

## RD2.0E to RD200E

500 mW DHD ZENER DIODE  
(DO-35)

## DESCRIPTION

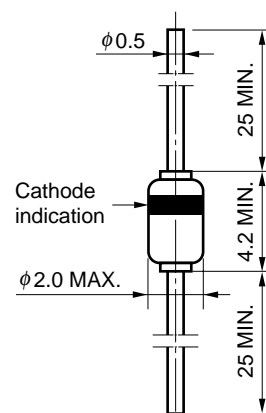
NEC Type RD2.0E to RD200E Series are planar type zener diode in the popular DO-35 package with DHD (Double Heatsink Diode) construction having allowable power dissipation of 500 mW. To meet various application at customers,  $V_z$  (zener voltage) is classified into the tight tolerance under the specific suffix (B, B1 to B7).

## FEATURES

- DHD (Double Heatsink Diode) Construction
- $V_z$ : Applied E24 standard (RD130E to RD200E: 10 volts step)
- DO-35 Glass sealed package

## ORDER INFORMATION

RD2.0 E to RD39E with suffix "B1", "B2", "B3", "B4", "B5", "B6" or "B7" should be applied for orders for suffix "B".

PACKAGE DIMENSIONS  
(in millimeters)

## APPLICATIONS

Circuits for Constant Voltage, Constant Current, Waveform Clipper, Surge absorber, etc.

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25\text{ }^{\circ}\text{C}$ )

|                      |           |                                       |                |
|----------------------|-----------|---------------------------------------|----------------|
| Forward Current      | $I_F$     | 200 mA                                |                |
| Power Dissipation    | P         | 500 mW                                |                |
| Surge Reverse Power  | $P_{RSM}$ | 100 W ( $t = 10\text{ }\mu\text{s}$ ) | to see Fig. 17 |
| Junction Temperature | $T_j$     | 175 $^{\circ}\text{C}$                |                |
| Storage Temperature  | $T_{stg}$ | -65 to +175 $^{\circ}\text{C}$        |                |

ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

| Type Number | Suffix | Zener Voltage<br>V <sub>Z</sub> (V) <sup>Note 1</sup> |      |                     | Dynamic Impedance<br>Z <sub>Z</sub> (Ω) <sup>Note 2</sup> |                     | Knee Dynamic Impedance<br>Z <sub>ZK</sub> (Ω) <sup>Note 2</sup> |                     | Reverse Current<br>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) |
| RD2.0E      | B      | 1.88  | 2.20 | 20                  | 140   | 20                  | 2 000   | 1                   | 120                                    | 0.5                |
|             | B1     | 1.88  | 2.10 |                     |   |                     |   |                     |  |                    |
|             | B2     | 2.02  | 2.20 |                     |   |                     |   |                     |  |                    |
| RD2.2E      | B      | 2.12  | 2.41 | 20                  | 120   | 20                  | 2 000   | 1                   | 120                                    | 0.7                |
|             | B1     | 2.12  | 2.30 |                     |   |                     |   |                     |  |                    |
|             | B2     | 2.22  | 2.41 |                     |   |                     |   |                     |  |                    |
| RD2.4E      | B      | 2.33  | 2.63 | 20                  | 100   | 20                  | 2 000   | 1                   | 120                                    | 1.0                |
|             | B1     | 2.33  | 2.52 |                     |   |                     |   |                     |  |                    |
|             | B2     | 2.43  | 2.63 |                     |   |                     |   |                     |  |                    |
| RD2.7E      | B      | 2.54  | 2.91 | 20                  | 100   | 20                  | 1 000   | 1                   | 100                                    | 1.0                |
|             | B1     | 2.54  | 2.75 |                     |   |                     |   |                     |  |                    |
|             | B2     | 2.69  | 2.91 |                     |   |                     |   |                     |  |                    |
| RD3.0E      | B      | 2.85  | 3.22 | 20                  | 80  | 20                  | 1 000   | 1                   | 50                                     | 1.0                |
|             | B1     | 2.85  | 3.07 |                     |   |                     |   |                     |  |                    |
|             | B2     | 3.01  | 3.22 |                     |   |                     |   |                     |  |                    |
| RD3.3E      | B      | 3.16  | 3.53 | 20                  | 70  | 20                  | 1 000   | 1                   | 20                                     | 1.0                |
|             | B1     | 3.16  | 3.38 |                     |   |                     |   |                     |  |                    |
