

TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

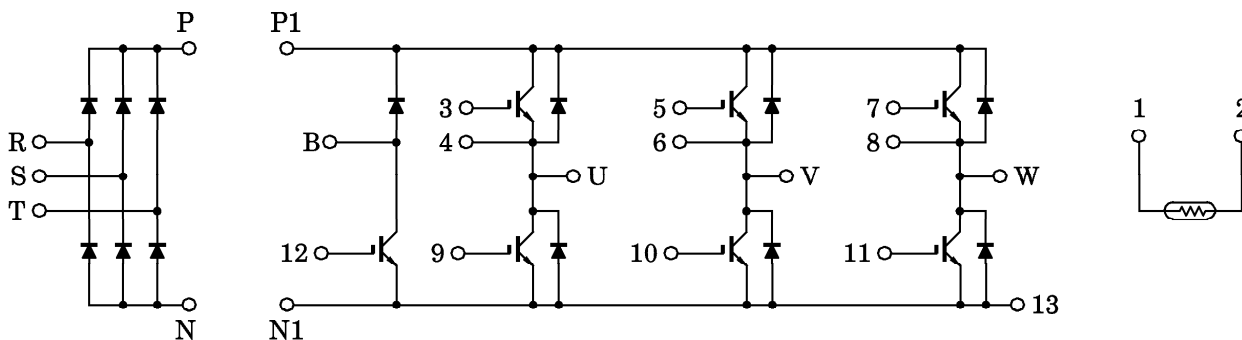
MIG10Q906H, MIG10Q906HA

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3 ϕ 10 A / 1200 V IGBT
- Input (Converter Stage) : 3 ϕ 15 A / 1600 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
 - MIG10Q906H : 2-108E5A
 - MIG10Q906HA : 2-108E6A
- Weight : 190 g

