

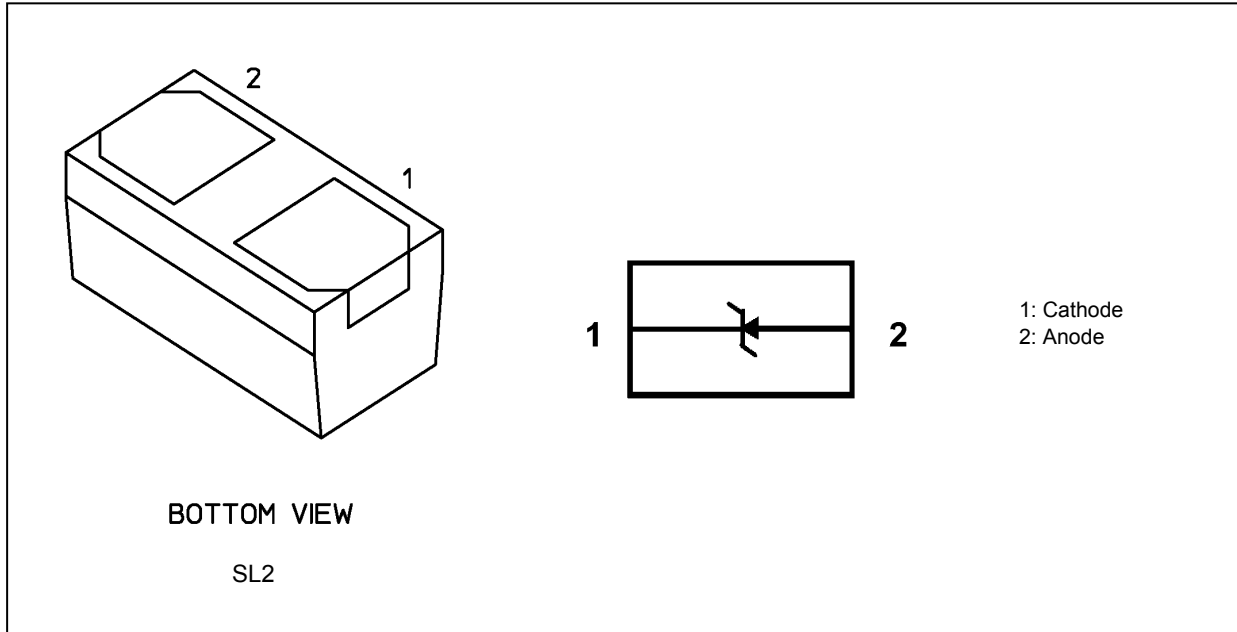
# DF2S5.1ASL

## 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)	$\pm 30$	kV
Electrostatic discharge voltage (IEC61000-4-2)(Air)				
Peak pulse power( $t_p = 8/20 \mu\text{s}$ )	$P_{PK}$		30	W
Peak pulse current( $t_p = 8/20 \mu\text{s}$ )	$I_{PP}$	(Note 2)	2.5	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.

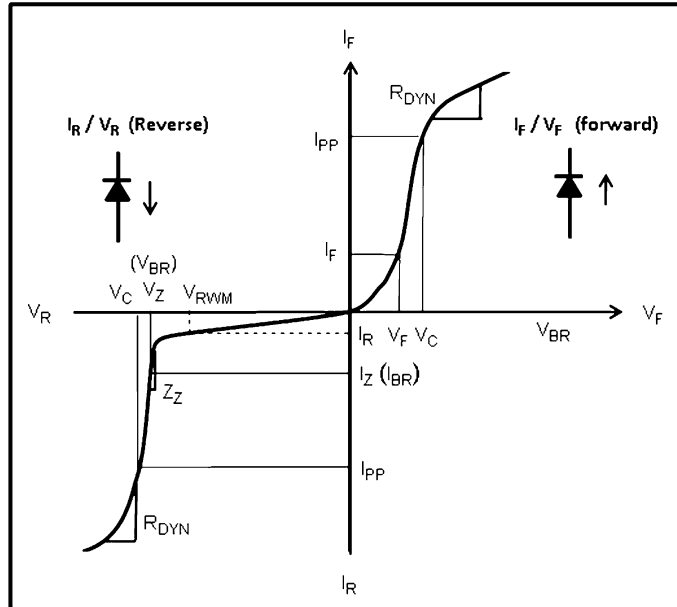
Note 2: According to IEC61000-4-5.

