MOSFETs Silicon N-Channel MOS (U-MOSⅢ)

# SSM3K15ACTC

## 1. Applications

- Load Switches

## 2. Features

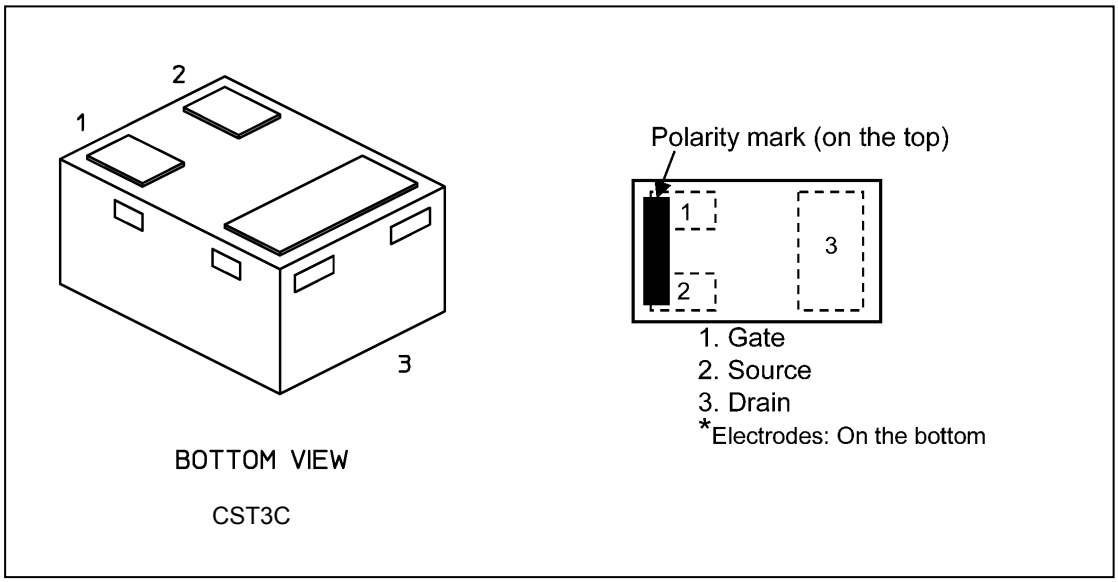
(1) 2.5 V drive

(2) Low drain-source on-resistance

: $R_{DS(ON)}$ = 3.6 Ω (max) (@$V_{GS}$ = 4 V)

$R_{DS(ON)}$ = 6.0 Ω (max) (@$V_{GS}$ = 2.5 V)

## 3. Packaging and Pin Assignment




Start of commercial production
2016-05

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

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DSS}$ | 30 | V |
| Gate-source voltage | | $V_{GSS}$ | ±20 | V |
| Drain current (DC) | (Note 1) | $I_D$ | 100 | mA |
| Drain current (pulsed) | (Note 1) | $I_{DP}$ | 400 | |
| Power dissipation | (Note 2) | $P_D$ | 500 | mW |
| Channel temperature | | $T_{ch}$ | 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: 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 $mm^2$)

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.

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# 5. Electrical Characteristics

## 5.1. Static Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Gate leakage current | | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±16 V | — | — | ±1 | μA |
| Drain cut-off current | | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | — | — | 1 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D$ = 0.1 mA, $V_{GS}$ = 0 V | 30 | — | — | V |
| Drain-source breakdown voltage | (Note 1) | $V_{(BR)DSX}$ | $I_D$ = 0.1 mA, $V_{GS}$ = -10 V | 16 | — | — | V |
| Gate threshold voltage | (Note 2) | $V_{th}$ | $V_{DS}$ = 3 V, $I_D$ = 0.1 mA | 0.8 | — | 1.5 | V |
| Drain-source on-resistance | (Note 3) | $R_{DS(ON)}$ | $I_D$ = 10 mA, $V_{GS}$ = 2.5 V | — | 3.5 | 6.0 | Ω |
| | | | $I_D$ = 10 mA, $V_{GS}$ = 4 V | — | 2.3 | 3.6 | |
| Forward transfer admittance | (Note 3) | $\|Y_{fs}\|$ | $V_{DS}$ = 3 V, $I_D$ = 10 mA | 35 | — | — | mS |

