TOSHIBA GTR MODULE SILICON N CHANNEL IGBT

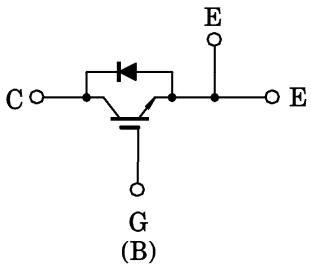
# MG300Q1US51

HIGH POWER SWITCHING APPLICATIONS

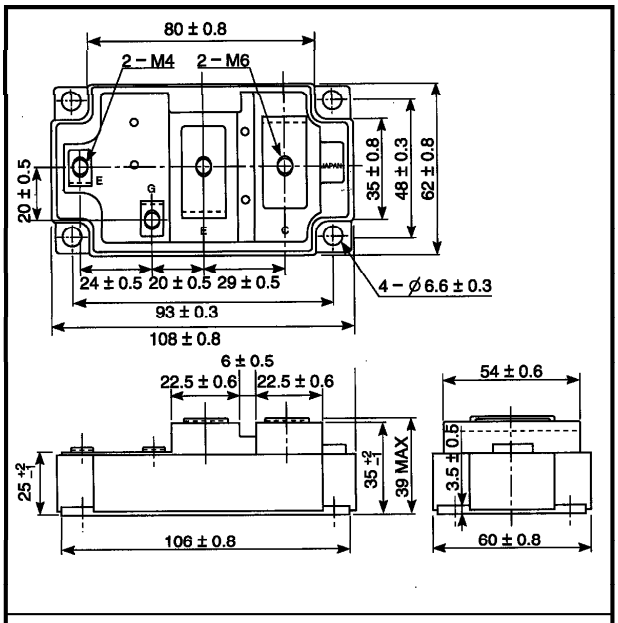
MOTOR CONTROL APPLICATIONS

- High Input Impedance
- High Speed : $t_f = 0.3\mu s$ (Max.) @Inductive Load
- Low Saturation Voltage : $V_{CE\,(sat)} = 3.6V$ (Max.)
- Enhancement-Mode
- The Electrodes are Isolated from Case.

EQUIVALENT CIRCUIT




Unit in mm




| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 2-109F1A |

Weight : 465g

MAXIMUM RATINGS (Ta = 25°C)

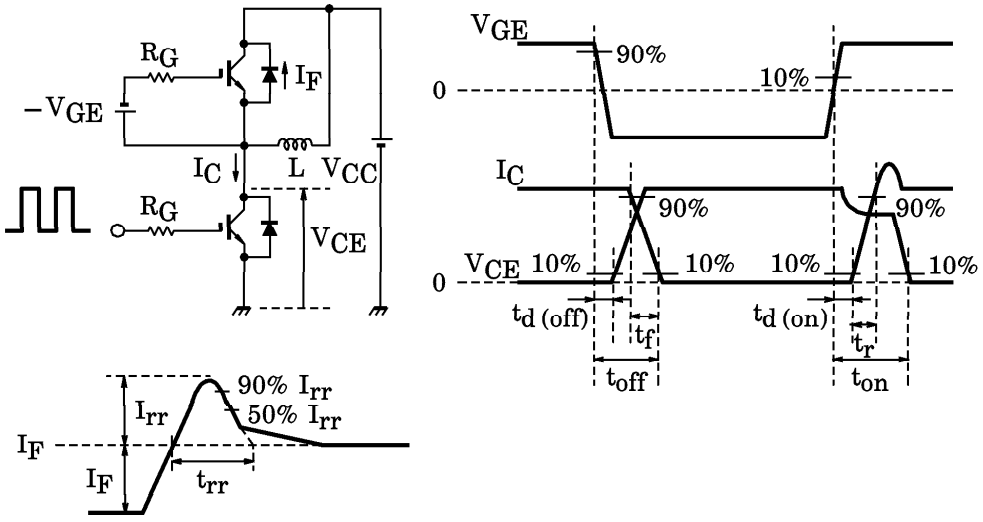
| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Collector-Emitter Voltage | | $V_{CES}$ | 1200 | V |
| Gate-Emitter Voltage | | $V_{GES}$ | ±20 | V |
| Collector Current | DC | $I_C$ (25°C / 80°C) | 400 / 300 | A |
| | 1ms | $I_{CP}$ (25°C / 80°C) | 800 / 600 | |
| Forward Current | DC | $I_F$ | 300 | A |
| | 1ms | $I_{FM}$ | 600 | |
| Collector Power Dissipation (Tc = 25°C) | | $P_C$ | 2500 | W |
| Junction Temperature | | $T_j$ | 150 | °C |
| Storage Temperature Range | | $T_{stg}$ | −40~125 | °C |
| Isolation Voltage | | $V_{Isol}$ | 2500 (AC 1 minute) | V |
| Screw Torque (Terminal : M4 / M6 / Mounting) | | — | 2 / 3 / 3 | N·m |

