Zener Diode Silicon Epitaxial Planar

CTZ series

1. Applications

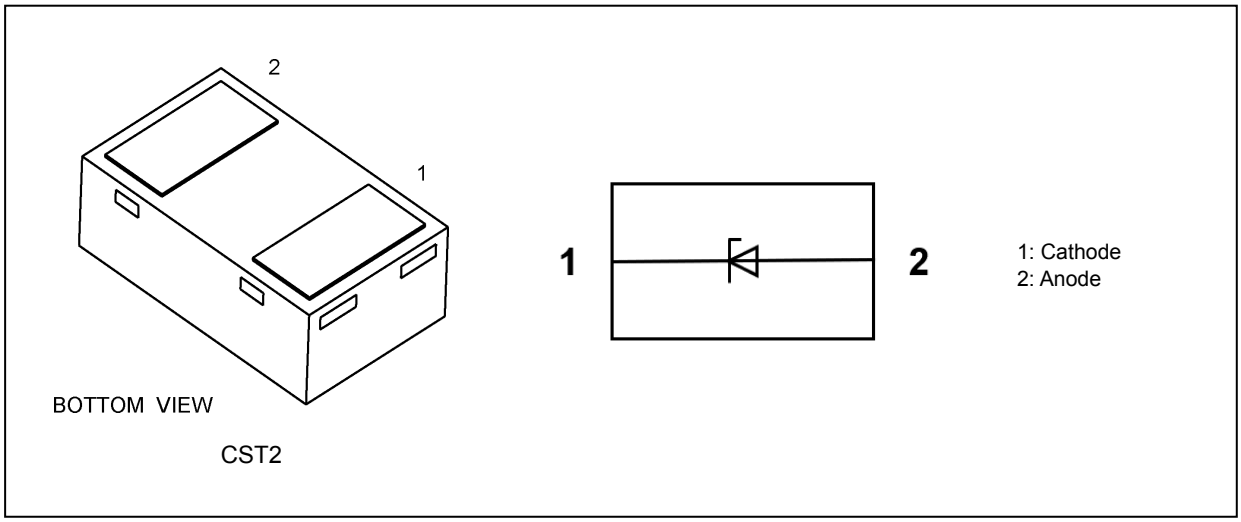
(1) Voltage surge protection

2. Features

(1) Small package

(2) The typical voltage of VZ is accorded to E24 series.

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings 1 (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Rating	Unit
Power dissipation	P_D	(Note 1)	150	mW
		(Note 2)	500	
Junction temperature	T_j		150	°C
Storage temperature	T_{stg}		-55 to 150	°C

Start of commercial production
2026-04

5. Absolute Maximum Ratings 2 (Note) (Unless otherwise specified, T_a = 25 °C)

Type No.	Electrostatic discharge voltage (Contact, Air) V_{ESD}(kV) (Note 3)	Peak pulse power P_{PK}(W) (Note 4)	Peak pulse current I_{PP}(A) (Note 4)
CTZ5V6	±30	155	12.0
CTZ6V2	±30	175	11.0
CTZ6V8	±30	180	10.0
CTZ7V5	±30	190	9.5
CTZ8V2	±30	200	8.5
CTZ9V1	±30	200	8.0
CTZ10V	±30	200	7.5
CTZ11V	±30	200	7.25
CTZ12V	±30	200	7.0
CTZ13V	±30	200	6.5
CTZ15V	±30	200	5.6
CTZ16V	±30	200	5.5
CTZ18V	±30	200	5.1
CTZ20V	±30	200	5.0
CTZ22V	±30	200	4.75
CTZ24V	±30	200	4.5
CTZ27V	±20	200	4.1
CTZ30V	±20	200	4.0
CTZ33V	±17	200	3.5
CTZ36V	±12	200	3.0

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).

Note 1: Mounted on an FR4 board (20 mm × 20 mm, Cu pad: 4 mm × 4 mm)

Note 2: Mounted on an FR4 board (25.4 mm × 25.4 mm × 1.6 mm, Cu pad: 645 mm^2)

Note 3: According to IEC61000-4-2.

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

6. Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

	Zener Voltage V_Z (V)				Dinamic Impedance Z_Z (Ω)		Dynamic Resistance R_{DYN} (Ω) (Note 1)	Clamp Voltage V_C (V) (Note 1) (Note 2)	Total Capacit-ance C_t (pF) (Note 3)	Reverse Current I_R (μA)	
Type No.	Min	Typ.	Max	Test Current I_Z (mA)	Max	Test Current I_Z (mA)	Typ.	Typ.	Typ.	Max	Test Voltage V_R (V)
CTZ5V6	5.3	5.6	6.0	5	30	5	0.16	9.0	125	1	3.5
CTZ6V2	5.8	6.2	6.6	5	30	5	0.21	10.0	105	2.5	5.0
CTZ6V8	6.4	6.8	7.2	5	30	5	0.27	13.0	88	1.5	5.5
CTZ7V5	7.0	7.5	7.9	5	30	5	0.32	14.0	78	0.1	6.0
CTZ8V2	7.7	8.2	8.7	5	30	5	0.37	16.5	67	0.1	7.0
CTZ9V1	8.5	9.1	9.6	5	30	5	0.44	17.0	62	0.1	7.5
CTZ10V	9.4	10.0	10.6	5	30	5	0.52	19.0	60	0.1	8.0
CTZ11V	10.4	11.0	11.6	5	30	5	0.60	24.0	48	0.1	9.0
CTZ12V	11.4	12.0	12.6	5	30	5	0.70	26.0	44	0.1	10.0
CTZ13V	12.4	13.0	14.1	5	30	5	0.80	27.0	42	0.1	11.0
CTZ15V	13.8	15.0	15.6	5	30	5	0.60	24.0	36	0.1	12.0
CTZ16V	15.3	16.0	17.1	5	35	5	0.50	27.0	35	0.1	14.0
CTZ18V	16.8	18.0	19.1	5	45	5	0.40	28.5	31	0.1	16.0
CTZ20V	18.8	20.0	21.2	5	70	5	0.35	30.5	29	0.1	17.6
CTZ22V	20.8	22.0	23.3	5	70	5	0.40	32.0	27	0.1	18.0
CTZ24V	22.8	24.0	25.6	5	70	5	0.60	36.5	26	0.1	19.0
CTZ27V	25.1	27.0	28.9	2	70	2	0.90	45.0	23	0.1	23.0
CTZ30V	28.0	30.0	32.0	2	100	2	1.25	47.5	21	0.1	27.0
CTZ33V	31.0	33.0	35.0	2	100	2	1.80	57.0	19	0.1	30.0
CTZ36V	34.0	36.0	38.0	2	100	2	2.60	63.0	18	0.1	32.5

Note1: 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.

Note2: I_{TLP} = 16 A

Note3: V_R = 0 V, f = 1 MHz

7. Marking List

Type No.	Marking	Type No.	Marking	Type No.	Marking
CTZ5V6	PC	CTZ11V	PK	CTZ22V	PT
CTZ6V2	PD	CTZ12V	PL	CTZ24V	PU
CTZ6V8	PE	CTZ13V	PM	CTZ27V	PV
CTZ7V5	PF	CTZ15V	PN	CTZ30V	PW
CTZ8V2	PG	CTZ16V	PP	CTZ33V	PX
CTZ9V1	PH	CTZ18V	PR	CTZ36V	PY
CTZ10V	PJ	CTZ20V	PS	—	—

8. Marking

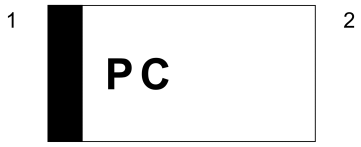


Fig. 8.1 CTZ5V6

9. Land Pattern Dimensions (for reference only)

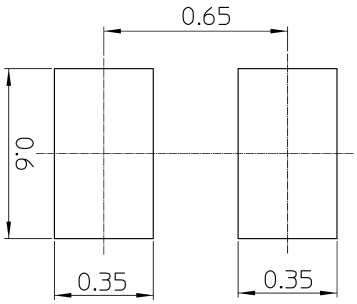


Fig. 9.1 Land Pattern Dimensions
(for reference only) (Unit: mm)

