

TOSHIBA Diodes for Protecting against ESD

# DF10G6M4N

## Application

- 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.

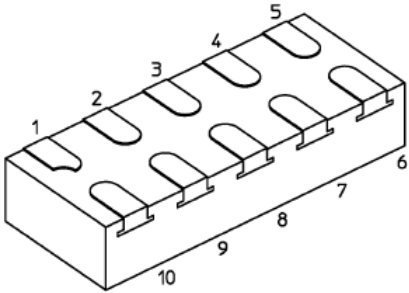
## Absolute Maximum Ratings (Ta = 25°C)

| Characteristic                                                                | Symbol                | Rating  | Unit |
|-------------------------------------------------------------------------------|-----------------------|---------|------|
| Electrostatic discharge voltage<br>IEC61000-4-2(Contact)<br>IEC61000-4-2(Air) | $V_{ESD}$<br>(Note 1) | ±23     | kV   |
| Peak pulse power ( tp = 8 / 20 s )                                            | $P_{PK}$              | 30      | W    |
| Maximum peak pulse current ( tp = 8 / 20 s )                                  | $I_{PP}$<br>(Note 2)  | 2       | A    |
| Junction temperature                                                          | $T_j$                 | 150     | °C   |
| Storage temperature range                                                     | $T_{stg}$             | -55~150 | °C   |

Note1 : according to IEC61000-4-2

Note2 : according to IEC61000-4-5

Note3: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:I/O                                                                               | 6:NC  |
| 2:I/O                                                                               | 7:NC  |
| 3:GND                                                                               | 8:NC  |
| 4:I/O                                                                               | 9:NC  |
| 5:I/O                                                                               | 10:NC |
| DFN10                                                                               |       |
| JEDEC                                                                               | —     |
| JEITA                                                                               | —     |
| TOSHIBA                                                                             | —     |

Weight: 3.2mg (typ.)

