

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (HIGH SPEED U-MOS)

# TPC8005-H

HIGH SPEED AND HIGH EFFICIENCY DC-DC CONVERTERS

LITHIUM ION BATTERY APPLICATIONS

NOTE BOOK PC, PORTABLE EQUIPMENTS APPLICATIONS

INDUSTRIAL APPLICATIONS

Unit in mm

- High Speed Switching : 60% speed up  
(compare with current type)
- Small Gate Charge :  $Q_g = 20 \text{ nC}$  (Typ.)
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 13 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 16 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 10 \mu\text{A}$  (Max.) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = 1.3 \sim 2.5 \text{ V}$   
( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

| CHARACTERISTIC                               |       | SYMBOL           | RATING  | UNIT |
|----------------------------------------------|-------|------------------|---------|------|
| Drain-Source Voltage                         |       | V <sub>DSS</sub> | 30      | V    |
| Drain-Gate Voltage (R <sub>GS</sub> = 20 kΩ) |       | V <sub>DGR</sub> | 30      | V    |
| Gate-Source Voltage                          |       | V <sub>GSS</sub> | ±20     | V    |
| Drain Current                                | DC    | I <sub>D</sub>   | 11      | A    |
|                                              | Pulse | I <sub>DP</sub>  | 44      | A    |
| Drain Power Dissipation***<br>(Ta = 25°C)    |       | P <sub>D</sub>   | 2.4     | W    |
| Single Pulse Avalanche Energy**              |       | E <sub>AS</sub>  | 157     | mJ   |
| Avalanche Current                            |       | I <sub>AR</sub>  | 11      | A    |
| Repetitive Avalanche Energy*                 |       | E <sub>AR</sub>  | 0.24    | mJ   |
| Channel Temperature                          |       | T <sub>ch</sub>  | 150     | °C   |
| Storage Temperature Range                    |       | T <sub>stg</sub> | −55~150 | °C   |

## THERMAL CHARACTERISTICS

| CHARACTERISTIC                            | SYMBOL         | MAX. | UNIT               |
|-------------------------------------------|----------------|------|--------------------|
| Thermal Resistance, Channel to Ambient*** | $R_{th(ch-a)}$ | 52.1 | $^\circ\text{C/W}$ |

Note ;

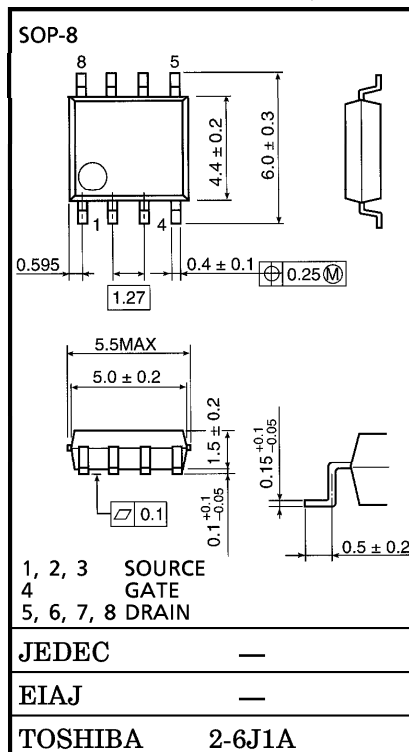
\* Repetitive rating ; Pulse Width Limited by Max. Junction Temperature.

\*\*  $V_{DD} = 24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 11 \text{ A}$ \*\*\* Drive operation ; Mount on glass epoxy board [ $1 \text{ inch}^2 \times 0.8 \text{ t}$ ] ( $t = 10 \text{ s}$ )

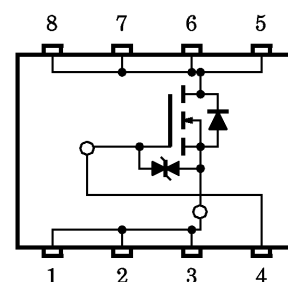
This transistor is an electrostatic sensitive device. Please handle with caution.