10. Characteristics Curves

10.1. CTZ series Characteristics Curves(Note)

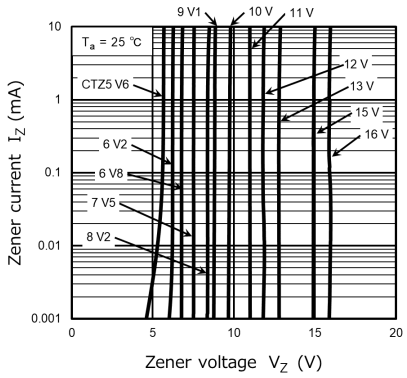


Fig. 10.1.1 I_Z - V_Z(1)

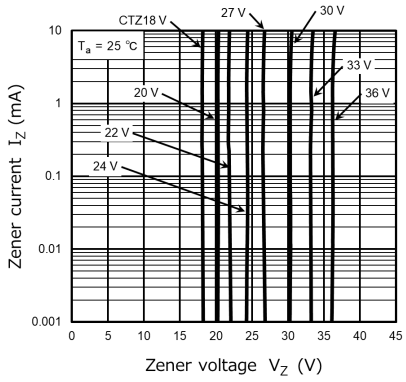


Fig. 10.1.2 I_Z - V_Z(2)

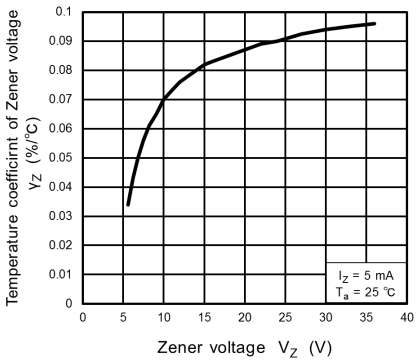


Fig. 10.1.3 γ_Z - V_Z

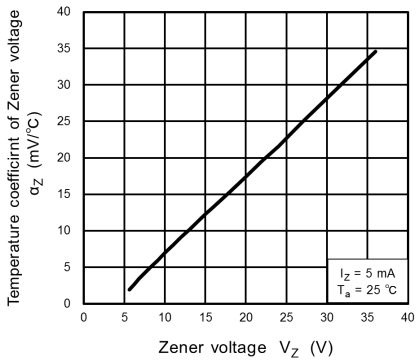


Fig. 10.1.4 α_Z - V_Z

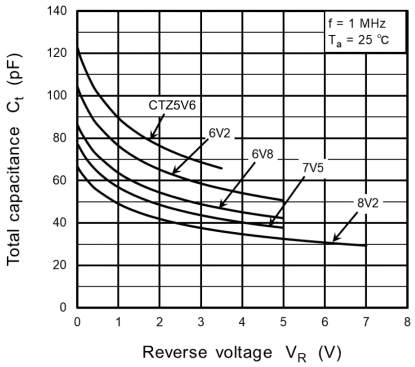


Fig. 10.1.5 C_t - V_R (1)

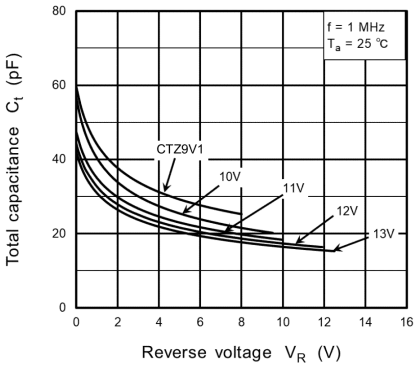


Fig. 10.1.6 C_t - V_R (2)

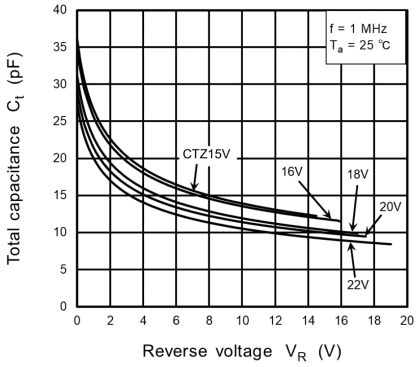


Fig. 10.1.7 C_t - V_R (3)

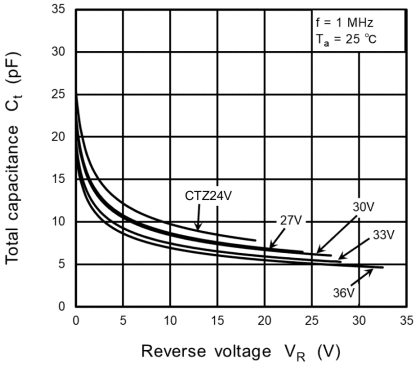


Fig. 10.1.8 C_t - V_R (4)

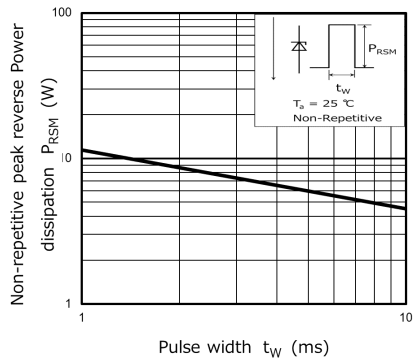


Fig. 10.1.9 P_{RSM} - t_w

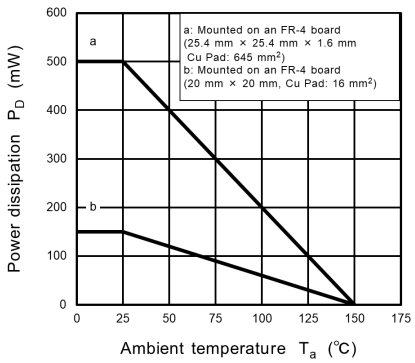


Fig. 10.1.10 P_D - T_a

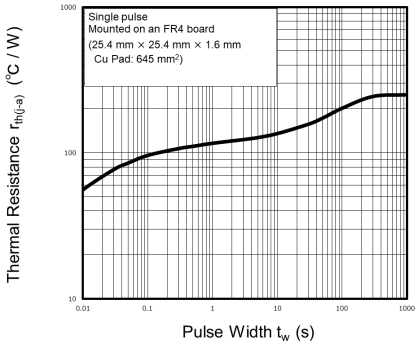


Fig. 10.1.11 $r_{th(j-a)}$ - t_w

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

10.2. CTZ5V6 Characteristics Curves(Note)

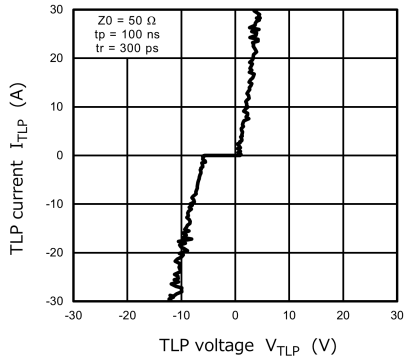


Fig. 10.2.1 I_{TLP} - V_{TLP}

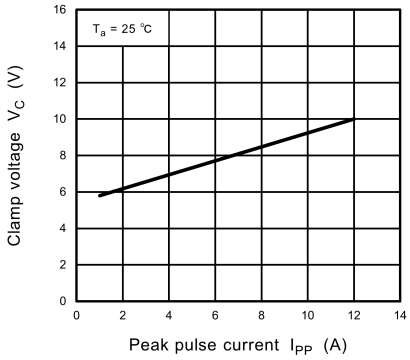


Fig. 10.2.2 V_C - I_{PP}

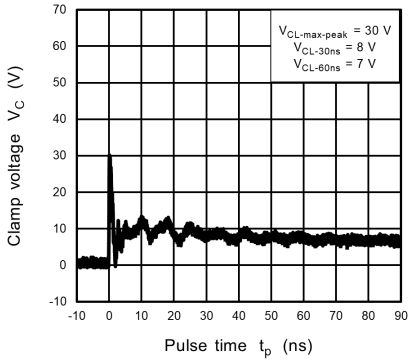


Fig. 10.2.3 IEC61000-4-2 Clamp Waveform +8 kV

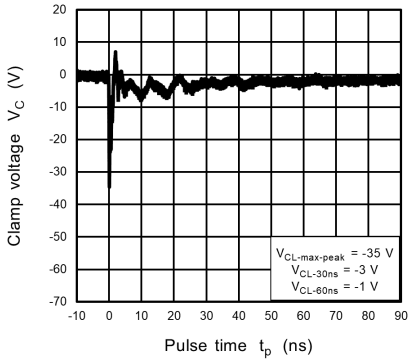


Fig. 10.2.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.3. CTZ6V2 Characteristics Curves(Note)

