

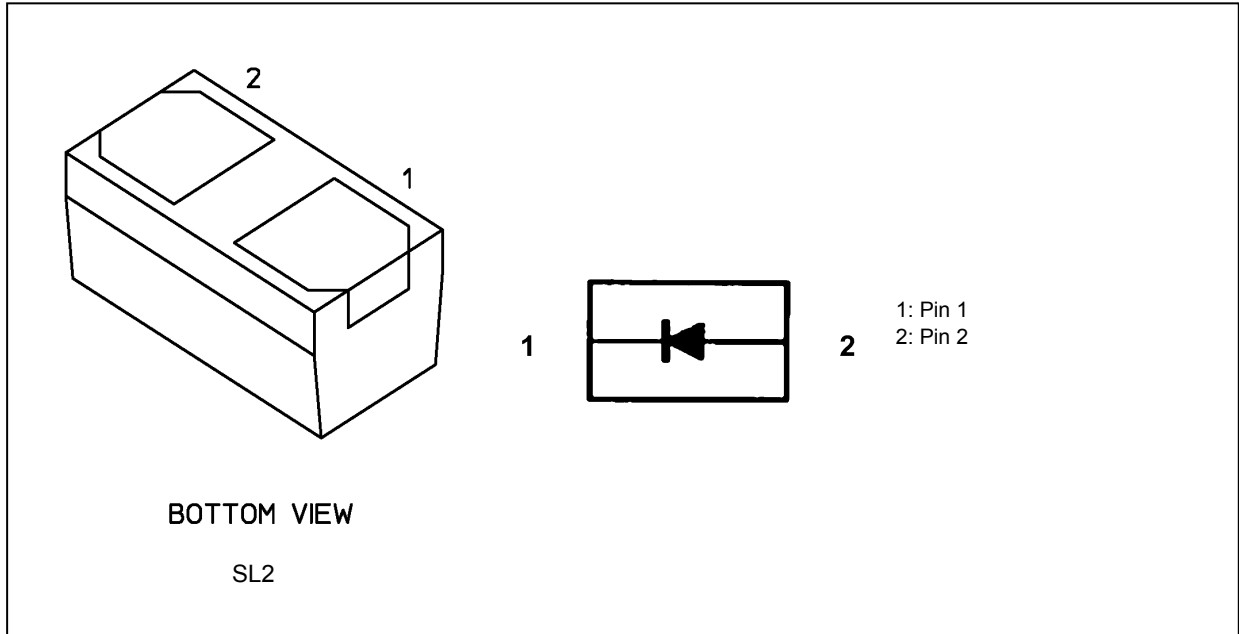
# DF2S7MSL

## 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	Note	Rating	Unit
Electrostatic discharge voltage (IEC61000-4-2)(Contact)	$V_{ESD}$	(Note 1)	$\pm 12$	kV
Electrostatic discharge voltage (IEC61000-4-2)(Air)			$\pm 12$	
Peak pulse power( $t_p = 8/20 \mu\text{s}$ )	$P_{PK}$		60	W
Peak pulse current( $t_p = 8/20 \mu\text{s}$ )	$I_{PP}$	(Note 2)	3	A
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).

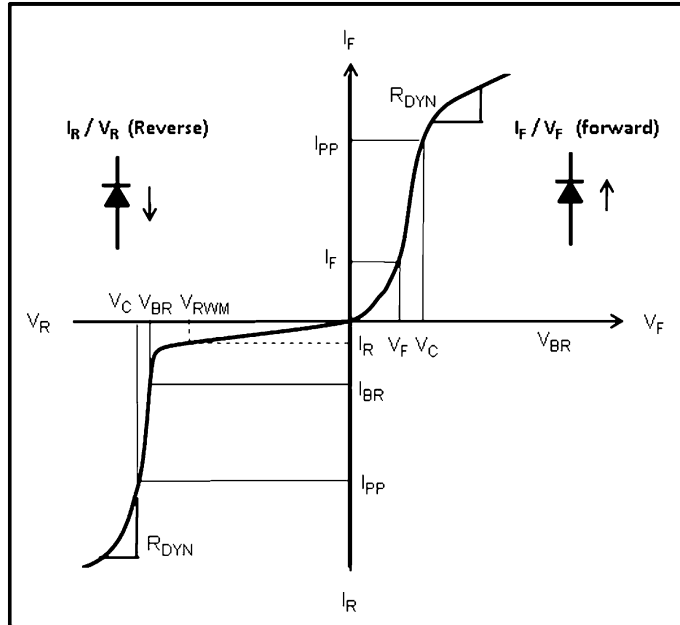
Note 1: According to IEC61000-4-2.