Start of commercial production

2015-11

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

- $V_{RWM}$ : Working peak reverse voltage
- $V_Z$ : Zener voltage
- $V_{BR}$ : Reverse breakdown voltage
- $Z_Z$ : Dynamic impedance
- $I_Z$ : Zener current
- $I_{BR}$ : 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	$V_{RWM}$		—	—	—	1.5	V
Zener voltage (Reverse breakdown voltage)	$V_Z$ ( $V_{BR}$ )		$I_Z = 5\text{ mA}$ ( $I_{BR} = 5\text{ mA}$ )	4.8	5.1	5.4	V
Dynamic impedance	$Z_Z$		$I_Z = 5\text{ mA}$ ( $I_{BR} = 5\text{ mA}$ )	—	—	70	$\Omega$
Reverse current	$I_R$		$V_{RWM} = 1.5\text{ V}$	—	—	1	$\mu\text{A}$
Clamp voltage	$V_C$	(Note 1)	$I_{PP} = 1\text{ A}$	—	5.5	—	V
			$I_{PP} = 2.5\text{ A}$	—	6.5	12	
Clamp voltage	$V_C$	(Note 2)	$I_{TLP} = 16\text{ A}$	—	10	—	V
			$I_{TLP} = 30\text{ A}$	—	13	—	
Dynamic resistance	$R_{DYN}$	(Note 2)	—	—	0.2	—	$\Omega$
Total capacitance	$C_t$	(Note 3)	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$	—	45	—	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.

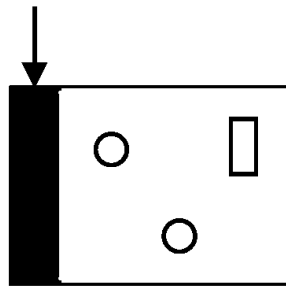
**5. Marking****Pin1 mark**

Fig. 5.1 Marking

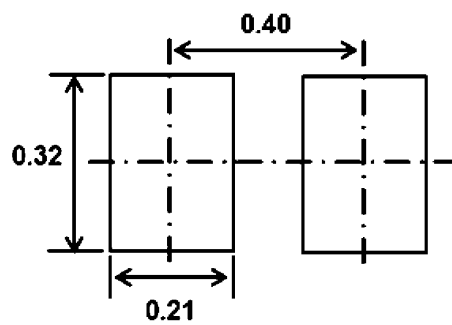
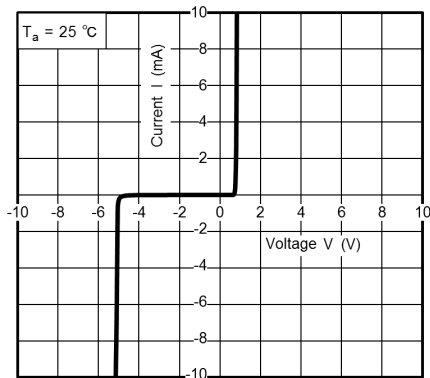
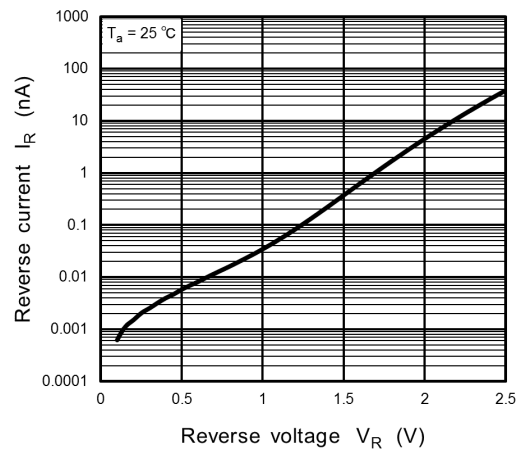
**6. Land Pattern Dimensions (for reference only)**

