

TOSHIBA Zener Diode Silicon Epitaxial Planar Type

MSZ Series

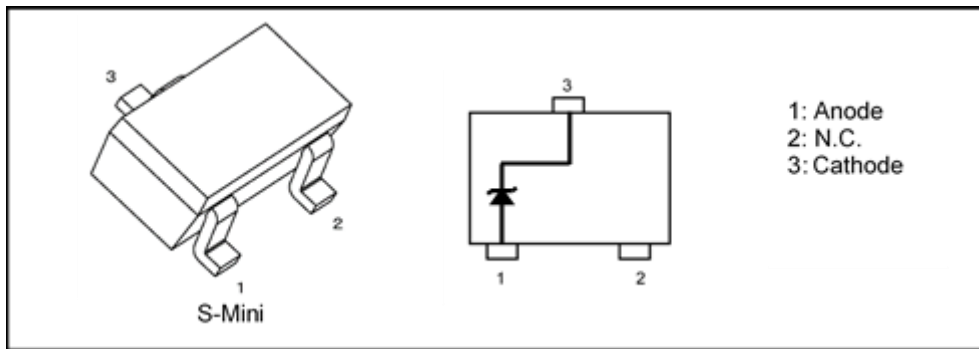
Applications

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	200	mW
	P _D ^{*1}	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 ^{*2}		Peak pulse power ^{*3}	Peak pulse current ^{*3}	Type No.	Electrostatic discharge voltage ^{*2}		Peak pulse power ^{*3}	Peak pulse current ^{*3}
	Contact	Air				Contact	Air		
	V _{ESD} (kV)					V _{ESD} (kV)			
MSZ5V6	± 30		155	12	MSZ16V	± 30		200	5.5
MSZ6V2	± 30		175	11	MSZ20V	± 30		200	5
MSZ6V8	± 30		180	10	MSZ24V	± 30		200	4.5
MSZ8V2	± 30		200	8.5	MSZ30V	± 20		200	4
MSZ12V	± 30		200	7	MSZ36V	± 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 x 25.4 mm, Cu pad: 645 mm²

*2: according to IEC61000-4-2

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

Start of commercial production
2020-07

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

Type No.	Zener Voltage			Dynamic Impedance		Dynamic resistance $R_{DYN} (\Omega)^{*1}$	Clamp voltage $V_C (V)^{*1*2}$	Total capacitance $C_t (pF)^{*3}$	Reverse Current		
	$V_Z (V)$			$Z_Z (\Omega)$	Test Current $I_Z (mA)$				$I_R (\mu A)$	Test Voltage $V_R (V)$	
	Min	Typ.	Max	Max	Test Current $I_Z (mA)$	Typ.	Typ.	Typ.	Max		
MSZ5V6	5.3	5.6	6.0	5	30	5	0.16	9	125	1	3.5
MSZ6V2	5.8	6.2	6.6	5	30	5	0.21	10	105	2.5	5.0
MSZ6V8	6.4	6.8	7.2	5	30	5	0.27	13	88	1.5	5.5
MSZ8V2	7.7	8.2	8.7	5	30	5	0.37	16.5	67	0.1	7
MSZ12V	11.4	12	12.6	5	30	5	0.7	26	44	0.1	10
MSZ16V	15.3	16	17.1	5	35	5	0.5	27	35	0.1	14
MSZ20V	18.8	20	21.2	5	70	5	0.35	30.5	29	0.1	17.6
MSZ24V	22.8	24	25.6	5	70	5	0.6	36.5	26	0.1	19
MSZ30V	28.0	30	32.0	2	100	2	1.25	47.5	21	0.1	27
MSZ36V	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 $I_{TLP2} = 30 \text{ A}$.

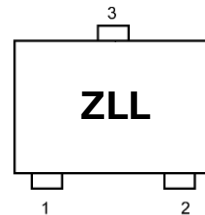
*2: $I_{TLP} = 16 \text{ A}$

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

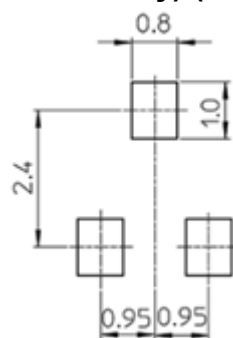
Marking List

Type No.	Marking	Type No.	Marking
MSZ5V6	ZLL	MSZ16V	ZM7
MSZ6V2	ZLM	MSZ20V	ZM9
MSZ6V8	ZLN	MSZ24V	ZMB
MSZ8V2	ZLQ	MSZ30V	ZMD
MSZ12V	ZM4	MSZ36V	ZMF

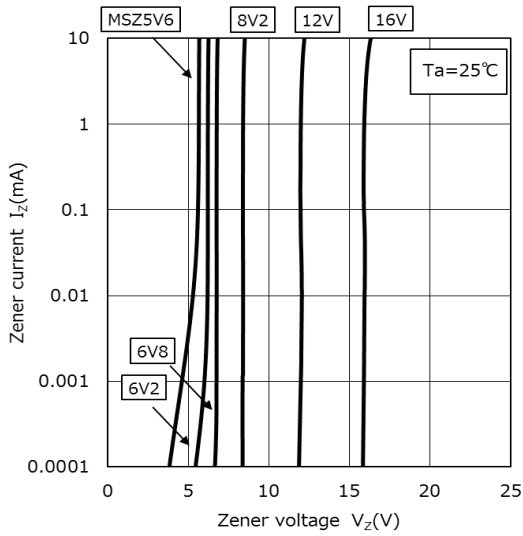
Marking (MSZ5V6)



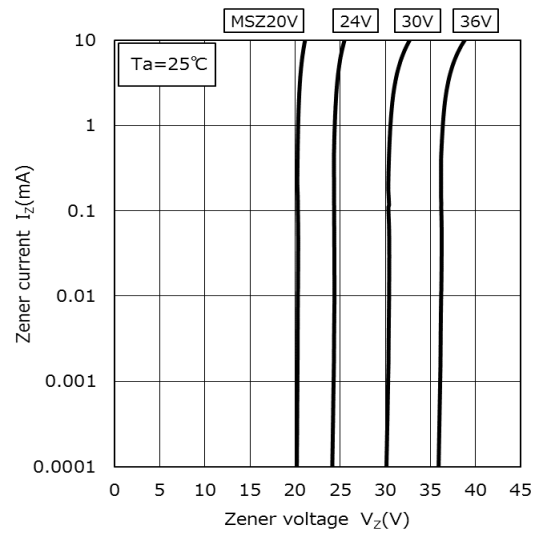
Land Pattern Dimensions (for reference only) (Unit: mm)



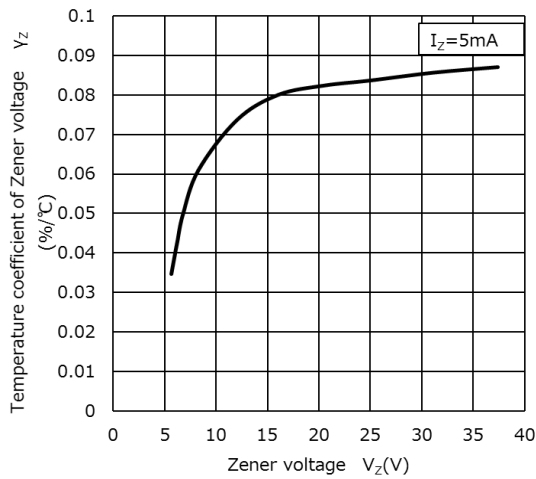
MSZ series Characteristics Curves (Note 1)



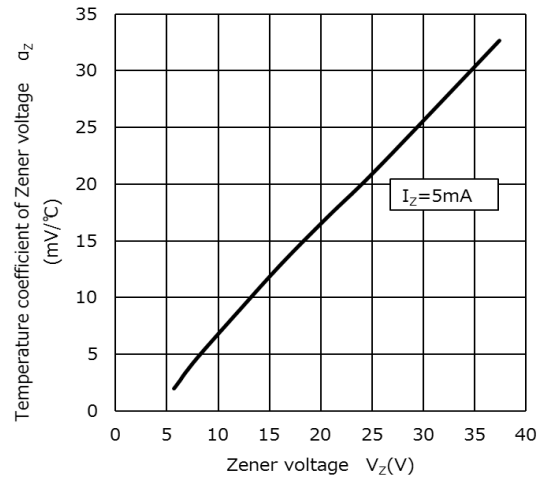
$I_Z - V_Z$ (1)



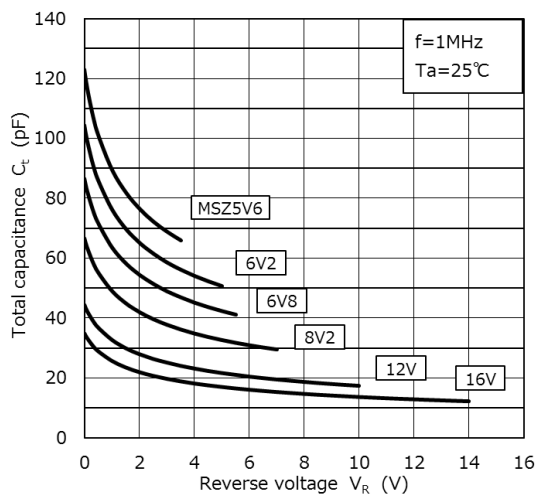
$I_Z - V_Z$ (2)



