

**TOSHIBA****MP4711**TOSHIBA POWER MOS FET MODULE SILICON N CHANNEL MOS TYPE (L<sup>2</sup>-π-MOS V 4 IN 1)**MP4711**

HIGH POWER, HIGH SPEED SWITCHING APPLICATIONS  
FOR PRINTER HEAD PIN DRIVER AND PULSE MOTOR DRIVER  
FOR SOLENOID DRIVER

- 4 V Gate Drive Available
- Package with Heat Sink Isolated to Lead (SIP 12 Pin)
- High Drain Power Dissipation (4 Devices Operation)  
:  $P_T = 36 \text{ W}$  ( $T_c = 25^\circ\text{C}$ )
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.17 \Omega$  (typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 4.5 \text{ S}$  (typ.)
- Low Leakage Current :  $I_{GSS} = \pm 10 \mu\text{A}$  (max.) ( $V_{GS} = \pm 16 \text{ V}$ )  
 $I_{DSS} = 100 \mu\text{A}$  (max.) ( $V_{DS} = 100 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = 0.8 \sim 2.0 \text{ V}$   
( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

| CHARACTERISTIC                                                             |                          | SYMBOL    | RATING         | UNIT             |
|----------------------------------------------------------------------------|--------------------------|-----------|----------------|------------------|
| Drain-Source Voltage                                                       |                          | $V_{DSS}$ | 100            | V                |
| Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )                       |                          | $V_{DGR}$ | 100            | V                |
| Gate-Source Voltage                                                        |                          | $V_{GSS}$ | $\pm 20$       | V                |
| Drain Current                                                              | DC                       | $I_D$     | 5              | A                |
|                                                                            | Pulse                    | $I_{DP}$  | 20             |                  |
| Drain Power Dissipation<br>(1 Device Operation, $T_a = 25^\circ\text{C}$ ) |                          | $P_D$     | 3.0            | W                |
| Drain Power Dissipation<br>(4 Devices Operation)                           | $T_a = 25^\circ\text{C}$ | $P_{DT}$  | 5.0            | W                |
|                                                                            | $T_c = 25^\circ\text{C}$ |           | 36             |                  |
| Single Pulse Avalanche Energy*                                             |                          | $E_{AS}$  | 180            | mJ               |
| Avalanche Current                                                          |                          | $I_{AR}$  | 5              | A                |
| Repetitive Avalanche<br>Energy**                                           | 1 Device<br>Operation    | $E_{AR}$  | 0.3            | mJ               |
|                                                                            | 4 Devices<br>Operation   | $E_{ART}$ | 0.5            |                  |
| Channel Temperature                                                        |                          | $T_{ch}$  | 150            | $^\circ\text{C}$ |
| Storage Temperature Range                                                  |                          | $T_{stg}$ | $-55 \sim 150$ | $^\circ\text{C}$ |

Note ;

\* Avalanche energy (single pulse) applied condition

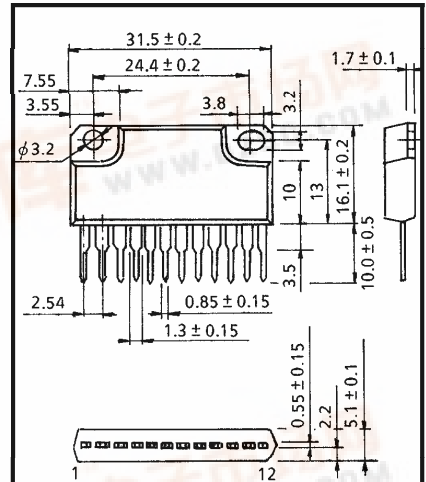
 $V_{DD} = 25 \text{ V}$ , Starting  $T_{ch} = 25^\circ\text{C}$ ,  $L = 11.6 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 5 \text{ A}$ 

\*\* Repetitive rating; Pulse Width Limited by maximum channel temperature.