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 °C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 3 V, $V_{GS}$ = 0 V, f = 1 MHz | — | 13.5 | — | pF |
| Reverse transfer capacitance | $C_{rss}$ | | — | 6.5 | — | |
| Output capacitance | $C_{oss}$ | | — | 8.0 | — | |
| Switching time (turn-on time) | $t_{on}$ | $V_{DD}$ = 5 V, $I_D$ = 10 mA, $V_{GS}$ = 0 to 5 V, $R_G$ = 50 Ω Duty ≤ 1 %, $V_{IN}$: $t_r$, $t_f$ < 5 ns, Common source, See Chapter 5.3. | — | 5.5 | — | ns |
| Switching time (turn-off time) | $t_{off}$ | | — | 35 | — | |

## 5.3. Switching Time Test Circuit

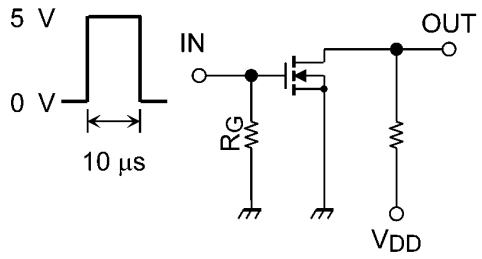



Fig. 5.3.1 Switching Time Test Circuit

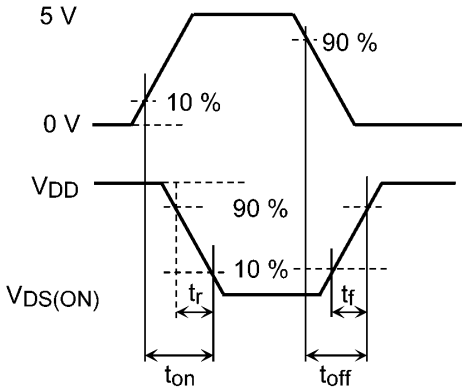



Fig. 5.3.2 Input Waveform/Output Waveform

## 5.4. Source-Drain Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Diode forward voltage | (Note 1) | $V_{DSF}$ | $I_D$ = -100 mA, $V_{GS}$ = 0 V | — | -0.85 | -1.2 | V |

Note 1: Pulse measurement.

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## 6. Marking

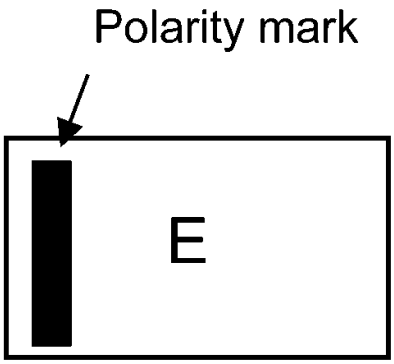
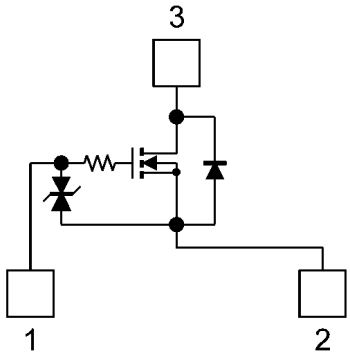



Fig. 6.1 Marking

## 7. Equivalent Circuit




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## 8. Characteristics Curves (Note)