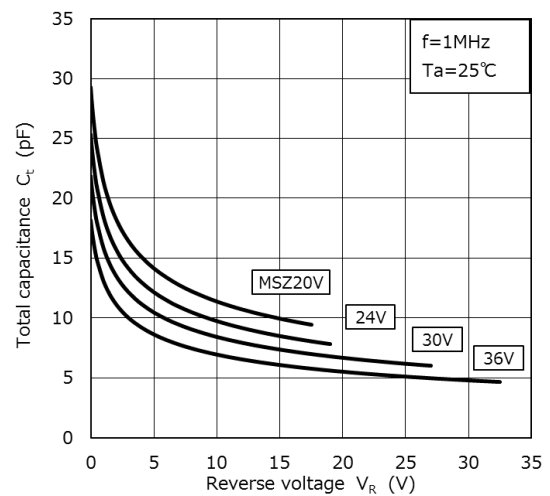
$\gamma_Z - V_Z$



$\alpha_Z - V_Z$



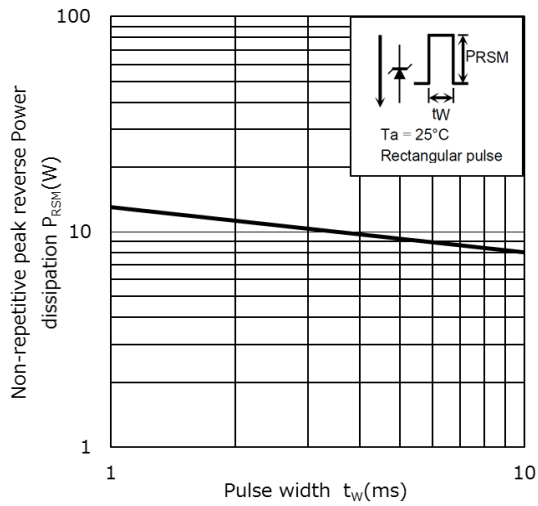
$C_t - V_R$ (1)



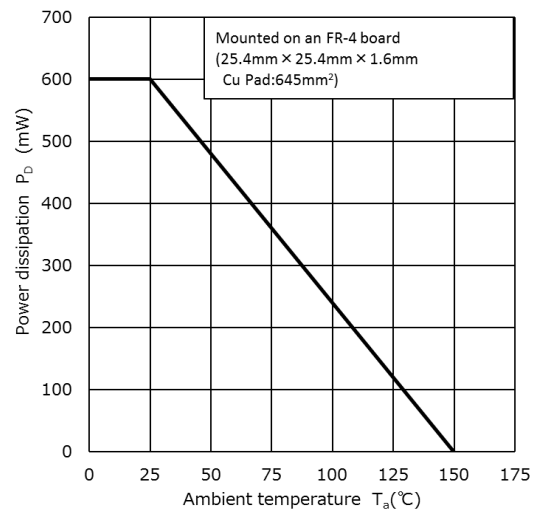
$C_t - V_R$ (2)

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

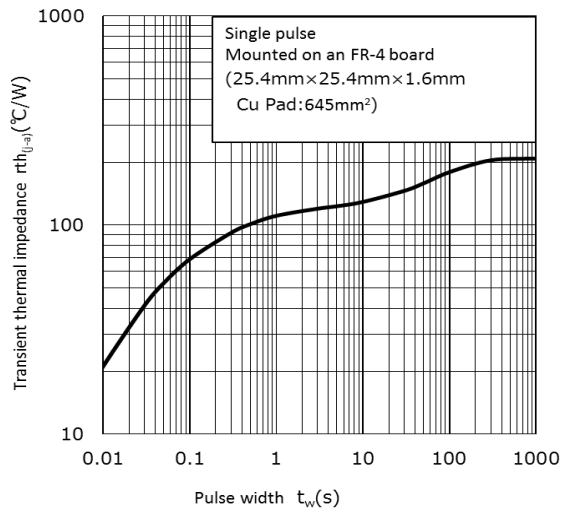
MSZ series Characteristics Curves (Note 1)



PRSM - t_w



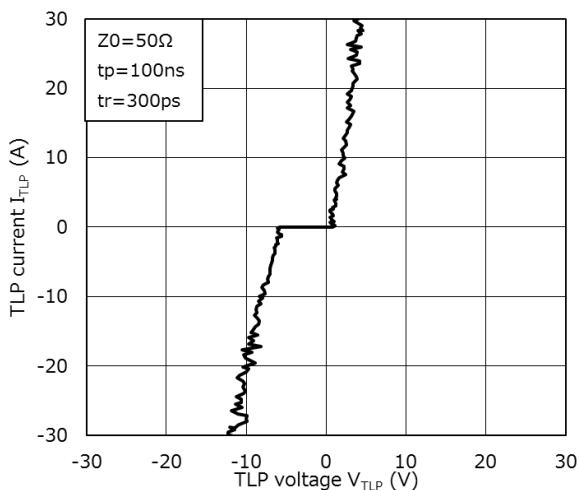
$P_D - T_a$



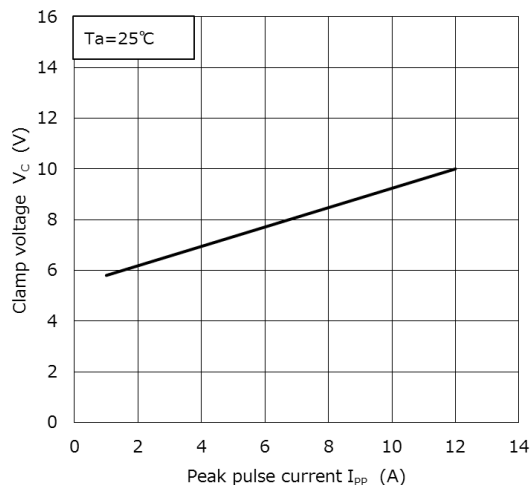
$r_{th(j-a)} - t_w$

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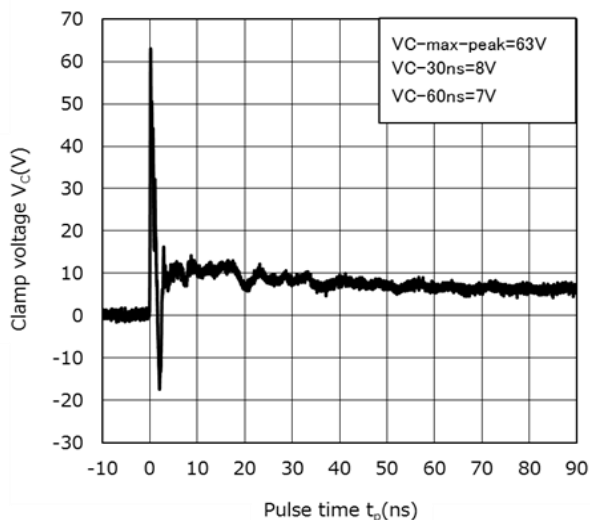
MSZ5V6 Characteristics Curves (Note 1)



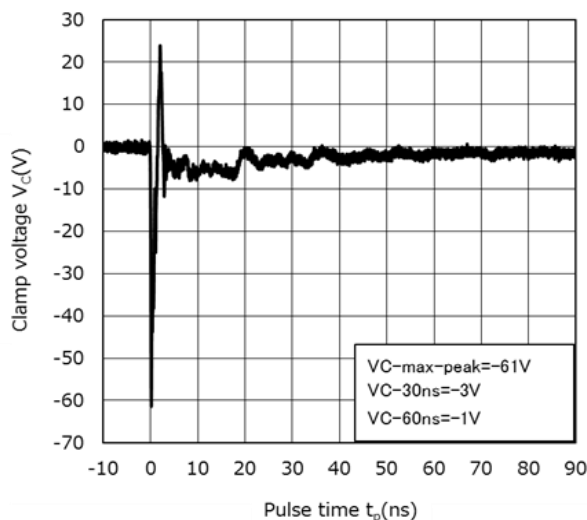
$I_{TLP} - V_{TLP}$



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

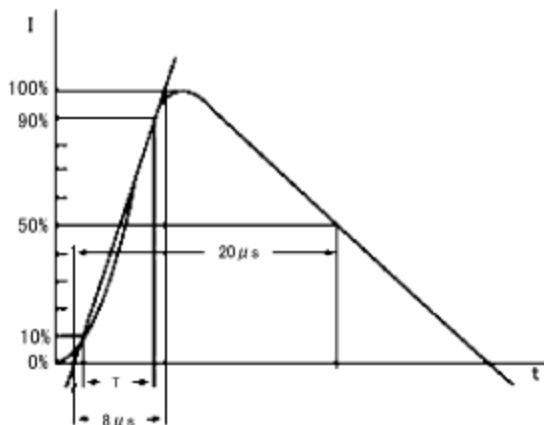


Clamp Waveform +8 kV (Note 3)



