

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS II)

TPCS8205

Lithium Ion Battery Applications
 Portable Equipment Applications
 Notebook PC Applications

- Small footprint due to small and thin package
- Low drain-source ON resistance: $R_{DS(ON)} = 30 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 10 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 20 \text{ V}$)
- Enhancement mode: $V_{th} = 0.5\sim 1.2 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 200 \text{ }\mu\text{A}$)

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

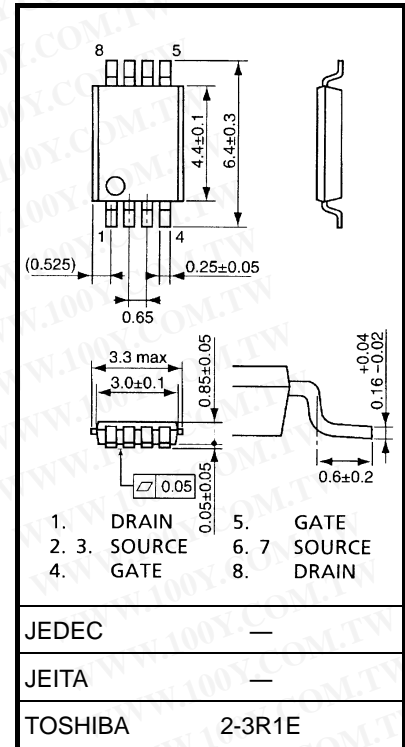
| Characteristics | | Symbol | Rating | Unit |
|--|---|-----------|----------|------------------|
| Drain-source voltage | | V_{DSS} | 20 | V |
| Drain-gate voltage ($R_{GS} = 20\text{k}\Omega$) | | V_{DGR} | 20 | V |
| Gate-source voltage | | V_{GSS} | ± 12 | V |
| Drain current | D C (Note 1) | I_D | 5 | A |
| | Pulse (Note 1) | I_{DP} | 20 | |
| Drain power dissipation ($t = 10\text{s}$) (Note 2a) | Single-device operation (Note 3a) | $P_D(1)$ | 1.1 | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 0.5 | |
| Drain power dissipation ($t = 10\text{s}$) (Note 2b) | Single-device operation (Note 3a) | $P_D(1)$ | 0.6 | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 0.35 | |
| Single pulse avalanche energy (Note 4) | | E_{AS} | 32.5 | mJ |
| Avalanche current | | I_{AR} | 5 | A |
| Repetitive avalanche energy Single-device value at operation (Note 2a, Note 3b, Note 5) | | E_{AR} | 0.05 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ\text{C}$ |

Note: (Note 1), (Note 2a), (Note 2b), (Note 3a), (Note 3b), (Note 4) and (Note 5): See 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).

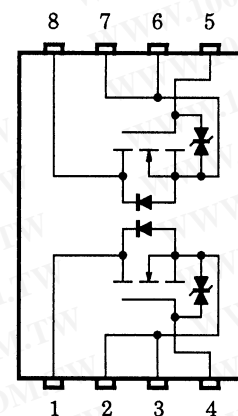
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.035 g (typ.)

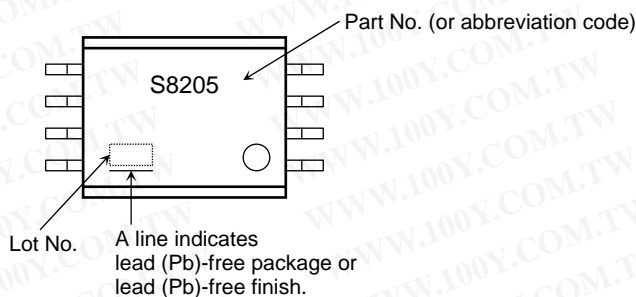
Circuit Configuration



Thermal Characteristics

| Characteristics | | Symbol | Max | Unit |
|---|---|----------------------------|-----|------|
| Thermal resistance, channel to ambient (t = 10s) | Single-device operation (Note 3a) | R _{th} (ch-a) (1) | 114 | °C/W |
| | Single-device value at dual operation (Note 3b) | R _{th} (ch-a) (2) | 250 | |
| Thermal resistance, channel to ambient (t = 10s) | Single-device operation (Note 3a) | R _{th} (ch-a) (1) | 208 | |
| | Single-device value at dual operation (Note 3b) | R _{th} (ch-a) (2) | 357 | |

