

ESD Protection Diodes Silicon Epitaxial Planar

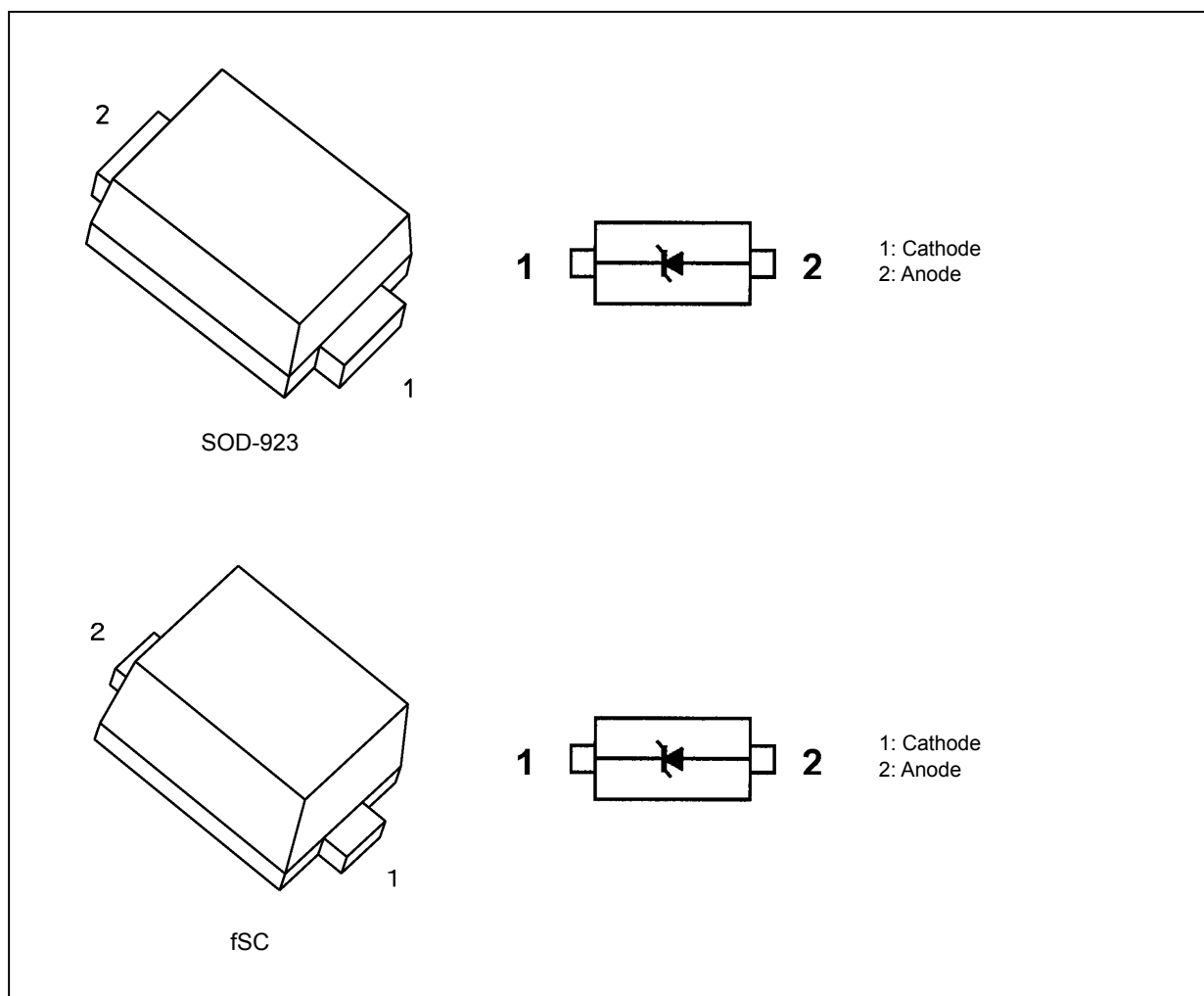
# DF2S5.1FS

## 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  
2011-11

### 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)	$V_{ESD}$	$\pm 30$	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

