

ESD Protection Diodes Silicon Epitaxial Planar

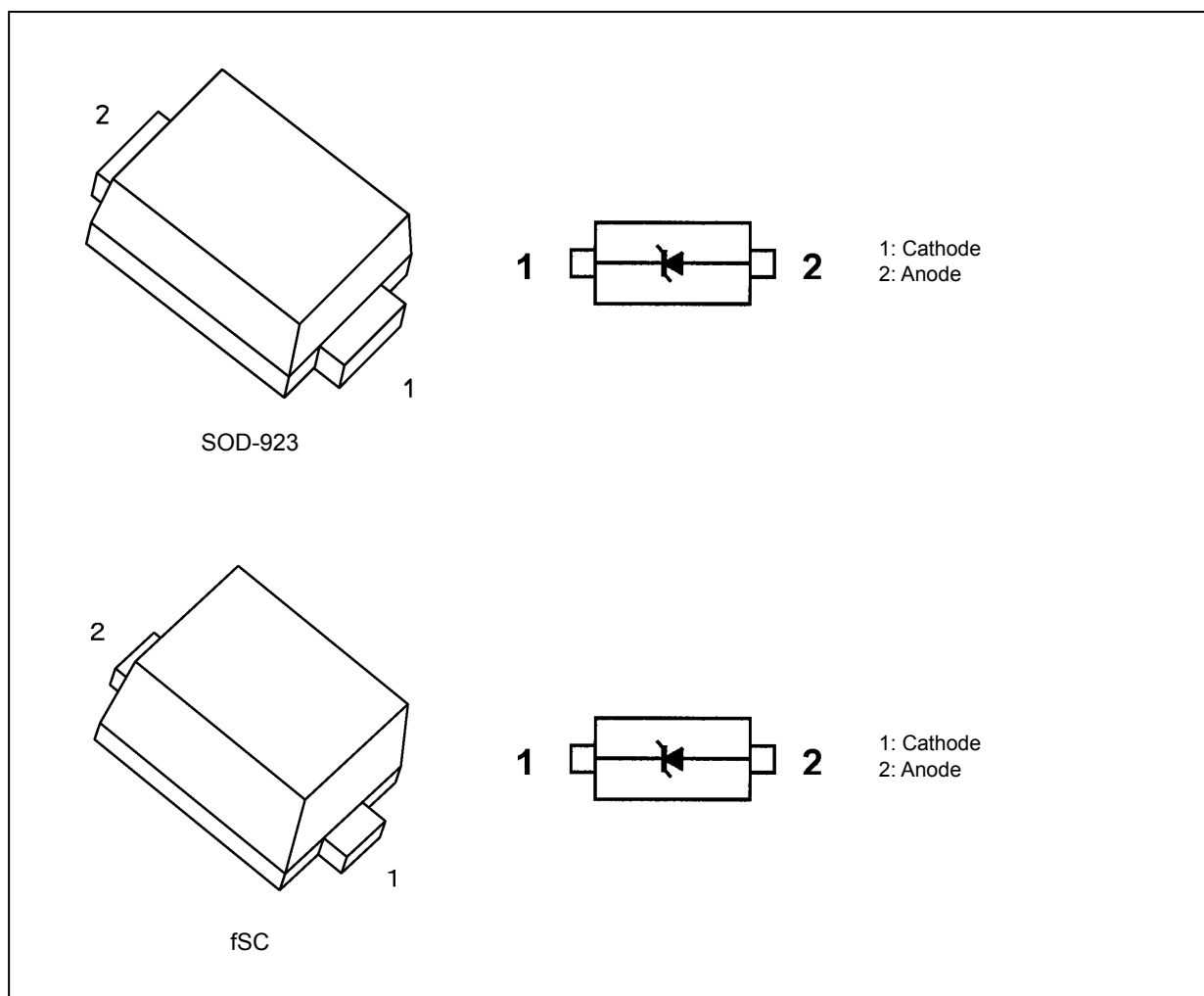
DF2S16FS

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



Start of commercial production
2013-12

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}	± 12	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).