EQUIVALENT CIRCUIT



961001EAA2

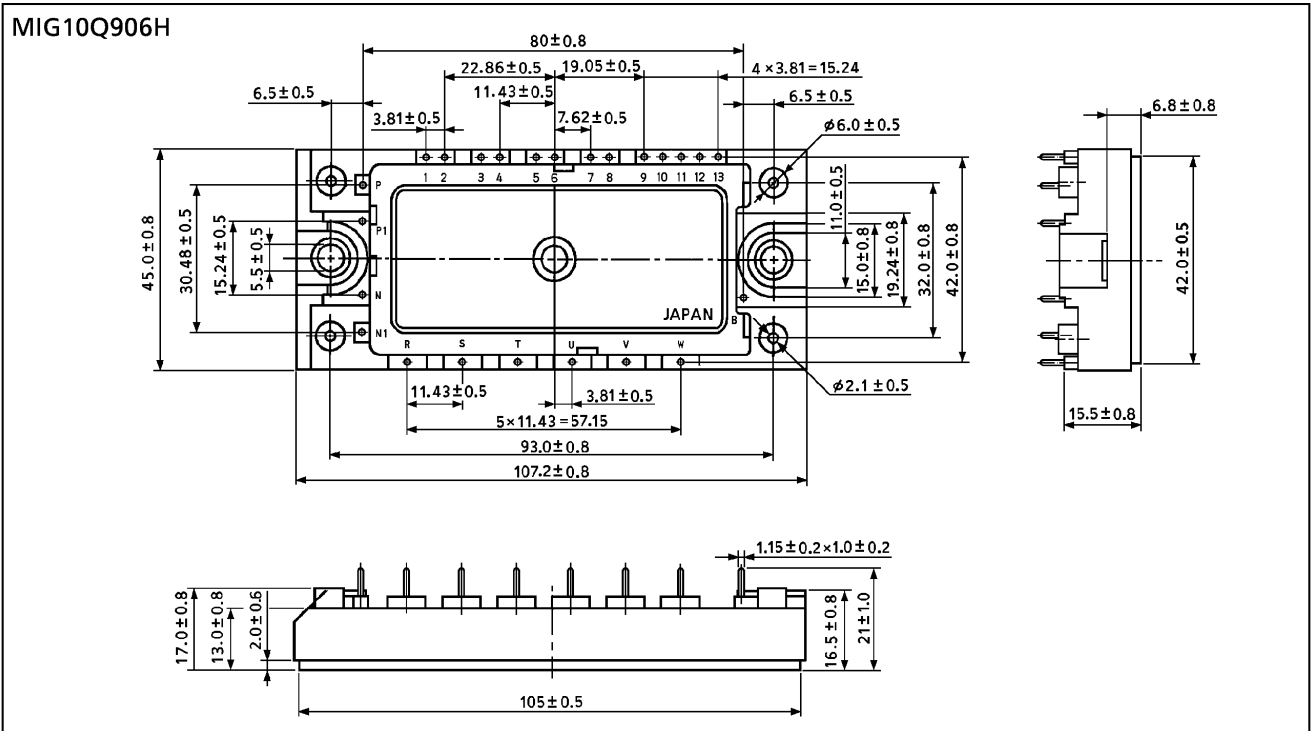
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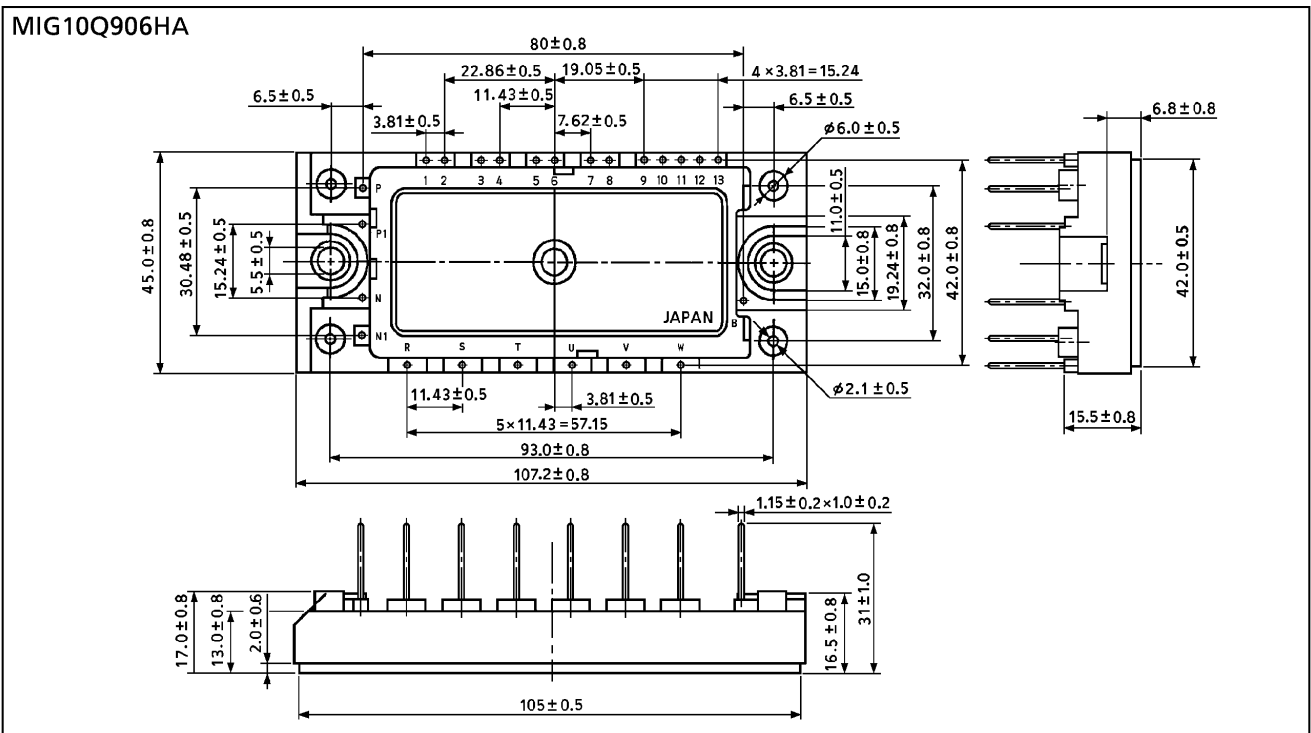
Package Dimension