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

INDUSTRIAL APPLICATIONS

Unit in mm



MOS FET

1, 5, 8, 12 GATE  
2, 4, 9, 11 DRAIN  
6, 7 SOURCE

DIODE

2, 4, 9, 11 ANODE  
3, 10 CATHODE

JEDEC

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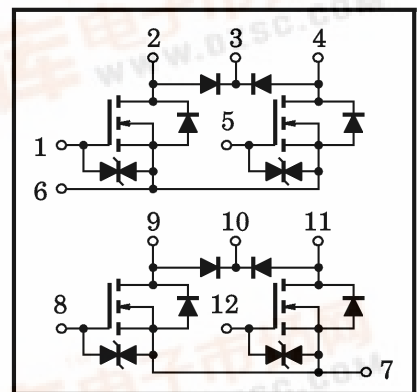
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TOSHIBA 2-32B1G

Weight : 6.0 g (typ.)

ARRAY CONFIGURATION



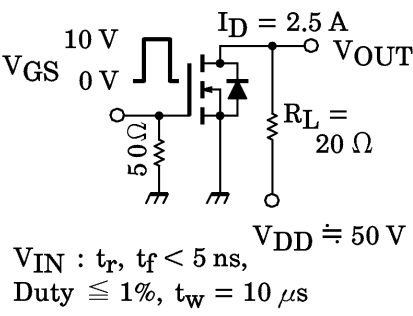
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## THERMAL CHARACTERISTICS

| CHARACTERISTIC                                                                               | SYMBOL                | MAX. | UNIT                      |
|----------------------------------------------------------------------------------------------|-----------------------|------|---------------------------|
| Thermal Resistance of Channel to Ambient (4 Devices Operation, $T_a = 25^\circ\text{C}$ )    | $\Sigma R_{th(ch-a)}$ | 25   | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance of Channel to Case (4 Devices Operation, $T_c = 25^\circ\text{C}$ )       | $\Sigma R_{th(ch-c)}$ | 3.47 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes<br>(3.2 mm from Case for $t = 10\text{ s}$ ) | $T_L$                 | 260  | $^\circ\text{C}$          |

ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

| 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                              |               | $I_{DSS}$     | $V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$                                                                                                                                                                                                                                                                                   | —    | —    | 100      | $\mu\text{A}$ |
| Drain-Source Breakdown Voltage                     |               | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}$ , $V_{GS} = 0\text{ V}$                                                                                                                                                                                                                                                                                      | 100  | —    | —        | V             |
| Gate Threshold Voltage                             |               | $V_{th}$      | $V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$                                                                                                                                                                                                                                                                                      | 0.8  | —    | 2.0      | V             |
| Drain-Source ON Resistance                         |               | $R_{DS(ON)}$  | $V_{GS} = 4\text{ V}$ , $I_D = 2.5\text{ A}$                                                                                                                                                                                                                                                                                      | —    | 0.22 | 0.30     | $\Omega$      |
|                                                    |               |               | $V_{GS} = 10\text{ V}$ , $I_D = 2.5\text{ A}$                                                                                                                                                                                                                                                                                     | —    | 0.17 | 0.23     |               |
| Forward Transfer Admittance                        |               | $ Y_{fs} $    | $V_{DS} = 10\text{ V}$ , $I_D = 2.5\text{ A}$                                                                                                                                                                                                                                                                                     | 2.0  | 4.5  | —        | S             |
| Input Capacitance                                  |               | $C_{iss}$     | $V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$<br>$f = 1\text{ MHz}$                                                                                                                                                                                                                                                              | —    | 500  | —        | pF            |
| Reverse Transfer Capacitance                       |               | $C_{rss}$     |                                                                                                                                                                                                                                                                                                                                   | —    | 80   | —        |               |
| Output Capacitance                                 |               | $C_{oss}$     |                                                                                                                                                                                                                                                                                                                                   | —    | 190  | —        |               |
| Switching Time                                     | Rise Time     | $t_r$         |  <p><math>I_D = 2.5\text{ A}</math><br/><math>R_L = 20\ \Omega</math><br/><math>V_{DD} \approx 50\text{ V}</math><br/><math>V_{IN} : t_r, t_f &lt; 5\text{ ns}</math>,<br/>Duty <math>\leq 1\%</math>, <math>t_w = 10\ \mu\text{s}</math></p> | —    | 17   | —        | ns            |
|                                                    | Turn-on Time  | $t_{on}$      |                                                                                                                                                                                                                                                                                                                                   | —    | 25   | —        |               |
|                                                    | Fall Time     | $t_f$         |                                                                                                                                                                                                                                                                                                                                   | —    | 50   | —        |               |
|                                                    | Turn-off Time | $t_{off}$     |                                                                                                                                                                                                                                                                                                                                   | —    | 195  | —        |               |
| Total Gate Charge<br>(Gate-Source Plus Gate-Drain) |               | $Q_g$         | $V_{DD} \approx 80\text{ V}$ , $V_{GS} = 10\text{ V}$<br>$I_D = 5\text{ A}$                                                                                                                                                                                                                                                       | —    | 22   | —        | nC            |
| Gate-Source Charge                                 |               | $Q_{gs}$      |                                                                                                                                                                                                                                                                                                                                   | —    | 15   | —        |               |
| Gate-Drain ("Miller") Charge                       |               | $Q_{gd}$      |                                                                                                                                                                                                                                                                                                                                   | —    | 7    | —        |               |