961001EAA2

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

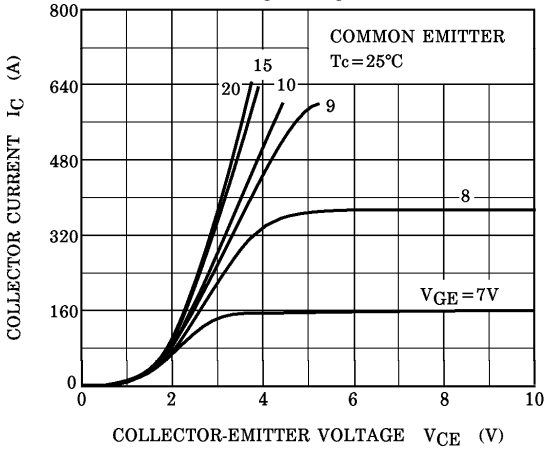
| CHARACTERISTIC | | SYMBOL | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| Gate Leakage Current | | $I_{GES}$ | $V_{GE}=\pm20V$, $V_{CE}=0$ | | — | — | ±500 | nA |
| Collector Cut-off Current | | $I_{CES}$ | $V_{CE}=1200V$, $V_{GE}=0$ | | — | — | 4.0 | mA |
| Gate-Emitter Cut-off Voltage | | $V_{GE\ (off)}$ | $I_C=300mA$, $V_{CE}=5V$ | | 3.0 | — | 6.0 | V |
| Collector-Emitter Saturation Voltage | | $V_{CE\ (sat)}$ | $I_C=300A$, $V_{GE}=15V$ | $T_j=25°C$ | — | 2.8 | 3.6 | V |
| | | | | $T_j=125°C$ | — | 3.1 | 4.0 | |
| Input Capacitance | | $C_{ies}$ | $V_{CE}=10V$, $V_{GE}=0$, f=1MHz | | — | 36.0 | — | nF |
| Switching Time | Turn-on Delay Time | $t_{d\ (on)}$ | Inductive Load $V_{CC}=600V$ $I_C=300A$ $V_{GE}=\pm15V$ $R_G=2.7\Omega$ (Note 1) | | — | 0.05 | — | μs |
| | Rise Time | $t_r$ | | | — | 0.05 | — | |
| | Turn-on Time | $t_{on}$ | | | — | 0.2 | — | |
| | Turn-off Delay Time | $t_{d\ (off)}$ | | | — | 0.5 | — | |
| | Fall Time | $t_f$ | | | — | 0.1 | 0.3 | |
| | Turn-off Time | $t_{off}$ | | | — | 0.6 | — | |
| Forward Voltage | | $V_F$ | $I_F=300A$, $V_{GE}=0$ | | — | 2.4 | 3.5 | V |
| Reverse Recovery Time | | $t_{rr}$ | $I_F=300A$, $V_{GE}=-10V$ $di/dt=1000A/\mu s$ (Note 1) | | — | 0.25 | 0.4 | μs |
| Thermal Resistance | | $R_{th\ (j-c)}$ | Transistor Stage | | — | — | 0.05 | °C / W |
| | | | Diode Stage | | — | — | 0.12 | |

(Note 1) Switching Time and Reverse Recovery Time Test Circuit & Timing Chart

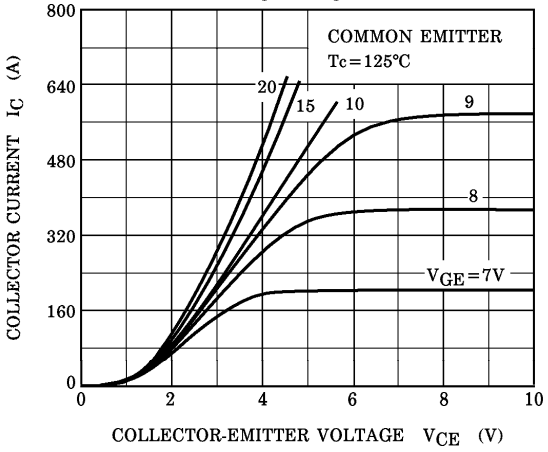



961001EAA2'