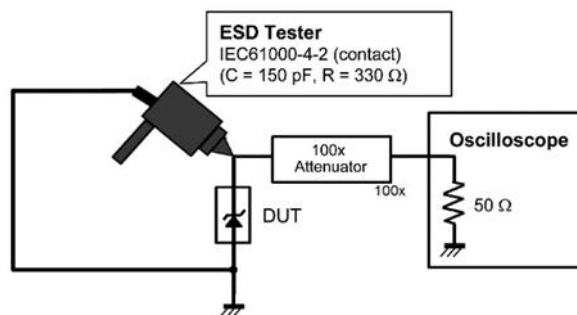
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

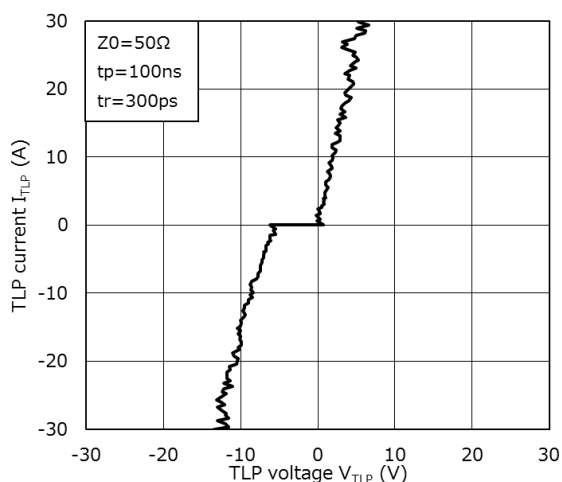
(Note 3) Clamp waveform measurement circuit



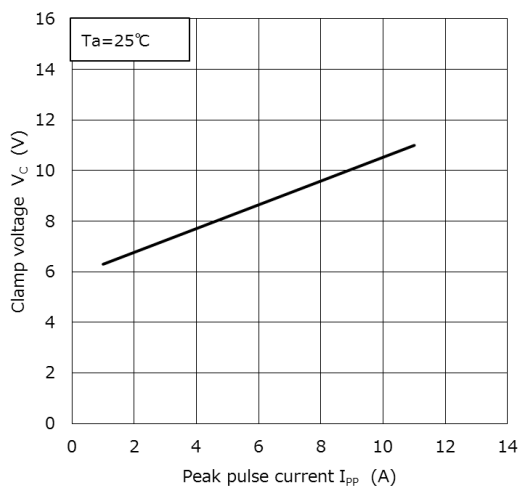
IEC61000-4-2 (Contact)

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

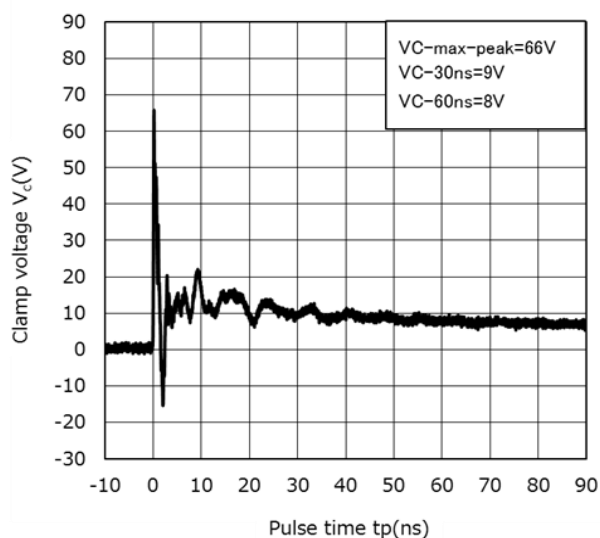
MSZ6V2 Characteristics Curves (Note 1)



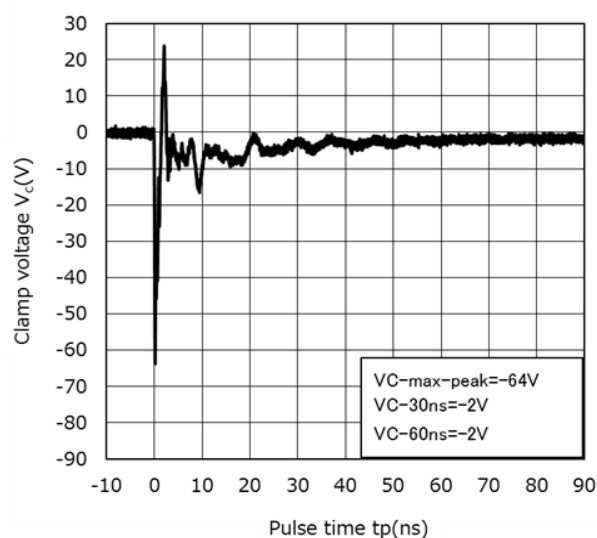
$I_{TLP} - V_{TLP}$



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

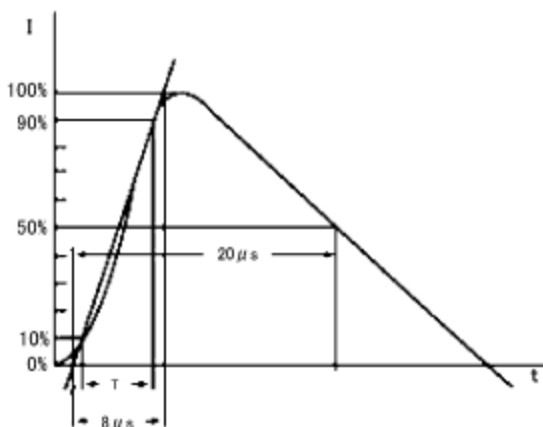


Clamp Waveform +8 kV (Note 3)



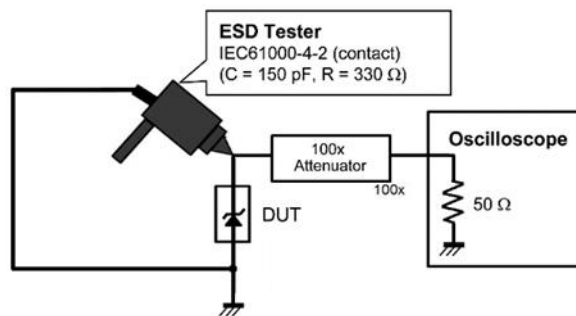
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

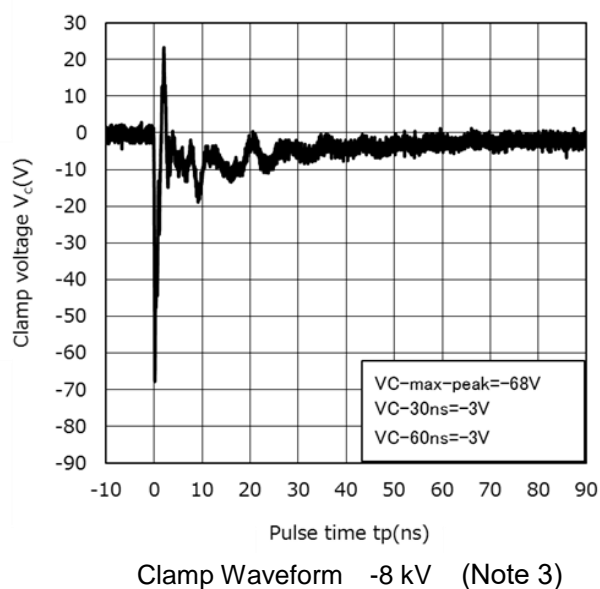
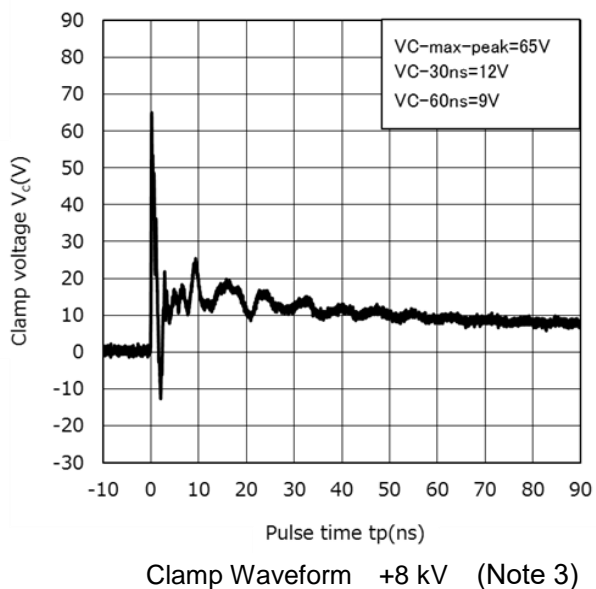
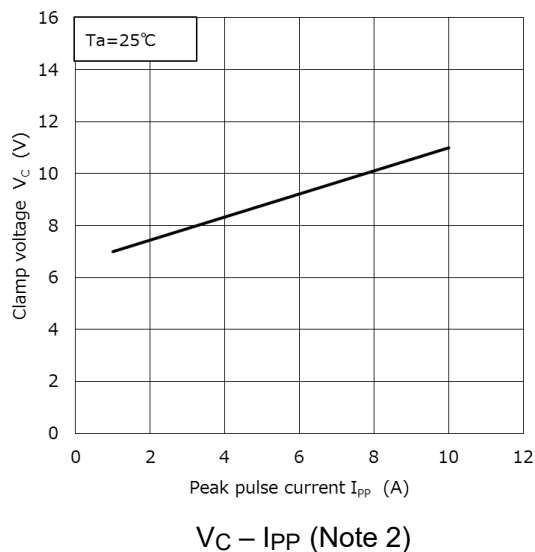
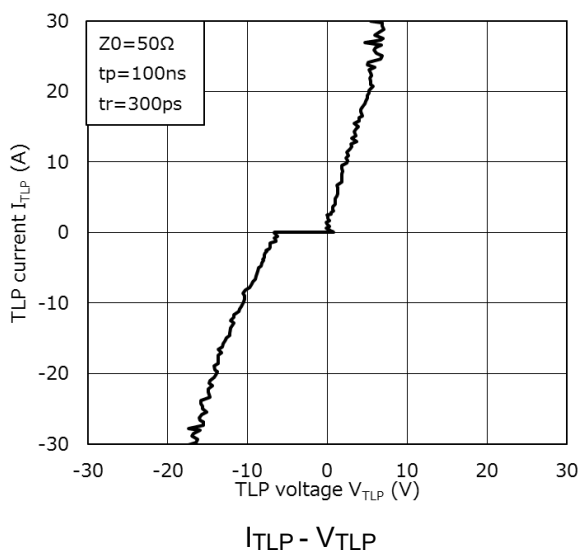
(Note 3) Clamp waveform measurement circuit



