

## ZENER DIODES

# RD2.0E to RD120E

### 500 mW PLANAR TYPE SILICON ZENER DIODES

The RD2.0E to RD120E are zener diodes with an allowable dissipation of 500 mW and a planar type glass sealed DHD (double heatsink diode) structure.

#### FEATURES

- The zener voltage series has a wide voltage range of 2 V to 120 V and is ideal for standardization.
- The E24 series is employed for the zener voltage nominal value.

#### ORDERING INFORMATION

Any of the B1 to B7 voltage classifications are available for customers who request the B grade product of the RD2.0E to RD39E.

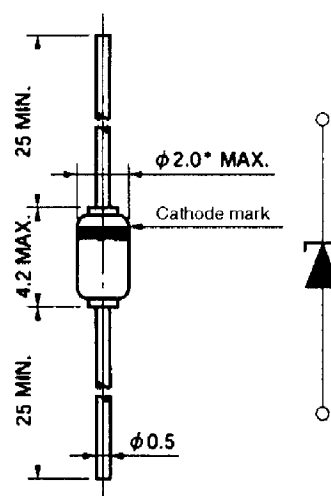
#### APPLICATIONS

- Zener voltage and constant-current circuit
- Waveform clipper circuit and limiter circuit
- Surge absorption circuit

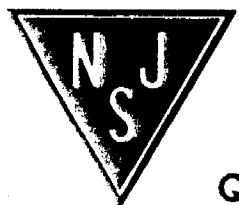
#### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

| Parameter            | Symbol    | Ratings                       | Unit             | Remarks            |
|----------------------|-----------|-------------------------------|------------------|--------------------|
| Power dissipation    | P         | 500                           | mW               |                    |
| Junction temperature | $T_j$     | 175                           | $^\circ\text{C}$ |                    |
| Forward current      | $I_F$     | 200                           | mA               |                    |
| Storage temperature  | $T_{stg}$ | -65 to +175                   | $^\circ\text{C}$ |                    |
| Surge reverse power  | $P_{RSM}$ | 100 ( $t = 100 \mu\text{s}$ ) | W                | Refer to Figure 6. |

#### PACKAGE DRAWING (UNIT: mm)



Marking color: Black  
JEDEC: DO-35



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### ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| Type Number | Suffix | Zener Voltage Vz (V) <sup>Note 1</sup> |      |         | Dynamic Impedance Zz (Ω) <sup>Note 2</sup> |         | Knee Dynamic Impedance Zzk (Ω) <sup>Note 2</sup> |         | Reverse Current Ir (μA) |         | Zener Voltage Temperature Coefficient γz (mV/°C) |         |
|-------------|--------|----------------------------------------|------|---------|--------------------------------------------|---------|--------------------------------------------------|---------|-------------------------|---------|--------------------------------------------------|---------|
|             |        | MIN.                                   | MAX. | Iz (mA) | MAX.                                       | Iz (mA) | MAX.                                             | Iz (mA) | MAX.                    | Iz (mA) | MAX.                                             | Iz (mA) |
| RD2.0E      | B      | 1.88                                   | 2.20 | 20      | 140                                        | 20      | 2000                                             | 1       | 120                     | 0.5     | -1.0                                             | 20      |
|             | B1     | 1.88                                   | 2.10 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 2.02                                   | 2.20 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD2.2E      | B      | 2.12                                   | 2.41 | 20      | 120                                        | 20      | 2000                                             | 1       | 120                     | 0.7     | -1.5                                             | 20      |
|             | B1     | 2.12                                   | 2.30 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 2.22                                   | 2.41 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD2.4E      | B      | 2.33                                   | 2.63 | 20      | 100                                        | 20      | 2000                                             | 1       | 120                     | 1.0     | -1.5                                             | 20      |
|             | B1     | 2.33                                   | 2.52 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 2.43                                   | 2.63 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD2.7E      | B      | 2.54                                   | 2.91 | 20      | 100                                        | 20      | 1000                                             | 1       | 100                     | 1.0     | -1.5                                             | 20      |
|             | B1     | 2.54                                   | 2.75 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 2.69                                   | 2.91 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD3.0E      | B      | 2.85                                   | 3.22 | 20      | 80                                         | 20      | 1000                                             | 1       | 50                      | 1.0     | -2.0                                             | 20      |
|             | B1     | 2.85                                   | 3.07 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 3.01                                   | 3.22 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD3.3E      | B      | 3.16                                   | 3.53 | 20      | 70                                         | 20      | 1000                                             | 1       | 20                      | 1.0     | -2.0                                             | 20      |
|             | B1     | 3.16                                   | 3.38 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 3.32                                   | 3.53 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD3.6E      | B      | 3.47                                   | 3.83 | 20      | 60                                         | 20      | 1000                                             | 1       | 10                      | 1.0     | -2.0                                             | 20      |
|             | B1     | 3.47                                   | 3.68 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 3.62                                   | 3.83 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD3.9E      | B      | 3.77                                   | 4.14 | 20      | 50                                         | 20      | 1000                                             | 1       | 5                       | 1.0     | -2.0                                             | 20      |
|             | B1     | 3.77                                   | 3.98 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 3.92                                   | 4.14 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD4.3E      | B      | 4.05                                   | 4.53 | 20      | 40                                         | 20      | 1000                                             | 1       | 5                       | 1.0     | -1.5                                             | 20      |
|             | 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     | -1.0                                             | 20      |
|             | 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     | 0.5                                              | 20      |
|             | 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     | 1.5                                              | 20      |
|             | 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     | 2.0                                              | 20      |
|             | B1     | 5.81                                   | 6.06 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 5.99                                   | 6.24 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 6.16                                   | 6.40 |         |                                            |         |                                                  |         |                         |         |                                                  |         |

