

# TPCC8106

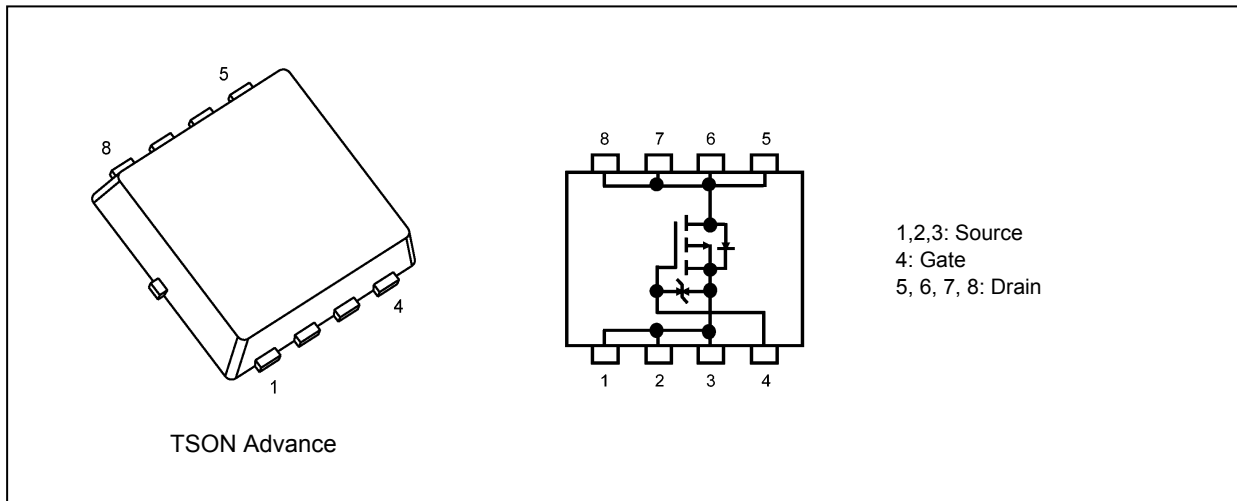
## 1. Applications

- Motor Drivers
- DC-DC Converters
- Switching Voltage Regulators

## 2. Features

- (1) Small, thin package
- (2) Low drain-source on-resistance:  $R_{DS(ON)} = 9.5 \text{ m}\Omega$  (typ.) ( $V_{GS} = -10 \text{ V}$ )
- (3) Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -40 \text{ V}$ )
- (4) Enhancement mode:  $V_{th} = -2.0$  to  $-3.0 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1.0 \text{ mA}$ )

## 3. Packaging and Internal Circuit



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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-40	V
Gate-source voltage	$V_{GSS}$	-20/+10	
Drain current (DC)	(Note 1) $I_D$	-30	A
Drain current (pulsed)	(Note 1) $I_{DP}$	-90	
Power dissipation	( $T_c = 25^\circ\text{C}$ ) $P_D$	46.8	W
Power dissipation	( $t = 10 \text{ s}$ ) (Note 2) $P_D$	2.27	W
Power dissipation	( $t = 10 \text{ s}$ ) (Note 3) $P_D$	0.84	W
Single-pulse avalanche energy	(Note 4) $E_{AS}$	78.9	mJ
Avalanche current	$I_{AR}$	-30	A
Channel temperature	(Note 5) $T_{ch}$	175	$^\circ\text{C}$
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).

**5. Thermal Characteristics**

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance (T <sub>c</sub> = 25°C)	R <sub>th(ch-c)</sub>	3.2	°C/W
Channel-to-ambient thermal resistance (t = 10 s) (Note 2)	R <sub>th(ch-a)</sub>	66	°C/W
Channel-to-ambient thermal resistance (t = 10 s) (Note 3)	R <sub>th(ch-a)</sub>	178	°C/W

Note 1: Ensure that the channel temperature does not exceed 175°C.