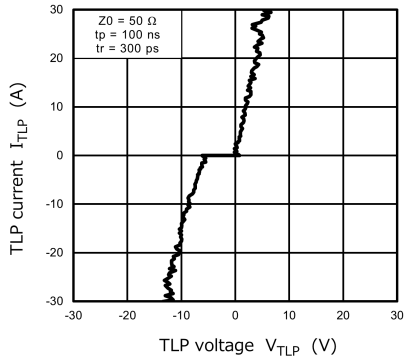


Fig. 10.3.1 I_{TLP} - V_{TLP}

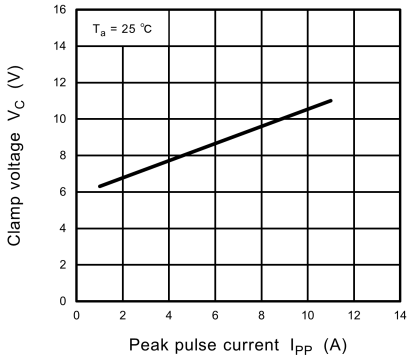


Fig. 10.3.2 V_C - I_{PP}

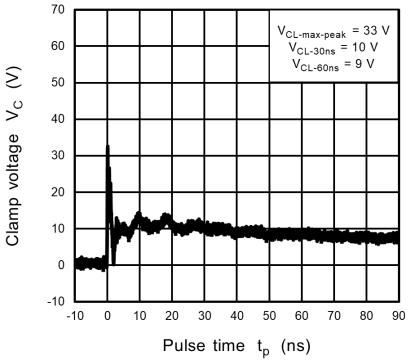


Fig. 10.3.3 IEC61000-4-2 Clamp Waveform +8 kV

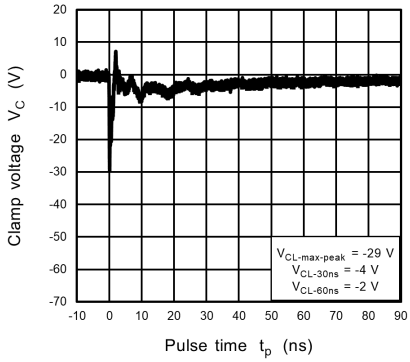


Fig. 10.3.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.4. CTZ6V8 Characteristics Curves(Note)

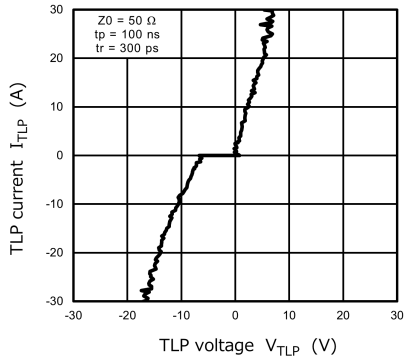


Fig. 10.4.1 I_{TLP} - V_{TLP}

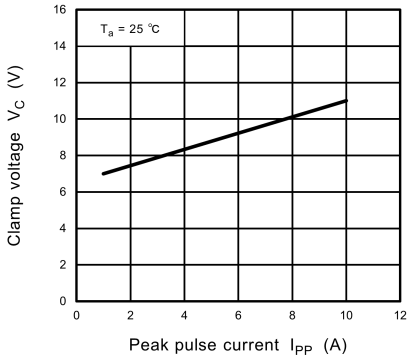


Fig. 10.4.2 V_C - I_{PP}

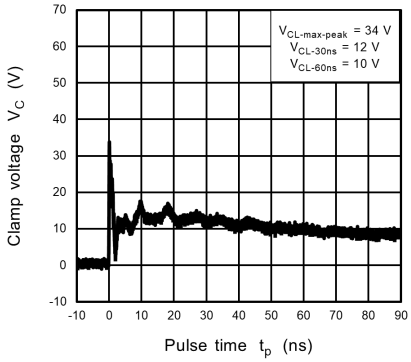


Fig. 10.4.3 IEC61000-4-2
Clamp Waveform +8 kV

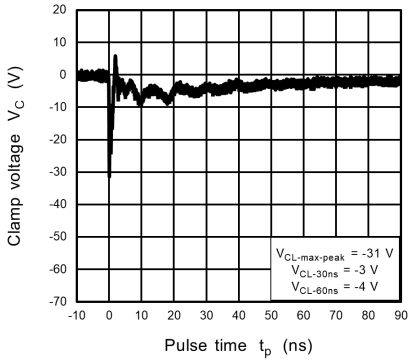


Fig. 10.4.4 IEC61000-4-2
Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_c-I_{PP}) and clamp waveform measurement circuit.

10.5. CTZ7V5 Characteristics Curves(Note)

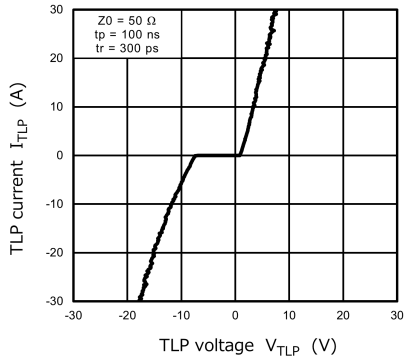


Fig. 10.5.1 I_{TLP} - V_{TLP}

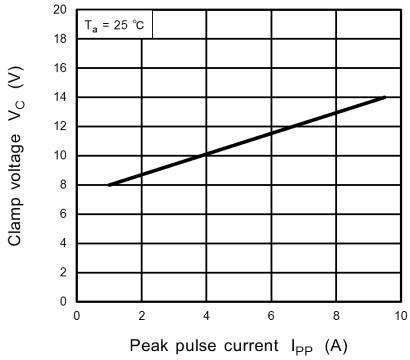


Fig. 10.5.2 V_C - I_{PP}

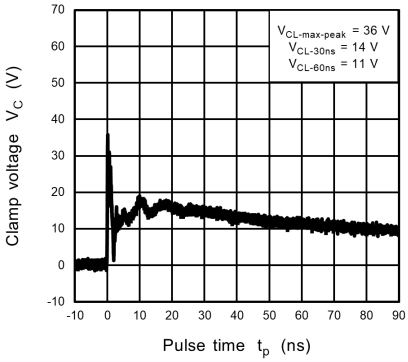


Fig. 10.5.3 IEC61000-4-2 Clamp Waveform +8 kV

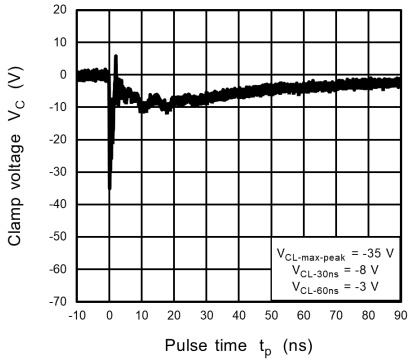


Fig. 10.5.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.6. CTZ8V2 Characteristics Curves(Note)

