

TOSHIBA Zener Diode Silicon Epitaxial Planar Type

## CUZ Series

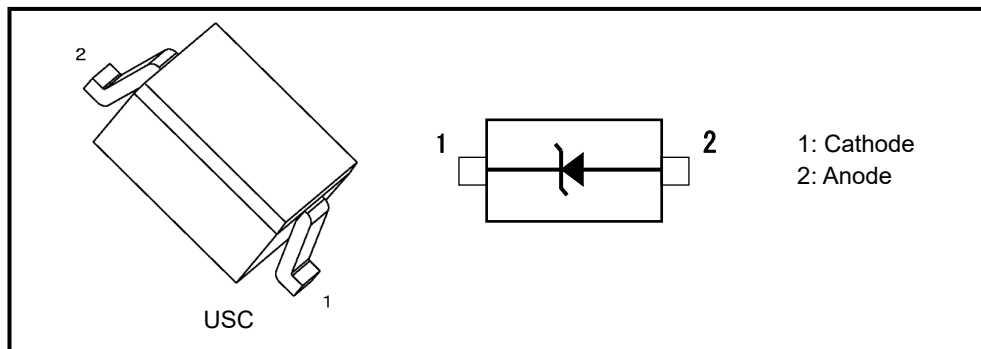
### Applications

Voltage surge protection

### Features

- Small package
- The typical voltage of VZ is accorded to E24 series

### Packaging and Internal Circuit



### Absolute Maximum Ratings 1 (Note) (Unless otherwise specified, Ta = 25°C)

| Characteristics      | Symbol     | Rating     | Unit |
|----------------------|------------|------------|------|
| Power dissipation    | $P_D^{*1}$ | 200        | mW   |
|                      | $P_D^{*2}$ | 600        | mW   |
| Junction temperature | $T_j$      | 150        | °C   |
| Storage temperature  | $T_{stg}$  | -55 to 150 | °C   |

### Absolute Maximum Ratings 2 (Note) (Unless otherwise specified, Ta = 25°C)

| Type No. | Electrostatic discharge voltage <sup>*3</sup> |     | Peak pulse power <sup>*4</sup> | Maximum peak pulse current <sup>*4</sup> | Type No. | Electrostatic discharge voltage <sup>*3</sup> |     | Peak pulse power <sup>*4</sup> | Maximum peak pulse current <sup>*4</sup> |
|----------|---|-----|--------------------------------|--|----------|---|-----|--------------------------------|--|
|          | Contact                                       | Air |                                |  |          | Contact                                       | Air |                                |  |
|          | $V_{ESD}(kV)$                                 |     |                                |  |          | $V_{ESD}(kV)$                                 |     |                                |  |
| CUZ5V6   | ± 30  |     | 155                            | 12                                       | CUZ16V   | ± 30  |     | 200                            | 5.5                                      |
| CUZ6V2   | ± 30  |     | 175                            | 11                                       | CUZ20V   | ± 30  |     | 200                            | 5  |
| CUZ6V8   | ± 30  |     | 180                            | 10                                       | CUZ24V   | ± 30  |     | 200                            | 4.5                                      |
| CUZ8V2   | ± 30  |     | 200                            | 8.5                                      | CUZ30V   | ± 20  |     | 200                            | 4  |
| CUZ12V   | ± 30  |     | 200                            | 7  | CUZ36V   | ± 12  |     | 200                            | 3  |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

\*1: Mounted on a glass epoxy circuit board of 20 mm × 20 mm, pad dimensions of 4 mm × 4 mm.

\*2: Mounted on a glass epoxy circuit board of 25.4 mm × 25.4 mm × 1.6 mm, Cu pad: 645 mm<sup>2</sup>

\*3: according to IEC61000-4-2

\*4: according to IEC61000-4-5, tp = 8 / 20 μs

Start of commercial production  
2020-07

### CUZ series Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Type No. | Zener Voltage |      |      |                           | Dynamic Impedance    |                           | Dynamic resistance<br>$R_{DYN}(\Omega)^{*1}$ | Clamp voltage<br>$V_C(V)^{*1*2}$ | Total capacitance<br>$C_t(pF)^{*3}$ | Reverse Current     |                          |
|----------|---------------|------|------|---------------------------|----------------------|---------------------------|--|----------------------------------|-------------------------------------|---------------------|--------------------------|
|          | $V_Z(V)$      |      |      | Test Current<br>$I_Z(mA)$ | $Z_Z(\Omega)$<br>Max | Test Current<br>$I_Z(mA)$ |  |                                  |                                     | $I_R(\mu A)$<br>Max | Test Voltage<br>$V_R(V)$ |
|          | Min           | Typ. | Max  |                           |                      |                           |  |                                  |                                     |                     |                          |
| CUZ5V6   | 5.3           | 5.6  | 6.0  | 5                         | 30                   | 5                         | 0.16   | 9                                | 125                                 | 1                   | 3.5                      |
| CUZ6V2   | 5.8           | 6.2  | 6.6  | 5                         | 30                   | 5                         | 0.21   | 10                               | 105                                 | 2.5                 | 5.0                      |
| CUZ6V8   | 6.4           | 6.8  | 7.2  | 5                         | 30                   | 5                         | 0.27   | 13                               | 88                                  | 1.5                 | 5.5                      |
| CUZ8V2   | 7.7           | 8.2  | 8.7  | 5                         | 30                   | 5                         | 0.37   | 16.5                             | 67                                  | 0.1                 | 7                        |
| CUZ12V   | 11.4          | 12   | 12.6 | 5                         | 30                   | 5                         | 0.7  | 26                               | 44                                  | 0.1                 | 10                       |
| CUZ16V   | 15.3          | 16   | 17.1 | 5                         | 35                   | 5                         | 0.5  | 27                               | 35                                  | 0.1                 | 14                       |
| CUZ20V   | 18.8          | 20   | 21.2 | 5                         | 70                   | 5                         | 0.35   | 30.5                             | 29                                  | 0.1                 | 17.6                     |
| CUZ24V   | 22.8          | 24   | 25.6 | 5                         | 70                   | 5                         | 0.6  | 36.5                             | 26                                  | 0.1                 | 19                       |
| CUZ30V   | 28.0          | 30   | 32.0 | 2                         | 100                  | 2                         | 1.25   | 47.5                             | 21                                  | 0.1                 | 27                       |
| CUZ36V   | 34.0          | 36   | 38.0 | 2                         | 100                  | 2                         | 2.6  | 63                               | 18                                  | 0.1                 | 32.5                     |

\*1: TLP parameters:  $Z_0 = 50\ \Omega$ ,  $t_p = 100\text{ ns}$ ,  $t_r = 300\text{ ps}$ , averaging window:  $t_1 = 30\text{ ns}$  to  $t_2 = 60\text{ ns}$ ,

extraction of dynamic resistance using least squares fit of TLP characteristics between  $I_{TLP1} = 16\text{ A}$  and  $I_{TLP2} = 30\text{ A}$ .

\*2:  $I_{TLP} = 16\text{ A}$

\*3:  $V_R = 0\text{ V}$ ,  $f = 1\text{ MHz}$

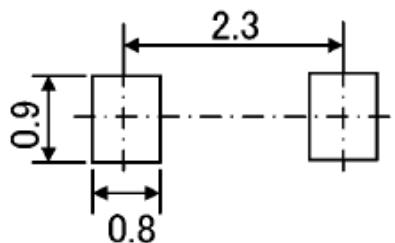
### Marking List

| Type No. | Marking | Type No. | Marking |
|----------|---------|----------|---------|
| CUZ5V6   | LL      | CUZ16V   | M7      |
| CUZ6V2   | LM      | CUZ20V   | M9      |
| CUZ6V8   | LN      | CUZ24V   | MB      |
| CUZ8V2   | LQ      | CUZ30V   | MD      |
| CUZ12V   | M4      | CUZ36V   | MF      |

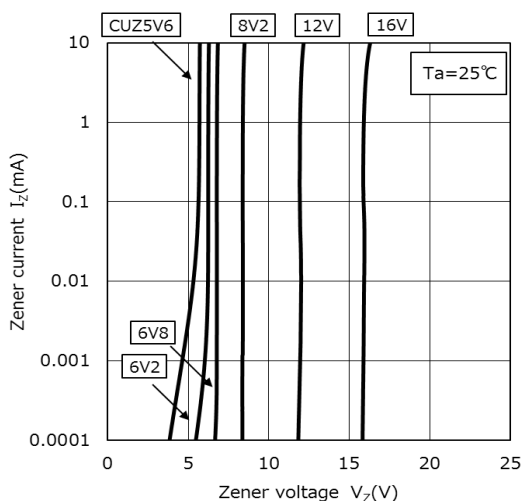
### Marking (CUZ5V6)



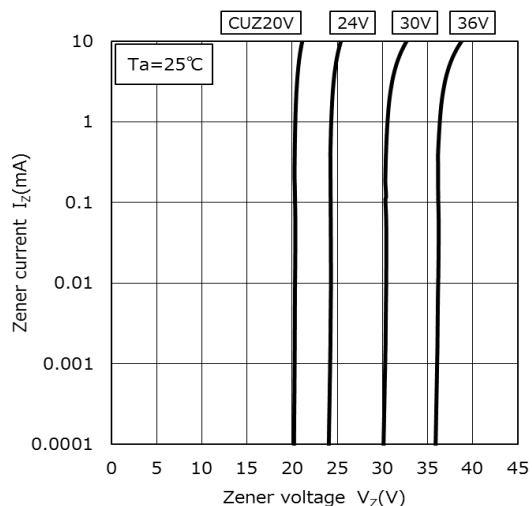
### Land Pattern Dimensions (for reference only) (Unit: mm)



