

TOSHIBA Zener Diode Silicon Epitaxial Planar Type

MUZ Series

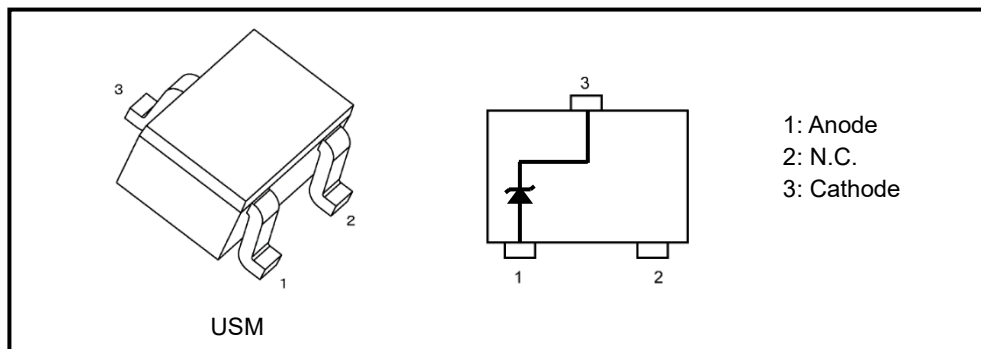
Applications

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} | 150 | 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 ^{*3} | | Peak pulse power ^{*4} | Peak pulse current ^{*4} | Type No. | Electrostatic discharge voltage ^{*3} | | Peak pulse power ^{*4} | Peak pulse current ^{*4} |
|----------|---|-----|--------------------------------|----------------------------------|----------|---|-----|--------------------------------|----------------------------------|
| | Contact | Air | | | | Contact | Air | | |
| | $V_{ESD}(kV)$ | | | | | $V_{ESD}(kV)$ | | | |
| MUZ5V6 | ± 30 | | 155 | 12 | MUZ16V | ± 30 | | 200 | 5.5 |
| MUZ6V2 | ± 30 | | 175 | 11 | MUZ20V | ± 30 | | 200 | 5 |
| MUZ6V8 | ± 30 | | 180 | 10 | MUZ24V | ± 30 | | 200 | 4.5 |
| MUZ8V2 | ± 30 | | 200 | 8.5 | MUZ30V | ± 20 | | 200 | 4 |
| MUZ12V | ± 30 | | 200 | 7 | MUZ36V | ± 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 25.4 mm × 25.4 mm × 1.6 mm, Cu pad: 0.5 mm² × 3

*2: Mounted on a glass epoxy circuit board of 25.4 mm × 25.4 mm × 1.6 mm, Cu pad: 645 mm²

*3: according to IEC61000-4-2

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

Start of commercial production
2020-07

MUZ series Electrical Characteristics (Unless otherwise specified, Ta = 25°C)

| Type No. | Zener Voltage | | | Test Current I _Z (mA) | Dynamic Impedance | | Dynamic resistance R _{DYN} (Ω) *1 | Clamp voltage V _C (V) *1*2 | Total capacitance C _t (pF) *3 | Reverse Current | |
|----------|--------------------|------|------|-------------------------------------|---------------------------|-------------------------------------|--|---|--|----------------------------|------------------------------------|
| | V _Z (V) | | | | Z _Z (Ω) Max | Test Current I _Z (mA) | | | | I _R (μA) Max | Test Voltage V _R (V) |
| | Min | Typ. | Max | | | | | | | | |
| MUZ5V6 | 5.3 | 5.6 | 6.0 | 5 | 30 | 5 | 0.16 | 9 | 125 | 1 | 3.5 |
| MUZ6V2 | 5.8 | 6.2 | 6.6 | 5 | 30 | 5 | 0.21 | 10 | 105 | 2.5 | 5.0 |
| MUZ6V8 | 6.4 | 6.8 | 7.2 | 5 | 30 | 5 | 0.27 | 13 | 88 | 1.5 | 5.5 |
| MUZ8V2 | 7.7 | 8.2 | 8.7 | 5 | 30 | 5 | 0.37 | 16.5 | 67 | 0.1 | 7 |
| MUZ12V | 11.4 | 12 | 12.6 | 5 | 30 | 5 | 0.7 | 26 | 44 | 0.1 | 10 |
| MUZ16V | 15.3 | 16 | 17.1 | 5 | 35 | 5 | 0.5 | 27 | 35 | 0.1 | 14 |
| MUZ20V | 18.8 | 20 | 21.2 | 5 | 70 | 5 | 0.35 | 30.5 | 29 | 0.1 | 17.6 |
| MUZ24V | 22.8 | 24 | 25.6 | 5 | 70 | 5 | 0.6 | 36.5 | 26 | 0.1 | 19 |
| MUZ30V | 28.0 | 30 | 32.0 | 2 | 100 | 2 | 1.25 | 47.5 | 21 | 0.1 | 27 |
| MUZ36V | 34.0 | 36 | 38.0 | 2 | 100 | 2 | 2.6 | 63 | 18 | 0.1 | 32.5 |

*1: TLP parameters: Z₀ = 50 Ω, t_p = 100 ns, t_r = 300 ps, averaging window: t₁ = 30 ns to t₂ = 60 ns,

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

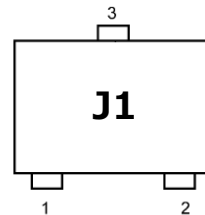
*2: I_{TLP} = 16 A

*3: V_R = 0 V, f = 1 MHz

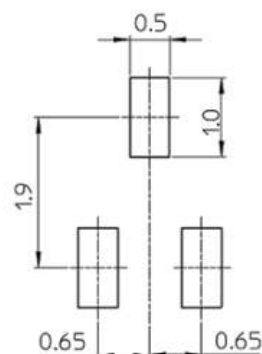
Marking List

| Type No. | Marking | Type No. | Marking |
|----------|---------|----------|---------|
| MUZ5V6 | J1 | MUZ16V | J7 |
| MUZ6V2 | J2 | MUZ20V | JA |
| MUZ6V8 | J3 | MUZ24V | JB |
| MUZ8V2 | J4 | MUZ30V | JC |
| MUZ12V | J6 | MUZ36V | JD |

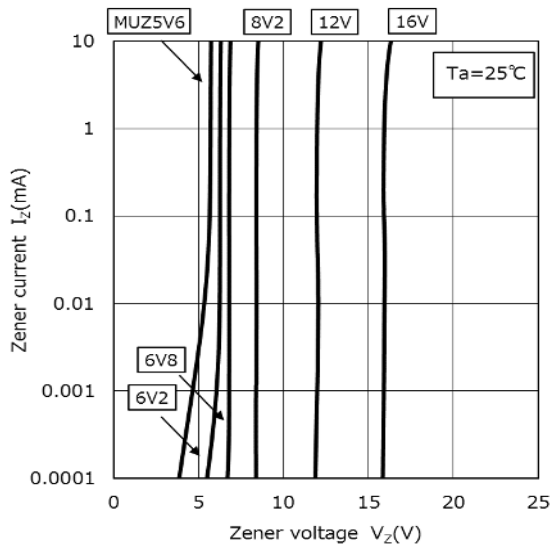
Marking (MUZ5V6)



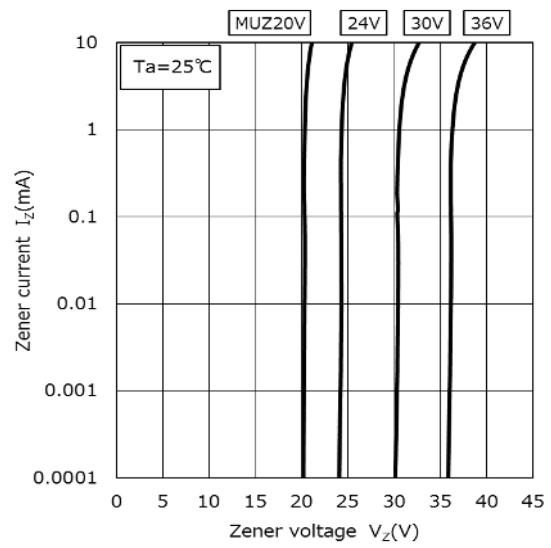
Land Pattern Dimensions (for reference only) (Unit: mm)



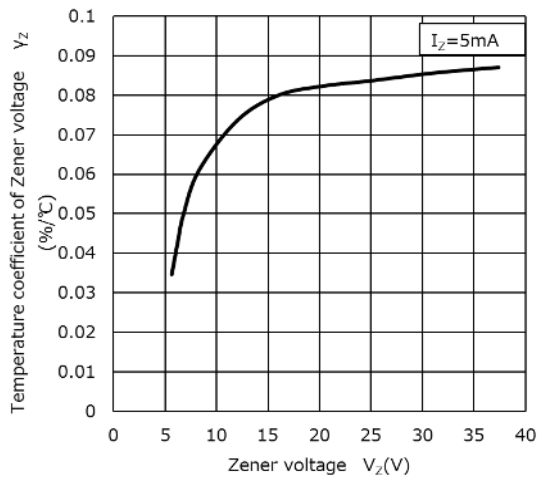
MUZ series Characteristics Curves (Note 1)