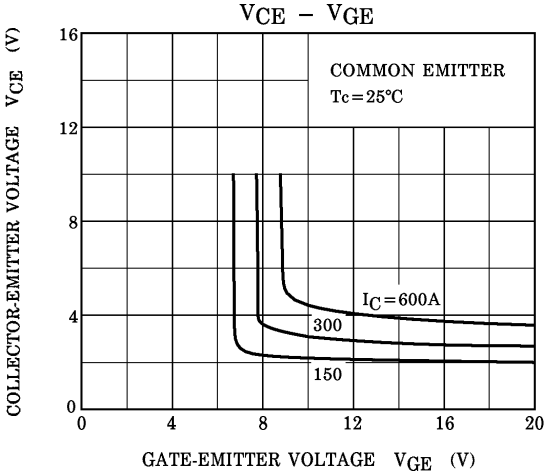
$I_C$ – $V_{CE}$



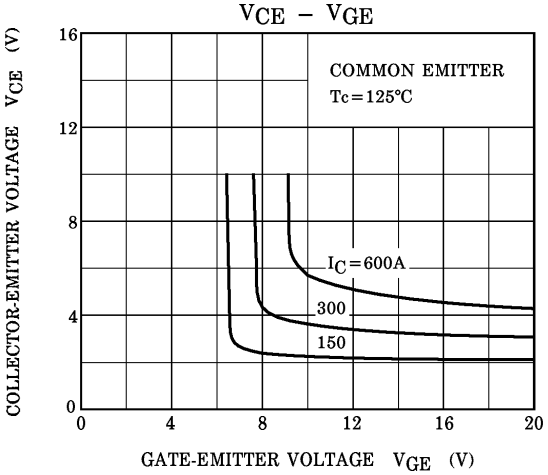

$I_C$ – $V_{CE}$



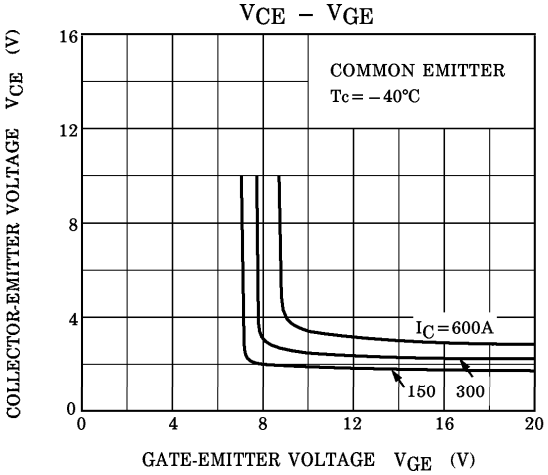

$V_{CE}$ – $V_{GE}$



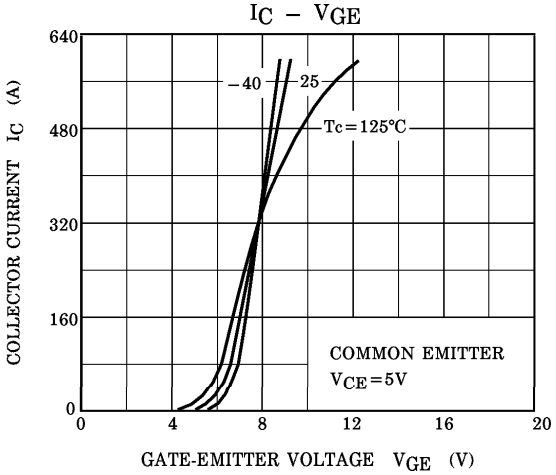

$V_{CE}$ – $V_{GE}$



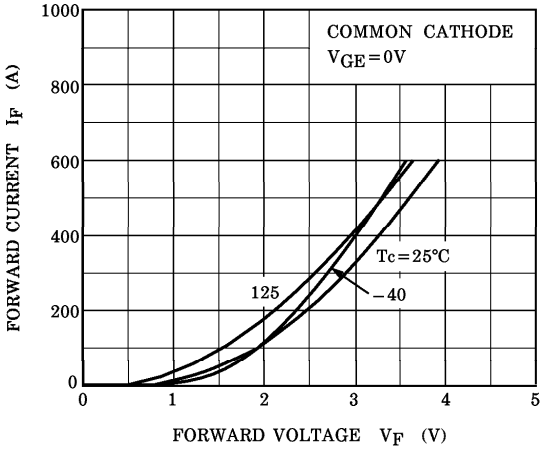

