

# SSM6J771G

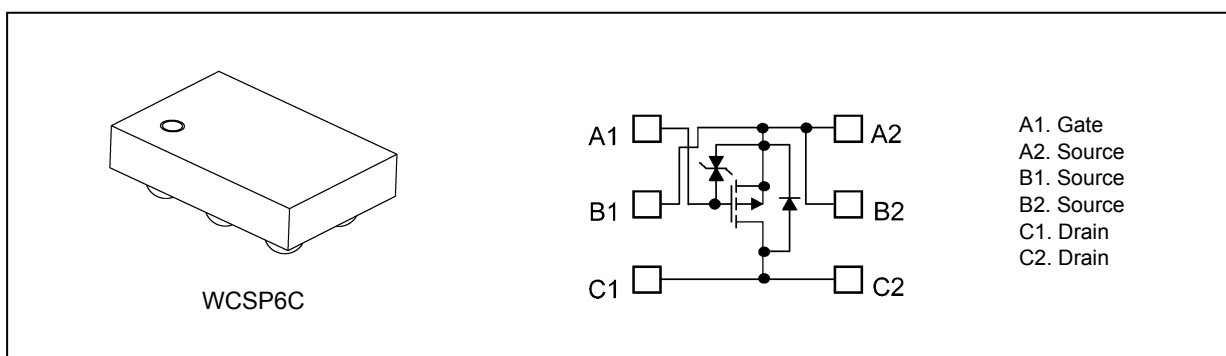
## 1. Applications

- BATFETs
- Power Management Switches

## 2. Features

- (1) High  $V_{GSS}$  voltage :  $\pm 12V$
- (2) High  $V_{DSS}$  voltage :  $-20V$
- (3) Low drain-source on-resistance  
 $R_{DS(ON)} = 26\text{ m}\Omega$  (typ.) (@ $V_{GS} = -4.5\text{ V}$ ,  $I_D = -3.0A$ )  
 $R_{DS(ON)} = 24\text{ m}\Omega$  (typ.) (@ $V_{GS} = -8.0\text{ V}$ ,  $I_D = -3.0A$ )  
 $R_{DS(ON)} = 23\text{ m}\Omega$  (typ.) (@ $V_{GS} = -8.5\text{ V}$ ,  $I_D = -3.0A$ )

## 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	$V_{DSS}$	-20	V
Gate-source voltage	$V_{GSS}$	$\pm 12$	
Drain current (DC) (Note 1)	$I_D$	-5.0	A
Drain current (pulsed) (Note 1), (Note 2)	$I_{DP}$	-10.0	
Power dissipation (Note 3)	$P_D$	1.6	W
Power dissipation ( $t \leq 10\text{ s}$ ) (Note 3)	$P_D$	2.9	
Power dissipation ( $t \leq 0.1\text{ s}$ ) (Note 3)	$P_D$	5.0	
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
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  $150\text{ }^\circ\text{C}$ .

Note 2: Pulse width (PW)  $\leq 10\text{ ms}$ , duty  $\leq 1\%$

Note 3: Device mounted on an FR-4 board.

(40.0mm  $\times$  40.0 mm  $\times$  1.6 mm ,Cu Pad: 1369 mm<sup>2</sup> 4 layer)

Start of commercial production

2013-07

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, $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
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)	$V_{(BR)DSX}$	$I_D = -1\text{ mA}, V_{GS} = 8\text{ V}$	-12	—	—	
Gate threshold voltage (Note 2)	$V_{th}$	$V_{DS} = -3\text{ V}, I_D = -1\text{ mA}$	-0.5	—	-1.2	
Drain-source on-resistance (Note 3)	$R_{DS(ON)}$	$I_D = -3.0\text{ A}, V_{GS} = -8.5\text{ V}$	—	23	31	$\text{m}\Omega$
		$I_D = -3.0\text{ A}, V_{GS} = -8.0\text{ V}$	—	24	34.7	
		$I_D = -3.0\text{ A}, V_{GS} = -4.5\text{ V}$	—	26	35	
		$I_D = -2.5\text{ A}, V_{GS} = -2.5\text{ V}$	—	37	47.5	$\text{m}\Omega$
Forward transfer admittance (Note 3)	$ Y_{fs} $	$V_{DS} = -3\text{ V}, I_D = -3.0\text{ A}$	—	19.0	—	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, $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	870	—	$\text{pF}$
Reverse transfer capacitance	$C_{rss}$		—	120	—	
Output capacitance	$C_{oss}$		—	150	—	
Switching time (turn-on time)	$t_{on}$	$V_{DD} = -10\text{ V}, I_D = -1\text{ A}$ $V_{GS} = 0\text{ to }-8.0\text{ V}, R_G = 20\ \Omega$ See Chapter 5.3.	—	28	—	$\text{ns}$
Switching time (turn-off time)	$t_{off}$	$V_{DD} = -10\text{ V}, I_D = -1\text{ A}$ $V_{GS} = 0\text{ to }-8.0\text{ V}, R_G = 20\ \Omega$ See Chapter 5.3.	—	90	—	

