

TOSHIBA Multi-Chip Device Silicon P Channel MOS Type (U-MOS III) / Schottky Barrier Diode

# TPCF8B01

## Notebook PC Applications

## Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 72 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 4.7 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -20 \text{ V}$ )
- Enhancement-model:  $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -200 \text{ }\mu\text{A}$ )
- Low forward voltage:  $V_{FM(2)} = 0.46 \text{ V}$  (typ.)

### Absolute Maximum Ratings

### MOSFET ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-20	V
Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )		$V_{DGR}$	-20	V
Gate-source voltage		$V_{GSS}$	$\pm 8$	V
Drain current	DC (Note 1)	$I_D$	-2.7	A
	Pulse (Note 1)	$I_{DP}$	-10.8	
Single pulse avalanche energy (Note 4)		$E_{AS}$	1.2	mJ
Avalanche current		$I_{AR}$	-1.35	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		$E_{AR}$	0.11	mJ

**SBD ( $T_a = 25^\circ\text{C}$ )**

Characteristics	Symbol	Rating	Unit
Repetitive peak reverse voltage	$V_{RRM}$	20	V
Average forward current (Note 2a, 6)	$I_F(AV)$	1.0	A
Peak one cycle surge forward current (non-repetitive)	$I_{FSM}$	7(50Hz)	A

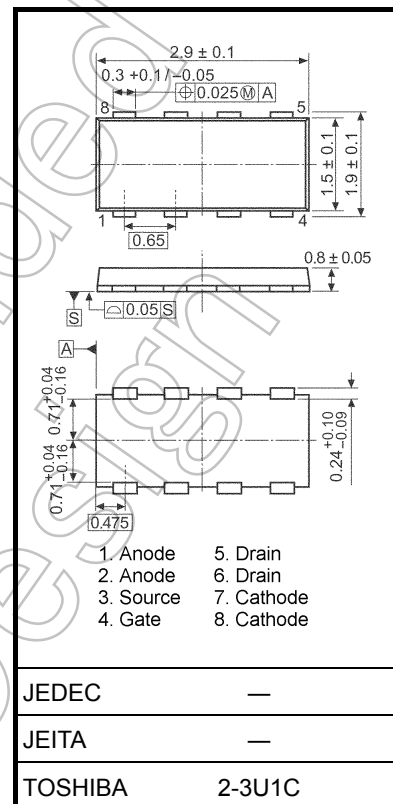
### Absolute Maximum Ratings for MOSFET and SBD (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain power dissipation (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	P <sub>D</sub> (1)	1.35	W
	Single-device value at dual operation (Note 3b)	P <sub>D</sub> (2)	1.12	
Drain power dissipation (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	P <sub>D</sub> (1)	0.53	
	Single-device value at dual operation (Note 3b)	P <sub>D</sub> (2)	0.33	
Channel temperature		T <sub>ch</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55~150	°C

Note: For (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) and (Note 6), please refer to the next page.

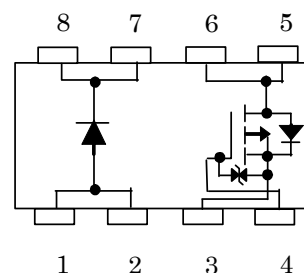
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within 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).

Unit: mm



Weight: 0.011 g (typ.)

### Circuit Configuration



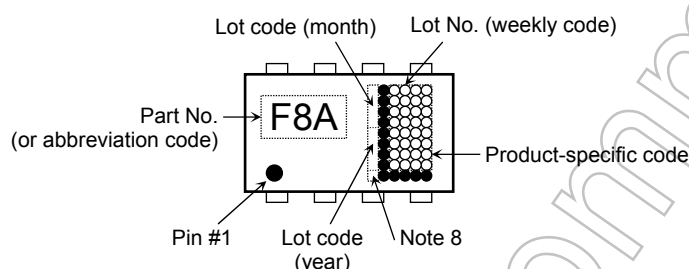
## Thermal Characteristics for MOSFET and SBD

Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	Single-device operation (Note 3a)	R <sub>th (ch-a)</sub> (1)	92.6	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th (ch-a)</sub> (2)	111.6	
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	Single-device operation (Note 3a)	R <sub>th (ch-a)</sub> (1)	235.8	°C/W
	Single-device value at dual operation (Note 3b)	R <sub>th (ch-a)</sub> (2)	378.8	

This transistor is an electrostatic sensitive device. Please handle with caution.

