

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} | ± 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 |

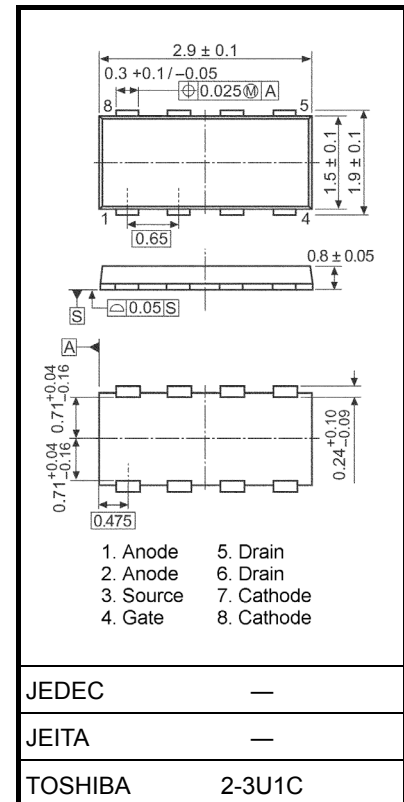
Absolute Maximum Ratings for MOSFET and SBD ($T_a = 25^\circ\text{C}$)

| Characteristics | | Symbol | Rating | Unit |
|--|--|-----------|---------|------------------|
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2a) | Single-device operation (Note 3a) | $P_D(1)$ | 1.35 | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 1.12 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2b) | Single-device operation (Note 3a) | $P_D(1)$ | 0.53 | |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 0.33 | |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ\text{C}$ |

Note: For (Note 1), (Note 2), (Note 3), (Note 4), (Note 5), (Note 6) and (Note 7), please refer to the next page.

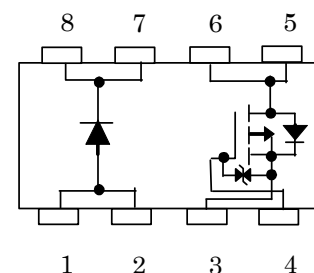
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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



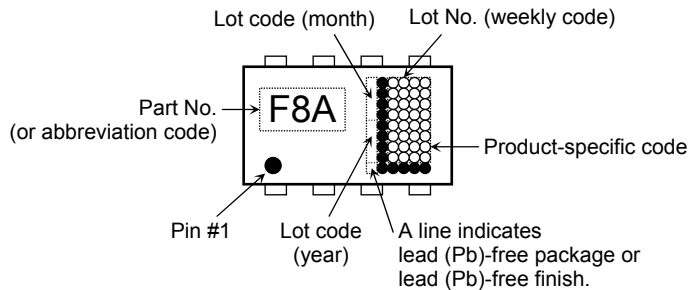
Thermal Characteristics for MOSFET and SBD

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

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

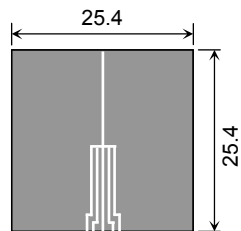
Schottky barrier diodes are having large-reverse-current-leakage characteristic compare to the other rectifier products. This current leakage and improper operating temperature or voltage may cause thermal runaway. Please take forward and reverse loss into consideration when you design.

Marking (Note 7)



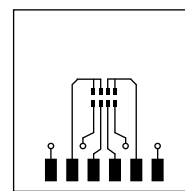
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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



(a)

FR-4
25.4 × 25.4 × 0.8
(unit: mm)



(b)

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) The 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), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = -1.35\text{ A}$

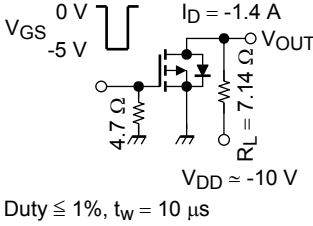
Note 5: Repetitive rating; Pulse width limited by maximum channel temperature.

