

MOSFETs Silicon P-Channel MOS

# SSM3J65CT

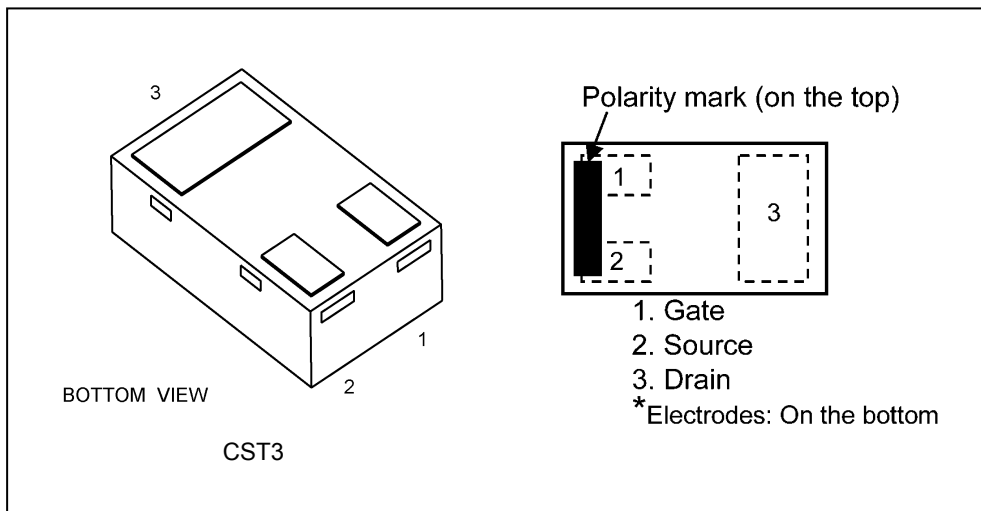
## 1. Applications

- Power Management Switches

## 2. Features

- (1) 1.2 V drive
- (2) Low drain-source on-resistance
  - :  $R_{DS(ON)} = 1110 \text{ m}\Omega$  (typ.) (@ $V_{GS} = -1.2 \text{ V}$ )
  - $R_{DS(ON)} = 780 \text{ m}\Omega$  (typ.) (@ $V_{GS} = -1.5 \text{ V}$ )
  - $R_{DS(ON)} = 650 \text{ m}\Omega$  (typ.) (@ $V_{GS} = -1.8 \text{ V}$ )
  - $R_{DS(ON)} = 510 \text{ m}\Omega$  (typ.) (@ $V_{GS} = -2.5 \text{ V}$ )
  - $R_{DS(ON)} = 400 \text{ m}\Omega$  (typ.) (@ $V_{GS} = -4.5 \text{ V}$ )

## 3. Packaging and Pin Assignment



Start of commercial production

2023-12

### 4. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ °C}$ )

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-20	V
Gate-source voltage	$V_{GSS}$	$\pm 10$	
Drain current (DC) (Note 1)	$I_D$	-700	mA
Drain current (pulsed) (Note 1)	$I_{DP}$	-1400	
Power dissipation (Note 2)	$P_D$	500	mW
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to 150	

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: Ensure that the channel temperature does not exceed 150 °C.

Note 2: Device mounted on a 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 645 mm<sup>2</sup>)

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

Note: The MOSFETs in this device are sensitive to electrostatic discharge. When handling this device, the worktables, operators, soldering irons and other objects should be protected against anti-static discharge.

Note: The channel-to-ambient thermal resistance,  $R_{th(ch-a)}$ , and the drain power dissipation,  $P_D$ , vary according to the board material, board area, board thickness and pad area. When using this device, be sure to take heat dissipation fully into account.

### 5. Electrical Characteristics

#### 5.1. Static Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$	—	—	-1	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1\text{ mA}, V_{GS} = 0\text{ V}$	-20	—	—	V
Drain-source breakdown voltage (Note 1)	$V_{(BR)DSX}$	$I_D = -1\text{ mA}, V_{GS} = 5\text{ V}$	-15	—	—	
Gate threshold voltage (Note 2)	$V_{th}$	$V_{DS} = -3\text{ V}, I_D = -1\text{ mA}$	-0.3	—	-1.0	
Drain-source on-resistance (Note 3)	$R_{DS(ON)}$	$I_D = -10\text{ mA}, V_{GS} = -1.2\text{ V}$	—	1110	11300	$\text{m}\Omega$
		$I_D = -50\text{ mA}, V_{GS} = -1.5\text{ V}$	—	780	1550	
		$I_D = -100\text{ mA}, V_{GS} = -1.8\text{ V}$	—	650	1070	
		$I_D = -300\text{ mA}, V_{GS} = -2.5\text{ V}$	—	510	700	
		$I_D = -500\text{ mA}, V_{GS} = -4.5\text{ V}$	—	400	500	
Forward transfer admittance (Note 3)	$ Y_{fs} $	$V_{DS} = -3\text{ V}, I_D = -700\text{ mA}$	—	2.2	—	S

