

ESD Protection Diodes Silicon Epitaxial Planar

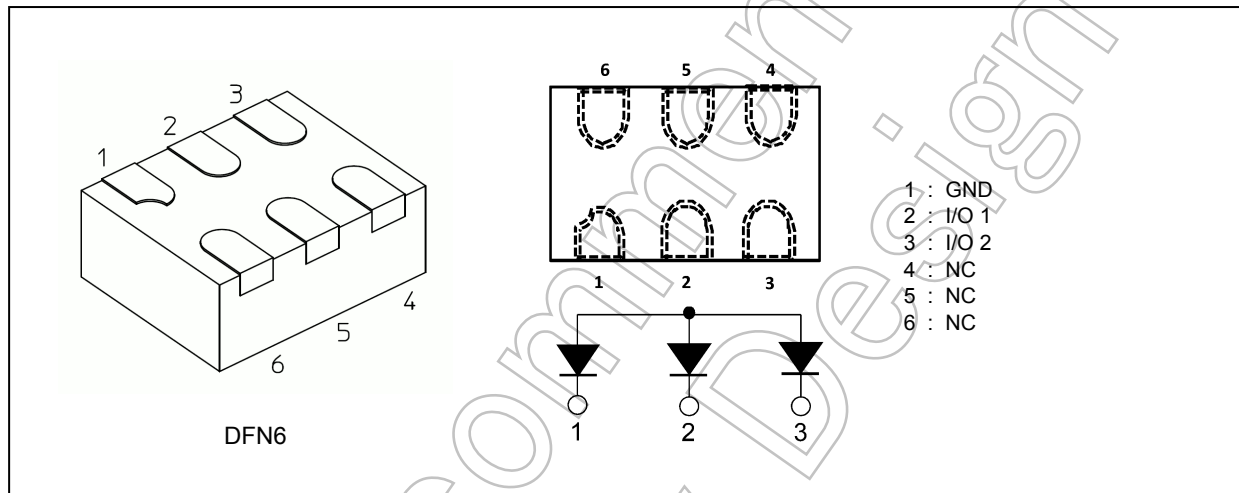
DF6D7M1N

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. Packaging and Internal Circuit



3. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25^\circ\text{C}$)

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

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).

Start of commercial production

2022-03

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

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

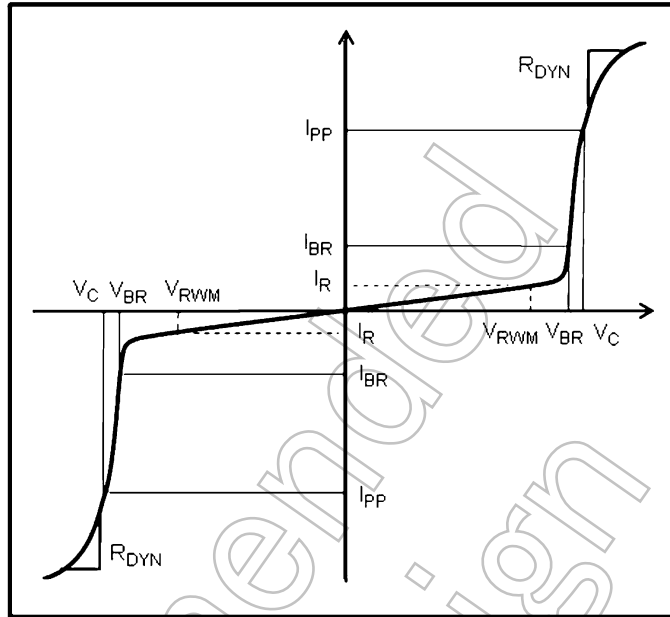


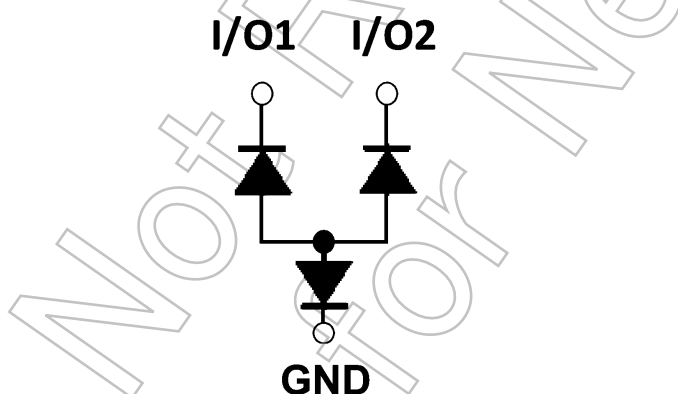
Fig. 4.1 Definitions of Electrical Characteristics