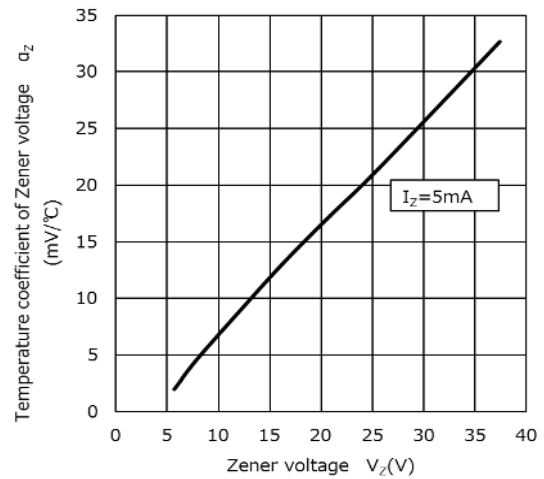
$I_z - V_z$ (1)



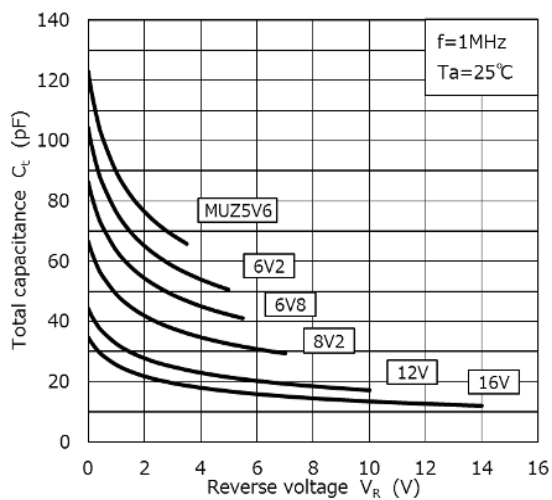
$I_z - V_z$ (2)



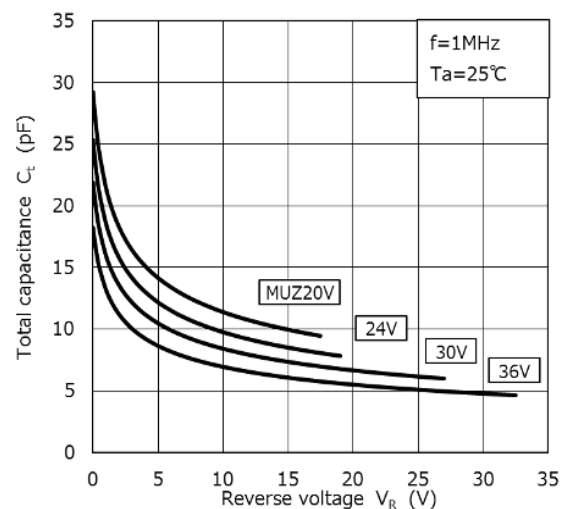
$\gamma_z - V_z$



$\alpha_z - V_z$



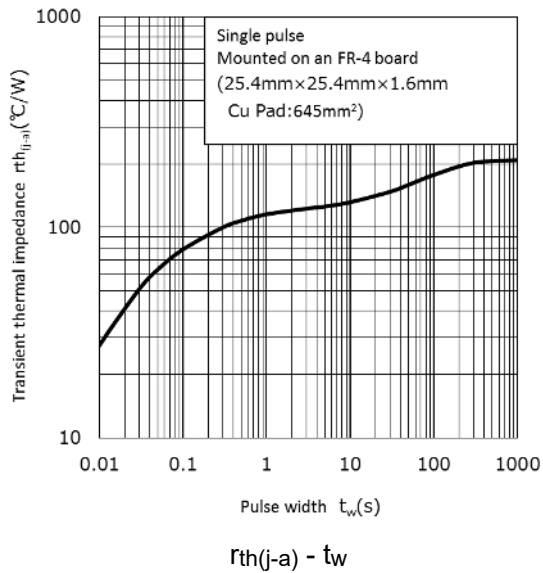
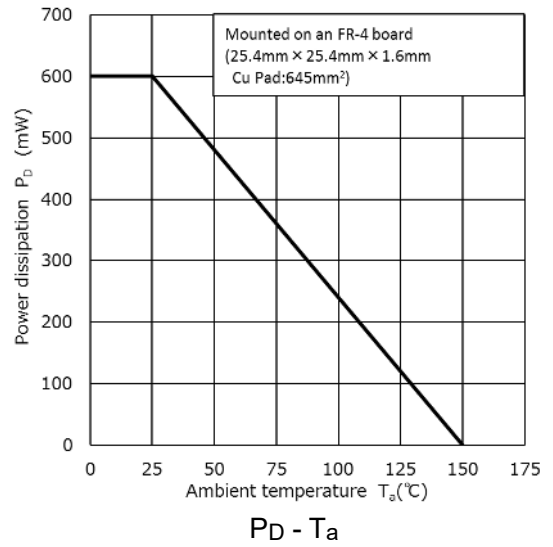
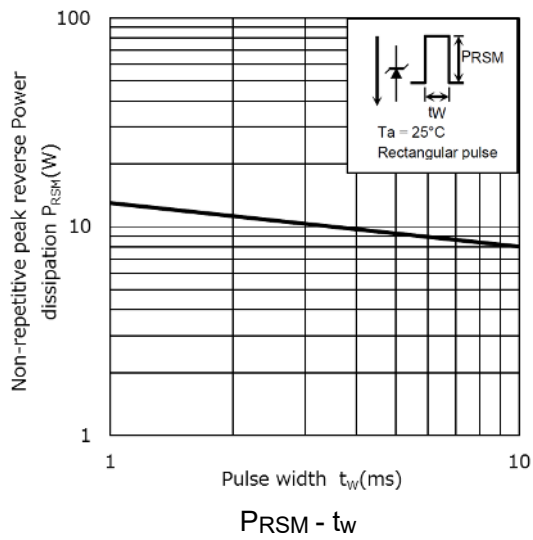
$C_t - V_R$ (1)



$C_t - V_R$ (2)

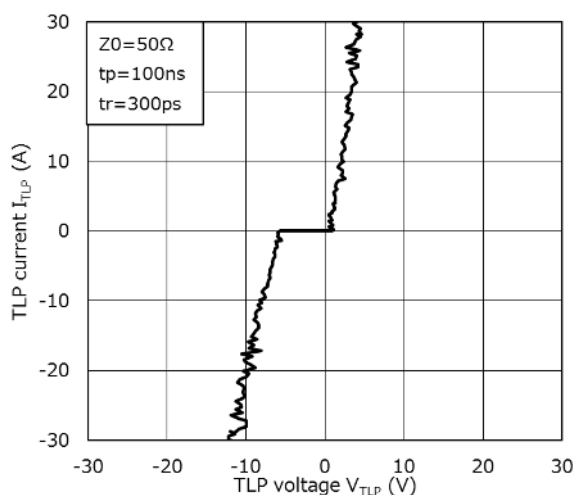
Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

MUZ series Characteristics Curves (Note 1)

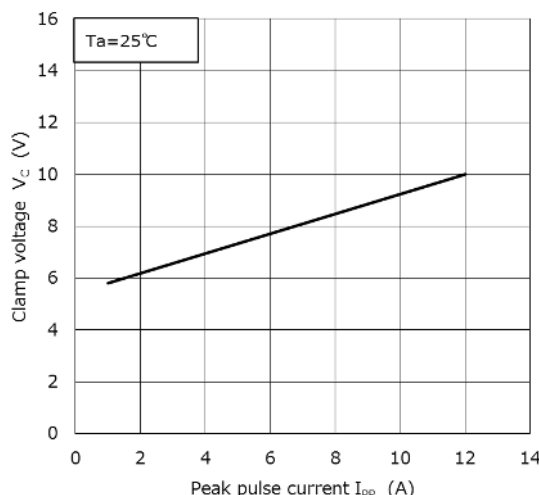


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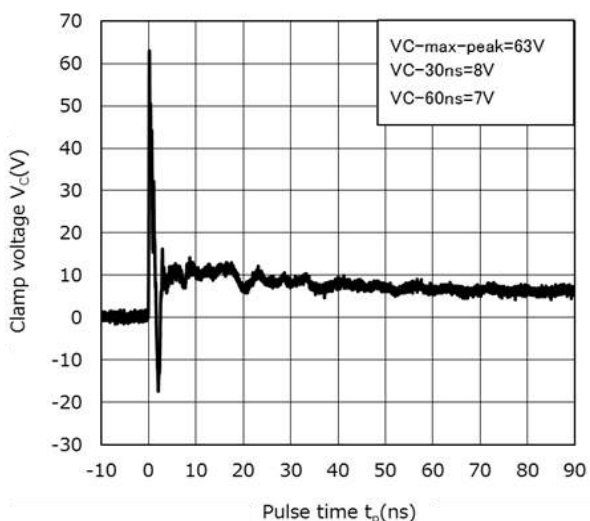
MUZ5V6 Characteristics Curves (Note 1)