Marking (Note 6)

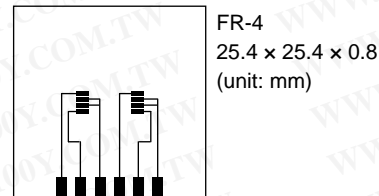
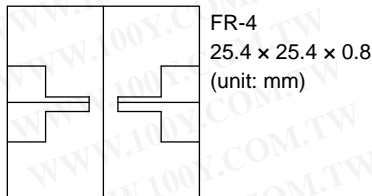


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Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:

- a) Device mounted on a glass-epoxy board (a) b) Device mounted on a glass-epoxy board (b)



Note 3:

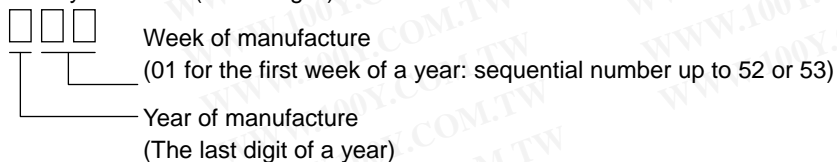
- a) The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.)
- b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both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

Note 4: V_{DD} = 16 V, T_{ch} = 25°C (Initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 5.0 A

Note 5: Repetitive rating: pulse width limited by maximum channel temperature

Note 6: ○ on lower right of the marking indicates Pin 1.

※ Weekly code: (Three digits)