IEC61000-4-2 (Contact)

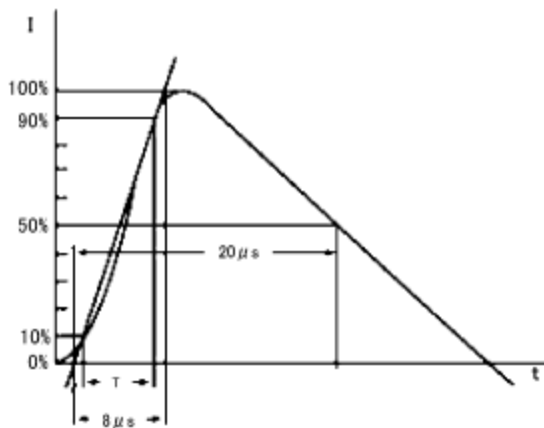
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MSZ6V8 Characteristics Curves (Note 1)

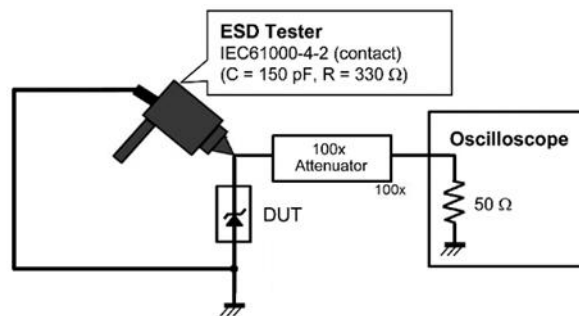


(Note 2) Peak Pulse Current ($V_C - I_{PP}$)

(Note 3) Clamp waveform measurement circuit



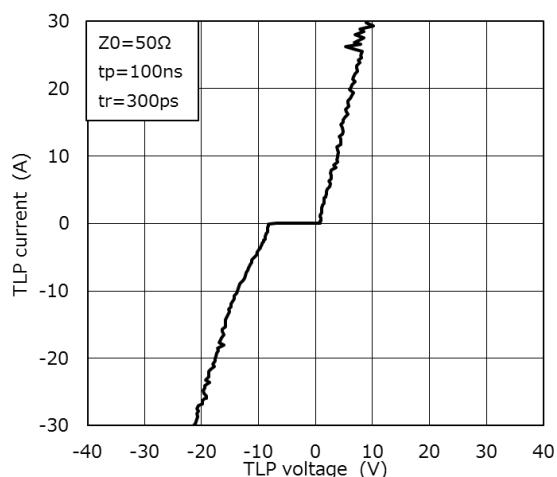
Based on IEC61000-4-5 8/20 μs pulse.



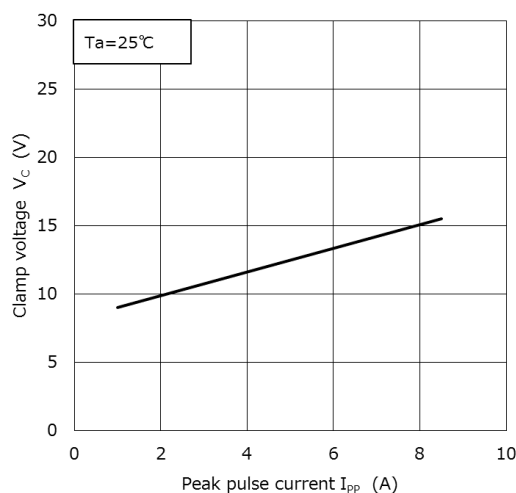
IEC61000-4-2 (Contact)

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

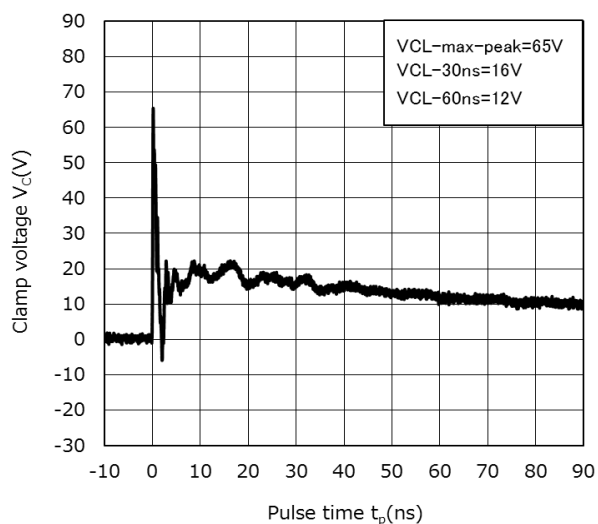
MSZ8V2 Characteristics Curves (Note 1)



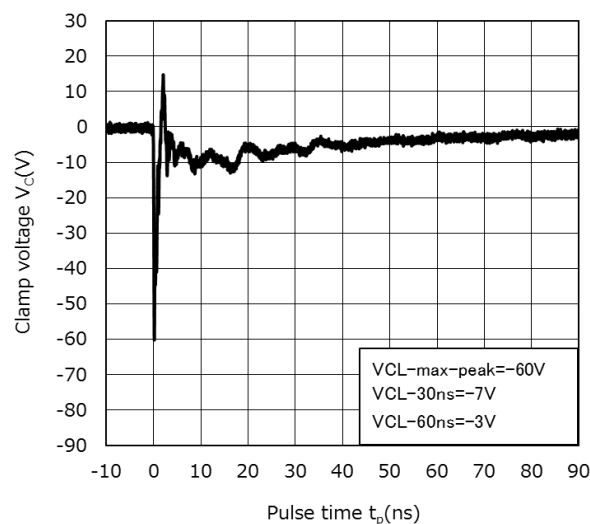
$I_{TLP} - V_{TLP}$



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

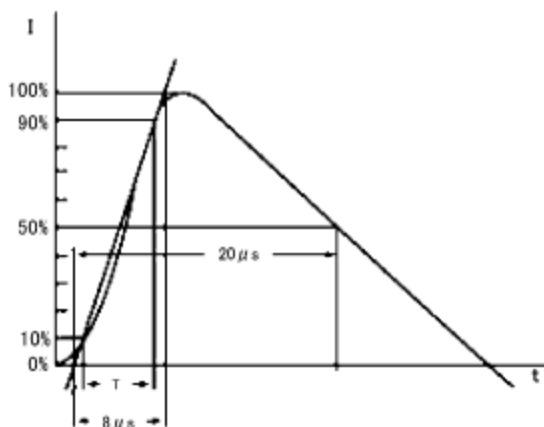


Clamp Waveform +8 kV (Note 3)



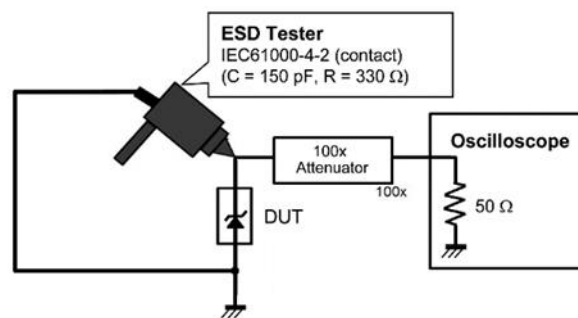
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

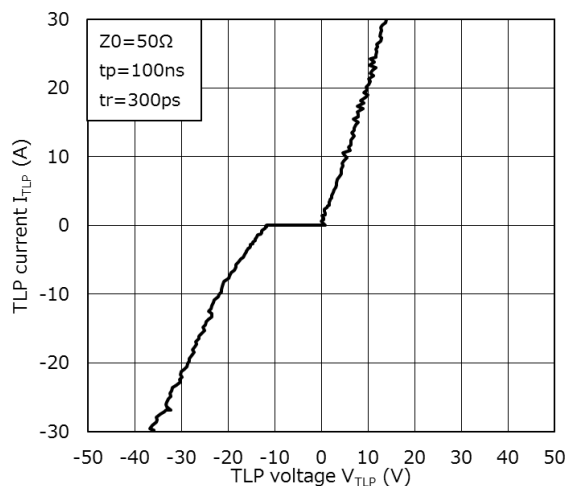
(Note 3) Clamp waveform measurement circuit