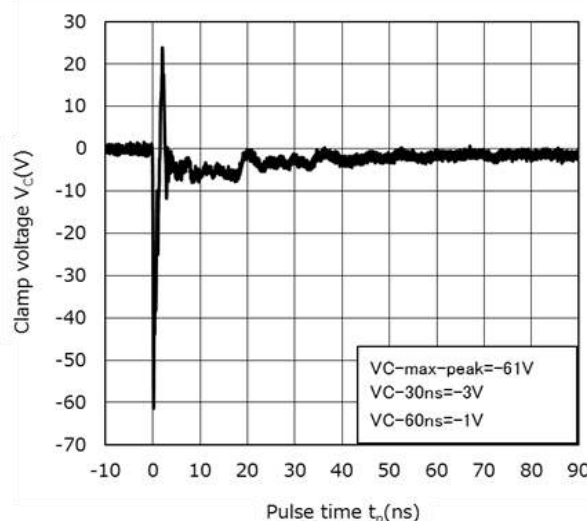
$I_{TLP} - V_{TLP}$



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

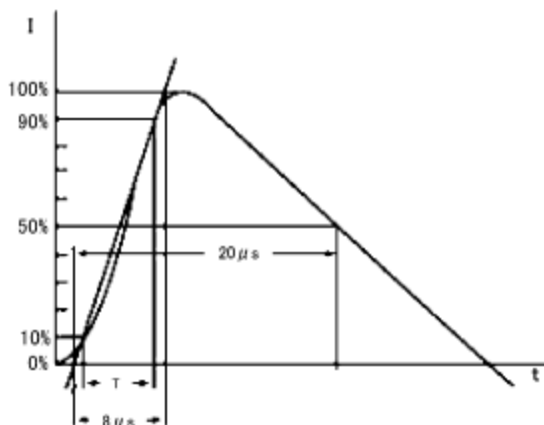


Clamp Waveform +8 kV (Note 3)



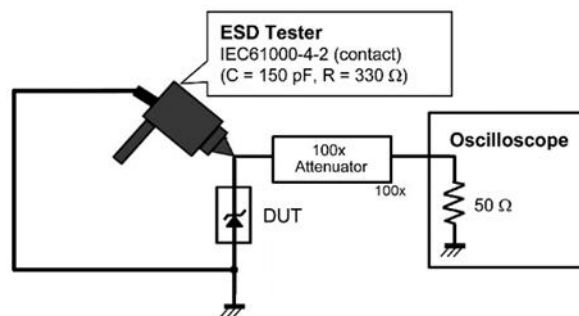
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

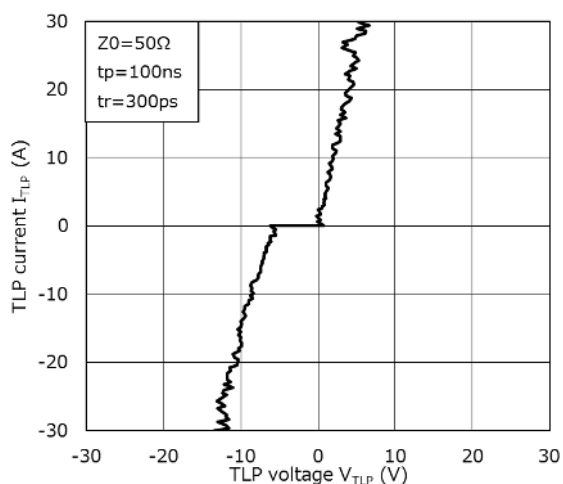
(Note 3) Clamp waveform measurement circuit



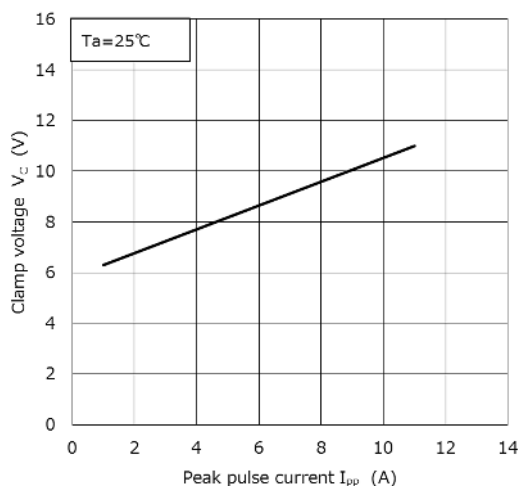
IEC61000-4-2 (Contact)

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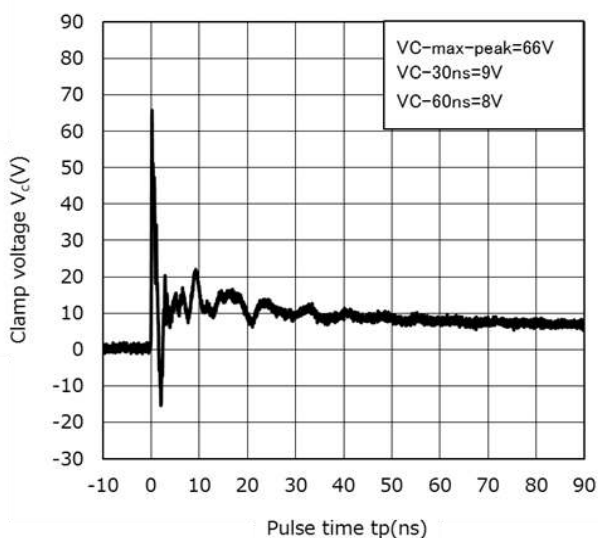
MUZ6V2 Characteristics Curves (Note 1)



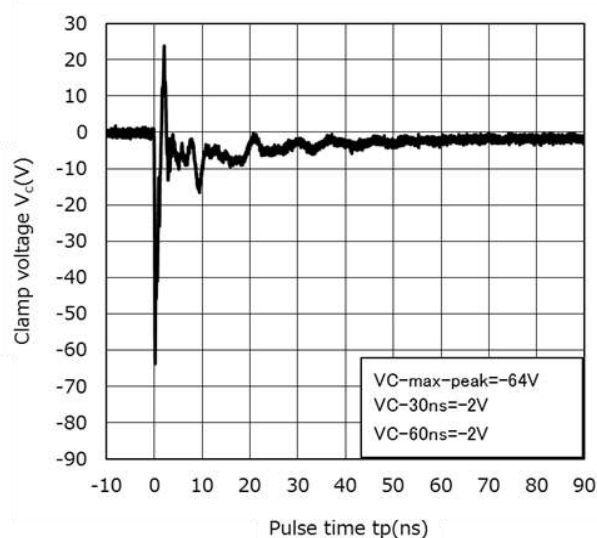
$I_{TLP} - V_{TLP}$



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

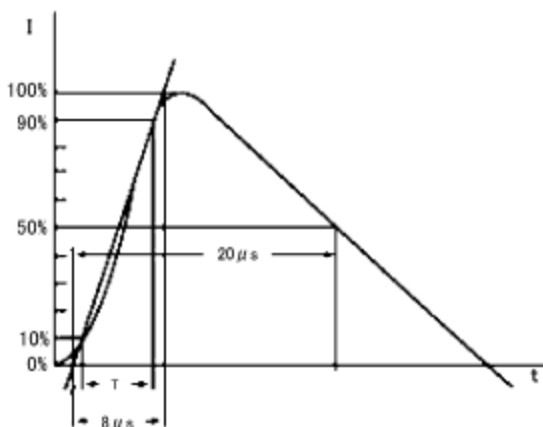


Clamp Waveform +8 kV (Note 3)



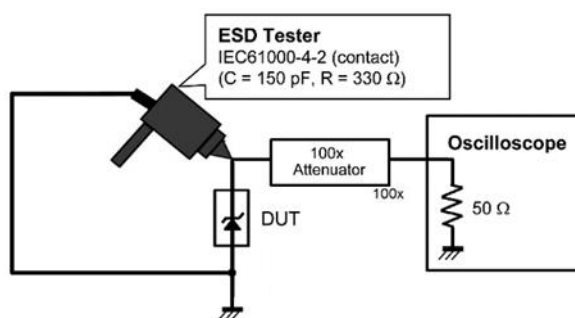
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

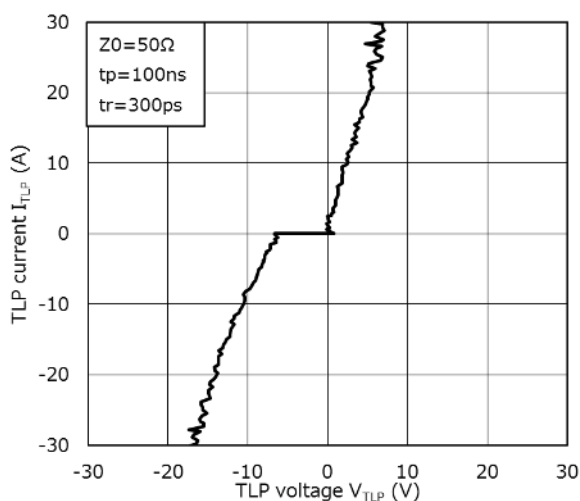
(Note 3) Clamp waveform measurement circuit



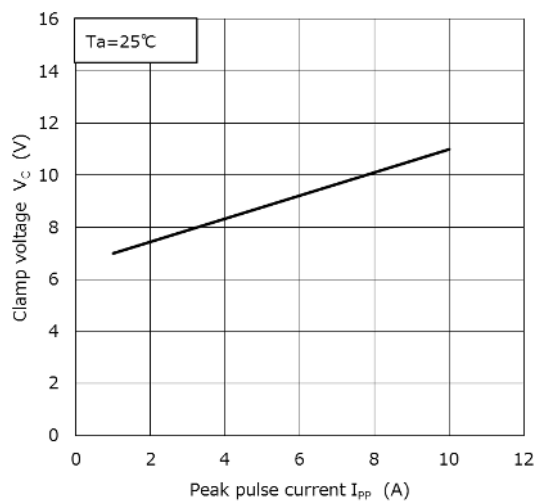
IEC61000-4-2 (Contact)