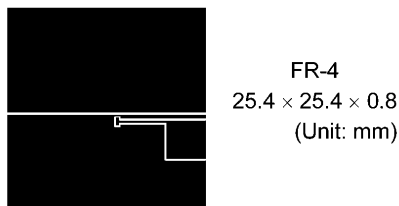
Note 2: Device mounted on a glass-epoxy board (a), Figure 5.1

Note 3: Device mounted on a glass-epoxy board (b), Figure 5.2

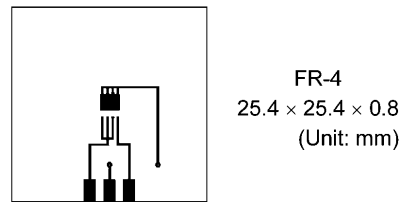
Note 4: V<sub>DD</sub> = -25 V, T<sub>ch</sub> = 25°C (initial), L = 91 μH, R<sub>G</sub> = 25 Ω, I<sub>AR</sub> = -30 A

Note 5: Merely channel temperature is guaranteed 175°C.

Storage temperature range is guaranteed as usual (-55 to 150°C).



**Fig. 5.1 Device Mounted on a Glass-Epoxy Board (a)**



**Fig. 5.2 Device Mounted on a Glass-Epoxy Board (b)**

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

**6. Electrical Characteristics**

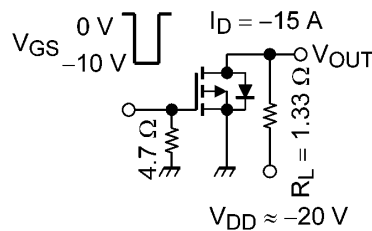
**6.1. Static Characteristics ( $T_a = 25^\circ\text{C}$  unless otherwise specified)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = -16/+10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-40	—	—	V
Drain-source breakdown voltage (Note 6)	$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 10\text{ V}$	-30	—	—	
Gate threshold voltage	$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1.0\text{ mA}$	-2.0	—	-3.0	
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS} = -6\text{ V}, I_D = -15\text{ A}$	—	11.8	18.9	$\text{m}\Omega$
		$V_{GS} = -10\text{ V}, I_D = -15\text{ A}$	—	9.5	12.3	

Note 6: 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.

**6.2. Dynamic Characteristics ( $T_a = 25^\circ\text{C}$  unless otherwise specified)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	3100	—	pF
Reverse transfer capacitance	$C_{rss}$		—	320	—	
Output capacitance	$C_{oss}$		—	390	—	
Switching time (rise time)	$t_r$	See Figure 6.2.1.	—	7	—	ns
Switching time (turn-on time)	$t_{on}$		—	16	—	
Switching time (fall time)	$t_f$		—	55	—	
Switching time (turn-off time)	$t_{off}$		—	209	—	



Duty  $\leq 1\%$ ,  $t_w = 10\ \mu\text{s}$

**Fig. 6.2.1 Switching Time Test Circuit**

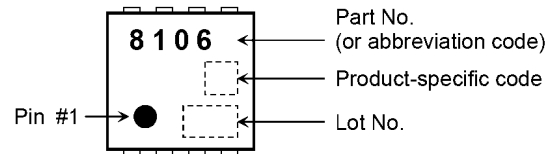
**6.3. Gate Charge Characteristics ( $T_a = 25^\circ\text{C}$  unless otherwise specified)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx -32\text{ V}, V_{GS} = -10\text{ V}, I_D = -30\text{ A}$	—	66	—	nC
Gate-source charge 1	$Q_{gs1}$		—	10	—	
Gate-drain charge	$Q_{gd}$		—	19	—	

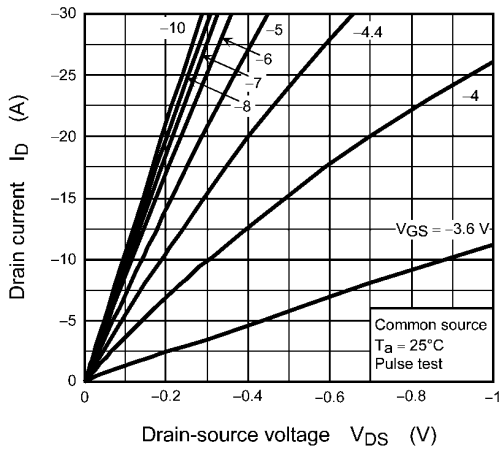
**6.4. Source-Drain Characteristics ( $T_a = 25^\circ\text{C}$  unless otherwise specified)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reverse drain current (pulsed) (Note 7)	$I_{DRP}$	—	—	—	-90	A
Diode forward voltage	$V_{DSF}$	$I_{DR} = -30\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.2	V