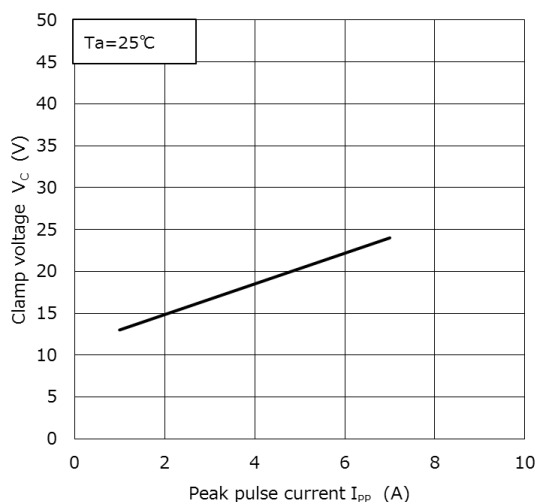
IEC61000-4-2 (Contact)

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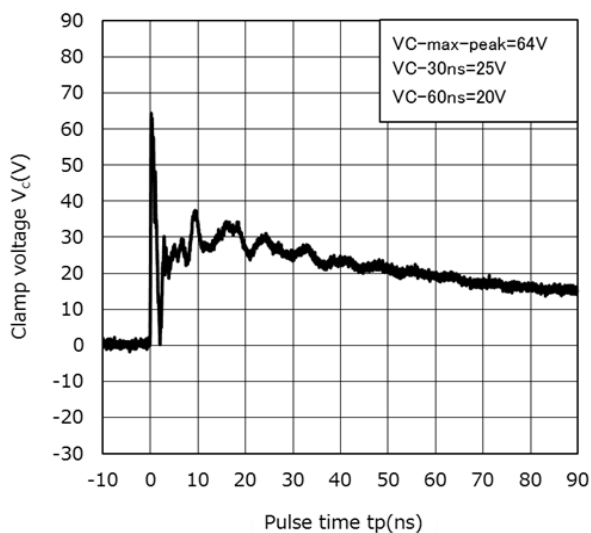
MSZ12V Characteristics Curves (Note 1)



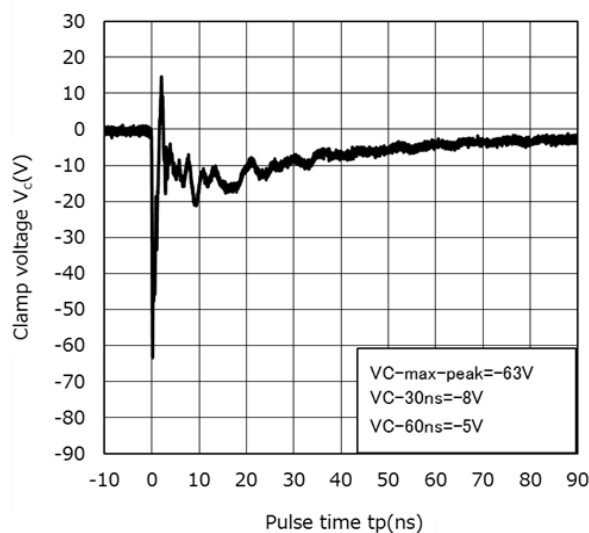
$I_{TLP} - V_{TLP}$



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



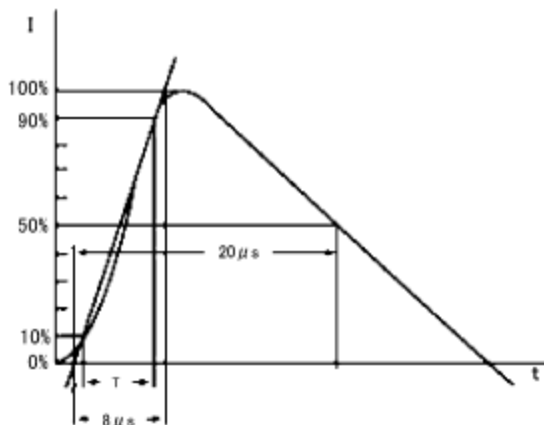
Clamp Waveform +8 kV (Note 3)



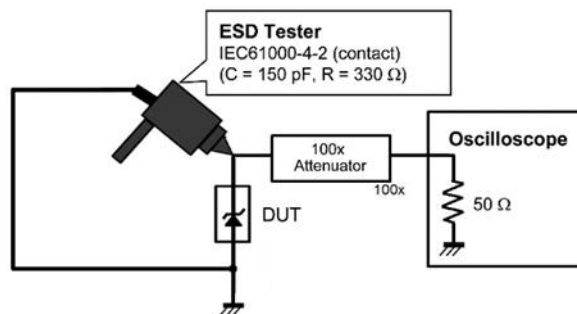
Clamp Waveform -8 kV (Note 3)

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

(Note 3) Clamp waveform measurement circuit



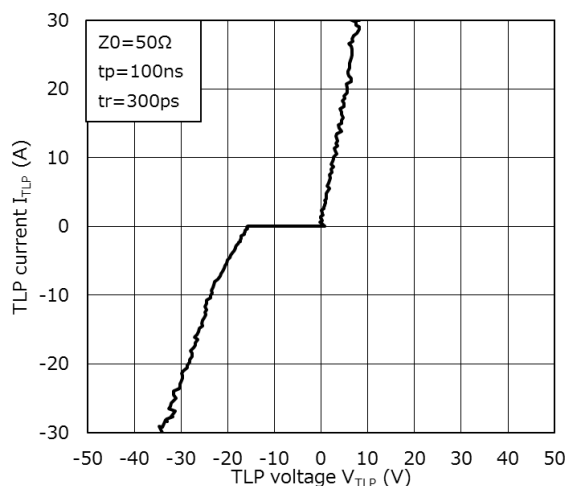
Based on IEC61000-4-5 8/20 μs pulse.



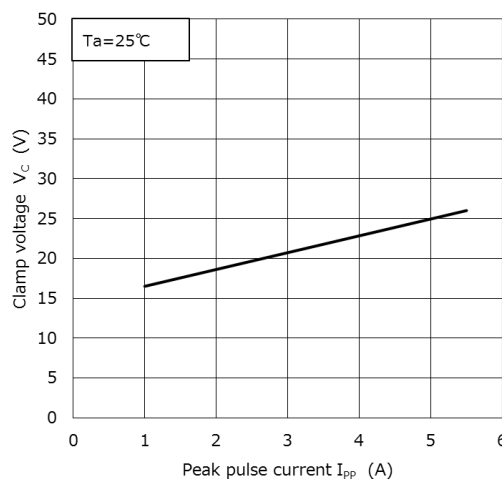
IEC61000-4-2 (Contact)

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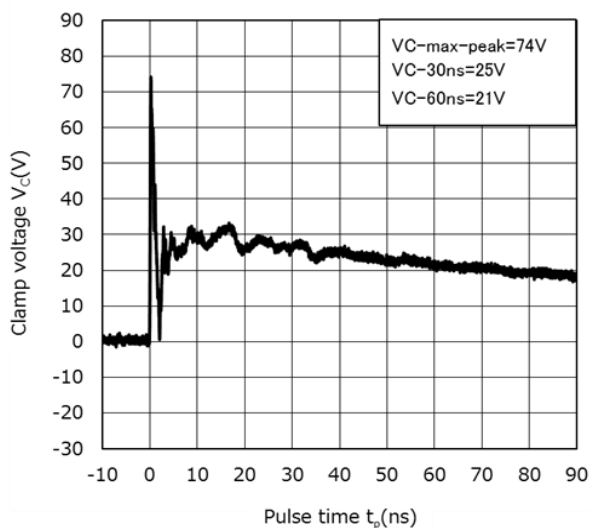
MSZ16V Characteristics Curves (Note 1)



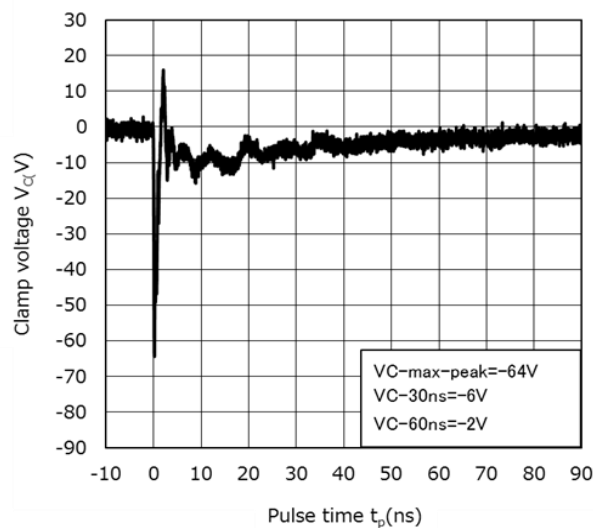
$I_{TLP} - V_{TLP}$



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

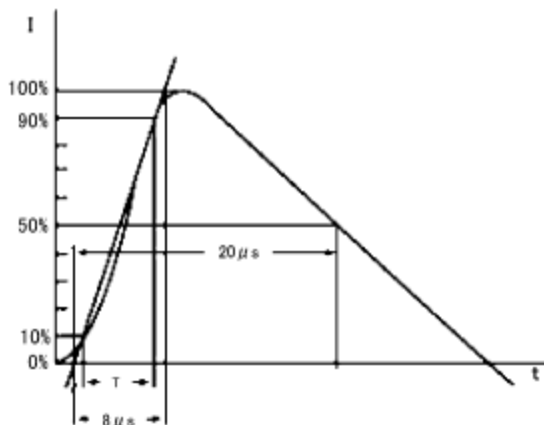


Clamp Waveform +8 kV (Note 3)