Unit : mm



2-108E5A

Unit : mm



2-108E6A

MAXIMUM RATINGS (Ta = 25°C)

| STAGE | | CHARACTERISTIC | | SYMBOL | RATING | UNIT | |
|---|--|---------------------------|-----------------|-------------------|-----------------------|---------------|---------------|
| Inverter | Collector-Emitter Voltage | | | V _{CES} | 1200 | V | |
| | Gate-Emitter Voltage | | | V _{GES} | ±20 | V | |
| | Collector Current | DC | I _C | 15 / 10 | A | (25°C / 80°C) | |
| | | 1 ms | I _{CP} | 30 / 20 | A | (25°C / 80°C) | |
| | Forward Current | DC | I _F | 10 | A | | |
| | | 1 ms | I _{FM} | 20 | A | | |
| Collector Power Dissipation (Tc = 25°C) | | | P _C | 82 | W | | |
| Converter | Repetitive Peak Reverse Voltage | | | V _R RM | 1600 | V | |
| | Average Output Rectified Current | | | I _O | 15 | A | |
| | Peak One Cycle Surge Forward Current (50 Hz, Non-Repetitive) | | | I _{FSM} | 250 | A | |
| Brake | IGBT | Collector-Emitter Voltage | | V _{CES} | 1200 | V | |
| | | Gate-Emitter Voltage | | V _{GES} | ±20 | V | |
| | | Collector Current | DC | I _C | 15 / 10 | A | (25°C / 80°C) |
| | | | 1 ms | I _{CP} | 30 / 20 | A | (25°C / 80°C) |
| | Collector Power Dissipation (Tc = 25°C) | | | P _C | 82 | W | |
| | FWD | Reverse Voltage | | | V _R | 1200 | V |
| | | Forward Current | DC | I _F | 10 | A | |
| | | | 1 ms | I _{FM} | 20 | A | |
| Module | 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 | | | — | 6 | N·m | |

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

a. Inverter stage

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|---------------|----------------------|--|------|------|-----------|---------------------------|
| Gate Leakage Current | | I_{GES} | $V_{GE} = \pm 20 \text{ V}, V_{CE} = 0$ | — | — | ± 500 | nA |
| Collector Cut-Off Current | | I_{CES} | $V_{CE} = 1200 \text{ V}, V_{GE} = 0$ | — | — | 0.5 | mA |
| Gate-Emitter Cut-Off Voltage | | $V_{GE}(\text{off})$ | $I_C = 10 \text{ mA}, V_{CE} = 5 \text{ V}$ | — | 6.0 | — | V |
| Collector-Emitter Saturation Voltage | | $V_{CE}(\text{sat})$ | $I_C = 10 \text{ A}$ | — | 2.8 | 3.2 | V |
| | | | $V_{GE} = 15 \text{ V}$ | — | 3.1 | 3.7 | |
| Input Capacitance | | C_{ies} | $V_{CE} = 10 \text{ V}, V_{GE} = 0,$ $f = 1 \text{ MHz}$ | — | 1200 | — | pF |
| Switching Time | Rise Time | t_r | $V_{CC} = 600 \text{ V}$ | — | 0.07 | 0.15 | μs |
| | Turn-On Time | t_{on} | $I_C = 10 \text{ A}$ | — | 0.15 | 0.30 | |
| | Fall Time | t_f | $V_{GE} = \pm 15 \text{ V}$ $R_G = 120 \Omega$ | — | 0.07 | 0.10 | |
| | Turn-Off Time | t_{off} | $T_j = 125^\circ\text{C}$ (Note 1) | — | 0.60 | 0.90 | |
| Forward Voltage | | V_F | $I_F = 10 \text{ A}, V_{GE} = 0$ | — | 2.0 | 2.8 | V |
| Reverse Recovery Time | | t_{rr} | $I_F = 10 \text{ A}, V_{GE} = -10 \text{ V},$ $di/dt = 200 \text{ A}/\mu\text{s}$ | — | 0.10 | 0.25 | μs |
| Thermal Resistance | | $R_{th(j-c)}$ | Transistor | — | — | 1.52 | $^\circ\text{C}/\text{W}$ |
| | | | Diode | — | — | 1.5 | |

b. Converter stage

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|--|---------------|----------------------------|------|------|------|---------------------------|
| Repetitive Peak Reverse Current | | I_{RRM} | $V_{RRM} = 1600 \text{ V}$ | — | — | 50 | μA |
| Peak Forward Voltage | | V_{FM} | $I_{FM} = 15 \text{ A}$ | — | 1.05 | 1.20 | V |
| Peak One Cycle Surge Forward Current | | I_{FSM} | 50 Hz sine-half-wave | 250 | — | — | A |
| Thermal Resistance | | $R_{th(j-c)}$ | — | — | — | 1.90 | $^\circ\text{C}/\text{W}$ |