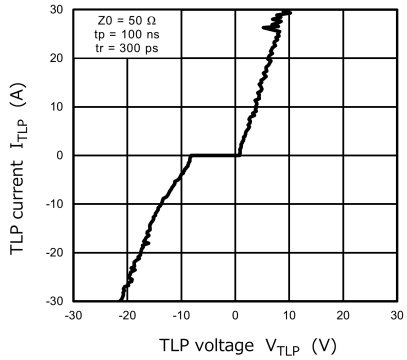


Fig. 10.6.1 I_{TLP} - V_{TLP}

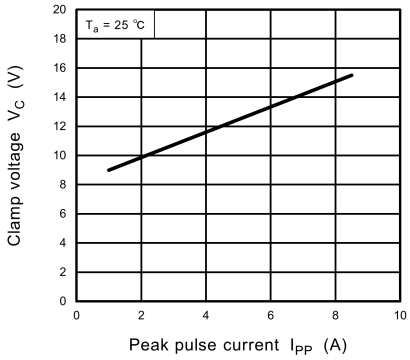


Fig. 10.6.2 V_C - I_{PP}

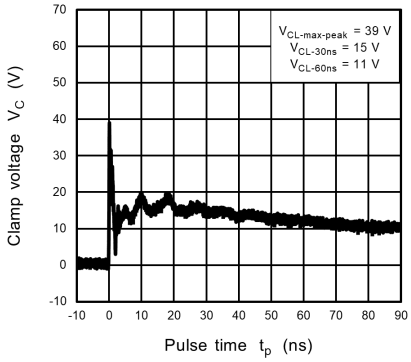


Fig. 10.6.3 IEC61000-4-2 Clamp Waveform +8 kV

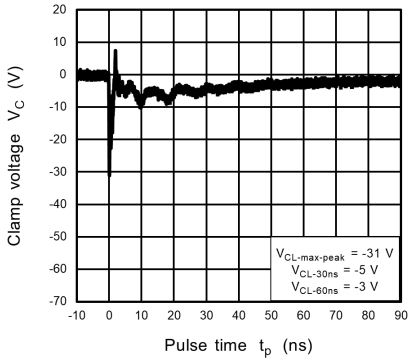


Fig. 10.6.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.7. CTZ9V1 Characteristics Curves(Note)

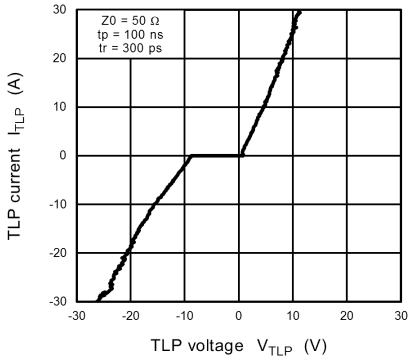


Fig. 10.7.1 I_{TLP} - V_{TLP}

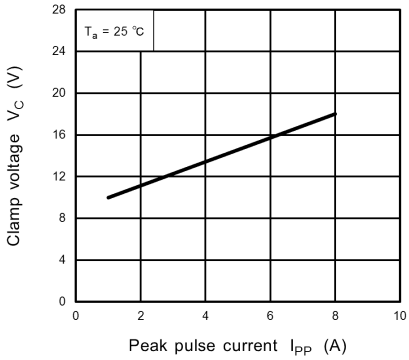


Fig. 10.7.2 V_C - I_{PP}

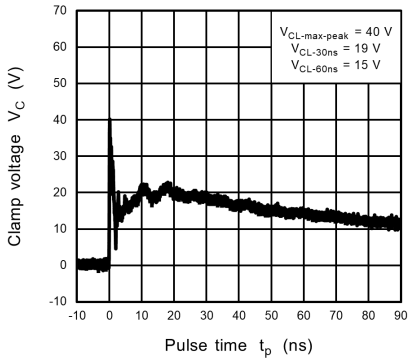


Fig. 10.7.3 IEC61000-4-2 Clamp Waveform +8 kV

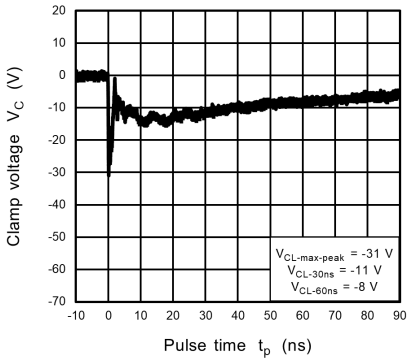


Fig. 10.7.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.8. CTZ10V Characteristics Curves(Note)

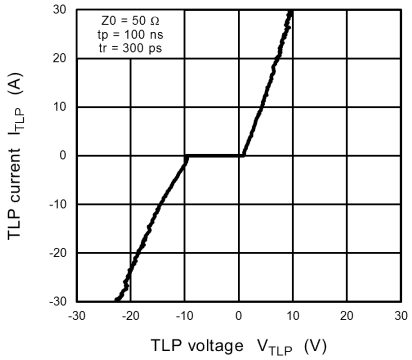


Fig. 10.8.1 I_{TLP} - V_{TLP}

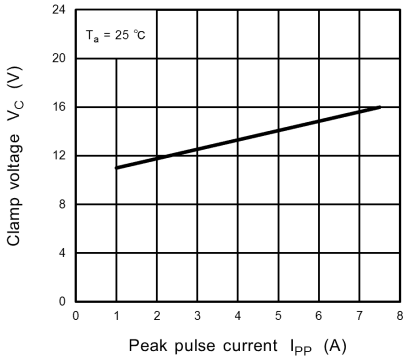


Fig. 10.8.2 V_C - I_{PP}

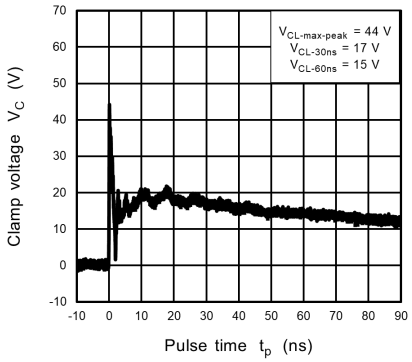


Fig. 10.8.3 IEC61000-4-2 Clamp Waveform +8 kV

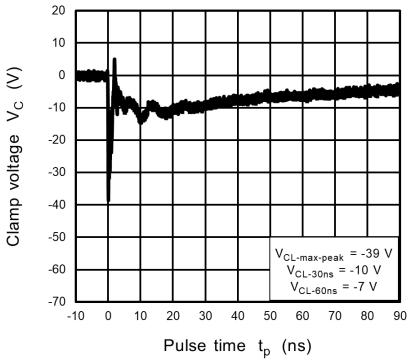


Fig. 10.8.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.9. CTZ11V Characteristics Curves(Note)

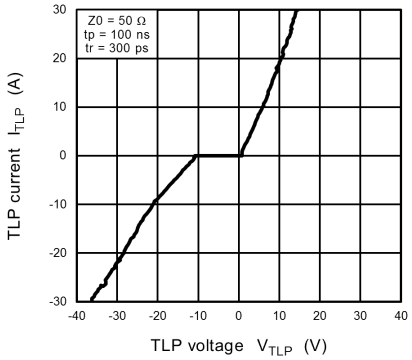


Fig. 10.9.1 I_{TLP} - V_{TLP}

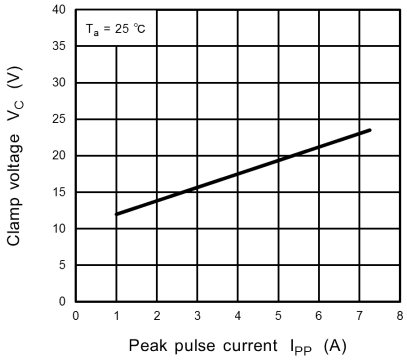


Fig. 10.9.2 V_C - I_{PP}

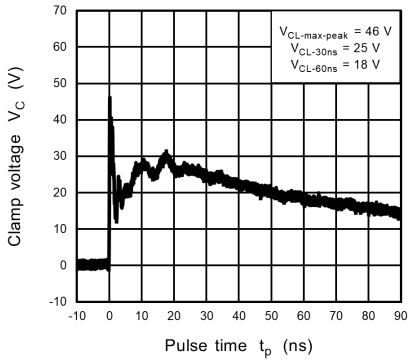


Fig. 10.9.3 IEC61000-4-2 Clamp Waveform +8 kV

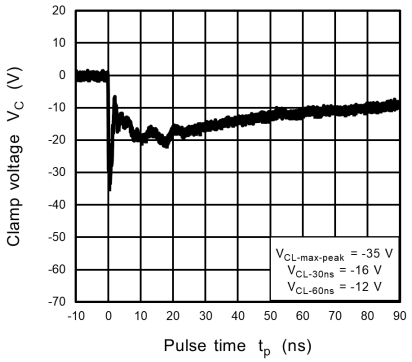


Fig. 10.9.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.10. CTZ12V Characteristics Curves(Note)