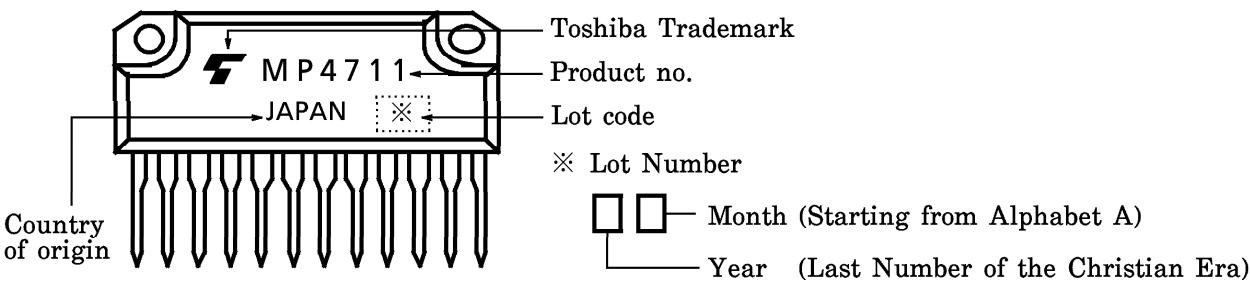
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

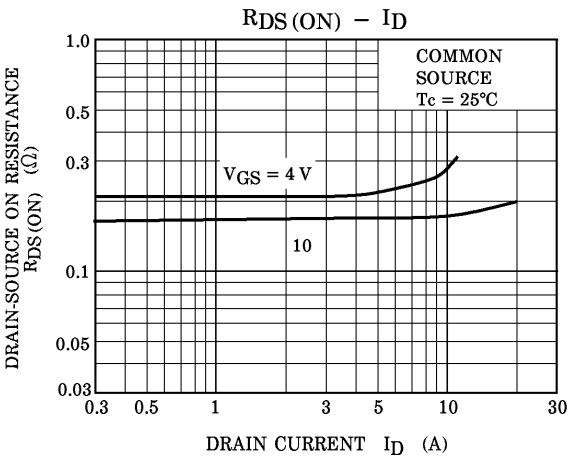
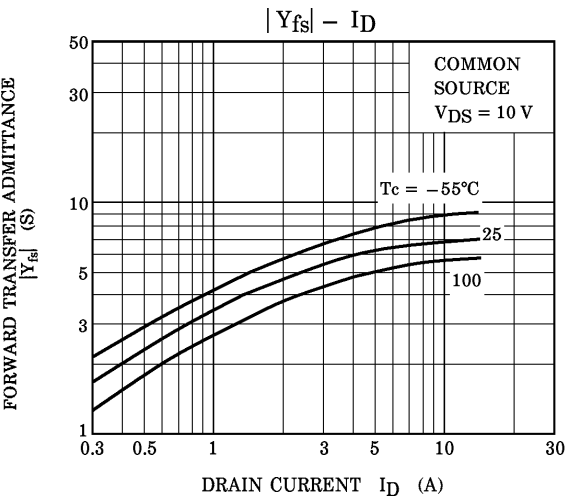
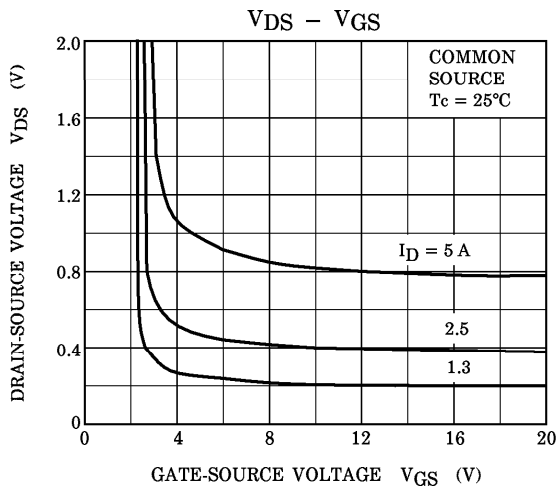
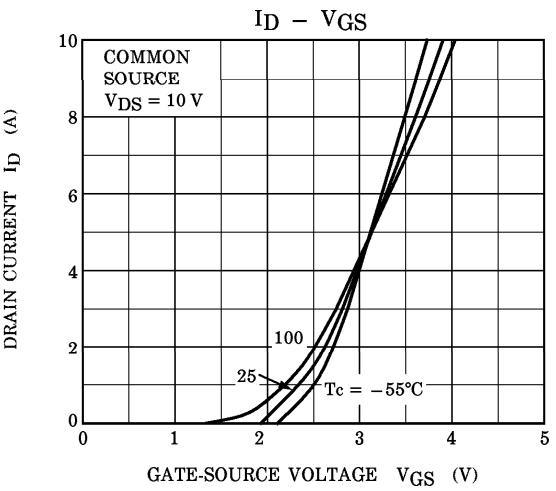
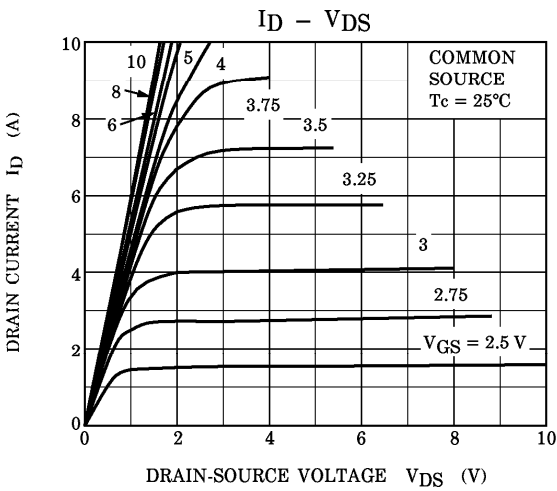
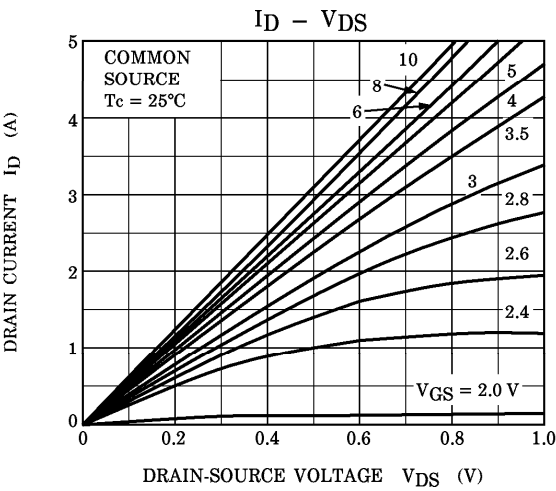
| CHARACTERISTIC                   | SYMBOL    | TEST CONDITION                                | MIN. | TYP. | MAX. | UNIT          |
|----------------------------------|-----------|-----------------------------------------------|------|------|------|---------------|
| Continuous Drain Reverse Current | $I_{DR}$  | —                                             | —    | —    | 5    | A             |
| Pulse Drain Reverse Current      | $I_{DRP}$ | —                                             | —    | —    | 20   | A             |
| Diode Forward Voltage            | $V_{DSF}$ | $I_{DR} = 5\text{ A}$ , $V_{GS} = 0\text{ V}$ | —    | —    | —1.7 | V             |
| Reverse Recovery Time            | $t_{rr}$  | $I_{DR} = 5\text{ A}$ , $V_{GS} = 0\text{ V}$ | —    | 160  | —    | ns            |
| Reverse Recovery Charge          | $Q_{rr}$  | $dI_{DR}/dt = 50\text{ A}/\mu\text{s}$        | —    | 0.28 | —    | $\mu\text{C}$ |