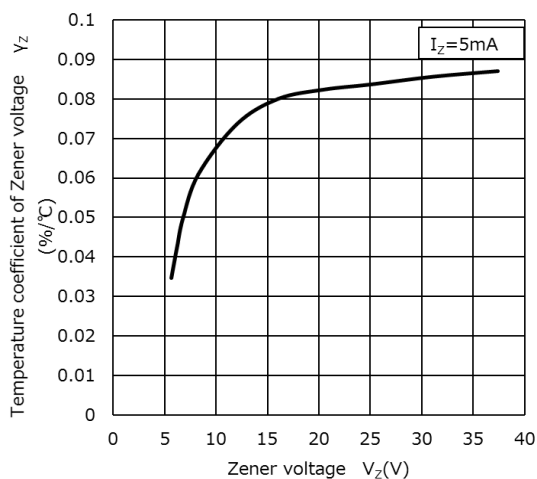
### CUZ series Characteristics Curves (Note)



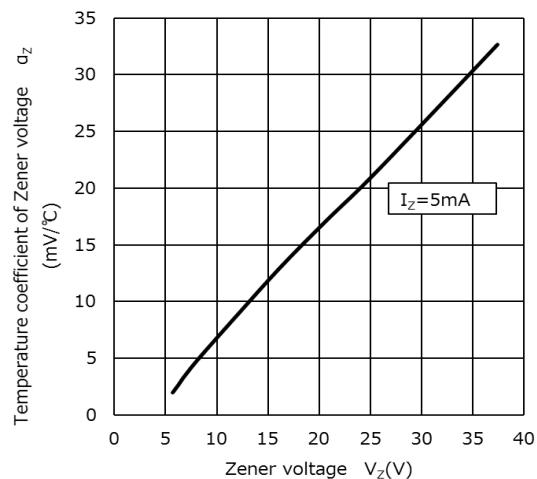
$I_z - V_z$  (1)



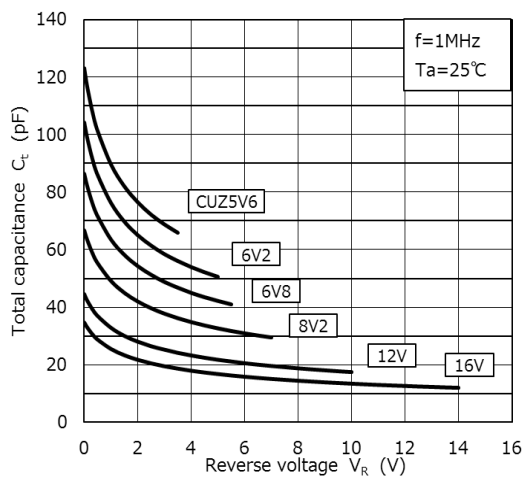
$I_z - V_z$  (2)



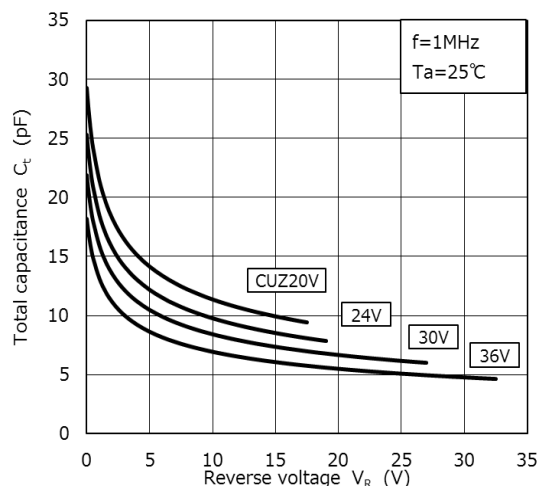
$\gamma_Z - V_Z$



$\alpha_Z - V_Z$



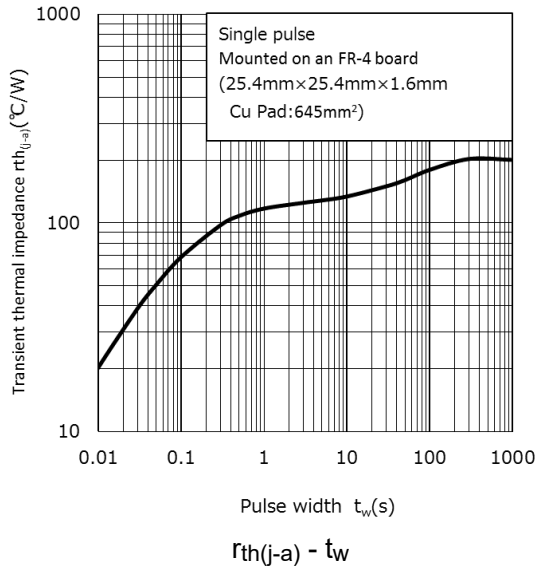
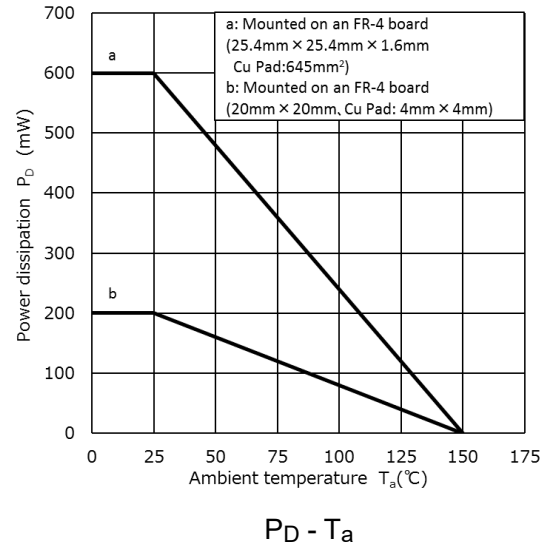
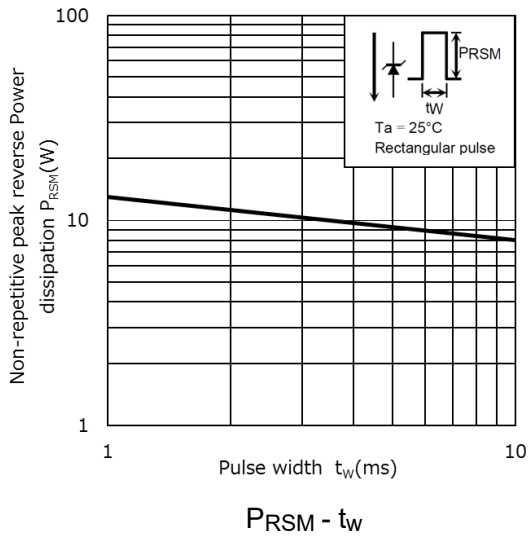
$C_t - V_R$  (1)



$C_t - V_R$  (2)

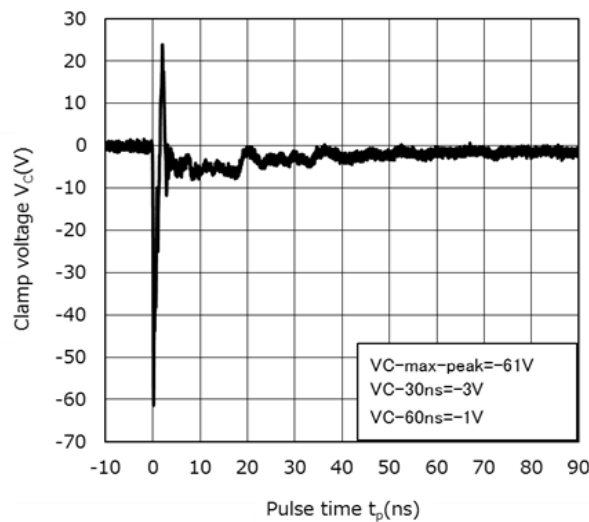
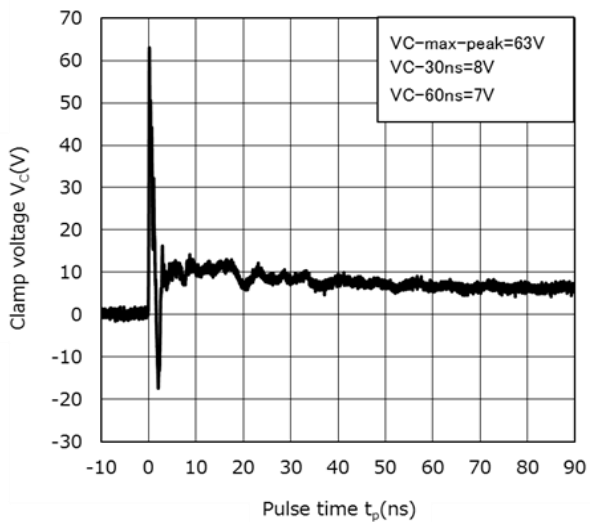
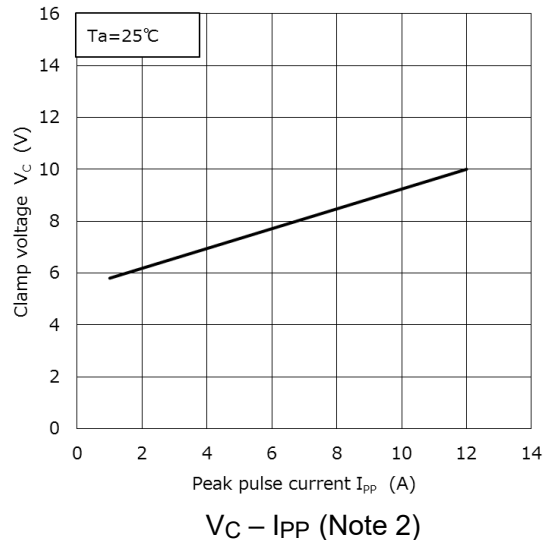
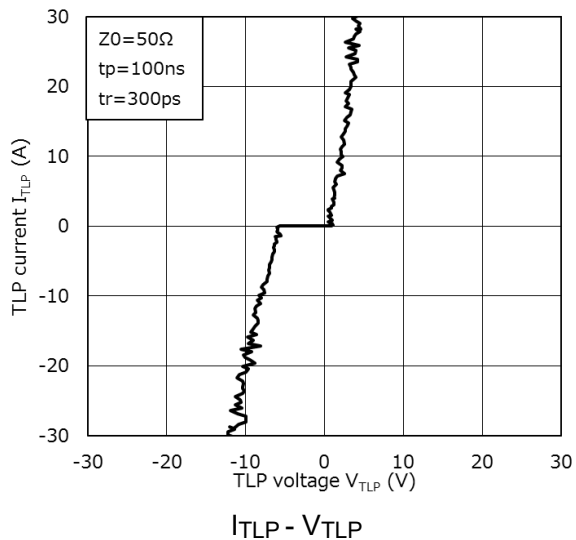
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