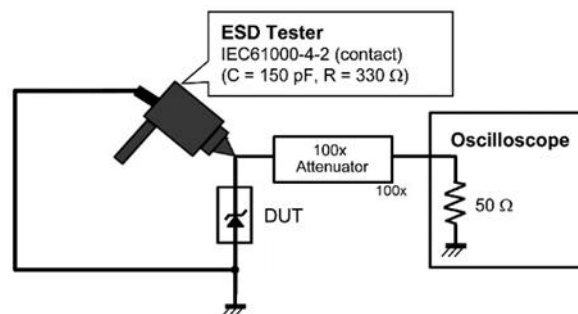
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

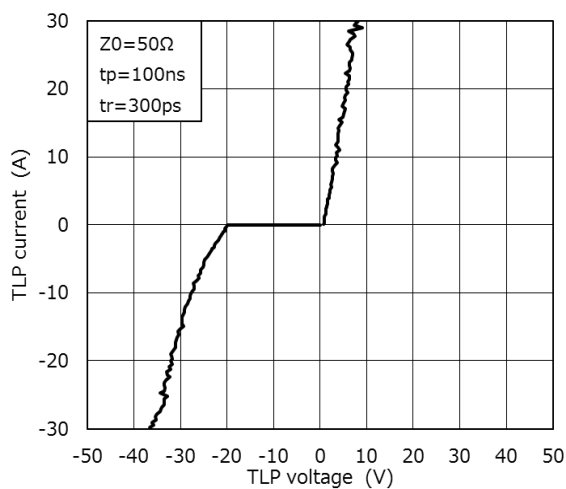
(Note 3) Clamp waveform measurement circuit



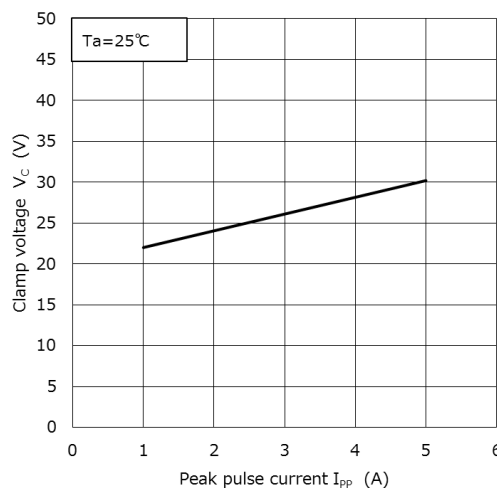
IEC61000-4-2 (Contact)

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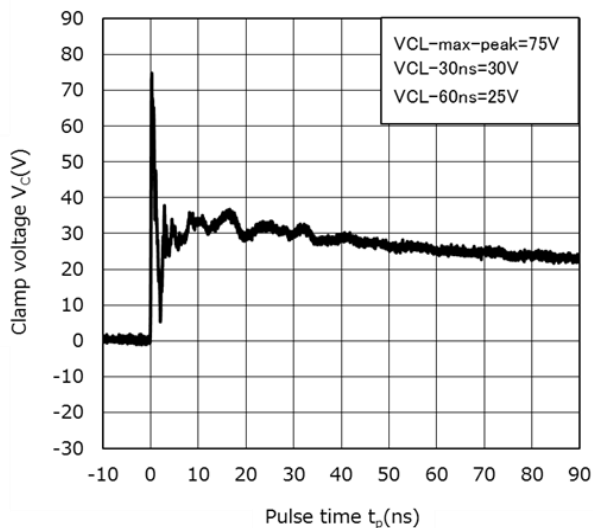
MSZ20V Characteristics Curves (Note 1)



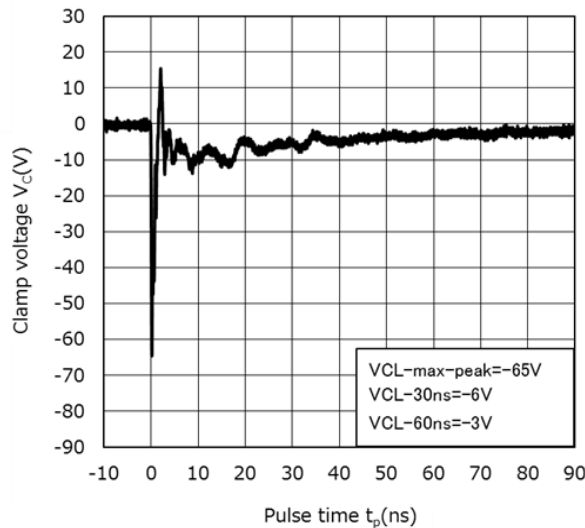
$I_{TLP} - V_{TLP}$



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

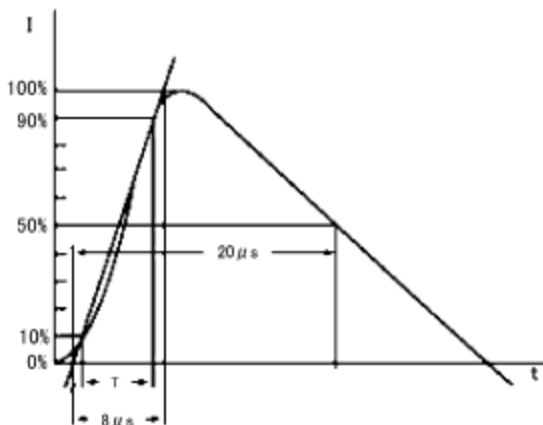


Clamp Waveform +8 kV (Note 3)



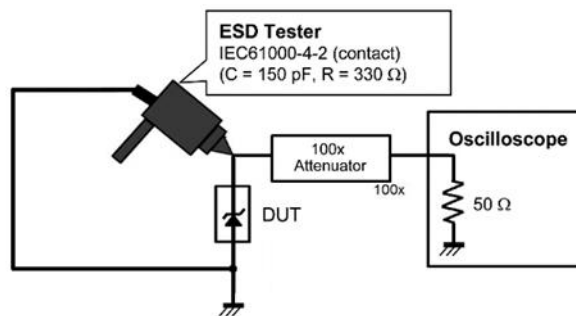
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μs pulse.

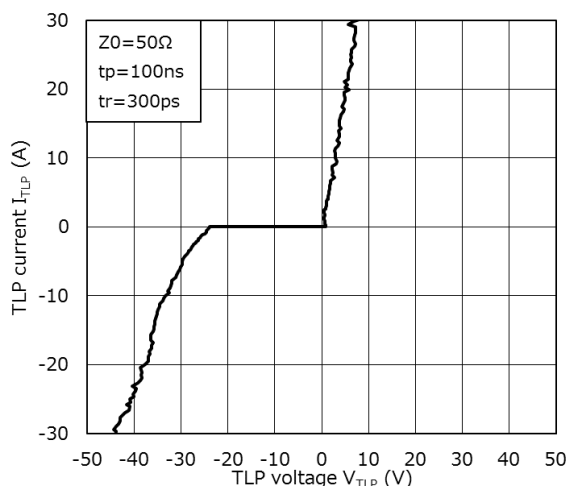
(Note 3) Clamp waveform measurement circuit



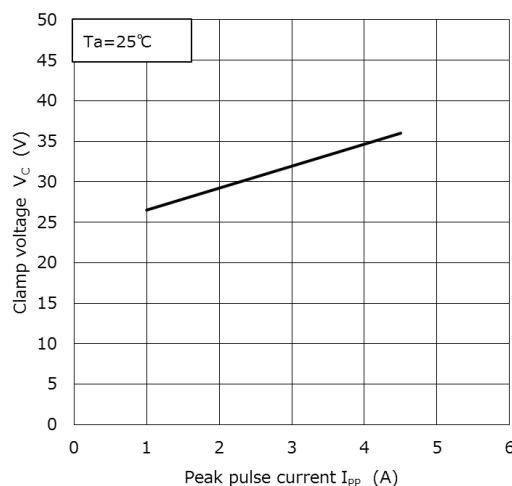
IEC61000-4-2 (Contact)