|             | B2     | 3.32  | 3.53 |                     |   |                     |   |                     |  |                    |
| RD3.6E      | B      | 3.47  | 3.83 | 20                  | 60  | 20                  | 1 000   | 1                   | 10                                     | 1.0                |
|             | B1     | 3.47  | 3.68 |                     |   |                     |   |                     |  |                    |
|             | B2     | 3.62  | 3.83 |                     |   |                     |   |                     |  |                    |
| RD3.9E      | B      | 3.77  | 4.14 | 20                  | 50  | 20                  | 1 000   | 1                   | 5                                      | 1.0                |
|             | B1     | 3.77  | 3.98 |                     |   |                     |   |                     |  |                    |
|             | B2     | 3.92  | 4.14 |                     |   |                     |   |                     |  |                    |
| RD4.3E      | B      | 4.05  | 4.53 | 20                  | 40  | 20                  | 1 000   | 1                   | 5                                      | 1.0                |
|             | B1     | 4.05  | 4.26 |                     |   |                     |   |                     |  |                    |
|             | B2     | 4.20  | 4.40 |                     |   |                     |   |                     |  |                    |
|             | B3     | 4.34  | 4.53 |                     |   |                     |   |                     |  |                    |
| RD4.7E      | B      | 4.47  | 4.91 | 20                  | 25  | 20                  | 900   | 1                   | 5                                      | 1.0                |
|             | B1     | 4.47  | 4.65 |                     |   |                     |   |                     |  |                    |
|             | B2     | 4.59  | 4.77 |                     |   |                     |   |                     |  |                    |
|             | B3     | 4.71  | 4.91 |                     |   |                     |   |                     |  |                    |
| RD5.1E      | B      | 4.85  | 5.35 | 20                  | 20  | 20                  | 800   | 1                   | 5                                      | 1.5                |
|             | B1     | 4.85  | 5.03 |                     |   |                     |   |                     |  |                    |
|             | B2     | 4.97  | 5.18 |                     |   |                     |   |                     |  |                    |
|             | B3     | 5.12  | 5.35 |                     |   |                     |   |                     |  |                    |
| RD5.6E      | B      | 5.29  | 5.88 | 20                  | 13  | 20                  | 500   | 1                   | 5                                      | 2.5                |
|             | B1     | 5.29  | 5.52 |                     |   |                     |   |                     |  |                    |
|             | B2     | 5.46  | 5.70 |                     |   |                     |   |                     |  |                    |
|             | B3     | 5.64  | 5.88 |                     |   |                     |   |                     |  |                    |
| RD6.2E      | B      | 5.81  | 6.40 | 20                  | 10  | 20                  | 300   | 1                   | 5                                      | 3.0                |
|             | B1     | 5.81  | 6.06 |                     |   |                     |   |                     |  |                    |
|             | B2     | 5.99  | 6.24 |                     |   |                     |   |                     |  |                    |
|             | B3     | 6.16  | 6.40 |                     |   |                     |   |                     |  |                    |
| RD6.8E      | B      | 6.32  | 6.97 | 20                  | 8   | 20                  | 150   | 0.5                 | 2                                      | 3.5                |
|             | B1     | 6.32  | 6.59 |                     |   |                     |   |                     |  |                    |
|             | B2     | 6.52  | 6.79 |                     |   |                     |   |                     |  |                    |
|             | B3     | 6.70  | 6.97 |                     |   |                     |   |                     |  |                    |