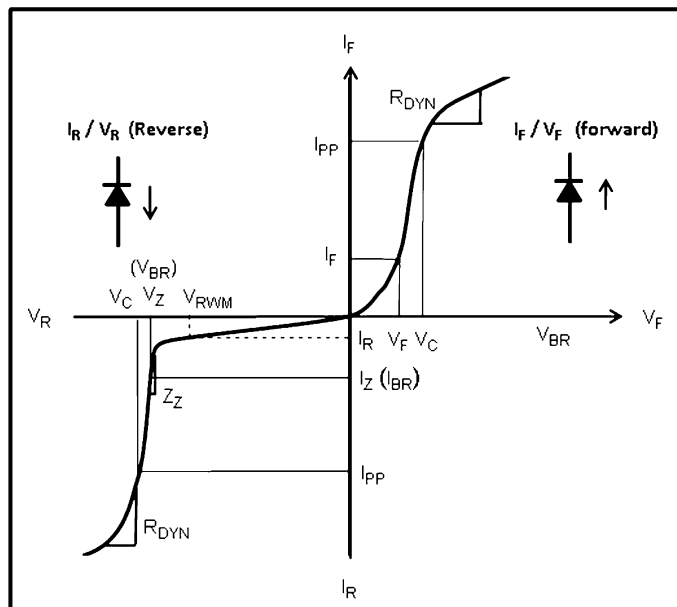


Fig. 4.1 Definitions of Electrical Characteristics

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	$V_{RWM}$		—	—	—	1.5	V
Zener voltage (Reverse breakdown voltage)	$V_Z$ ( $V_{BR}$ )		$I_Z = 5 \text{ mA}$ ( $I_{BR}$ )	4.8	5.1	5.4	V
Dynamic impedance	$Z_Z$		$I_Z = 5 \text{ mA}$ ( $I_{BR}$ )	—	—	70	$\Omega$
Reverse current	$I_R$		$V_{RWM} = 1.5 \text{ V}$	—	—	1.0	$\mu\text{A}$
Clamp voltage	$V_C$	(Note 1)	$I_{PP} = 1 \text{ A}$	—	5.5	—	V
Total capacitance	$C_t$		$V_R = 0 \text{ V}$ , $f = 1 \text{ MHz}$	—	45	—	pF

Note 1: Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.

## 5. Guaranteed ESD Protection (Note)

Test Condition	ESD Protection
IEC61000-4-2 (Contact discharge)	±30 kV

Note: Criterion: No damage to devices.

## 6. Marking

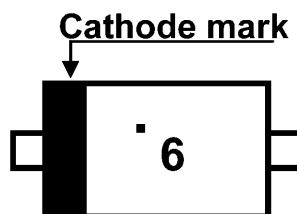


Fig. 6.1 Marking

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

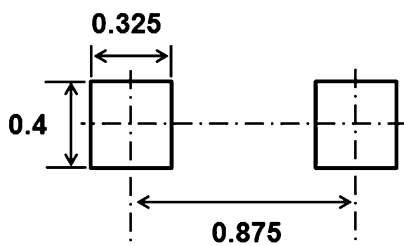


Fig. 7.1 SOD-923 (unit: mm)

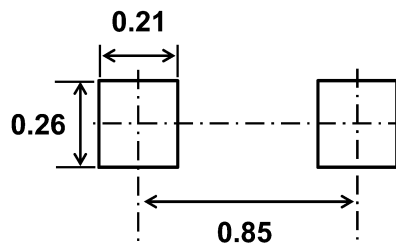


Fig. 7.2 fSC (unit: mm)