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

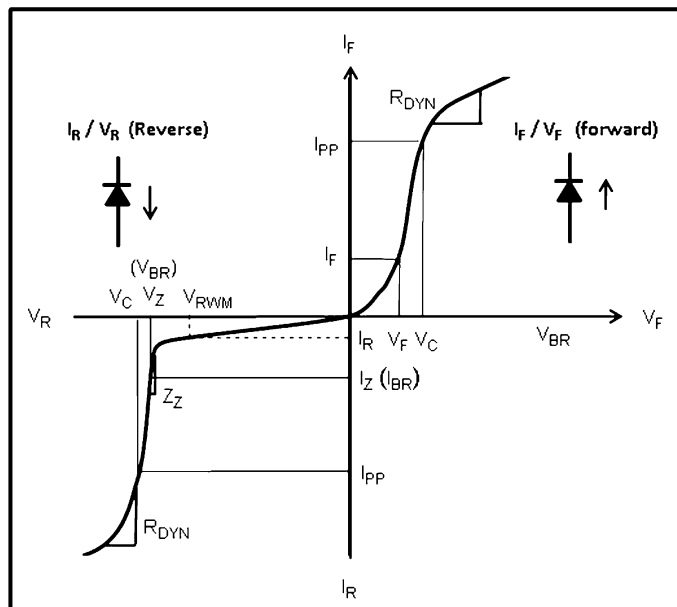


Fig. 4.1 Definitions of Electrical Characteristics

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	V_{RWM}		—	—	—	12	V
Zener voltage (Reverse breakdown voltage)	V_Z (V_{BR})		$I_Z = 5\text{ mA}$ (I_{BR})	15.3	16.0	17.1	V
Dynamic impedance	Z_Z		$I_Z = 5\text{ mA}$ (I_{BR})	—	—	35	Ω
Reverse current	I_R		$V_{RWM} = 12\text{ V}$	—	—	0.5	μA
Clamp voltage	V_C	(Note1)	$I_{PP} = 1\text{ A}$ (Reverse side)	—	22	—	V
			$I_{PP} = 1\text{ A}$ (Forward side)	—	2.0	—	V
Total capacitance	C_t		$V_R = 0\text{ V}$, $f = 1\text{ MHz}$	—	10	—	pF

Note1: Based on IEC61000-4-5 8/20 μs pulse.

5. Guaranteed ESD Protection (Note)

Test Condition	ESD Protection
IEC61000-4-2 (Contact discharge)	±12 kV

Note: Criterion: No damage to devices.

6. Marking

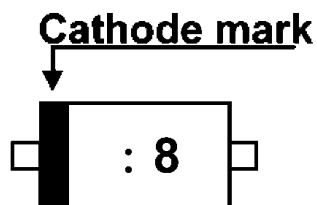


Fig. 6.1 Marking

7. Land Pattern Dimensions (for reference only)

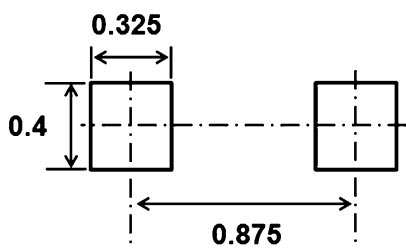


Fig. 7.1 SOD-923 (unit: mm)

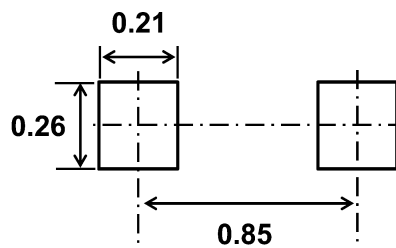


Fig. 7.2 fSC (unit: mm)

8. Characteristics Curves (Note)

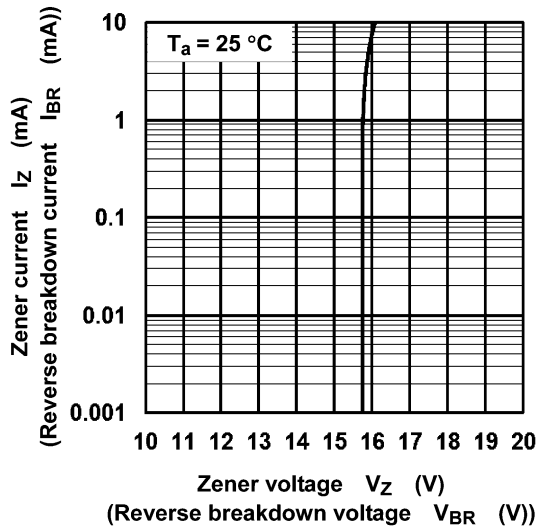


Fig. 8.1 $I_Z - V_Z (I_{BR} - V_{BR})$

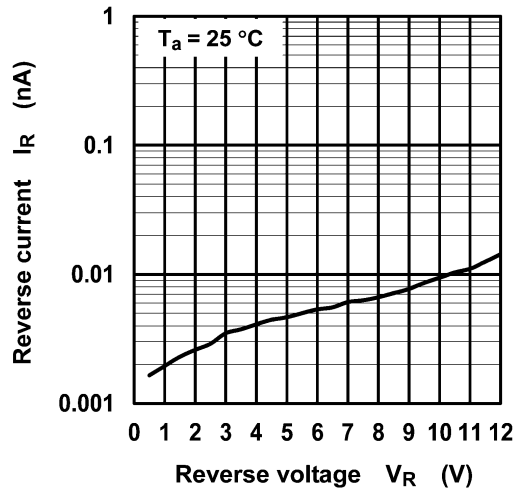


Fig. 8.2 $I_R - V_R$

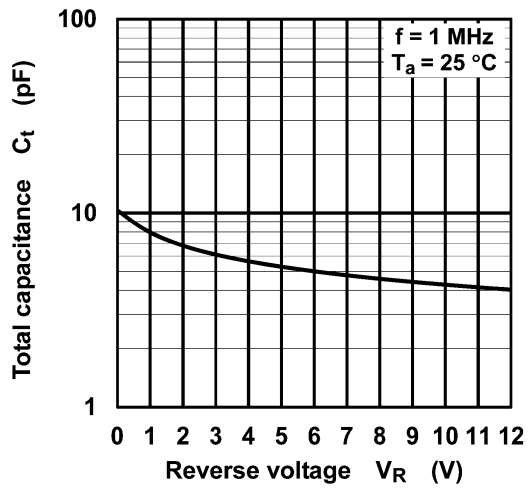


Fig. 8.3 $C_t - V_R$

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

Package Dimensions

Unit: mm



The shapes and dimensions of the package vary, depending on the manufacturing plant. For details, contact the Toshiba sales representative.

Weight: 0.6 mg (typ.)

Package Name(s)
TOSHIBA: 1-1L1S
Nickname: fSC

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