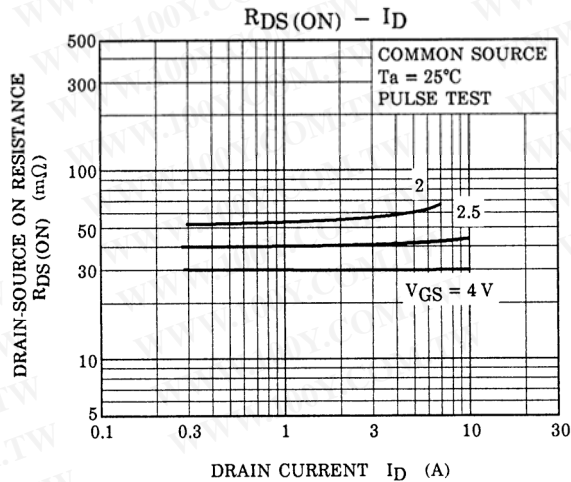
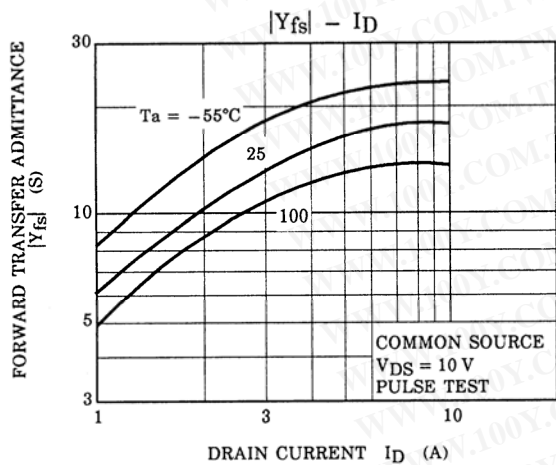
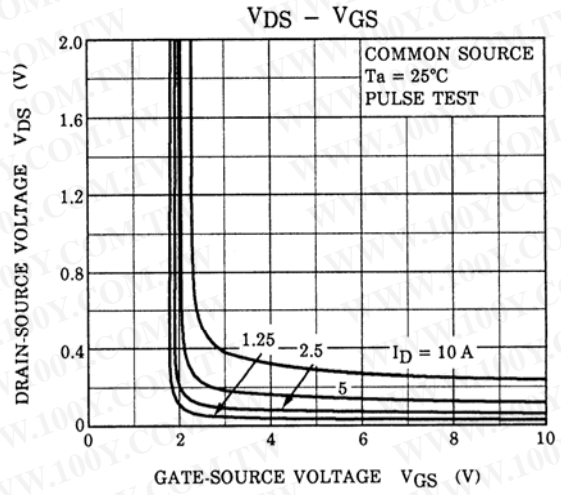
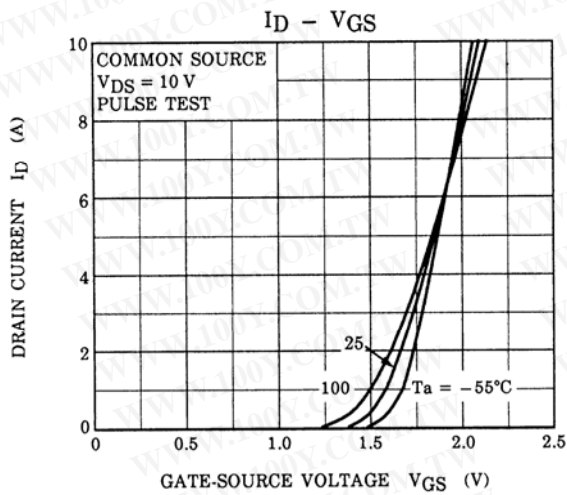
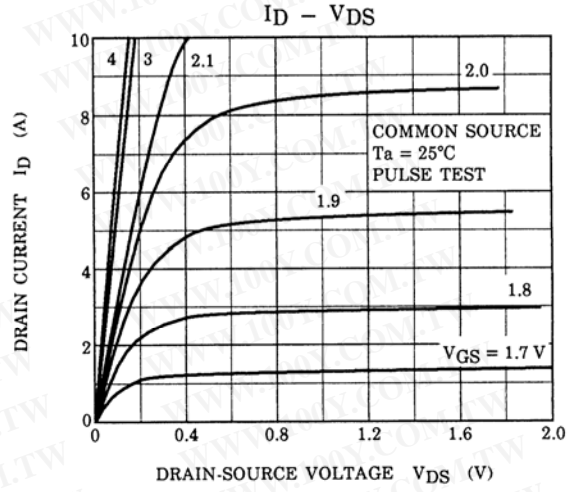
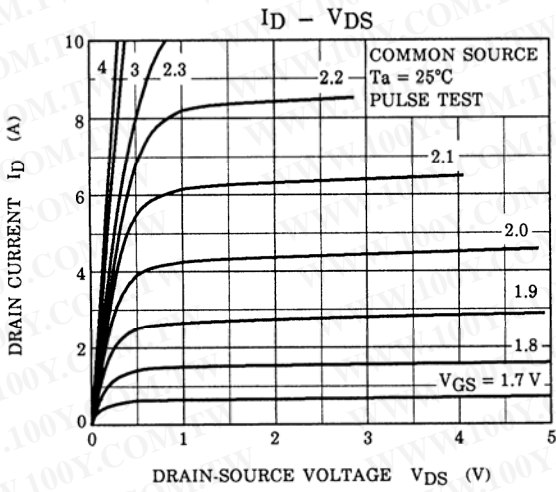
Electrical Characteristics (Ta = 25°C)