## Electrical Characteristics (Ta = 25°C)

$V_{RWM}$  : Working peak reverse voltage

$V_{BR}$  : Reverse breakdown voltage

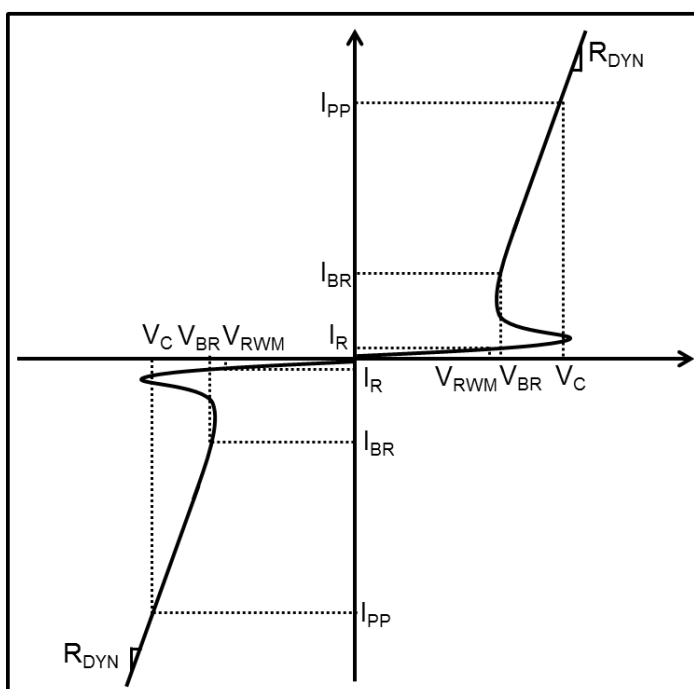
$I_{BR}$  : Reverse breakdown current

$I_R$  : Reverse Current

$V_C$  : Clamping Voltage

$I_{PP}$  : Peak pulse current

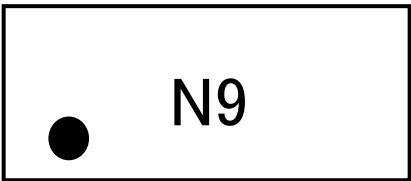
$R_{DYN}$  : Dynamic resistance



| Characteristic               | Symbol    | Test Condition                                 | Min | Typ. | Max | Unit          |
|------------------------------|-----------|------------------------------------------------|-----|------|-----|---------------|
| Working peak reverse voltage | $V_{RWM}$ | —                                              | —   | —    | 5.5 | V             |
| Reverse breakdown voltage    | $V_{BR}$  | $I_{BR} = 1\text{ mA}$                         | 5.6 | 6.2  | 8   | V             |
| Reverse Current              | $I_R$     | $V_{RWM} = 5.5\text{ V}$                       | —   | —    | 0.1 | $\mu\text{A}$ |
| Clamping Voltage             | $V_C$     | $I_{PP}=1\text{A}$ (Note1)                     | —   | 8.5  | —   | V             |
|                              | $V_C$     | $I_{PP}=2\text{A}$ (Note1)                     | —   | 10   | 15  | V             |
| Clamping Voltage             | $V_C$     | $I_{TLP}=16\text{A}$ (Note2)                   | —   | 18   | —   | V             |
|                              | $V_C$     | $I_{TLP}=30\text{A}$ (Note2)                   | —   | 25   | —   | V             |
| Dynamic resistance           | $R_{DYN}$ | (Note:2)                                       | —   | 0.5  | —   | $\Omega$      |
| Terminal capacitance         | $C_t$     | $V_R = 0\text{ V}$ , $f=1\text{ MHz}$ (Note.3) | —   | 0.2  | 0.3 | pF            |

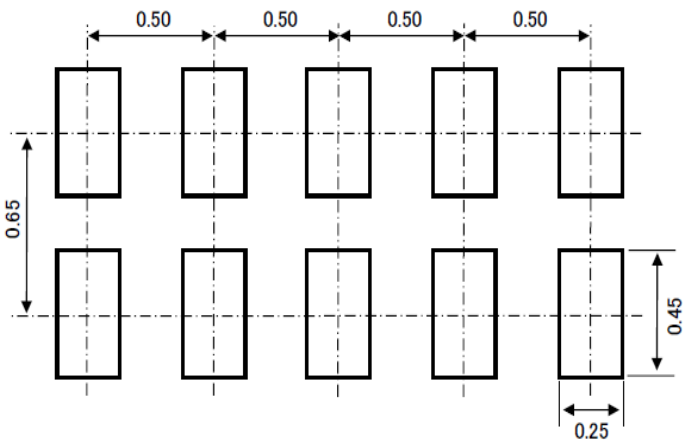
Note1 : Based on IEC61000-4-5 8/20  $\mu\text{ s}$  pulse.  
Note2 : TLP parameter:  $Z_0 = 50\ \Omega$  ,  $t_p = 100\text{ns}$ ,  $t_r = 300\text{ps}$ , averaging window:  $t_1 = 30\text{ ns}$  to  $t_2 = 60\text{ ns}$ ,  
extraction of dynamic resistance using least squares fit of TLP characteristics between  $I_{PP1} = 8\text{A}$  and  $I_{PP2} = 16\text{A}$ .  
Note3 : Guaranteed by design.

Marking (Unit: mm)

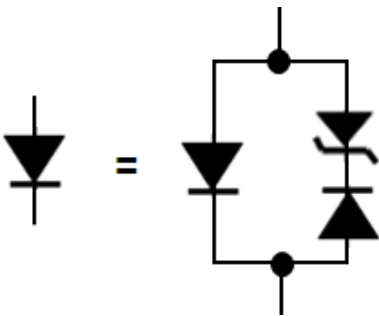
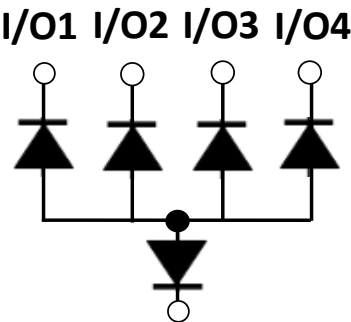


| Marking Code | Part number |
|--------------|-------------|
| N9           | DF10G6M4N   |