Note 1: If a reverse bias is applied between gate and source, this device enters  $V_{(BR)DSX}$  mode. Note that the drain-source breakdown voltage is lowered in this mode.

Note 2: Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current ( $I_D$ ) to below (-1 mA for this device). Then, for normal switching operation,  $V_{GS(ON)}$  must be higher than  $V_{th}$ , and  $V_{GS(OFF)}$  must be lower than  $V_{th}$ . This relationship can be expressed as:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ .

Take this into consideration when using the device.

Note 3: Pulse measurement.

#### 5.2. Dynamic Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	48	—	$\text{pF}$
Reverse transfer capacitance	$C_{rss}$		—	4.6	—	
Output capacitance	$C_{oss}$		—	8.9	—	
Switching time (turn-on time)	$t_{on}$	$V_{DD} = -10\text{ V}, I_D = -100\text{ mA},$ $V_{GS} = 0\text{ to }-4.5\text{ V}, R_{GS} = 50\ \Omega$ Duty $\leq 1\%$ , $V_{IN}$ : $t_r, t_f < 5\text{ ns}$ , Common source, See Chapter 5.3.	—	130	—	ns
Switching time (turn-off time)	$t_{off}$		—	1075	—	

#### 5.3. Switching Time Test Circuit

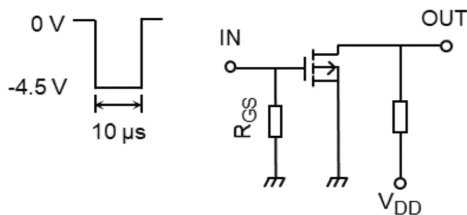


Fig. 5.3.1 Switching Time Test Circuit

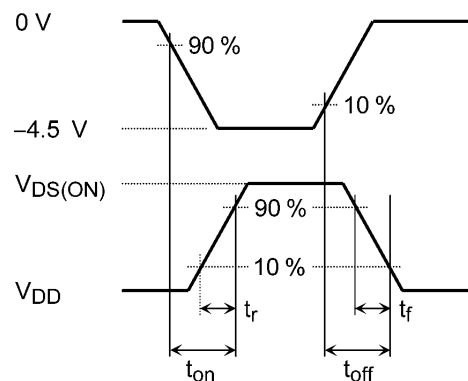


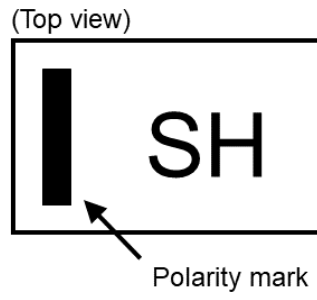
Fig. 5.3.2 Input Waveform/Output Waveform

#### 5.4. Source-Drain Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

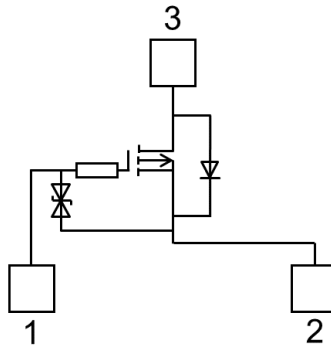
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage (Note 1)	$V_{DSF}$	$I_D = 700\text{ mA}, V_{GS} = 0\text{ V}$	—	0.94	1.2	V

Note 1: Pulse measurement.

