

SSM3K59CTB

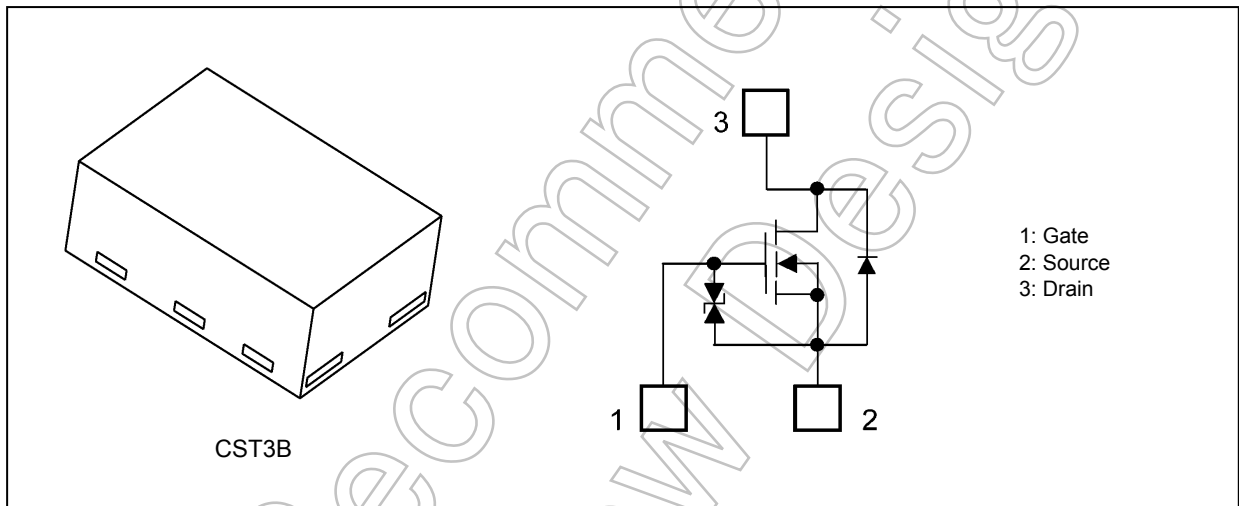
1. Applications

- DC-DC Converters

2. Features

- (1) 1.8-V gate drive voltage.
- (2) Low drain-source on-resistance
 - : $R_{DS(ON)} = 250 \text{ m}\Omega$ (typ.) (@ $V_{GS} = 1.8 \text{ V}$, $I_D = 0.2 \text{ A}$)
 - $R_{DS(ON)} = 210 \text{ m}\Omega$ (typ.) (@ $V_{GS} = 2.5 \text{ V}$, $I_D = 0.5 \text{ A}$)
 - $R_{DS(ON)} = 185 \text{ m}\Omega$ (typ.) (@ $V_{GS} = 4.5 \text{ V}$, $I_D = 1.0 \text{ A}$)
 - $R_{DS(ON)} = 175 \text{ m}\Omega$ (typ.) (@ $V_{GS} = 8.0 \text{ V}$, $I_D = 1.0 \text{ A}$)

3. Packaging and Pin Assignment



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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	40	V
Gate-source voltage	V_{GSS}	± 12	
Drain current (DC)	I_D (Note 1)	2.0	A
Drain current (pulsed)	I_{DP} (Note 1)	4.0	
Power dissipation	P_D (Note 2)	1000	mW
Channel temperature	T_{ch}	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: Ensure that the channel temperature does not exceed $150 \text{ }^\circ\text{C}$.

Note 2: Device mounted on an FR4 board. (25.4 mm \times 25.4 mm \times 1.6 mm, Cu pad: 645 mm²)

Start of commercial production

2015-01

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.