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	V_{RWM}			—	—	5	V
Reverse breakdown voltage	V_{BR}		$I_{BR} = 1 \text{ mA}$	6	—	—	V
Reverse current	I_R		$V_{RWM} = 5 \text{ V}$	—	—	0.5	μA
Clamp voltage	V_C	(Note 1)	$I_{PP} = 1 \text{ A}$	—	12	—	V
Dynamic resistance	R_{DYN}	(Note 2)	—	—	0.9	—	Ω
Total capacitance	C_t	(Note 3)	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.3	0.5	pF

Note 1: Based on IEC61000-4-5 8/20 μs pulse.

Note 2: TLP parameter: $Z_0 = 50 \Omega$, $t_p = 100 \text{ ns}$, $t_r = 300 \text{ ps}$, averaging window: $t_1 = 30 \text{ ns}$ to $t_2 = 60 \text{ ns}$, extraction of dynamic resistance using a least-squares fit of TLP characteristics at I_{PP} between 3 A to 8 A.

Note 3: Guaranteed by design.



5. Guaranteed ESD Protection (Note)

Test Condition	ESD Protection
IEC61000-4-2 (Contact discharge)	$\pm 8 \text{ kV}$

Note: Criterion: No damage to devices.

6. Marking

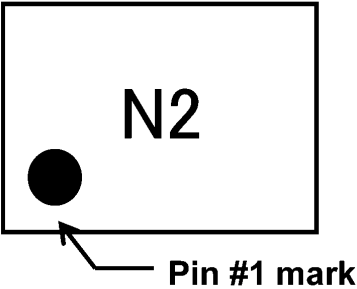


Fig. 6.1 Marking

Marking Code	Part Number
N2	DF6D7M1N

7. Land Pattern Dimensions (for reference only)

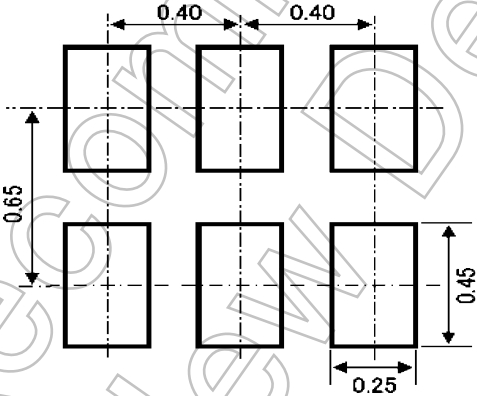


Fig. 7.1 Land Pattern Dimensions (Unit: mm)