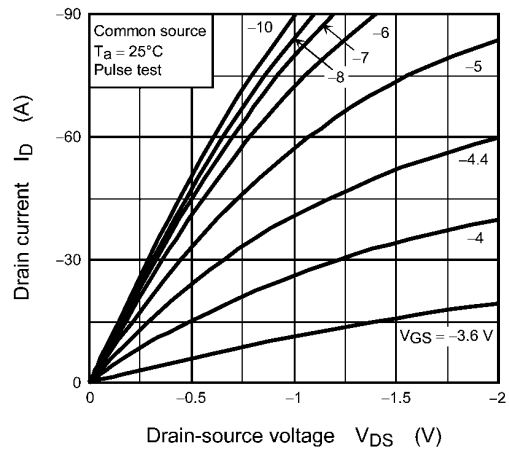
Note 7: Ensure that the channel temperature does not exceed  $175^\circ\text{C}$ .

**7. Marking****Fig. 7.1 Marking**

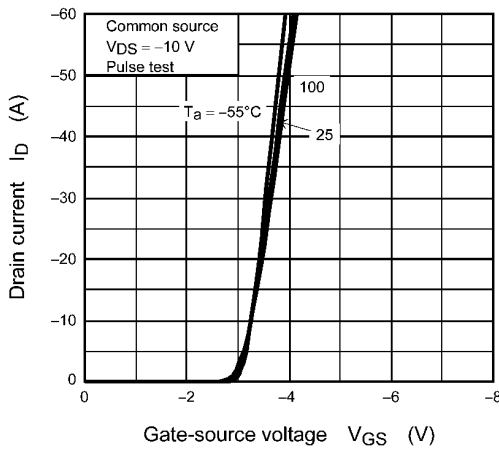
**8. Characteristics Curves (Note)**



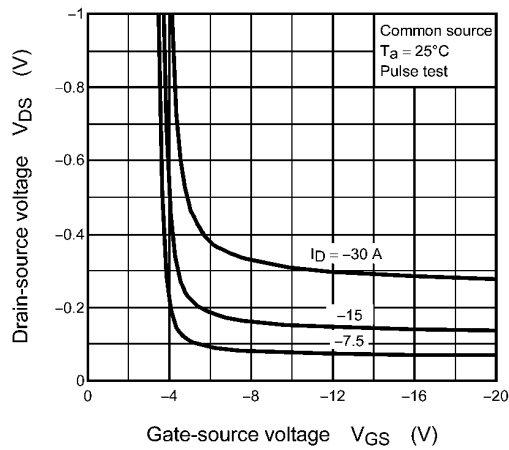
**Fig. 8.1  $I_D - V_{DS}$**



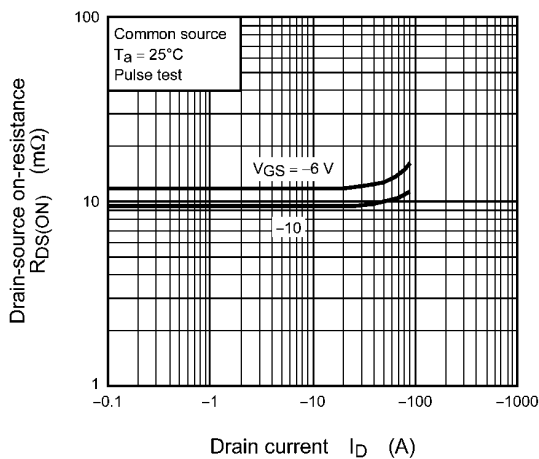
**Fig. 8.2  $I_D - V_{DS}$**



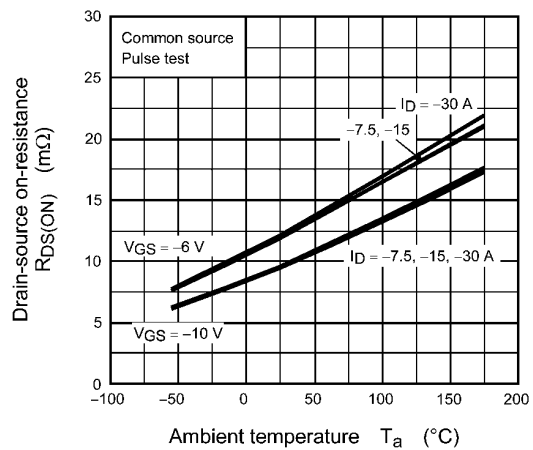