### 5.3. Switching Time Test Circuit

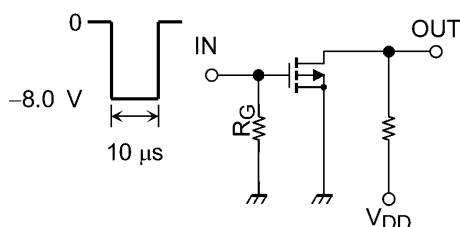


Fig. 5.3.1 Switching Time Test Circuit

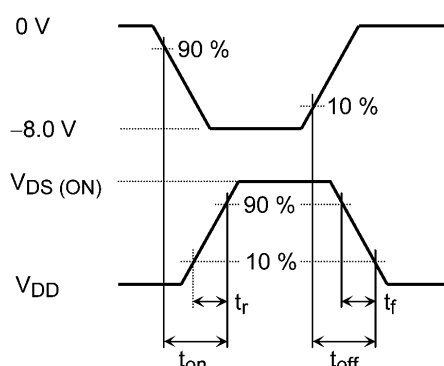


Fig. 5.3.2 Input Waveform/Output Waveform

#### 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)	$Q_g$	$V_{DD} = -10\text{ V}$ , $V_{GS} = -4.5\text{ V}$ , $I_D = -5.0\text{ A}$	—	9.8	—	nC
Gate-source charge 1	$Q_{gs1}$		—	1.5	—	
Gate-drain charge	$Q_{gd}$		—	2.7	—	

#### 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)	$V_{DSF}$	$I_D = 5.0\text{ A}$ , $V_{GS} = 0\text{ V}$	—	0.8	1.3	V

Note 1: Pulse measurement.

### 6. Marking

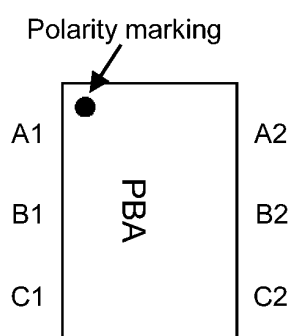


Fig. 6.1 Marking

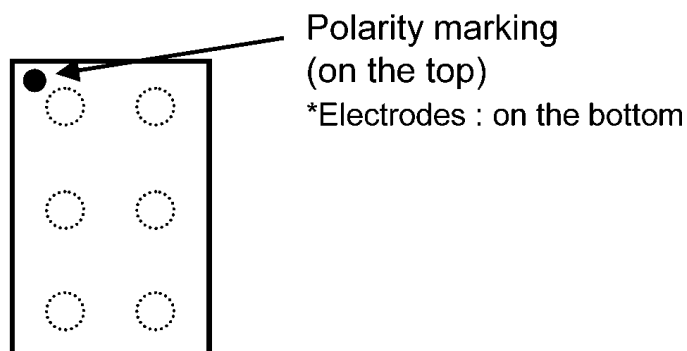
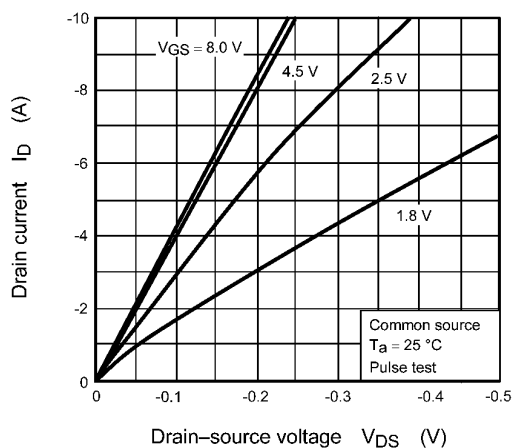
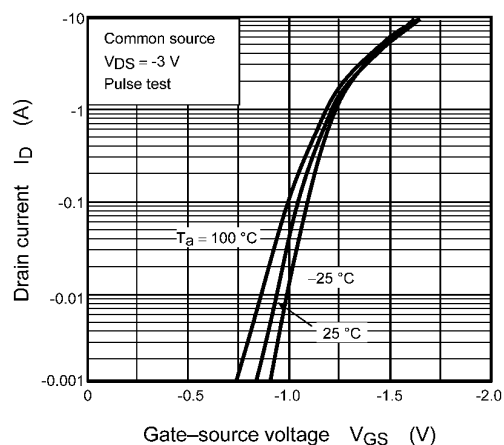