## 8. Characteristics Curves (Note)

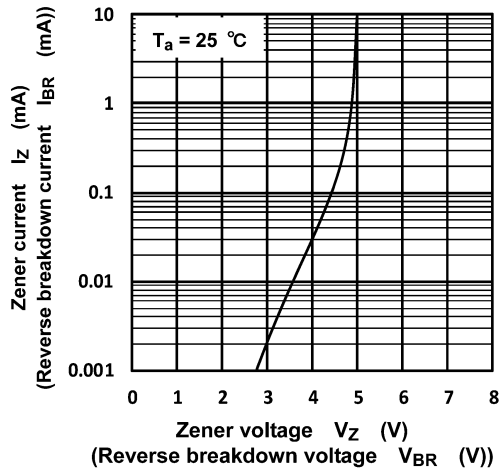


Fig. 8.1  $I_Z - V_Z$  ( $I_{BR} - V_{BR}$ )

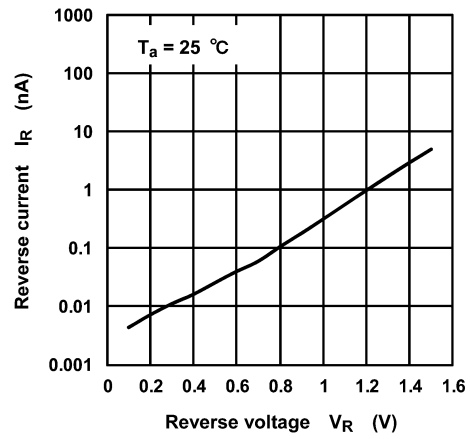


Fig. 8.2  $I_R - V_R$

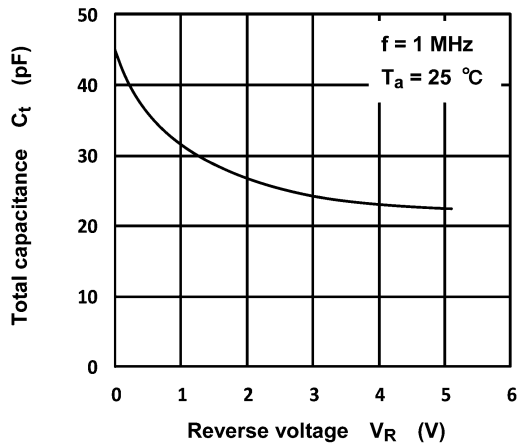


Fig. 8.3  $C_t - V_R$

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

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

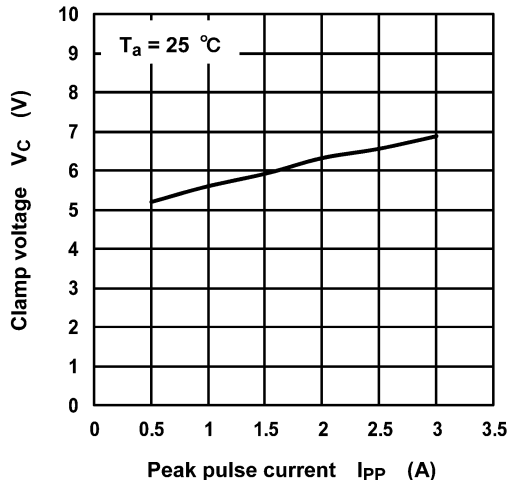


Fig. 9.1  $V_C$  -  $I_{PP}$

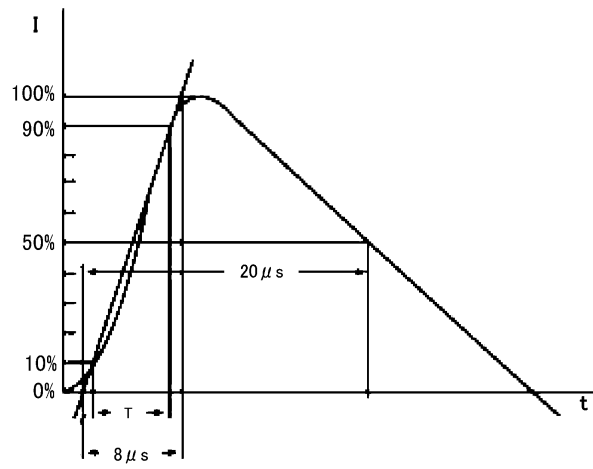


Fig. 9.2 Based on IEC61000-4-5 8/20  $\mu\text{s}$  pulse.