### CUZ series Characteristics Curves (Note)



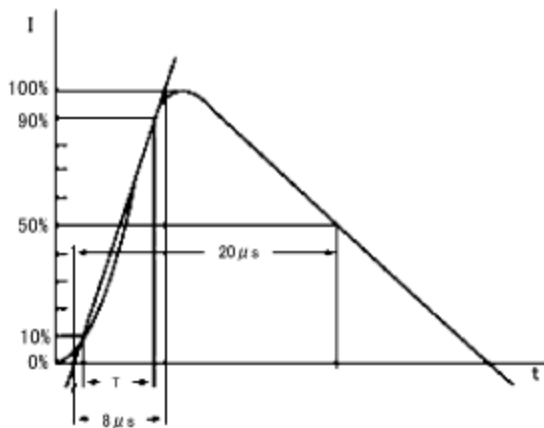
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

### CUZ5V6 Characteristics Curves (Note 1)

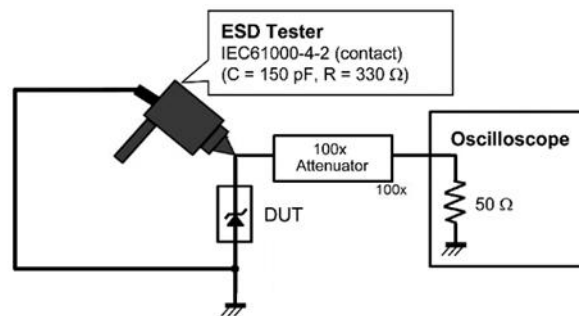


### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )

### (Note 3) Clamp waveform measurement circuit



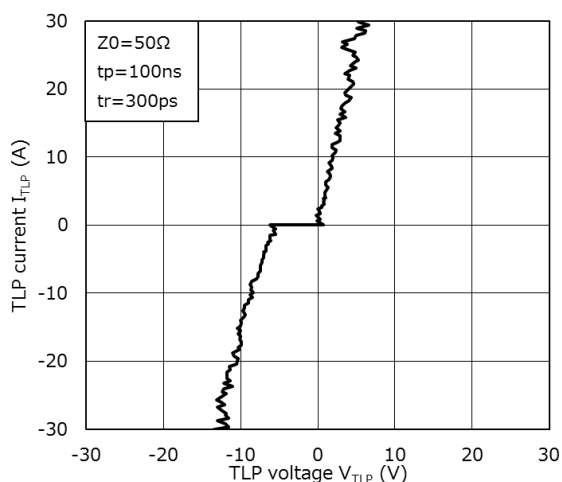
Based on IEC61000-4-5 8/20  $\mu$ s pulse.



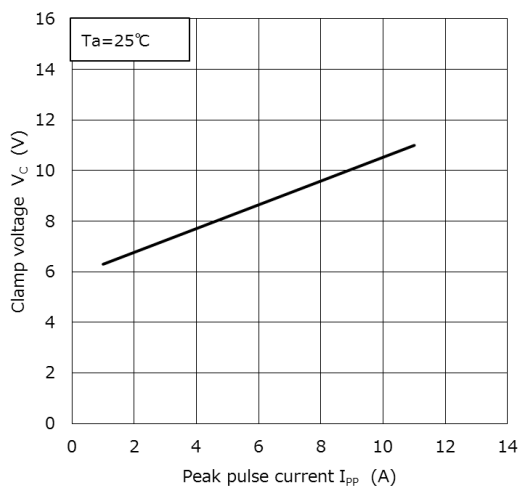
IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

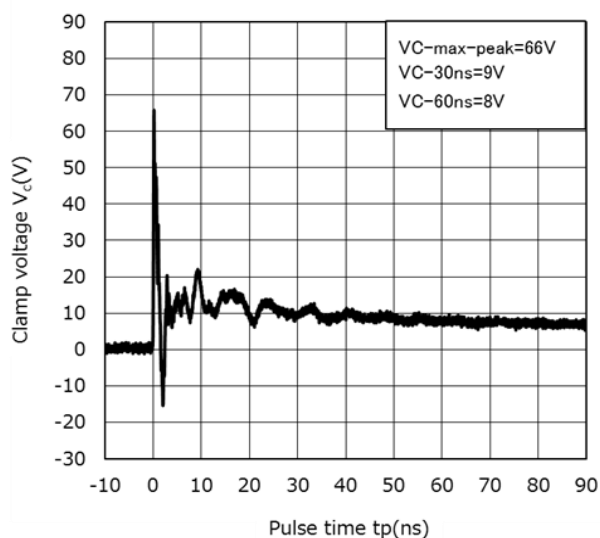
### CUZ6V2 Characteristics Curves (Note 1)



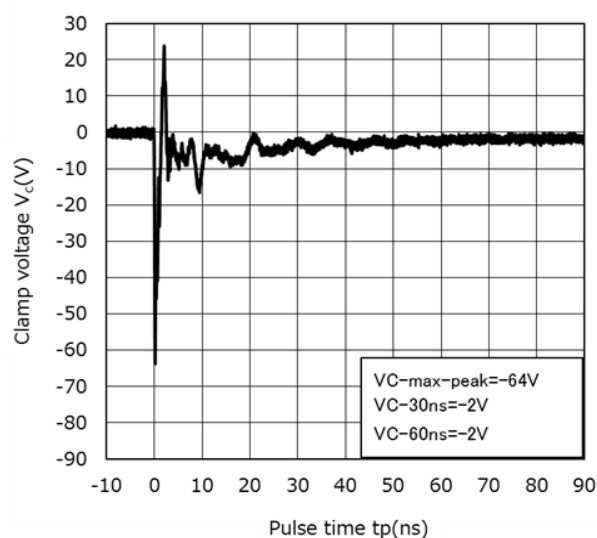
$I_{TLP} - V_{TLP}$



$V_C - I_{PP}$  (Note 2)



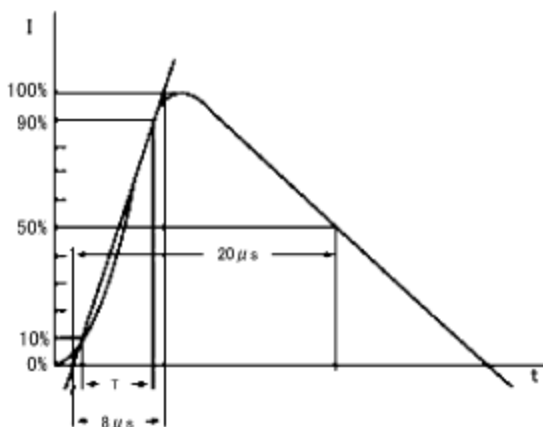
Clamp Waveform +8 kV (Note 3)



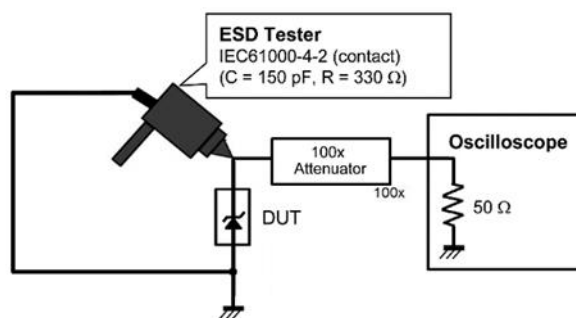
Clamp Waveform -8 kV (Note 3)

#### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )

#### (Note 3) Clamp waveform measurement circuit



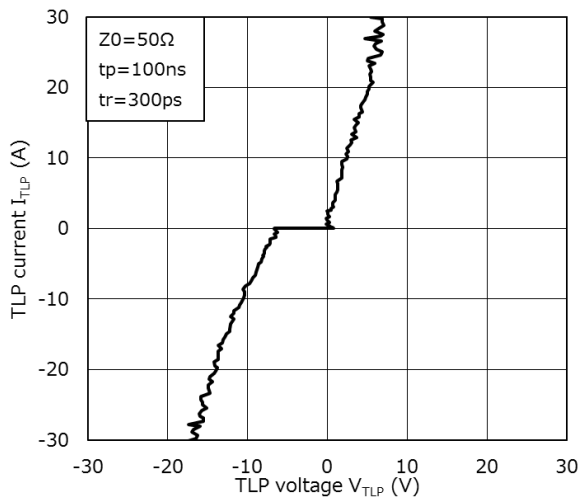
Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.