Fig. 6.1 Land Pattern Dimensions (Unit: mm)

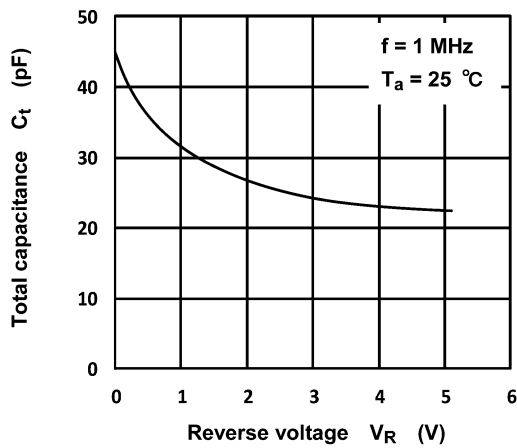
**7. Characteristics Curves (Note)**



**Fig. 7.1 I - V**



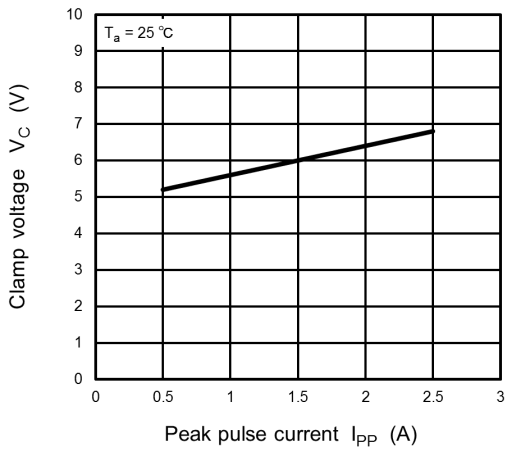
**Fig. 7.2  $I_R - V_R$**



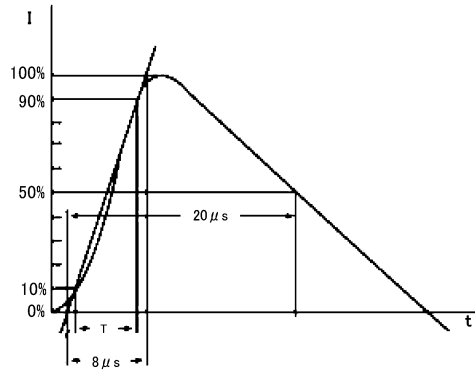
**Fig. 7.3  $C_t - V_R$**

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

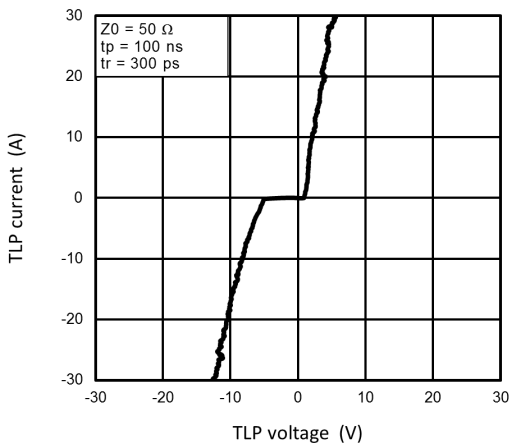
**8. Clamp Voltage - Peak Pulse Current ( $V_C - I_{PP}$ ) (Note)**



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



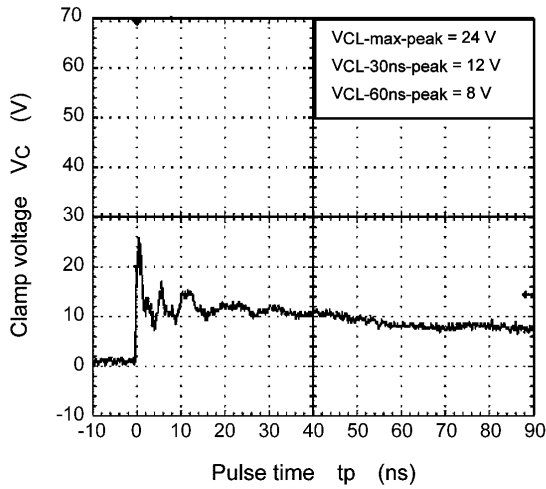
**Fig. 8.2 Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.(Ed.2)**