**Fig. 8.3  $I_D - V_{GS}$**



**Fig. 8.4  $V_{DS} - V_{GS}$**



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



**Fig. 8.6  $R_{DS(ON)} - T_a$  (Note 8)**

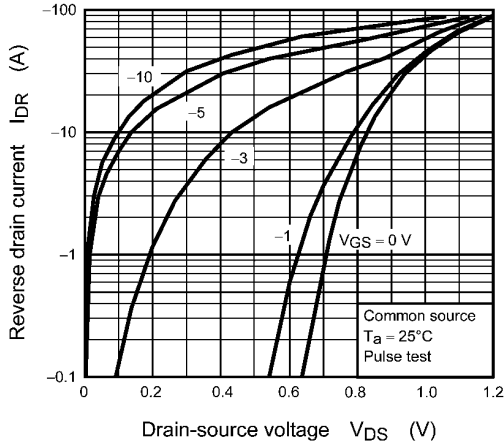


Fig. 8.7  $I_{DR} - V_{DS}$

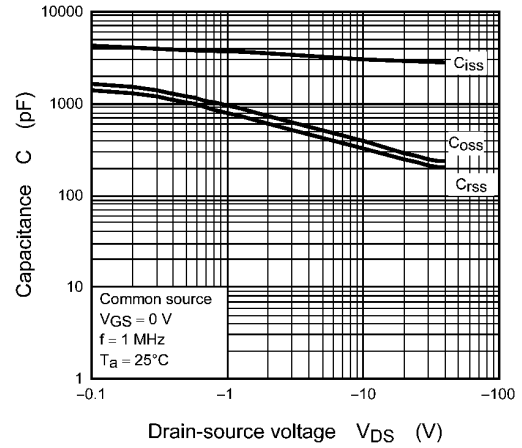


Fig. 8.8 Capacitance -  $V_{DS}$

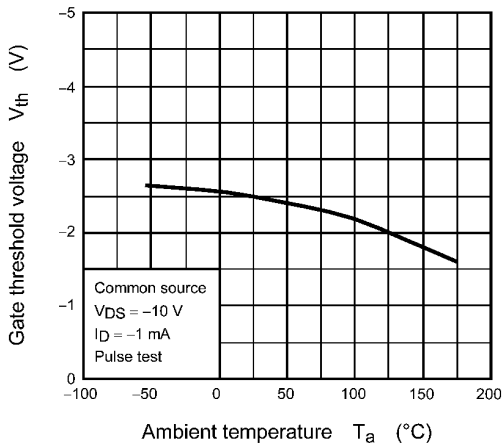


Fig. 8.9  $V_{th} - T_a$  (Note 8)