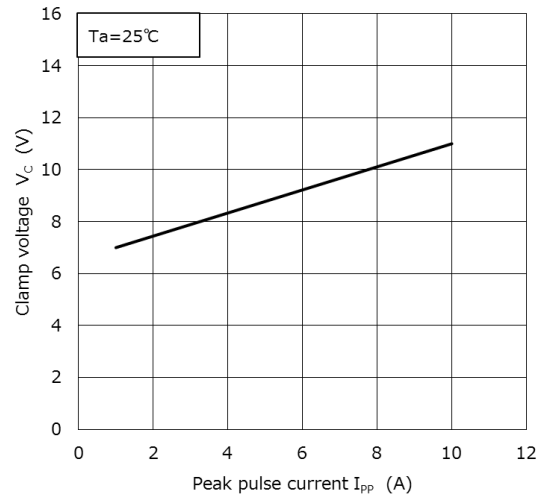
IEC61000-4-2 (Contact)

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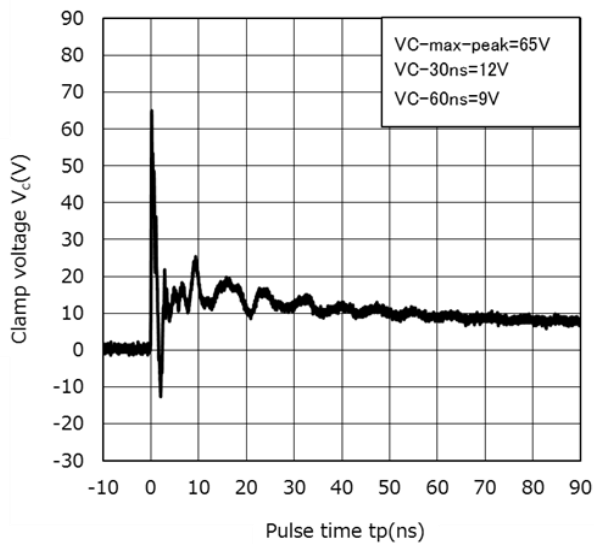
### CUZ6V8 Characteristics Curves (Note 1)



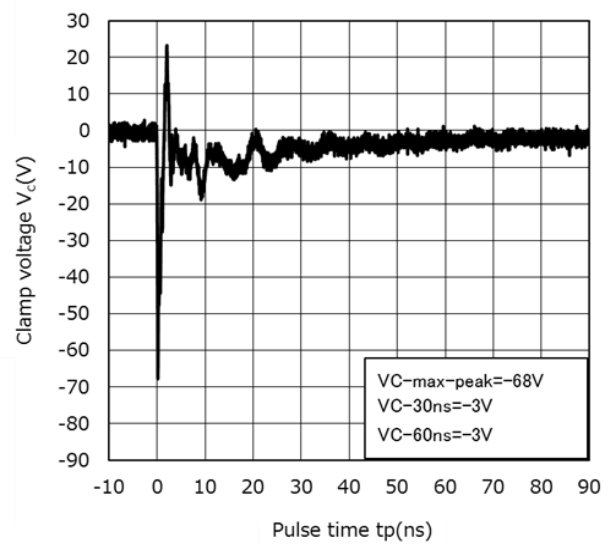
$I_{TLP} - V_{TLP}$



$V_C - I_{PP}$  (Note 2)

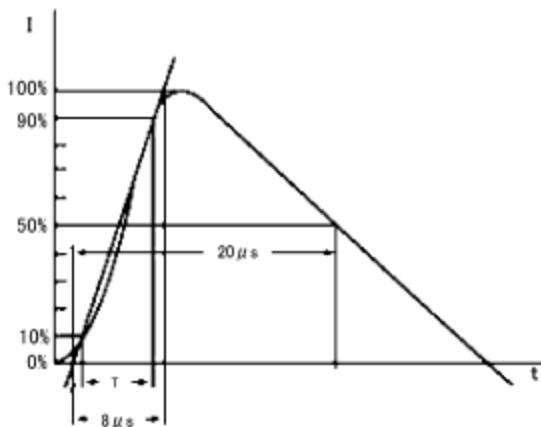


Clamp Waveform +8 kV (Note 3)



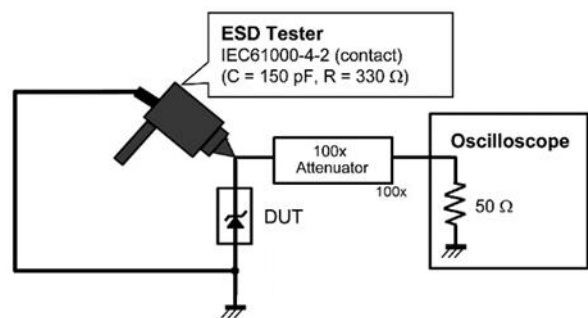
Clamp Waveform -8 kV (Note 3)

### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )



Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.

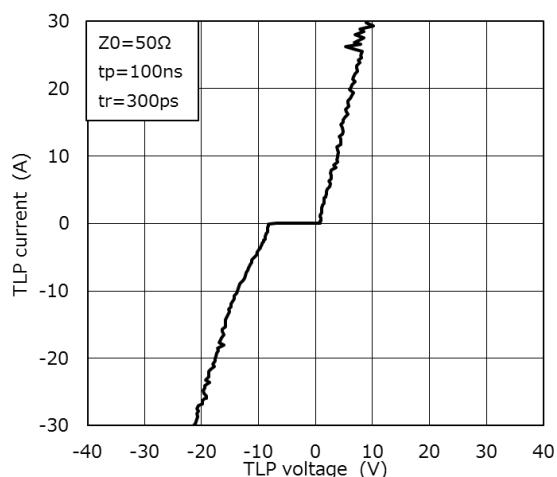
### (Note 3) Clamp waveform measurement circuit



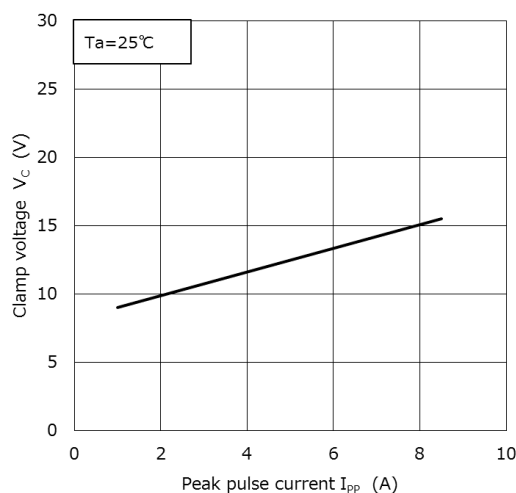
IEC61000-4-2 (Contact)

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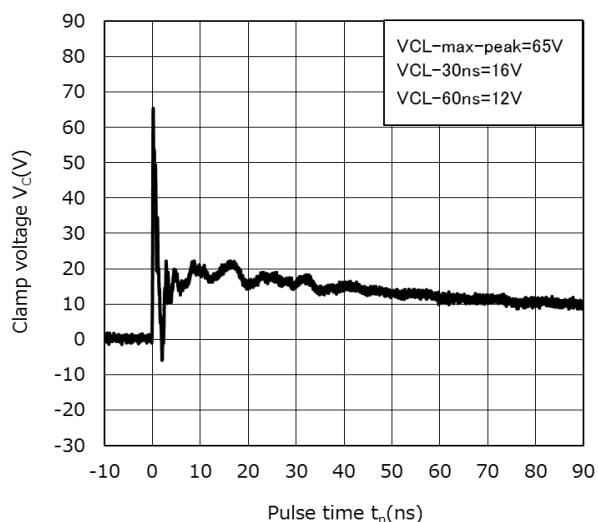
### CUZ8V2 Characteristics Curves (Note 1)



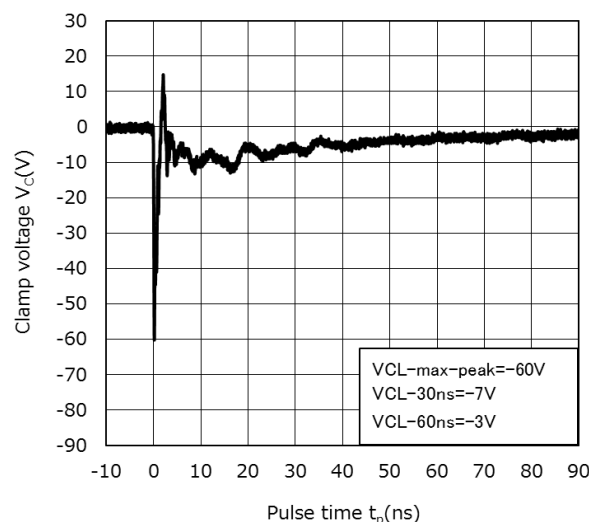
$I_{TLP} - V_{TLP}$



$V_C - I_{pp}$  (Note 2)

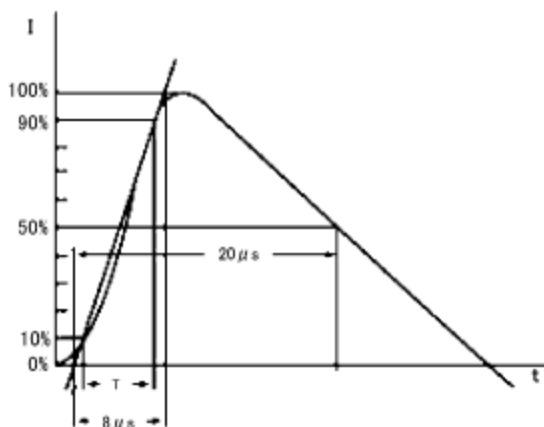


Clamp Waveform +8 kV (Note 3)