$V_{CE}$ – $V_{GE}$



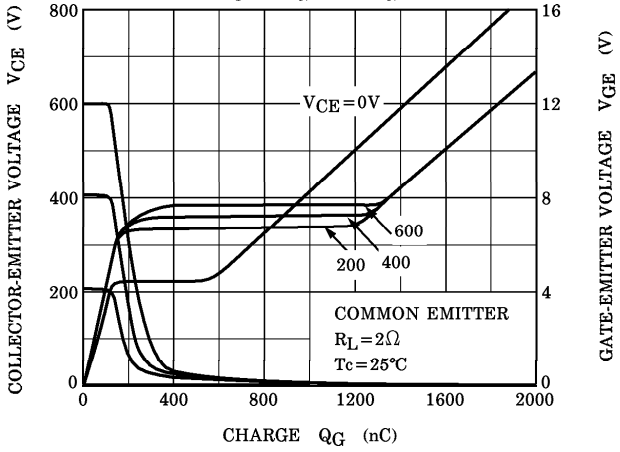

$I_C$ – $V_{GE}$



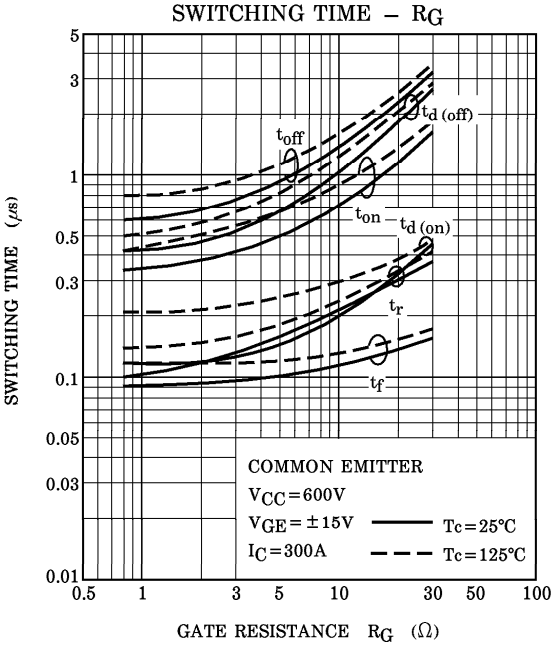
$I_F$ – $V_F$



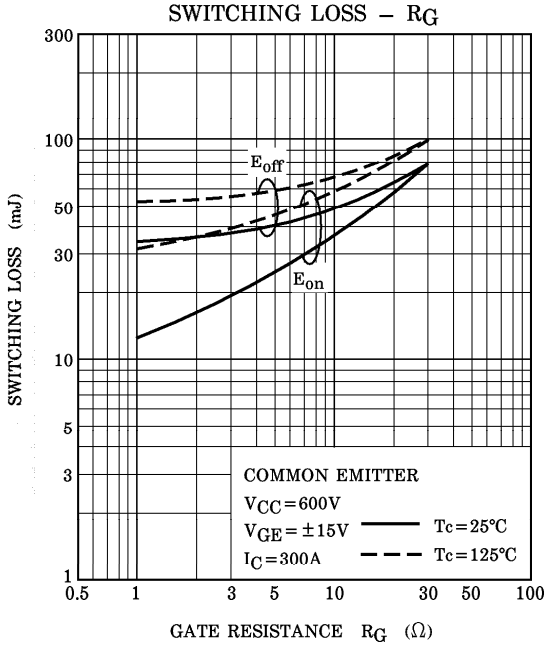

$V_{CE}$, $V_{GE}$ – $Q_G$



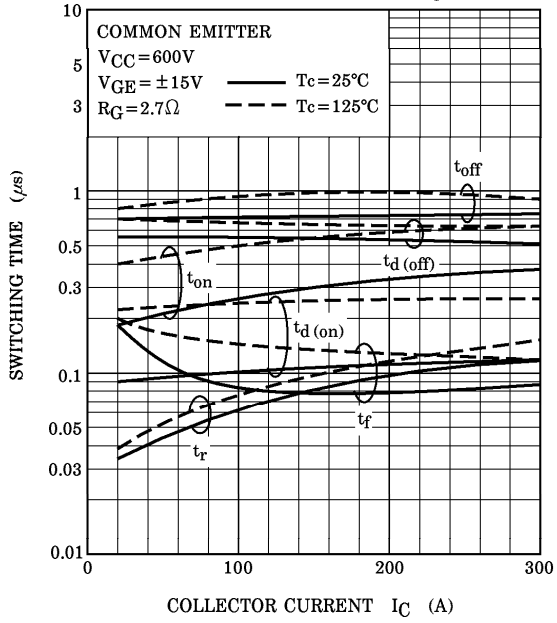

