

TOSHIBA INTEGRATED IGBT MODULE SILICON N CHANNEL IGBT

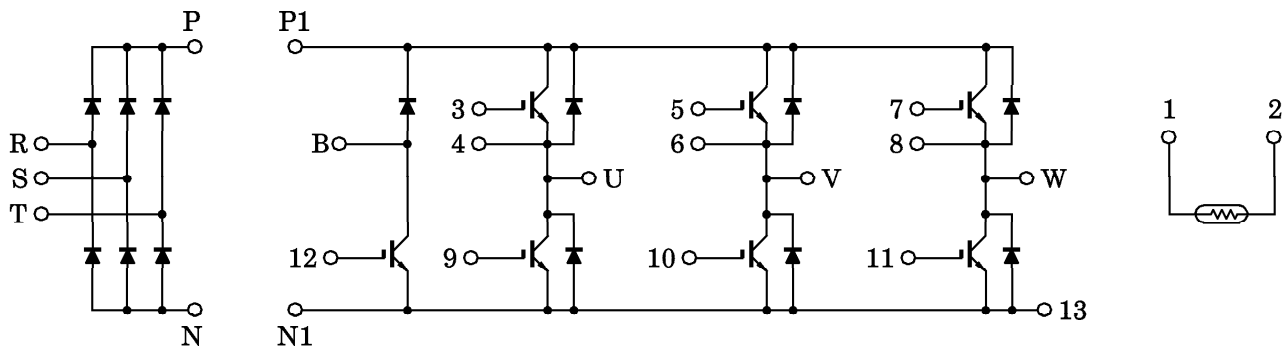
MIG50J906H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Converter and Brake Power Circuits and Thermistor in One Package.
- Output (Inverter Stage) : 3ϕ 50 A / 600 V IGBT
- Input (Converter Stage) : 3ϕ 30 A / 800 V Silicon Rectifier
- The Electrodes are Isolated from Case.
- Outline
MIG50J906H : 2-108E5A
- Weight : 190 g

EQUIVALENT CIRCUIT



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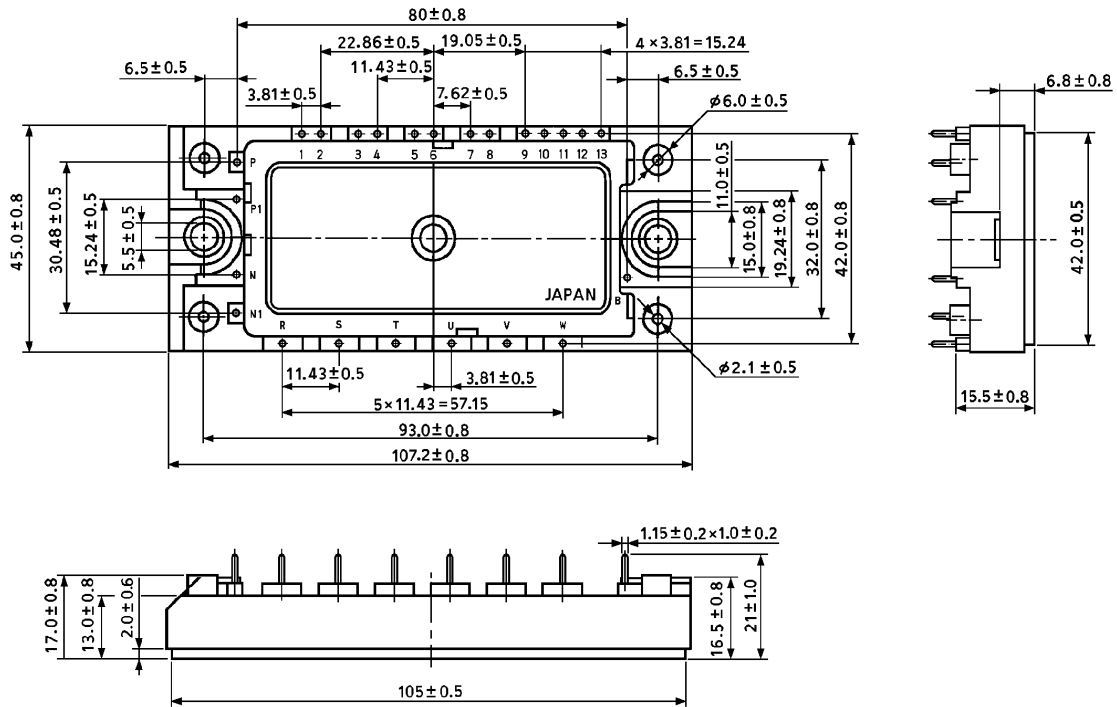
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PACKAGE DIMENSION