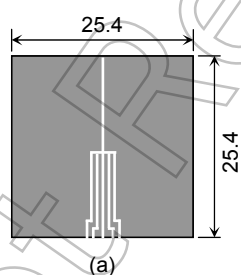
Schottky barrier diodes are having large-reverse-current-leakage characteristic compare to the other rectifier products. This current leakage and improper operating temperature or voltage may cause thermal runaway. Please take forward and reverse loss into consideration when you design.

### Marking (Note 7)

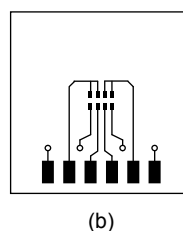


Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)



FR-4  
25.4 × 25.4 × 0.8  
(unit: mm)

Note 3: a) The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.).

(b) he power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4:  $V_{DD} = -16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AB} = -1.35\text{ A}$

Note 5: Repetitive rating; Pulse width limited by maximum channel temperature.

Note 6: Rectangular waveform ( $\alpha = 180^\circ$ ),  $V_R = 15V$ .

Note 7: Black round marking “●” locates on the left lower side of parts number marking “F8A” indicates terminal No. 1.

Note 8 A dot marking identifies the indication of product Labels.

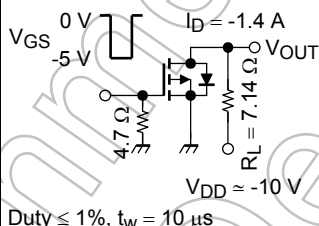
Without a dot: `[[Pb]]/INCLUDES > MCV`

With a dot: `[[G]]/RoHS COMPATIBLE` or `[[G]]/RoHS [[Pb]]`

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

## Electrical Characteristics (Ta = 25°C)

## MOSFET

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain cut-off current		I <sub>DSS</sub>	V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V <sub>(BR) DSS</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V	-20	—	—	V
		V <sub>(BR) DSX</sub>	I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 8 V	-12	—	—	
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -200 μA	-0.5	—	-1.2	V
Drain-source ON resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.7 A	—	215	300	mΩ
		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -1.4 A	—	110	160	
		R <sub>DS (ON)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1.4 A	—	72	110	
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1.4 A	2.4	4.7	—	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	470	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	70	—	
Output capacitance		C <sub>oss</sub>		—	80	—	
Switching time	Rise time	t <sub>r</sub>		—	5	—	ns
	Turn-on time	t <sub>on</sub>		—	9	—	
	Fall time	t <sub>f</sub>		—	8	—	
	Turn-off time	t <sub>off</sub>		—	26	—	
Total gate charge (gate-source plus gate-drain)		Q <sub>g</sub>	V <sub>DD</sub> ≈ -16 V, V <sub>GS</sub> = -5 V, I <sub>D</sub> = -2.7 A	—	6	—	nC
Gate-source charge		Q <sub>gs</sub>		—	4	—	
Gate-drain ("miller") charge		Q <sub>gd</sub>		—	2	—	