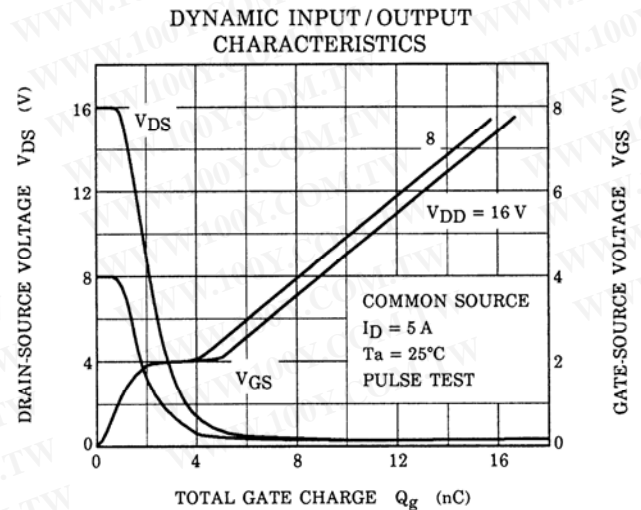
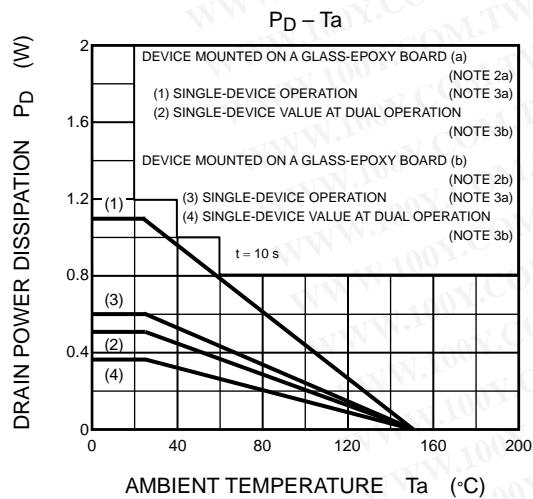
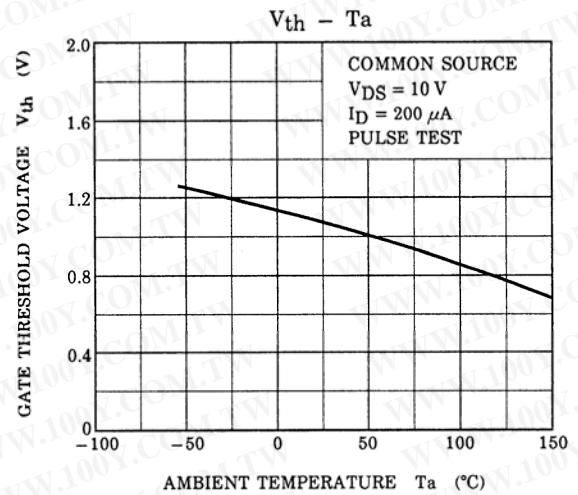
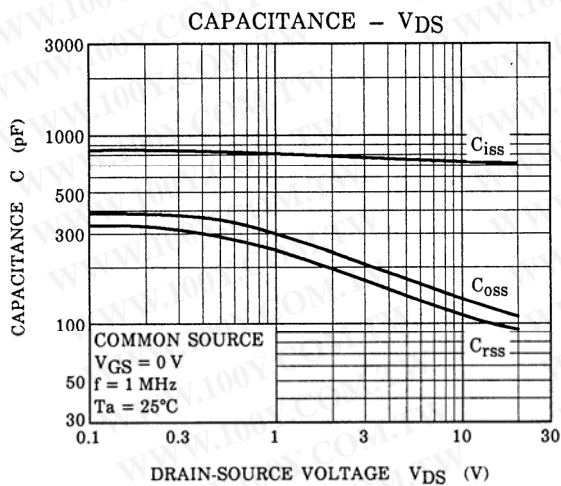
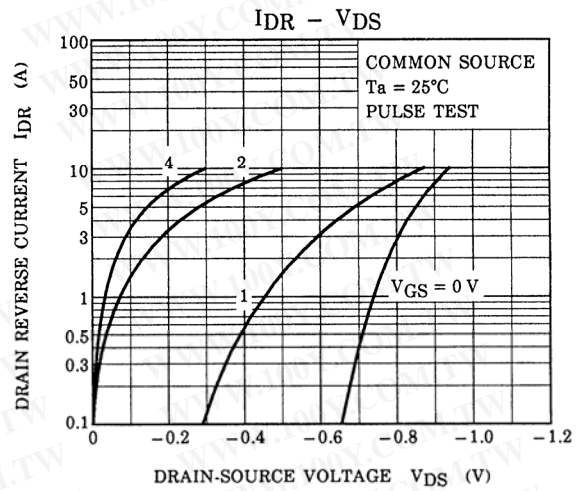
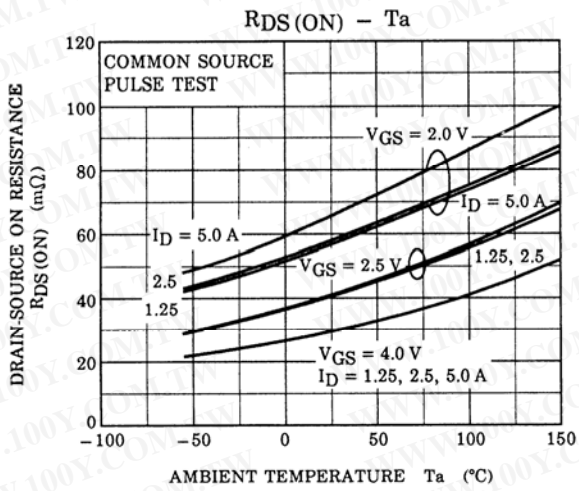
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|-----|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cut-OFF current | | I_{DSS} | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 20 | — | — | V |
| | | $V_{(BR)DSX}$ | $I_D = 10\text{ mA}, V_{GS} = -12\text{ V}$ | 8 | — | — | |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10\text{ V}, I_D = 200\text{ }\mu\text{A}$ | 0.5 | — | 1.2 | V |
| Drain-source ON resistance | | $R_{DS(ON)}$ | $V_{GS} = 2.0\text{ V}, I_D = 3.5\text{ A}$ | — | 60 | 90 | m Ω |
| | | $R_{DS(ON)}$ | $V_{GS} = 2.5\text{ V}, I_D = 3.5\text{ A}$ | — | 40 | 60 | |
| | | $R_{DS(ON)}$ | $V_{GS} = 4\text{ V}, I_D = 4\text{ A}$ | — | 30 | 45 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$ | 5 | 10 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 760 | — | pF |
| Reverse transfer capacitance | | C_{riss} | | — | 110 | — | pF |
| Output capacitance | | C_{oss} | | — | 130 | — | pF |
| Switching time | Rise time | t_r | <p>$I_D = 2.5\text{ A}$ $V_{GS} = 5\text{ V}$ 0 V 4.7Ω $V_{DD} \doteq 10\text{ V}$ $R_L = 4\Omega$ V_{OUT} $Duty \leq 1\%, t_w = 10\text{ }\mu\text{s}$</p> | — | 7 | — | ns |
| | Turn-ON time | t_{on} | | — | 13 | — | |
| | Fall time | t_f | | — | 13 | — | |
| | Turn-OFF time | t_{off} | | — | 49 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 16\text{ V}, V_{GS} = 5\text{ V}, I_D = 5\text{ A}$ | — | 11 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 8 | — | nC |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 3 | — | nC |