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

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

Electrical Characteristics (Ta = 25°C)

MOSFET

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

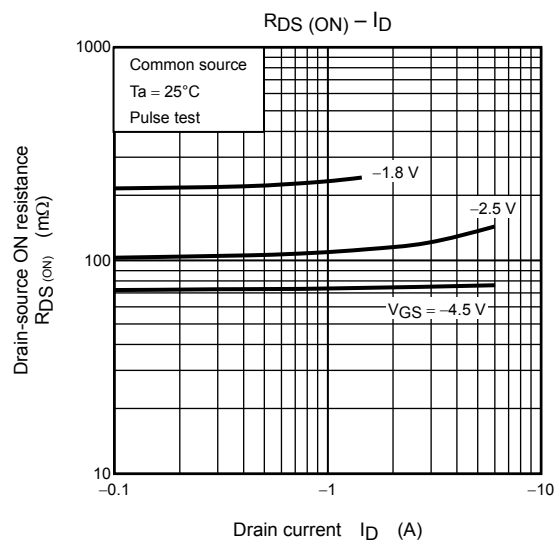
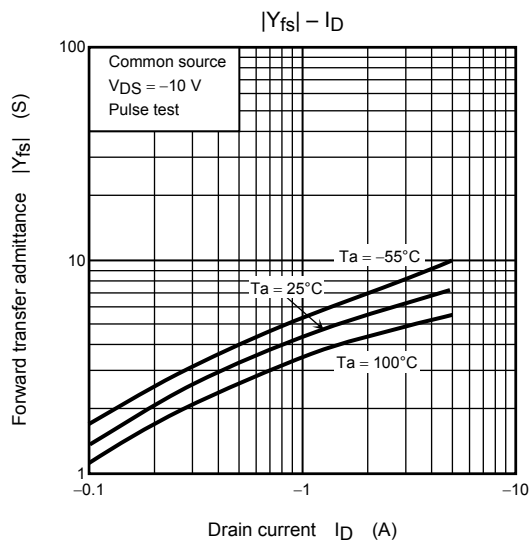
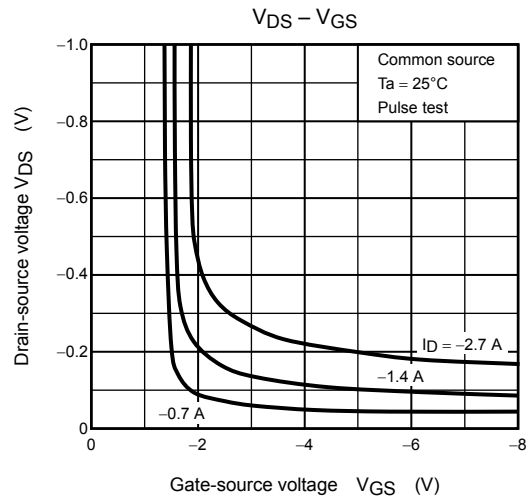
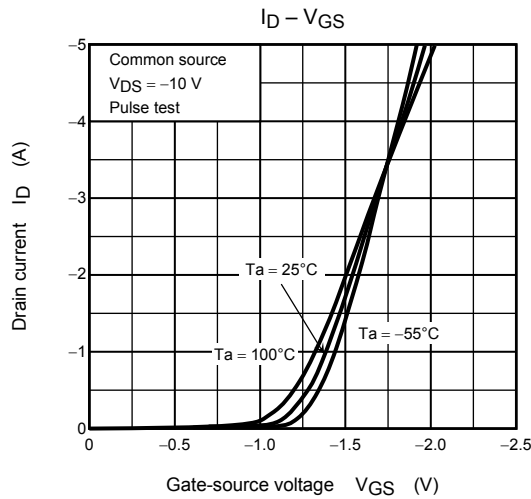
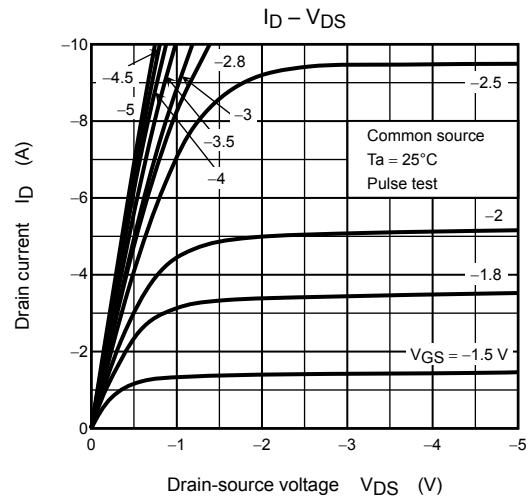
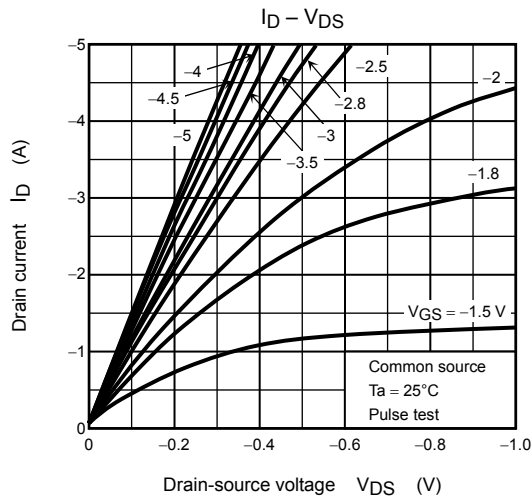
MOSFET Source-Drain Ratings and Characteristics