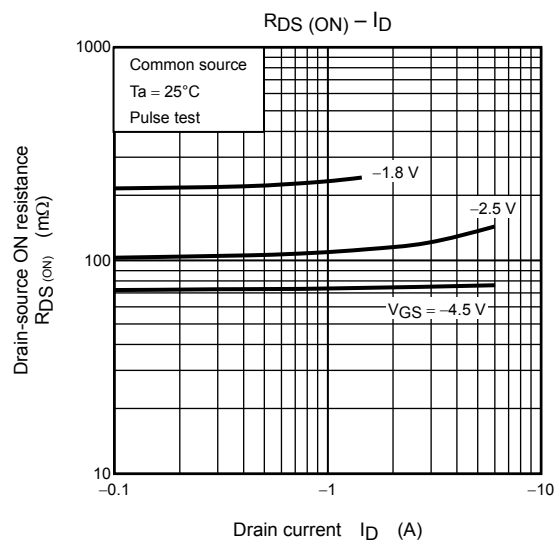
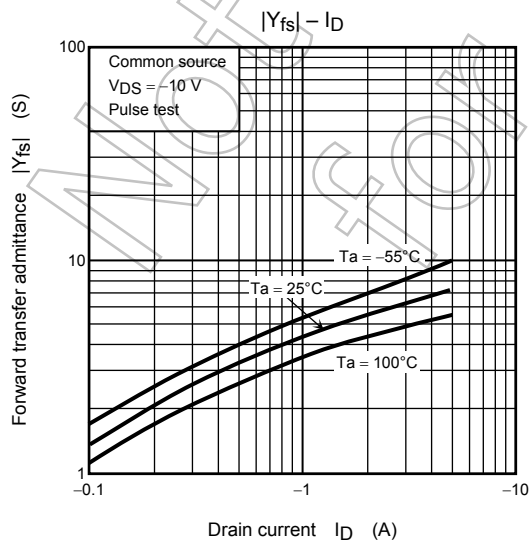
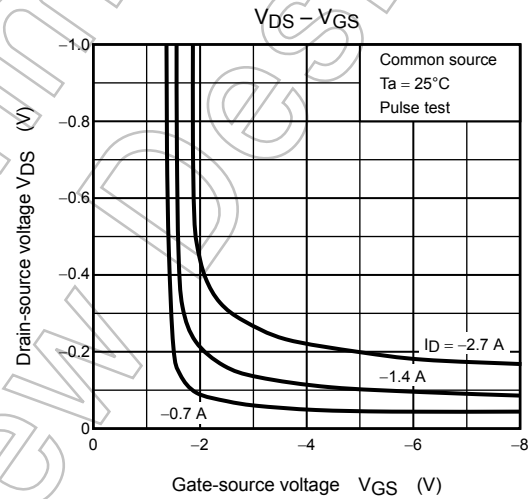
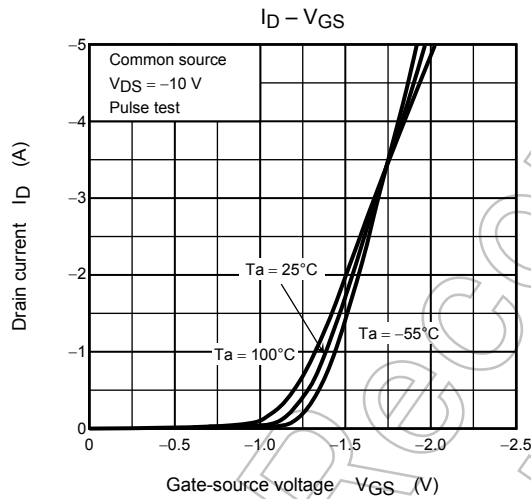
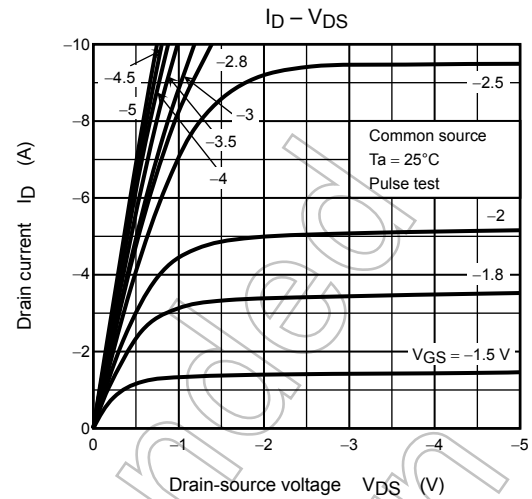
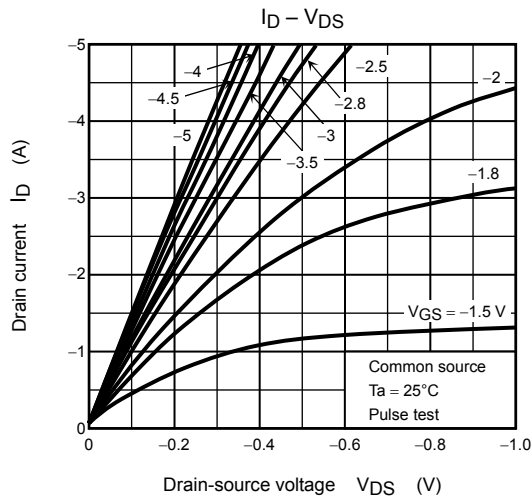
## MOSFET Source-Drain Ratings and Characteristics

