ESD Protection Diodes Silicon Epitaxial Planar

DF6F6.8MTU

1. Applications

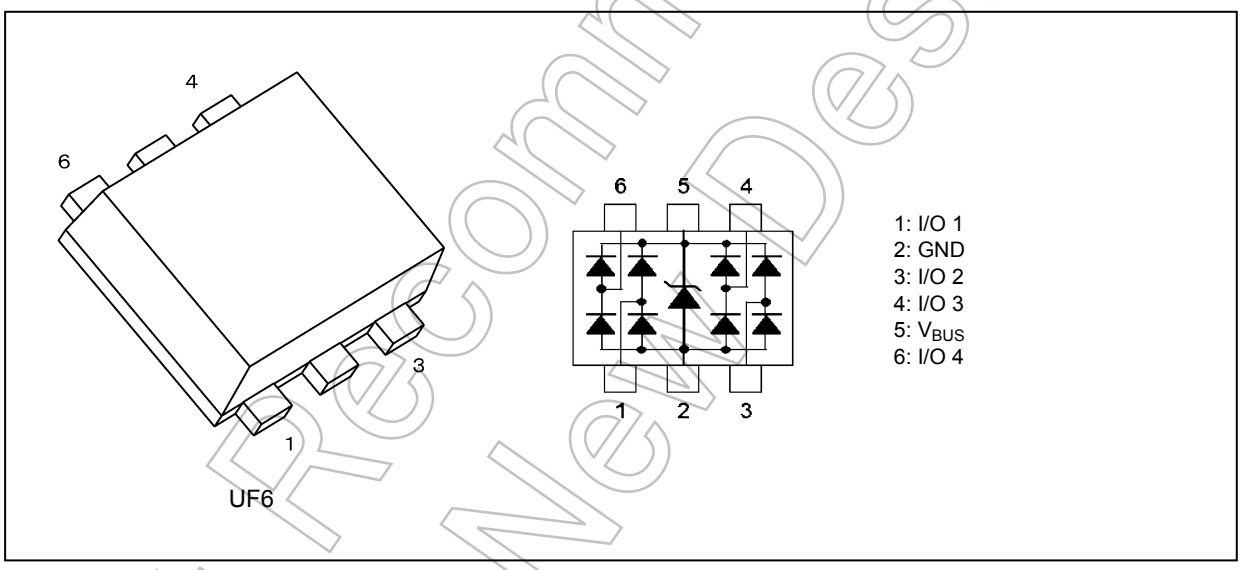
- ESD Protection

Note: This product is designed for protection against electrostatic discharge (ESD) and is not intended for any other purpose, including, but not limited to, voltage regulation.

2. Features

(1) ESD protection for up to 4 high-speed data lines and 1 V_{BUS} line.
(2) Ultra compact packaging for easy configuration in any ESD protection circuits.
(3) Low Input/output-to-ground capacitance: $C_{t(1)}$ = 0.6 pF (typ.).

3. Packaging and Internal Circuit



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

Characteristics	Symbol	Rating	Unit
Electrostatic discharge voltage (IEC61000-4-2)(Contact)	V_{ESD}	±8	kV
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to 150	°C

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).

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

V_{RWM}: Working peak reverse voltage
V_{BR}: Reverse breakdown voltage
I_{BR}: Reverse breakdown current
I_R: Reverse current
V_C: Clamp voltage
I_{PP}: Peak pulse current
R_{DYN}: Dynamic resistance
I_F: Forward current
V_F: Forward voltage