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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}	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	—	—	1	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}$	40	—	—	V
Drain-source breakdown voltage (Note 1)	$V_{(BR)DSX}$	$I_D = 1\text{ mA}, V_{GS} = -12\text{ V}$	25	—	—	V
Gate threshold voltage (Note 2)	V_{th}	$V_{DS} = 3\text{ V}, I_D = 1\text{ mA}$	0.5	—	1.2	V
Drain-source on-resistance (Note 3)	$R_{DS(ON)}$	$I_D = 1.0\text{ A}, V_{GS} = 8.0\text{ V}$	—	175	215	m Ω
		$I_D = 1.0\text{ A}, V_{GS} = 4.5\text{ V}$	—	185	228	
		$I_D = 1.0\text{ A}, V_{GS} = 4.2\text{ V}$	—	186	231	
		$I_D = 1.0\text{ A}, V_{GS} = 3.6\text{ V}$	—	190	238	
		$I_D = 0.5\text{ A}, V_{GS} = 2.5\text{ V}$	—	210	268	
		$I_D = 0.2\text{ A}, V_{GS} = 1.8\text{ V}$	—	250	420	
Forward transfer admittance (Note 3)	$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 200\text{ mA}$	—	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}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	130	—	μF
Reverse transfer capacitance	C_{rss}		—	7.5	—	
Output capacitance	C_{oss}		—	26	—	
Switching time (turn-on time)	t_{on}	$V_{DD} = 10\text{ V}, I_D = 0.5\text{ A},$ $V_{GS} = 0\text{ to }2.5\text{ V}, R_G = 4.7\text{ }\Omega$	—	13	—	ns
Switching time (turn-off time)	t_{off}		—	8	—	

5.3. Switching Time Test Circuit

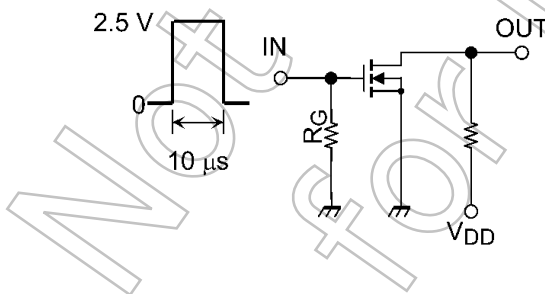


Fig. 5.3.1 Switching Time Test Circuit

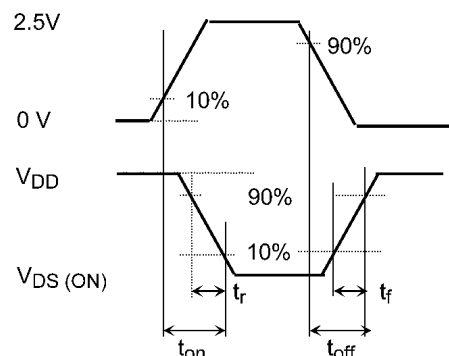


Fig. 5.3.2 Input Waveform/Output Waveform

5.4. Gate Charge Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} = 10\text{ V}$, $I_D = 1.8\text{ A}$, $V_{GS} = 4.2\text{ V}$	—	1.1	—	nC
Gate-source charge 1	Q_{gs1}		—	0.18	—	
Gate-drain charge	Q_{gd}		—	0.5	—	

5.5. 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}	$I_D = -2.0\text{ A}$, $V_{GS} = 0\text{ V}$	—	-0.85	-1.2	V

Note 1: Pulse measurement.

6. Marking

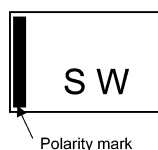


Fig. 6.1 Marking

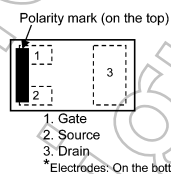


Fig. 6.2 Pin Condition (top view)

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7. Characteristics Curves (Note)

