TOSHIBA GTR Module Silicon N Channel IGBT

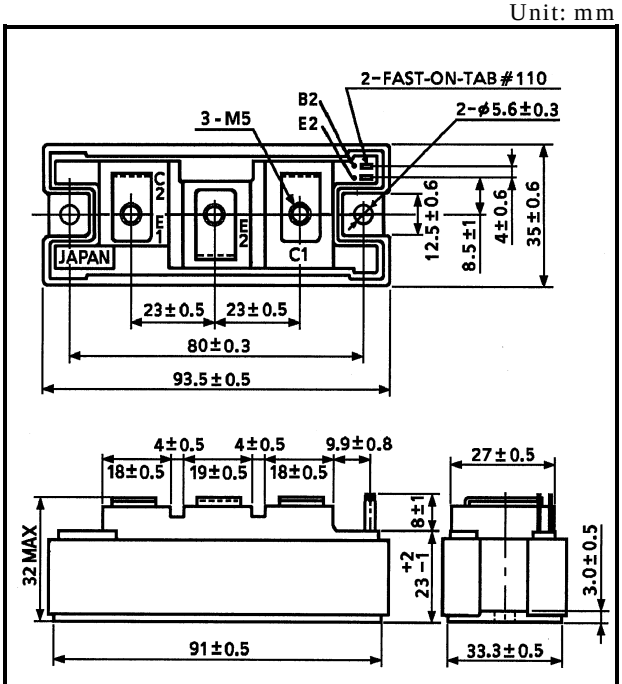
# MG50Q1ZS50

High Power Switching Applications

Motor Control Applications

- High input impedance
- High speed : $t_f$ = 0.3 μs (Max)
  @Inductive load
- Low saturation voltage
  : $V_{CE\ (sat)}$ = 3.6 V (Max)
- Enhancement-mode
- The electrodes are isolated from case.

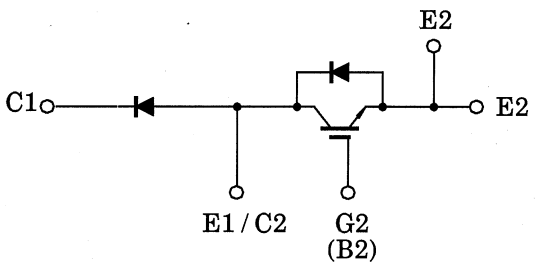
Unit: mm




| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 2-94D7A |

Weight: 202g

## Equivalent Circuit



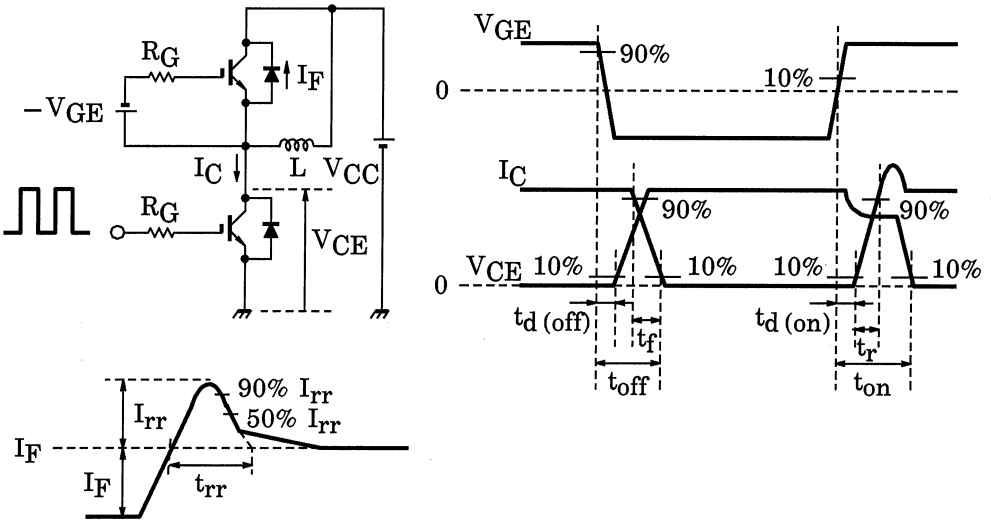

## Maximum Ratings (Ta = 25°C)

| 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) | 78 / 50 | A |
| | 1ms | $I_{CP}$ (25°C / 80°C) | 156 / 100 | |
| Forward current | DC | $I_F$ | 50 | A |
| | 1ms | $I_{FM}$ | 100 | |
| Collector power dissipation (Tc = 25°C) | | $P_C$ | 400 | 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 / mounting) | | — | 3 / 3 | N·m |