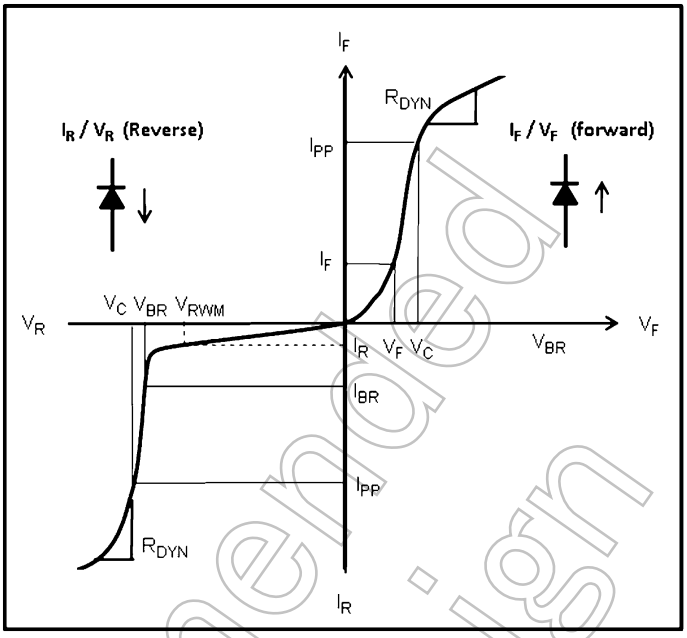

Fig. 5.1 Definitions of Electrical Characteristics

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	V_{RWM}		—	—	—	5.0	V
Reverse breakdown voltage	$V_{BR(1)}$		I_{BR} = 5 mA (between I/O and GND)	6.0	—	—	V
	$V_{BR(2)}$		I_{BR} = 5 mA (between V_{BUS} and GND)	6.8	—	—	V
Reverse current	$I_{R(1)}$		V_{RWM} = 5 V (between I/O and GND)	—	—	0.5	μA
	$I_{R(2)}$		V_{RWM} = 5 V (between V_{BUS} and GND)	—	—	0.5	μA
Clamp voltage	$V_{C(1)}$	(Note 1)	I_{PP} = 1 A (between I/O and GND)	—	15	20	V
	$V_{C(2)}$	(Note 1)	I_{PP} = 2.5 A (between I/O and GND)	—	18	24	V
	$V_{C(3)}$	(Note 1)	I_{PP} = 1 A (between V_{BUS} and GND)	—	14	19	V
	$V_{C(4)}$	(Note 1)	I_{PP} = 9 A (between V_{BUS} and GND)	—	25	30	V
Dynamic resistance	$R_{DYN(1)}$	(Note 2)	(between I/O and GND)	—	0.9	—	Ω
	$R_{DYN(2)}$	(Note 2)	(between V_{BUS} and GND)	—	0.6	—	Ω
Total capacitance	$C_{t(1)}$	(Note 3)	V_R = 0 V, f = 1 MHz (between I/O and GND)	—	0.6	1.0	pF
	$C_{t(2)}$		V_R = 0 V, f = 1 MHz (between V_{BUS} and GND)	—	67	—	pF
	$C_{t(3)}$		V_R = 0 V, f = 1 MHz (between I/O and I/O)	—	0.3	—	pF
Input/output-to-ground capacitance difference	$\Delta C_{t\text{-}GND}$		V_R = 0 V, f = 1 MHz (between I/O and GND)	—	0.01	—	pF

Note 1: Based on IEC61000-4-5 8/20 μs pulse.
Note 2: TLP parameter: Z0 = 50 Ω, tp = 100 ns, tr = 300 ps, averaging window: t1 = 30 ns to t2 = 60 ns, extraction of dynamic resistance using a least-squares fit of TLP characteristics at I_{PP} between 3 A to 8 A.
Note 3: Guaranteed by design.

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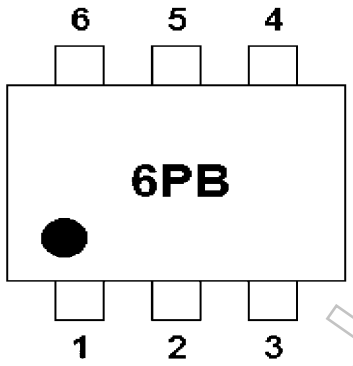
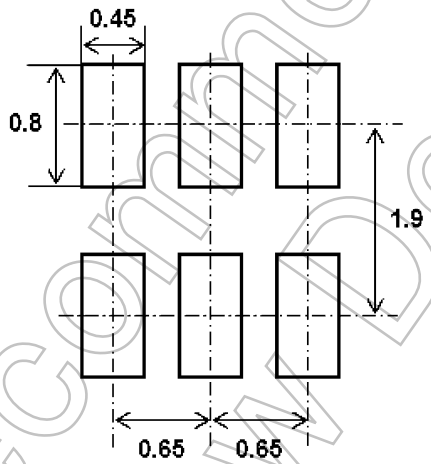
6. Marking