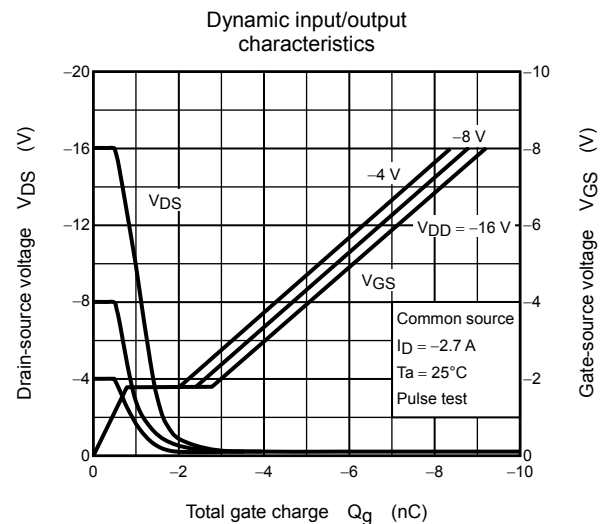
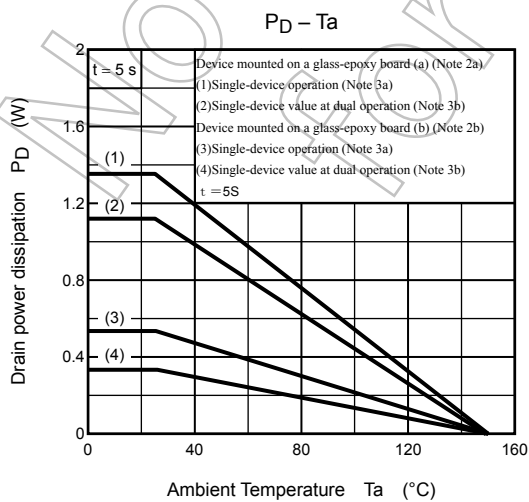
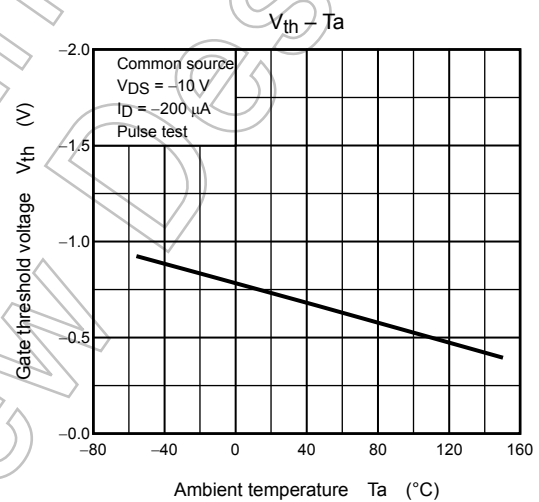
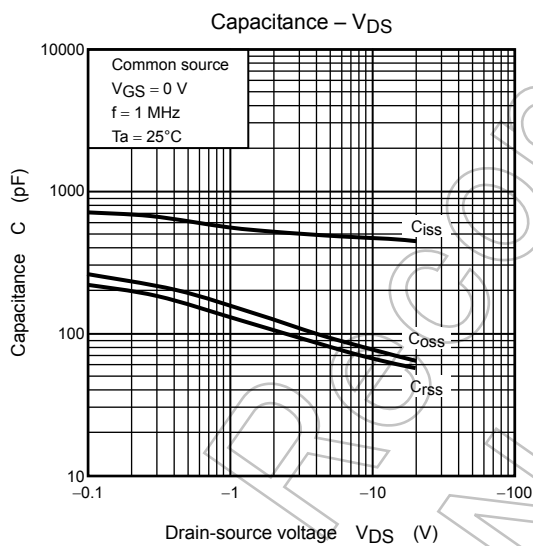
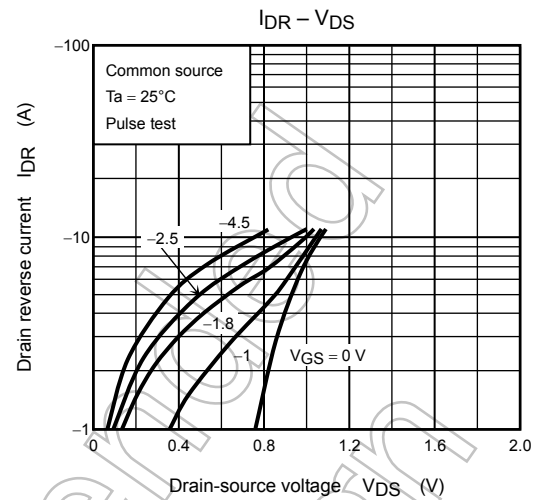
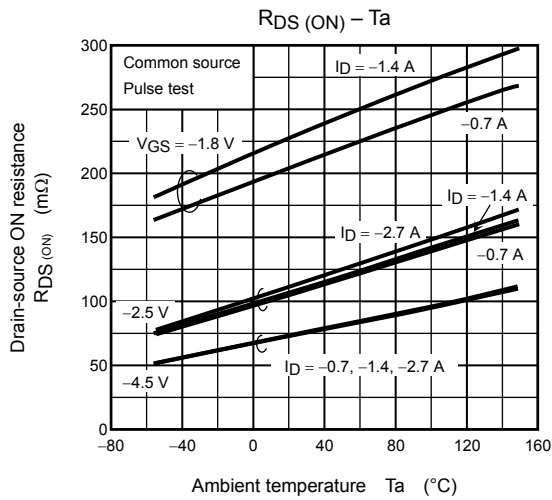
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I <sub>DRP</sub>	—	—	—	-10.8	A
Forward voltage (diode)		V <sub>DSF</sub>	I <sub>DR</sub> = -2.7 A, V <sub>GS</sub> = 0 V	—	—	-1.2	V