Unit : mm

MIG50J906H



2-108E5A

MAXIMUM RATINGS (Ta = 25°C)

| STAGE | | CHARACTERISTIC | | SYMBOL | RATING | UNIT | | |
|---|---|---------------------------|----------------|-------------------|-----------------------|-----------|---------------|---------------|
| Inverter | Collector-Emitter Voltage | | | V _{CES} | 600 | V | | |
| | Gate-Emitter Voltage | | | V _{GES} | ±20 | V | | |
| | Collector Current | DC | | I _C | 75 / 50 | A | (25°C / 40°C) | |
| | | 1 ms | | I _{CP} | 150 / 100 | A | (25°C / 40°C) | |
| | Forward Current | DC | | I _F | 50 | A | | |
| | | 1 ms | | I _{FM} | 100 | A | | |
| Collector Power Dissipation (Tc = 25°C) | | | P _C | 200 | W | | | |
| Converter | Repetitive Peak Reverse Voltage | | | V _{RRM} | 800 | V | | |
| | Average Output Rectified Current | | | I _O | 30 | A | | |
| | Peak One Cycle Surge Forward Current (50Hz, Non-Repetitive) | | | I _{FSM} | 400 | A | | |
| Brake | IGBT | Collector-Emitter Voltage | | V _{CES} | 600 | V | | |
| | | Gate-Emitter Voltage | | V _{GES} | ±20 | V | | |
| | | Collector Current | DC | | I _C | 75 / 50 | A | (25°C / 40°C) |
| | | | 1 ms | | I _{CP} | 150 / 100 | A | (25°C / 40°C) |
| | Collector Power Dissipation (Tc = 25°C) | | | P _C | 200 | W | | |
| | FWD | Reverse Voltage | | | V _R | 600 | V | |
| Forward Current | | DC | | I _F | 50 | A | | |
| | | 1 ms | | I _{FM} | 100 | 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} = ±20 V, V _{CE} = 0 | — | — | ±500 | nA |
| Collector Cut-Off Current | | I _{CES} | V _{CE} = 600 V, V _{GE} = 0 | — | — | 1.0 | mA |
| Gate-Emitter Cut-Off Voltage | | V _{GE (off)} | I _C = 5 mA, V _{CE} = 5 V | 5.0 | — | 8.0 | V |
| Collector-Emitter Saturation Voltage | | V _{CE (sat)} | I _C = 50 A | — | 2.1 | 2.7 | V |
| | | | V _{GE} = 15 V | | 2.2 | 2.8 | |
| Input Capacitance | | C _{ies} | V _{CE} = 10 V, V _{GE} = 0, f = 1 MHz | — | 4800 | — | pF |
| Switching Time | Rise Time | t _r | V _{CC} = 300 V I _C = 50 A V _{GE} = ±15 V R _G = 24 Ω (Note 1) | — | 0.13 | 0.20 | μs |
| | Turn-On Time | t _{on} | | — | 0.30 | 0.50 | |
| | Fall Time | t _f | | — | 0.15 | 0.30 | |
| | Turn-Off Time | t _{off} | | — | 0.50 | 0.80 | |
| Forward Voltage | | V _F | I _F = 50 A, V _{GE} = 0 | — | 2.3 | 3.0 | V |
| Reverse Recovery Time | | t _{rr} | I _F = 50 A, V _{GE} = -10 V di/dt = 100 A/μs | — | 0.08 | 0.15 | μs |
| Thermal Resistance | | R _{th (j-c)} | Transistor | — | — | 0.6 | °C/W |
| | | | Diode | — | — | 1.5 | |

b. Converter stage

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|--|-----------------------|--------------------------|------|------|------|------|
| Repetitive Peak Reverse Current | | I _{RRM} | V _{RRM} = 800 V | — | — | 50 | μA |
| Peak Forward Voltage | | V _{FM} | I _{FM} = 30 A | — | 1.05 | 1.20 | V |
| Peak One Cycle Surge Forward Current | | I _{FSM} | 50 Hz sine-half-wave | 400 | — | — | A |
| Thermal Resistance | | R _{th (j-c)} | — | — | — | 1.56 | °C/W |