SWITCHING TIME – $R_G$



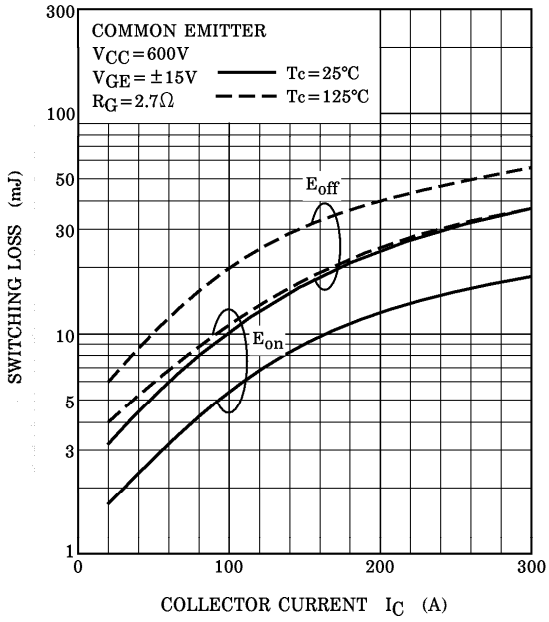

SWITCHING LOSS – $R_G$



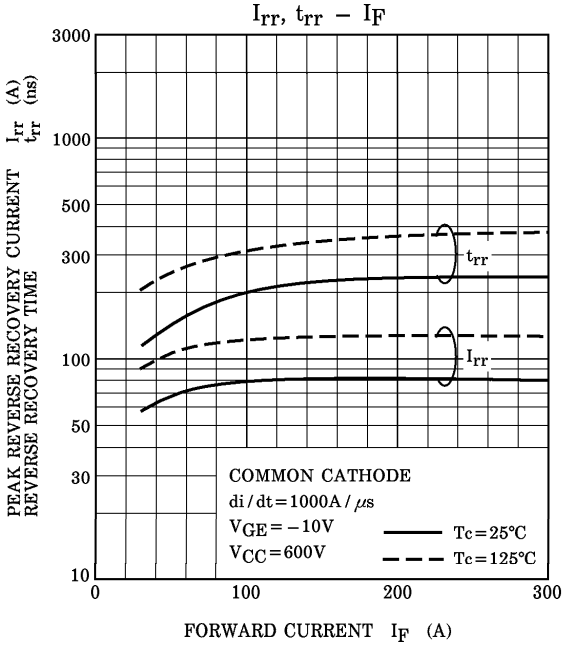
SWITCHING TIME – $I_C$



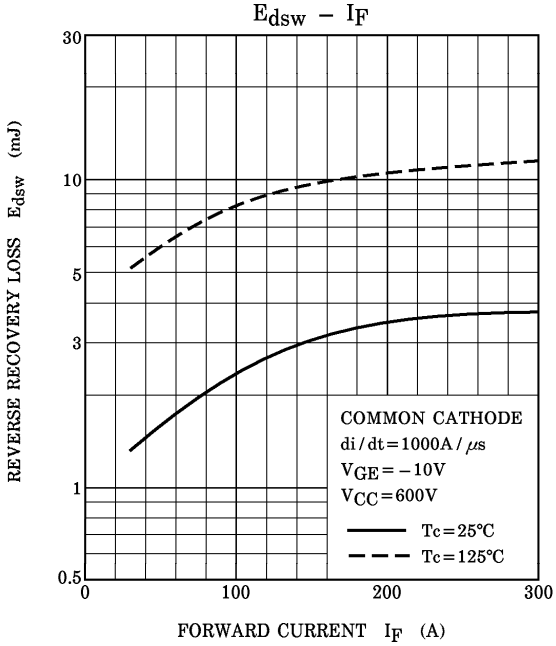

SWITCHING LOSS – $I_C$



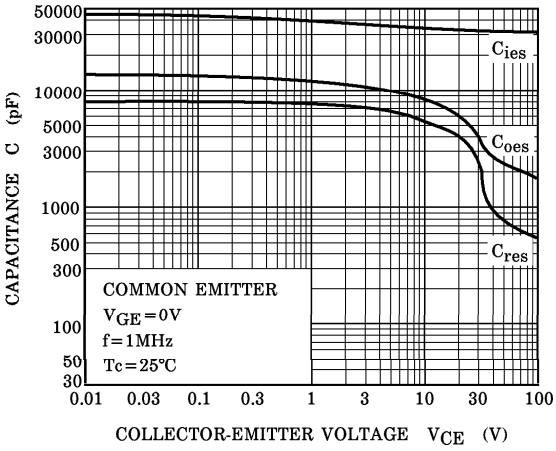