8. Characteristics Curves (Note)

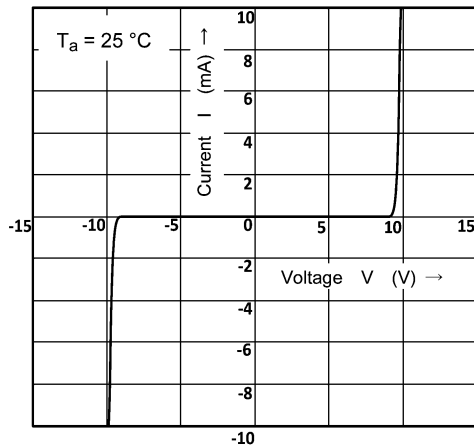


Fig. 8.1 I - V

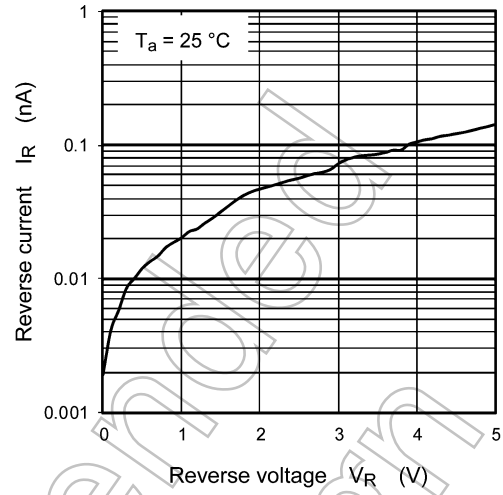


Fig. 8.2 $I_R - V_R$

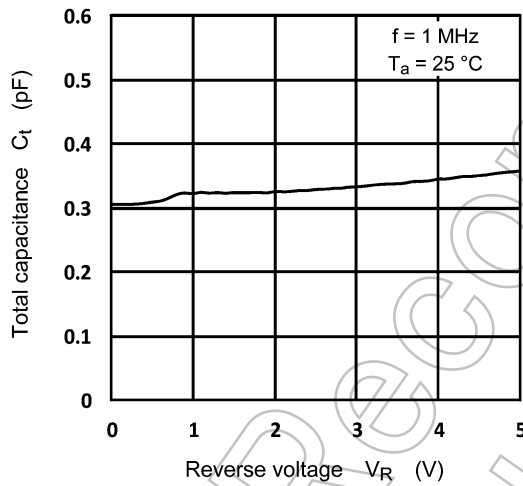


Fig. 8.3 $C_t - V_R$

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

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

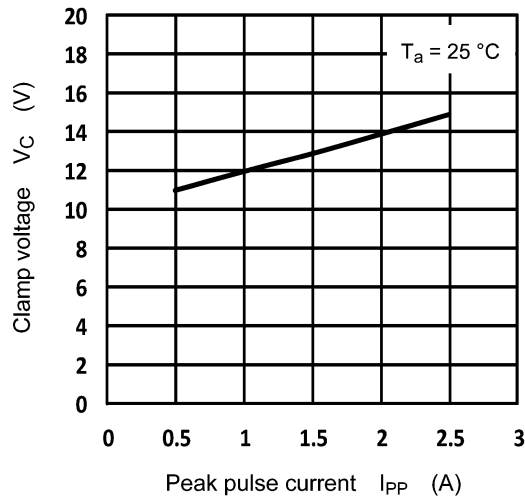


Fig. 9.1 V_C - I_{PP}

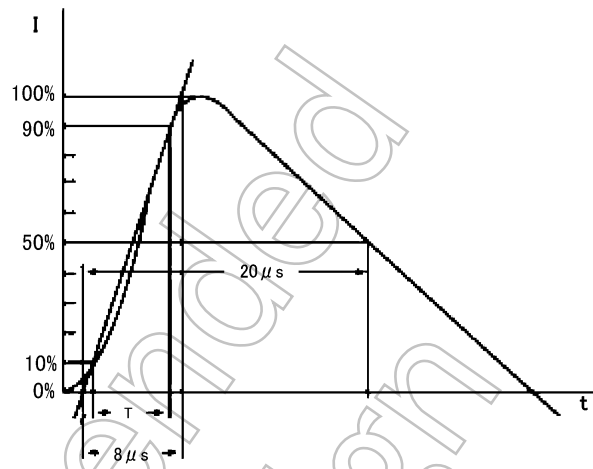


Fig. 9.2 Based on IEC61000-4-5 8/20 μ s pulse.