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

## 10. ESD Clamp Waveform (Note)

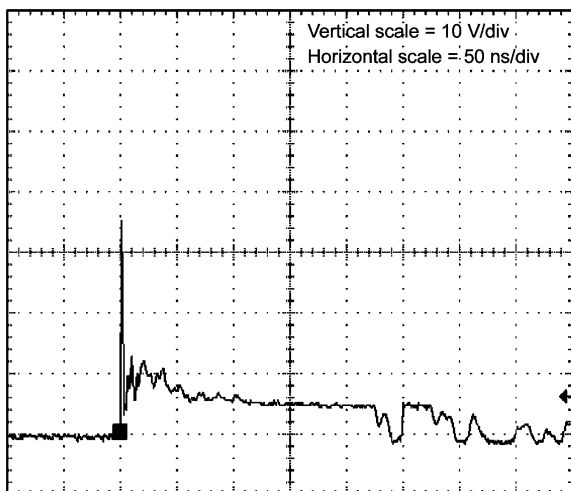


Fig. 10.1 +8 kV

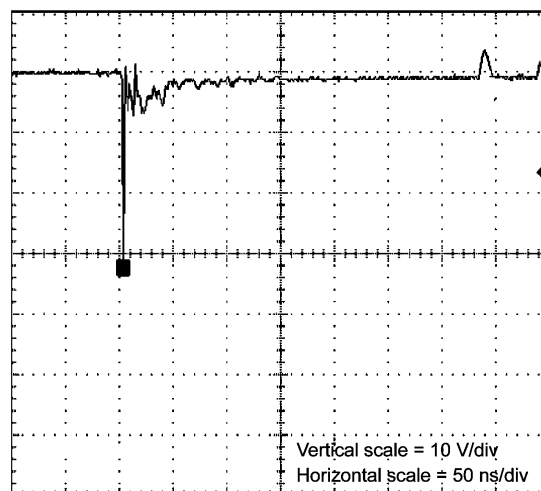


Fig. 10.2 -8 kV

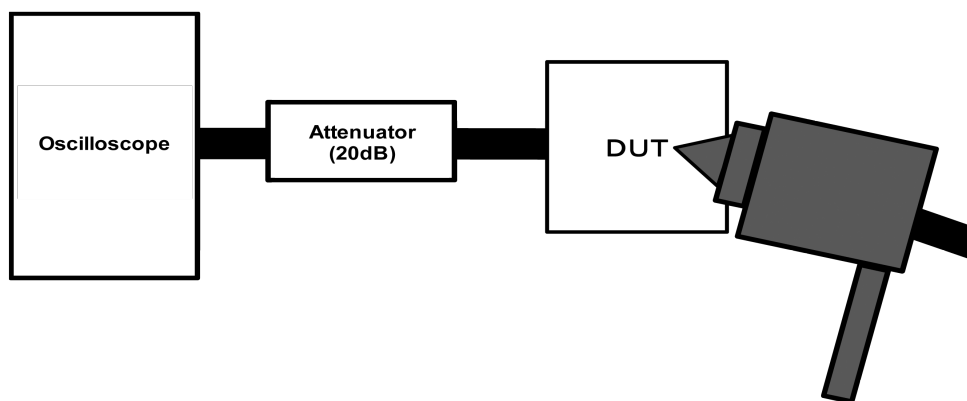
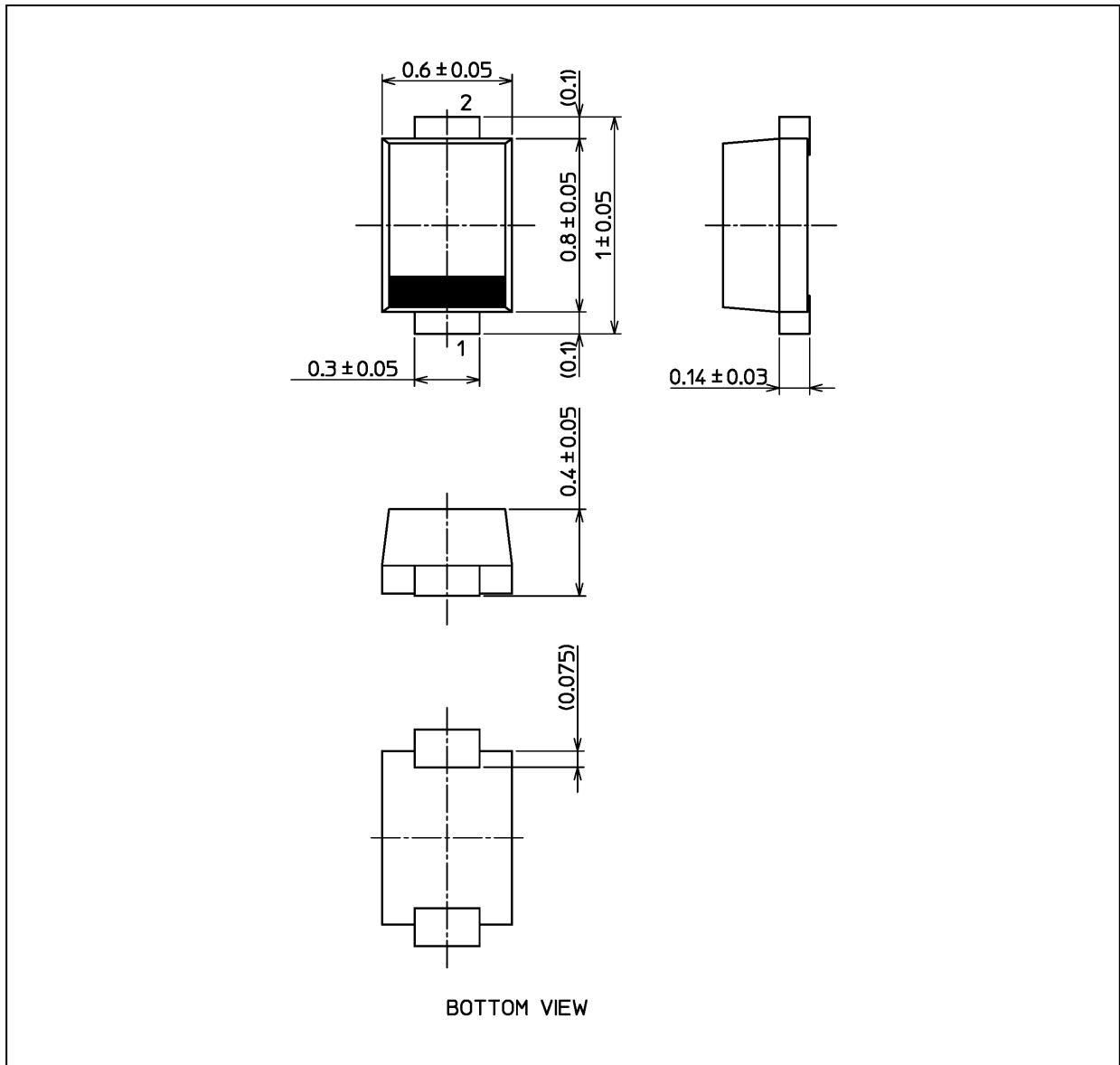


Fig. 10.3 IEC61000-4-2(Contact)