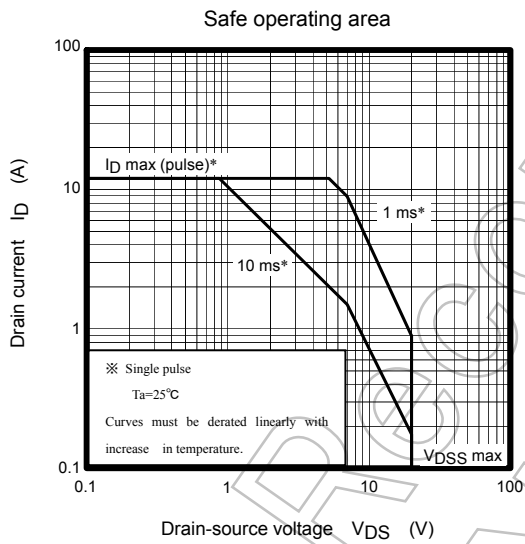
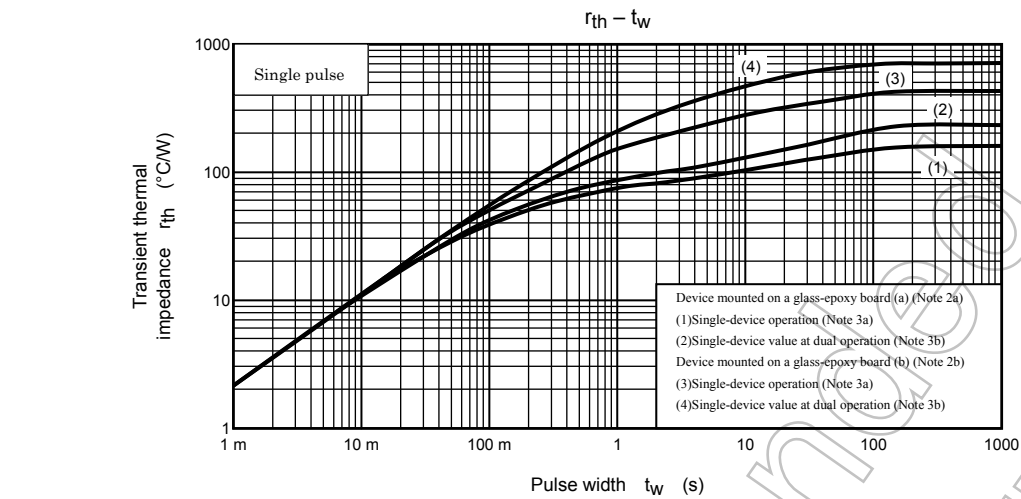
## SBD