Marking

7. Land Pattern Dimensions (for reference only)



(Unit: mm)

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8. Characteristics Curves (Note)

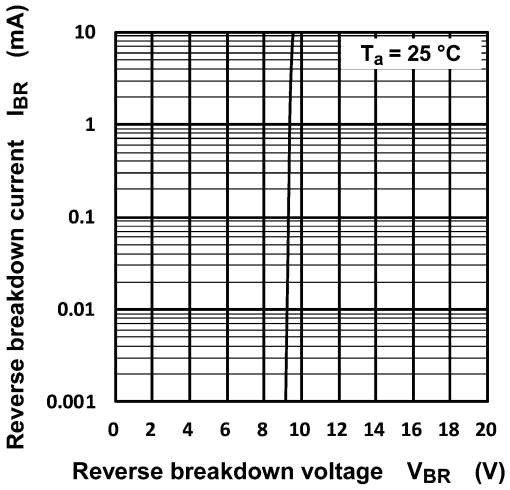

Fig. 8.1 I_{BR} - V_{BR}
(I/O to GND)

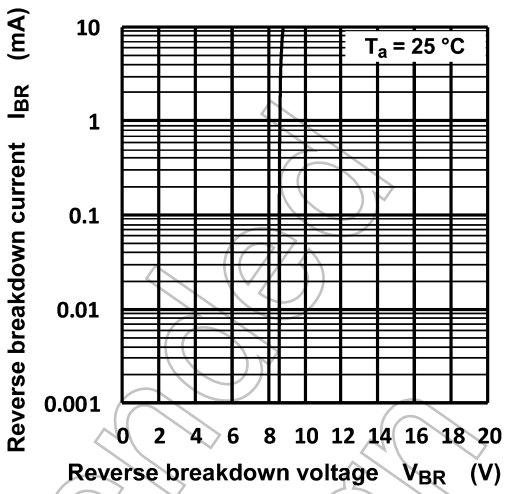

Fig. 8.2 I_{BR} - V_{BR}
(V_{BUS} to GND)

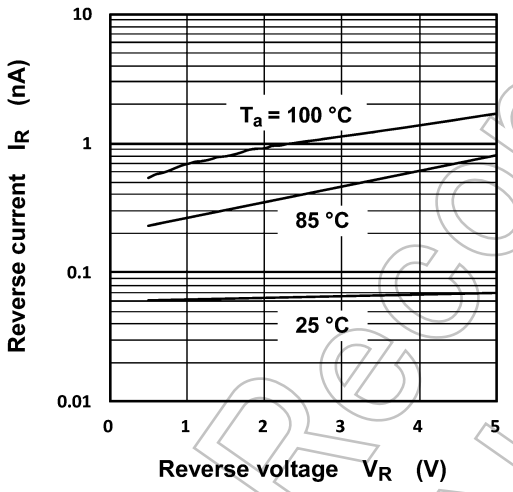

Fig. 8.3 I_R - V_R
(I/O to GND)

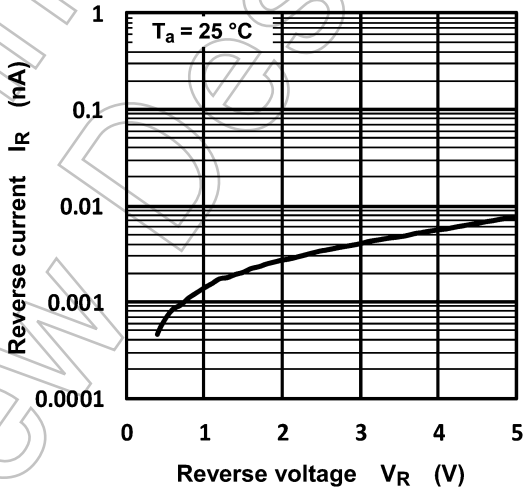

Fig. 8.4 I_R - V_R
(V_{BUS} to GND)