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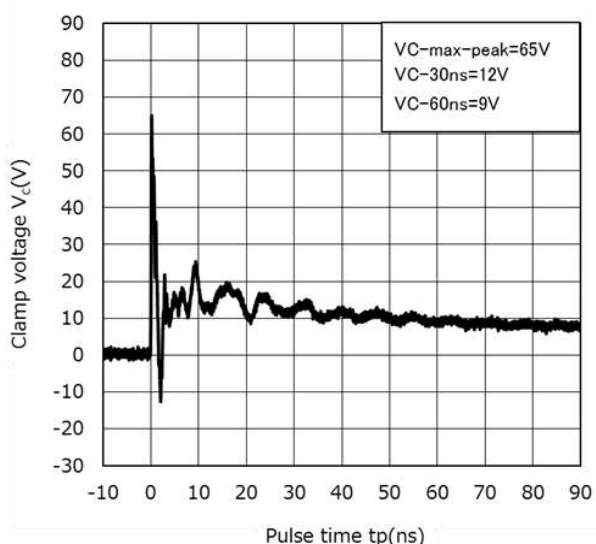
MUZ6V8 Characteristics Curves (Note 1)



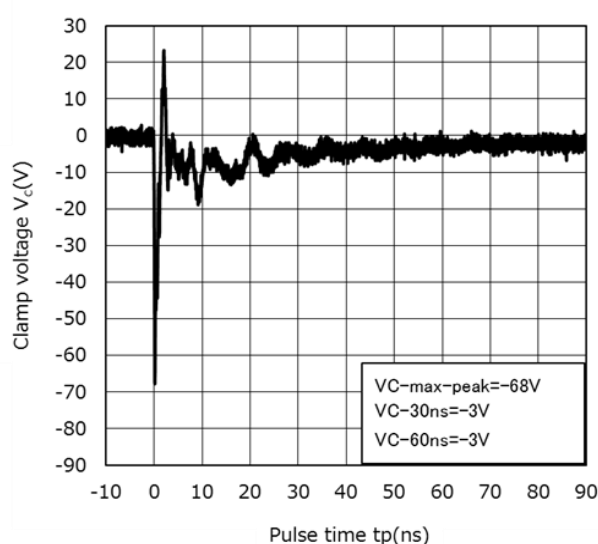
$I_{TLP} - V_{TLP}$



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

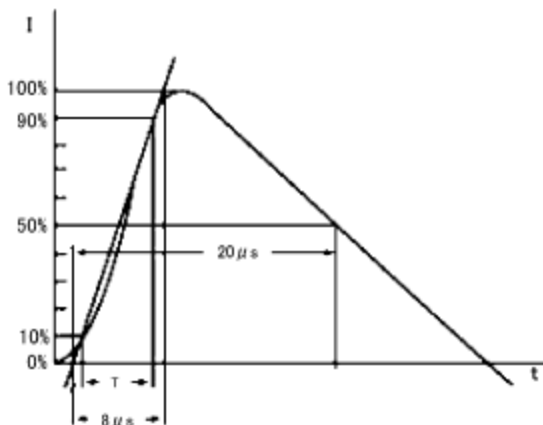


Clamp Waveform +8 kV (Note 3)



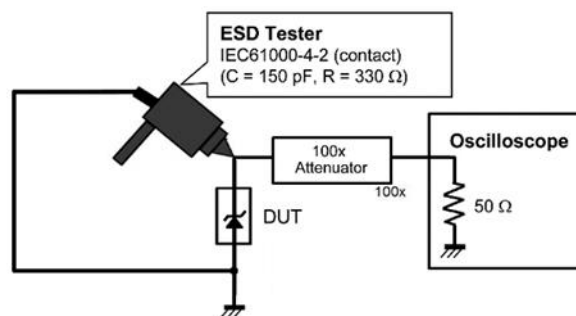
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

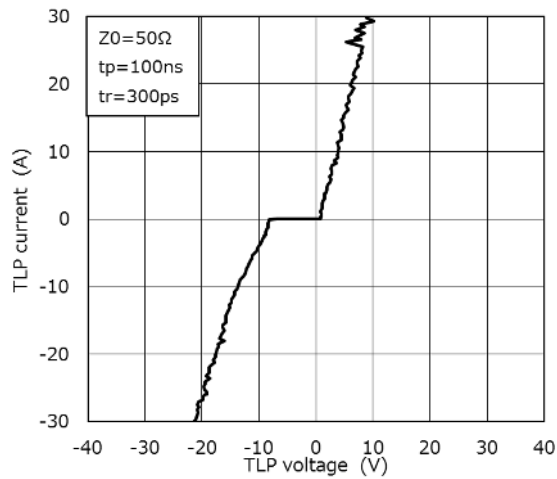
(Note 3) Clamp waveform measurement circuit



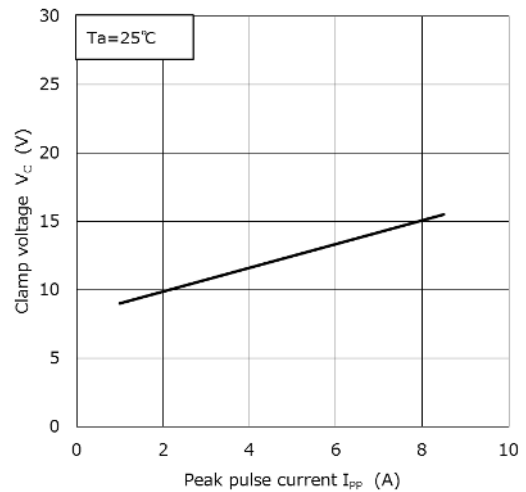
IEC61000-4-2 (Contact)

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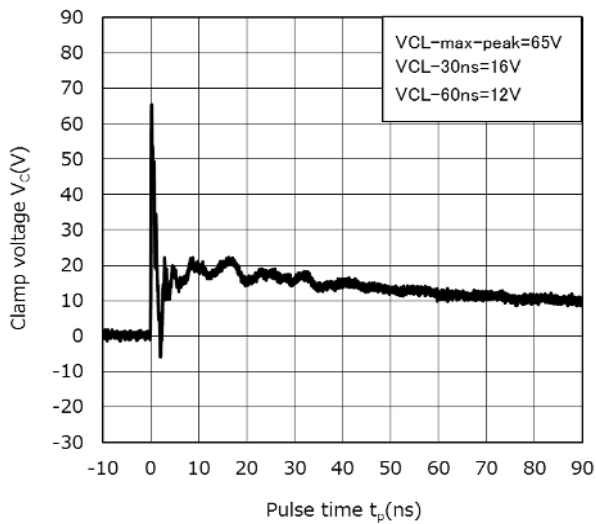
MUZ8V2 Characteristics Curves (Note 1)



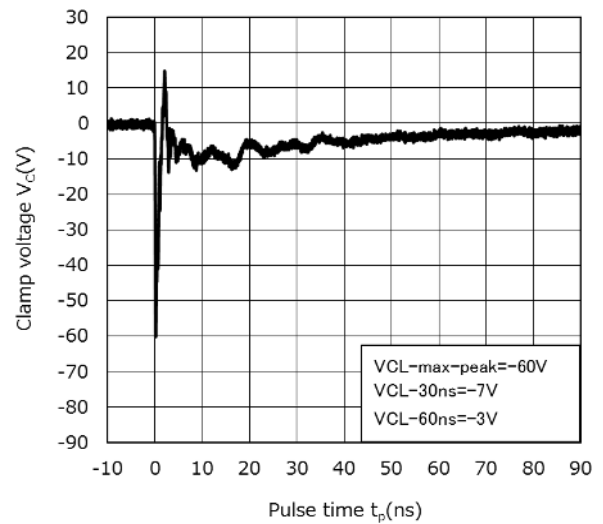
$I_{TLP} - V_{TLP}$



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

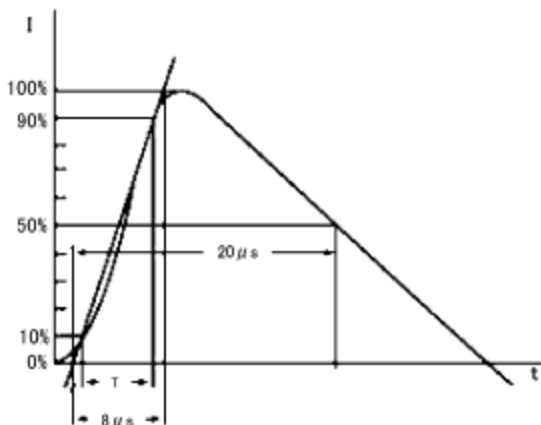


Clamp Waveform +8 kV (Note 3)



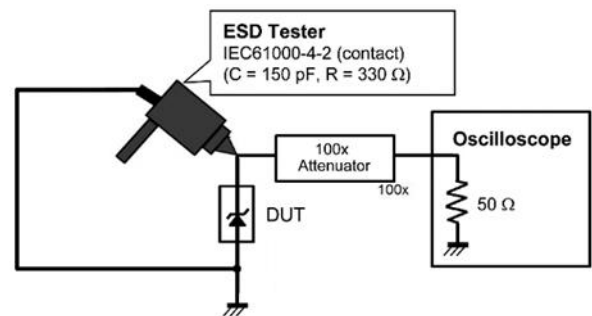
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