| Type Number | Suffix | Zener Voltage<br>V <sub>Z</sub> (V) <sup>Note 1</sup> |       |                     | Dynamic Impedance<br>Z <sub>Z</sub> (Ω) <sup>Note 2</sup> |                     | Knee Dynamic Impedance<br>Z <sub>ZK</sub> (Ω) <sup>Note 2</sup> |                     | Reverse Current<br>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) |
| RD7.5E      | B      | 6.88  | 7.64  | 20                  | 8   | 20                  | 120   | 0.5                 | 0.5                                    | 4.0                |
|             | B1     | 6.88  | 7.19  |                     |   |                     |   |                     |  |                    |
|             | B2     | 7.11  | 7.41  |                     |   |                     |   |                     |  |                    |
|             | B3     | 7.33  | 7.64  |                     |   |                     |   |                     |  |                    |
| RD8.2E      | B      | 7.56  | 8.41  | 20                  | 8   | 20                  | 120   | 0.5                 | 0.5                                    | 5.0                |
|             | B1     | 7.56  | 7.90  |                     |   |                     |   |                     |  |                    |
|             | B2     | 7.82  | 8.15  |                     |   |                     |   |                     |  |                    |
|             | B3     | 8.07  | 8.41  |                     |   |                     |   |                     |  |                    |
| RD9.1E      | B      | 8.33  | 9.29  | 20                  | 8   | 20                  | 120   | 0.5                 | 0.5                                    | 6.0                |
|             | B1     | 8.33  | 8.70  |                     |   |                     |   |                     |  |                    |
|             | B2     | 8.61  | 8.99  |                     |   |                     |   |                     |  |                    |
|             | B3     | 8.89  | 9.29  |                     |   |                     |   |                     |  |                    |
| RD10E       | B      | 9.19  | 10.30 | 20                  | 8   | 20                  | 120   | 0.5                 | 0.2                                    | 7.0                |
|             | B1     | 9.19  | 9.59  |                     |   |                     |   |                     |  |                    |
|             | B2     | 9.48  | 9.90  |                     |   |                     |   |                     |  |                    |
|             | B3     | 9.82  | 10.30 |                     |   |                     |   |                     |  |                    |
| RD11E       | B      | 10.18   | 11.26 | 10                  | 10  | 10                  | 120   | 0.5                 | 0.2                                    | 8.0                |
|             | B1     | 10.18   | 10.63 |                     |   |                     |   |                     |  |                    |
|             | B2     | 10.50   | 10.95 |                     |   |                     |   |                     |  |                    |
|             | B3     | 10.82   | 11.16 |                     |   |                     |   |                     |  |                    |
| RD12E       | B      | 11.13   | 12.30 | 10                  | 12  | 10                  | 110   | 0.5                 | 0.2                                    | 9.0                |
|             | B1     | 11.13   | 11.63 |                     |   |                     |   |                     |  |                    |
|             | B2     | 11.50   | 11.92 |                     |   |                     |   |                     |  |                    |
|             | B3     | 11.80   | 12.30 |                     |   |                     |   |                     |  |                    |
| RD13E       | B      | 12.18   | 13.62 | 10                  | 14  | 10                  | 110   | 0.5                 | 0.2                                    | 10                 |
|             | B1     | 12.18   | 12.71 |                     |   |                     |   |                     |  |                    |
|             | B2     | 12.59   | 13.16 |                     |   |                     |   |                     |  |                    |
|             | B3     | 13.03   | 13.62 |                     |   |                     |   |                     |  |                    |
| RD15E       | B      | 13.48   | 15.02 | 10                  | 16  | 10                  | 110   | 0.5                 | 0.2                                    | 11                 |
|             | B1     | 13.48   | 14.09 |                     |   |                     |   |                     |  |                    |
|             | B2     | 13.95   | 14.56 |                     |   |                     |   |                     |  |                    |
|             | B3     | 14.42   | 15.02 |                     |   |                     |   |                     |  |                    |
| RD16E       | B      | 14.87   | 16.50 | 10                  | 18  | 10                  | 150   | 0.5                 | 0.2                                    | 12                 |
|             | B1     | 14.87   | 15.50 |                     |   |                     |   |                     |  |                    |
|             | B2     | 15.33   | 15.96 |                     |   |                     |   |                     |  |                    |
|             | B3     | 15.79   | 16.50 |                     |   |                     |   |                     |  |                    |
| RD18E       | B      | 16.34   | 18.30 | 10                  | 23  | 10                  | 150   | 0.5                 | 0.2                                    | 13                 |
|             | B1     | 16.34   | 17.06 |                     |   |                     |   |                     |  |                    |
|             | B2     | 16.90   | 17.67 |                     |   |                     |   |                     |  |                    |
|             | B3     | 17.51   | 18.30 |                     |   |                     |   |                     |  |                    |
| RD20E       | B      | 18.11   | 20.72 | 10                  | 28  | 10                  | 200   | 0.5                 | 0.2                                    | 15                 |
|             | B1     | 18.11   | 18.92 |                     |   |                     |   |                     |  |                    |
|             | B2     | 18.73   | 19.57 |                     |   |                     |   |                     |  |                    |
|             | B3     | 19.38   | 20.22 |                     |   |                     |   |                     |  |                    |
|             | B4     | 19.88   | 20.72 |                     |   |                     |   |                     |  |                    |
| RD22E       | B      | 20.23   | 22.61 | 5                   | 30  | 5                   | 200   | 0.5                 | 0.2                                    | 17                 |
|             | B1     | 20.23   | 21.08 |                     |   |                     |   |                     |  |                    |
|             | B2     | 20.76   | 21.65 |                     |   |                     |   |                     |  |                    |
|             | B3     | 21.22   | 22.09 |                     |   |                     |   |                     |  |                    |
|             | B4     | 21.68   | 22.61 |                     |   |                     |   |                     |  |                    |