961001EAA1

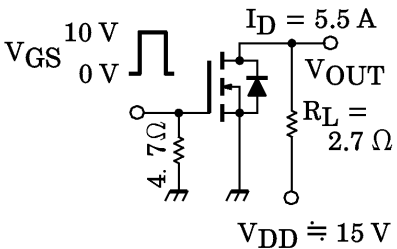
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## CIRCUIT CONFIGURATION



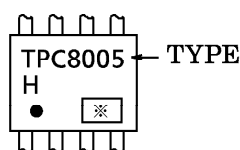
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                                  | SYMBOL         | TEST CONDITION                                                                                                                                                                                                                                                                              | MIN. | TYP. | MAX.     | UNIT             |
|-------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|------------------|
| Gate Leakage Current                            | $I_{GSS}$      | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$                                                                                                                                                                                                                                           | —    | —    | $\pm 10$ | $\mu\text{A}$    |
| Drain Cut-Off Current                           | $I_{DSS}$      | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                                                               | —    | —    | 10       | $\mu\text{A}$    |
| Drain-Source Breakdown Voltage                  | $V_{(BR) DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$                                                                                                                                                                                                                                                 | 30   | —    | —        | V                |
|                                                 | $V_{(BR) DSX}$ | $I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$                                                                                                                                                                                                                                               | 15   | —    | —        | V                |
| Gate Threshold Voltage                          | $V_{th}$       | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$                                                                                                                                                                                                                                                 | 1.3  | —    | 2.5      | V                |
| Drain-Source ON Resistance                      | $R_{DS(ON)}$   | $V_{GS} = 4.5 \text{ V}, I_D = 5.5 \text{ A}$                                                                                                                                                                                                                                               | —    | 23   | 27       | $\text{m}\Omega$ |
|                                                 | $R_{DS(ON)}$   | $V_{GS} = 10 \text{ V}, I_D = 5.5 \text{ A}$                                                                                                                                                                                                                                                | —    | 13   | 16       | $\text{m}\Omega$ |
| Forward Transfer Admittance                     | $ Y_{fs} $     | $V_{DS} = 10 \text{ V}, I_D = 5.5 \text{ A}$                                                                                                                                                                                                                                                | 8    | 16   | —        | S                |
| Input Capacitance                               | $C_{iss}$      | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                                                                                                                                                                                                                            | —    | 1150 | —        | pF               |
| Reverse Transfer Capacitance                    | $C_{rss}$      |                                                                                                                                                                                                                                                                                             | —    | 140  | —        |                  |
| Output Capacitance                              | $C_{oss}$      |                                                                                                                                                                                                                                                                                             | —    | 400  | —        |                  |
| Switching Time                                  | Rise Time      |  <p><math>V_{GS} = 10 \text{ V}, 0 \text{ V}</math><br/> <math>I_D = 5.5 \text{ A}</math><br/> <math>V_{OUT}</math><br/> <math>R_L = 2.7 \Omega</math><br/> <math>V_{DD} \approx 15 \text{ V}</math></p> | —    | 4    | —        | ns               |
|                                                 | Turn-On Time   |                                                                                                                                                                                                                                                                                             | —    | 12   | —        |                  |
|                                                 | Fall Time      |                                                                                                                                                                                                                                                                                             | —    | 8    | —        |                  |
|                                                 | Turn-Off Time  |                                                                                                                                                                                                                                                                                             | —    | 40   | —        |                  |
| Total Gate Charge (Gate-Source Plus Gate-Drain) | $Q_g$          | $V_{DD} \approx 24 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 11 \text{ A}$                                                                                                                                                                                                                    | —    | 20   | —        | nC               |
| Gate-Source Charge                              | $Q_{gs}$       |                                                                                                                                                                                                                                                                                             | —    | 15   | —        |                  |
| Gate-Drain ("Miller") Charge                    | $Q_{gd}$       |                                                                                                                                                                                                                                                                                             | —    | 5    | —        |                  |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                   | SYMBOL    | TEST CONDITION                                | MIN. | TYP. | MAX. | UNIT |
|----------------------------------|-----------|-----------------------------------------------|------|------|------|------|
| Continuous Drain Reverse Current | $I_{DR}$  | —                                             | —    | —    | 11   | A    |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —                                             | —    | —    | 44   | A    |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = 11 \text{ A}, V_{GS} = 0 \text{ V}$ | —    | —    | -1.2 | V    |