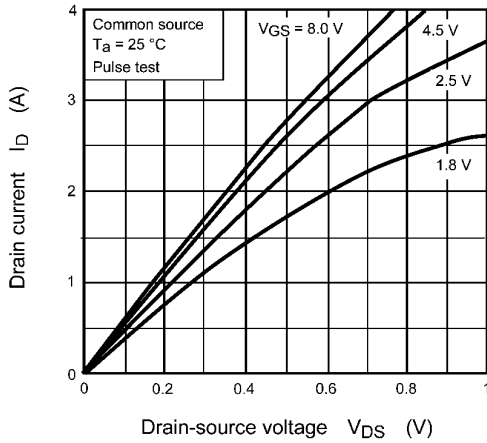


Fig. 7.1 $I_D - V_{DS}$

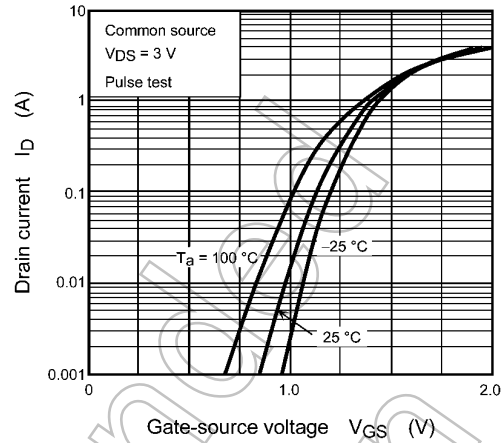


Fig. 7.2 $I_D - V_{GS}$

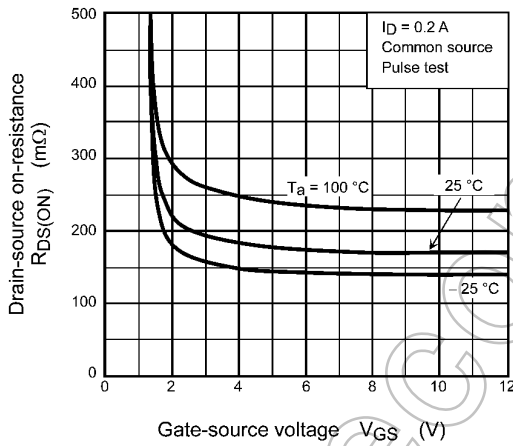


Fig. 7.3 $R_{DS(ON)} - V_{GS}$

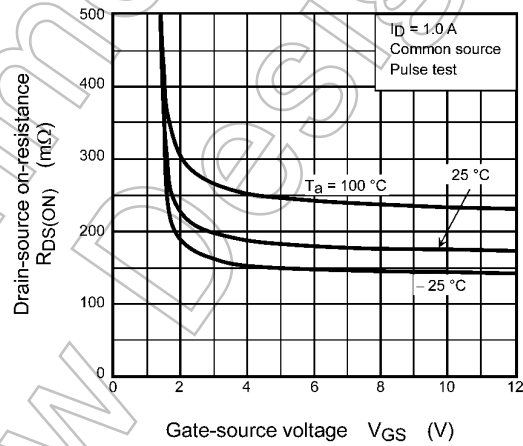


Fig. 7.4 $R_{DS(ON)} - V_{GS}$

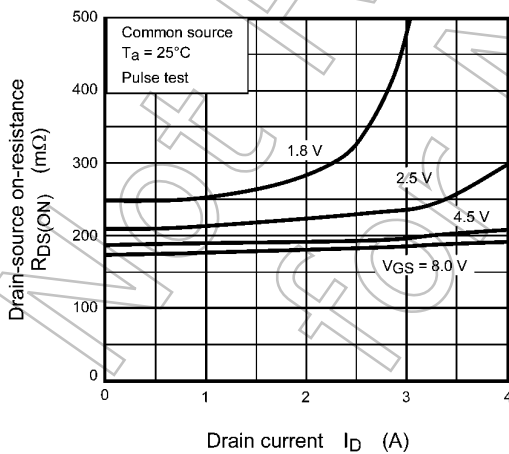