| Type Number | Suffix | Zener Voltage<br>$V_Z$ (V) <sup>Note 1</sup> |       |            | Dynamic Impedance<br>$Z_Z$ ( $\Omega$ ) <sup>Note 2</sup> |            | Knee Dynamic Impedance<br>$Z_{ZK}$ ( $\Omega$ ) <sup>Note 2</sup> |            | Reverse Current<br>$I_R$ ( $\mu A$ ) |           |
|-------------|--------|--|-------|------------|---|------------|---|------------|--------------------------------------|-----------|
|             |        | MIN.   | MAX.  | $I_Z$ (mA) | MAX.  | $I_Z$ (mA) | MAX.  | $I_Z$ (mA) | MAX.                                 | $V_R$ (V) |
| RD24E       | B      | 22.26  | 24.81 | 5          | 35  | 5          | 200   | 0.5        | 0.2                                  | 19        |
|             | B1     | 22.26  | 23.12 |            |   |            |   |            |                                      |           |
|             | B2     | 23.75  | 23.73 |            |   |            |   |            |                                      |           |
|             | B3     | 23.29  | 24.27 |            |   |            |   |            |                                      |           |
|             | B4     | 23.81  | 24.81 |            |   |            |   |            |                                      |           |
| RD27E       | B      | 24.26  | 27.64 | 5          | 45  | 5          | 250   | 0.5        | 0.2                                  | 21        |
|             | B1     | 24.26  | 25.52 |            |   |            |   |            |                                      |           |
|             | B2     | 24.97  | 26.26 |            |   |            |   |            |                                      |           |
|             | B3     | 25.63  | 26.95 |            |   |            |   |            |                                      |           |
|             | B4     | 26.29  | 27.64 |            |   |            |   |            |                                      |           |
| RD30E       | B      | 26.99  | 30.51 | 5          | 55  | 5          | 250   | 0.5        | 0.2                                  | 23        |
|             | B1     | 26.99  | 28.39 |            |   |            |   |            |                                      |           |
|             | B2     | 27.70  | 29.13 |            |   |            |   |            |                                      |           |
|             | B3     | 28.36  | 29.82 |            |   |            |   |            |                                      |           |
|             | B4     | 29.02  | 30.51 |            |   |            |   |            |                                      |           |
| RD33E       | B      | 29.68  | 33.11 | 5          | 65  | 5          | 250   | 0.5        | 0.2                                  | 25        |
|             | B1     | 29.68  | 31.22 |            |   |            |   |            |                                      |           |
|             | B2     | 30.32  | 31.88 |            |   |            |   |            |                                      |           |
|             | B3     | 30.90  | 32.50 |            |   |            |   |            |                                      |           |
|             | B4     | 31.49  | 33.11 |            |   |            |   |            |                                      |           |
| RD36E       | B      | 32.14  | 35.77 | 5          | 75  | 5          | 250   | 0.5        | 0.2                                  | 27        |
|             | B1     | 32.14  | 33.79 |            |   |            |   |            |                                      |           |
|             | B2     | 32.79  | 34.49 |            |   |            |   |            |                                      |           |
|             | B3     | 33.40  | 35.13 |            |   |            |   |            |                                      |           |
|             | B4     | 34.01  | 35.77 |            |   |            |   |            |                                      |           |
| RD39E       | B      | 34.68  | 40.80 | 5          | 85  | 5          | 250   | 0.5        | 0.2                                  | 30        |
|             | B1     | 34.68  | 36.47 |            |   |            |   |            |                                      |           |
|             | B2     | 35.36  | 37.19 |            |   |            |   |            |                                      |           |
|             | B3     | 36.00  | 37.85 |            |   |            |   |            |                                      |           |
|             | B4     | 36.63  | 38.52 |            |   |            |   |            |                                      |           |
|             | B5     | 37.36  | 39.29 |            |   |            |   |            |                                      |           |
|             | B6     | 38.14  | 40.11 |            |   |            |   |            |                                      |           |
|             | B7     | 38.94  | 40.80 |            |   |            |   |            |                                      |           |
| RD43E       | B      | 40   | 45    | 5          | 90  | 5          |   |            | 0.2                                  | 33        |
| RD47E       | B      | 44   | 49    | 5          | 90  | 5          |   |            | 0.2                                  | 36        |
| RD51E       | B      | 48   | 54    | 5          | 110   | 5          |   |            | 0.2                                  | 39        |
| RD56E       | B      | 53   | 60    | 5          | 110   | 5          |   |            | 0.2                                  | 43        |
| RD62E       | B      | 58   | 66    | 2          | 200   | 2          |   |            | 0.2                                  | 47        |
| RD68E       | B      | 64   | 72    | 2          | 200   | 2          |   |            | 0.2                                  | 52        |
| RD75E       | B      | 70   | 79    | 2          | 300   | 2          |   |            | 0.2                                  | 57        |
| RD82E       | B      | 77   | 87    | 2          | 300   | 2          |   |            | 0.2                                  | 63        |
| RD91E       | B      | 85   | 96    | 2          | 400   | 2          |   |            | 0.2                                  | 69        |
| RD100E      | B      | 94   | 106   | 2          | 400   | 2          |   |            | 0.2                                  | 76        |
| RD110E      | B      | 104  | 116   | 1          | 750   | 1          |   |            | 0.2                                  | 84        |
| RD120E      | B      | 114  | 126   | 1          | 900   | 1          |   |            | 0.2                                  | 91        |
| RD130E      | B      | 120  | 140   | 1          | 1100  | 1          |   |            | 0.2                                  | 100       |
| RD140E      | B      | 130  | 150   | 1          | 1300  | 1          |   |            | 0.2                                  | 110       |
| RD150E      | B      | 140  | 160   | 1          | 1500  | 1          |   |            | 0.2                                  | 120       |
| RD160E      | B      | 150  | 170   | 1          | 1700  | 1          |   |            | 0.2                                  | 130       |
| RD170E      | B      | 160  | 180   | 1          | 1900  | 1          |   |            | 0.2                                  | 140       |
| RD180E      | B      | 170  | 190   | 1          | 2200  | 1          |   |            | 0.2                                  | 140       |
| RD190E      | B      | 180  | 200   | 1          | 2400  | 1          |   |            | 0.2                                  | 150       |
| RD200E      | B      | 190  | 210   | 1          | 2500  | 1          |   |            | 0.2                                  | 160       |

