

DF2S23P1CT

1. General

The DF2S23P1CT is a TVS diode (ESD protection diode) protects semiconductor devices used in mobile device interfaces and other applications to protect against static electricity and noise.

The DF2S23P1CT has realized high I_{PP} , in order to protect a semiconductor devices from the indirect lightning stroke and the transition voltage (at the time of power activation).

Furthermore, the DF2S23P1CT is housed in an ultra-compact package (1.0 mm × 0.6 mm) to meet applications that require a small footprint.

2. Applications

Mobile Equipment

- Smartphones
- Tablets
- Notebook PCs

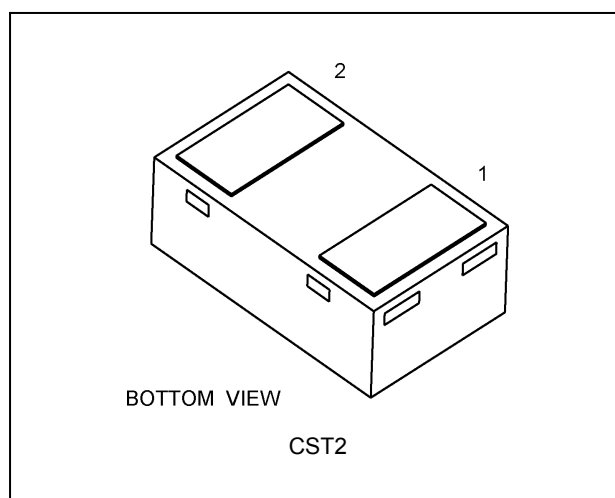
Desktop PCs

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.

3. Features

- (1) Suitable for use with a 20 V signal line. ($V_{RWM} \leq 21$ V)
- (2) Protects devices with its high ESD performance.
($V_{ESD} = \pm 30$ kV (Contact / Air) @IEC61000-4-2)
- (3) Low dynamic resistance protects semiconductor devices from static electricity and noise.
($R_{DYN} = 0.55 \Omega$ (typ.))
- (4) Low clamping voltage characteristic protects semiconductor devices from static electricity and noise.
($V_C = 39$ V@ $I_{PP} = 5.5$ A (typ.))
- (5) Compact package is suitable for use in high density board layouts such as in mobile devices.
(1.0 mm × 0.6 mm size (Nickname: CST2))

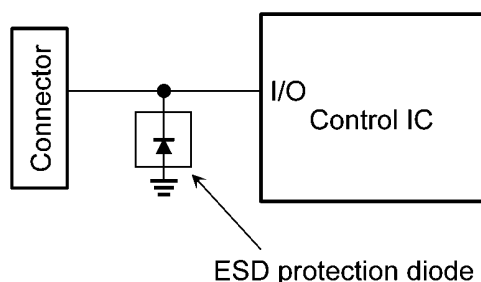
4. Packaging



Start of commercial production

2018-06

5. Example of Circuit Diagram



6. Quick Reference Data

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	V_{RWM}	(Note 1)	—	—	—	21	V
Dynamic resistance	R_{DYN}	(Note 2)	—	—	0.55	—	Ω
Electrostatic discharge voltage (IEC61000-4-2) (Contact)	V_{ESD}	(Note 3)	—	—	—	30	kV

Note 1: Recommended operating condition.

Note 2: TLP parameters: $Z_0 = 50 \Omega$, $t_p = 100$ ns, $t_r = 300$ ps, averaging window: $t_1 = 30$ ns to $t_2 = 60$ ns, extraction of dynamic resistance using least squares fit of TLP characteristics between $I_{PP1} = 16$ A and $I_{PP2} = 30$ A.

Note 3: Criterion: No damage to devices.

7. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25$ °C)

Characteristics	Symbol	Note	Rating	Unit
Electrostatic discharge voltage (IEC61000-4-2) (Contact)	V_{ESD}	(Note 1)	± 30	kV
Electrostatic discharge voltage (IEC61000-4-2) (Air)			± 30	
Peak pulse power ($t_p = 8/20$ μ s)	P_{PK}		250	W
Peak pulse current ($t_p = 8/20$ μ s)	I_{PP}	(Note 2)	5.5	A
Junction temperature	T_j		150	°C
Storage temperature	T_{stg}		-55 to 150	°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.