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

10. Insertion Loss (S_{21}) (Note)

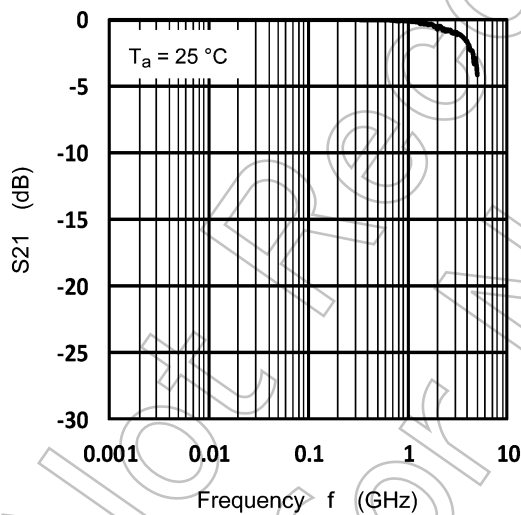
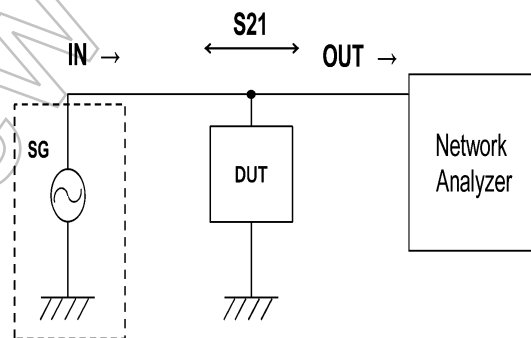