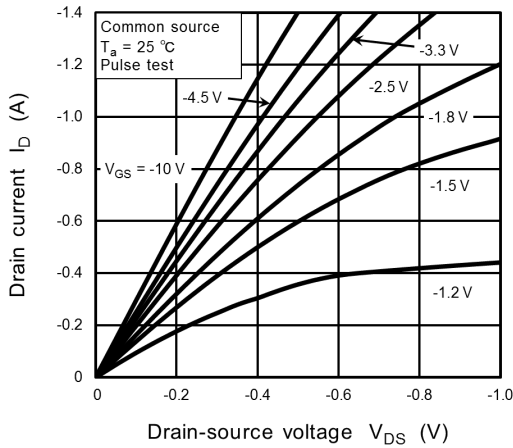
## 6. Marking



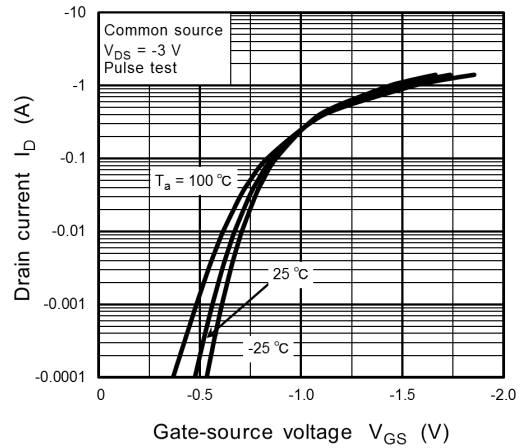
## 7. Equivalent Circuit



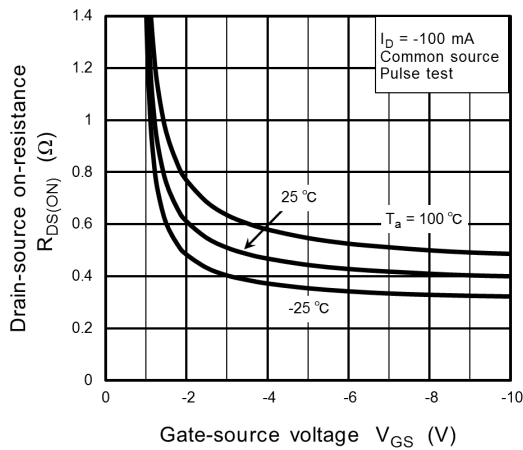
## 8. Characteristics Curves (Note)