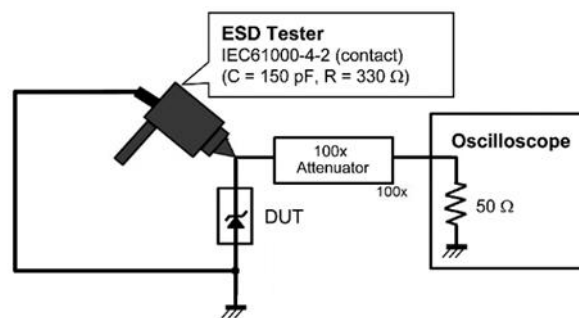
Clamp Waveform -8 kV (Note 3)

#### (Note 2) Peak Pulse Current ( $V_C - I_{pp}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

#### (Note 3) Clamp waveform measurement circuit

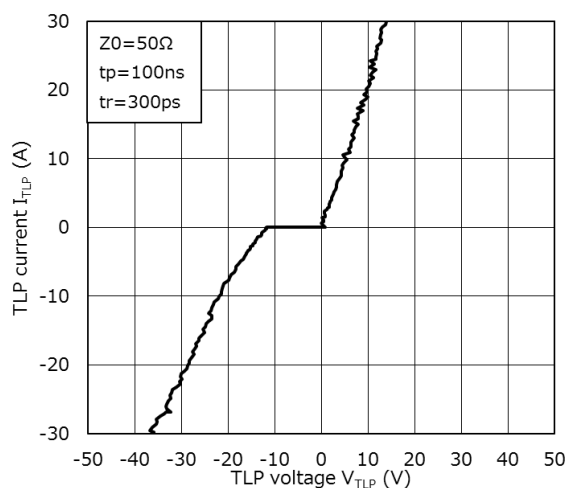


IEC61000-4-2 (Contact)

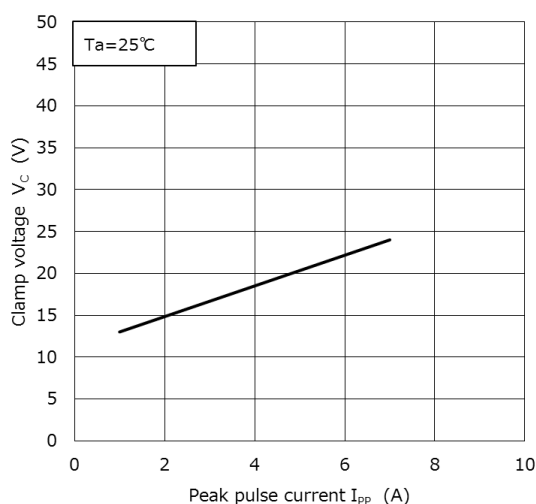
Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



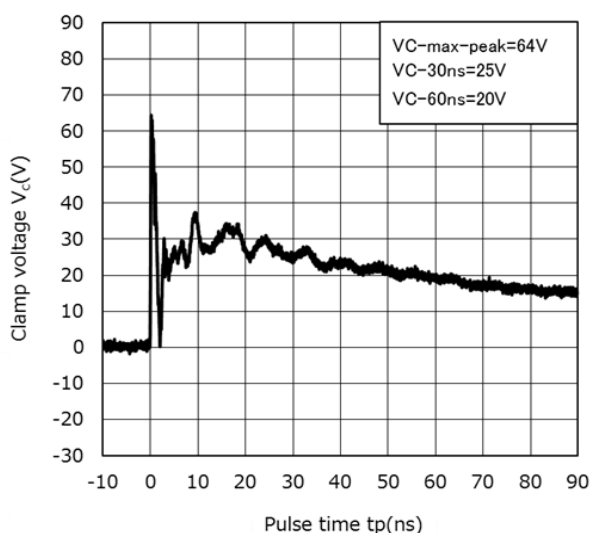
### CUZ12V Characteristics Curves (Note 1)



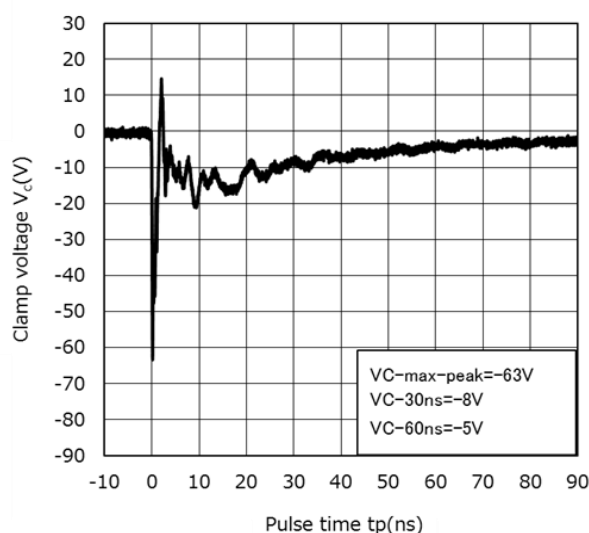
$I_{TLP} - V_{TLP}$



$V_C - I_{PP}$  (Note 2)



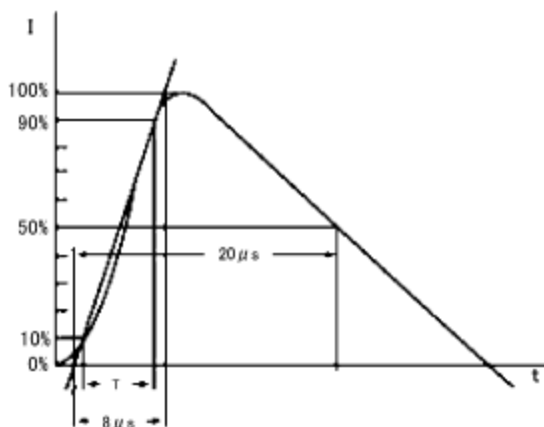
Clamp Waveform +8 kV (Note 3)



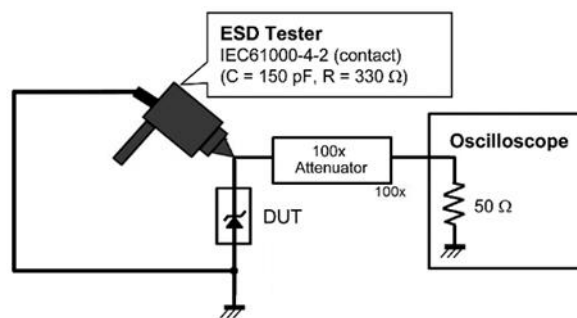
Clamp Waveform -8 kV (Note 3)

### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )

### (Note 3) Clamp waveform measurement circuit



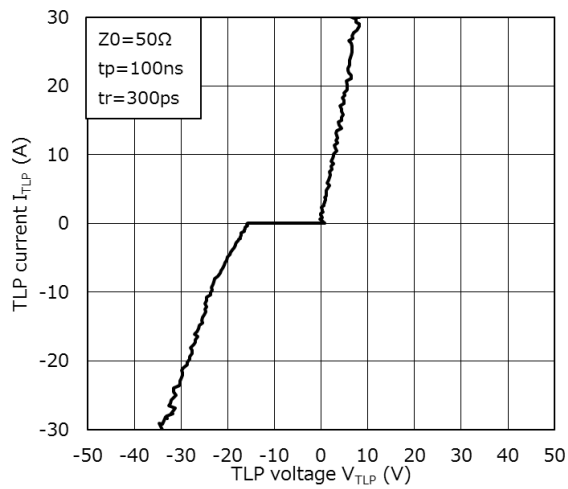
Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.



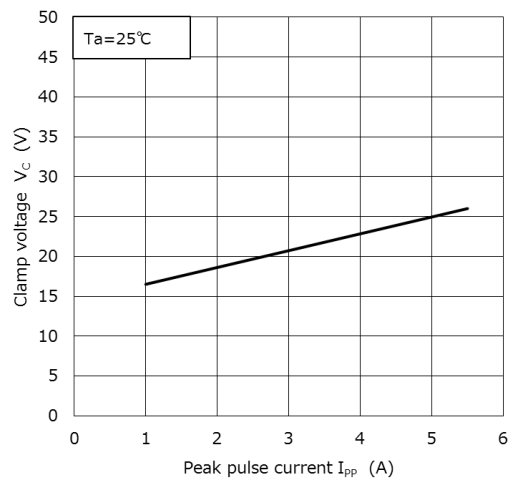
IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

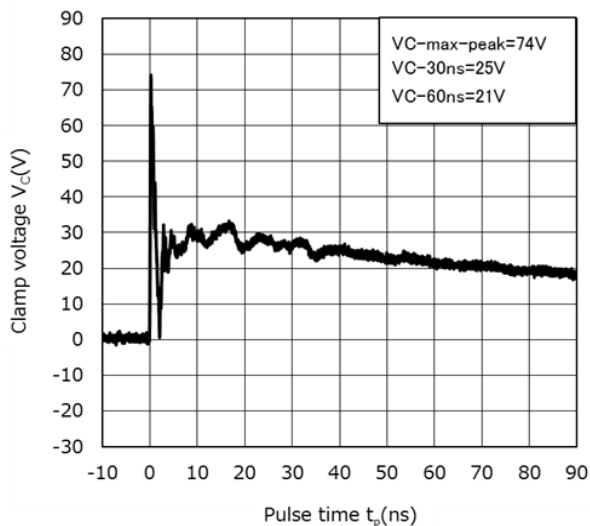
### CUZ16V Characteristics Curves (Note 1)