Fig. 7.5 $R_{DS(ON)} - I_D$

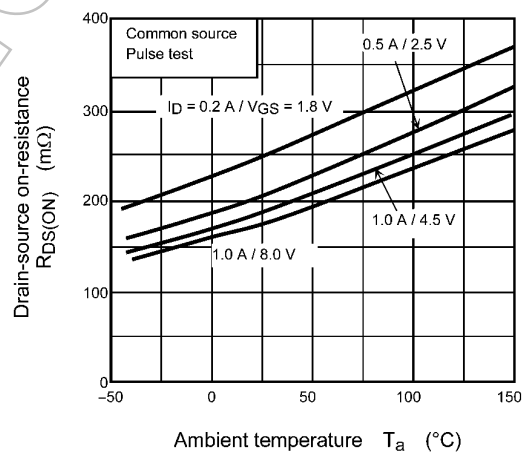


Fig. 7.6 $R_{DS(ON)} - T_a$

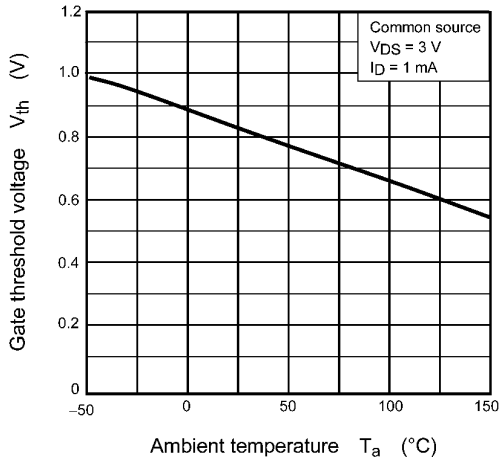


Fig. 7.7 $V_{th} - T_a$

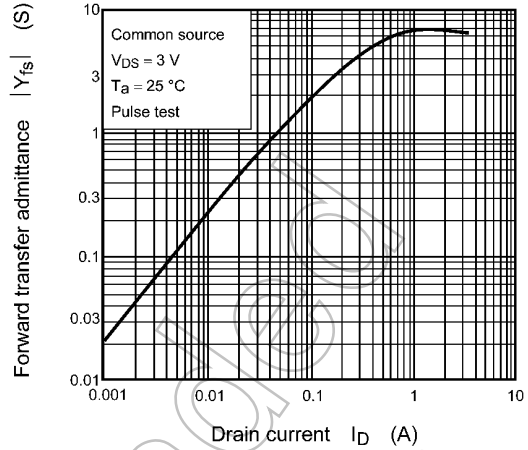


Fig. 7.8 $|Y_{fs}| - I_D$

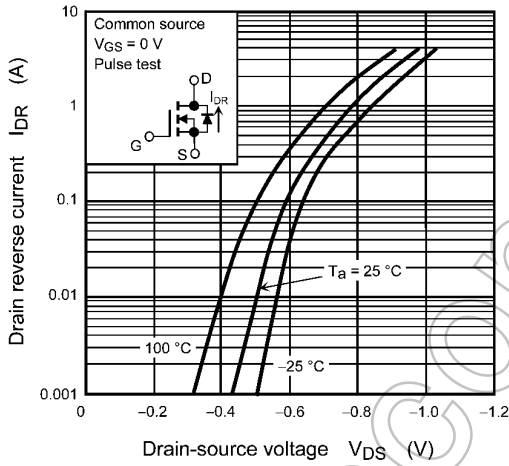


Fig. 7.9 $I_{DR} - V_{DS}$