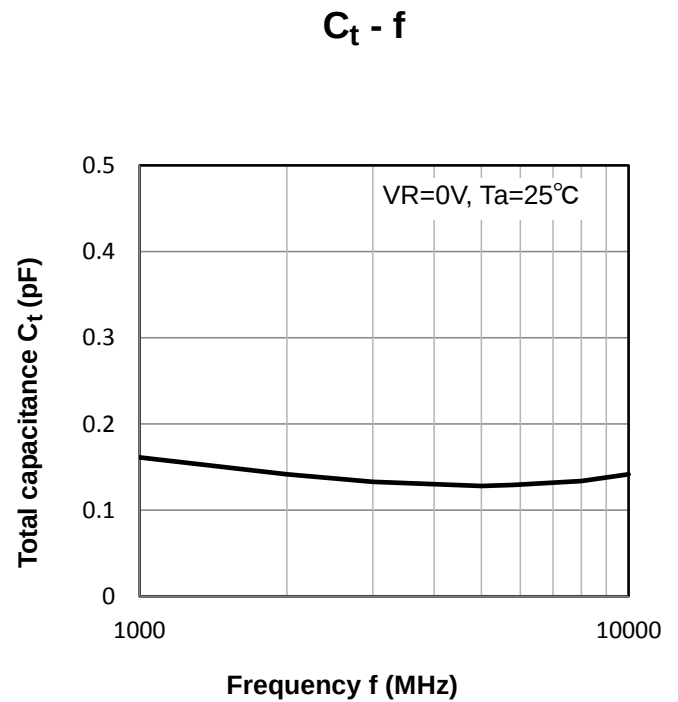
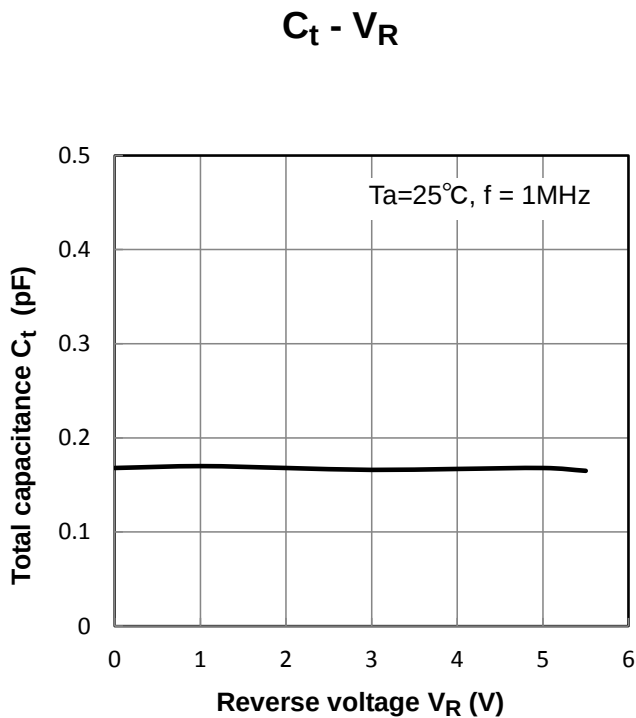
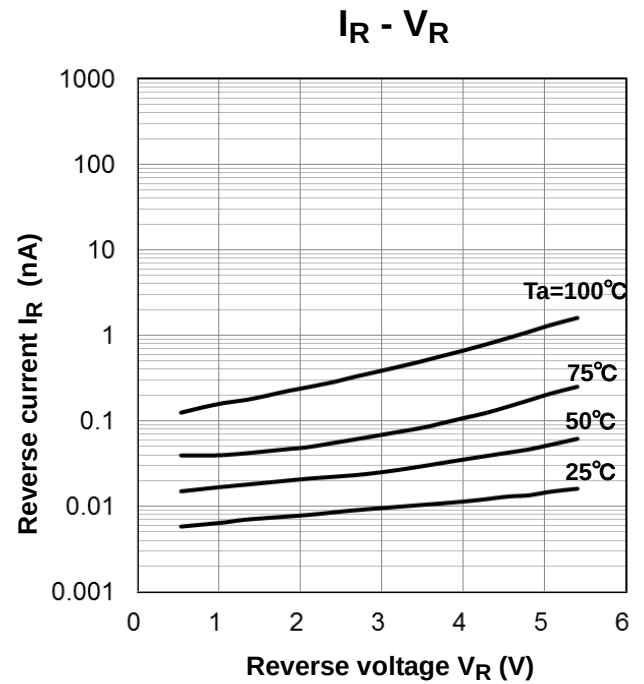
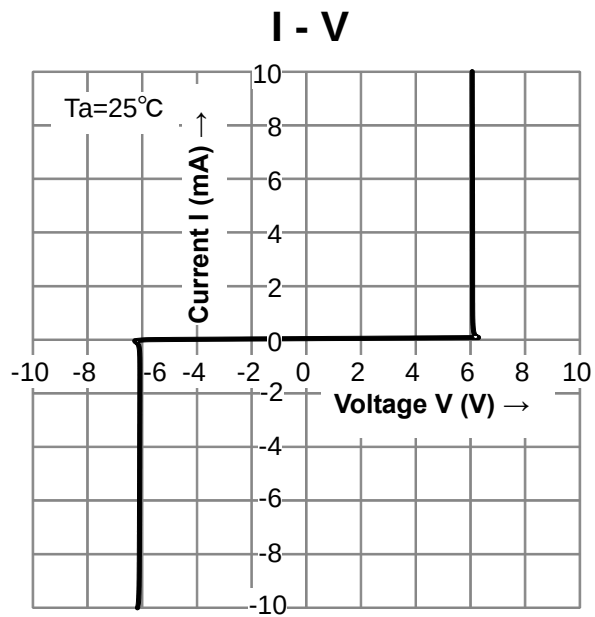
Land Pattern Dimensions for Reference Only