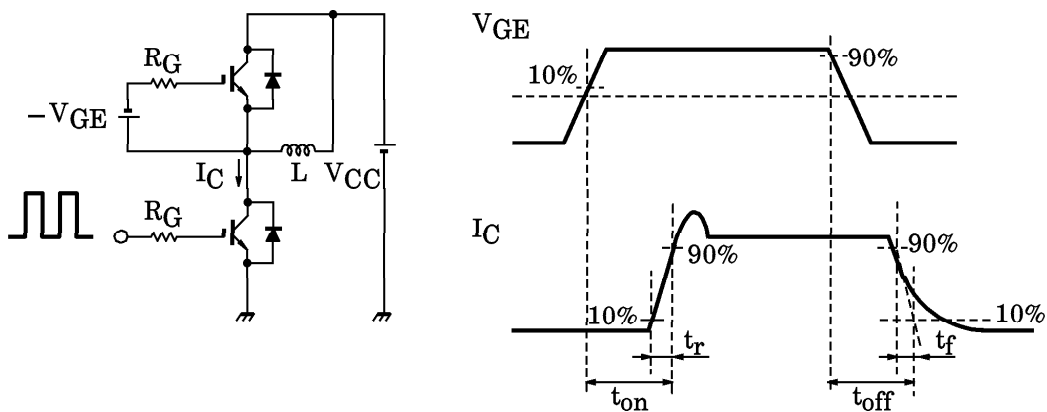
c. Brake stage

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|---------------|----------------------|---|------|------|-----------|--------------------|
| Gate Leakage Current | | I_{GES} | $V_{GE} = \pm 20\text{ V}, V_{CE} = 0$ | — | — | ± 500 | nA |
| Collector Cut-Off Current | | I_{CES} | $V_{CE} = 1200\text{ V}, V_{GE} = 0$ | — | — | 0.5 | mA |
| Reverse Current | | I_R | $V_R = 1200\text{ V}, V_{GE} = 0$ | — | — | 0.5 | mA |
| Gate-Emitter Cut-Off Voltage | | $V_{GE}(\text{off})$ | $I_C = 10\text{ mA}, V_{CE} = 5\text{ V}$ | — | 6.0 | — | V |
| Collector-Emitter Saturation Voltage | | $V_{CE}(\text{sat})$ | $I_C = 10\text{ A}$ | — | 2.8 | 3.2 | V |
| | | | $V_{GE} = 15\text{ V}$ | — | 3.1 | 3.7 | |
| Input Capacitance | | C_{ies} | $V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$ | — | 1200 | — | pF |
| Switching Time | Rise Time | t_r | $V_{CC} = 600\text{ V}$ | — | 0.07 | 0.15 | μs |
| | Turn-On Time | t_{on} | $I_C = 10\text{ A}$ | — | 0.15 | 0.30 | |
| | Fall Time | t_f | $V_{GE} = \pm 15\text{ V}$ $R_G = 120\ \Omega$ | — | 0.07 | 0.10 | |
| | Turn-Off Time | t_{off} | $T_j = 125^\circ\text{C}$ (Note 1) | — | 0.60 | 0.90 | |
| Forward Voltage | | V_F | $I_F = 10\text{ A}, V_{GE} = 0$ | — | 2.0 | 2.8 | V |
| Thermal Resistance | | $R_{th(j-c)}$ | Transistor | — | — | 1.52 | $^\circ\text{C/W}$ |
| | | | Diode | — | — | 1.5 | |