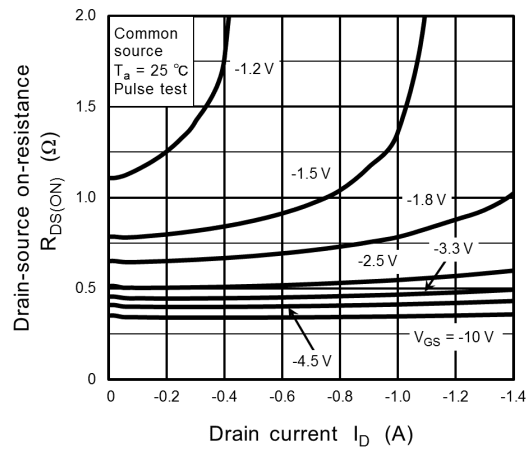
**Fig. 8.1**  $I_D - V_{DS}$



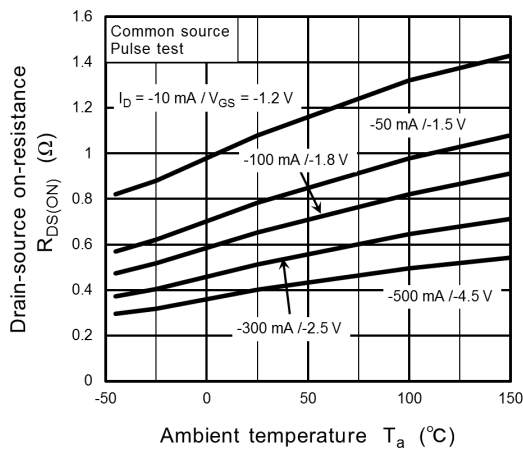
**Fig. 8.2**  $I_D - V_{GS}$



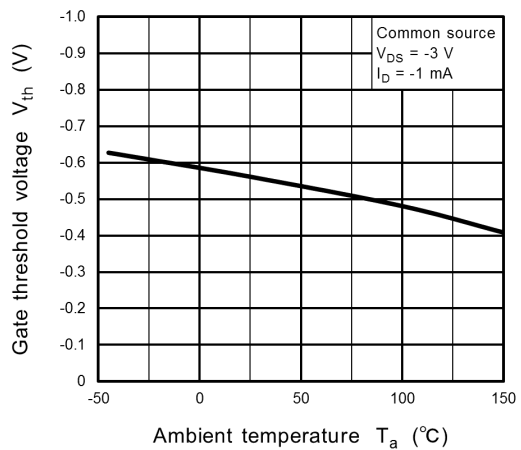
**Fig. 8.3**  $R_{DS(ON)} - V_{GS}$



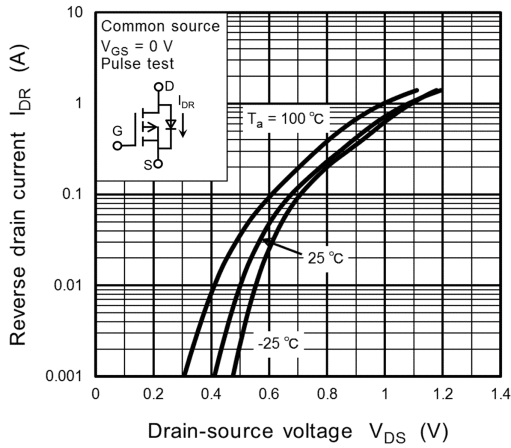
**Fig. 8.4**  $R_{DS(ON)} - I_D$



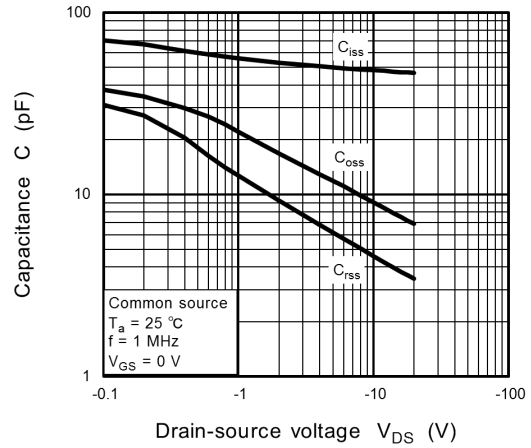
**Fig. 8.5**  $R_{DS(ON)} - T_a$



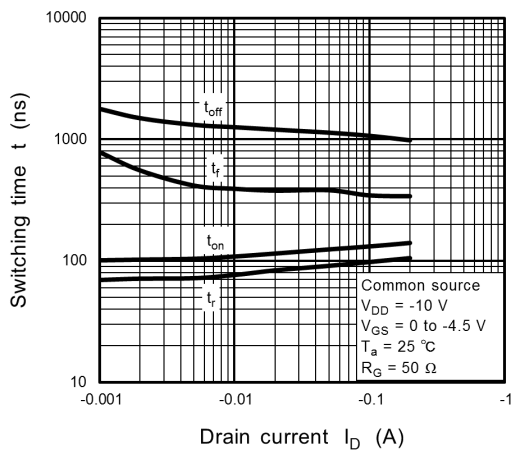