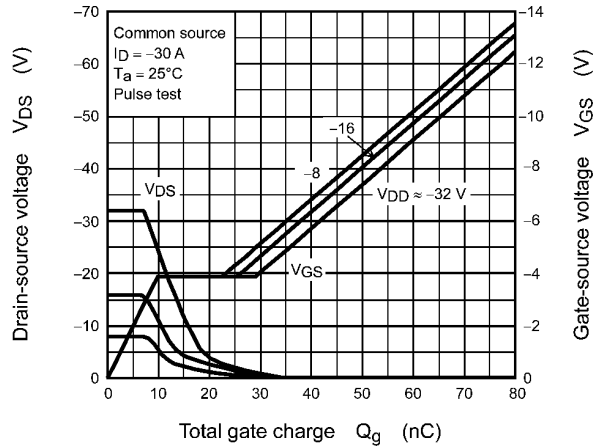


Fig. 8.10 Dynamic Input/Output Characteristics

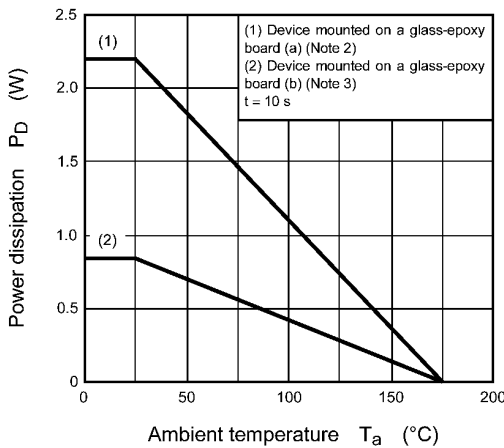


Fig. 8.11  $P_D - T_a$  (Note 8)  
 (Guaranteed Maximum)

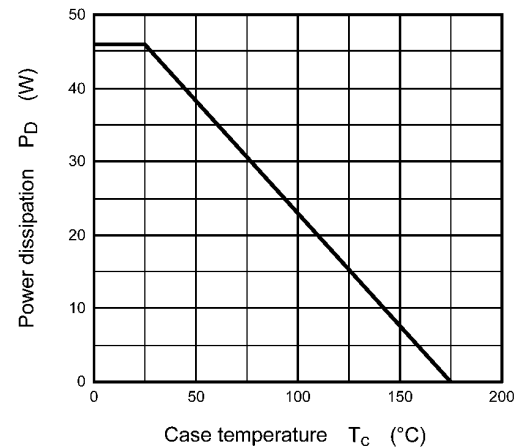
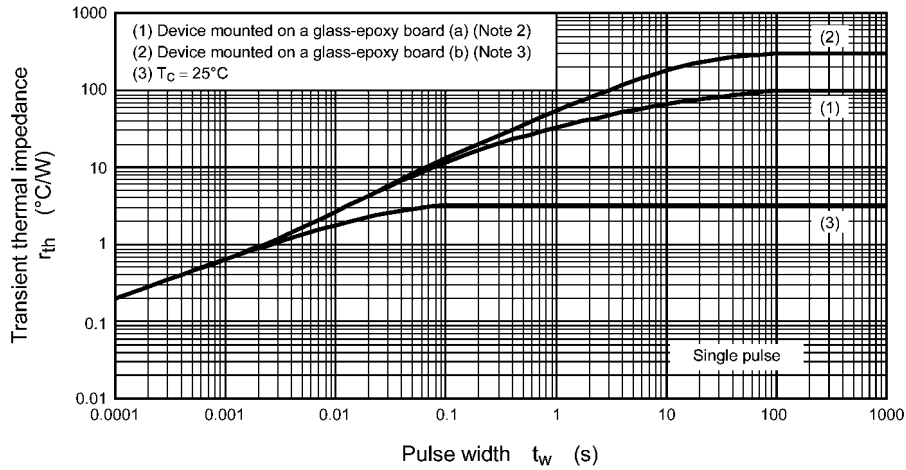
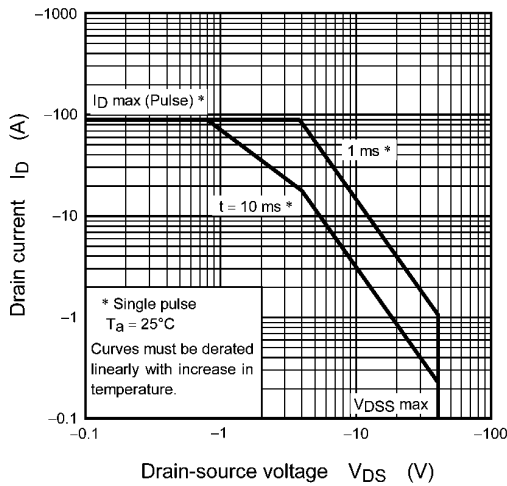


Fig. 8.12  $P_D - T_c$  (Note 8)  
 (Guaranteed Maximum)