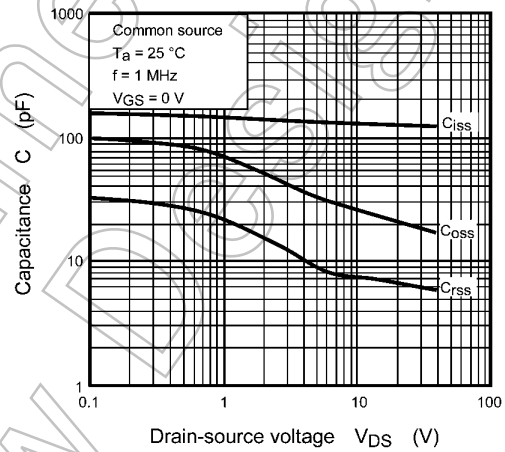


Fig. 7.10 $C - V_{DS}$

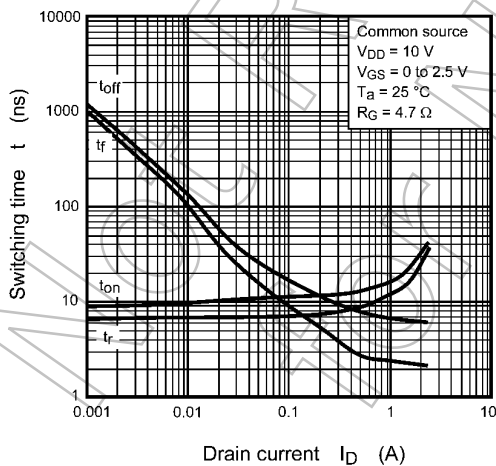


Fig. 7.11 $t - I_D$

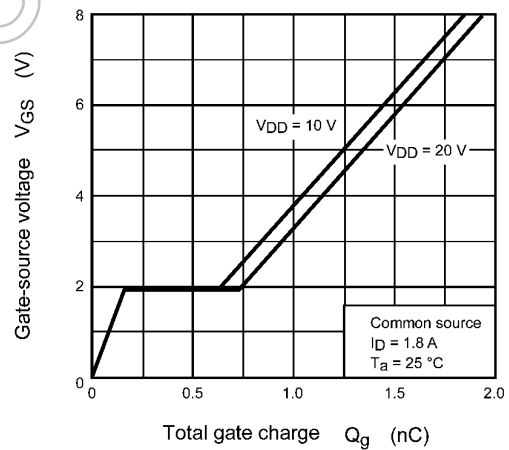


Fig. 7.12 Dynamic Input Characteristics

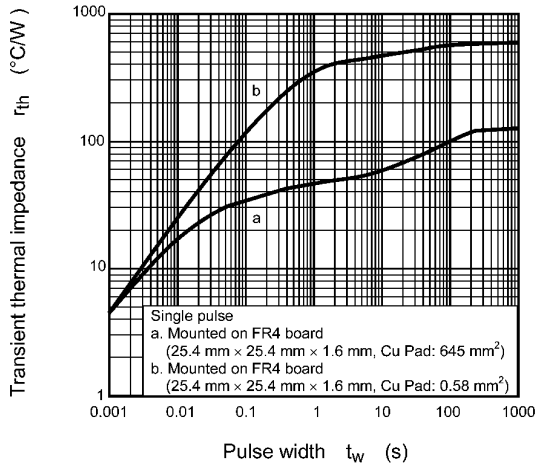


Fig. 7.13 $r_{th} - t_w$

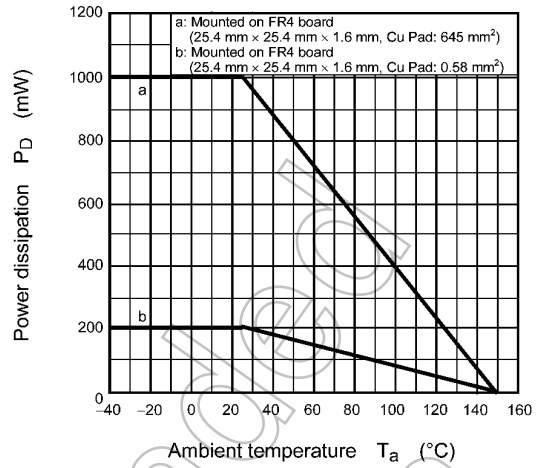