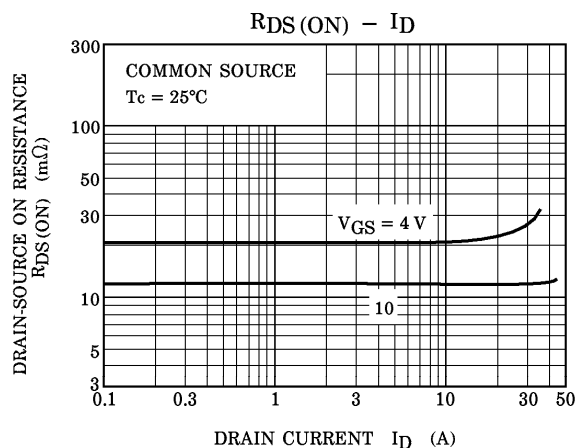
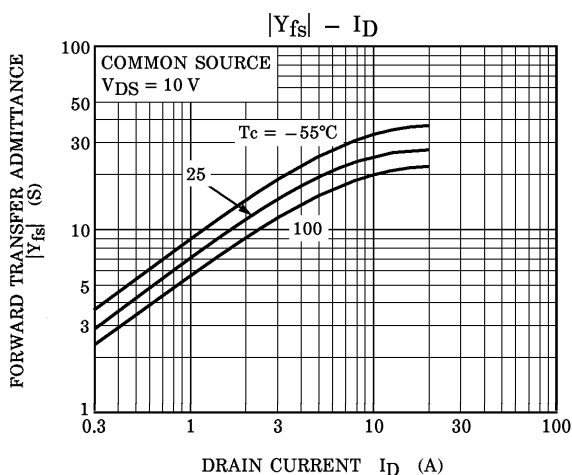
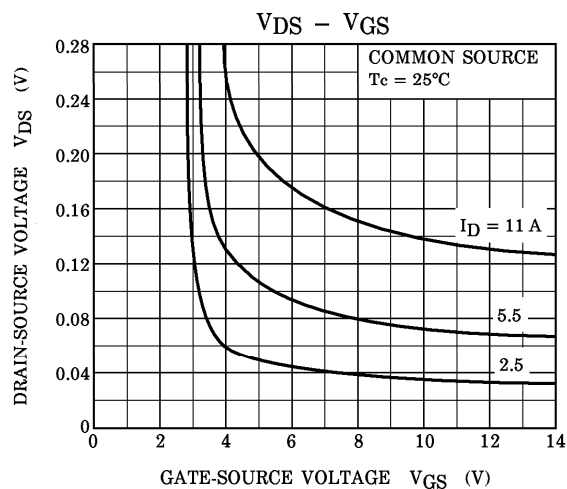
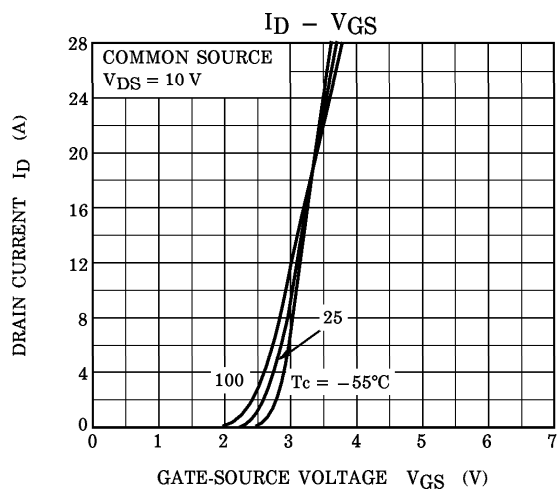
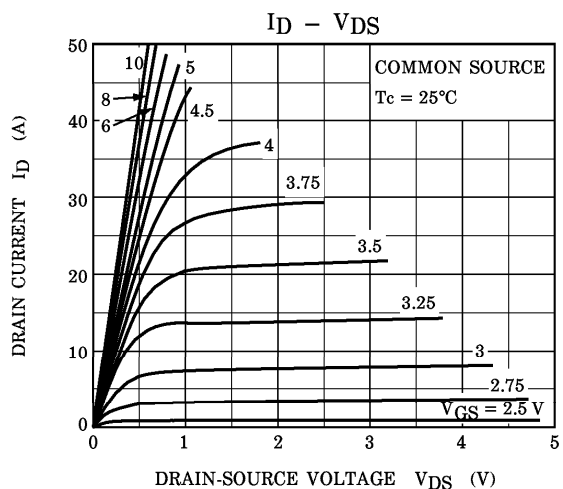
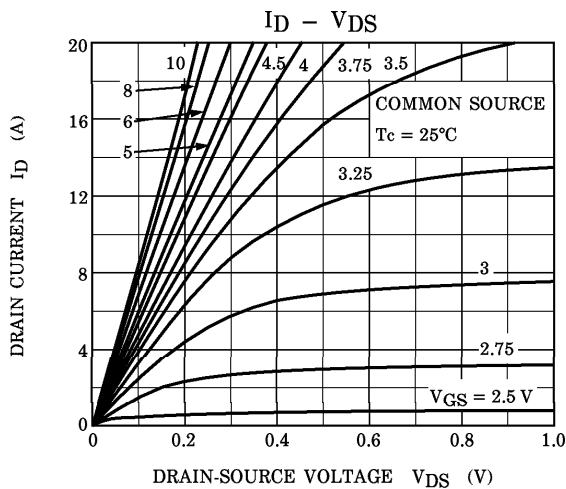
## MARKING