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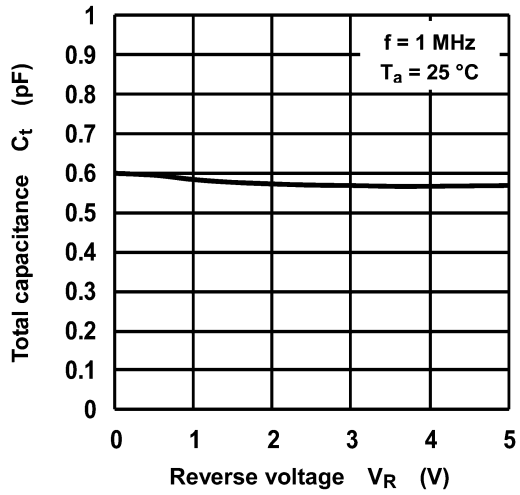

Fig. 8.5 C_t - V_R
(I/O to GND)

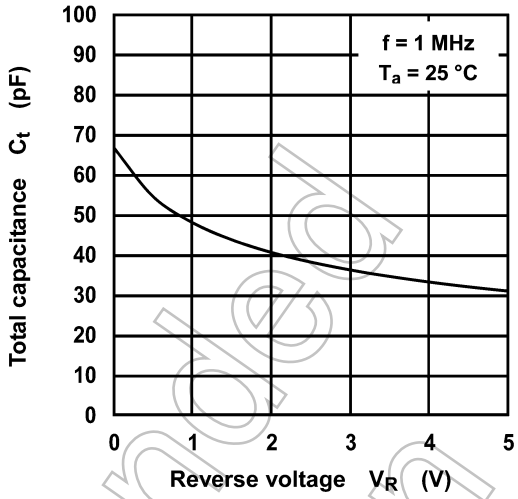

Fig. 8.6 C_t - V_R
(V_{BUS} to GND)

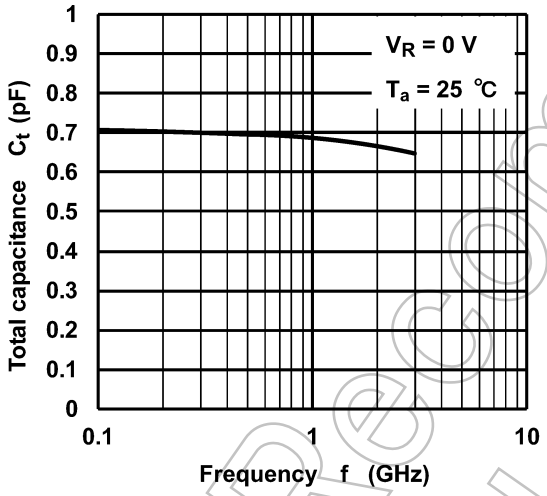

Fig. 8.7 C_t - f
(I/O to GND)

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

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9. Clamp Voltage V_C - Peak Pulse Current (I_{PP}) (Note)

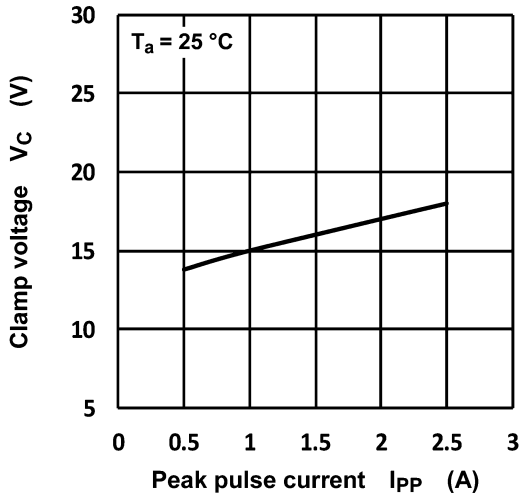

Fig. 9.1 V_C - I_{PP} (I/O to GND)