| Type Number | Suffix | Zener Voltage Vz (V) <sup>Note 1</sup> |       |         | Dynamic Impedance Zz (Ω) <sup>Note 2</sup> |         | Knee dynamic Impedance Zzk (Ω) <sup>Note 2</sup> |         | Reverse Current IR (μA) |         | Zener Voltage Temperature Coefficient γz (mV/°C) |         |
|-------------|--------|----------------------------------------|-------|---------|--------------------------------------------|---------|--------------------------------------------------|---------|-------------------------|---------|--------------------------------------------------|---------|
|             |        | MIN.                                   | MAX.  | Iz (mA) | MAX.                                       | Iz (mA) | MAX.                                             | Iz (mA) | MAX.                    | Iz (mA) | MAX.                                             | Iz (mA) |
| RD20E       | B      | 18.11                                  | 20.72 | 10      | 28                                         | 10      | 200                                              | 0.5     | 0.2                     | 15      | 15                                               | 10      |
|             | 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      | 17                                               | 5       |
|             | B1     | 20.23                                  | 21.08 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 20.76                                  | 21.65 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 21.22                                  | 22.09 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B4     | 21.68                                  | 22.61 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD24E       | B      | 22.26                                  | 24.81 | 5       | 35                                         | 5       | 200                                              | 0.5     | 0.2                     | 19      | 19                                               | 5       |
|             | B1     | 22.26                                  | 23.12 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 22.75                                  | 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      | 21                                               | 5       |
|             | 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      | 24                                               | 5       |
|             | 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      | 26                                               | 5       |
|             | 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      | 29                                               | 5       |
|             | B1     | 32.14                                  | 33.79 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 32.79                                  | 34.49 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 33.40                                  | 35.13 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B4     | 34.01                                  | 35.77 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| R39E        | B      | 34.68                                  | 40.80 | 5       | 85                                         | 5       | 250                                              | 0.5     | 0.2                     | 30      | 32                                               | 5       |
|             | 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 |         |                                            |         |                                                  |         |                         |         |                                                  |         |

**Notes** 1. The zener voltage (Vz) of the B and B1 to B7 grades is tested for 40 ms after power ON.

2. The operation resistance (Zz, Zzk) is tested by superimposing a micro AC on the standard current (Iz).

3. The B grade is a composition of the B1 to B7 grades. Any of the B1 to B7 voltage classifications are available for customers who request the B grade product.