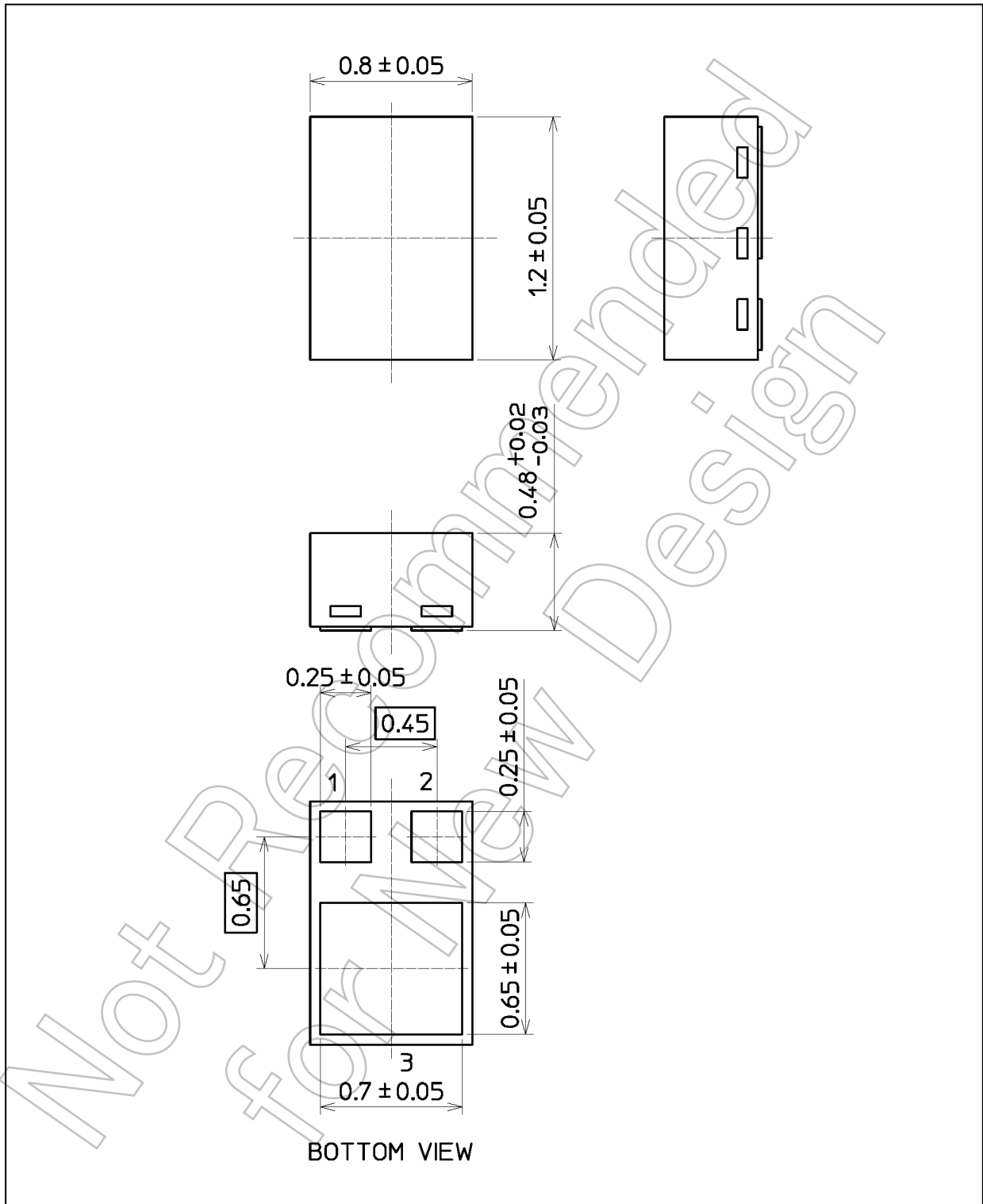
Fig. 7.14 $P_D - T_a$

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

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Package Dimensions

Unit: mm



Weight: 0.75 mg (typ.)

Package Name(s)
Nickname: CST3B

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