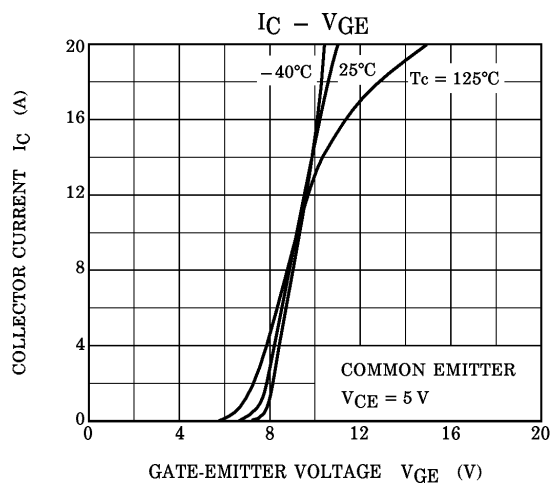
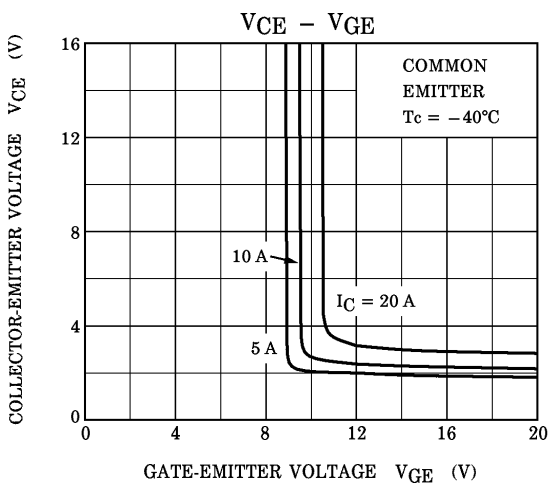
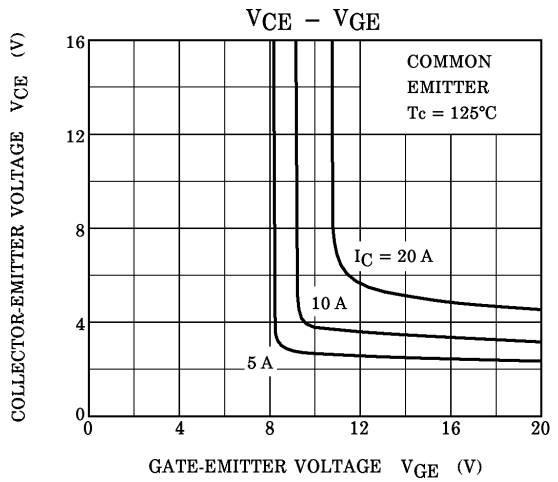
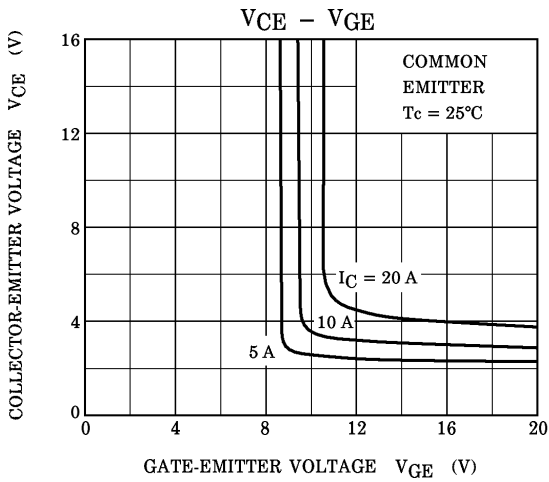
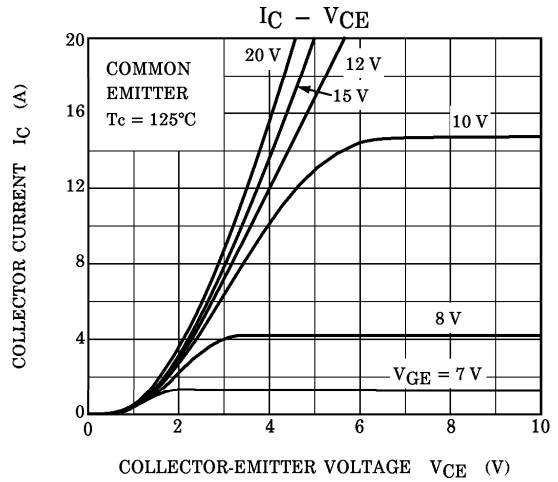
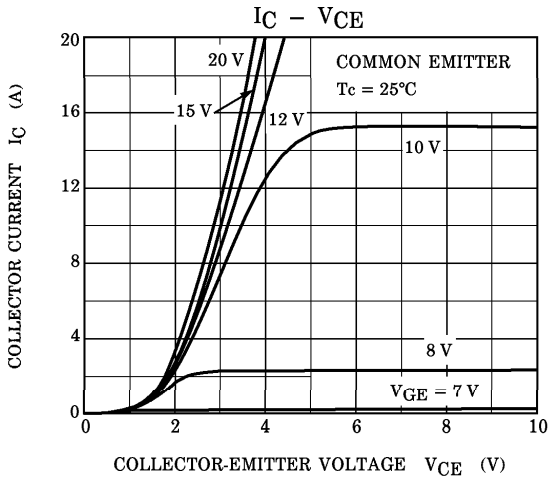
d. Thermistor