**Note** 1. tested with pulse (40 ms)

2.  $Z_Z$  and  $Z_{ZK}$  are measured at  $I_Z$  by given a very small A.C. current signal.

3. Suffix B is Suffix B1, B2, B3, B4, B5, B6 or B7.

TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Fig. 1 ZENER CURRENT vs. ZENER VOLTAGE

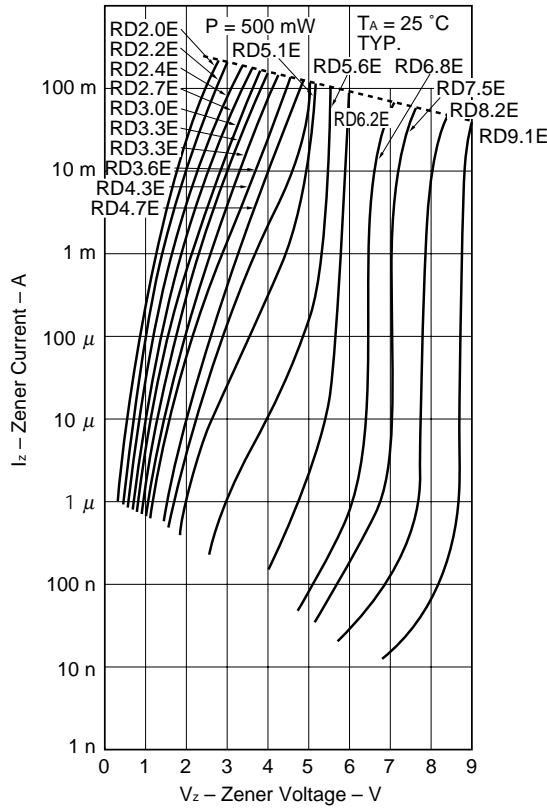


Fig. 2 ZENER CURRENT vs. ZENER VOLTAGE

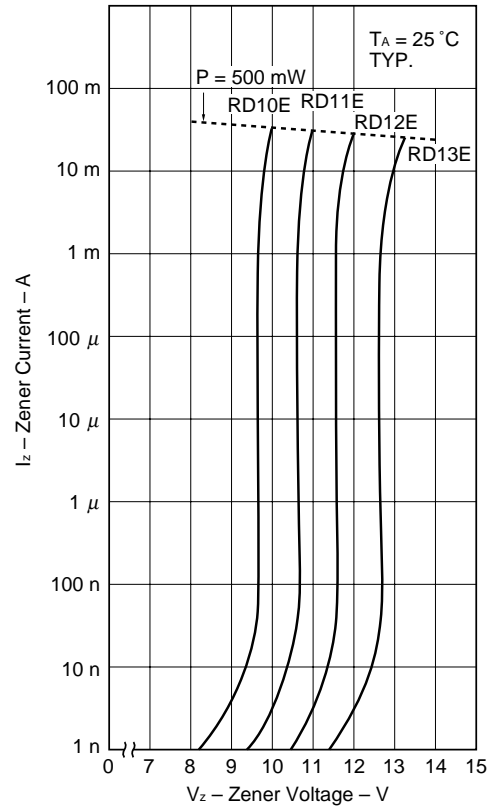


Fig. 3 ZENER CURRENT vs. ZENER VOLTAGE

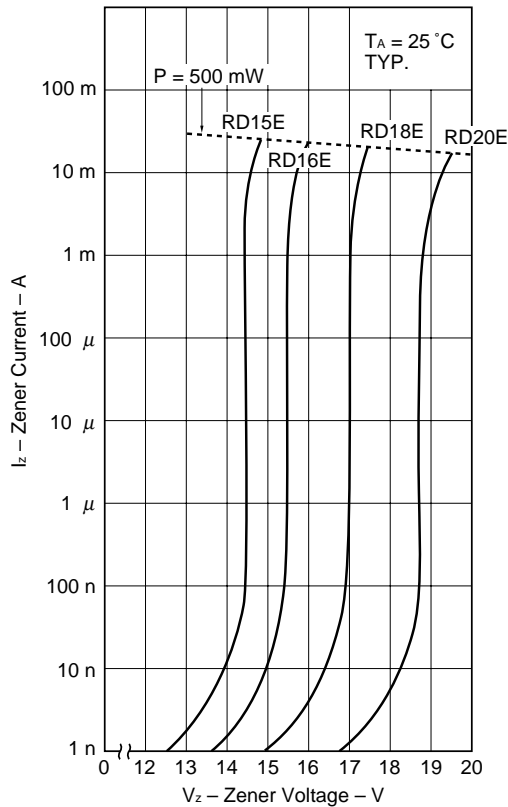
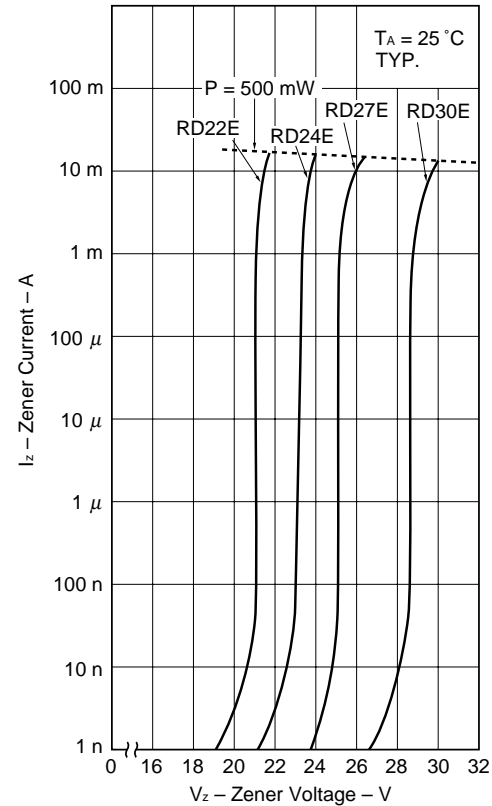
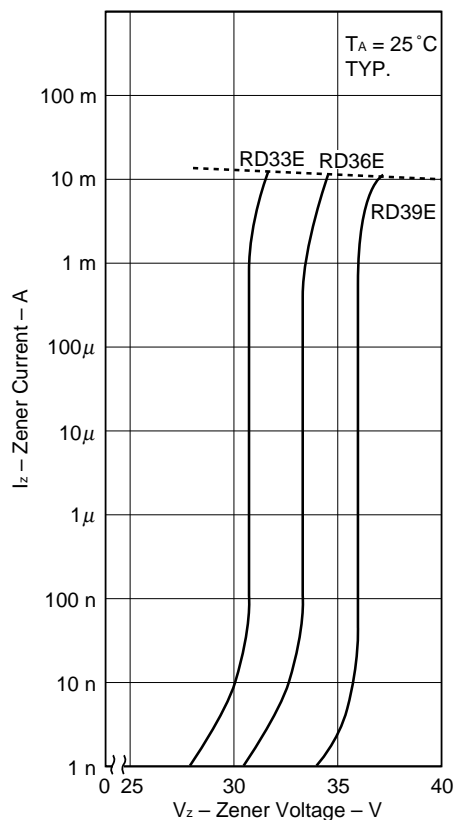