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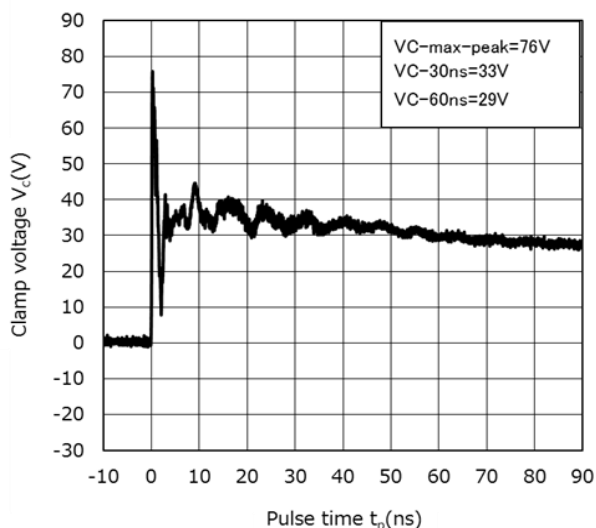
MSZ24V Characteristics Curves (Note 1)



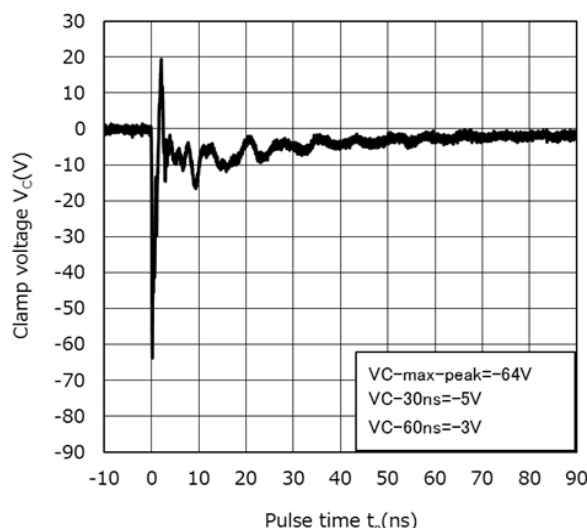
$I_{TLP} - V_{TLP}$



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

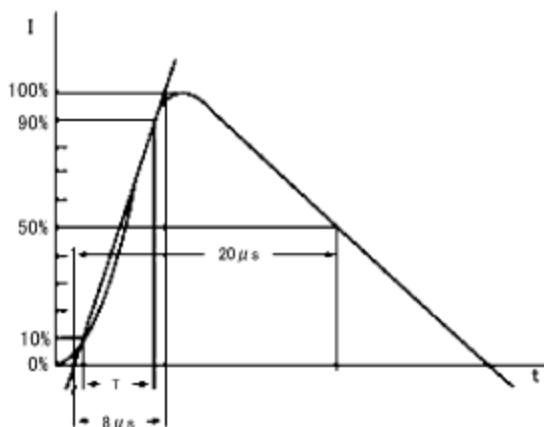


Clamp Waveform +8 kV (Note 3)



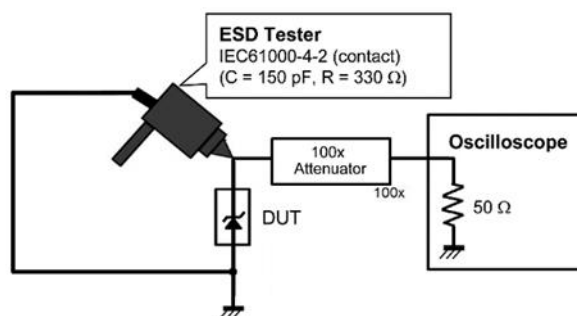
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

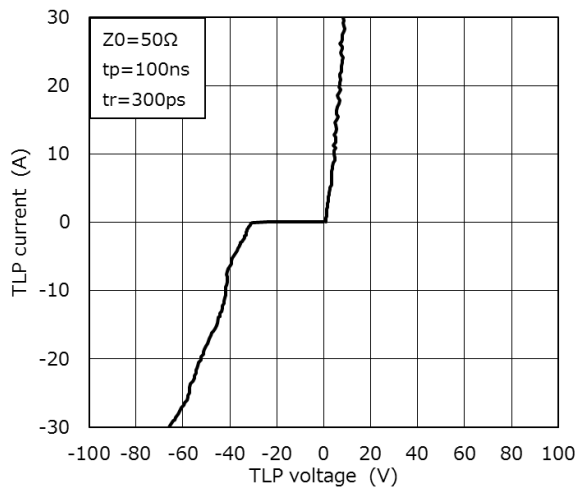
(Note 3) Clamp waveform measurement circuit



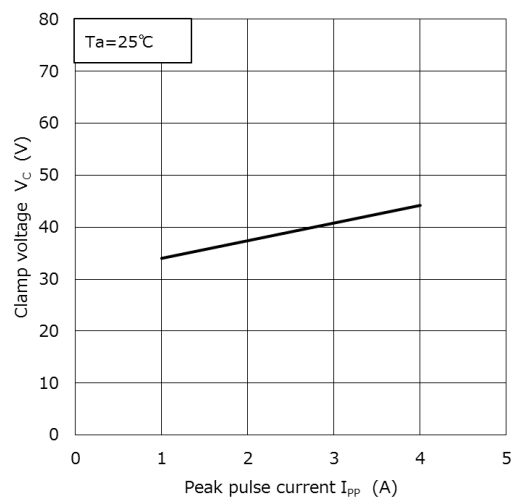
IEC61000-4-2 (Contact)

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

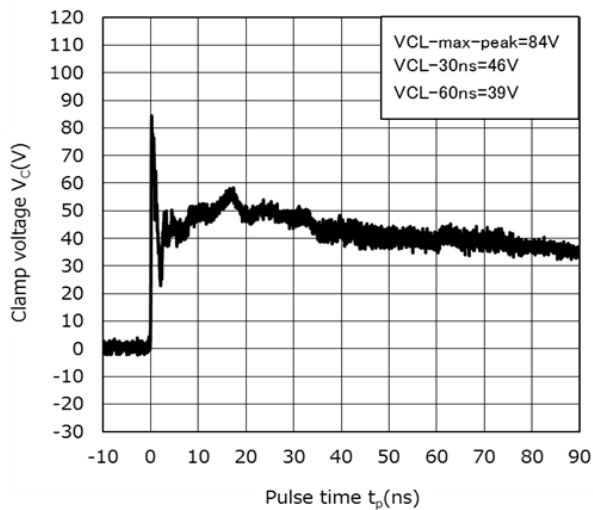
MSZ30V Characteristics Curves (Note 1)



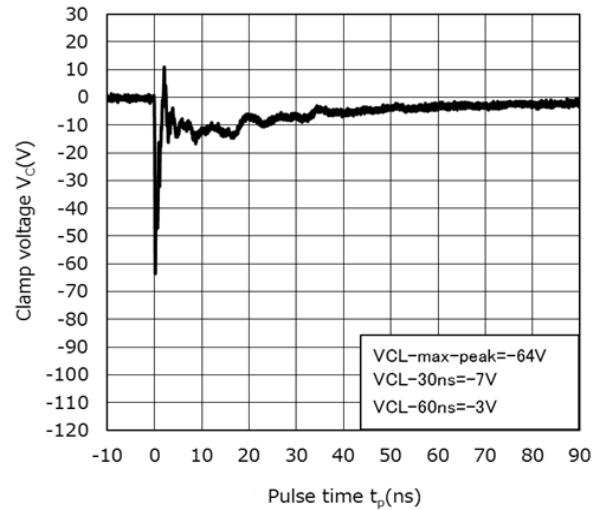
$I_{TLP} - V_{TLP}$



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

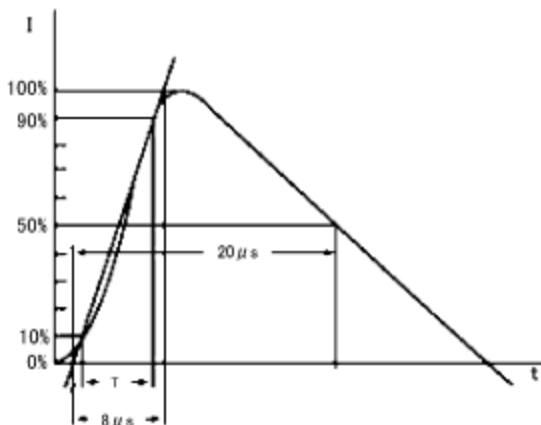


Clamp Waveform +8 kV (Note 3)



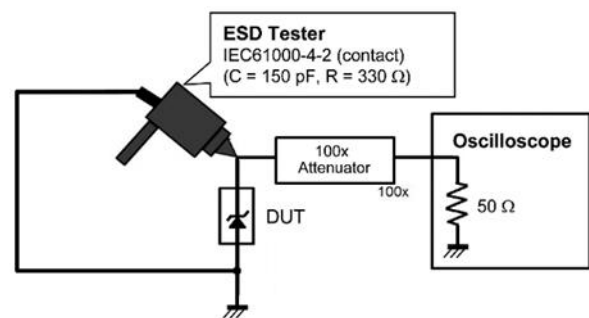
Clamp Waveform -8 kV (Note 3)

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



Based on IEC61000-4-5 8/20 μ s pulse.