**Fig. 8.13  $r_{th} - t_w$**   
**(Guaranteed Maximum)**



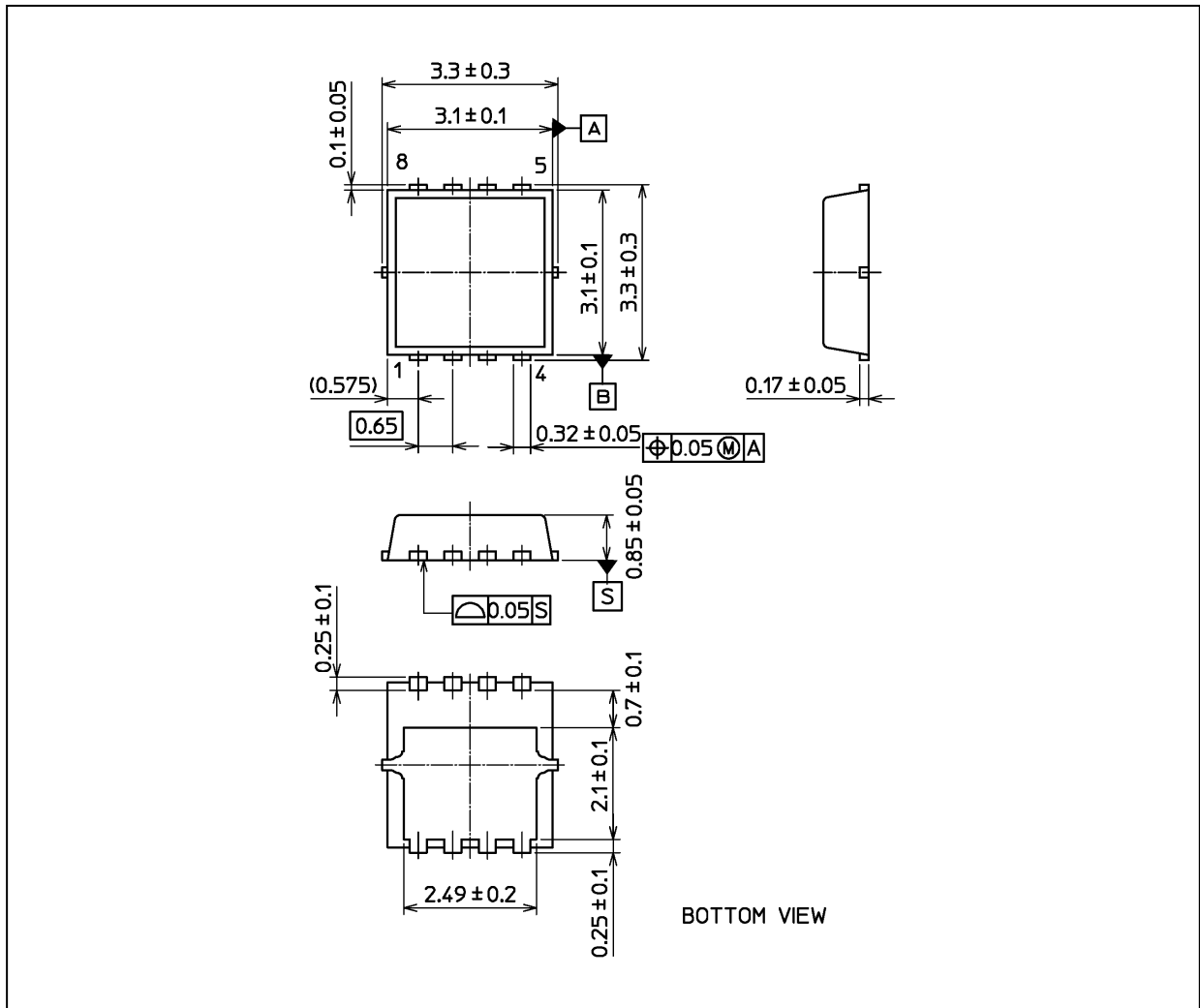
**Fig. 8.14 Safe Operating Area**  
**(Guaranteed Maximum)**

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

Note 8: Although several performance curves are shown up to a  $T_a$  or  $T_c$  of  $175^\circ\text{C}$ , the device is not guaranteed at storage temperatures up to  $175^\circ\text{C}$ . The storage temperature ( $T_{stg}$ ) range is rated at  $-55^\circ\text{C}$  to  $150^\circ\text{C}$ .

Package Dimensions

Unit: mm



Weight: 0.02 g (typ.)

Package Name(s)
TOSHIBA: 2-3X1S
Nickname: TSON Advance

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