

# DF10G7M1N

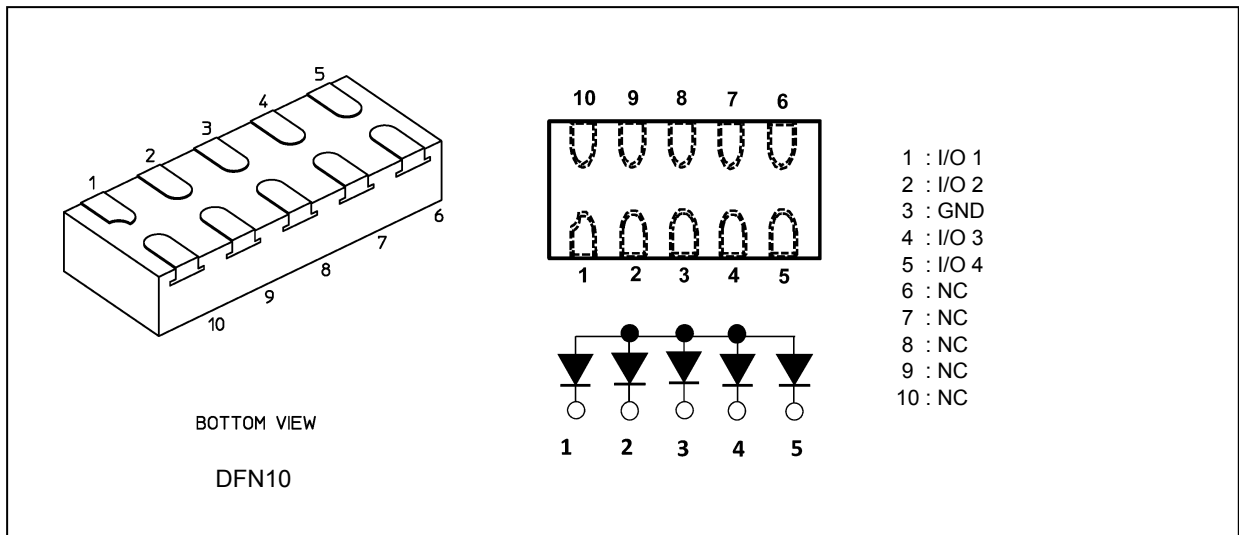
## 1. Applications

ESD Protection for:

- USB 2.0
- USB 3.0
- HDMI
- SATA/eSATA
- DisplayPort Interface
- Digital Visual Interface (DVI)
- MDDI
- PCI Express

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



Start of commercial production

2012-11

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

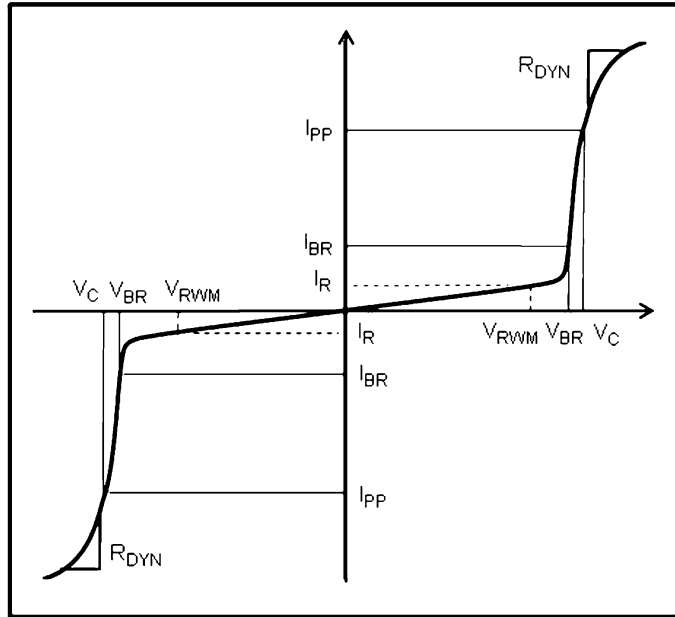
Characteristics	Symbol	Rating	Unit
Electrostatic discharge voltage (IEC61000-4-2)(Contact)	$V_{\text{ESD}}$	$\pm 8$	kV
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{\text{stg}}$	-55 to 150	$^\circ\text{C}$

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).