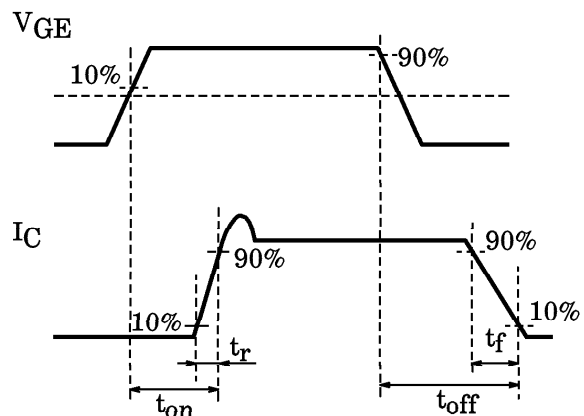
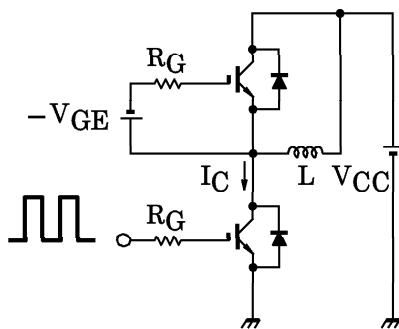
c. Brake stage

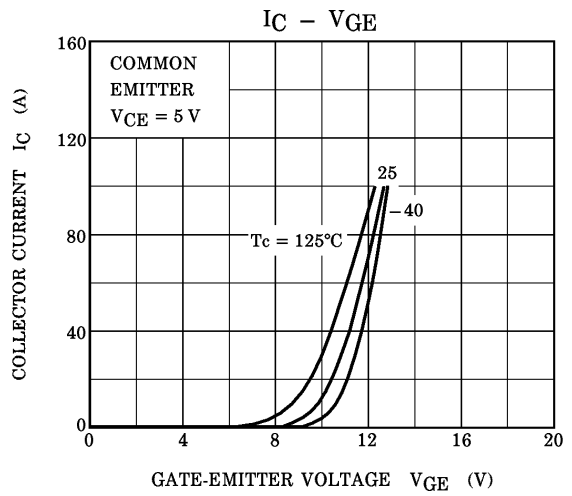
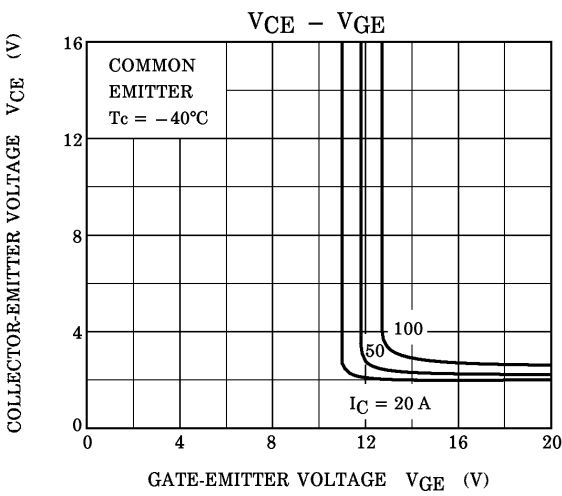
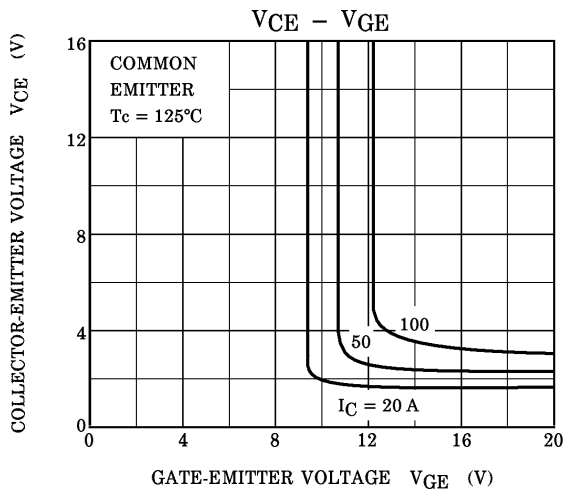
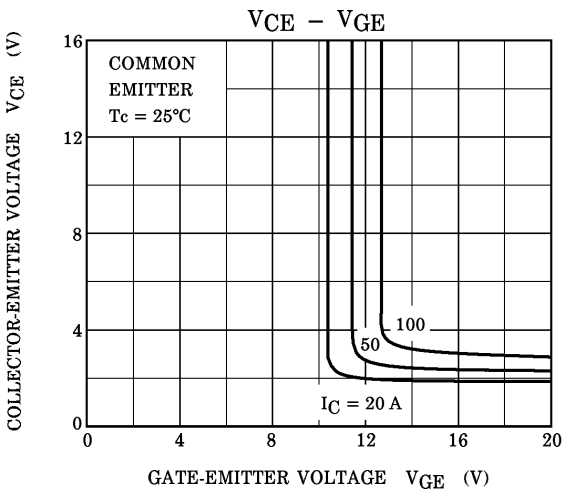
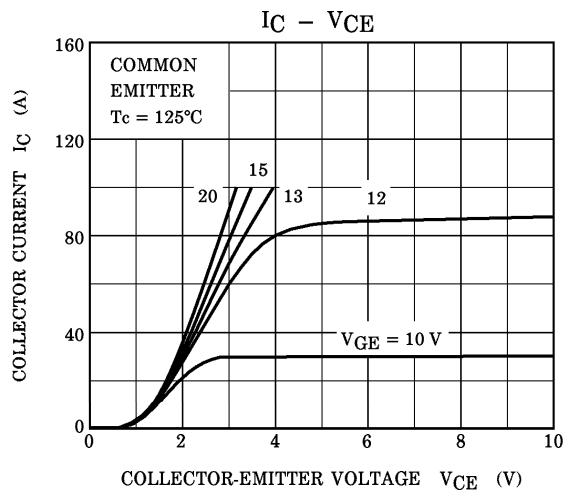
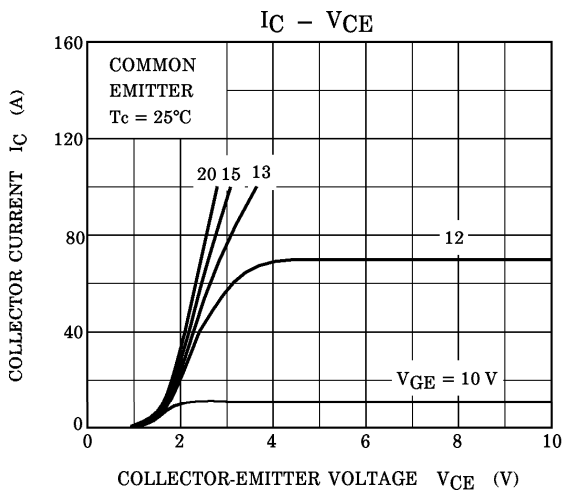
| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--------------------------------------|---------------|----------------------|--|---------------------------|------|-----------|--------------------|---|
| Gate Leakage Current | | I_{GES} | $V_{GE} = \pm 20\text{ V}, V_{CE} = 0$ | — | — | ± 500 | nA | |
| Collector Cut-Off Current | | I_{CES} | $V_{CE} = 600\text{ V}, V_{GE} = 0$ | — | — | 1.0 | mA | |
| Reverse Current | | I_R | $V_R = 600\text{ V}$ | — | — | 1.0 | mA | |
| Gate-Emitter Cut-Off Voltage | | $V_{GE}(\text{off})$ | $I_C = 5\text{ mA}, V_{CE} = 5\text{ V}$ | 5.0 | — | 8.0 | V | |