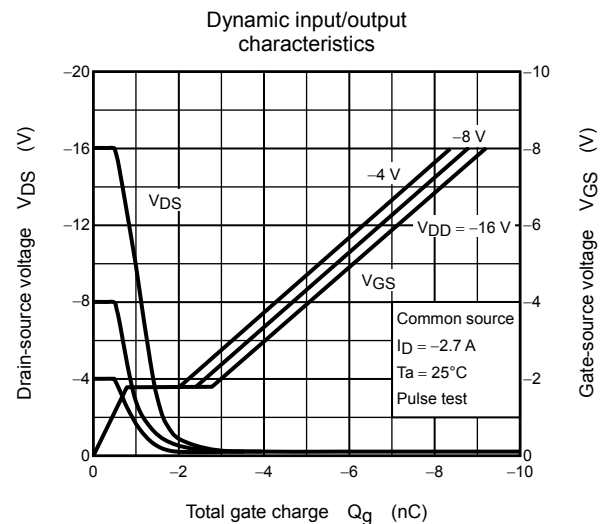
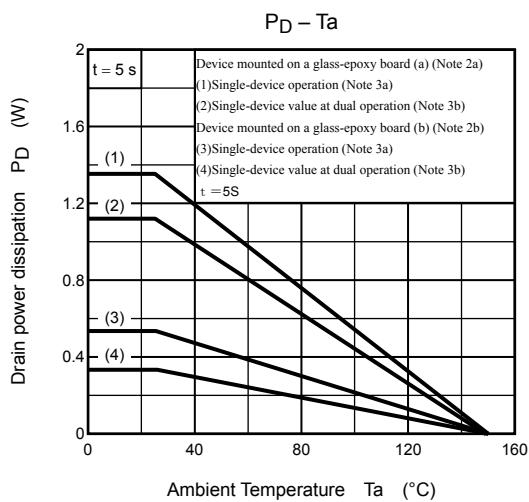
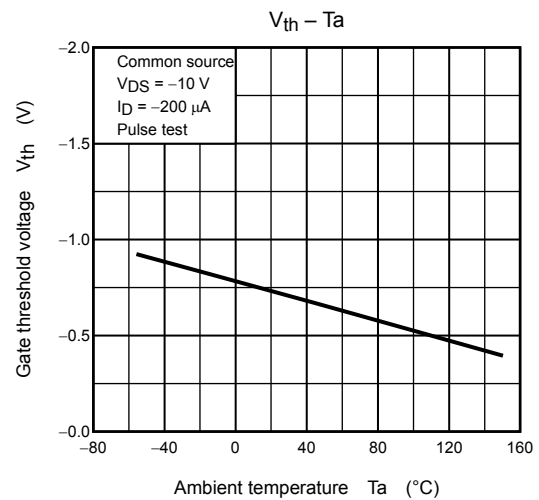
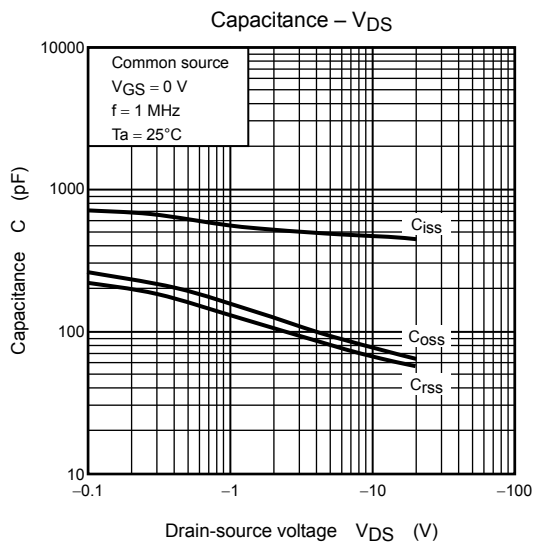
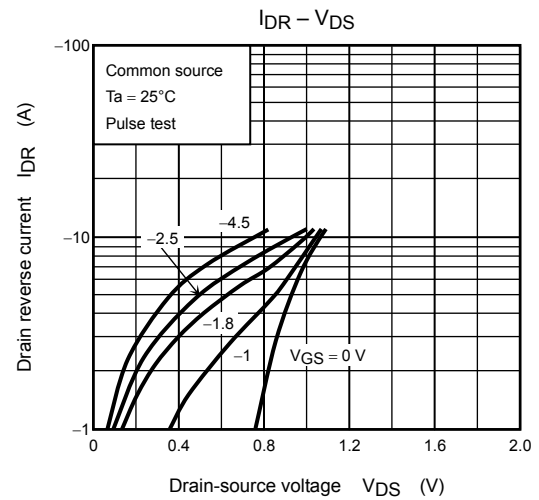
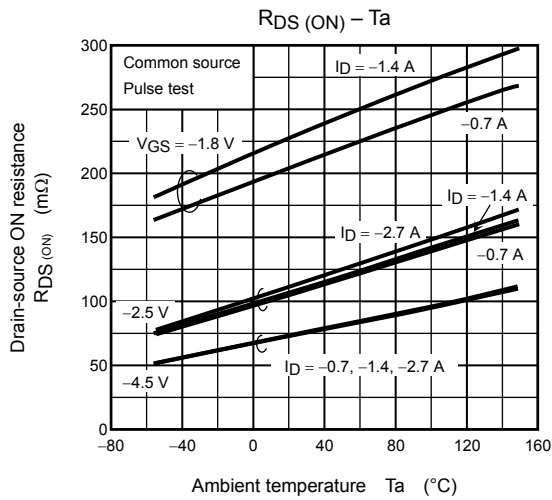
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|-------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | -10.8 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = -2.7 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | -1.2 | V |