**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



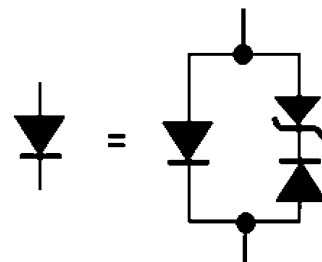
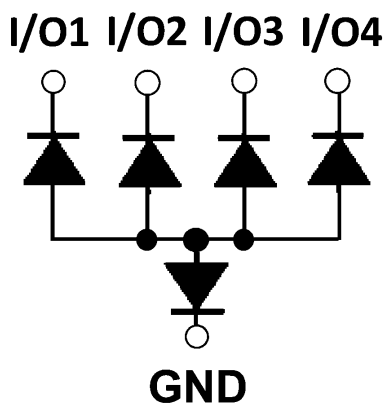
**Fig. 4.1 Definitions of Electrical Characteristics**

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	$\mu\text{A}$
Clamp voltage	$V_C$	(Note 1)	$I_{PP} = 1 \text{ A}$	—	12	—	V
Dynamic resistance	$R_{DYN}$	(Note 2)	—	—	0.9	—	$\Omega$
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  $\mu\text{s}$  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)	±8 kV

Note: Criterion: No damage to devices.

**6. Marking**

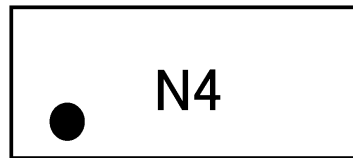


Fig. 6.1 Marking

Marking Code	Part Number
N4	DF10G7M1N

**7. Land Pattern Dimensions (for reference only)**

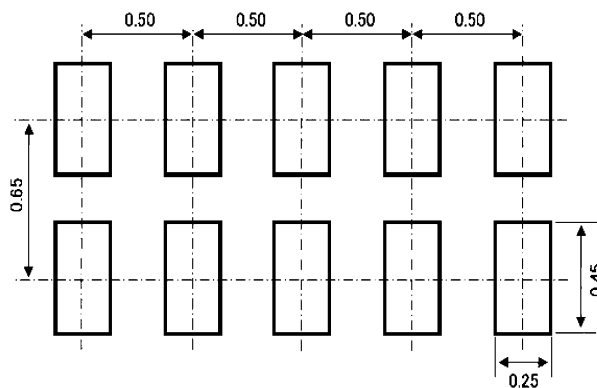
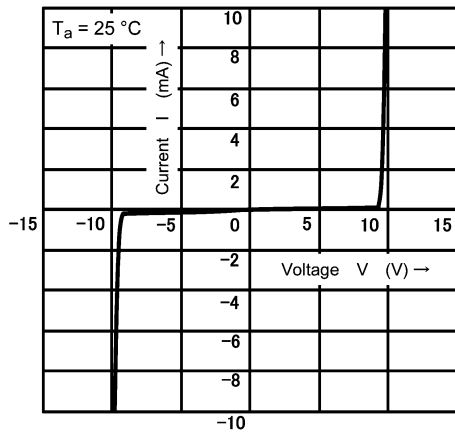
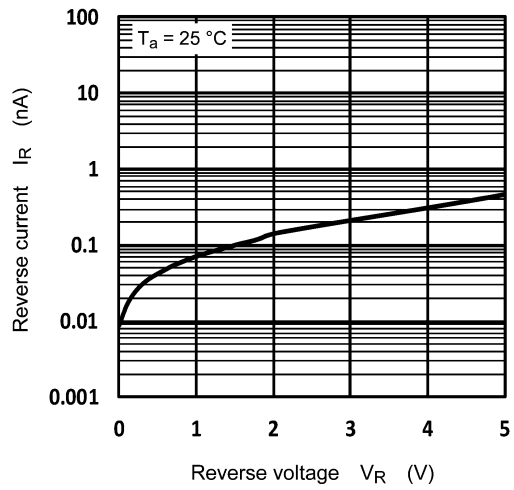