| Collector-Emitter Saturation Voltage | | $V_{CE}(\text{sat})$ | $I_C = 50\text{ A}$ | $T_j = 25^\circ\text{C}$ | | — | 2.1 | V |
| | | | $V_{GE} = 15\text{ V}$ | $T_j = 125^\circ\text{C}$ | | — | 2.2 | |
| Input Capacitance | | C_{ies} | $V_{CE} = 10\text{ V}, V_{GE} = 0,$ $f = 1\text{ MHz}$ | — | 4800 | — | pF | |
| Switching Time | Rise Time | t_r | $V_{CC} = 600\text{ V}$ $I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 24\ \Omega$ (Note 1) | — | 0.13 | 0.20 | μs | |
| | Turn-On Time | t_{on} | | — | 0.30 | 0.50 | | |
| | Fall Time | t_f | | — | 0.15 | 0.30 | | |
| | Turn-Off Time | t_{off} | | — | 0.50 | 0.80 | | |
| Forward Voltage | | V_F | $I_F = 50\text{ A}, V_{GE} = 0$ | — | 2.3 | 3.0 | V | |
| Thermal Resistance | | $R_{th(j-c)}$ | Transistor | — | — | 0.6 | $^\circ\text{C/W}$ | |
| | | | Diode | — | — | 1.5 | | |