Fig. 10.1 S_{21} - f



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

11. ESD Clamp Waveform (Note)

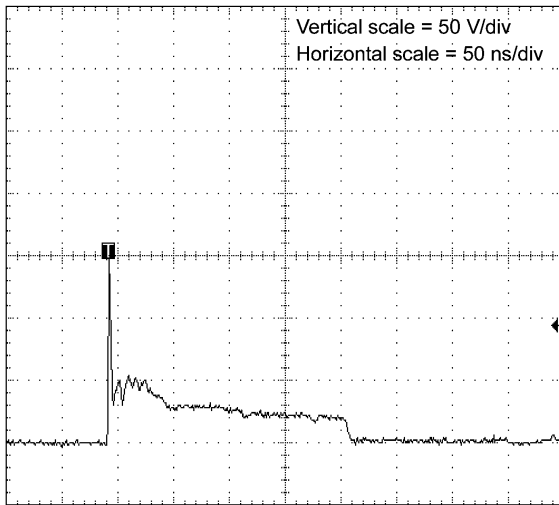


Fig. 11.1 +8 kV

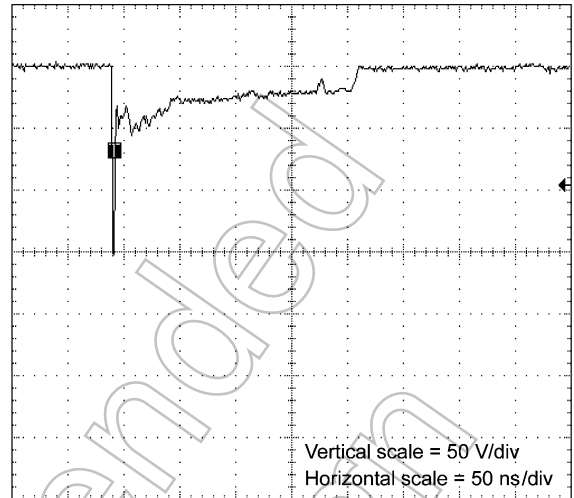


Fig. 11.2 -8 kV

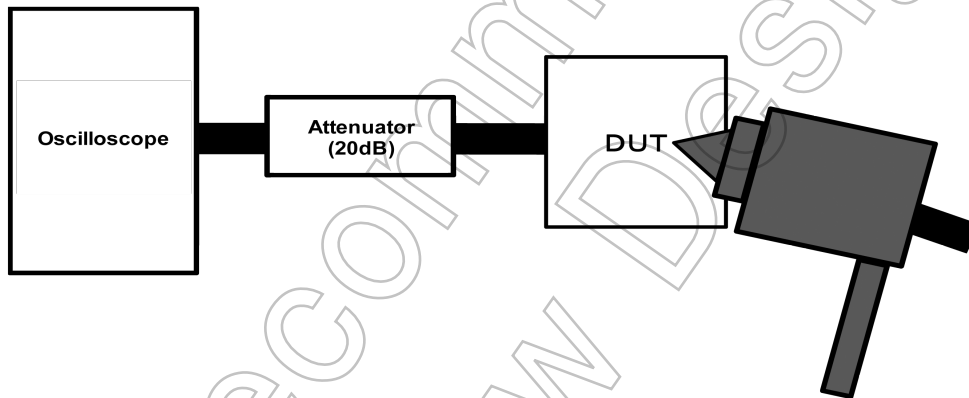
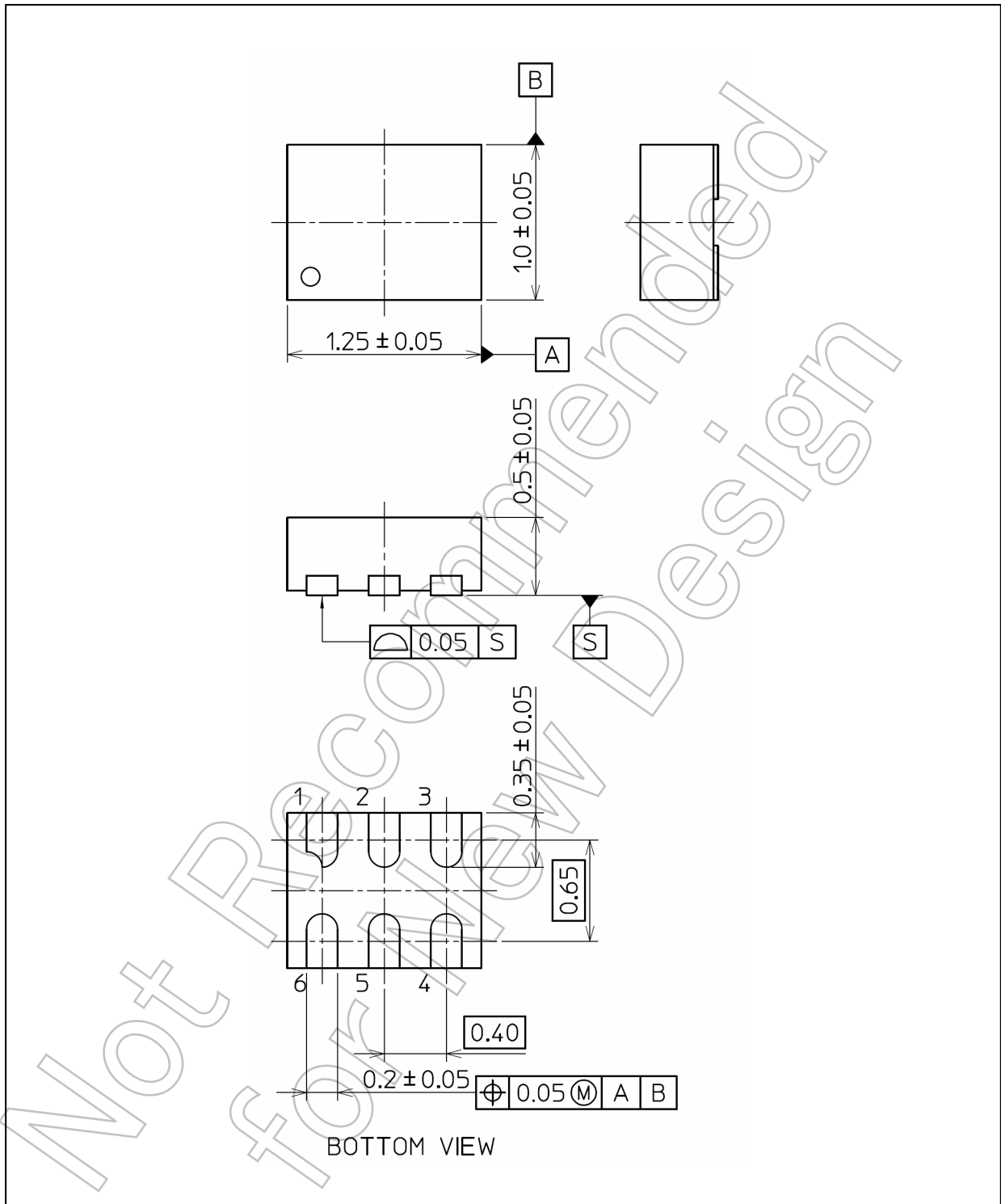


Fig. 11.3 IEC61000-4-2 (Contact)

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

Package Dimensions

Unit: mm



Weight: 0.0017 g (typ.)

Package Name(s)
Nickname: DFN6

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