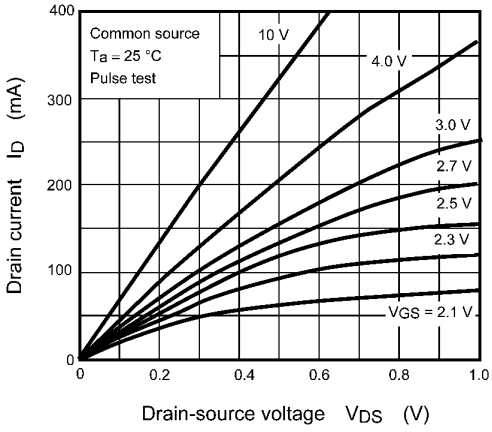



Fig. 8.1 $I_D$ - $V_{DS}$

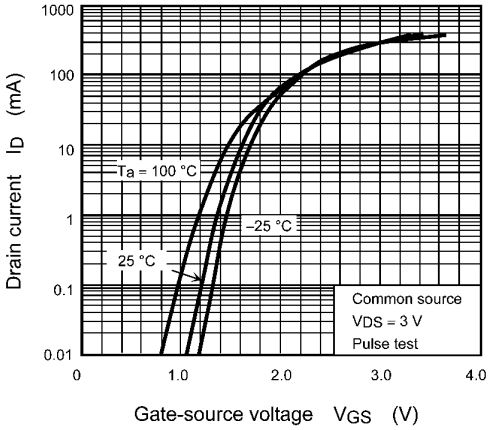



Fig. 8.2 $I_D$ - $V_{GS}$

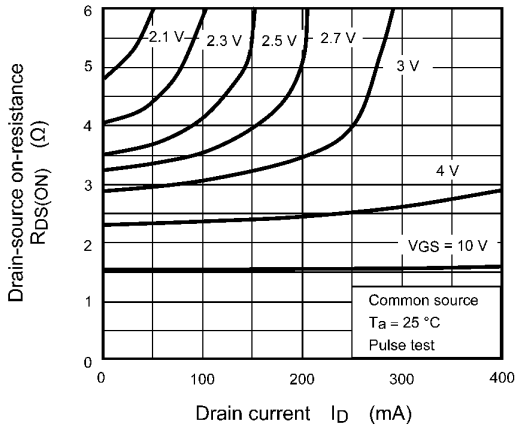



Fig. 8.3 $R_{DS(ON)}$ - $V_{GS}$

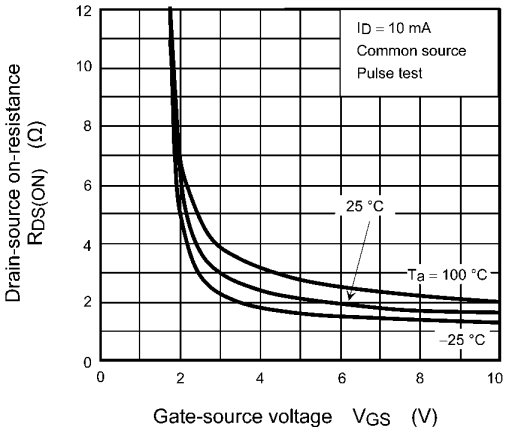



Fig. 8.4 $R_{DS(ON)}$ - $I_D$

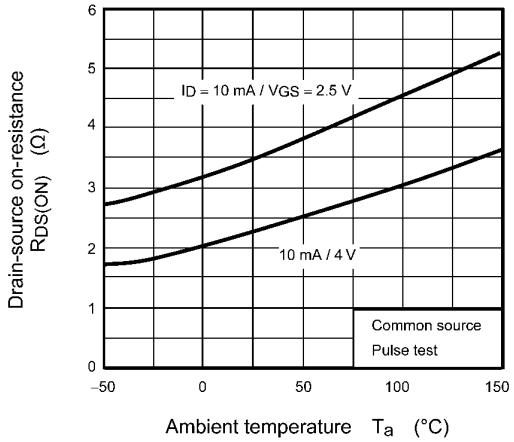



Fig. 8.5 $R_{DS(ON)}$ - $T_a$

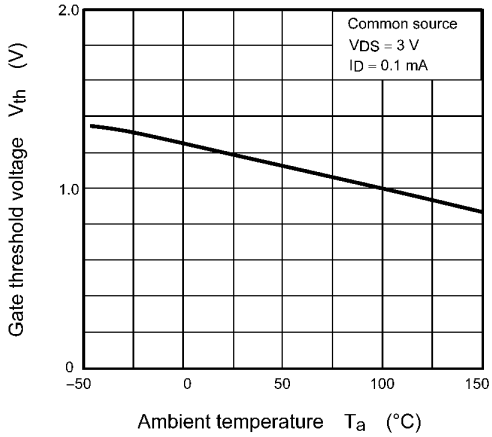



Fig. 8.6 $V_{th}$ - $T_a$

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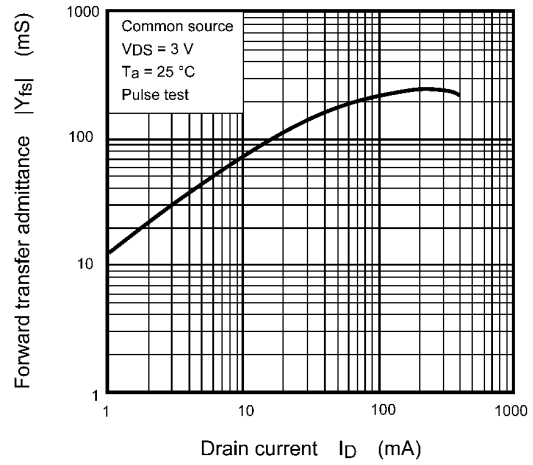