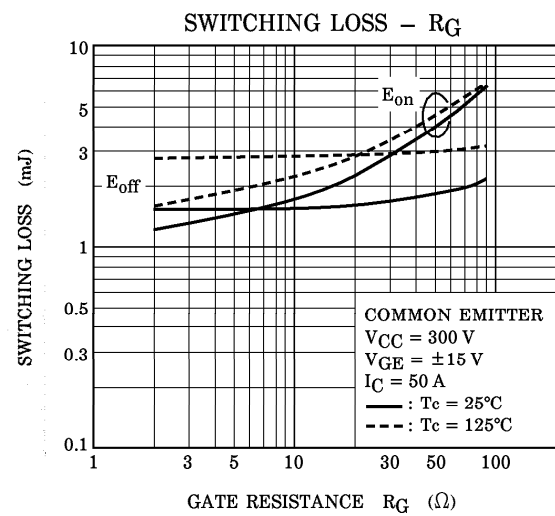
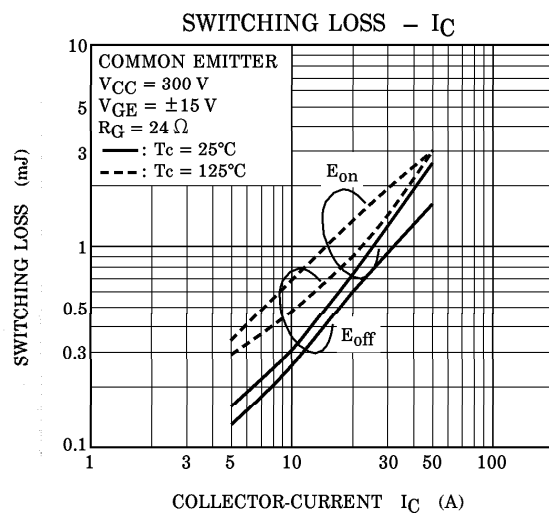
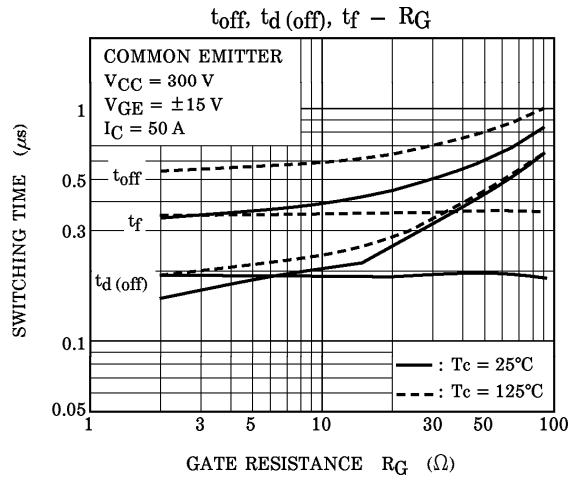
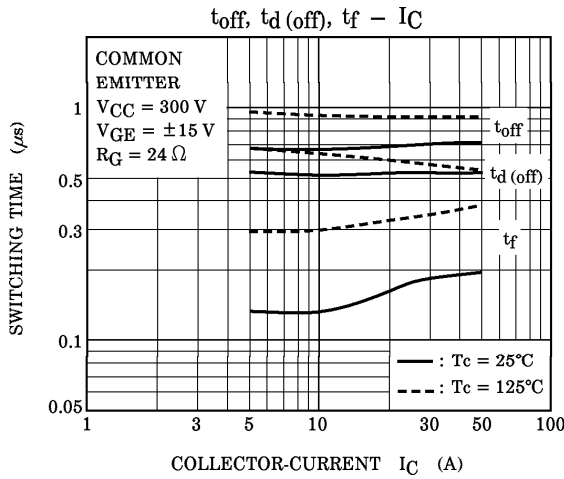
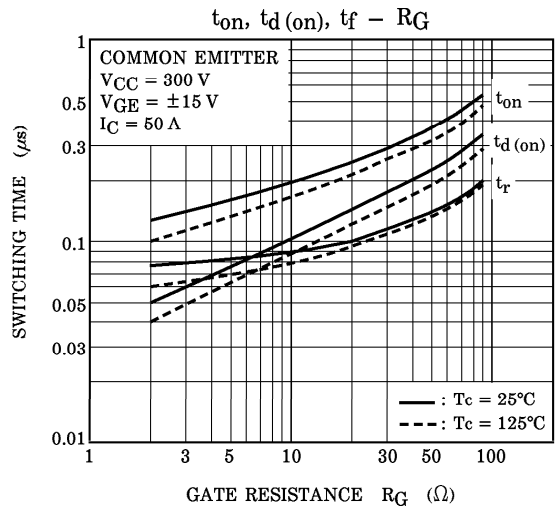
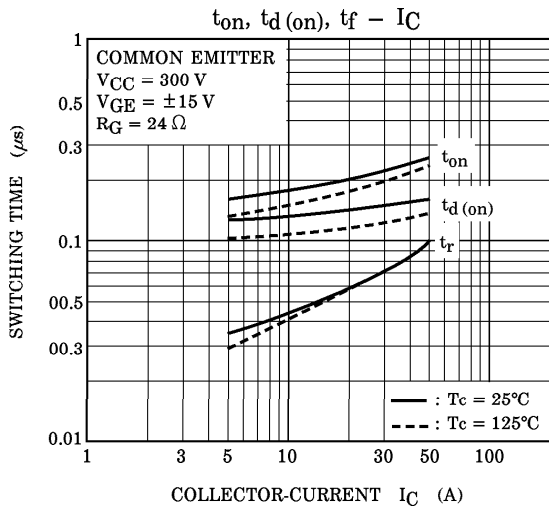
d. Thermistor