$I_{rr}$, $t_{rr}$ – $I_F$



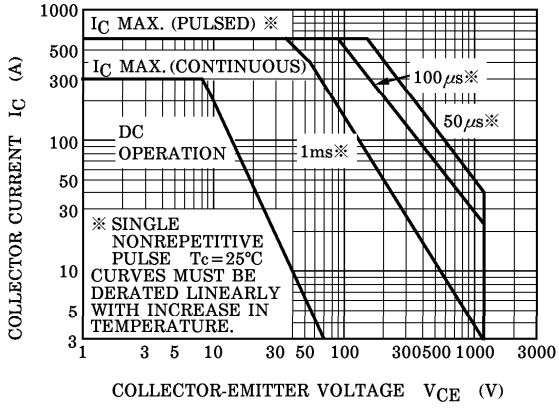

$E_{dsw}$ – $I_F$



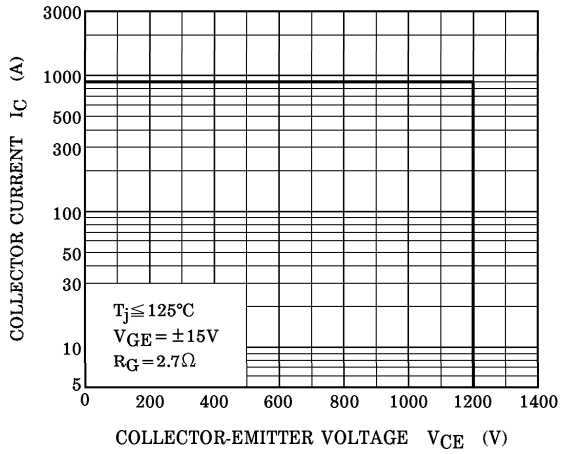
C – $V_{CE}$



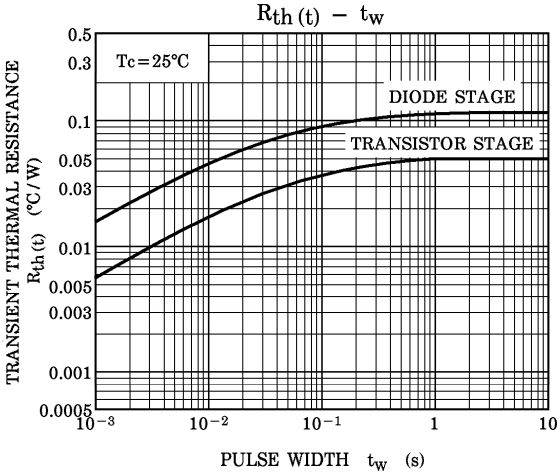

SAFE-OPERATING AREA




REVERSE BIAS SOA




$R_{th\,(t)}$ – $t_w$




SHORT CIRCUIT SOA