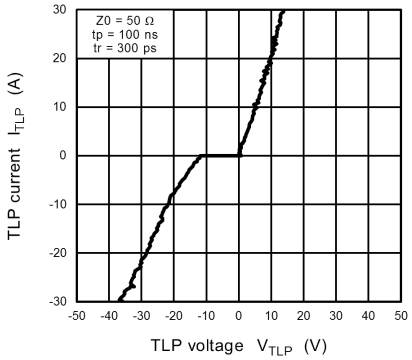


Fig. 10.10.1 I_{TLP} - V_{TLP}

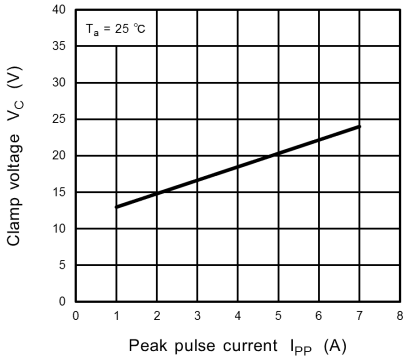


Fig. 10.10.2 V_C - I_{PP}

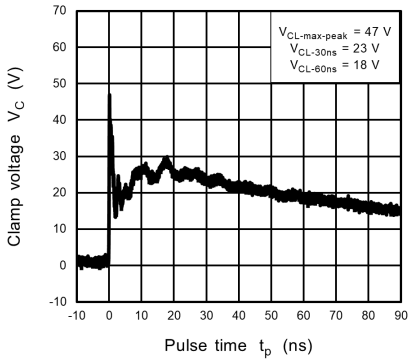


Fig. 10.10.3 IEC61000-4-2 Clamp Waveform +8 kV

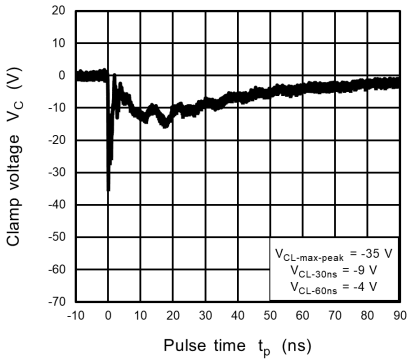


Fig. 10.10.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.11. CTZ13V Characteristics Curves(Note)

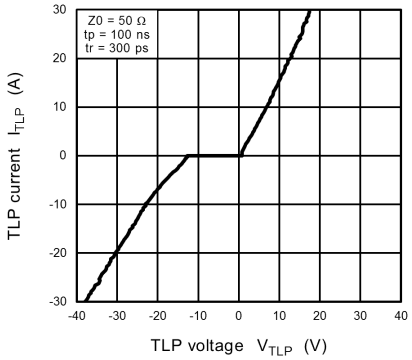


Fig. 10.11.1 I_{TLP} - V_{TLP}

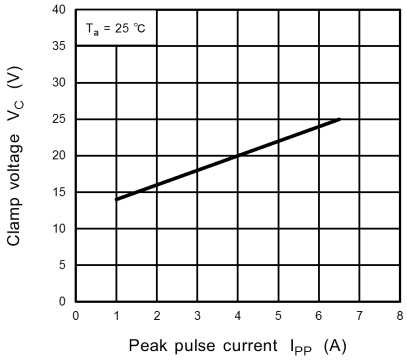


Fig. 10.11.2 V_C - I_{PP}

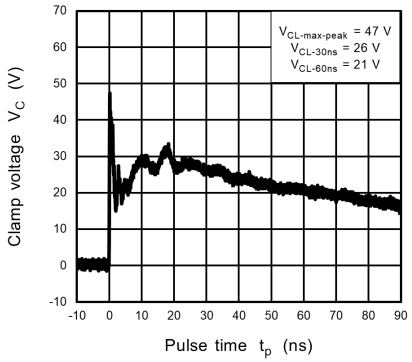


Fig. 10.11.3 IEC61000-4-2 Clamp Waveform +8 kV

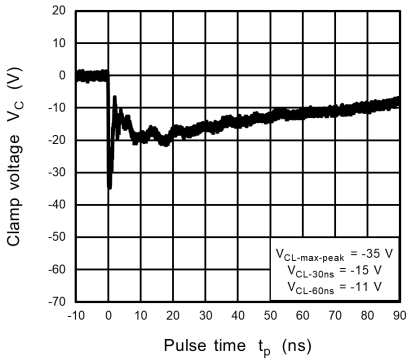


Fig. 10.11.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.12. CTZ15V Characteristics Curves(Note)

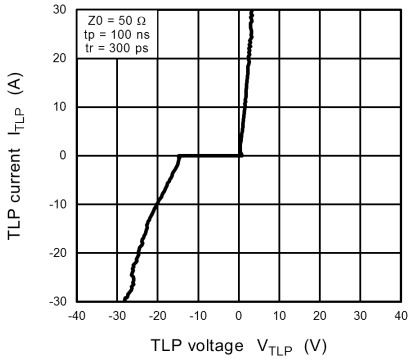


Fig. 10.12.1 I_{TLP} - V_{TLP}

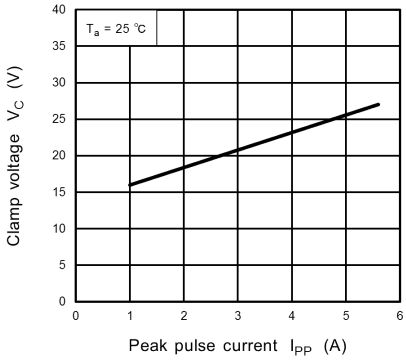


Fig. 10.12.2 V_C - I_{PP}

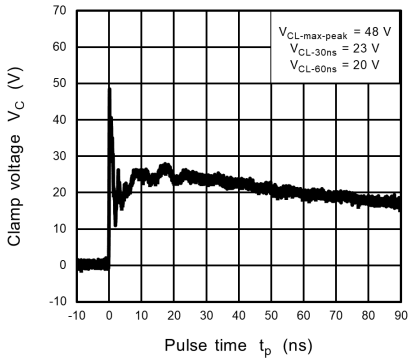


Fig. 10.12.3 IEC61000-4-2 Clamp Waveform +8 kV

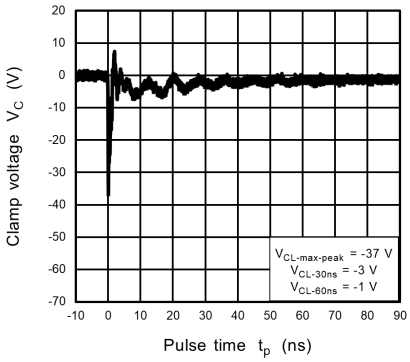


Fig. 10.12.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.13. CTZ16V Characteristics Curves(Note)

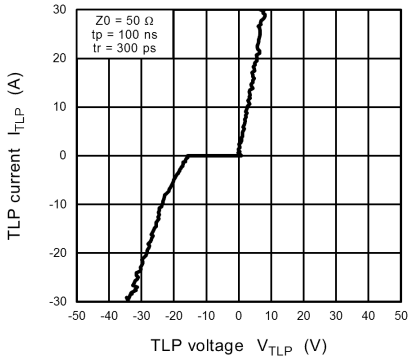


Fig. 10.13.1 I_{TLP} - V_{TLP}

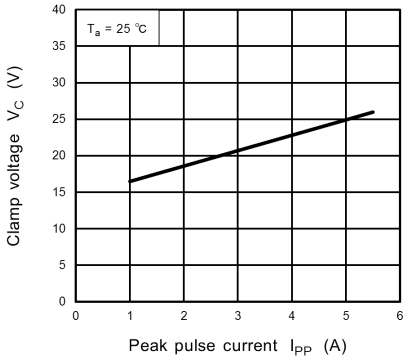


Fig. 10.13.2 V_C - I_{PP}

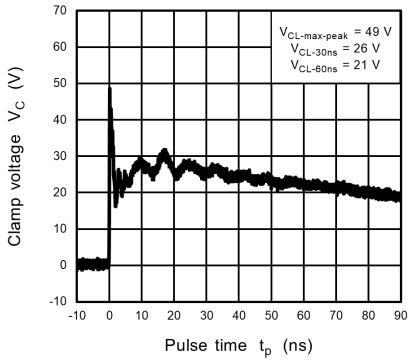


Fig. 10.13.3 IEC61000-4-2 Clamp Waveform +8 kV

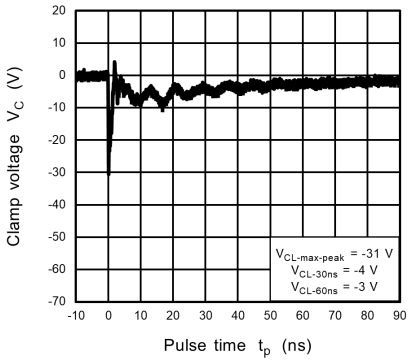


Fig. 10.13.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.14. CTZ18V Characteristics Curves(Note)