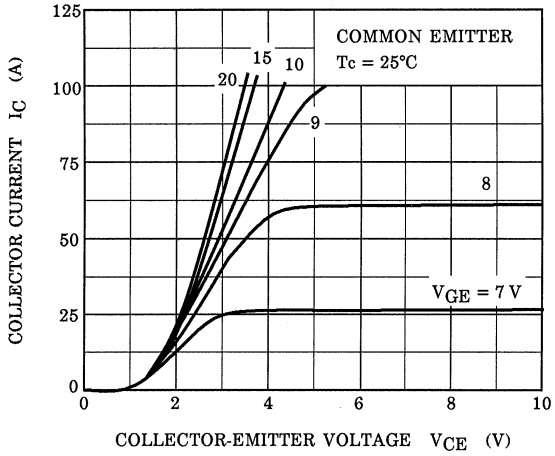
## Electrical Characteristics (Ta = 25°C)

| Characteristic | | Symbol | Test Condition | | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Gate leakage current | | $I_{GES}$ | $V_{GE}$ = ±20V, $V_{CE}$ = 0 | | — | — | ±500 | nA |
| Collector cut-off current | | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0 | | — | — | 1.0 | mA |
| Gate-emitter cut-off voltage | | $V_{GE\ (off)}$ | $I_C$ = 50mA, $V_{CE}$ = 5V | | 3.0 | — | 6.0 | V |
| Collector-emitter saturation voltage | | $V_{CE\ (sat)}$ | $I_C$ = 50A, $V_{GE}$ = 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 | | — | 6.0 | — | nF |
| Switching time | Turn-on delay time | $t_{d\ (on)}$ | Inductive load $V_{CC}$ = 600 V $I_C$ = 50 A $V_{GE}$ = ±15 V $R_G$ = 24 Ω (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 | | $V_F$ | $I_F$ = 50 A, $V_{GE}$ = 0 | | — | 2.4 | 3.5 | V |
| Reverse recovery time | | $t_{rr}$ | $I_F$ = 50 A, $V_{GE}$ = −10 V, di / dt = 700 A / μs (Note 1) | | — | 0.1 | 0.25 | μs |
| Thermal resistance | | $R_{th\ (j-c)}$ | Transistor stage | | — | — | 0.31 | °C / W |
| | | | Diode stage | | — | — | 0.94 | |

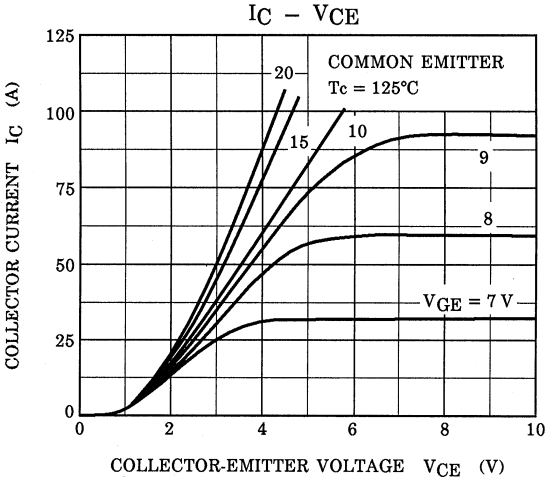
Note 1: Switching time and reverse recovery time test circuit & timing chart