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

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

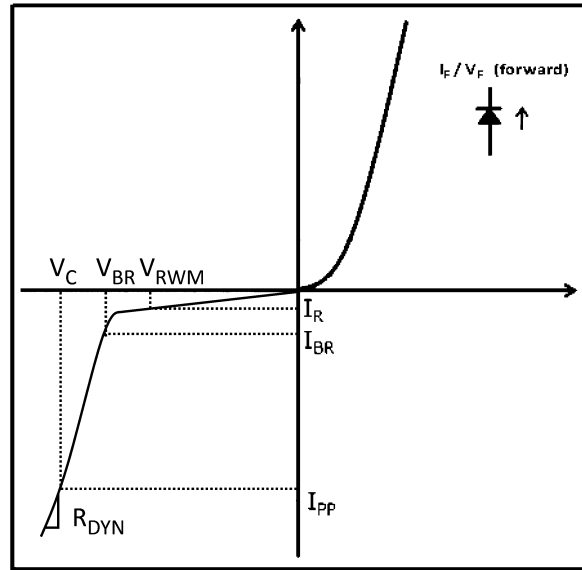


Fig. 8.1 Definitions of Electrical Characteristics

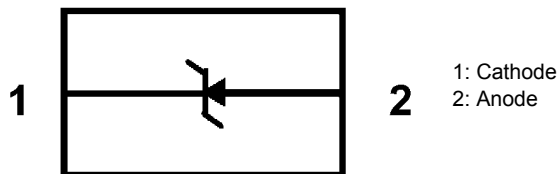
Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Working peak reverse voltage	V_{RWM}	(Note 1)	—	—	—	21	V
Total capacitance	C_t		$V_R = 0\text{ V}$, $f = 1\text{ MHz}$	—	26	—	pF
Dynamic resistance	R_{DYN}	(Note 2)	—	—	0.55	—	Ω
Reverse breakdown voltage	V_{BR}		$I_{BR} = 1\text{ mA}$	21.5	24.1	25.5	V
Reverse current	I_R		$V_{RWM} = 21\text{ V}$	—	—	0.1	μA
Clamp voltage	V_C	(Note 3)	$I_{PP} = 1\text{ A}$	—	27.5	—	V
			$I_{PP} = 5.5\text{ A}$	—	39	45	
		(Note 2)	$I_{TLP} = 16\text{ A}$	—	34	—	V
			$I_{TLP} = 30\text{ A}$	—	42	—	

Note 1: Recommended operating condition.

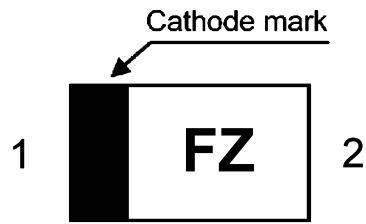
Note 2: TLP parameters: $Z_0 = 50\ \Omega$, $t_p = 100\text{ ns}$, $t_r = 300\text{ ps}$, averaging window: $t_1 = 30\text{ ns}$ to $t_2 = 60\text{ ns}$, extraction of dynamic resistance using least squares fit of TLP characteristics between $I_{PP1} = 16\text{ A}$ and $I_{PP2} = 30\text{ A}$.

Note 3: Based on IEC61000-4-5 8/20 μs pulse.