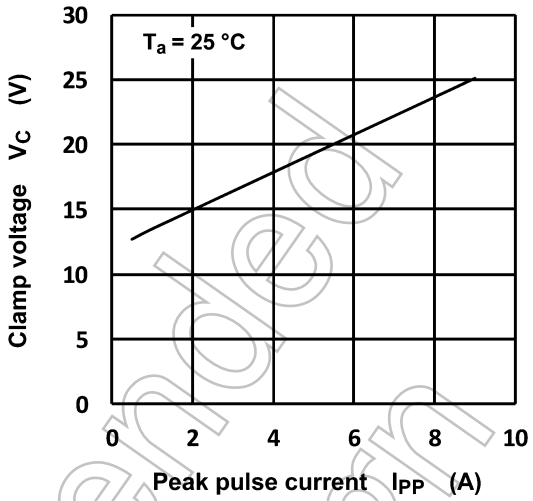

Fig. 9.2 V_C - I_{PP} (V_{BUS} to GND)

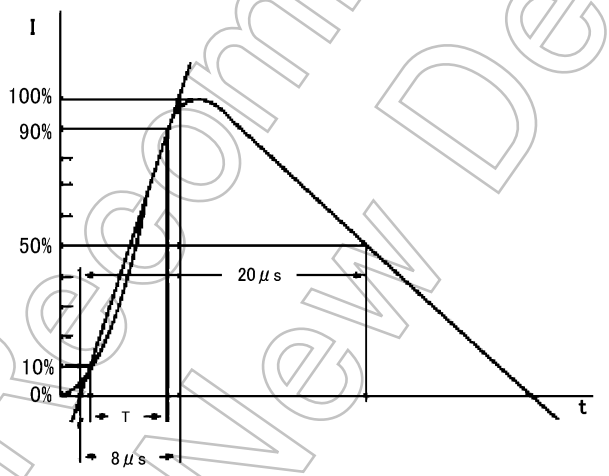

Fig. 9.3 Based on IEC61000-4-5 8/20 μs pulse

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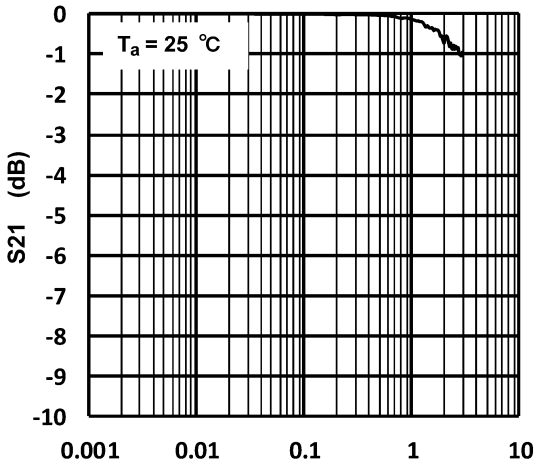
10. Insertion Loss (S21) (Note)



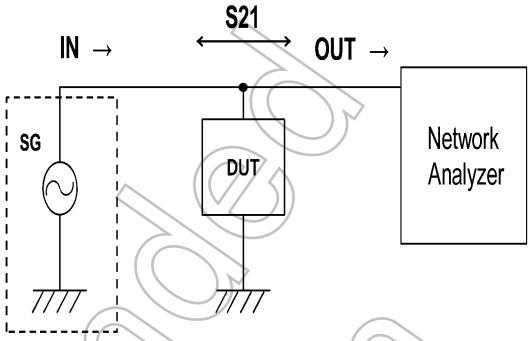


Fig. 10.1 S21 - f
(I/O to GND)

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11. ESD Clamp Waveform (Note)

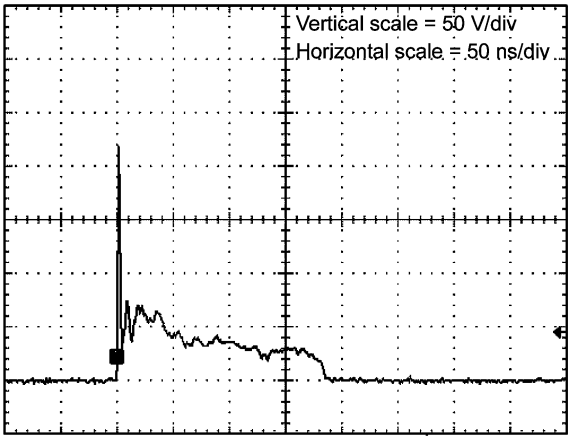

Fig. 11.1 +8 kV
(I/O to GND)

