# TOSHIBA

## INSULATED GATE BIPOLAR TRANSISTOR

MG15J6ES40

### GTR Module

### Silicon N Channel IGBT

### High Power Switching Applications

### Motor Control Applications

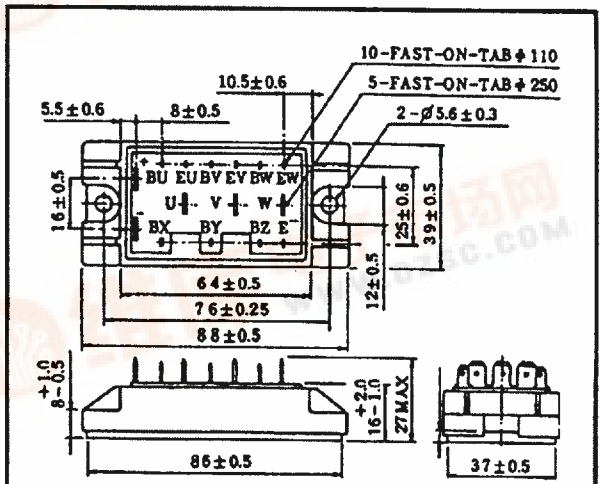
**Features**

- 6 IGBTs are built into 1 package
- High speed: $t_f$ = 0.35μs (Max.) ($I_C$ = 15A)
  $t_{rr}$ = 0.15μs (Max.) ($I_C$ = 15A)
- Low saturation voltage: $V_{CE\ (sat)}$ = 3.5V (Max.) ($I_F$ = 15A)
- Enhancement mode
- The electrodes are isolated from case

**Maximum Ratings (Tc = 25°C)**

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Collector-Emitter Voltage | | $V_{CES}$ | 600 | V |
| Gate-Emitter Voltage | | $V_{GES}$ | ± 20 | V |
| Collector Current | DC | $I_C$ | 15 | A |
| | 1ms | $I_{CP}$ | 30 | |
| Forward Current | DC | $I_F$ | 15 | A |
| | 1ms | $I_{FM}$ | 30 | |
| Collector Power Dissipation | | $P_C$ | 80 | 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 | | — | 3 | N ¥ m |