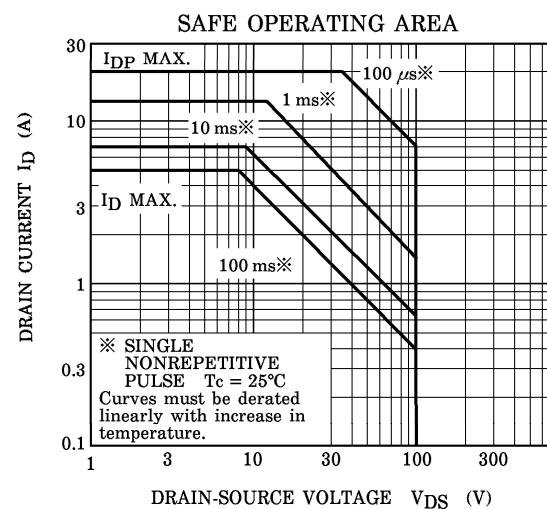
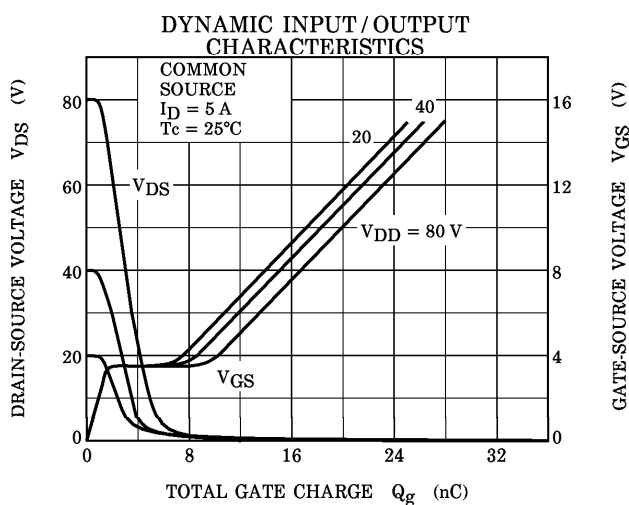
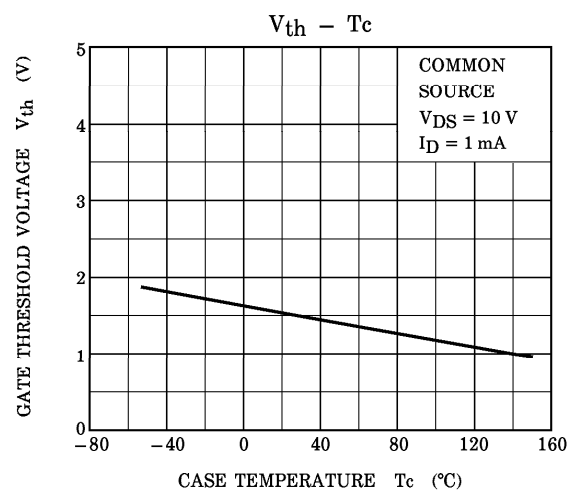
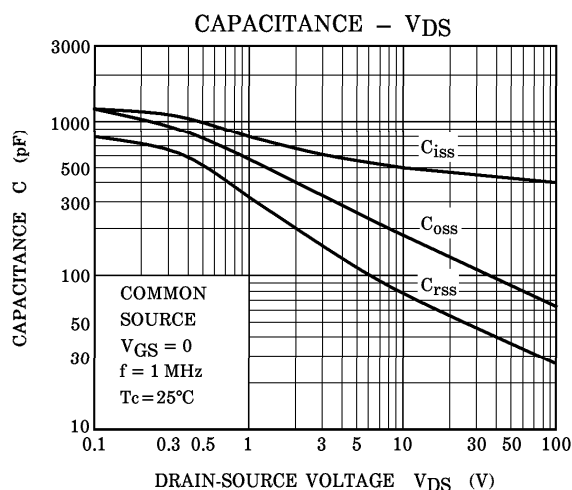