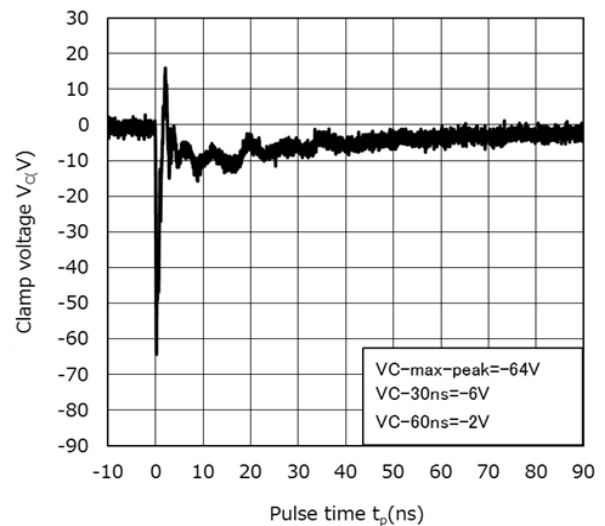
$I_{TLP} - V_{TLP}$



$V_C - I_{PP}$  (Note 2)

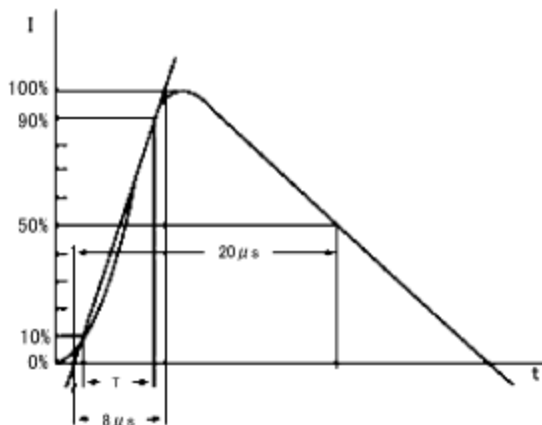


Clamp Waveform +8 kV (Note 3)



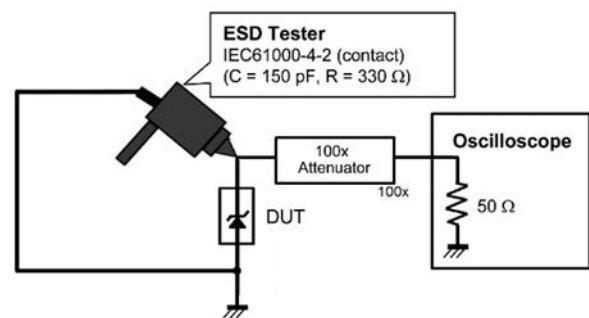
Clamp Waveform -8 kV (Note 3)

#### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

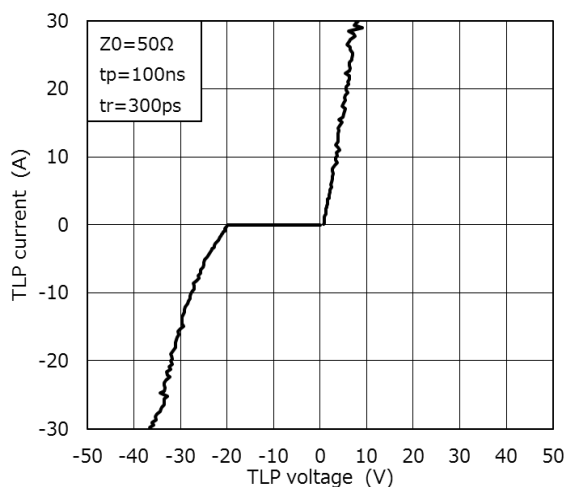
#### (Note 3) Clamp waveform measurement circuit



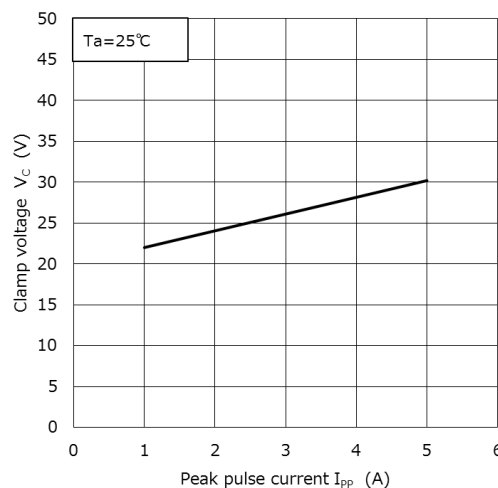
IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

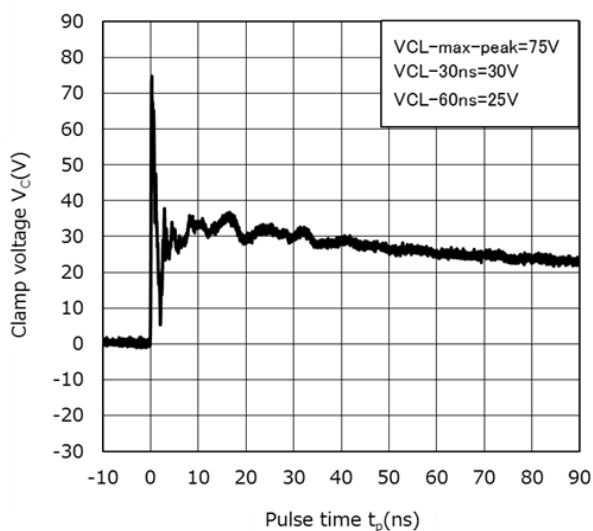
### CUZ20V Characteristics Curves (Note 1)



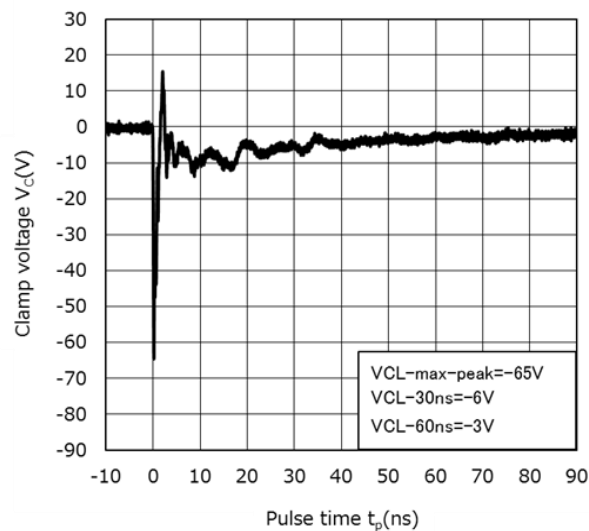
$I_{TLP} - V_{TLP}$



$V_C - I_{pp}$  (Note 2)

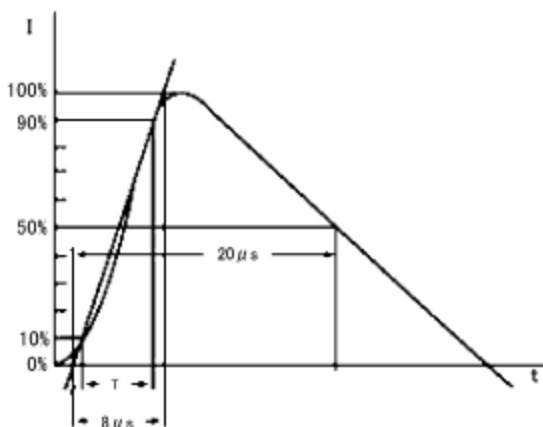


Clamp Waveform +8 kV (Note 3)



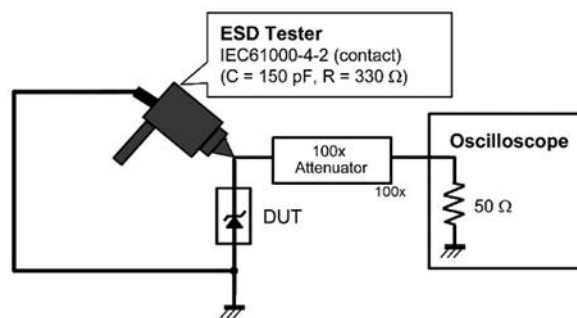
Clamp Waveform -8 kV (Note 3)

#### (Note 2) Peak Pulse Current ( $V_C - I_{pp}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

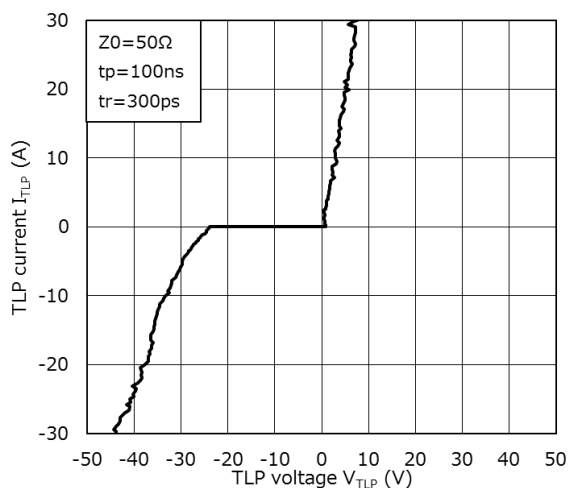
#### (Note 3) Clamp waveform measurement circuit