**Fig. 8.6**  $V_{th} - T_a$



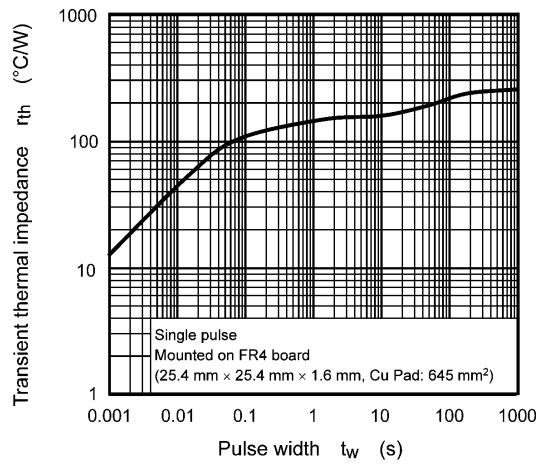
**Fig. 8.7  $I_{DR} - V_{DS}$**



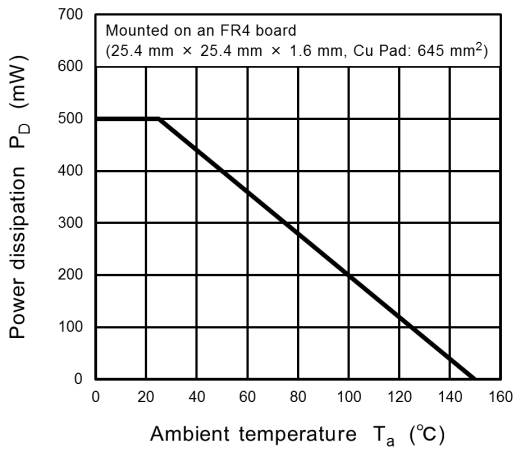
**Fig. 8.8  $C - V_{DS}$**



**Fig. 8.9  $t - I_D$**



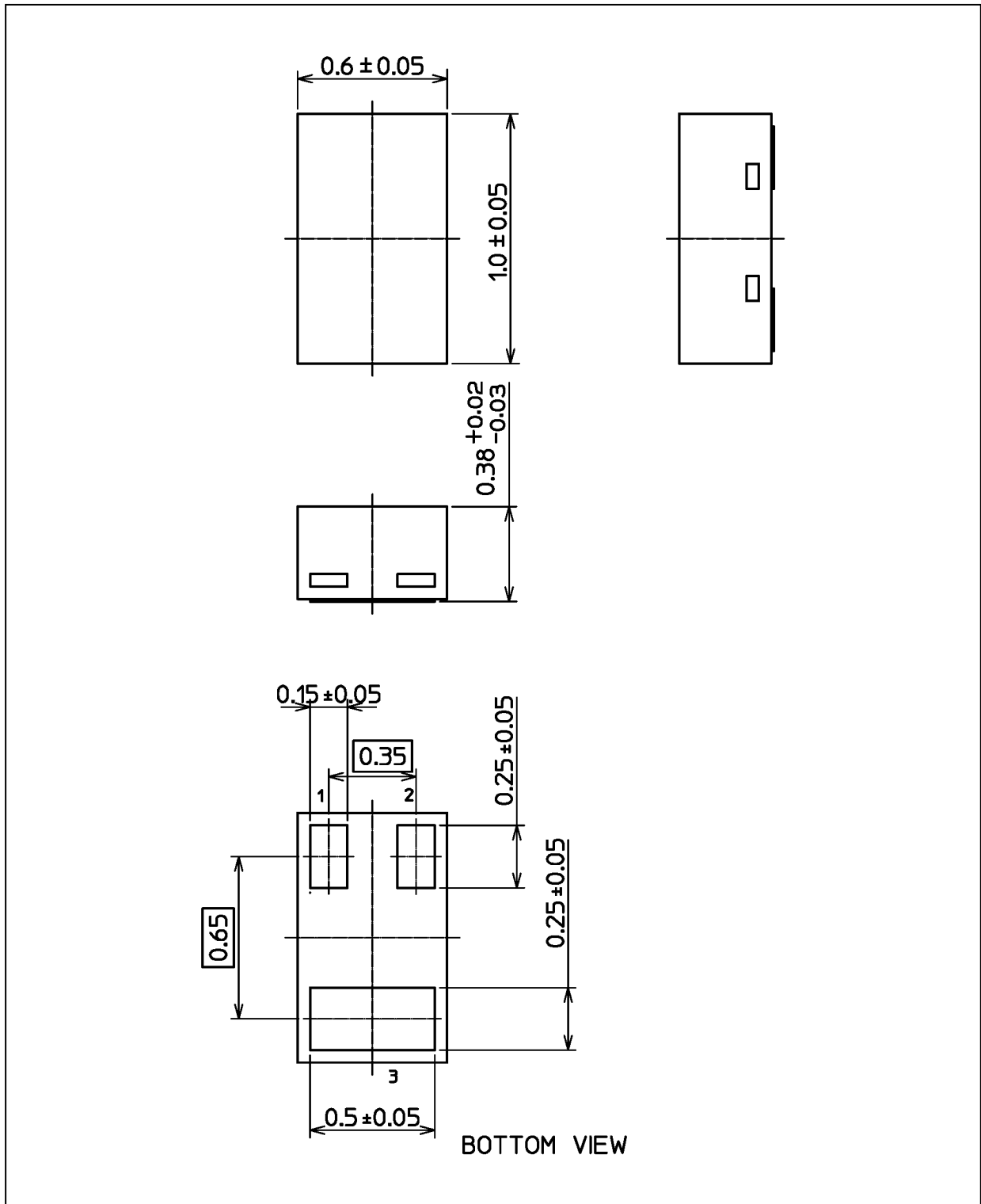
**Fig. 8.10  $r_{th} - t_w$**



**Fig. 8.11  $P_D - T_a$**

## Package Dimensions

Unit: mm



Weight: 0.75 mg (typ.)

Package Name(s)
Nickname: CST3

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