**Fig. 8.7 $|Y_{fs}|$ - $I_D$**

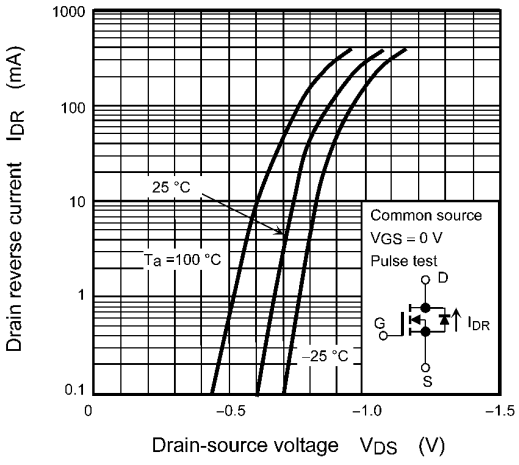



**Fig. 8.8 $I_{DR}$ - $V_{DS}$**

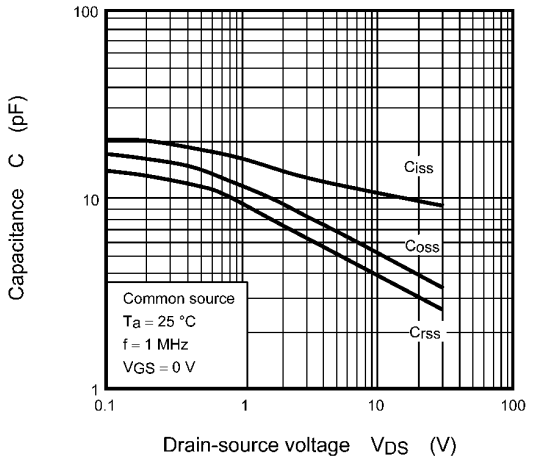



**Fig. 8.9 C - $V_{DS}$**

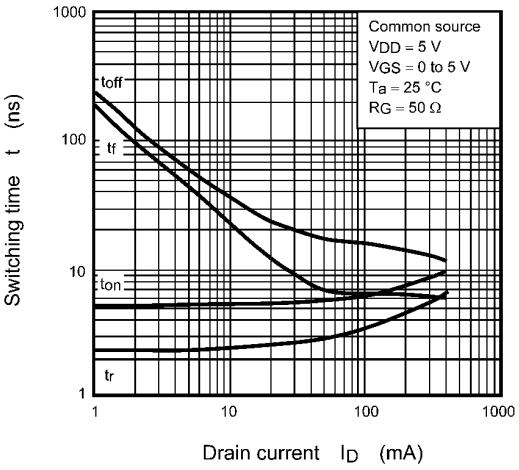



**Fig. 8.10 t - $I_D$**

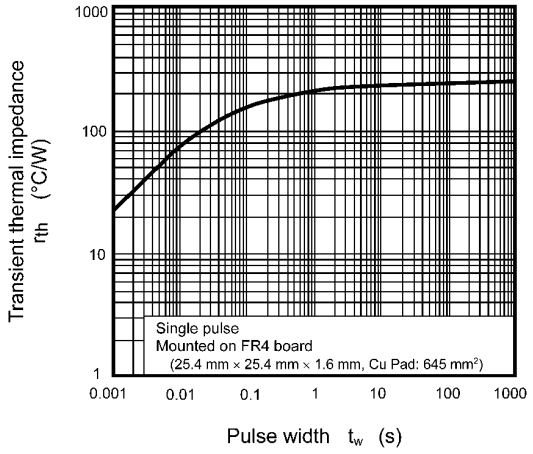