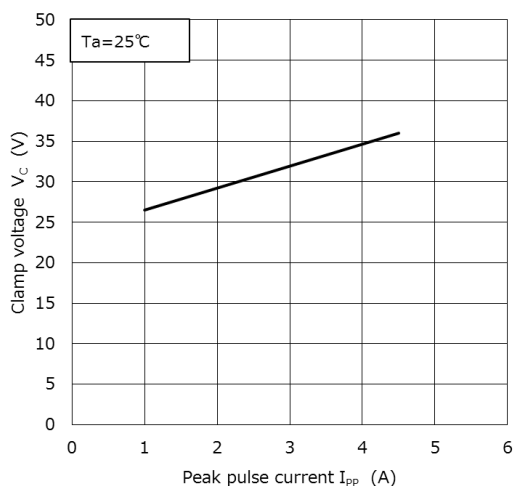
IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

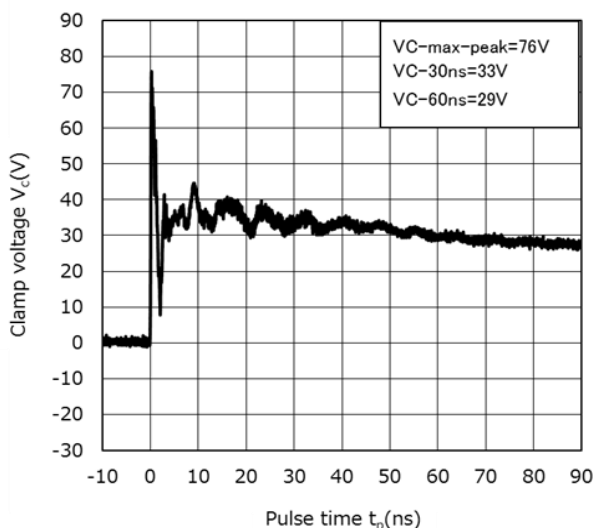
### CUZ24V Characteristics Curves (Note 1)



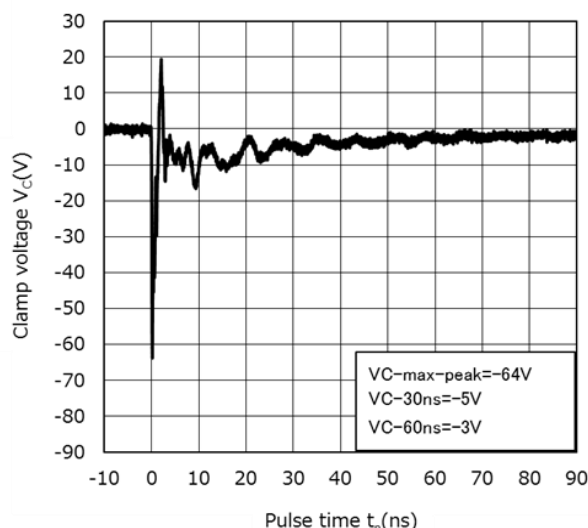
$I_{TLP} - V_{TLP}$



$V_C - I_{pp}$  (Note 2)

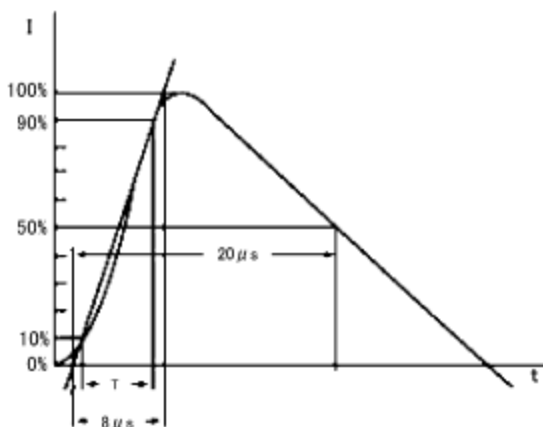


Clamp Waveform +8 kV (Note 3)



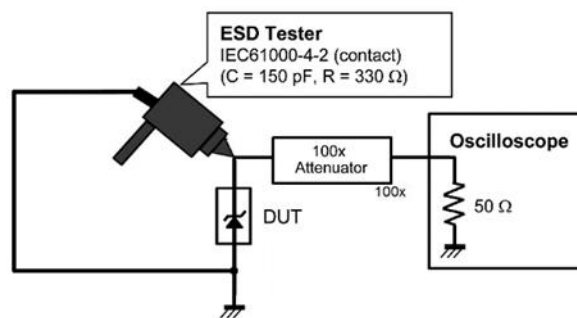
Clamp Waveform -8 kV (Note 3)

### (Note 2) Peak Pulse Current ( $V_C - I_{pp}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

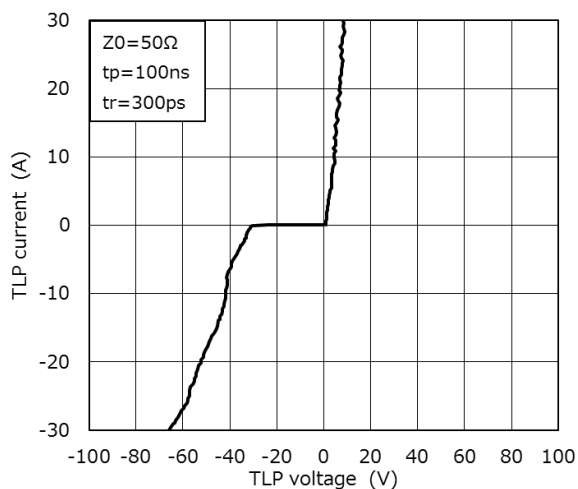
### (Note 3) Clamp waveform measurement circuit



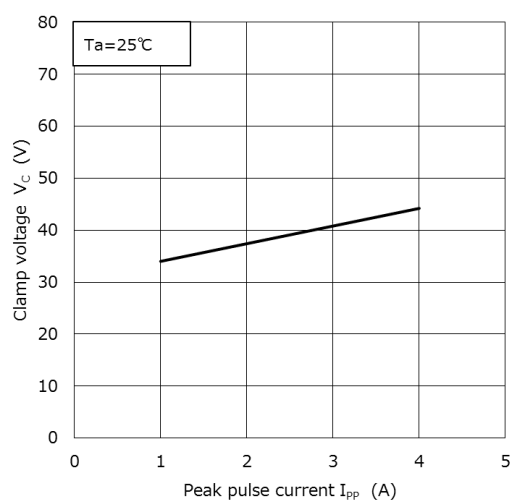
IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

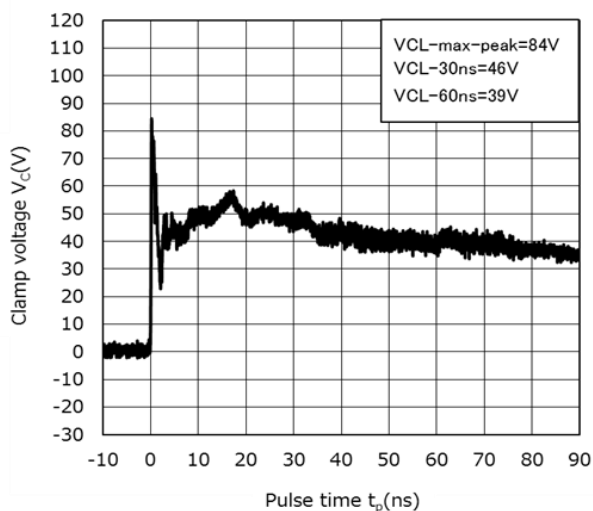
### CUZ30V Characteristics Curves (Note 1)



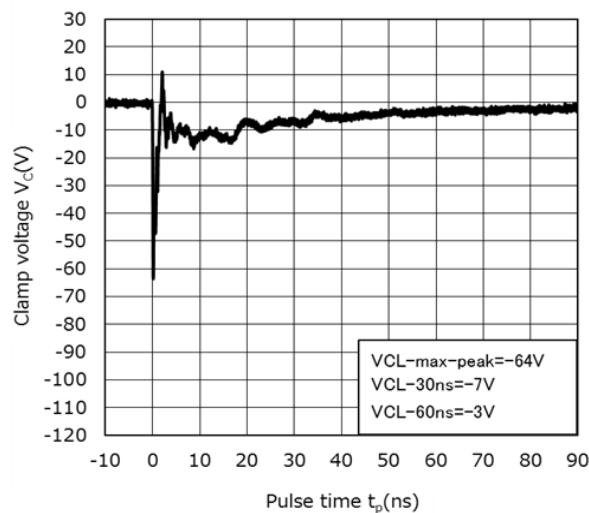
$I_{TLP} - V_{TLP}$



$V_C - I_{PP}$  (Note 2)

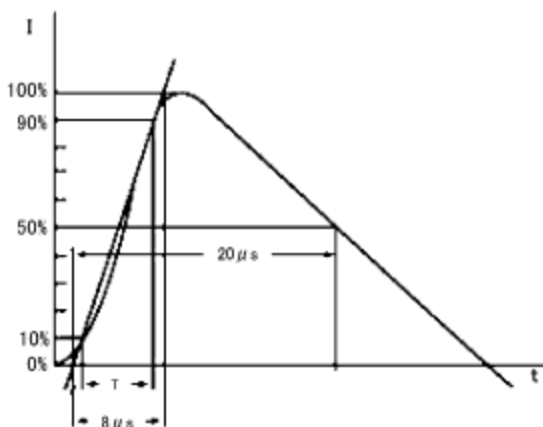


Clamp Waveform +8 kV (Note 3)