Fig. 7.1 Land Pattern Dimensions (Unit: mm)

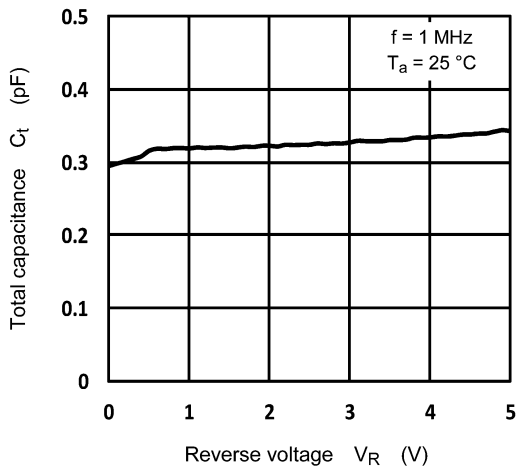
**8. Characteristics Curves (Note)**



**Fig. 8.1 I - V**



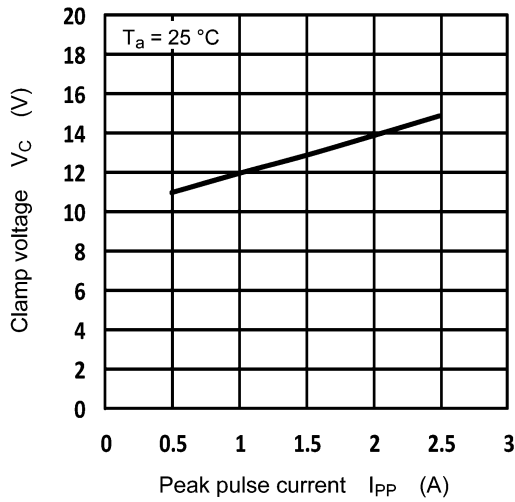
**Fig. 8.2  $I_R - V_R$**



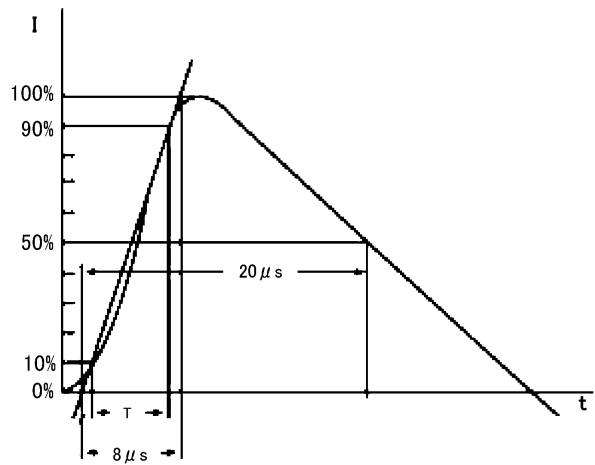
**Fig. 8.3  $C_t - V_R$**

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)**



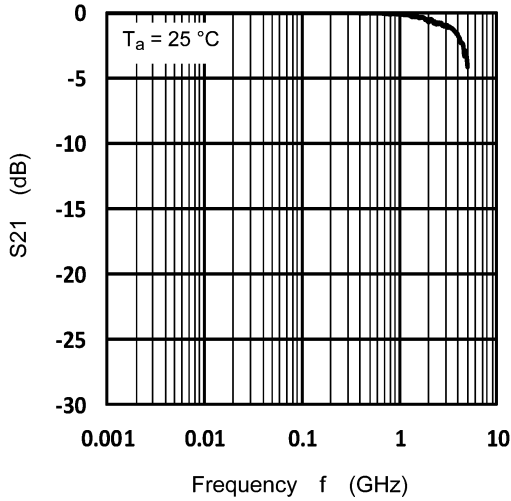
**Fig. 9.1  $V_C$  -  $I_{PP}$**



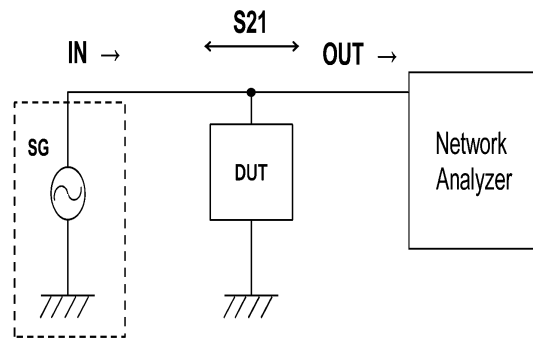
**Fig. 9.2 Based on IEC61000-4-5 8/20  $\mu$ s pulse.**

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)