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

## Package Dimensions

Unit: mm



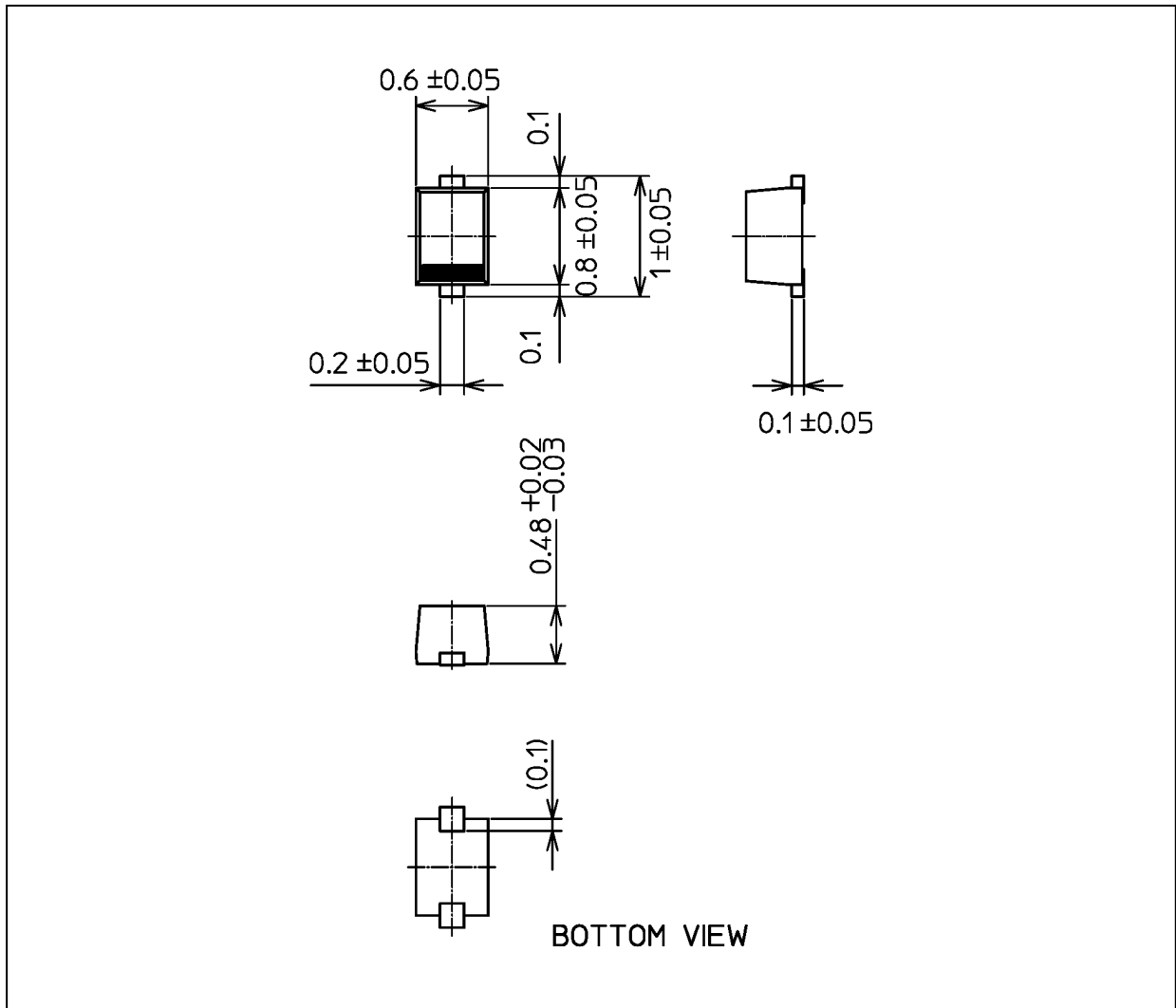
The shapes and dimensions of the package vary, depending on the manufacturing plant. For details, contact the Toshiba sales representative.

Weight: 0.55 mg (typ.)

Package Name(s)
TOSHIBA: 1-1AH1A
Nickname: SOD-923

## 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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