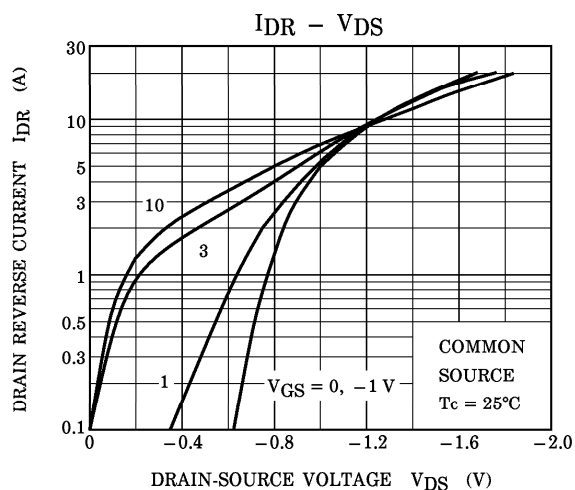
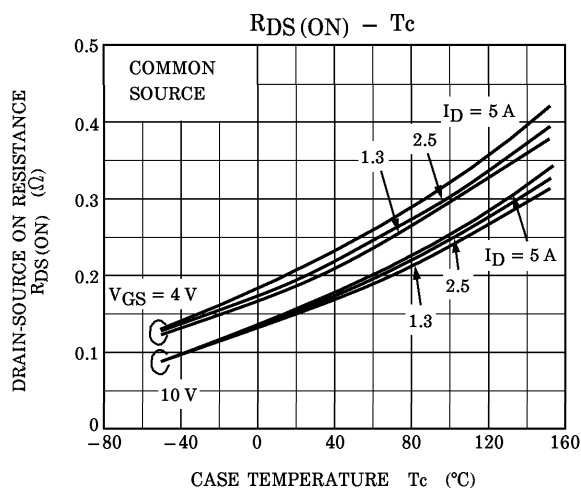
FLYBACK-DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