| Type Number | Suffix | Zener Voltage Vz (V) <sup>Note 1</sup> |       |         | Dynamic Impedance Zz (Ω) <sup>Note 2</sup> |         | Knee Dynamic Impedance Zzk (Ω) <sup>Note 2</sup> |         | Reverse Current Ir (μA) |         | Zener Voltage Temperature Coefficient γz (mV/°C) |         |
|-------------|--------|----------------------------------------|-------|---------|--------------------------------------------|---------|--------------------------------------------------|---------|-------------------------|---------|--------------------------------------------------|---------|
|             |        | MIN.                                   | MAX.  | Iz (mA) | MAX.                                       | Iz (mA) | MAX.                                             | Iz (mA) | MAX.                    | Iz (mA) | MAX.                                             | Iz (mA) |
| RD6.8E      | B      | 6.32                                   | 6.97  | 20      | 8                                          | 20      | 150                                              | 0.5     | 2                       | 3.5     | 2.5                                              | 20      |
|             | B1     | 6.32                                   | 6.59  |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 6.52                                   | 6.79  |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 6.70                                   | 6.97  |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD7.5E      | B      | 6.88                                   | 7.64  | 20      | 8                                          | 20      | 120                                              | 0.5     | 0.5                     | 4.0     | 3.0                                              | 20      |
|             | 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     | 4.0                                              | 20      |
|             | 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     | 4.5                                              | 20      |
|             | 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     | 5.5                                              | 20      |
|             | 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     | 6.5                                              | 10      |
|             | B1     | 10.18                                  | 10.63 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 10.50                                  | 10.95 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 10.82                                  | 11.26 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD12E       | B      | 11.13                                  | 12.30 | 10      | 12                                         | 10      | 110                                              | 0.5     | 0.2                     | 9.0     | 7.5                                              | 10      |
|             | 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      | 8.5                                              | 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      | 10                                               | 10      |
|             | 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      | 11                                               | 10      |
|             | B1     | 14.87                                  | 15.50 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 15.33                                  | 15.93 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 15.79                                  | 16.50 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
| RD18E       | B      | 16.34                                  | 18.30 | 10      | 23                                         | 10      | 150                                              | 0.5     | 0.2                     | 13      | 13                                               | 10      |
|             | B1     | 16.34                                  | 17.06 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B2     | 16.90                                  | 17.67 |         |                                            |         |                                                  |         |                         |         |                                                  |         |
|             | B3     | 17.51                                  | 18.30 |         |                                            |         |                                                  |         |                         |         |                                                  |         |

| 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> |                     | Reverse Current<br>I <sub>R</sub> (μA) |                     | Zener Voltage<br>Temperature<br>Coefficient<br>γ <sub>z</sub> (mV/°C) |                     |
|-------------|--------|-------------------------------------------------------|------|---------------------|-----------------------------------------------------------|---------------------|----------------------------------------|---------------------|-----------------------------------------------------------------------|---------------------|
|             |        | MIN.                                                  | MAX. | I <sub>z</sub> (mA) | MAX.                                                      | I <sub>z</sub> (mA) | MAX.                                   | I <sub>z</sub> (mA) | MAX.                                                                  | I <sub>z</sub> (mA) |
| RD43E       | B      | 40                                                    | 45   | 5                   | 90                                                        | 5                   | 0.2                                    | 33                  | 37                                                                    | 5                   |
| RD47E       | B      | 44                                                    | 49   | 5                   | 90                                                        | 5                   | 0.2                                    | 36                  | 41                                                                    | 5                   |
| RD51E       | B      | 48                                                    | 54   | 5                   | 110                                                       | 5                   | 0.2                                    | 39                  | 45                                                                    | 5                   |
| RD56E       | B      | 53                                                    | 60   | 5                   | 110                                                       | 5                   | 0.2                                    | 43                  | 51                                                                    | 5                   |
| RD62E       | B      | 58                                                    | 66   | 2                   | 200                                                       | 2                   | 0.2                                    | 47                  | 56                                                                    | 2                   |
| RD68E       | B      | 64                                                    | 72   | 2                   | 200                                                       | 2                   | 0.2                                    | 52                  | 62                                                                    | 2                   |
| RD75E       | B      | 70                                                    | 79   | 2                   | 300                                                       | 2                   | 0.2                                    | 57                  | 69                                                                    | 2                   |
| RD82E       | B      | 77                                                    | 87   | 2                   | 300                                                       | 2                   | 0.2                                    | 63                  | 76                                                                    | 2                   |
| RD91E       | B      | 85                                                    | 96   | 2                   | 400                                                       | 2                   | 0.2                                    | 69                  | 85                                                                    | 2                   |
| RD100E      | B      | 94                                                    | 106  | 2                   | 400                                                       | 2                   | 0.2                                    | 76                  | 95                                                                    | 2                   |
| RD110E      | B      | 104                                                   | 116  | 1                   | 750                                                       | 1                   | 0.2                                    | 84                  | 105                                                                   | 1                   |
| RD120E      | B      | 114                                                   | 126  | 1                   | 900                                                       | 1                   | 0.2                                    | 91                  | 115                                                                   | 1                   |

**Notes** 1. The zener voltage (V<sub>z</sub>) is tested for 40 ms after power ON.

2. The operation resistance (Z<sub>z</sub>) is tested by superimposing a micro AC on the standard current (I<sub>z</sub>).