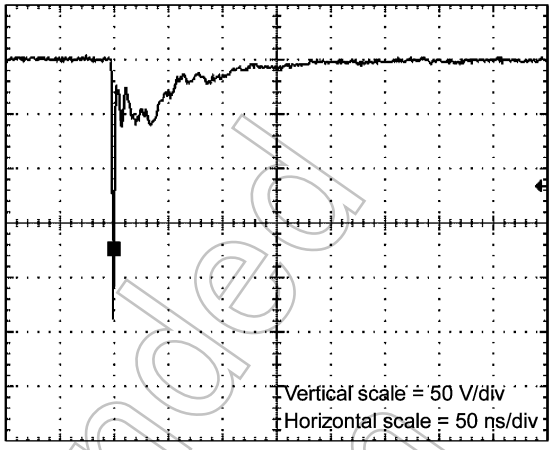

Fig. 11.2 -8 kV
(I/O to GND)

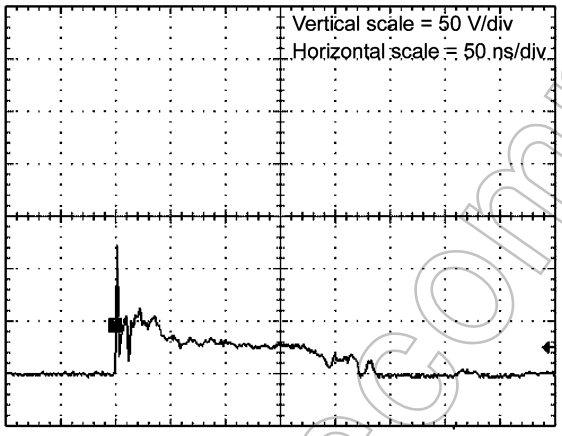

Fig. 11.3 +8 kV
(V_{BUS} to GND)

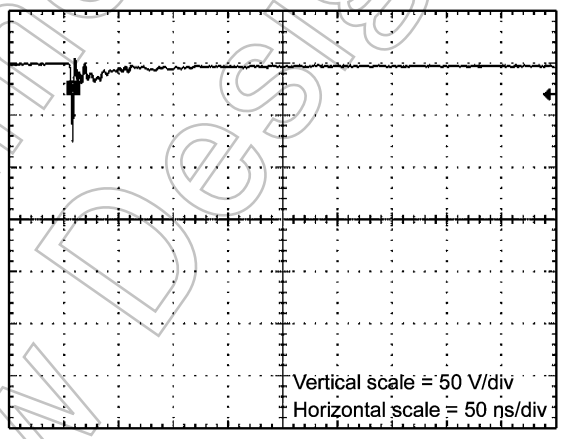

Fig. 11.4 -8 kV
(V_{BUS} to GND)

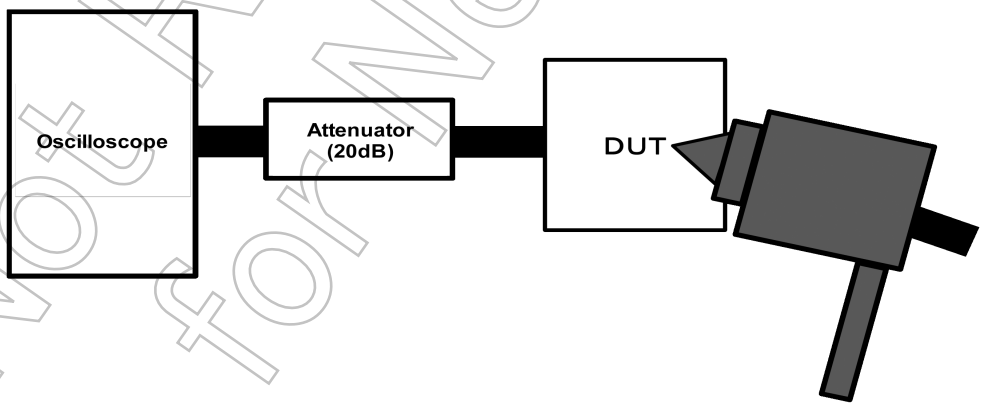

Fig. 11.5 IEC61000-4-2 (Contact)