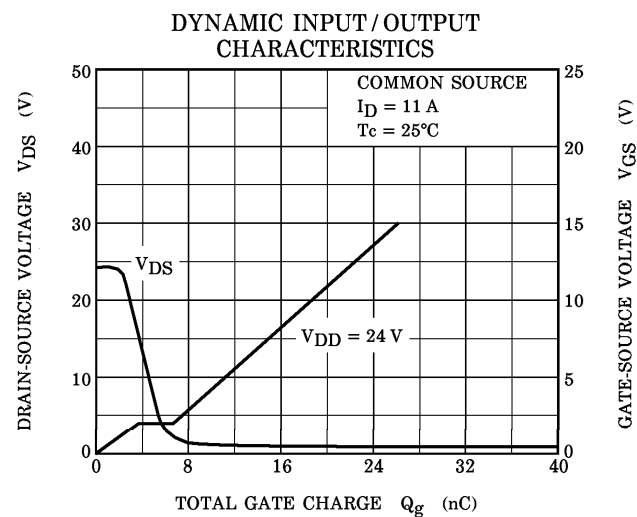
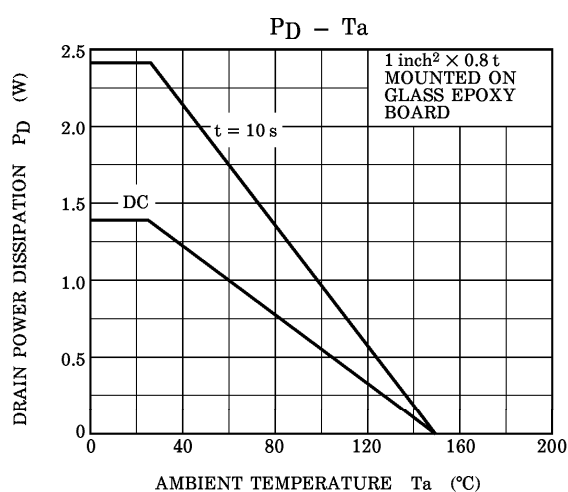
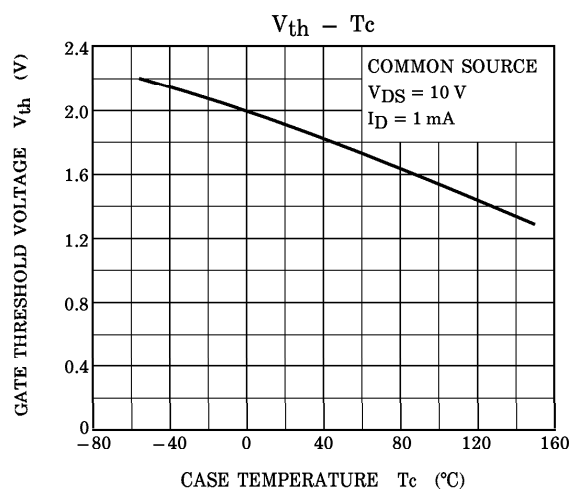
