

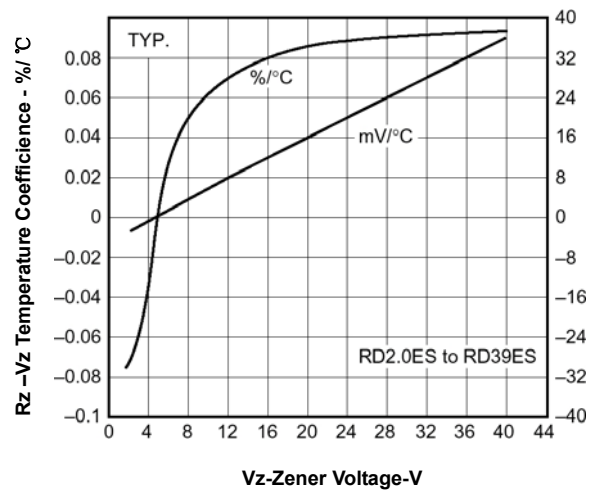


Figure 9. Zener voltage temperature coefficient vs. zener voltage

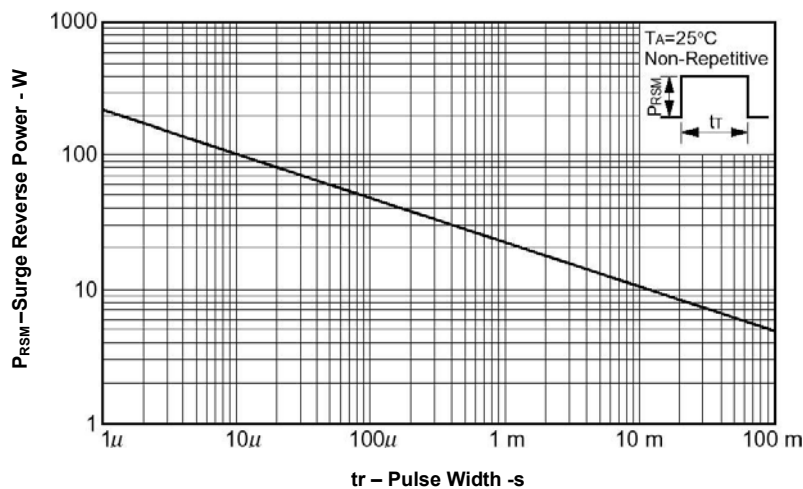


Figure 10. Surge reverse power ratings

Excel Semiconductor

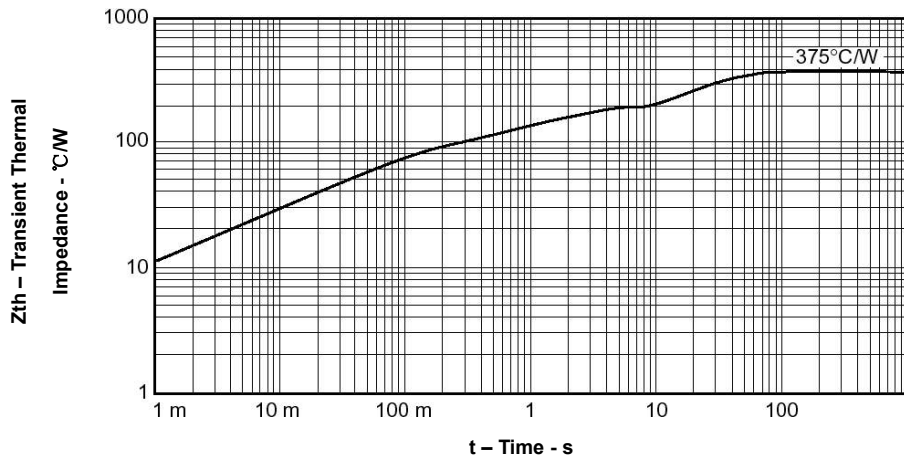
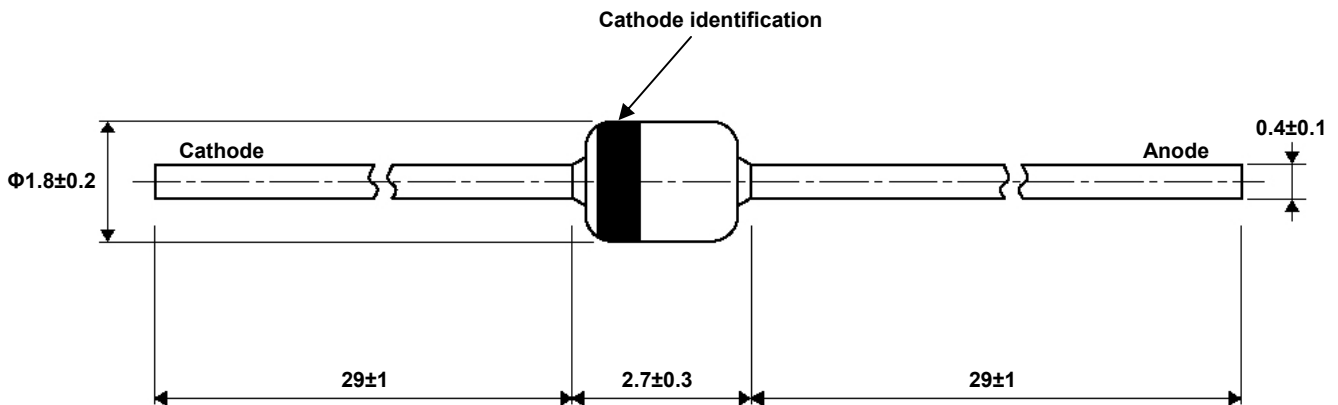


Figure 11. Transient thermal impedance characteristic

### Dimensions in mm



Standard Glass Case  
JEDEC DO-34