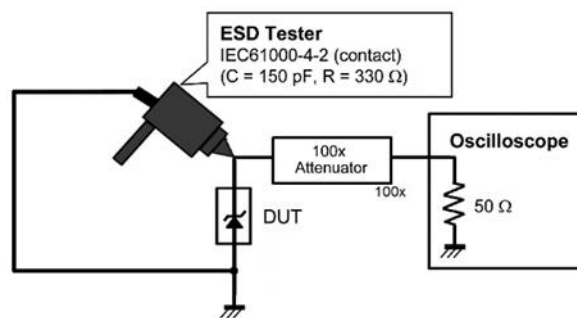
Clamp Waveform -8 kV (Note 3)

### (Note 2) Peak Pulse Current ( $V_C - I_{PP}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

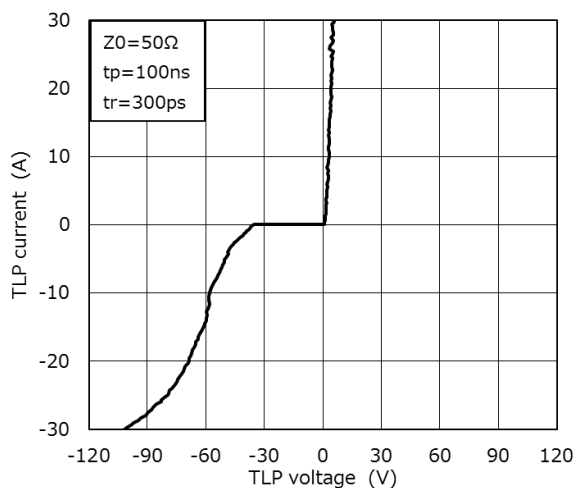
### (Note 3) Clamp waveform measurement circuit



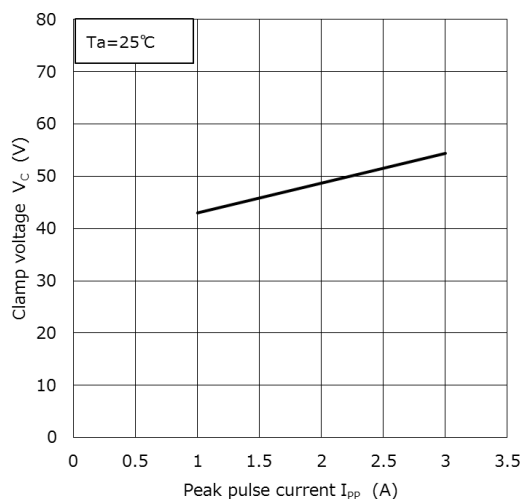
IEC61000-4-2 (Contact)

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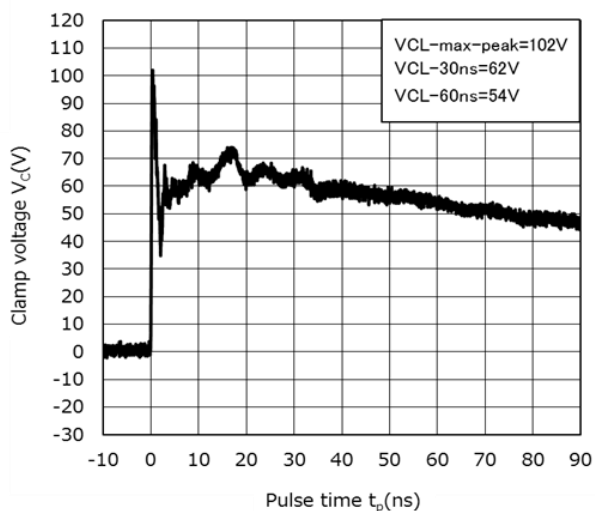
### CUZ36V Characteristics Curves (Note 1)



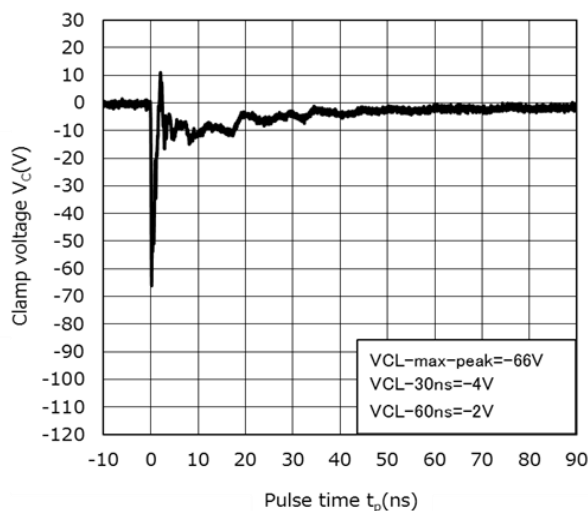
$I_{TLP} - V_{TLP}$



$V_C - I_{pp}$  (Note 2)

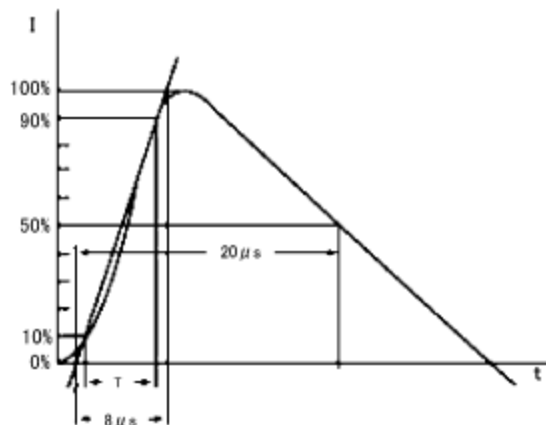


Clamp Waveform +8 kV (Note 3)



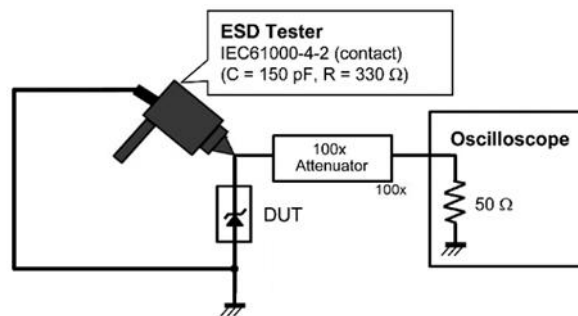
Clamp Waveform -8 kV (Note 3)

### (Note 2) Peak Pulse Current ( $V_C - I_{pp}$ )



Based on IEC61000-4-5 8/20  $\mu$ s pulse.

### (Note 3) Clamp waveform measurement circuit

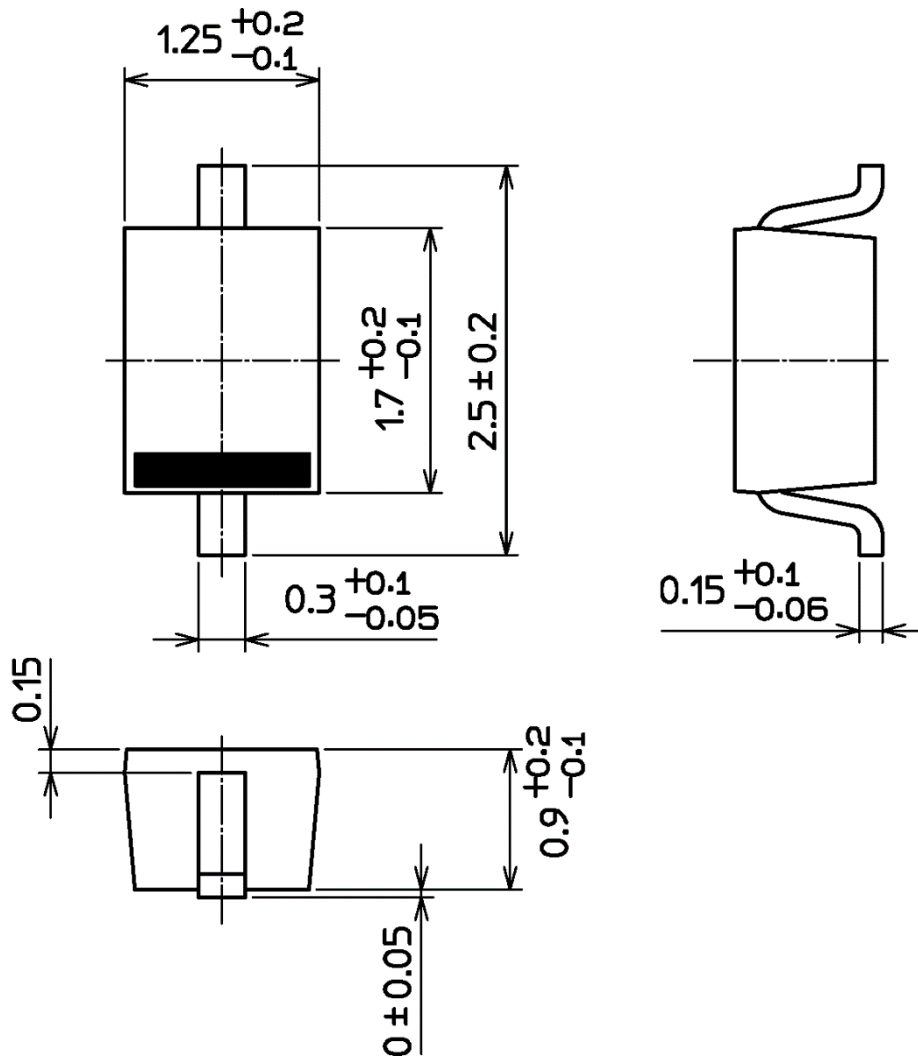


IEC61000-4-2 (Contact)

Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

### Package Dimensions

Unit: mm



Weight: 4.5 mg (typ.)

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