**Fig. 8.11 $r_{th}$ - $t_w$**

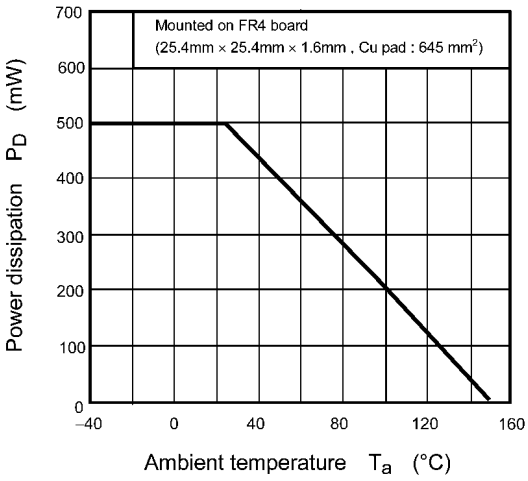


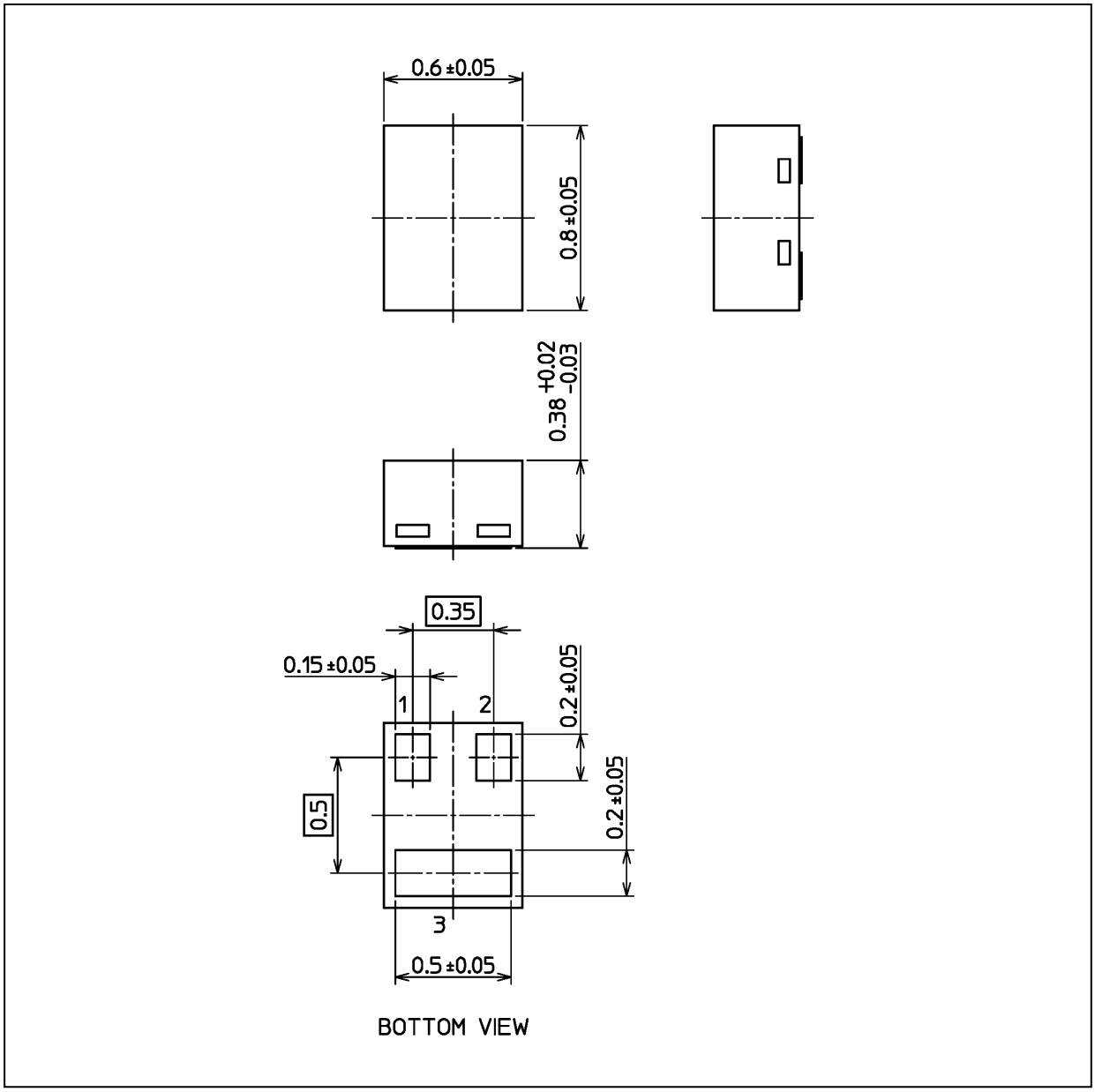

**Fig. 8.12 $P_D$ - $T_a$**

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: 0.55 mg (typ.)

| Package Name(s) |
| --- |
| Nickname: CST3C |

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