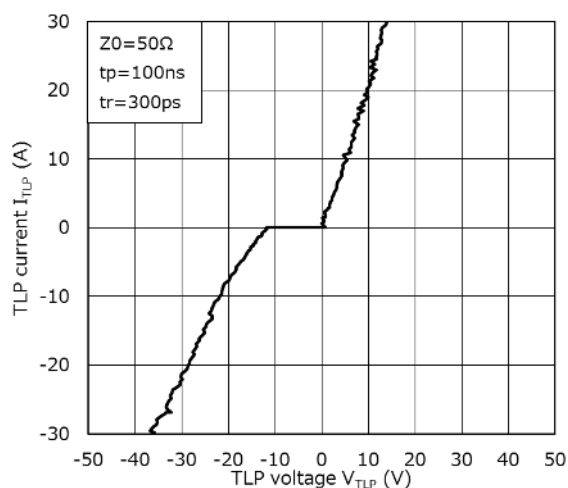
(Note 3) Clamp waveform measurement circuit



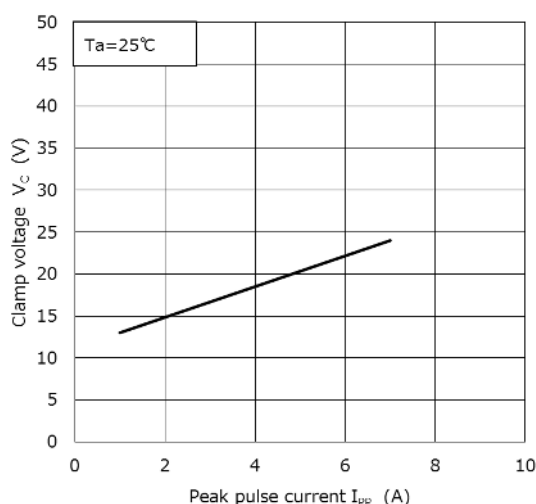
IEC61000-4-2 (Contact)

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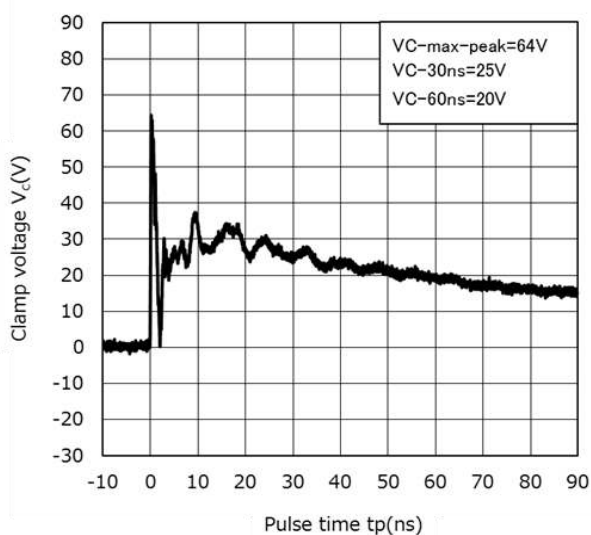
MUZ12V Characteristics Curves (Note 1)



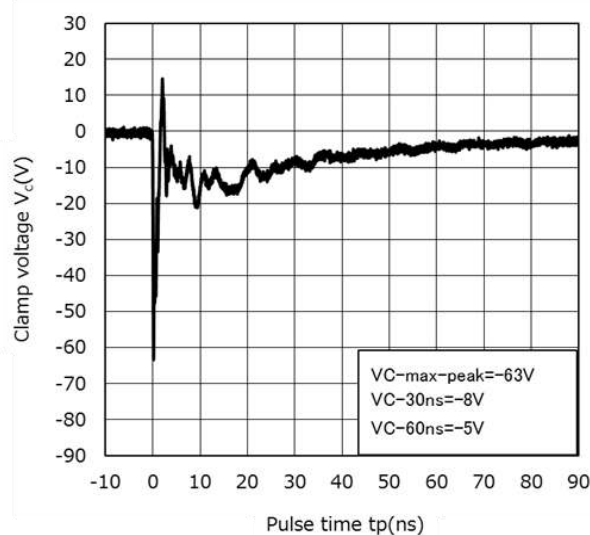
$I_{TLP} - V_{TLP}$



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



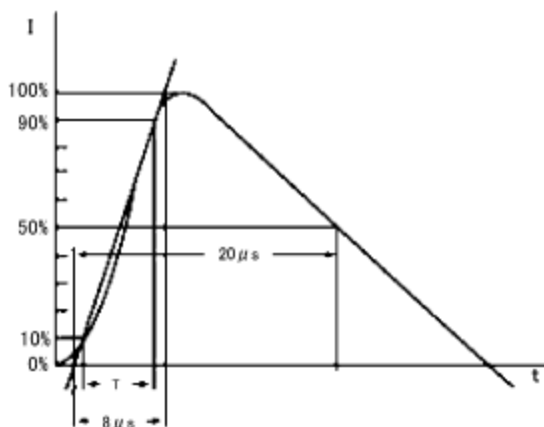
Clamp Waveform +8 kV (Note 3)



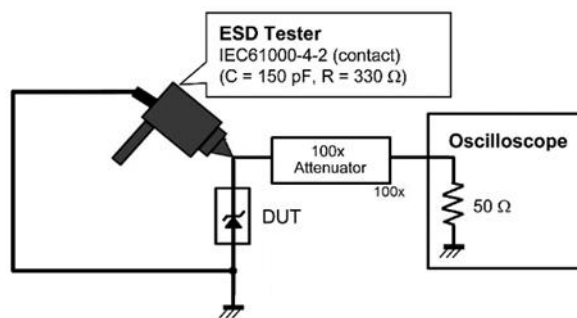
Clamp Waveform -8 kV (Note 3)

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

(Note 3) Clamp waveform measurement circuit



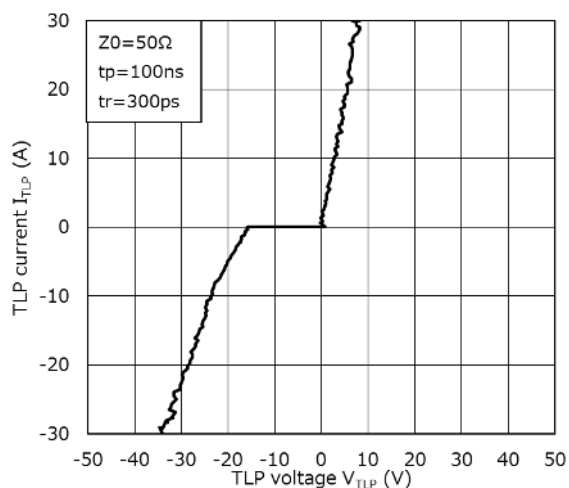
Based on IEC61000-4-5 8/20 μs pulse.



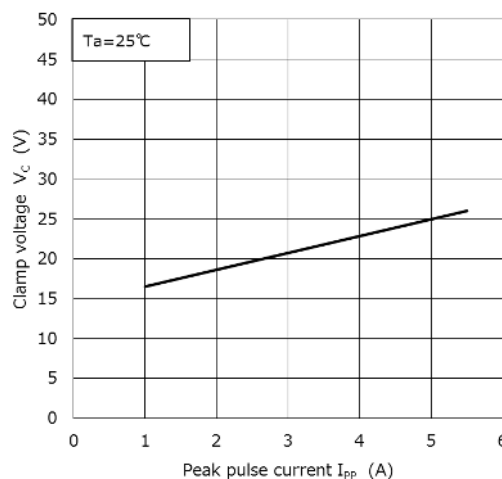
IEC61000-4-2 (Contact)

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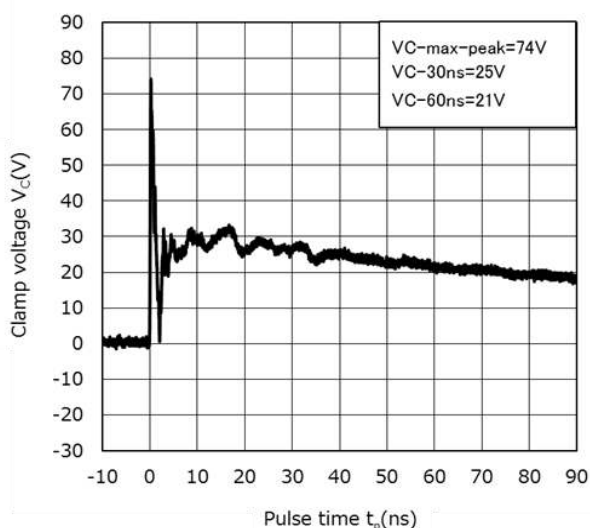
MUZ16V Characteristics Curves (Note 1)