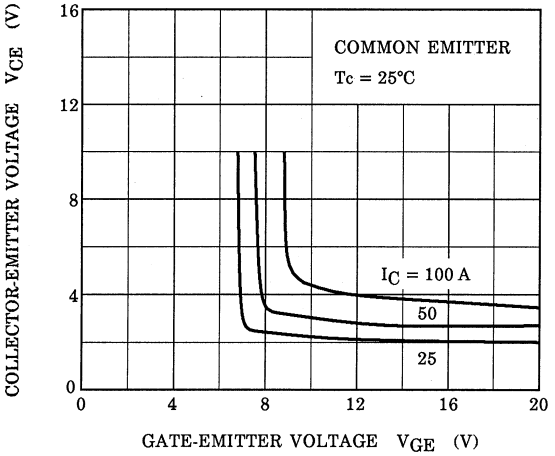
$I_C$ – $V_{CE}$



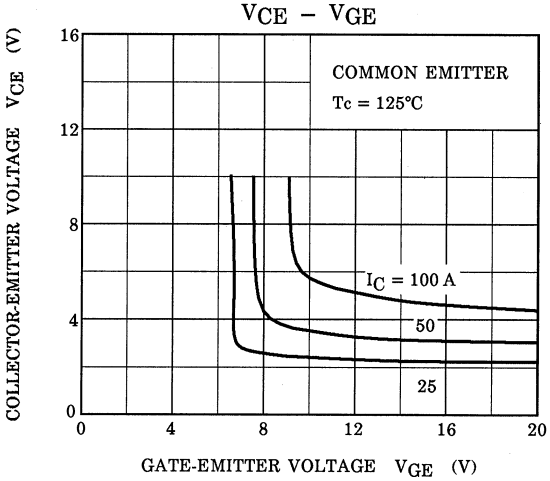

$I_C$ – $V_{CE}$



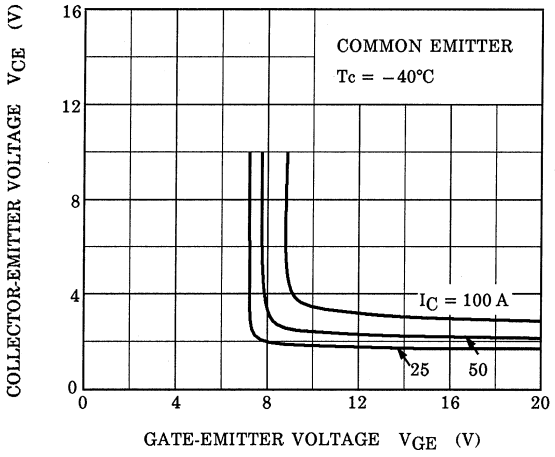

$V_{CE}$ – $V_{GE}$



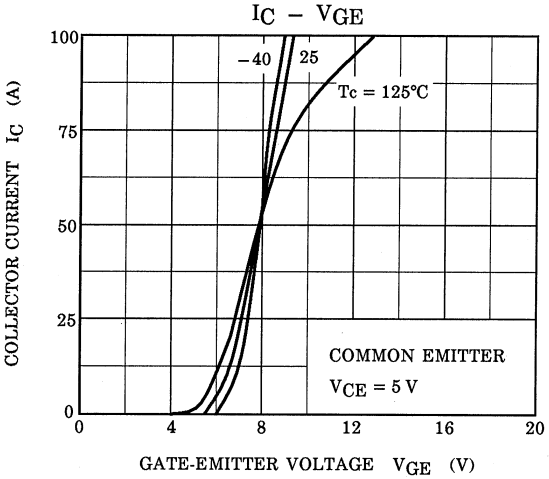

$V_{CE}$ – $V_{GE}$



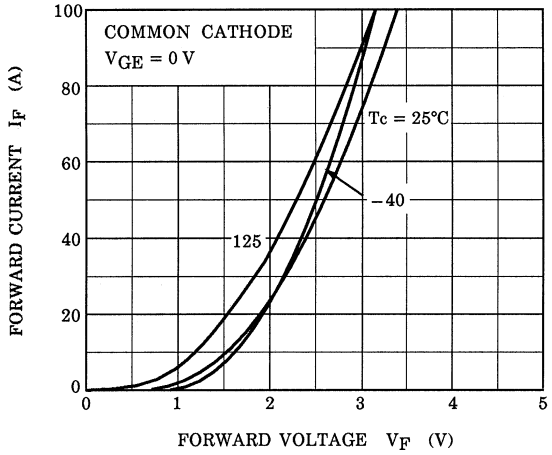