Equivalent Circuit



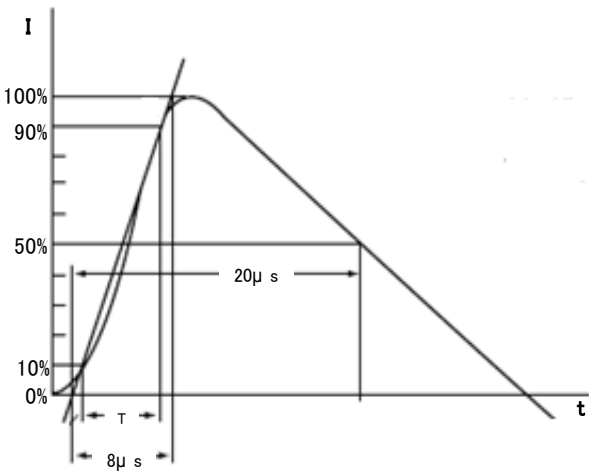
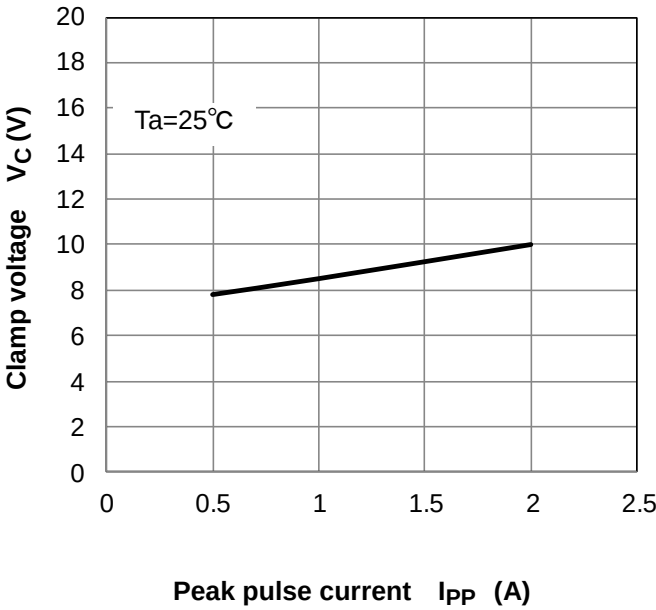
## Characteristics Curves (Note)