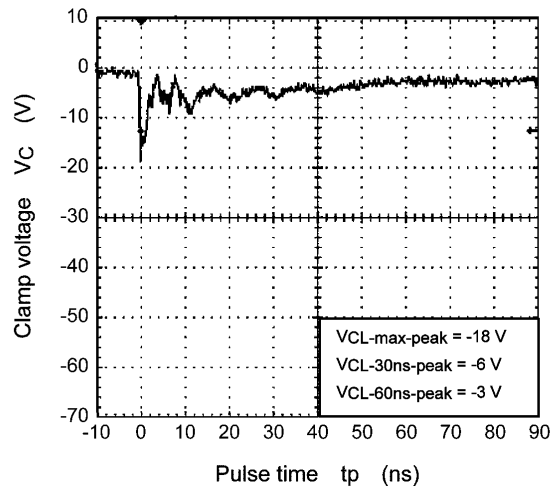
**Fig. 8.3 TLP**

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

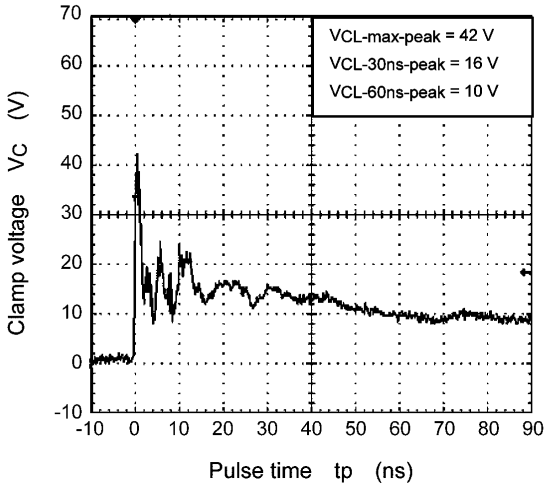
**9. ESD Clamp Waveform (Note)**



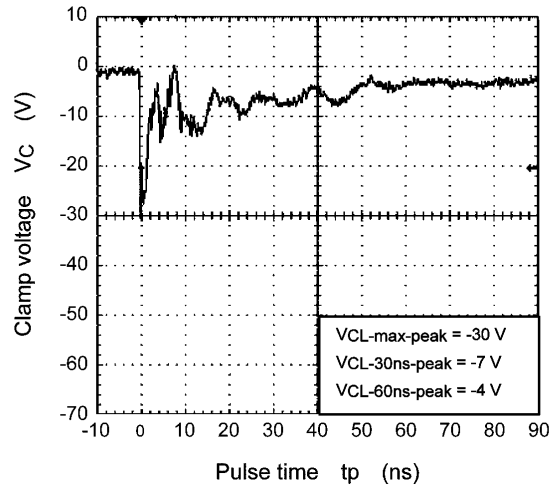
**Fig. 9.1 +8 kV**



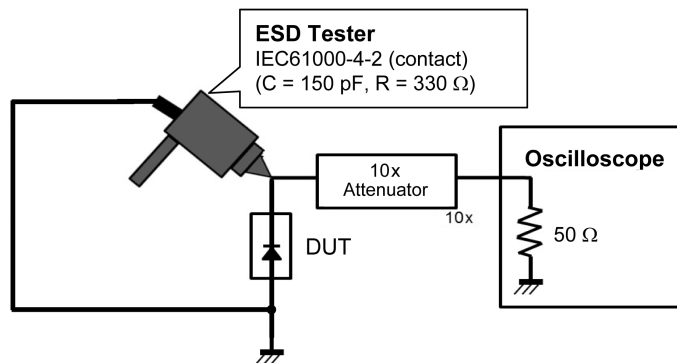