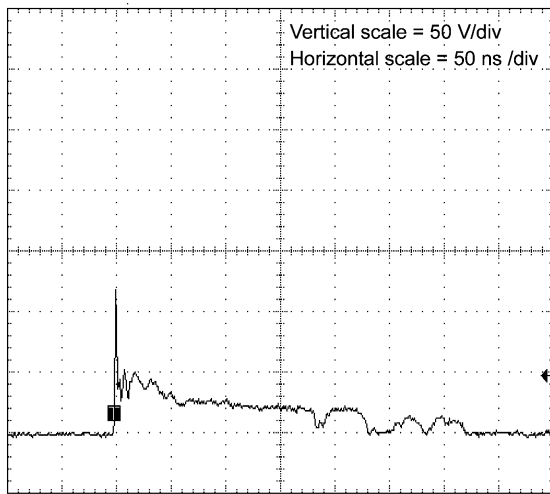


Fig. 11.1 +8 kV

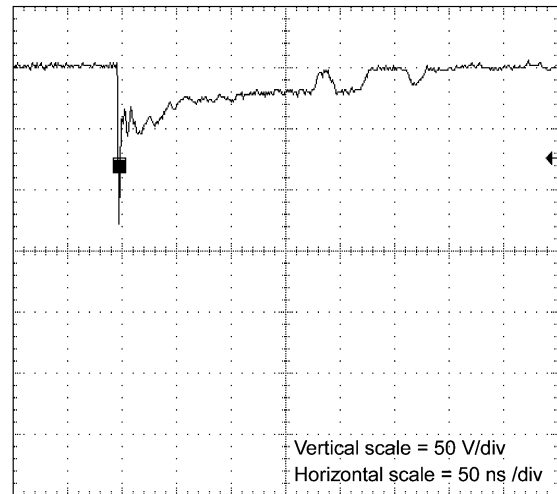


Fig. 11.2 -8 kV

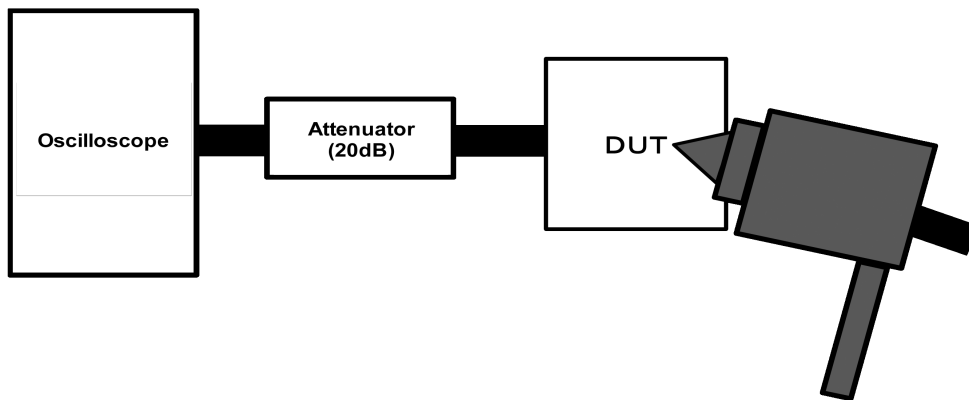
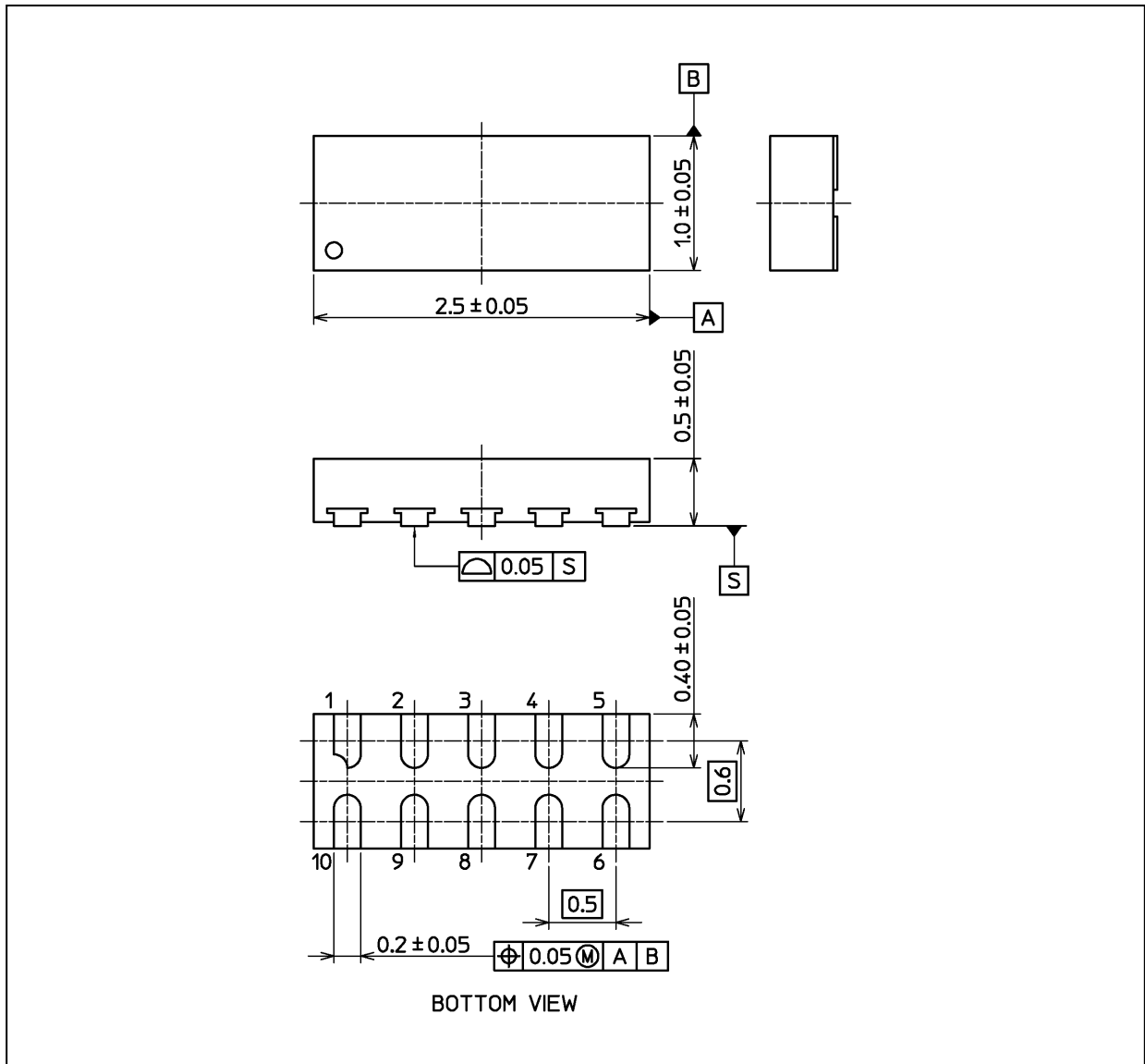


Fig. 11.3 IEC61000-4-2 (Contact)

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

Package Dimensions

Unit: mm



Weight: 0.0032 g (typ.)

Package Name(s)
TOSHIBA: 1-3V1A
Nickname: DFN10



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