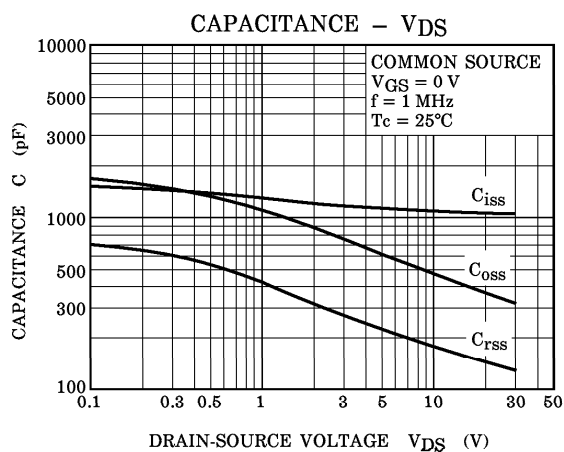
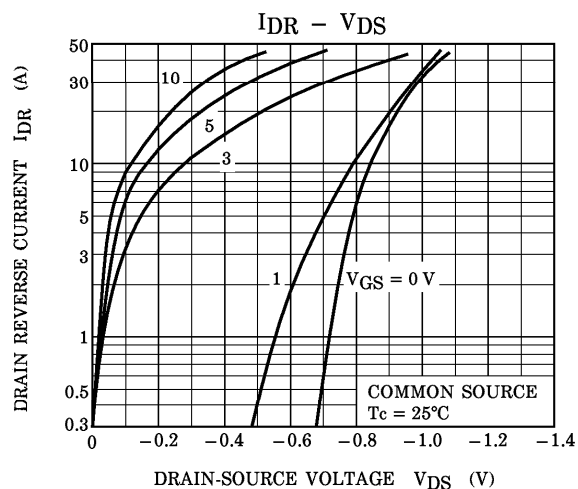
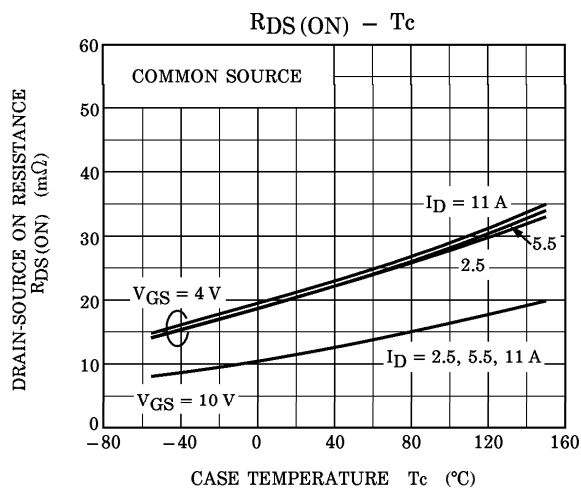