Fig. 6.2 Pin Condition(Top View)

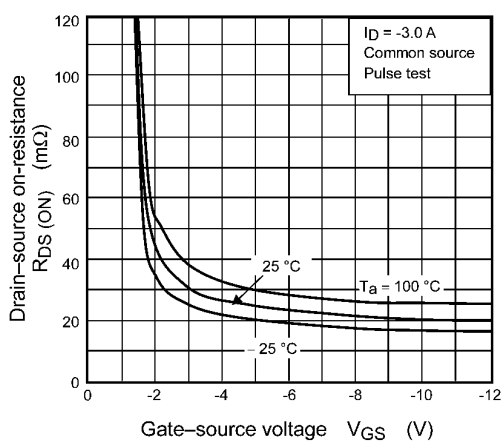
# 7. Characteristics Curves (Note)



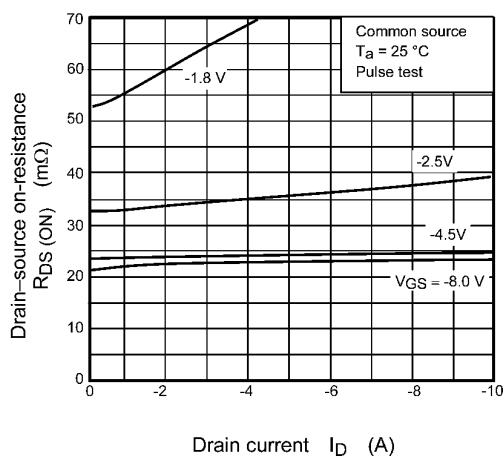
**Fig. 7.1  $I_D - V_{DS}$**



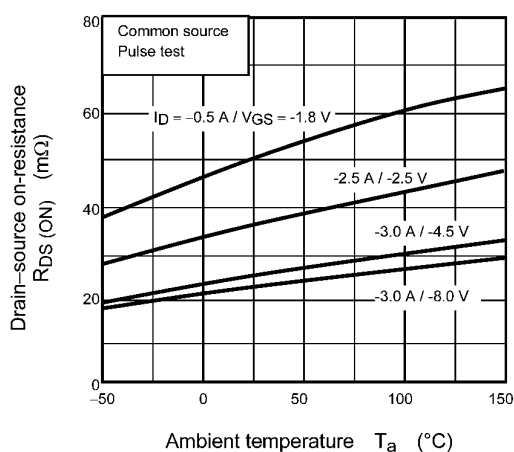
**Fig. 7.2  $I_D - V_{GS}$**



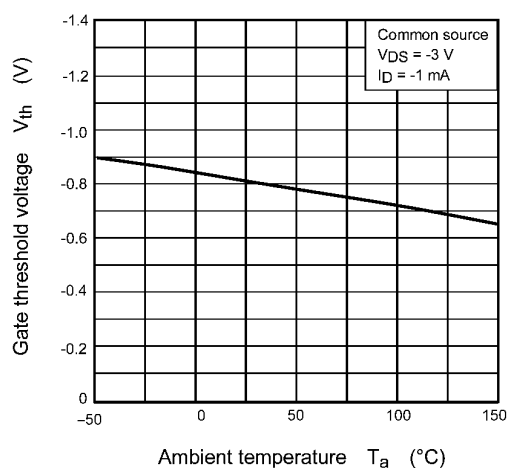
**Fig. 7.3  $R_{DS(ON)} - V_{GS}$**



**Fig. 7.4  $R_{DS(ON)} - I_D$**



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