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward voltage		V <sub>FM(1)</sub>	I <sub>FM</sub> = 0.7 A	—	0.43	—	V
		V <sub>FM(2)</sub>	I <sub>FM</sub> = 1.0 A	—	0.46	0.49	V
Repetitive peak reverse current		I <sub>RRM</sub>	V <sub>RRM</sub> = 20 V	—	—	50	μA
Junction capacitance		C <sub>j</sub>	V <sub>R</sub> = 10 V, f = 1 MHz	—	54	—	pF

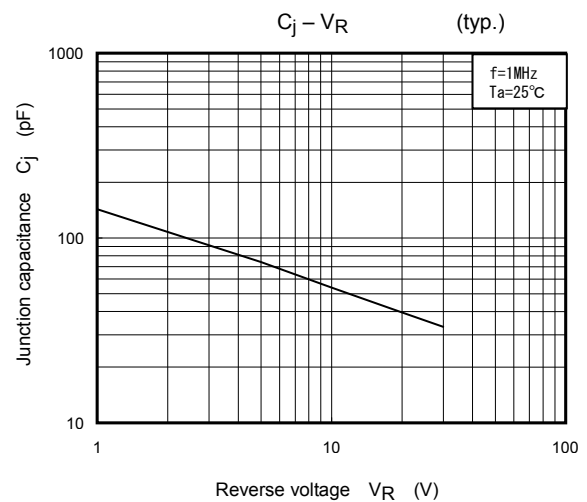
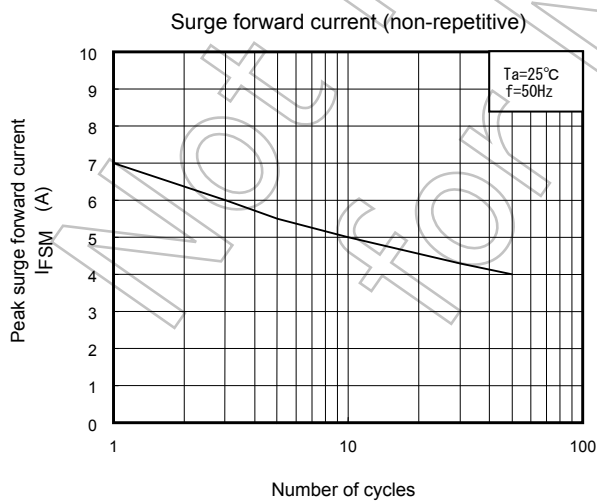
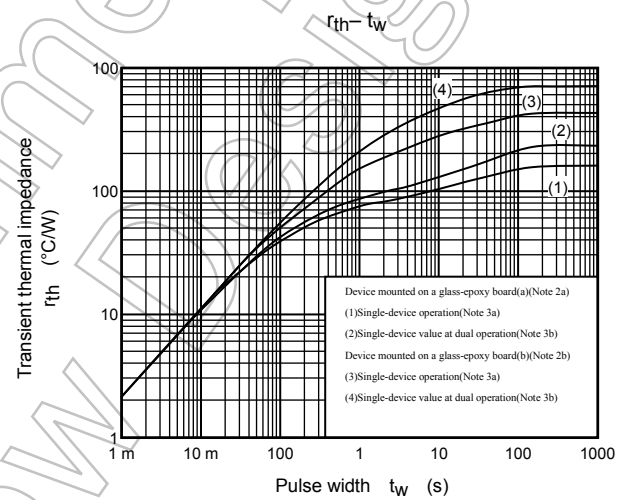
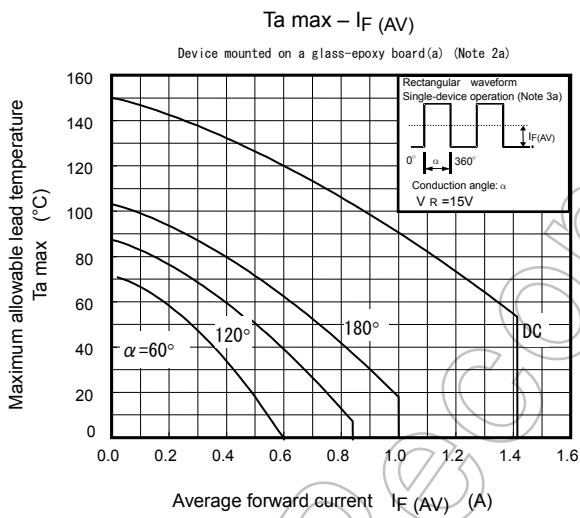
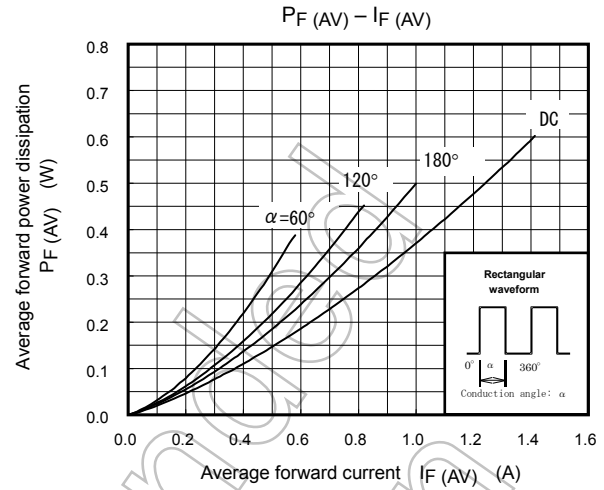
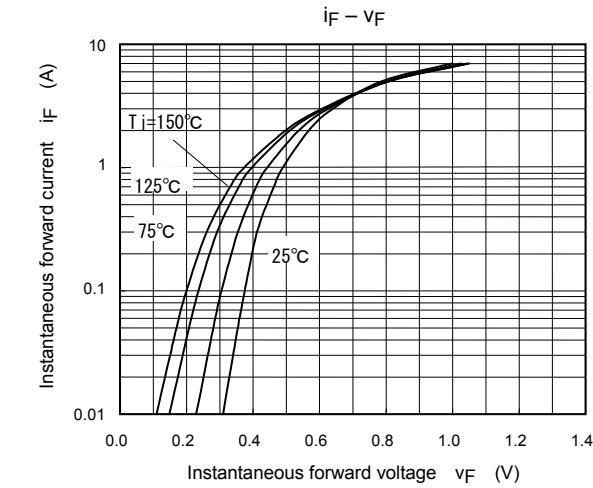
## MOSFET