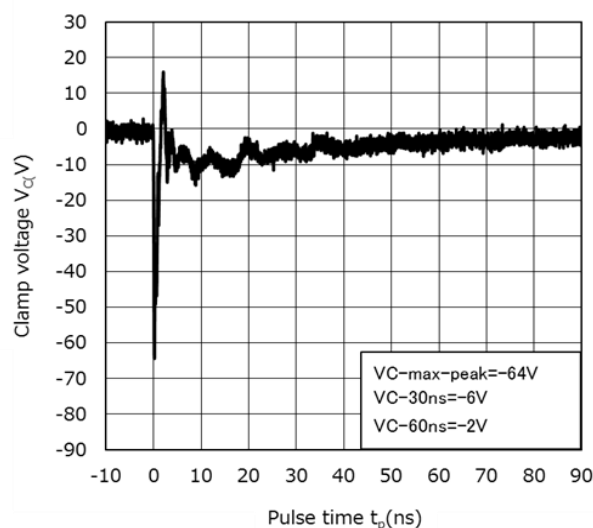
$I_{TLP} - V_{TLP}$



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

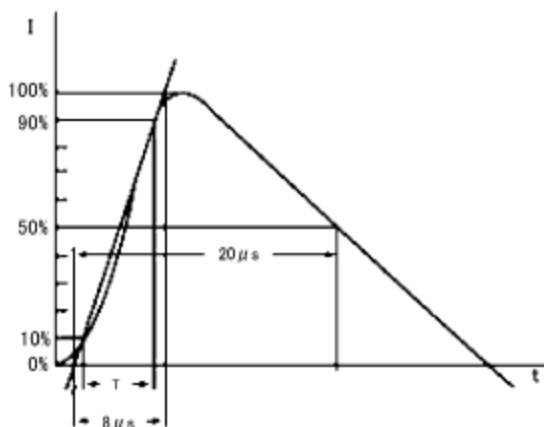


Clamp Waveform +8 kV (Note 3)



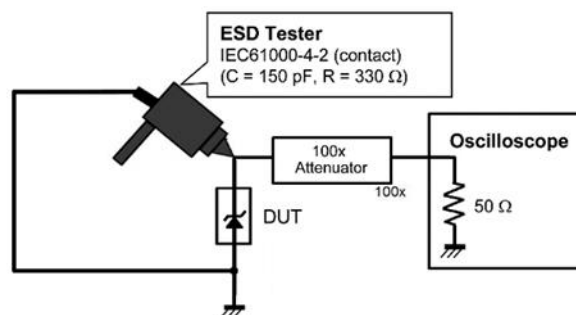
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

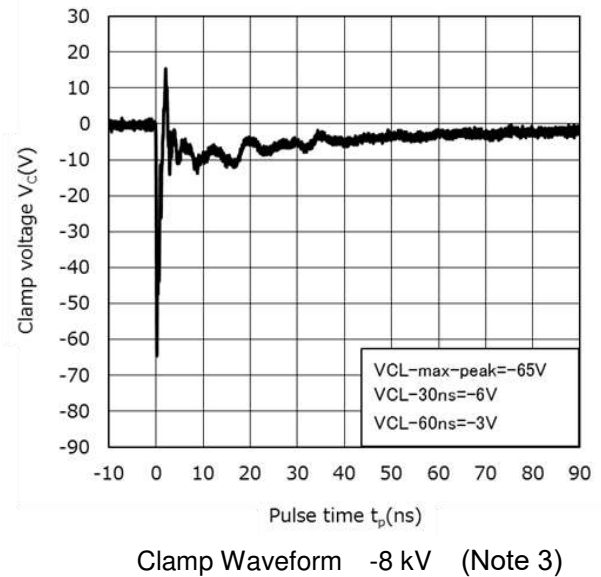
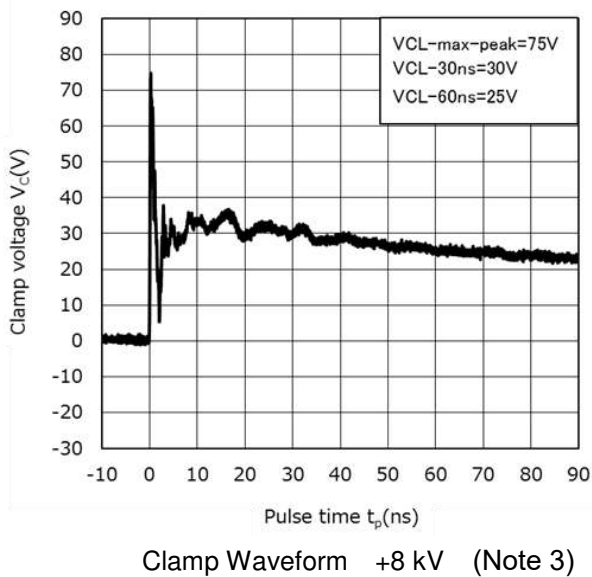
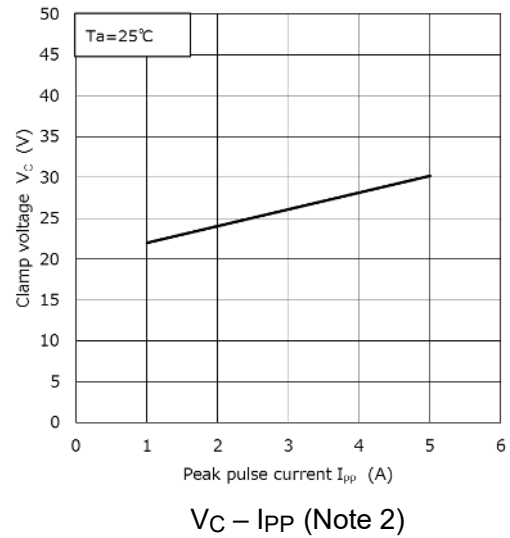
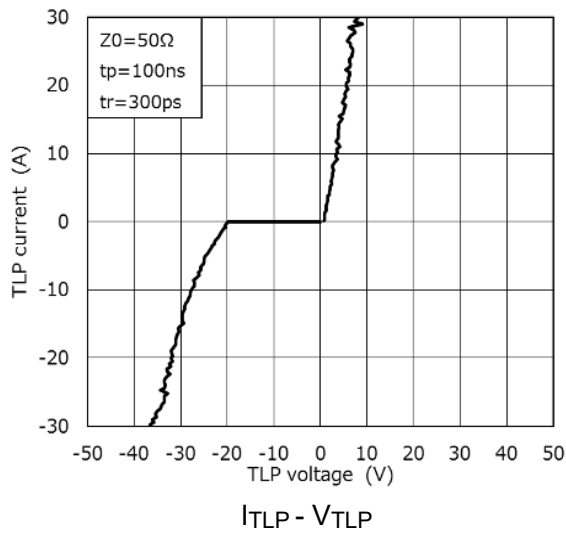
(Note 3) Clamp waveform measurement circuit



IEC61000-4-2 (Contact)

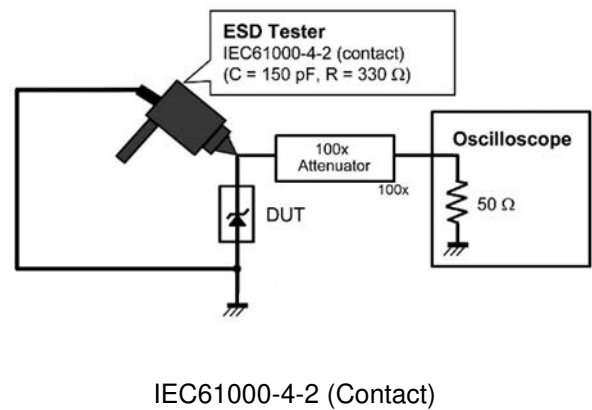
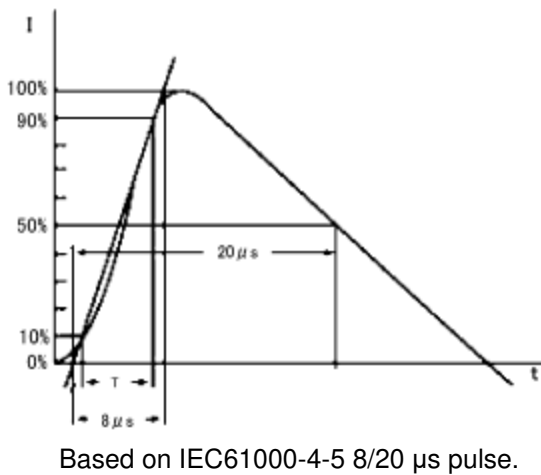
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MUZ20V Characteristics Curves (Note 1)



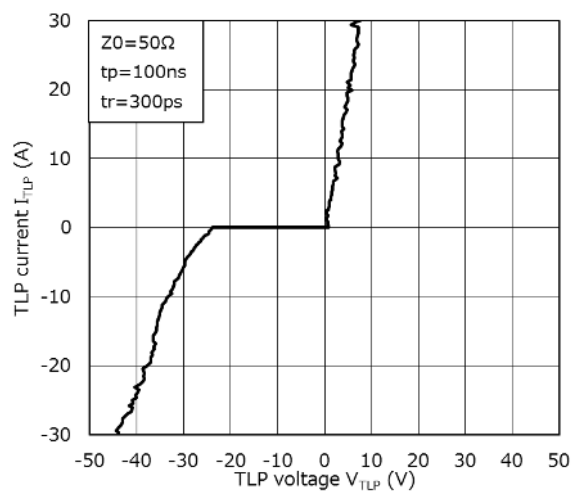
(Note 2) Peak Pulse Current ($V_c - I_{pp}$)