Note 2: According to IEC61000-4-5.

Start of commercial production  
2015-09

**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
- $I_F$ : Forward current
- $V_F$ : Forward voltage



**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	$V_{BR}$		$I_R = 5 \text{ mA}$	6.0	—	10	V
Reverse current	$I_R$		$V_{RWM} = 5 \text{ V}$	—	—	0.5	$\mu\text{A}$
Clamp voltage	$V_C$	(Note 1)	$I_{PP} = 1 \text{ A}$	—	9.5	—	V
			$I_{PP} = 3 \text{ A}$	—	12	20	
Clamp voltage	$V_C$	(Note 2)	$I_{TLP} = 16 \text{ A}$	—	15	—	V
			$I_{TLP} = 30 \text{ A}$	—	20	—	
Dynamic resistance	$R_{DYN}$	(Note 2)	—	—	0.35	—	$\Omega$
Total capacitance	$C_t$	(Note 3)	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.5	0.9	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 8 A to 16 A.

Note 3: Guaranteed by design.

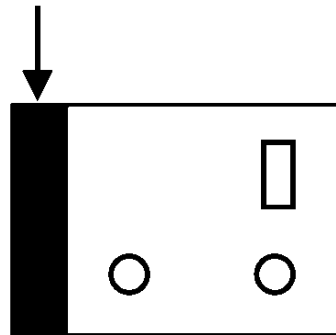
**5. Marking****Pin 1 mark**

Fig. 5.1 Marking

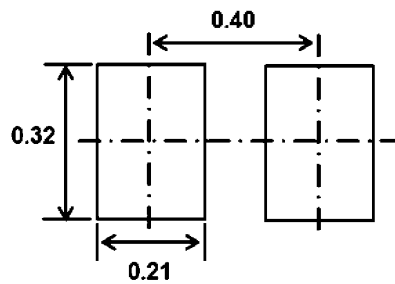
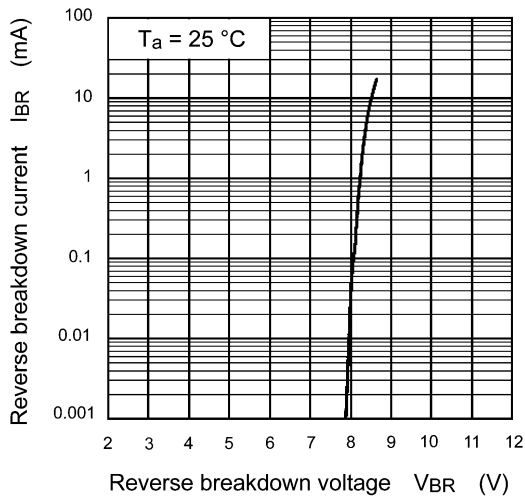
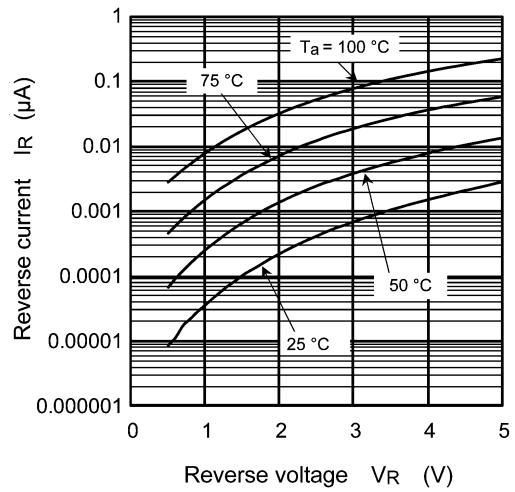
**6. Land Pattern Dimensions (for reference only)**

Fig. 6.1 Land Pattern Dimensions (Unit: mm)