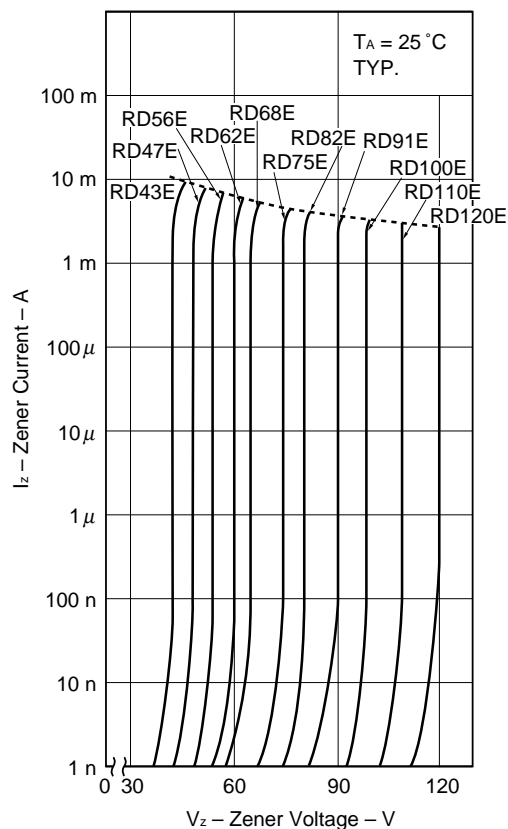
Fig. 4 ZENER CURRENT vs. ZENER VOLTAGE



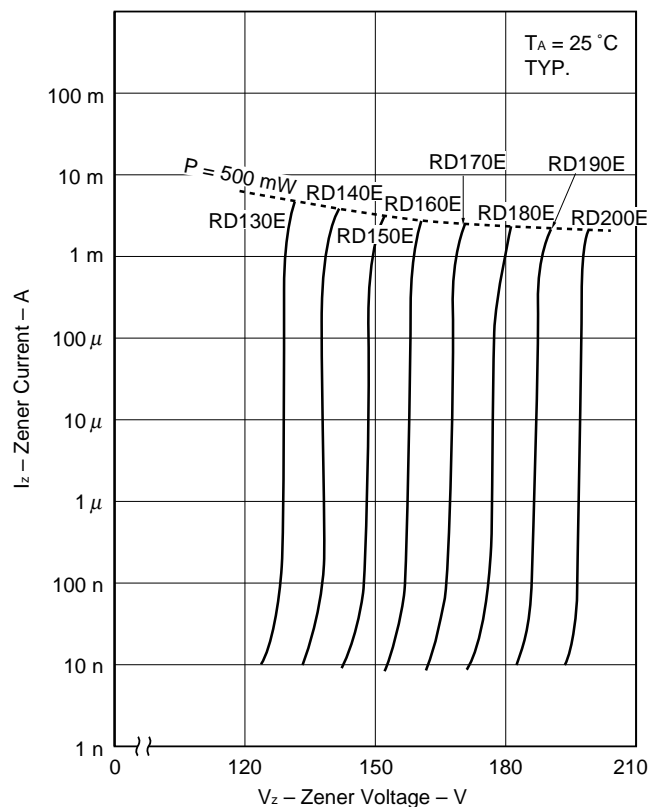
**Fig. 5 ZENER CURRENT vs.  
ZENER VOLTAGE**



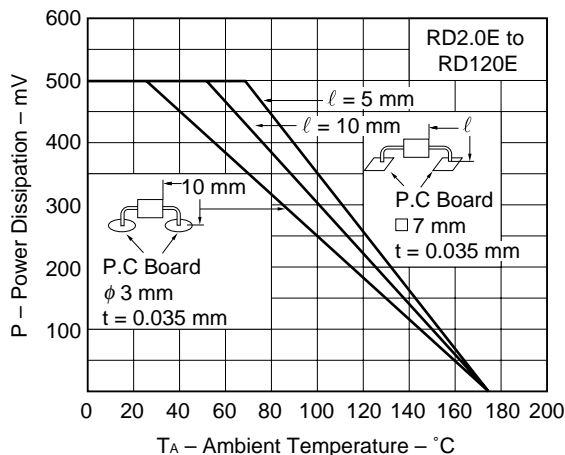
**Fig. 6 ZENER CURRENT vs.  
ZENER VOLTAGE**



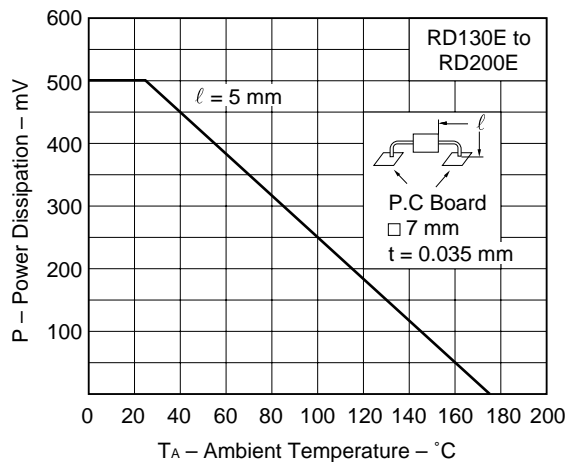
**Fig. 7 ZENER CURRENT vs.  
ZENER VOLTAGE**