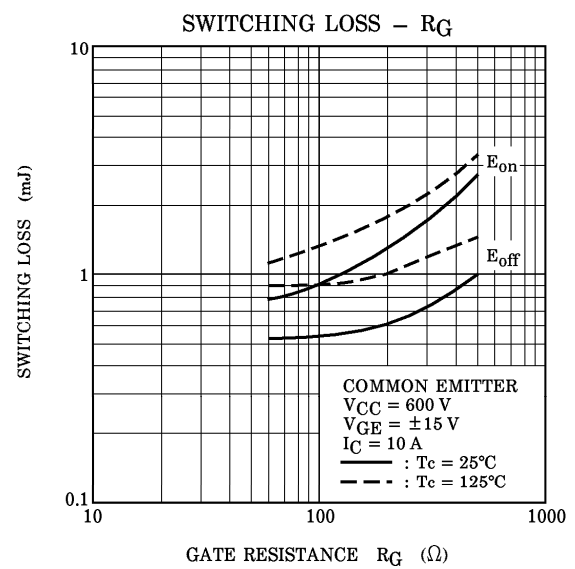
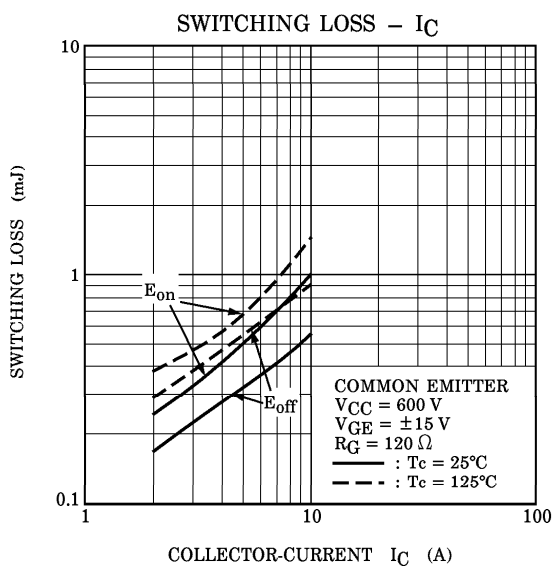
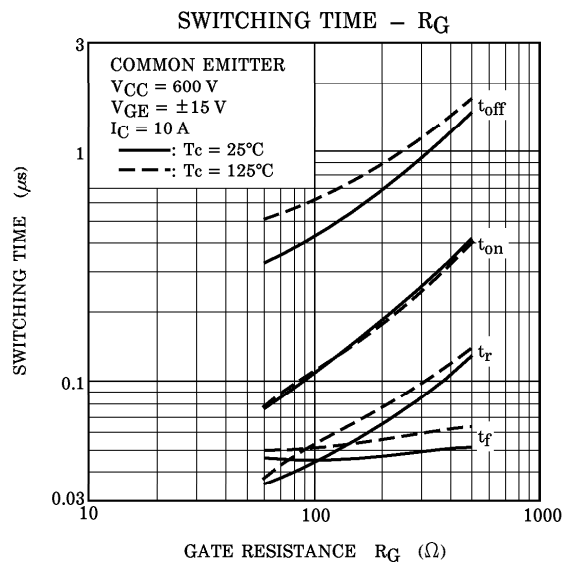
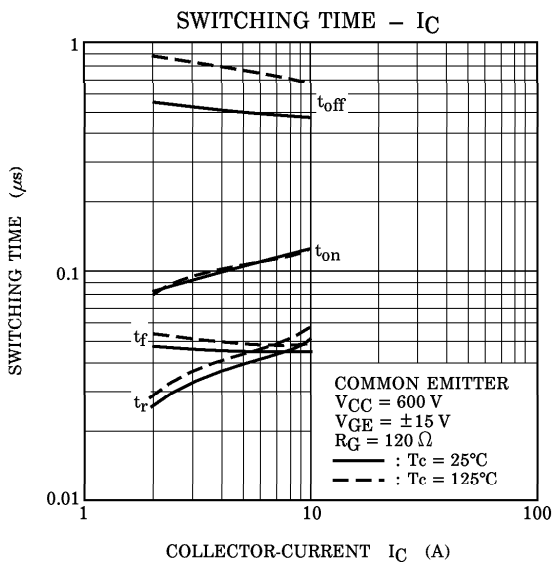
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-------------|---|-------|------|-------|------------------|
| Zero-power Resistance | R_{25} | $I_{TM} = 0.2\text{ mA}, T_c = 25^\circ\text{C}$ | 17.31 | 20 | 23.14 | $\text{k}\Omega$ |
| B Value | $B_{25/85}$ | $T_c = 25^\circ\text{C} / T_c = 85^\circ\text{C}$ | — | 3760 | — | K |