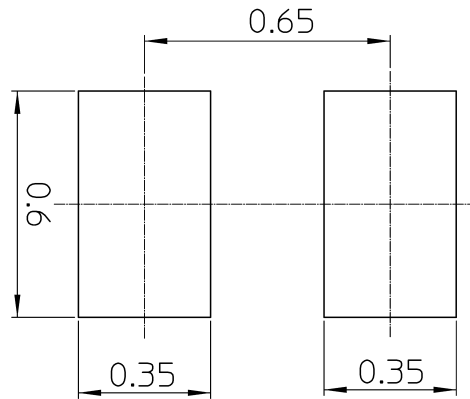
9. Internal Circuit



10. Marking (Top view)



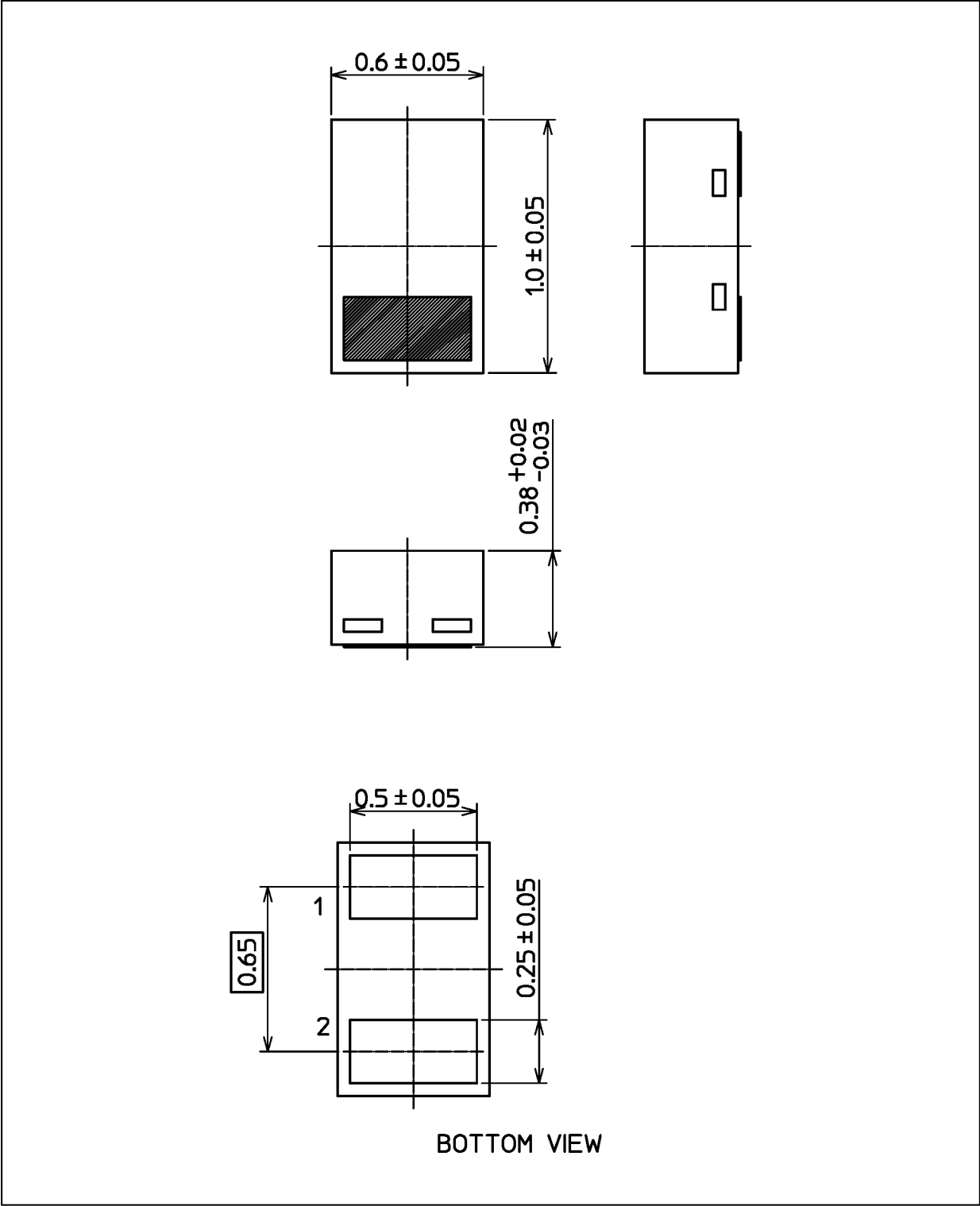
11. Land Pattern Dimensions (for reference only)



Unit: mm

Package Dimensions

Unit: mm



Weight: 0.7 mg (typ.)

Package Name(s)
Nickname: CST2

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