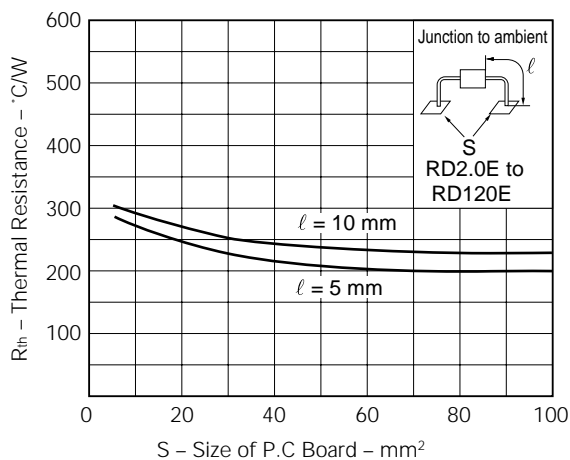
**Fig. 8 POWER DISSIPATION vs. AMBIENT TEMPERATURE**



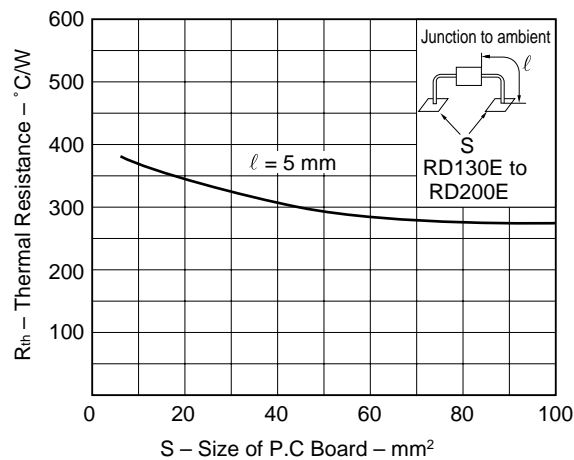
**Fig. 9 POWER DISSIPATION vs. AMBIENT TEMPERATURE**



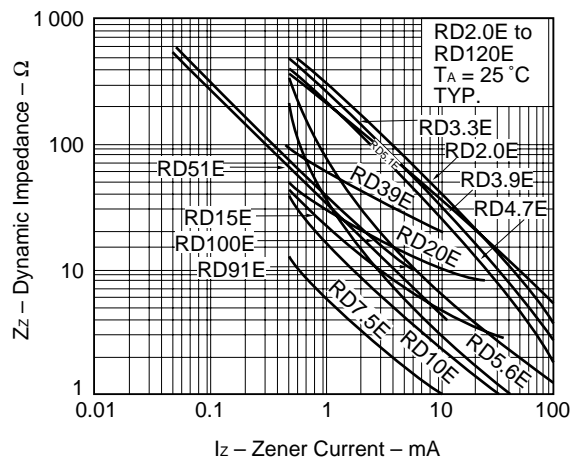
**Fig. 10 THERMAL RESISTANCE vs. SIZE OF P.C BOARD**



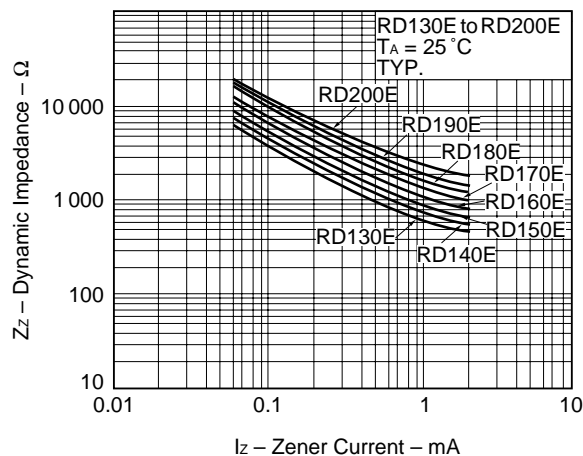
**Fig. 11 THERMAL RESISTANCE vs. SIZE OF P.C BOARD**



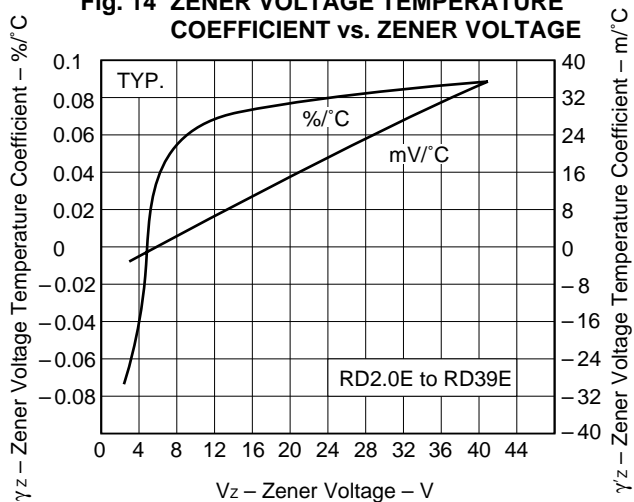
**Fig. 12 DYNAMIC IMPEDANCE vs. ZENER CURRENT**