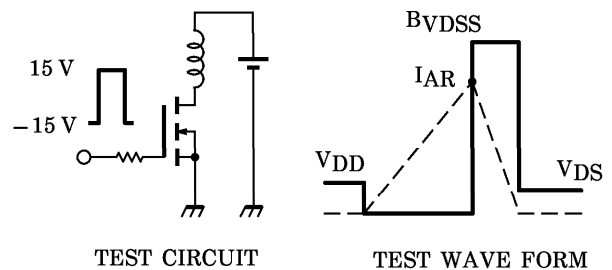
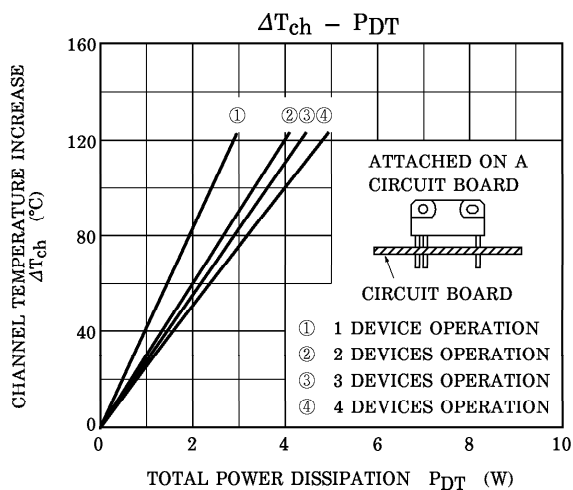
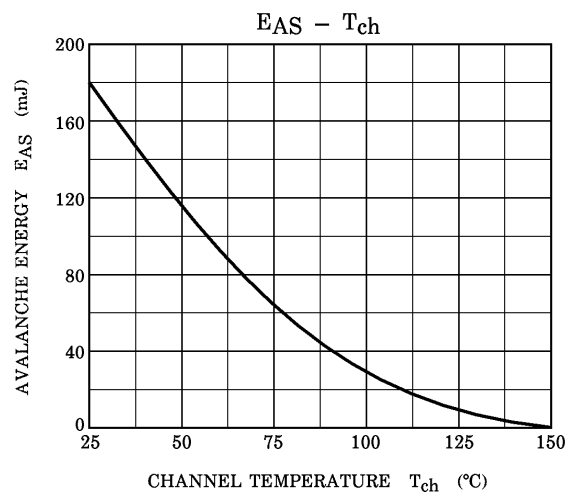
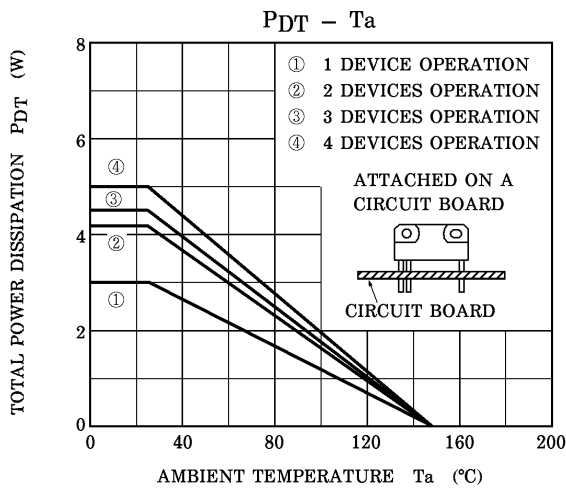
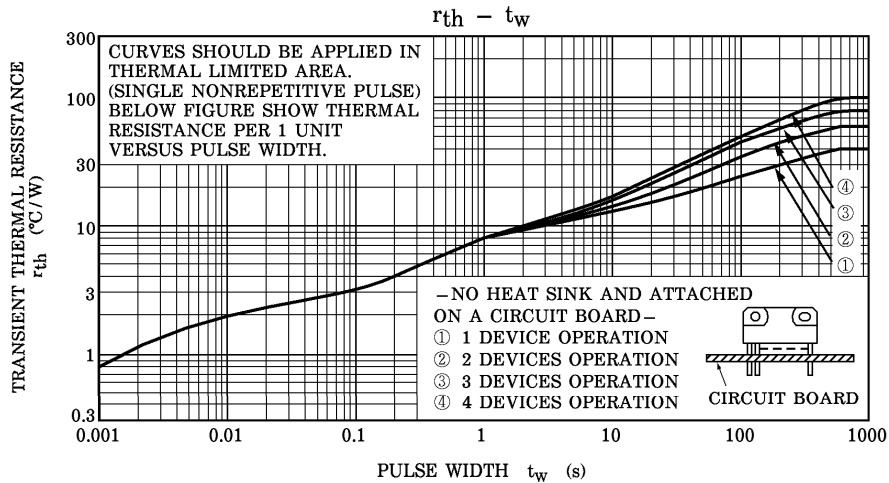
| CHARACTERISTIC  | SYMBOL   | TEST CONDITION                 | MIN. | TYP. | MAX. | UNIT          |
|-----------------|----------|--------------------------------|------|------|------|---------------|
| Forward Current | $I_{FM}$ | —                              | —    | —    | 5    | A             |
| Reverse Current | $I_R$    | $V_R = 100\text{ V}$           | —    | —    | 0.4  | $\mu\text{A}$ |
| Reverse Voltage | $V_R$    | $I_R = 100\text{ }\mu\text{A}$ | 100  | —    | —    | V             |
| Forward Voltage | $V_F$    | $I_F = 2\text{ A}$             | —    | —    | 2.3  | V             |

MARKING









Peak  $I_{AR} = 5 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 25 \text{ V}$ ,  $L = 11.6 \text{ mH}$

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