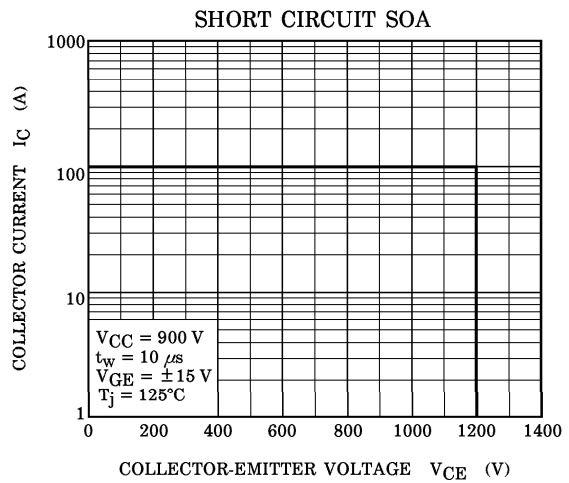
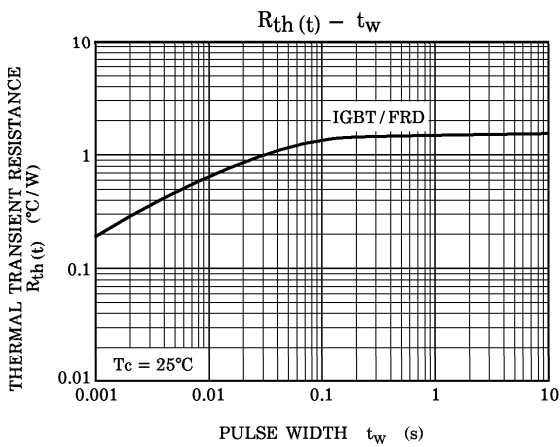
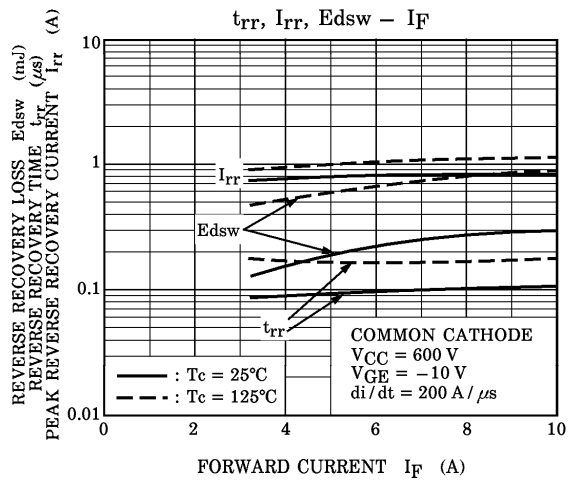
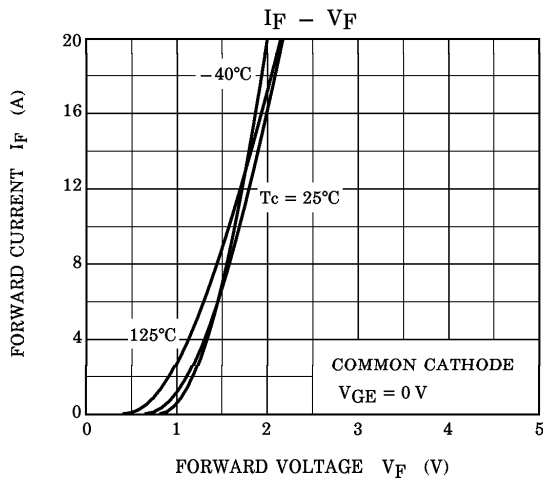
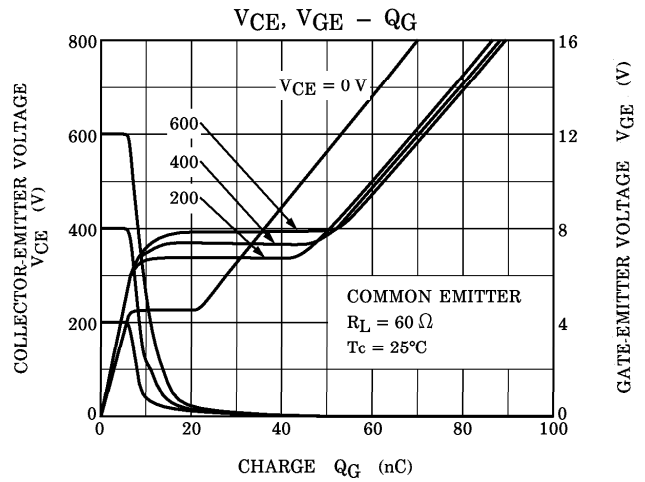