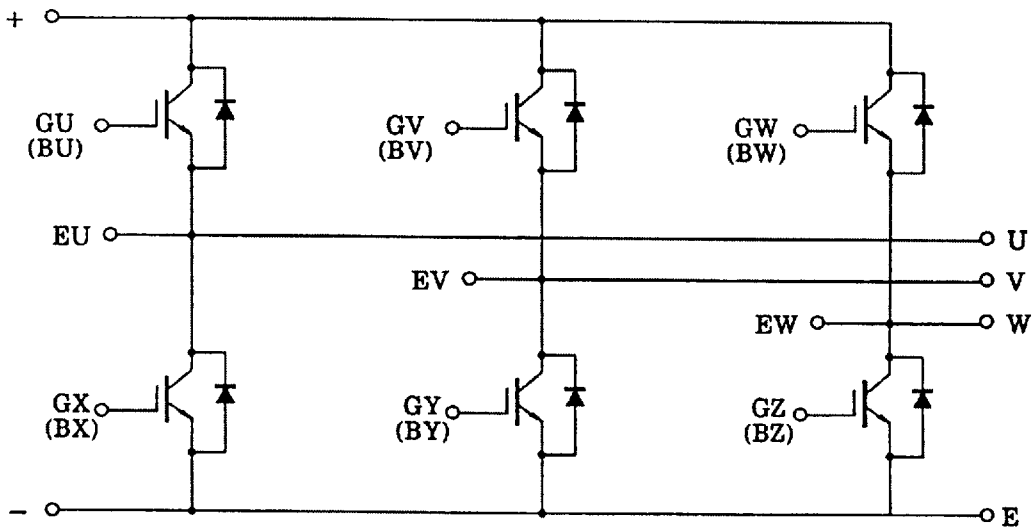
Unit in mm



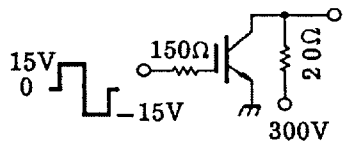

| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 2-64A2A |

Weight : 152g

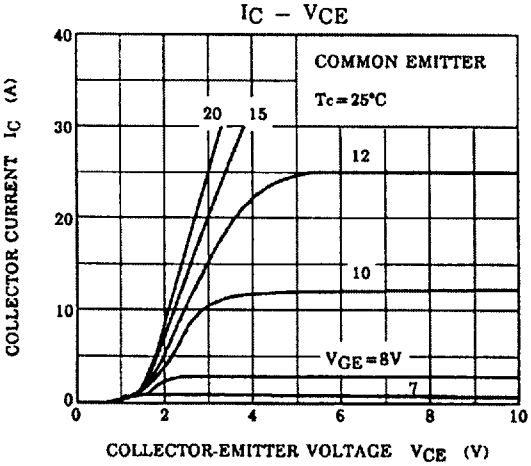
## Equivalent Circuit



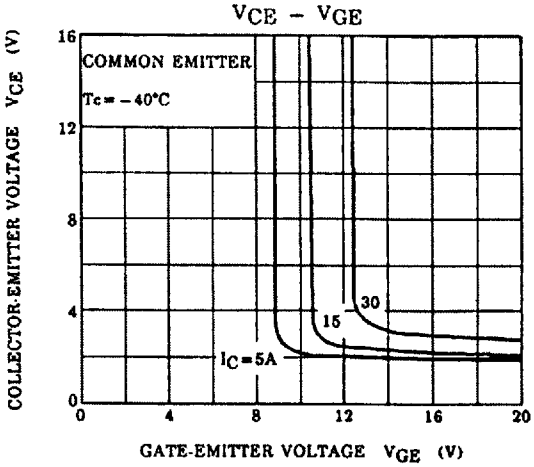

## Electrical Characteristics (Tc = 25°C)

| 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 | | $I_{CES}$ | $V_{CE}$ = 600V, $V_{GE}$ = 0 | — | — | 1.0 | mA |
| Collector-Emitter Breakdown Voltage | | $V_{(BR)\ CES}$ | $I_C$ = 10mA, $V_{GE}$ = 0 | 600 | — | — | V |
| Gate-Emitter Cut-off Voltage | | $V_{GE\ (OFF)}$ | $I_C$ = 15mA, $V_{CE}$ = 5V | 3.0 | — | 6.0 | V |
| Collector-Emitter Saturation Voltage | | $V_{CE\ (sat)}$ | $I_C$ = 15A, $V_{GE}$ = 15V | — | 2.7 | 3.5 | V |
| Input Capacitance | | $C_{ies}$ | $V_{CE}$ = 10V, $V_{GE}$ = 0, f = 1MHz | — | 1400 | — | pF |
| Switching Time | Rise Time | $t_r$ |  | — | 0.30 | 0.60 | µs |
| | Turn-on Time | $t_{on}$ | | — | 0.40 | 0.80 | |
| | Fall Time | $t_f$ | | — | 0.18 | 0.35 | |
| | Turn-off Time | $t_{off}$ | | — | 0.60 | 1.00 | |
| Forward Voltage | | $V_F$ | $I_F$ = 15A, $V_{GE}$ = 0 | — | 2.0 | 2.7 | V |
| Reverse Recovery Time | | $t_{rr}$ | $I_F$ = 15A, $V_{GE}$ = -10V<br>di/dt = 50A/µs | — | 0.08 | 0.15 | µs |
| Thermal Resistance | | $R_{th\ (j-c)}$ | Transistor | — | — | 1.56 | °C/W |
| | | | Diode | — | — | 2.80 | |