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

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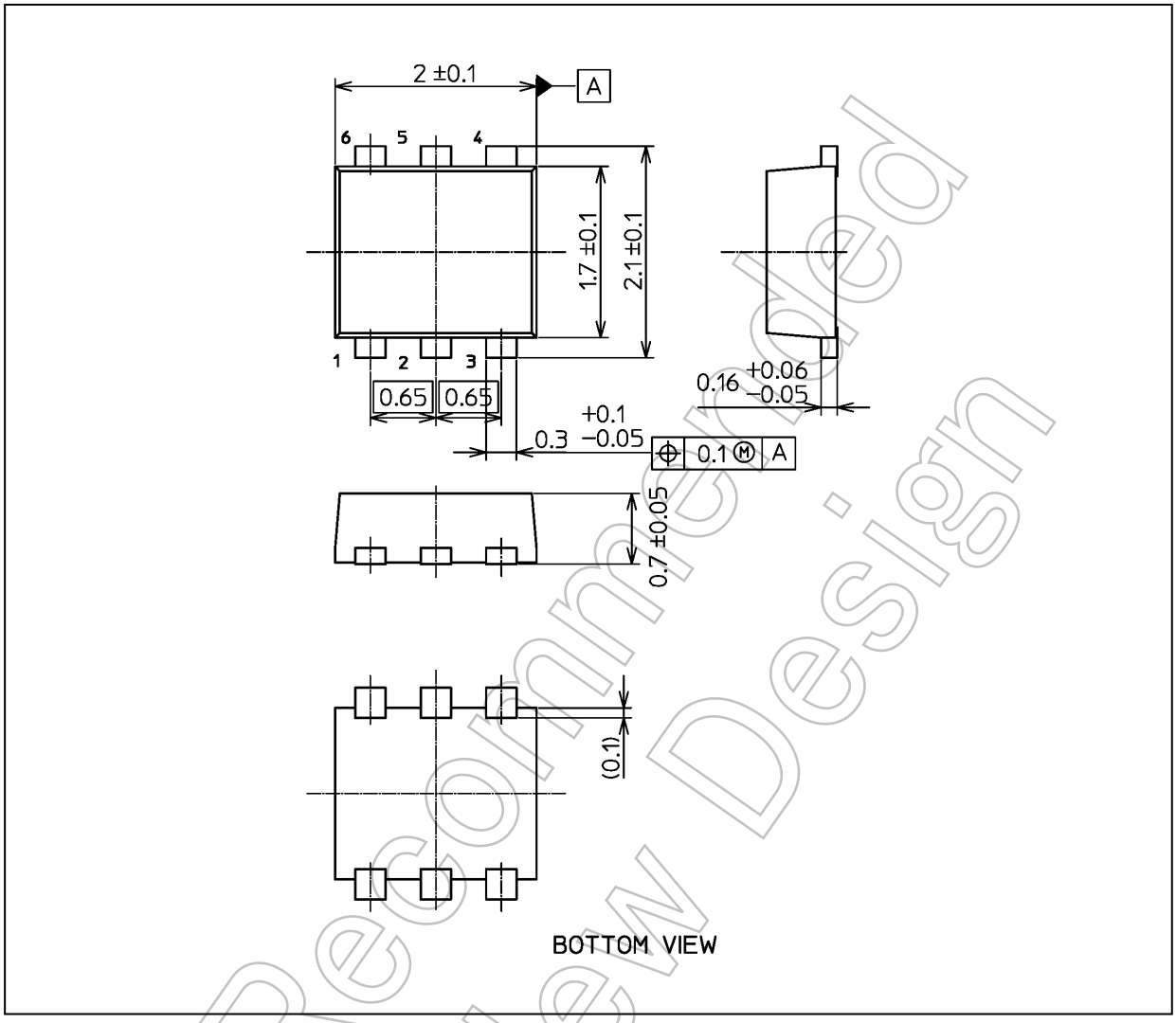
Package Dimensions

Unit: mm



Weight: 7.0 mg (typ.)

Package Name(s)
TOSHIBA: 2-2T1S
Nickname: UF6

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