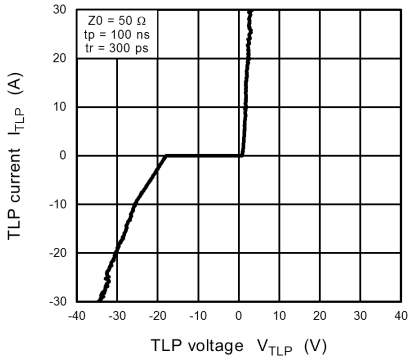


Fig. 10.14.1 I_{TLP} - V_{TLP}

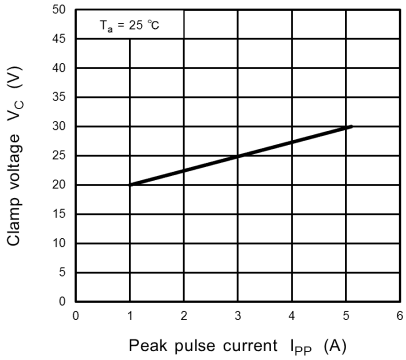


Fig. 10.14.2 V_C - I_{PP}

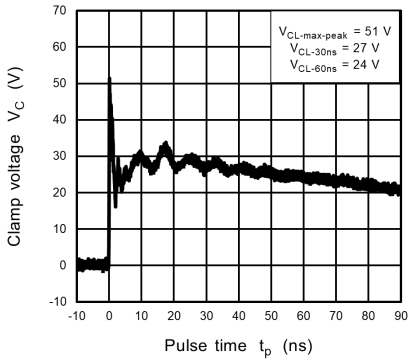


Fig. 10.14.3 IEC61000-4-2 Clamp Waveform +8 kV

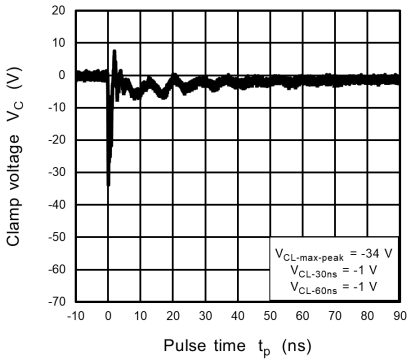


Fig. 10.14.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.15. CTZ20V Characteristics Curves(Note)

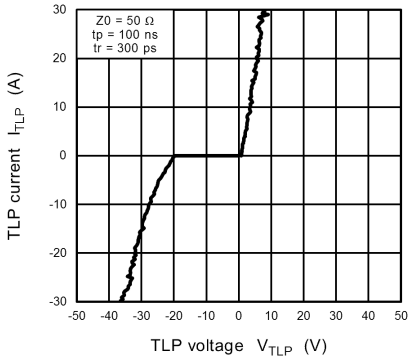


Fig. 10.15.1 I_{TLP} - V_{TLP}

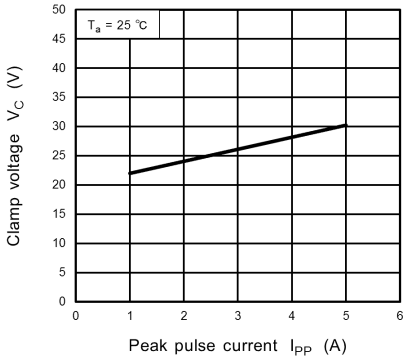


Fig. 10.15.2 V_C - I_{PP}

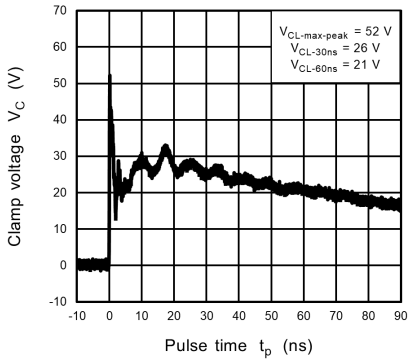


Fig. 10.15.3 IEC61000-4-2 Clamp Waveform +8 kV

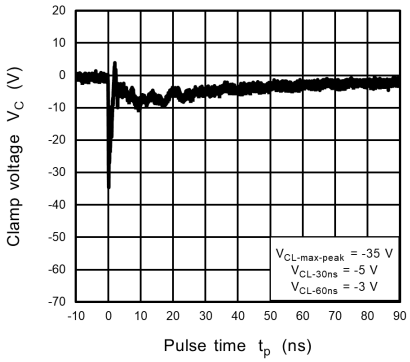


Fig. 10.15.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.16. CTZ22V Characteristics Curves(Note)

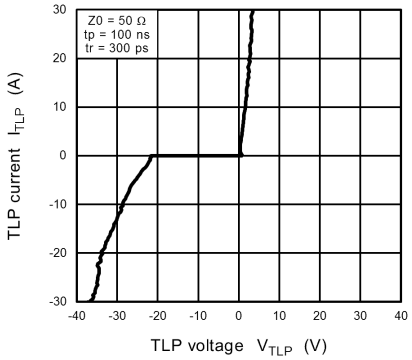


Fig. 10.16.1 I_{TLP} - V_{TLP}

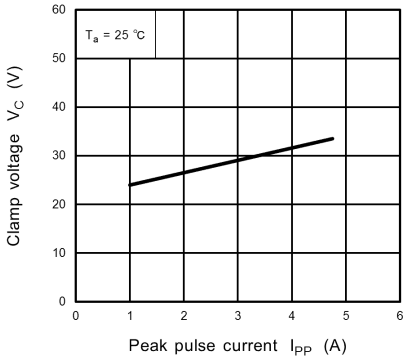


Fig. 10.16.2 V_C - I_{PP}

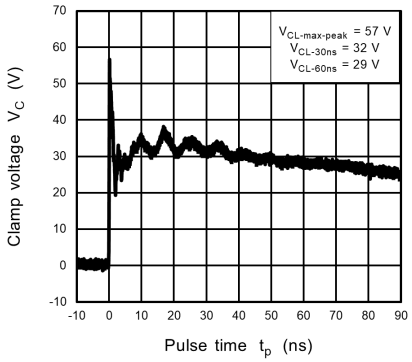


Fig. 10.16.3 IEC61000-4-2 Clamp Waveform +8 kV

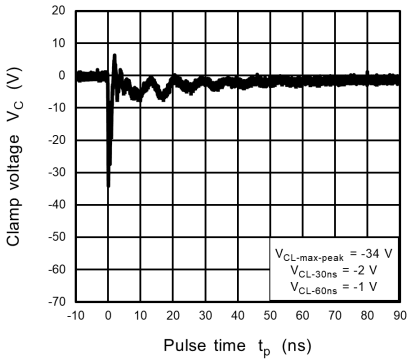


Fig. 10.16.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.17. CTZ24V Characteristics Curves(Note)