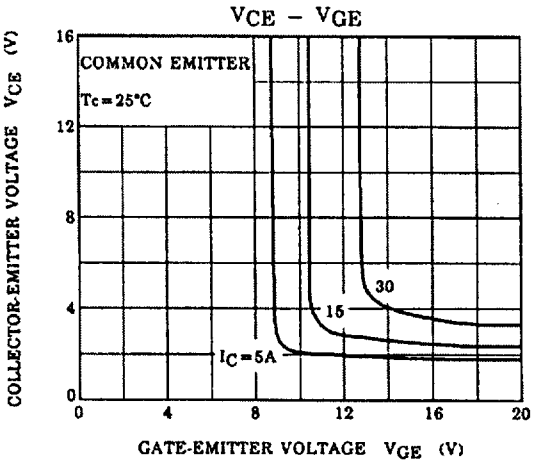
$I_C$ – $V_{CE}$



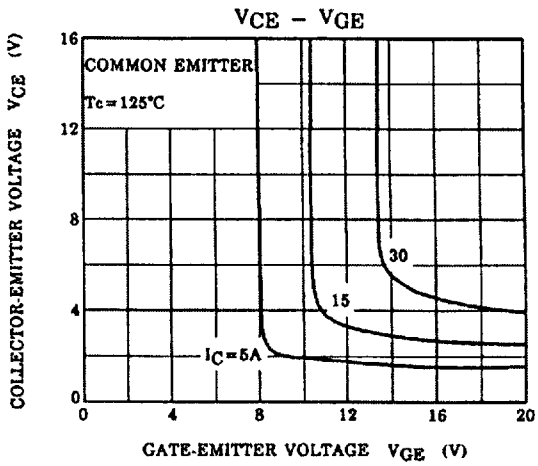

$V_{CE}$ – $V_{GE}$



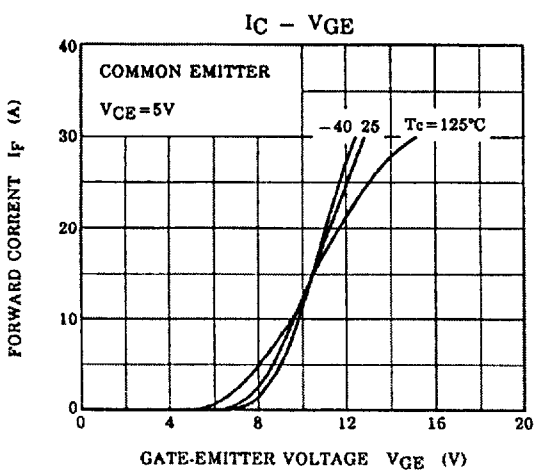

$V_{CE}$ – $V_{GE}$



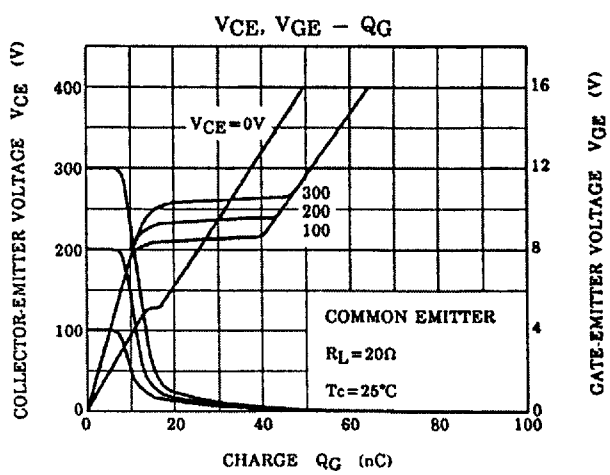

$V_{CE}$ – $V_{GE}$



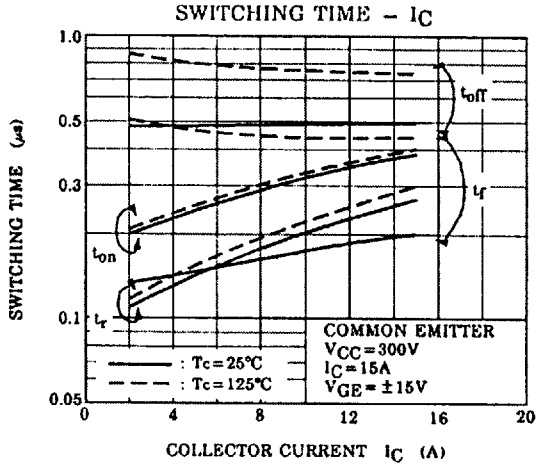

$I_C$ – $V_{GE}$



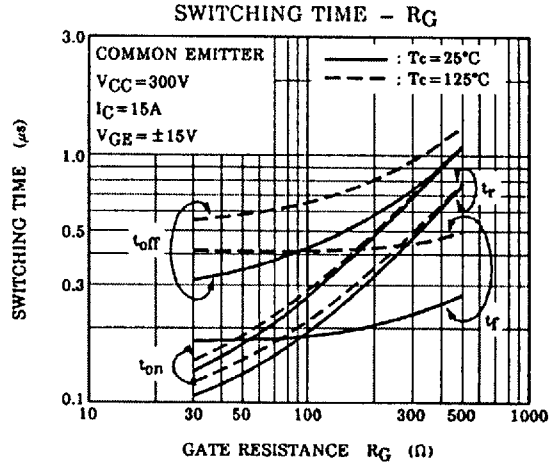

$V_{CE}$, $V_{GE}$ – $Q_G$