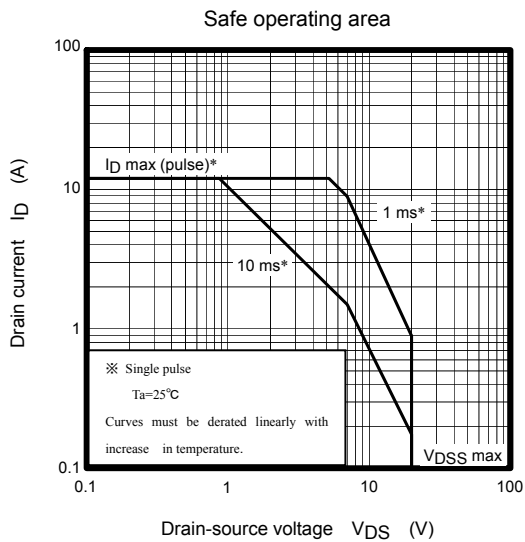
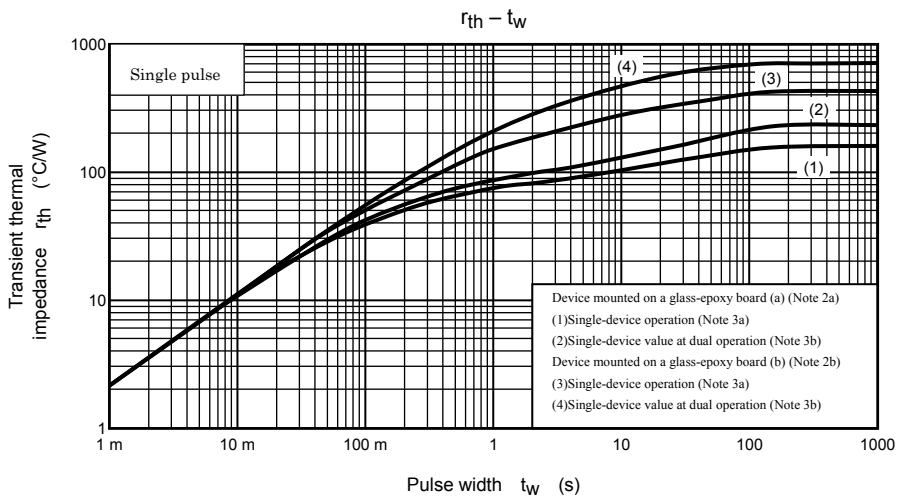
SBD