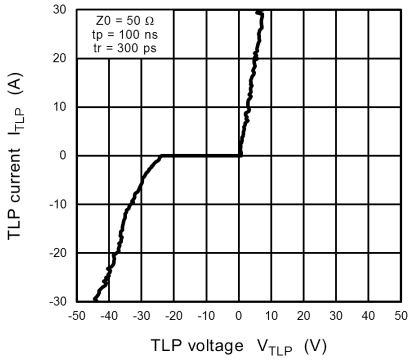


Fig. 10.17.1 I_{TLP} - V_{TLP}

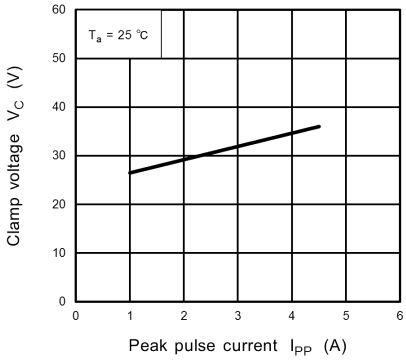


Fig. 10.17.2 V_C - I_{PP}

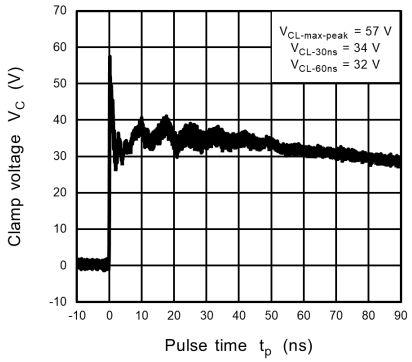


Fig. 10.17.3 IEC61000-4-2 Clamp Waveform +8 kV

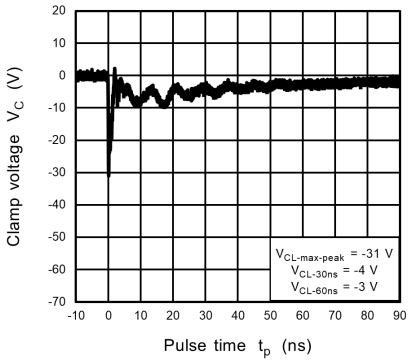


Fig. 10.17.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.18. CTZ27V Characteristics Curves(Note)

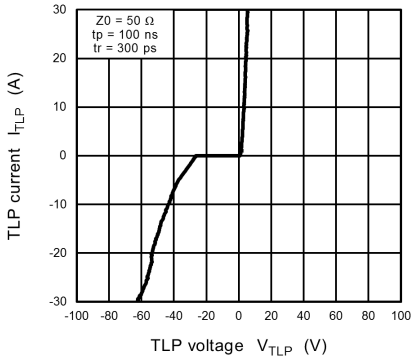


Fig. 10.18.1 I_{TLP} - V_{TLP}

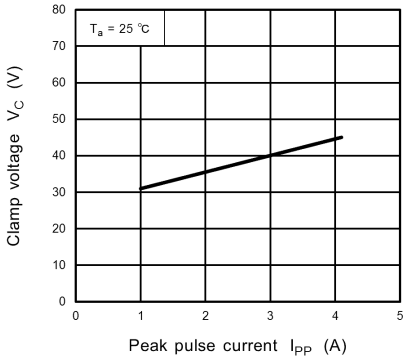


Fig. 10.18.2 V_C - I_{PP}

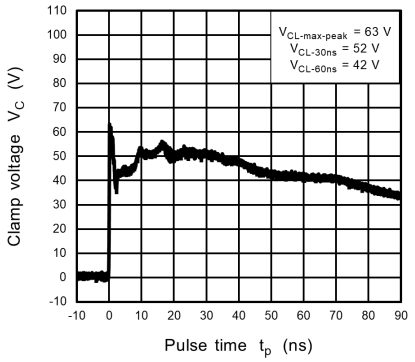


Fig. 10.18.3 IEC61000-4-2 Clamp Waveform +8 kV

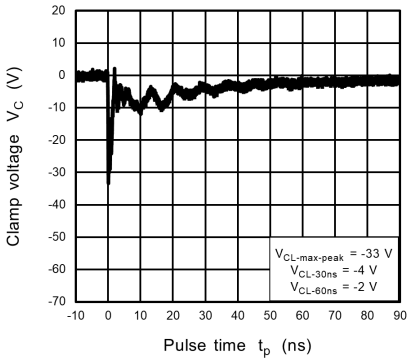


Fig. 10.18.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.19. CTZ30V Characteristics Curves(Note)

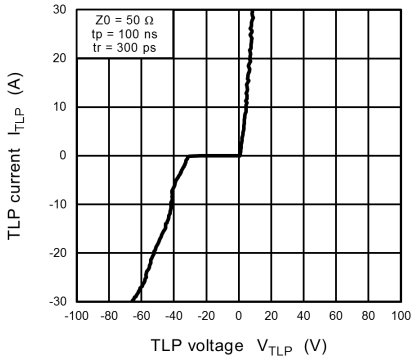


Fig. 10.19.1 I_{TLP} - V_{TLP}

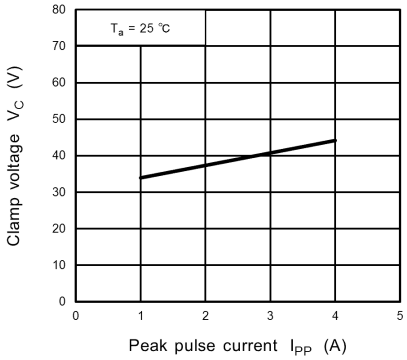


Fig. 10.19.2 V_C - I_{PP}

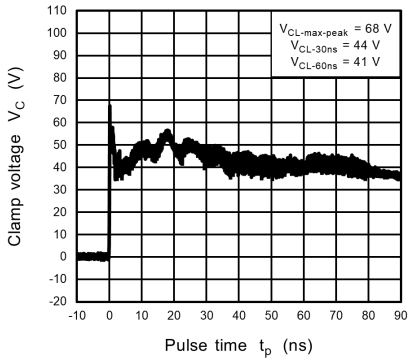


Fig. 10.19.3 IEC61000-4-2 Clamp Waveform +8 kV

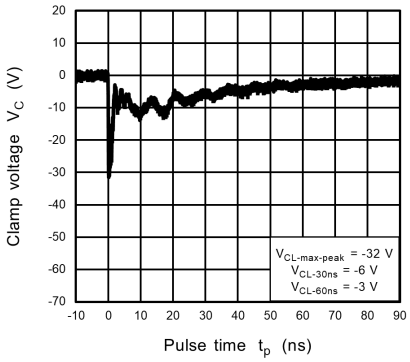


Fig. 10.19.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.20. CTZ33V Characteristics Curves(Note)

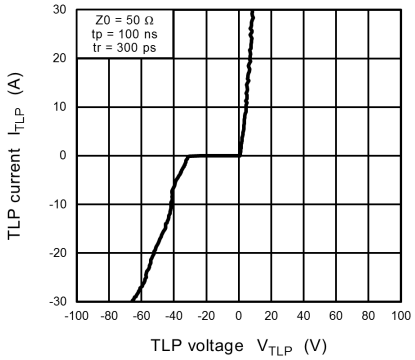


Fig. 10.20.1 I_{TLP} - V_{TLP}

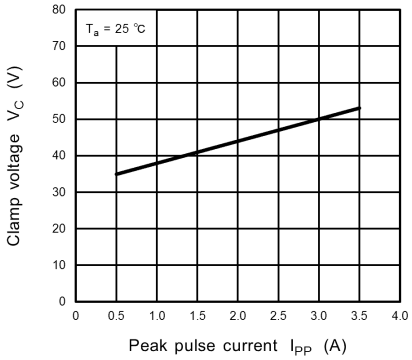


Fig. 10.20.2 V_C - I_{PP}

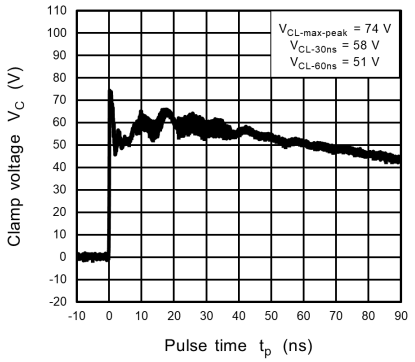


Fig. 10.20.3 IEC61000-4-2 Clamp Waveform +8 kV

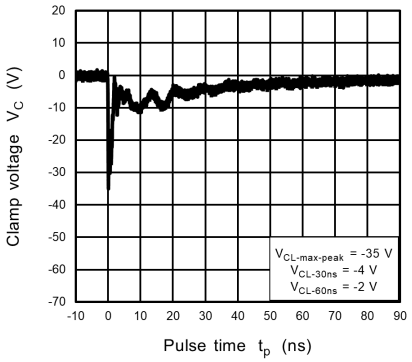


Fig. 10.20.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.21. CTZ36V Characteristics Curves(Note)