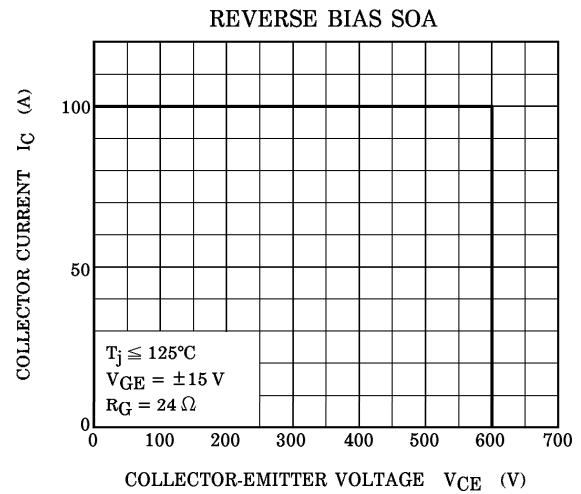
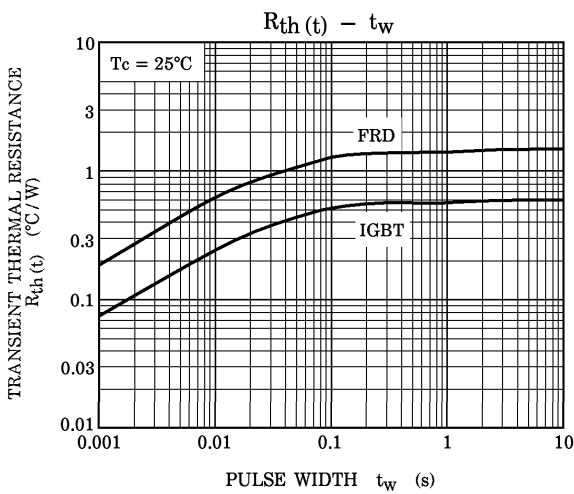
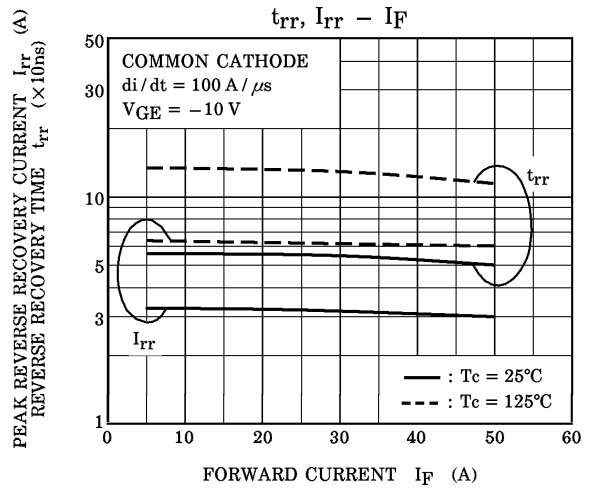
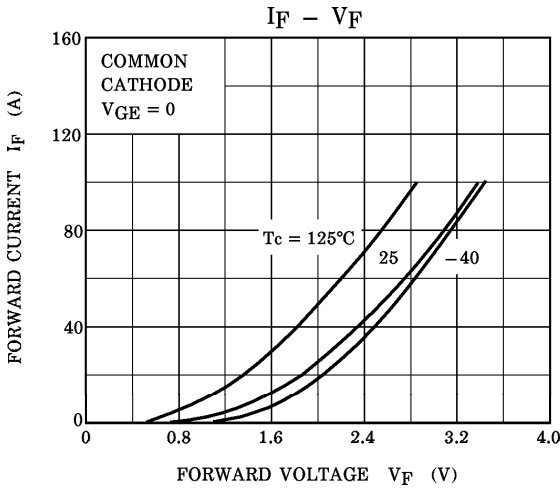
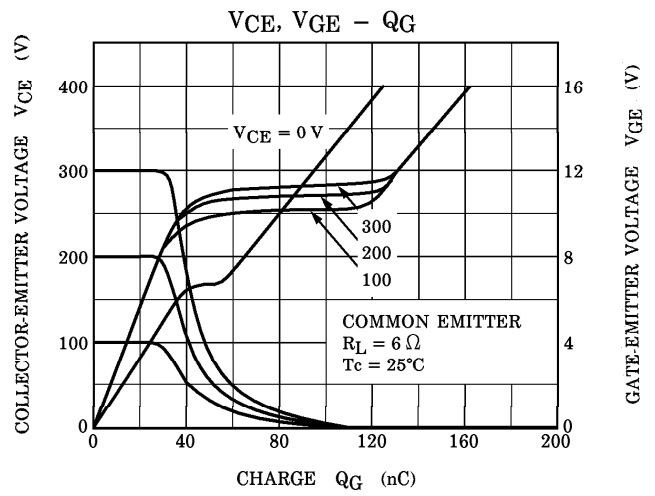
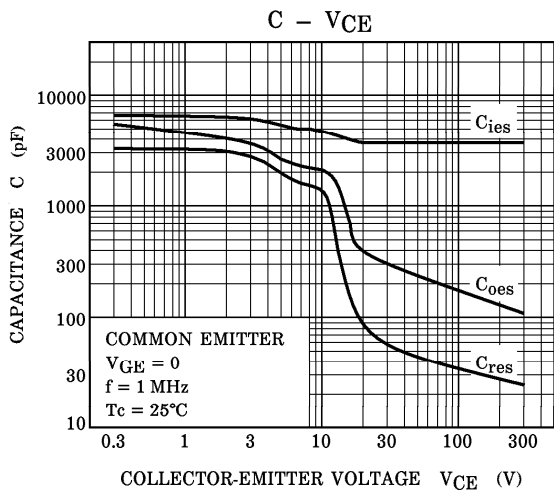
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------------------|-------------|---|-------|------|-------|-----------|
| Zero-power Resistance | R_{25} | $I_{TM} = 0.2\text{ mA}, T_c = 25^\circ\text{C}$ | 17.31 | 20 | 23.14 | $k\Omega$ |
| B Value | $B_{25/85}$ | $T_c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

(Note 1) : Switching Time Test Circuit & Timing Chart









b. Converter stage