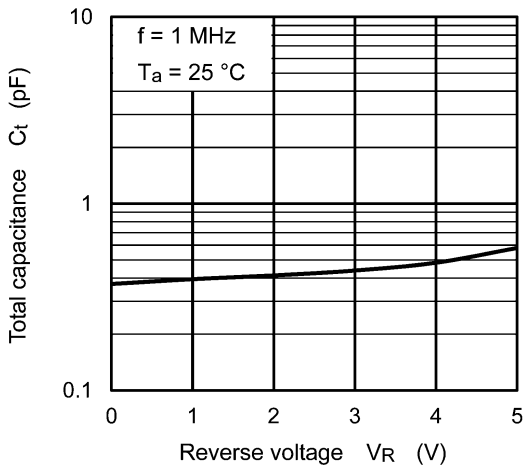
**7. Characteristics Curves (Note)**



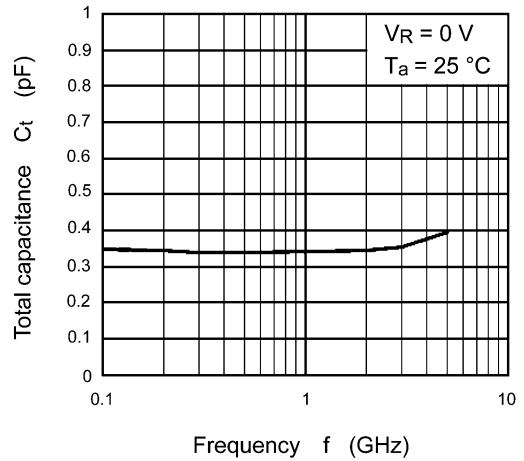
**Fig. 7.1  $I_{BR} - V_{BR}$**



**Fig. 7.2  $I_R - V_R$**



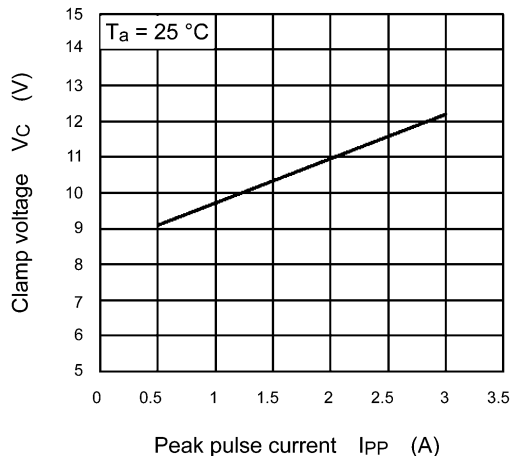
**Fig. 7.3  $C_t - V_R$**



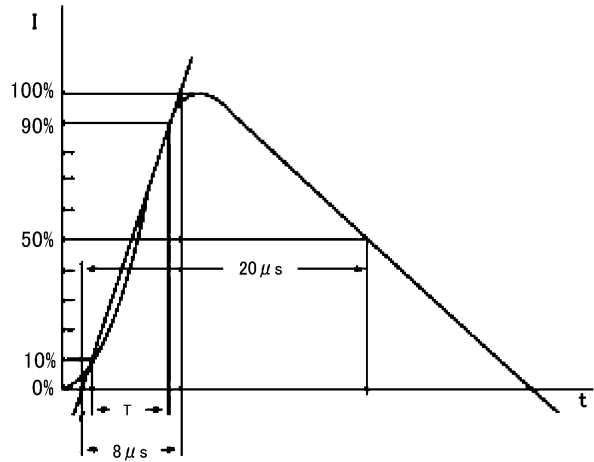
**Fig. 7.4  $C_t - f$**

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

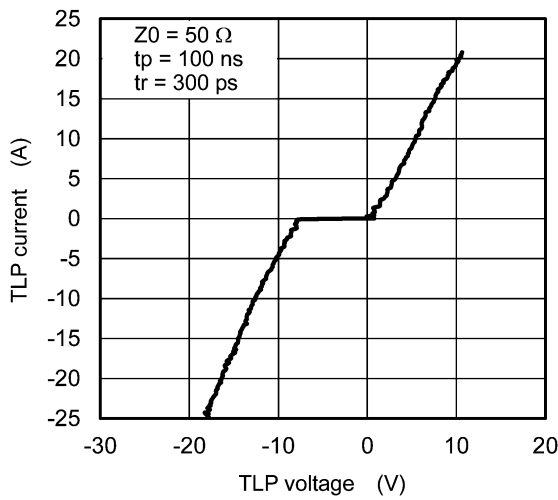
**8. Clamp Voltage  $V_C$  - Peak Pulse Current ( $I_{PP}$ ) (Note)**