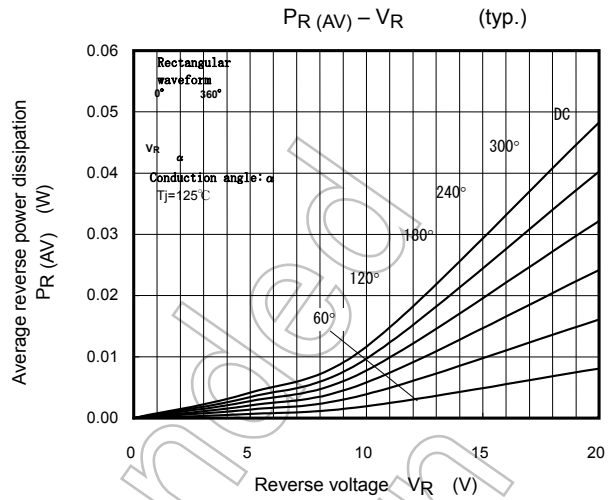
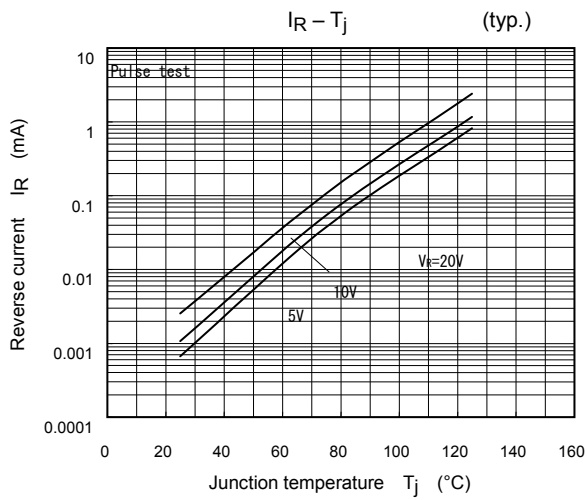






## SBD







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