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---------------------------------|--------------------|----------------------------------|-----|------|------|------|
| Peak forward voltage | V _{FM(1)} | I _{FM} = 0.7 A | — | 0.43 | — | V |
| | V _{FM(2)} | I _{FM} = 1.0 A | — | 0.46 | 0.49 | V |
| Repetitive peak reverse current | I _{RRM} | V _{RRM} = 20 V | — | — | 50 | μA |
| Junction capacitance | C _j | V _R = 10 V, f = 1 MHz | — | 54 | — | pF |

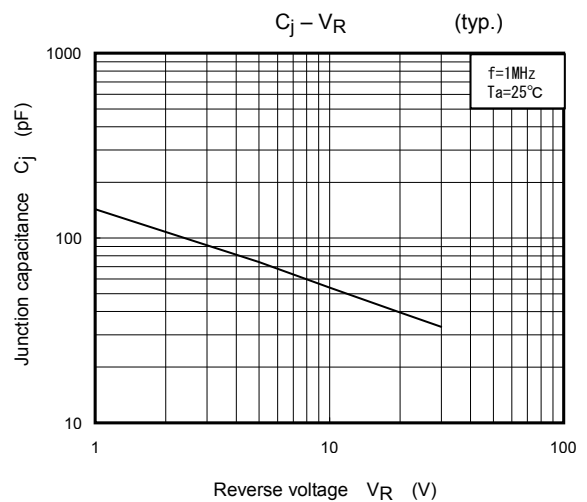
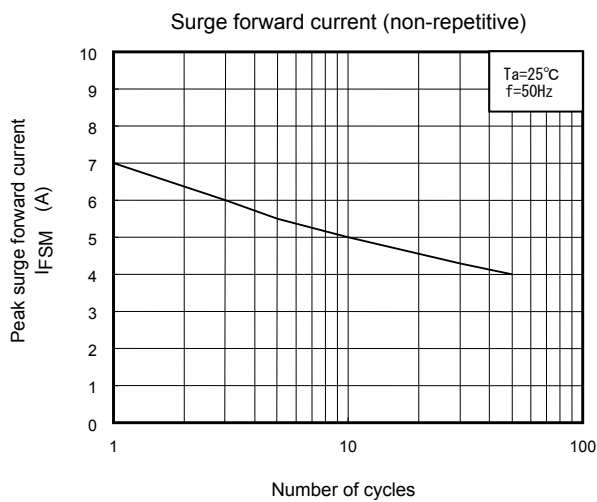
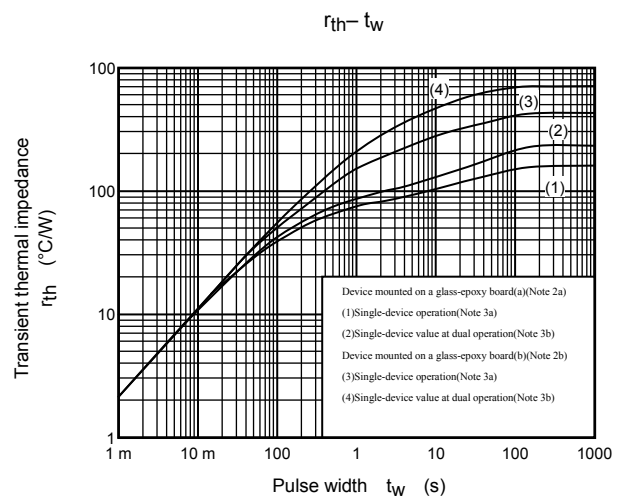
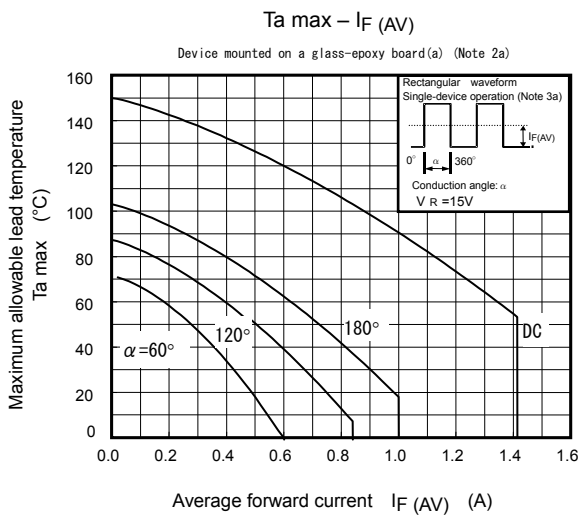
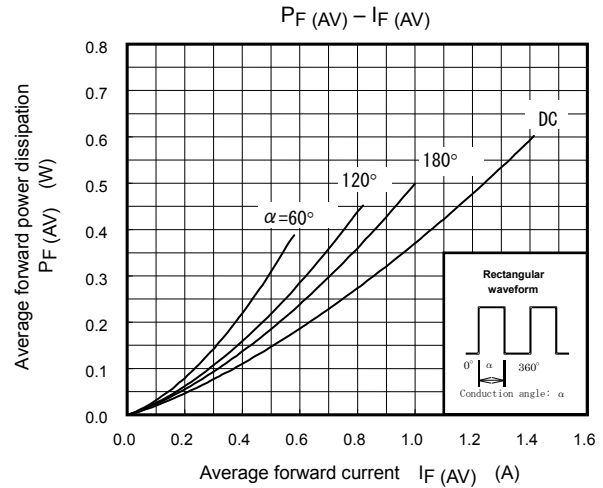
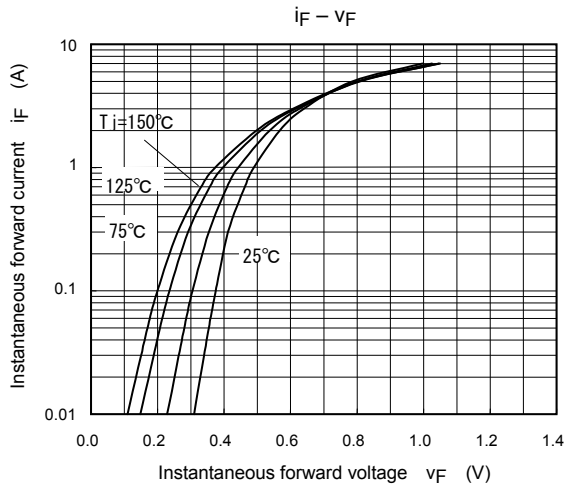
MOSFET