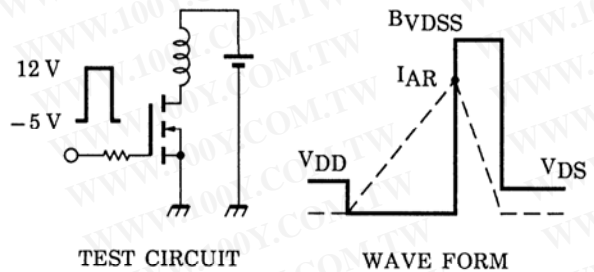
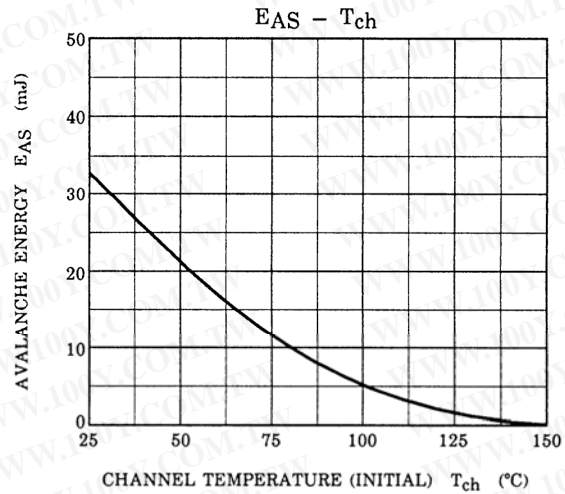
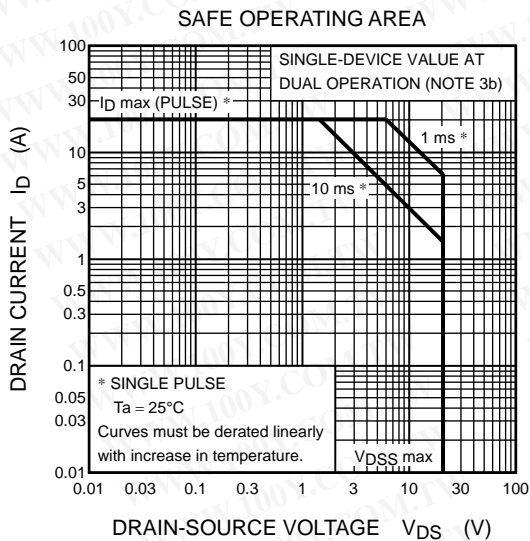
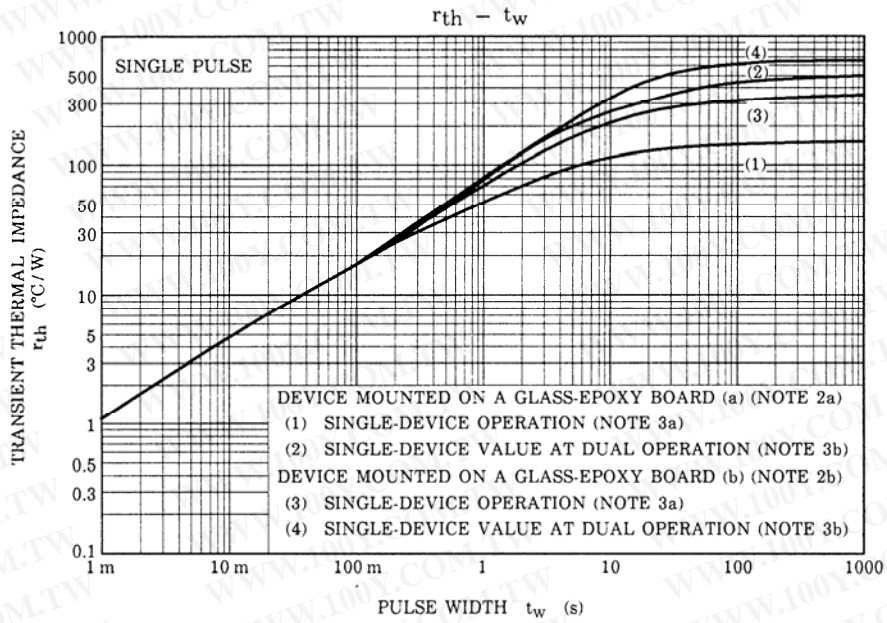
Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|--|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 20 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 5\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.2 | V |

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$T_{ch} = 25^\circ\text{C}$ (Initial)
 Peak $I_{AR} = 5\text{ A}$, $R_G = 25\ \Omega$
 $V_{DD} = 16\text{ V}$, $L = 1.0\text{ mH}$

$$EAS = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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