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

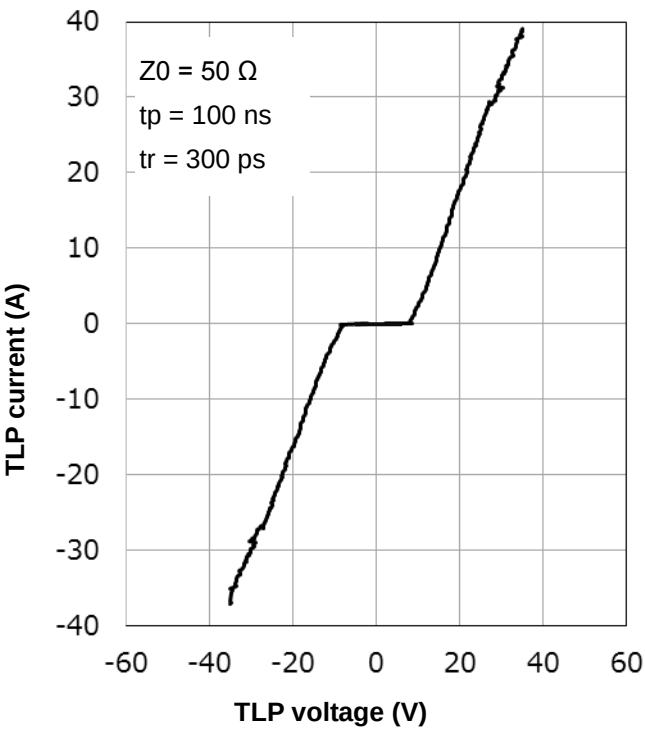
**$V_C - I_{PP}$**

Based on IEC61000-4-5 8/20  $\mu$  s pulse.(Ed2)

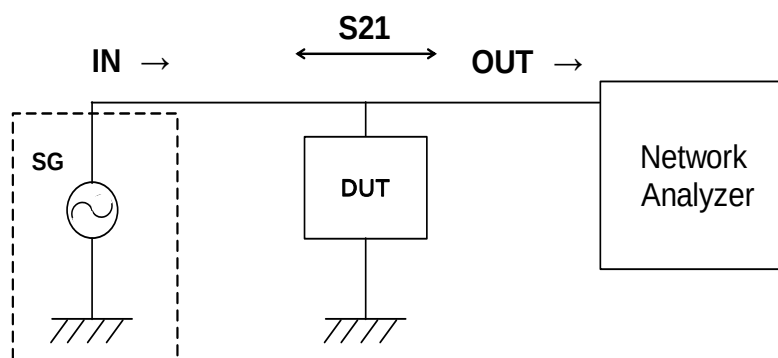
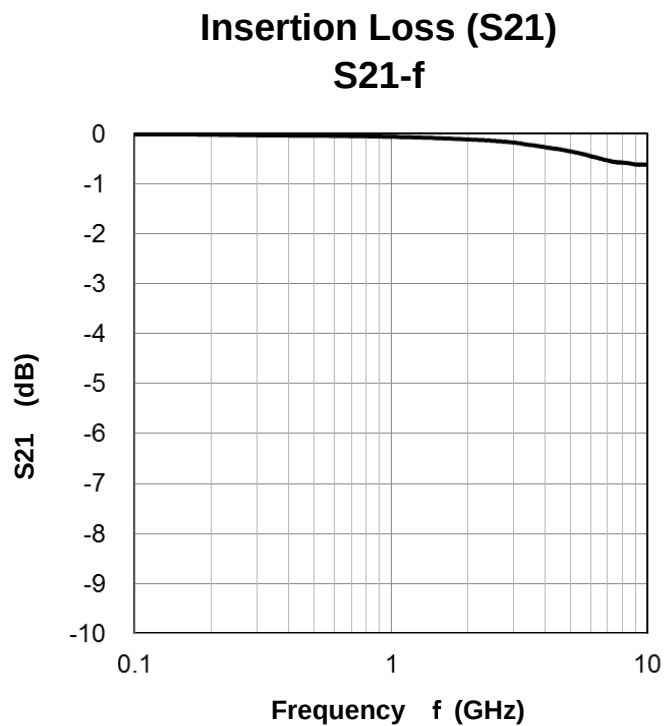