**Fig. 7.6  $V_{th} - T_a$**

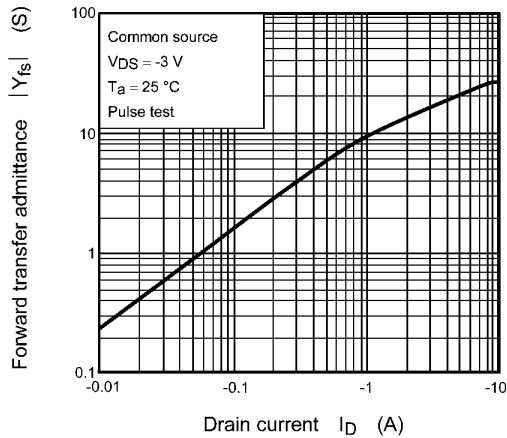


Fig. 7.7  $|Y_{fs}| - I_D$

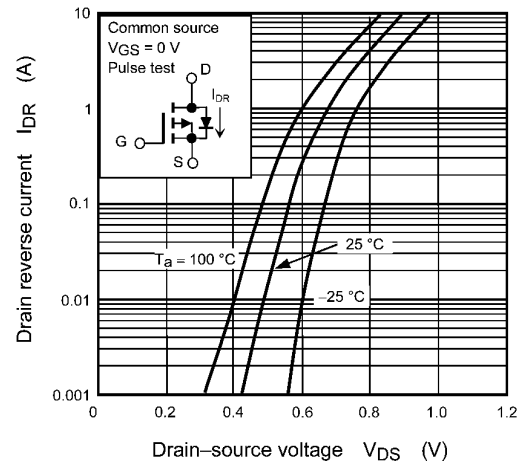


Fig. 7.8  $I_{DR} - V_{DS}$

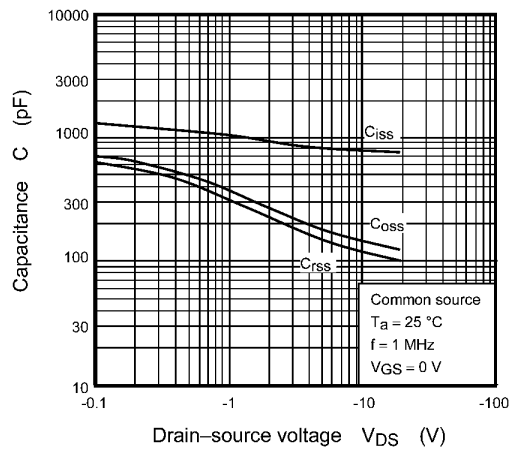


Fig. 7.9  $C - V_{DS}$

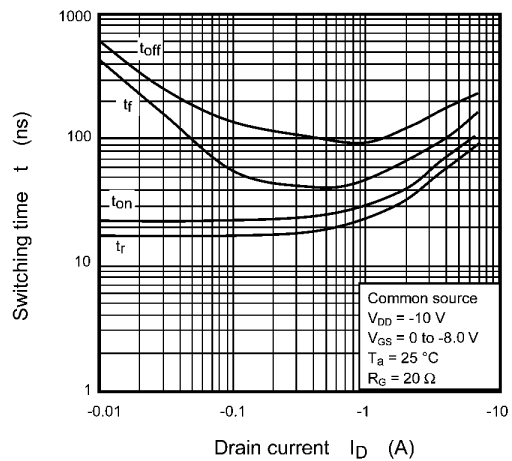


Fig. 7.10  $t - I_D$

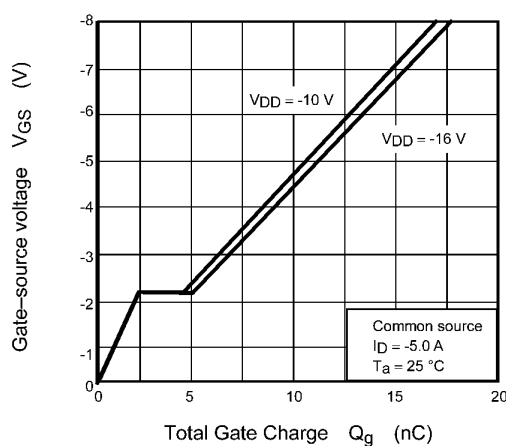


Fig. 7.11 Dynamic Input Characteristics

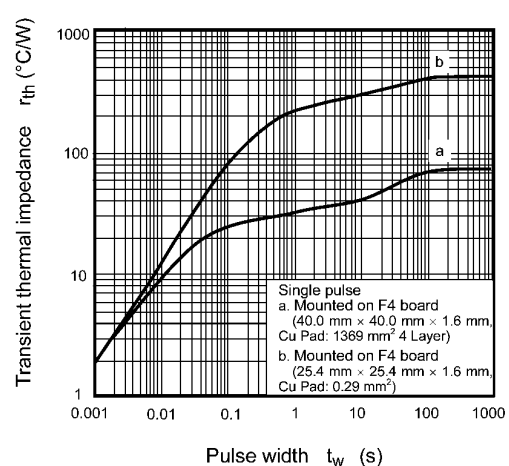
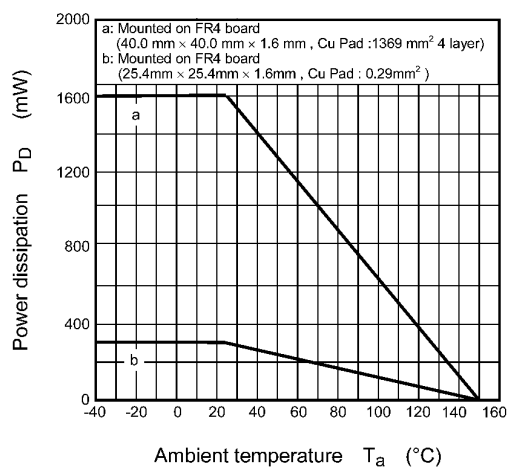