$V_{CE}$ – $V_{GE}$



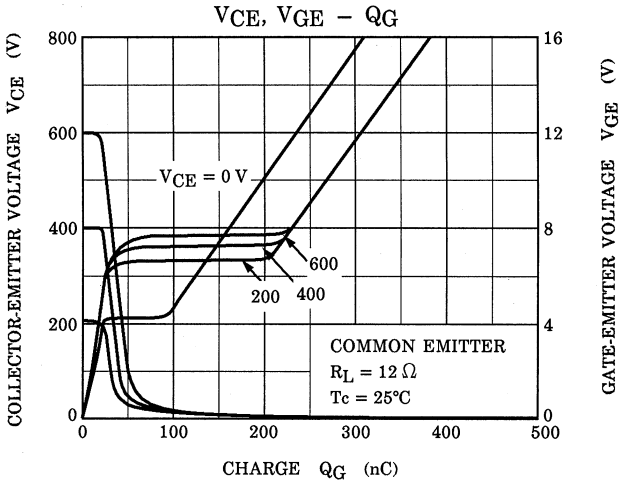

$I_C$ – $V_{GE}$



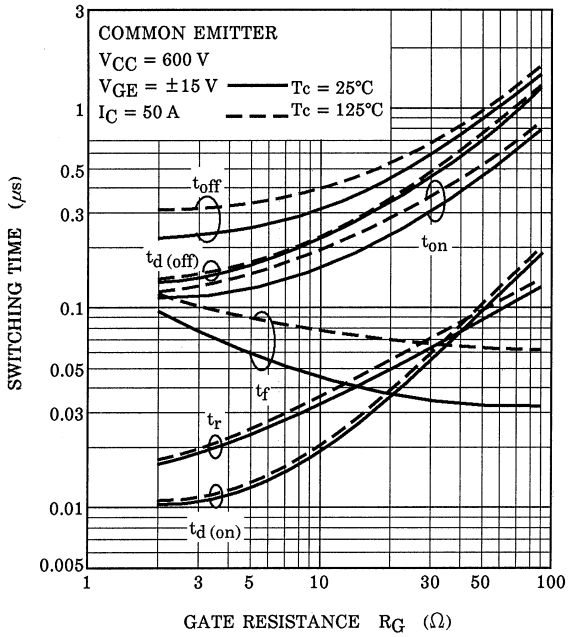
$I_F$ – $V_F$



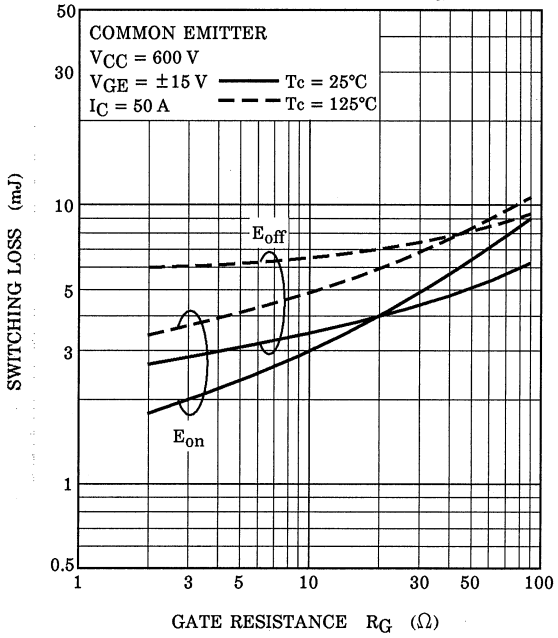

$V_{CE}$, $V_{GE}$ – $Q_G$



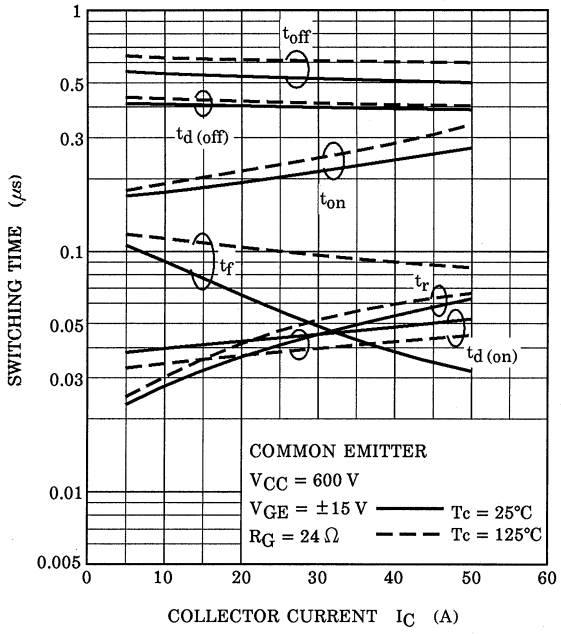

SWITCHING TIME – $R_G$



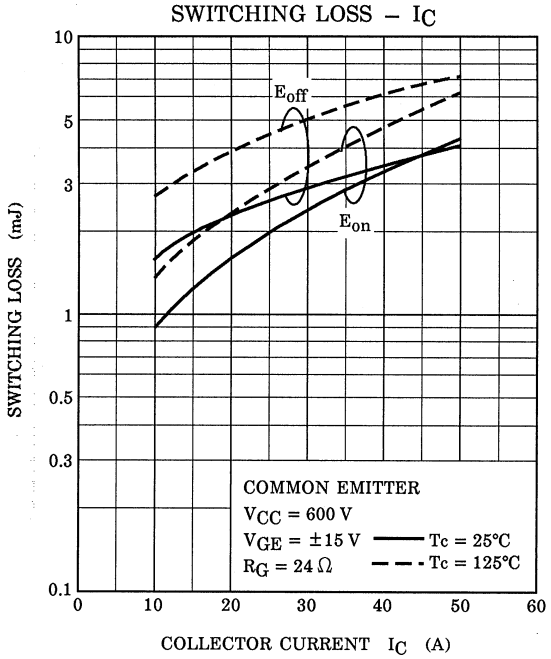