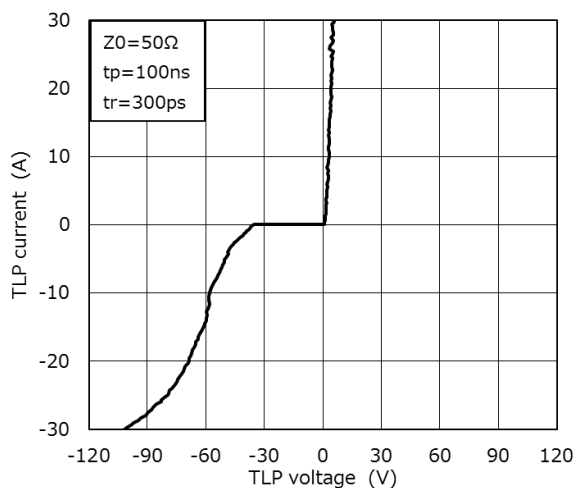
(Note 3) Clamp waveform measurement circuit



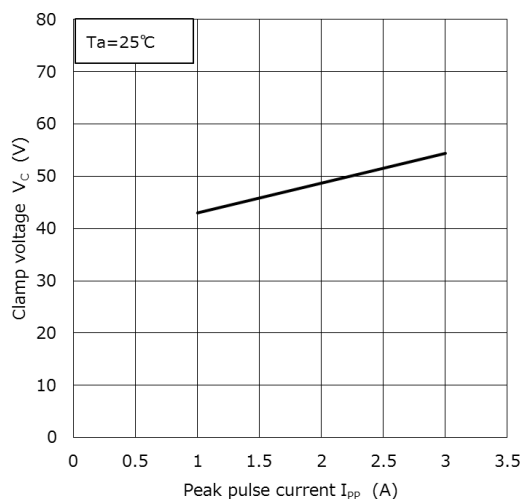
IEC61000-4-2 (Contact)

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

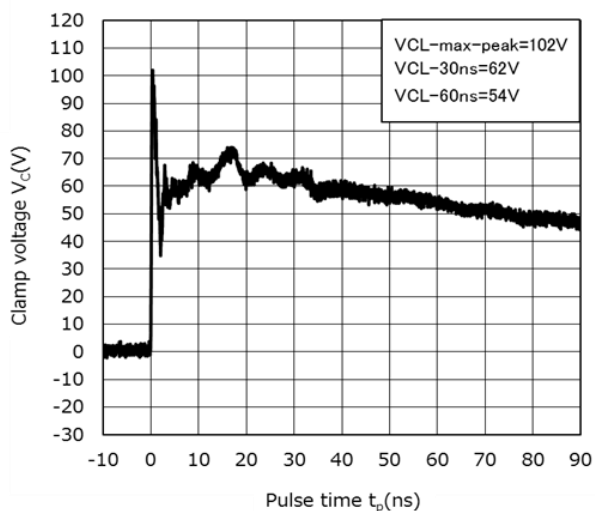
MSZ36V Characteristics Curves (Note 1)



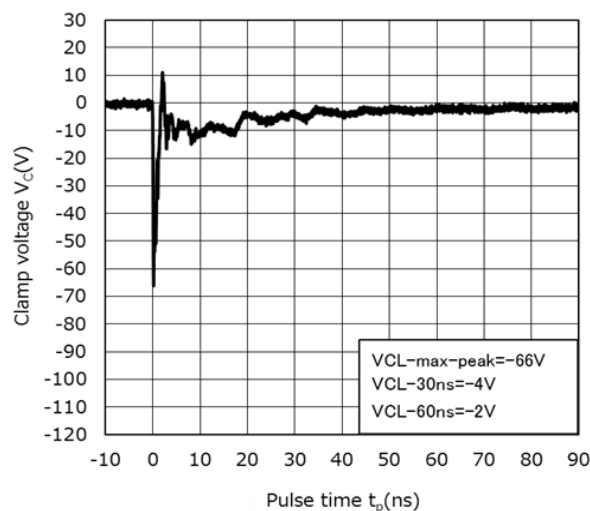
$I_{TLP} - V_{TLP}$



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

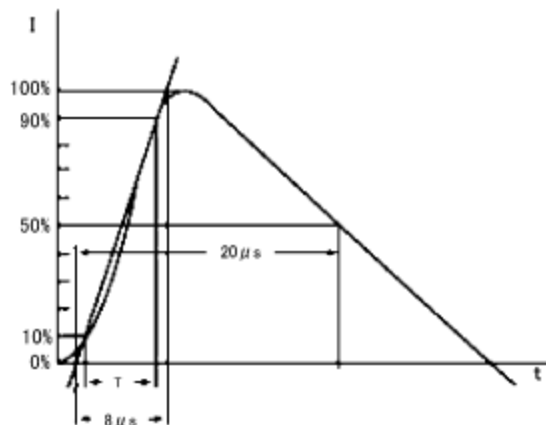


Clamp Waveform +8 kV (Note 3)



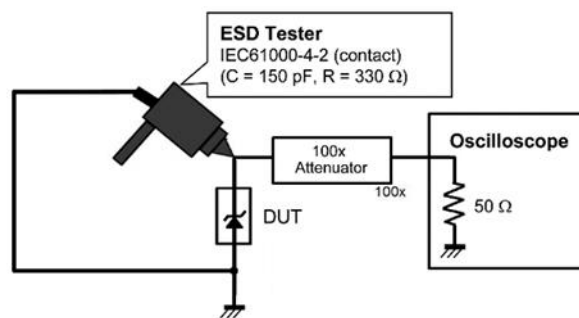
Clamp Waveform -8 kV (Note 3)

(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

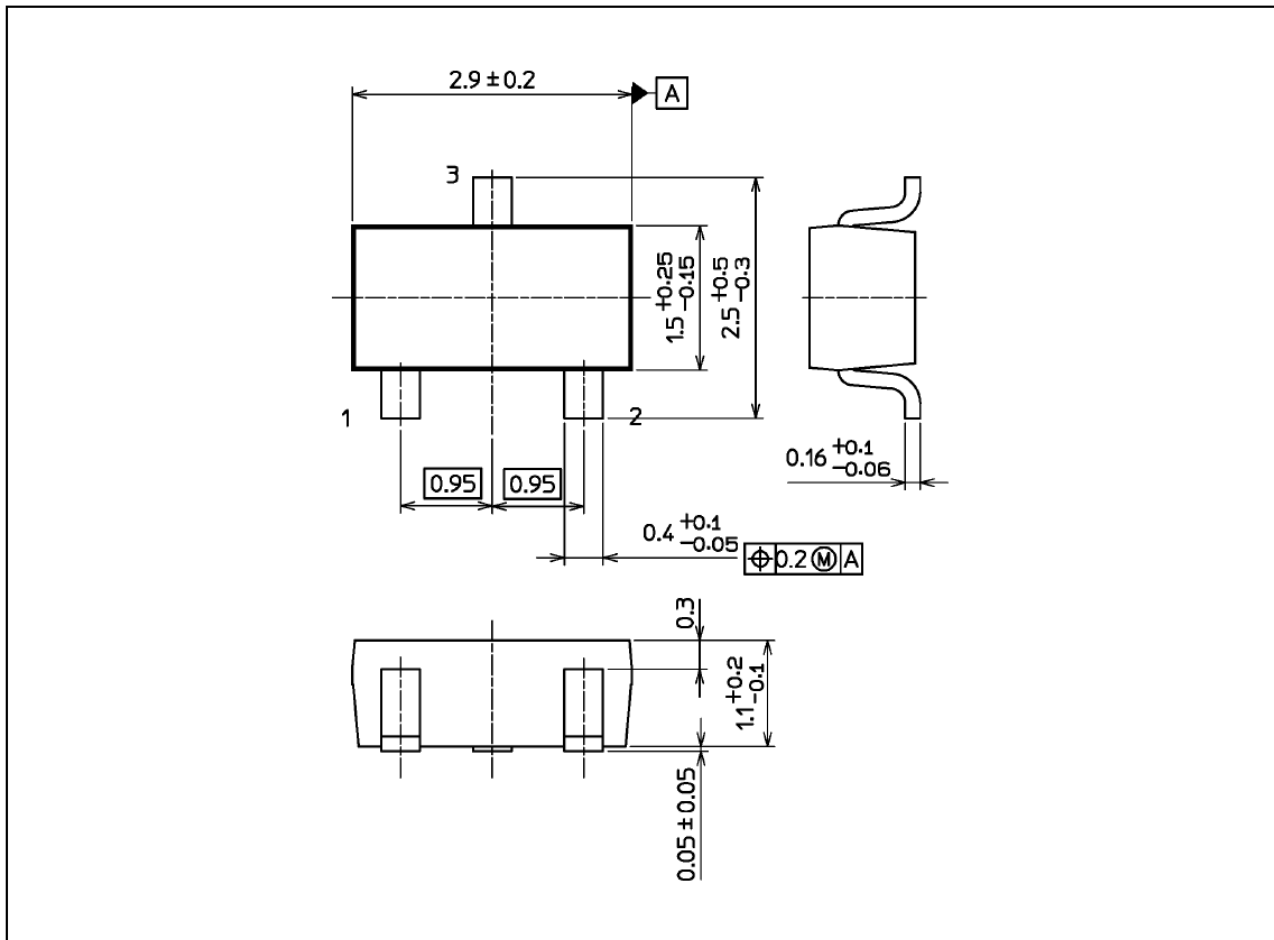


IEC61000-4-2 (Contact)

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: 12mg (typ.)

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