Fig. 7.12  $r_{th} - t_w$

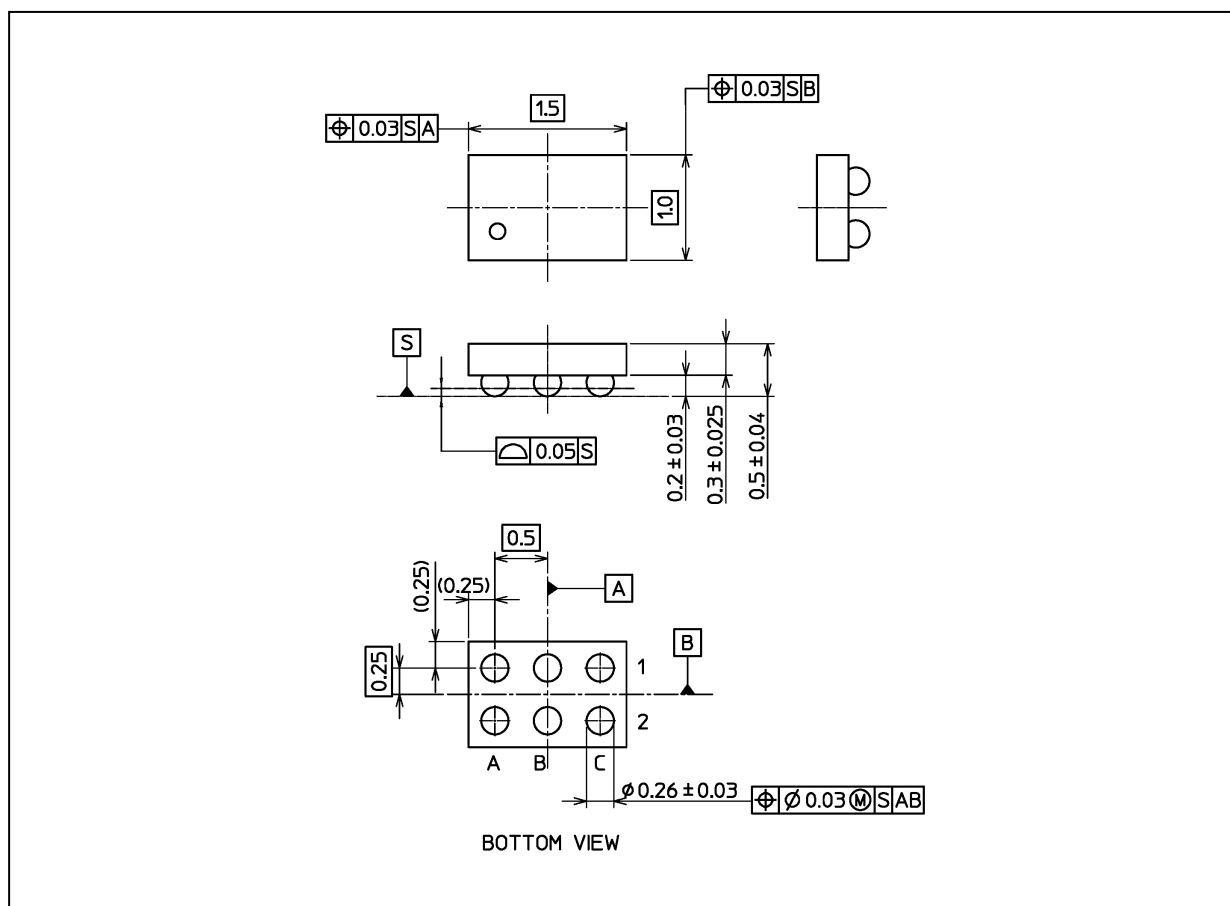


**Fig. 7.13  $P_D - T_a$**

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

## Package Dimensions

Unit: mm



Weight: 1.4 mg (typ.)

Package Name(s)
Nickname: WCSP6C



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**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.