**Fig Based on IEC61000-4-5 8/20  $\mu$  s pulse.(Ed.2)**

**TLP**



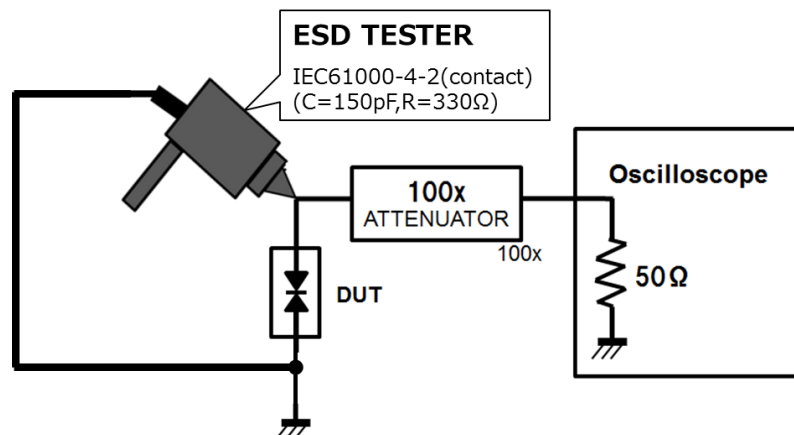
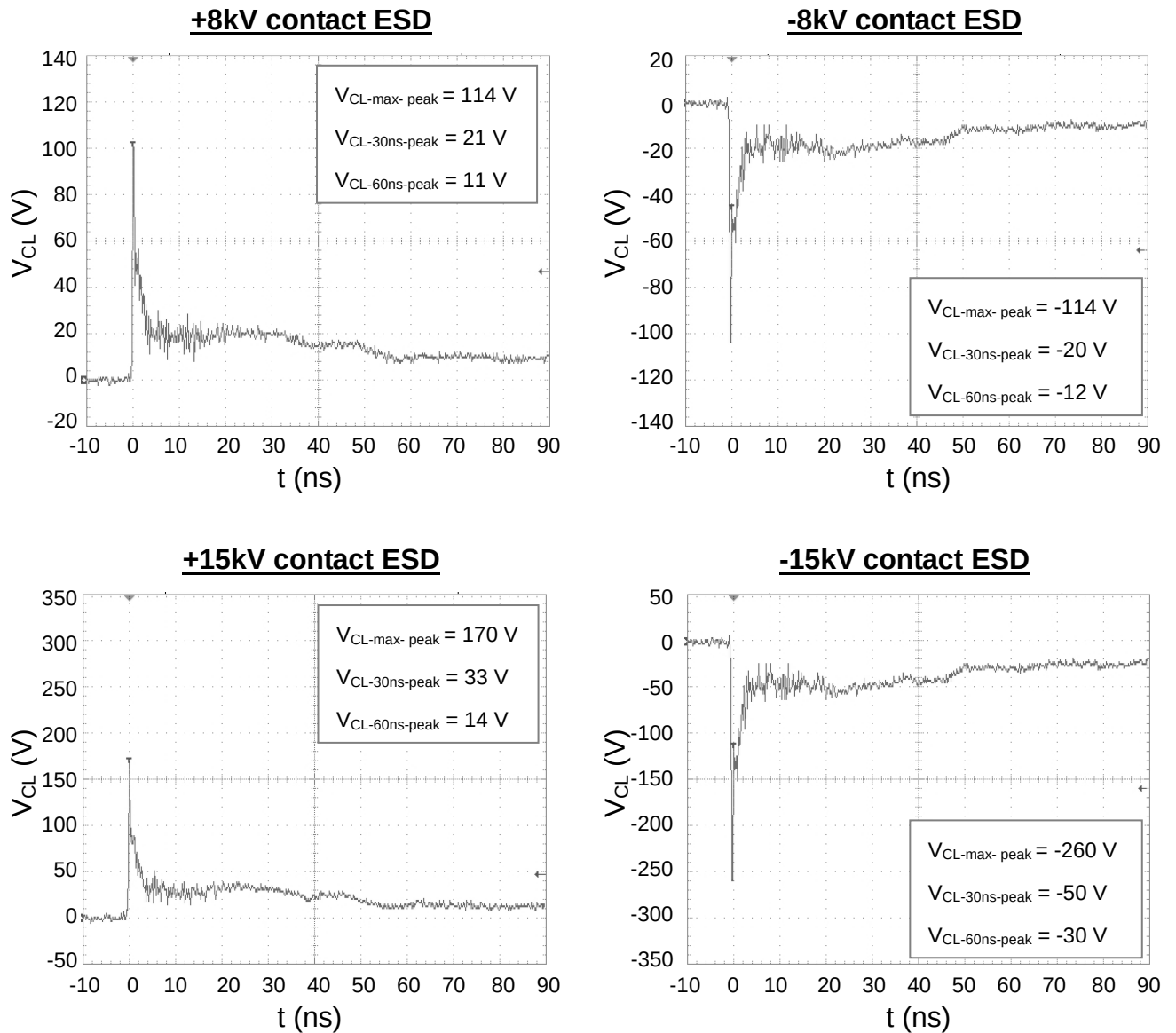
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