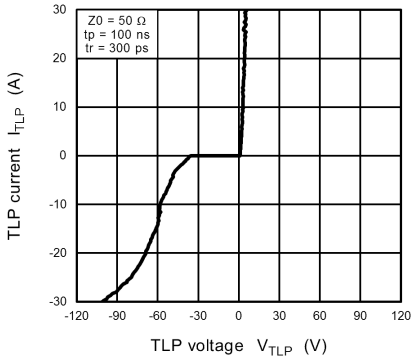


Fig. 10.21.1 I_{TLP} - V_{TLP}

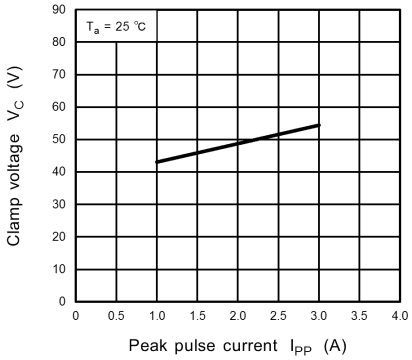


Fig. 10.21.2 V_C - I_{PP}

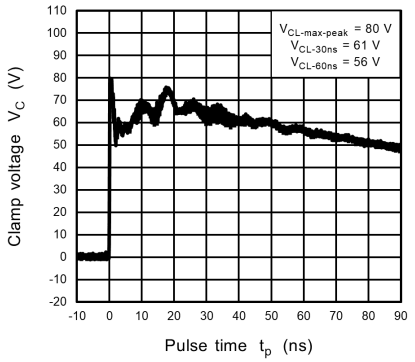


Fig. 10.21.3 IEC61000-4-2 Clamp Waveform +8 kV

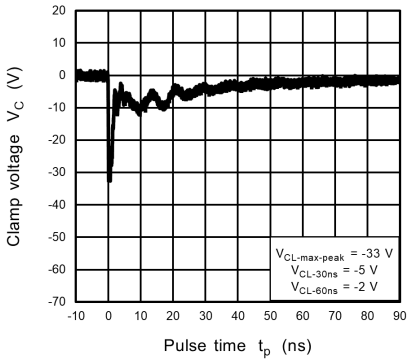


Fig. 10.21.4 IEC61000-4-2 Clamp Waveform -8 kV

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.
Refer to Fig.10.22.1, Fig.10.22.2 for peak pulse current(V_C-I_{PP}) and clamp waveform measurement circuit.

10.22. V_C-I_{PP} Peak Pulse and Clamp waveform measurement circuit

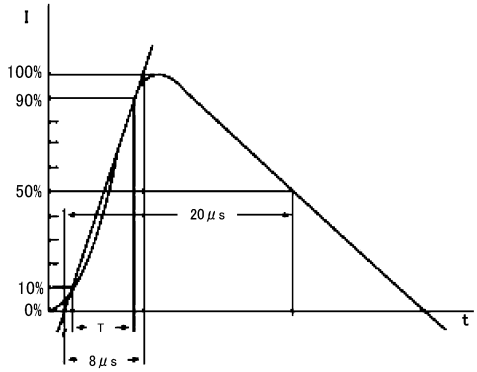


Fig. 10.22.1 V_C-I_{PP} Peak Pulse Current (according to IEC61000-4-5 8/20 μs pulse)

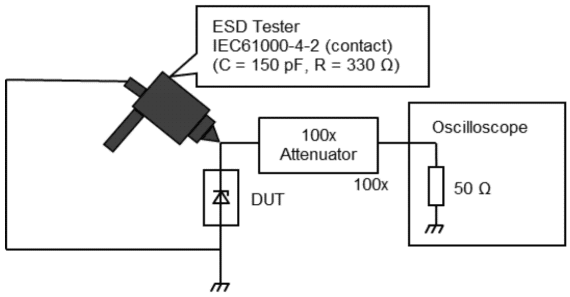
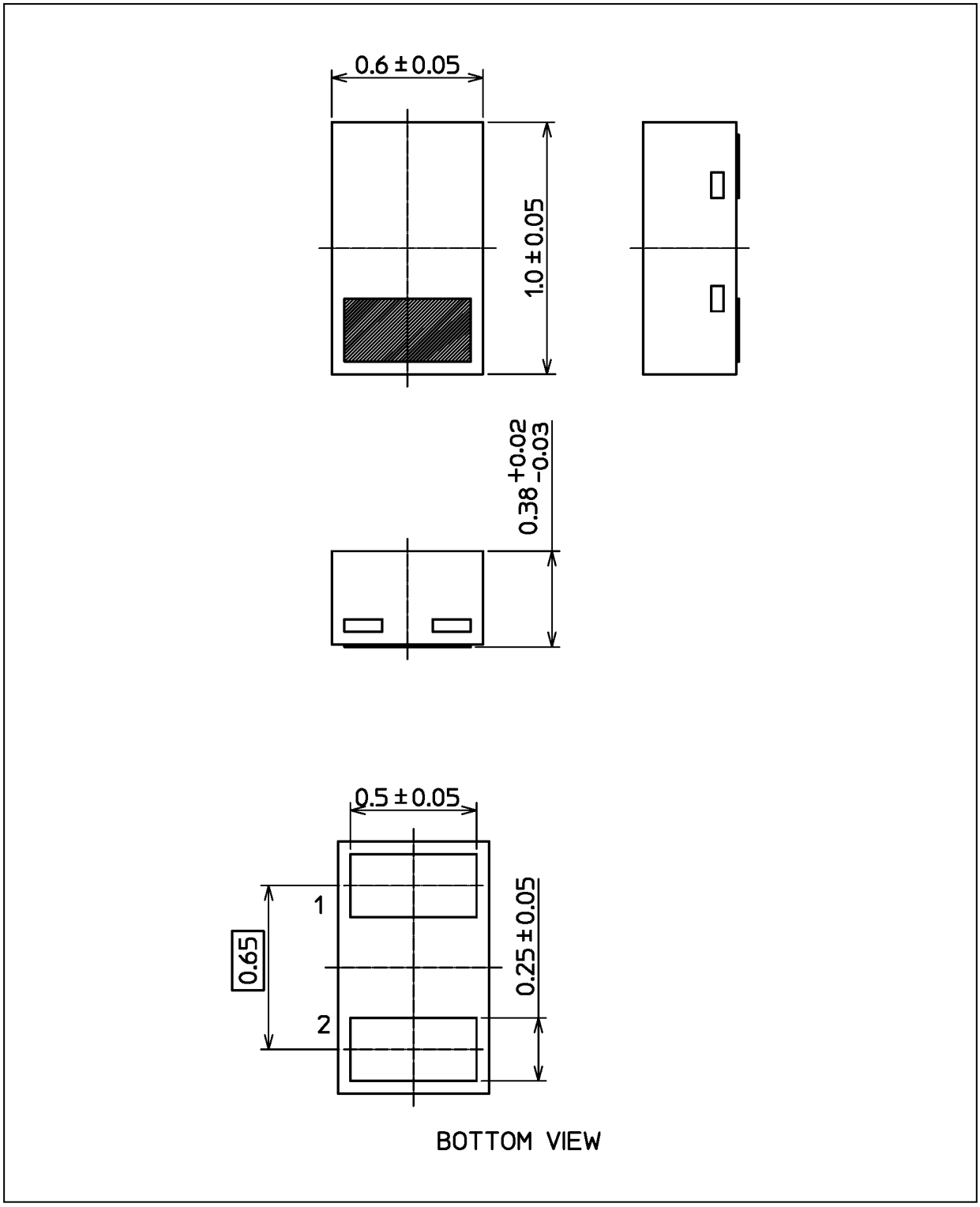


Fig. 10.22.2 Clamp waveform measurement circuit (according to IEC61000-4-2)

Package Dimensions

Unit: mm



Weight: 0.7 mg (typ.)

Package Name(s)
Nickname: CST2

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