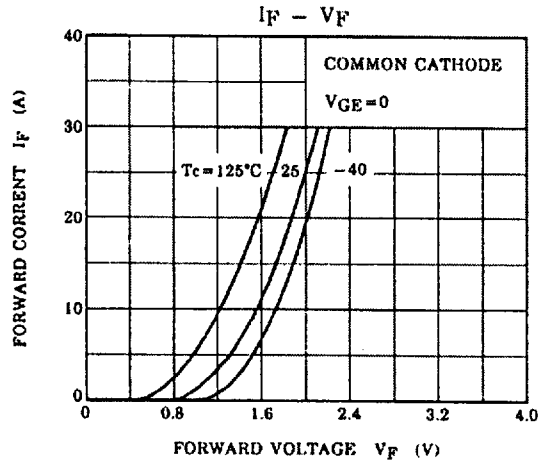
SWITCHING TIME – $I_C$



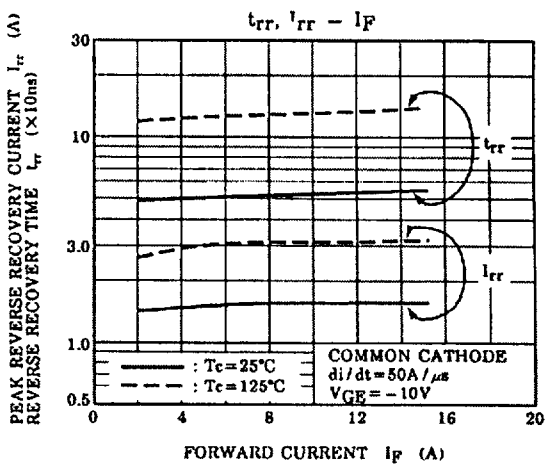

SWITCHING TIME – $R_G$



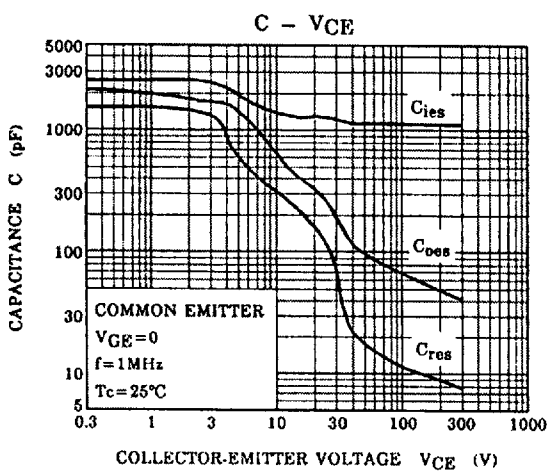

$I_F$ – $V_F$



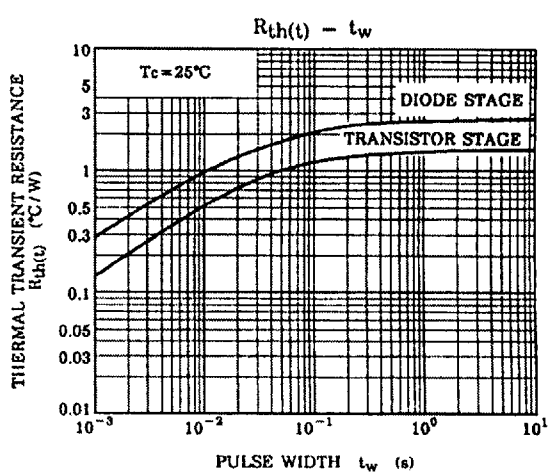

$t_{rr}$, $I_{rr}$ – $I_F$



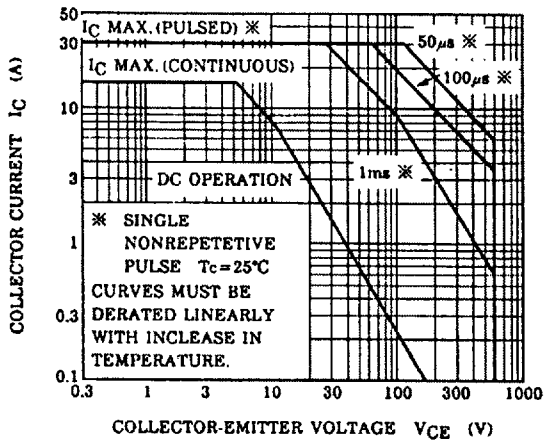

C – $V_{CE}$




$R_{th(t)}$ – $t_w$



SAFE OPERATING AREA




REVERSE BIAS SOA