(Note 3) Clamp waveform measurement circuit

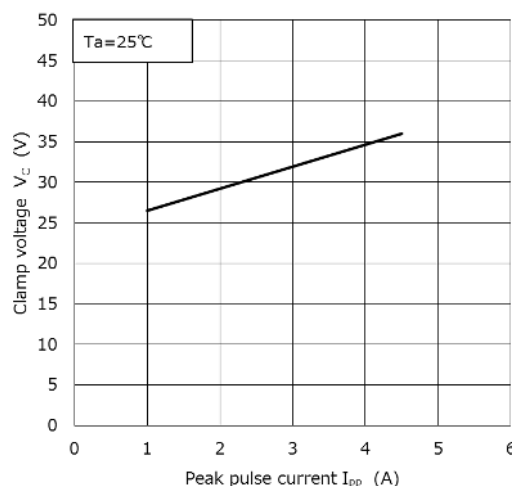


Note 1: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

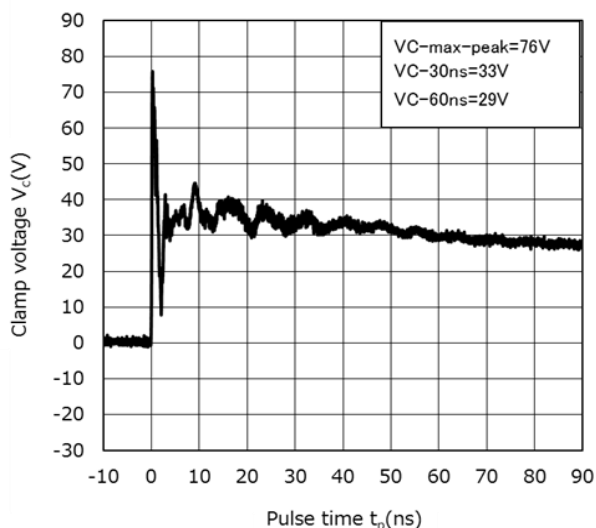
MUZ24V Characteristics Curves (Note 1)



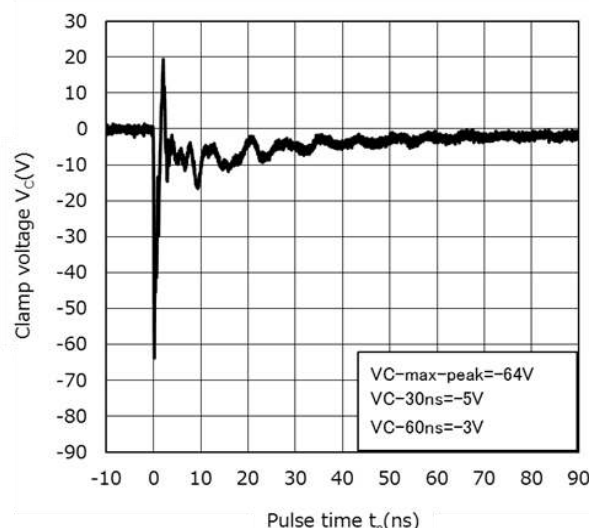
$I_{TLP} - V_{TLP}$



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

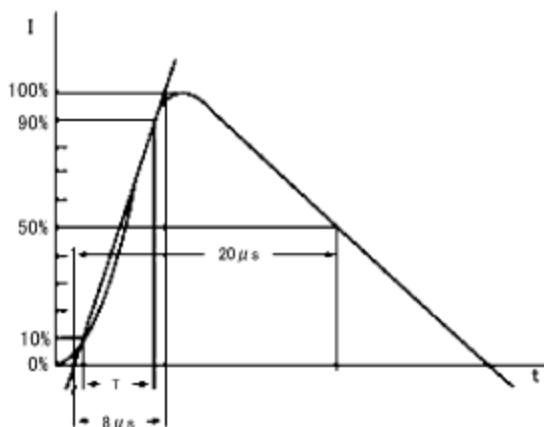


Clamp Waveform +8 kV (Note 3)



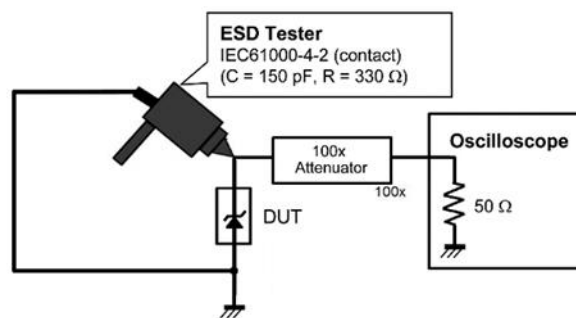
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

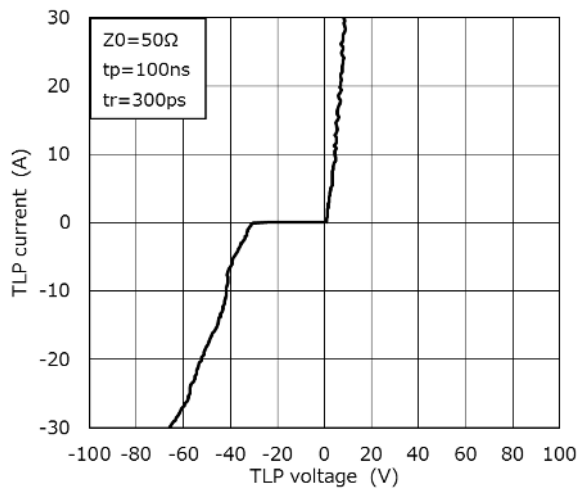
(Note 3) Clamp waveform measurement circuit



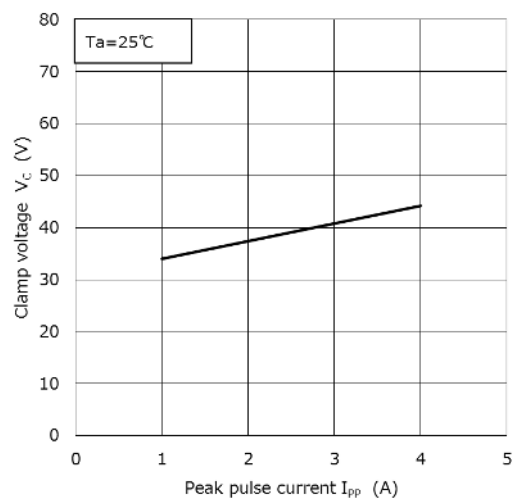
IEC61000-4-2 (Contact)

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

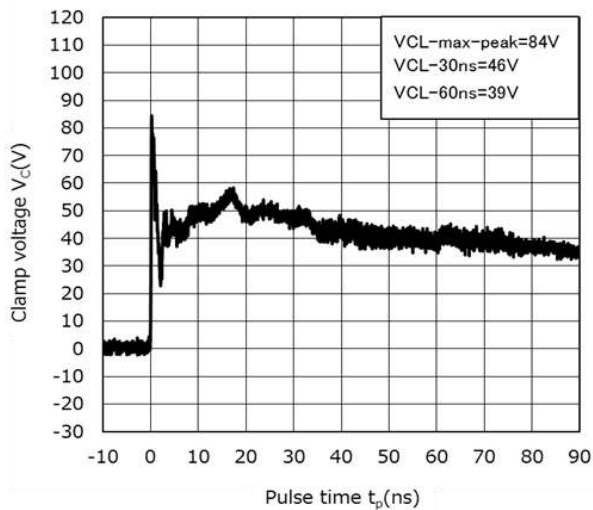
MUZ30V Characteristics Curves (Note 1)



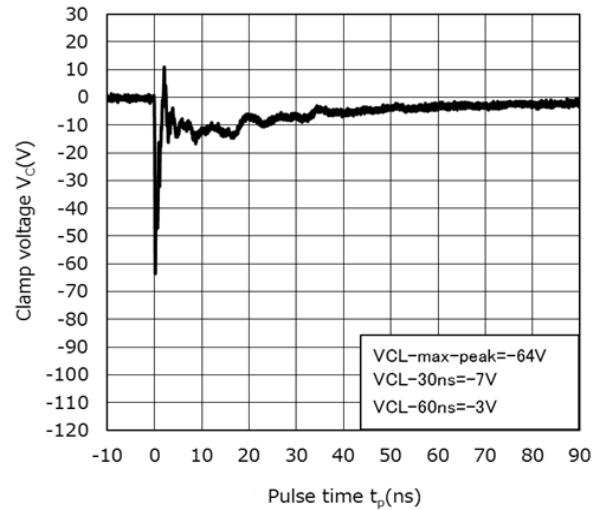
$I_{TLP} - V_{TLP}$



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

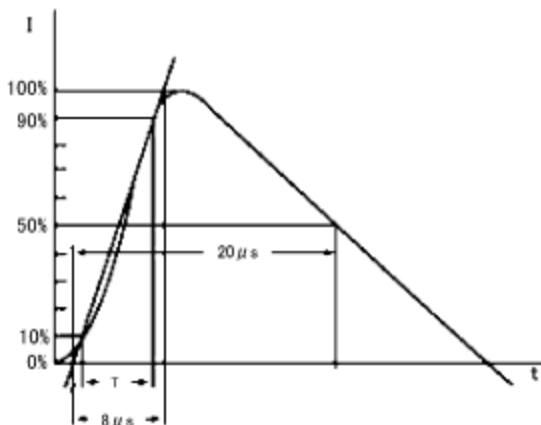


Clamp Waveform +8 kV (Note 3)