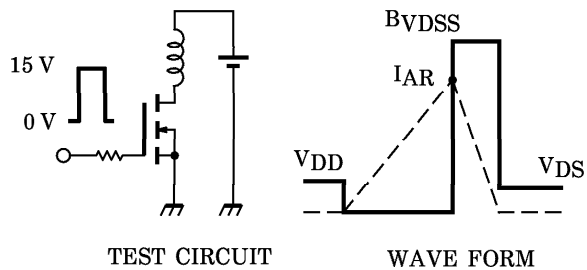
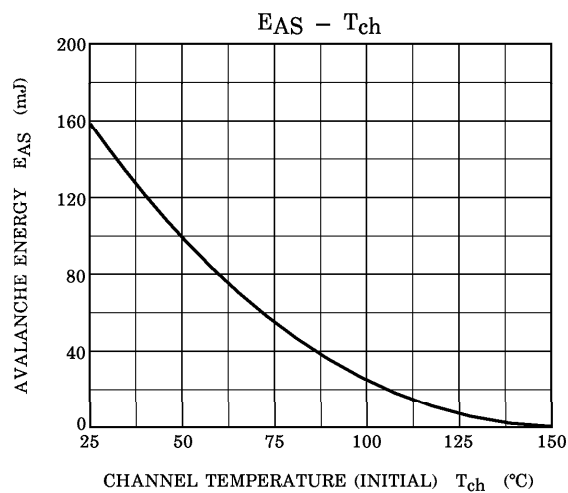
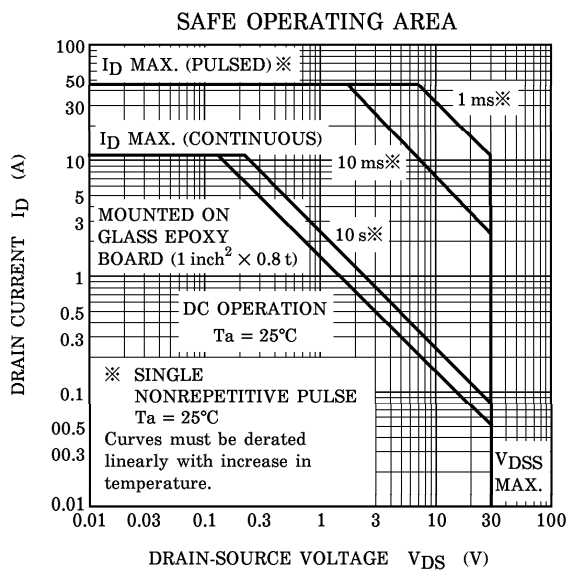
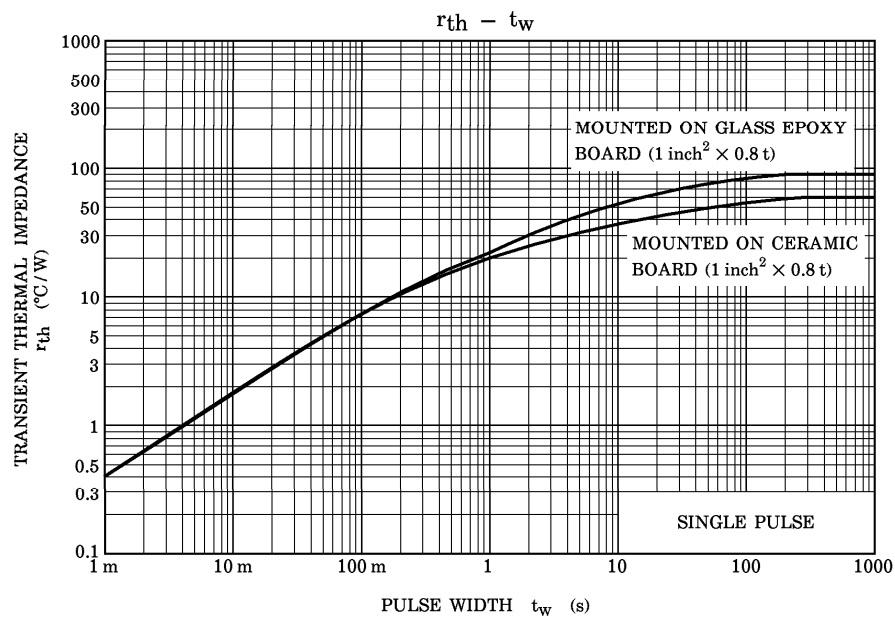
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







Peak  $I_{AR} = 11\text{ A}$ ,  $R_G = 25\ \Omega$   
 $V_{DD} = 24\text{ V}$ ,  $L = 1.0\text{ mH}$

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