**Fig. 9.2 -8 kV**



**Fig. 9.3 +15 kV**



**Fig. 9.4 -15 kV**

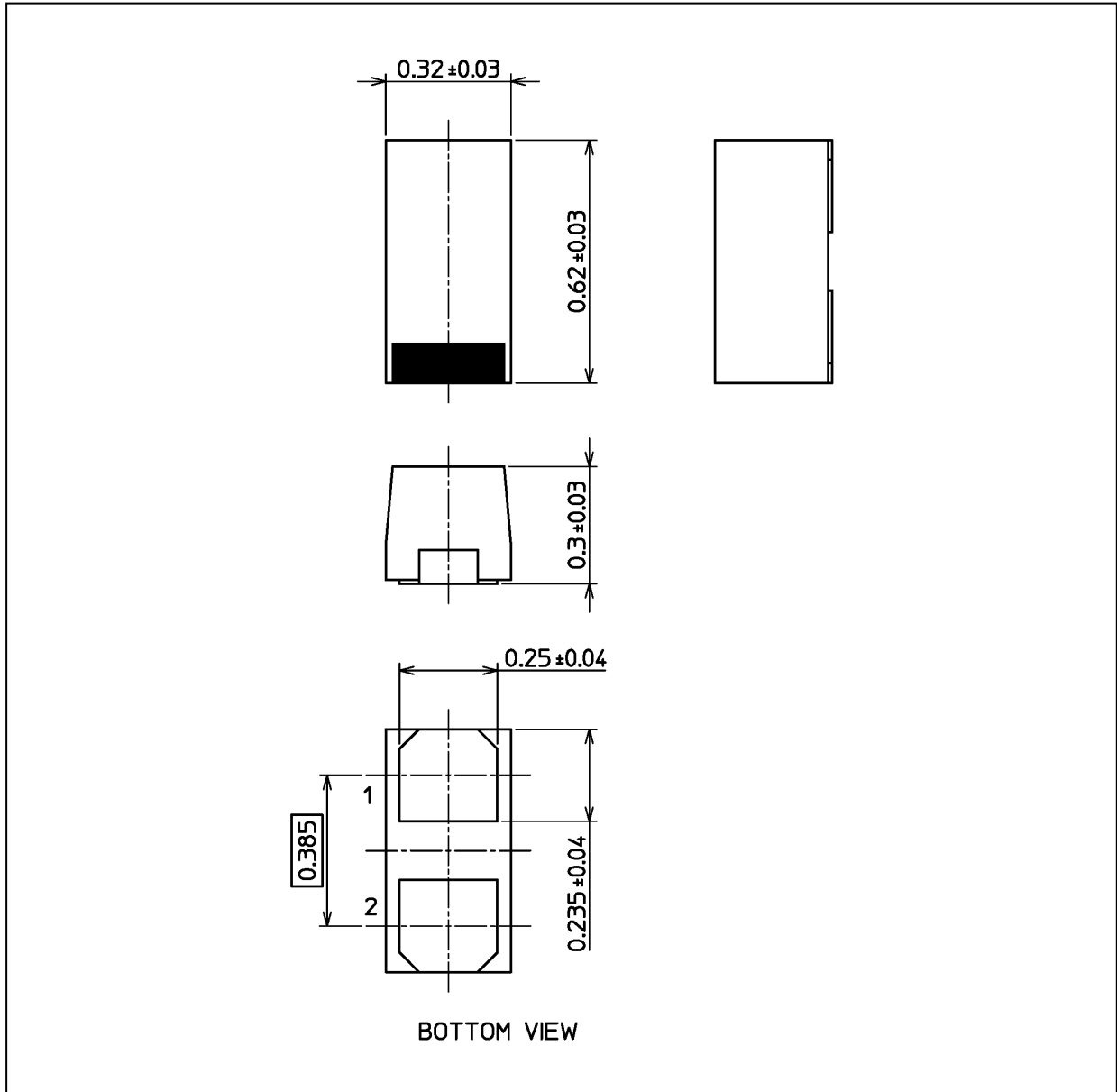


**Fig. 9.5 IEC61000-4-2 (Contact)**

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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