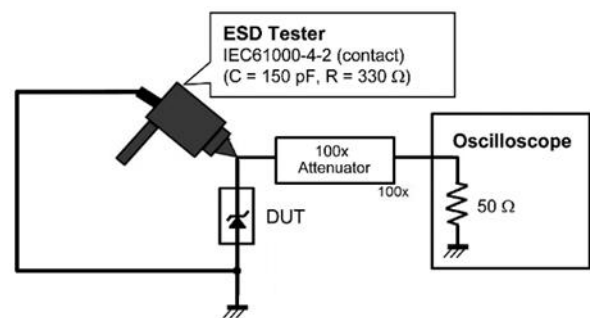
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

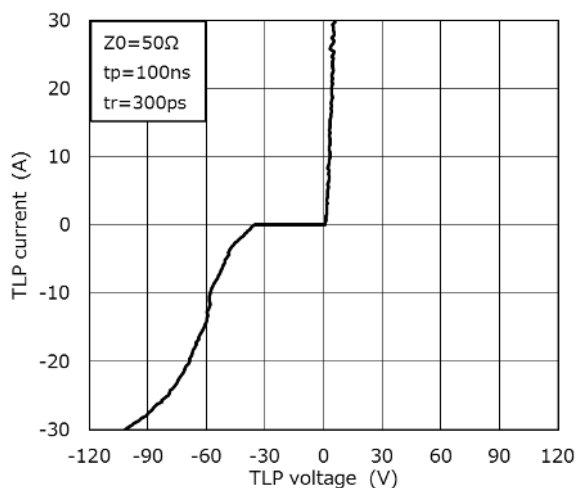
(Note 3) Clamp waveform measurement circuit



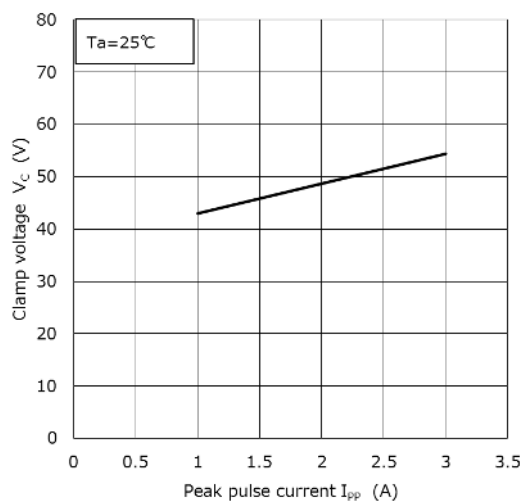
IEC61000-4-2 (Contact)

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

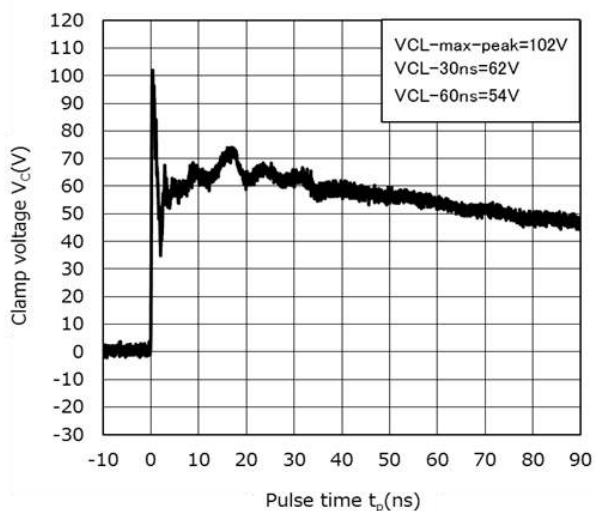
MUZ36V Characteristics Curves (Note 1)



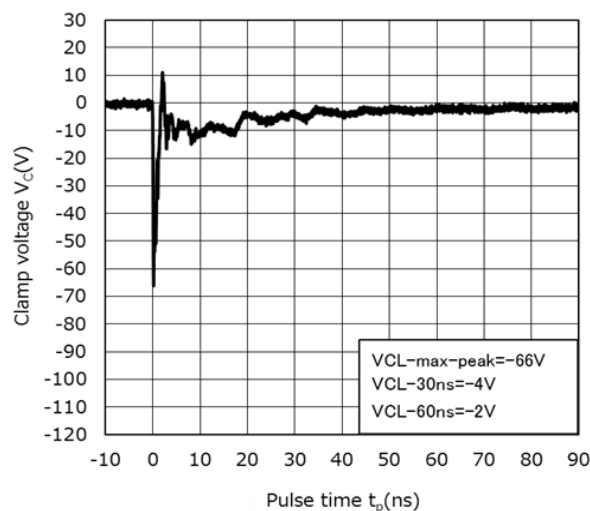
$I_{TLP} - V_{TLP}$



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

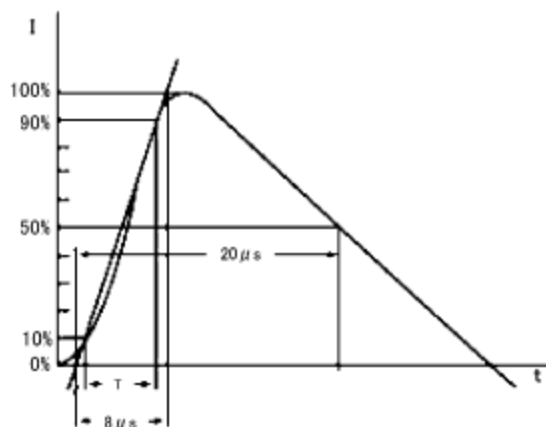


Clamp Waveform +8 kV (Note 3)



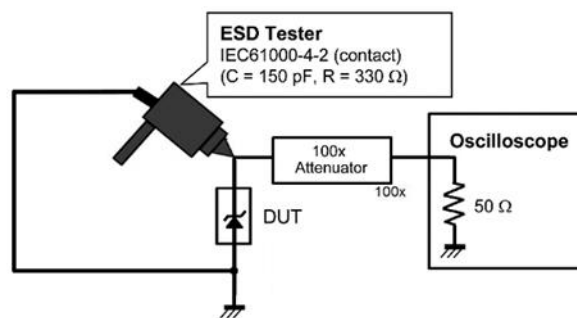
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

(Note 3) Clamp waveform measurement circuit

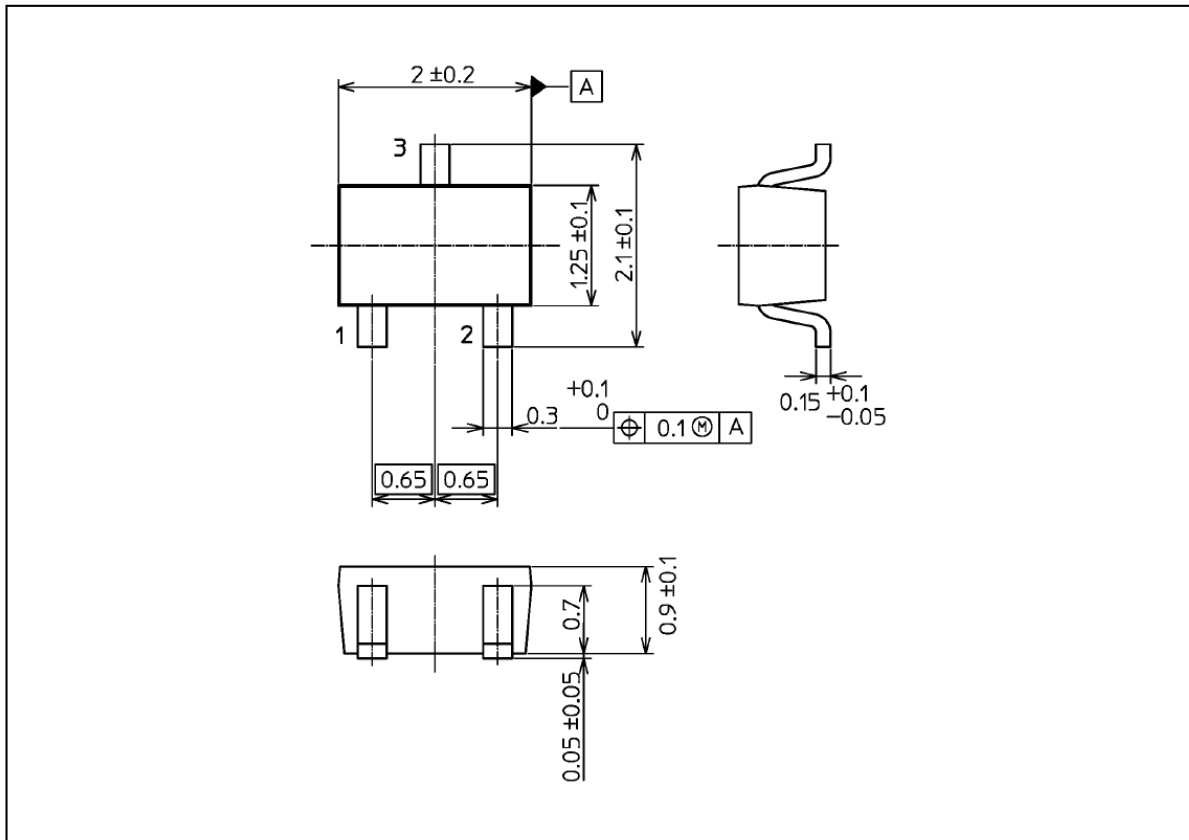


IEC61000-4-2 (Contact)

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: 6.0 mg (typ.)

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