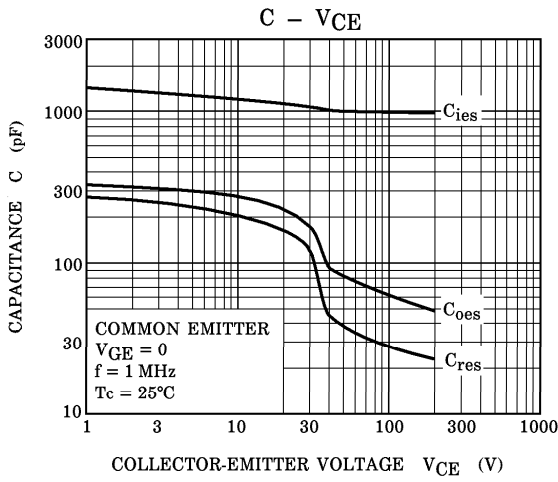
(Note 1) Switching Time Test Circuit & Timing Chart

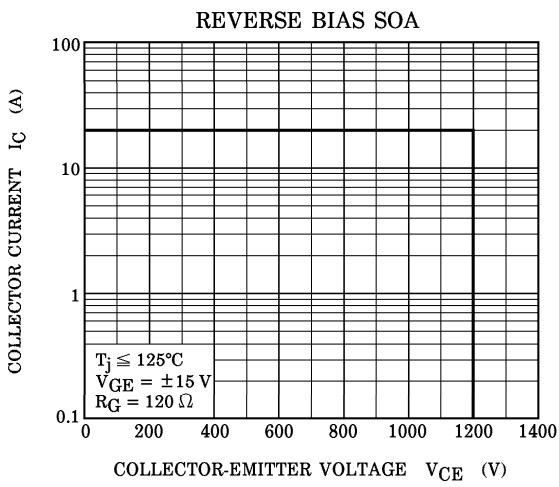


a. Inverter stage/c. Brake stage









b. Converter stage