**Fig. S21 measurement circuit**

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# ESD Clamp Waveform (IEC61000-4-2) (Note)

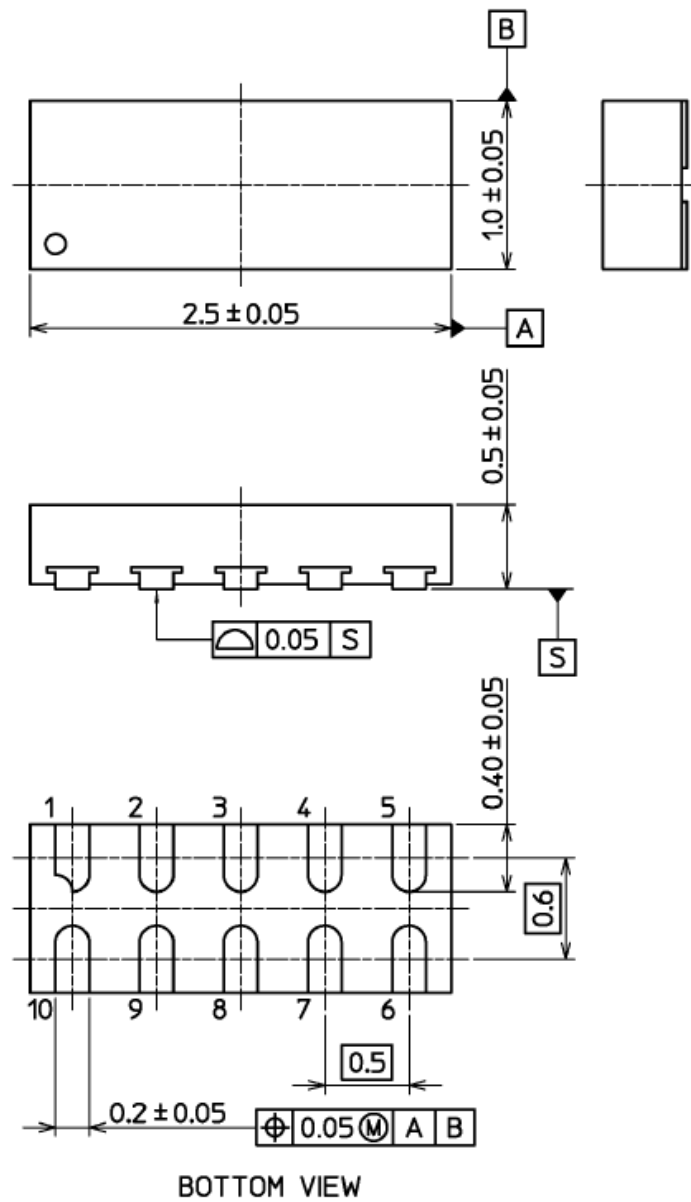


**Fig. IEC61000-4-2 (Contact)**

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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