SWITCHING LOSS – $R_G$



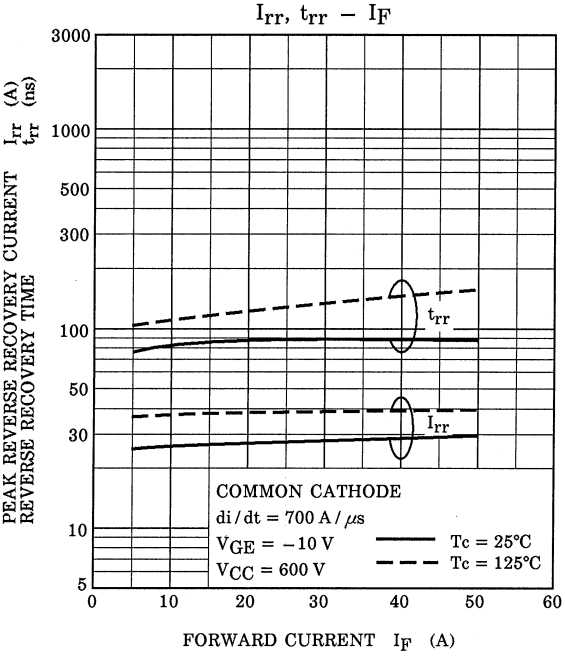
SWITCHING TIME – $I_C$



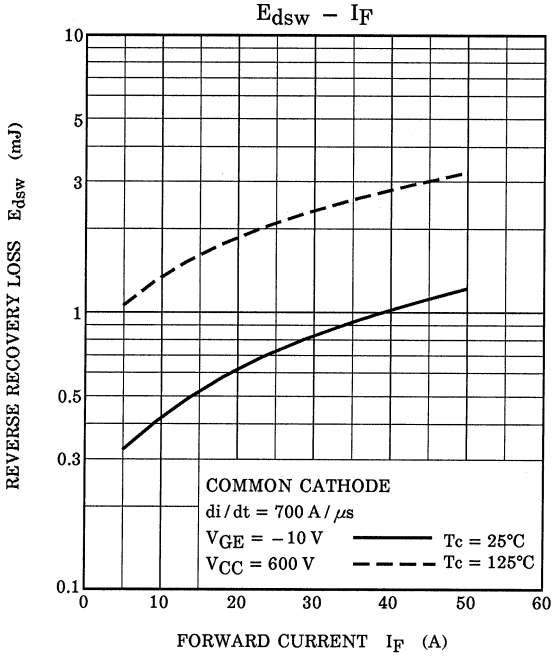

SWITCHING LOSS – $I_C$



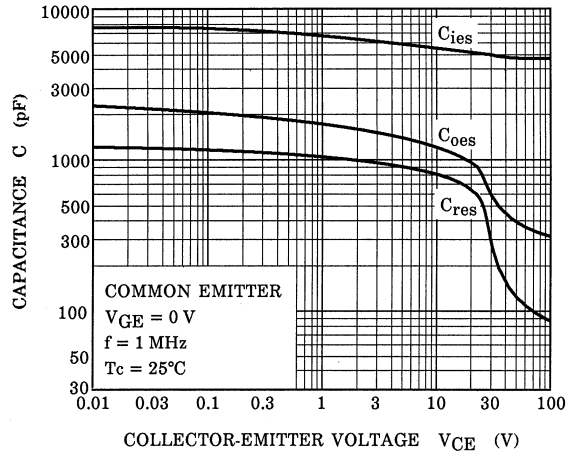

$I_{rr}$, $t_{rr}$ – $I_F$



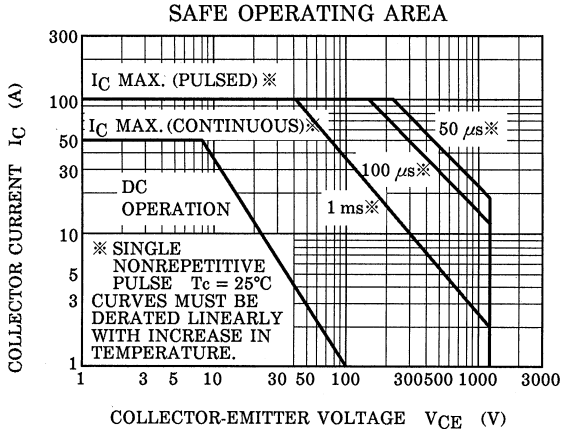