**Fig. 8.1  $V_C$  -  $I_{PP}$**



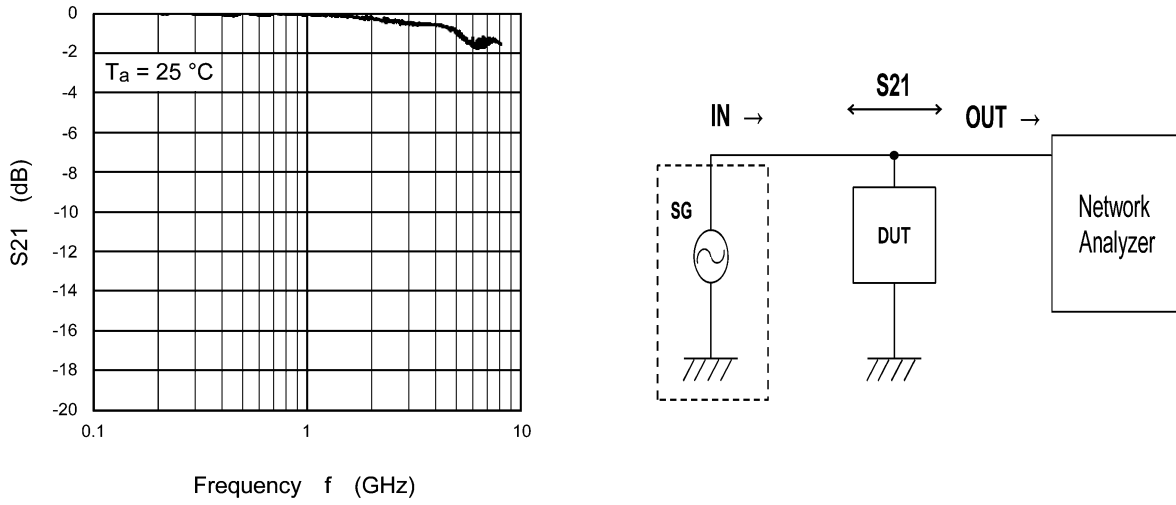
**Fig. 8.2 Based on IEC61000-4-5 8/20  $\mu$ s pulse.(Ed.2)**



**Fig. 8.3 TLP**

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

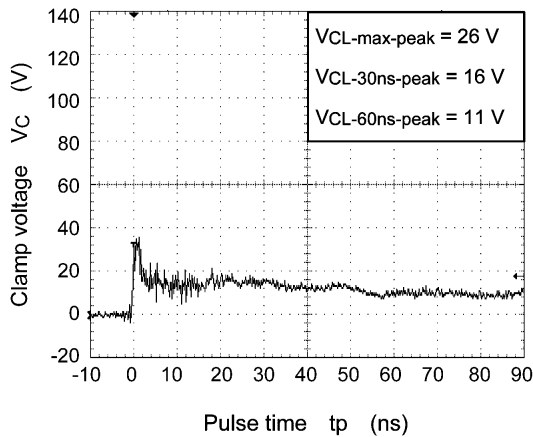
**9. Insertion Loss (S21) (Note)**



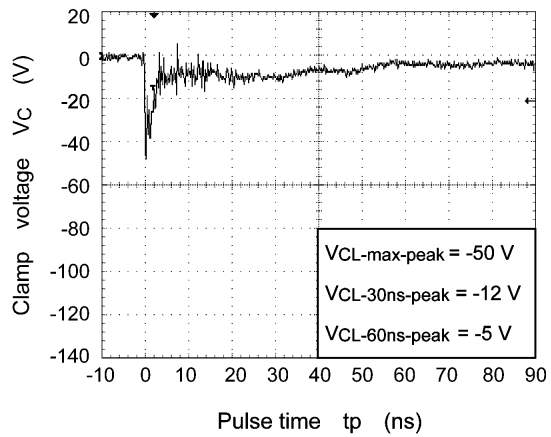
**Fig. 9.1 S21 - f**

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

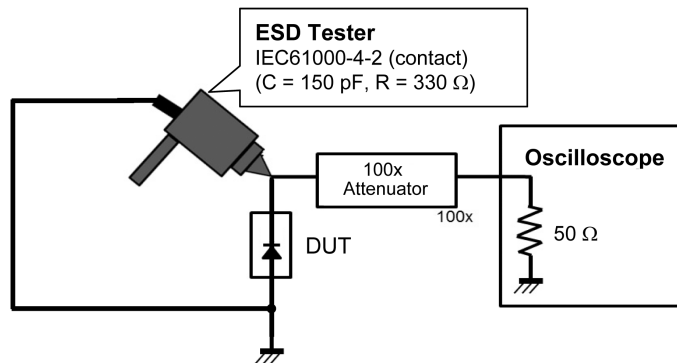
**10. ESD Clamp Waveform (Note)**



**Fig. 10.1 +8 kV**



**Fig. 10.2 -8 kV**



**Fig. 10.3 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: 0.2 mg (typ.)

Package Name(s)
TOSHIBA: 1-1AL1A
Nickname: SL2

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