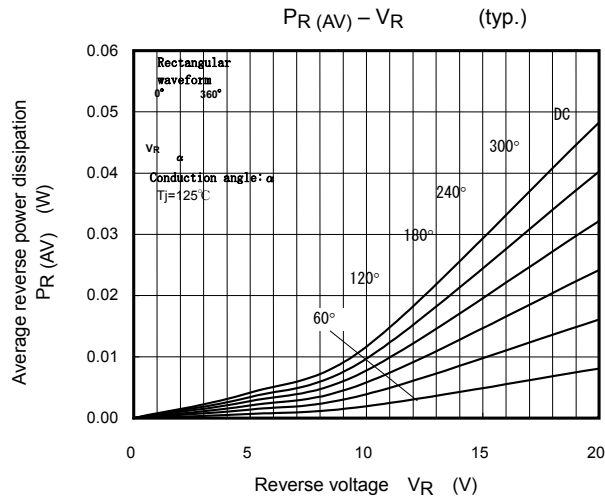
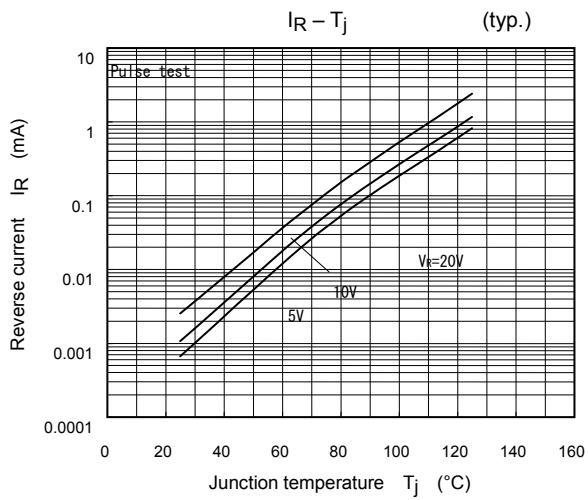






SBD





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