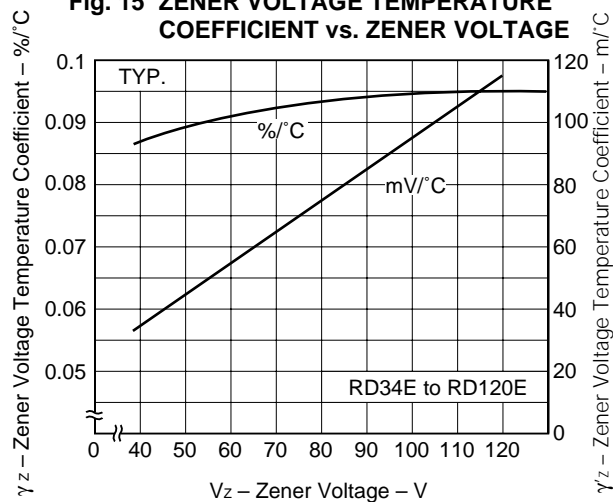
**Fig. 13 DYNAMIC IMPEDANCE vs. ZENER CURRENT**



**Fig. 14 ZENER VOLTAGE TEMPERATURE COEFFICIENT vs. ZENER VOLTAGE**



**Fig. 15 ZENER VOLTAGE TEMPERATURE COEFFICIENT vs. ZENER VOLTAGE**



**Fig. 16 ZENER VOLTAGE TEMPERATURE COEFFICIENT vs. ZENER VOLTAGE**

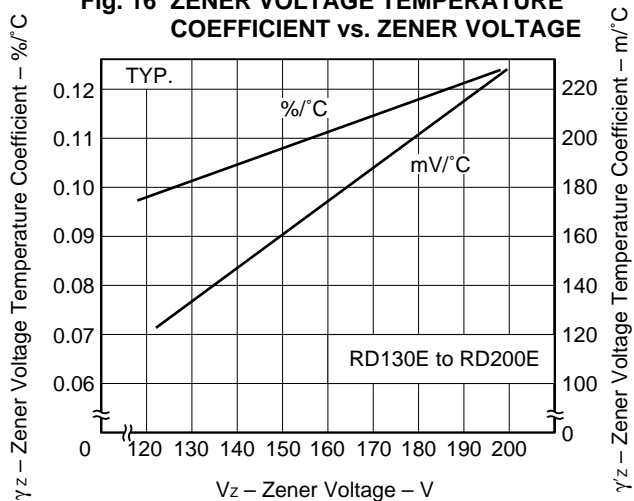
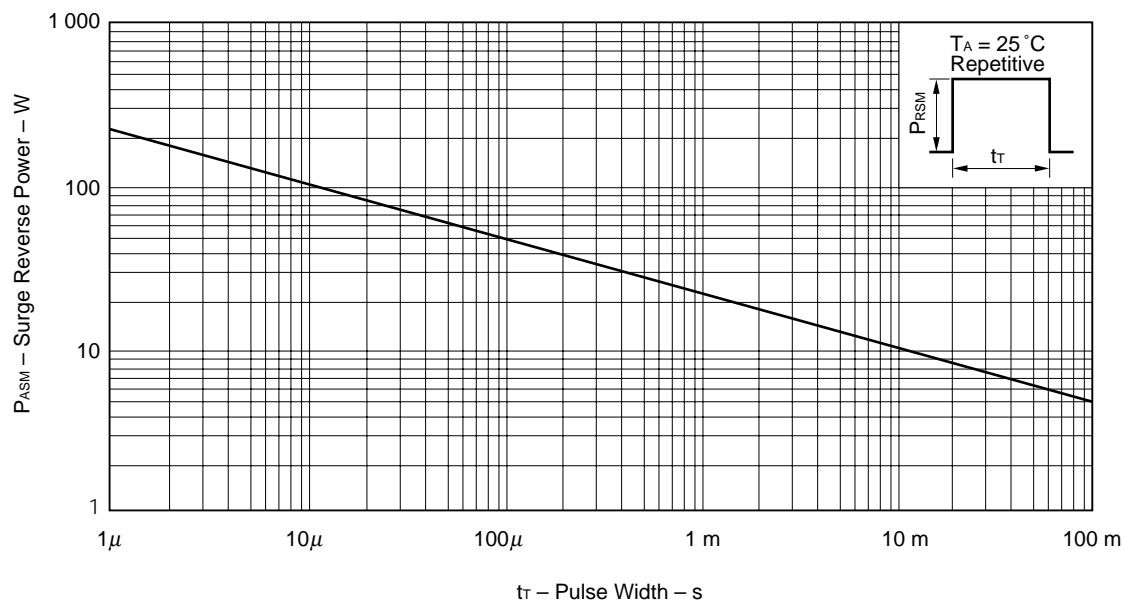




Fig. 17 SURGE REVERSE POWER RATINGS



### GENERAL PURPOSE INFORMATION

- Power Dissipation

Total power dissipation  $P$  can be calculated by the maximum junction temperature, ambient temperature and thermal resistance.

$$P = \frac{T_{jMAX.} - T_A}{R_{th}}$$

$T_{jMAX.}$  : Maximum Junction Temperature

$T_A$  : Ambient Temperature

$R_{th}$  : Thermal Resistance (to see Fig. 10, 11)

[MEMO]

[MEMO]

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Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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