$E_{dsw}$ – $I_F$



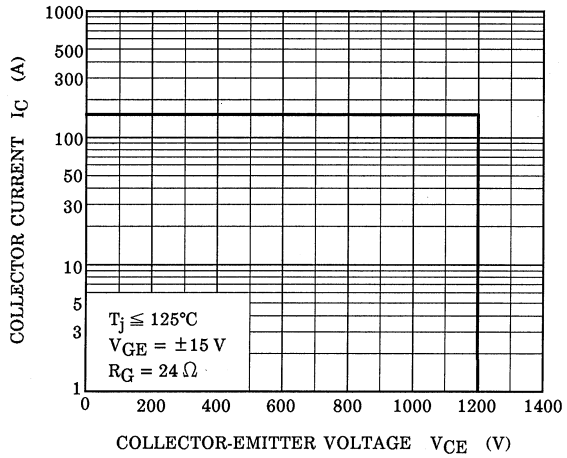
C – $V_{CE}$



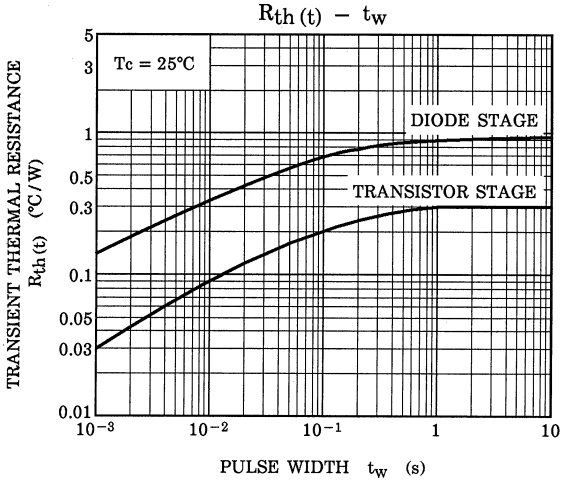

SAFE OPERATING AREA



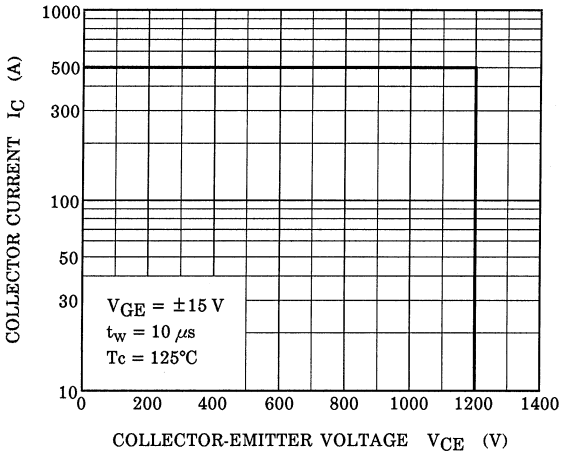

REVERSE BIAS SOA




$R_{th\,(t)}$ – $t_w$




SHORT CIRCUIT SOA



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