

7MBR50VM120-50

IGBT Modules

IGBT MODULE (V series)

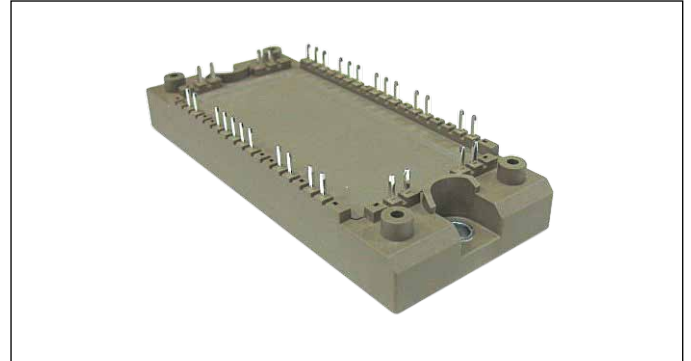
1200V / 50A / PIM

■ Features

- Low $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (at $T_c=25^\circ\text{C}$ unless otherwise specified)

| Items | | Symbols | Conditions | | Maximum ratings | Units |
|---|---|-----------------|-------------------------------|-------------------------|------------------|----------------------|
| Inverter | Collector-Emitter voltage | V_{CES} | | | 1200 | V |
| | Gate-Emitter voltage | V_{GES} | | | ± 20 | V |
| | Collector current | I_c | Continuous | $T_c=100^\circ\text{C}$ | 50 | A |
| | | I_{cp} | 1ms | $T_c=80^\circ\text{C}$ | 100 | |
| | | $-I_c$ | | | 50 | |
| $-I_c$ pulse | | 1ms | | | 100 | |
| Collector power dissipation | P_c | 1 device | | 280 | W | |
| Brake | Collector-Emitter voltage | V_{CES} | | | 1200 | V |
| | Gate-Emitter voltage | V_{GES} | | | ± 20 | V |
| | Collector current | I_c | Continuous | $T_c=80^\circ\text{C}$ | 35 | A |
| | | I_{cp} | 1ms | $T_c=80^\circ\text{C}$ | 70 | |
| | Collector power dissipation | P_c | 1 device | | 210 | W |
| Repetitive peak reverse voltage (Diode) | V_{RRM} | | | 1200 | V | |
| Converter | Repetitive peak reverse voltage | V_{RRM} | | | 1600 | V |
| | Average output current | I_o | 50Hz/60Hz, sine wave | | 50 | A |
| | Surge current (Non-Repetitive) | I_{FSM} | 10ms, $T_j=150^\circ\text{C}$ | | 360 | A |
| | I^2t (Non-Repetitive) | I^2t | half sine wave | | 648 | A^2s |
| Junction temperature | T_j | Inverter, Brake | | 175 | $^\circ\text{C}$ | |
| | | Converter | | 150 | | |
| Operating junction temperature (under switching conditions) | T_{jop} | Inverter, Brake | | 150 | | |
| | | Converter | | 150 | | |
| Case temperature | T_c | | | 125 | | |
| Storage temperature | T_{stg} | | | -40 to +125 | | |
| Isolation voltage | between terminal and copper base (*1) between thermistor and others (*2) | V_{iso} | AC : 1min. | | 2500 | VAC |
| Screw torque | Mounting (*3) | - | M5 | | 3.5 | N m |

Note *1: All terminals should be connected together during the test.

Note *2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note *3: Recommendable value : 2.5-3.5 Nm (M5)

● Electrical characteristics (at T_j = 25°C unless otherwise specified)

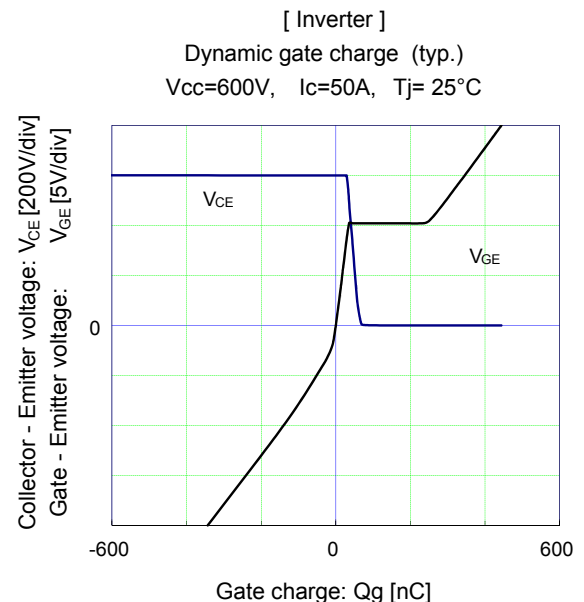
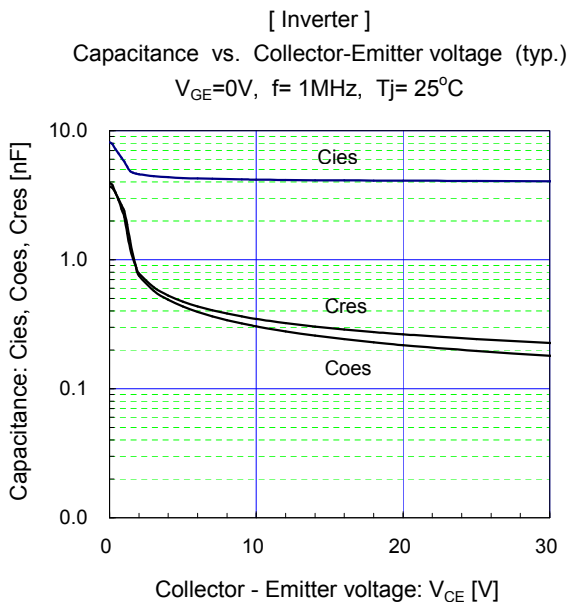
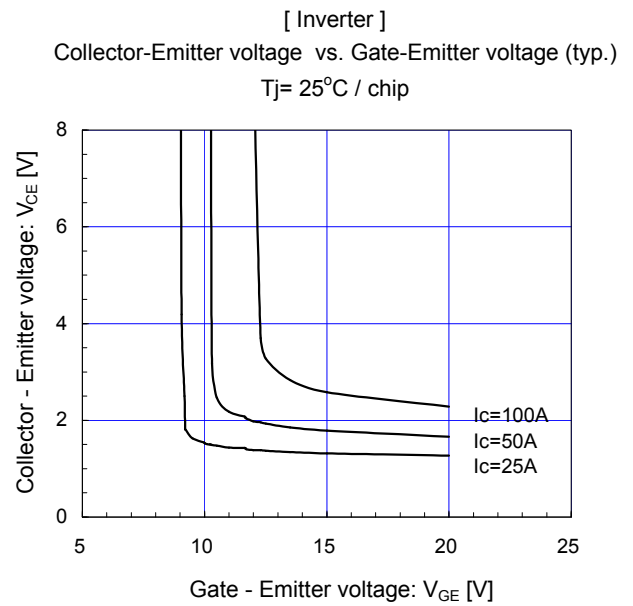
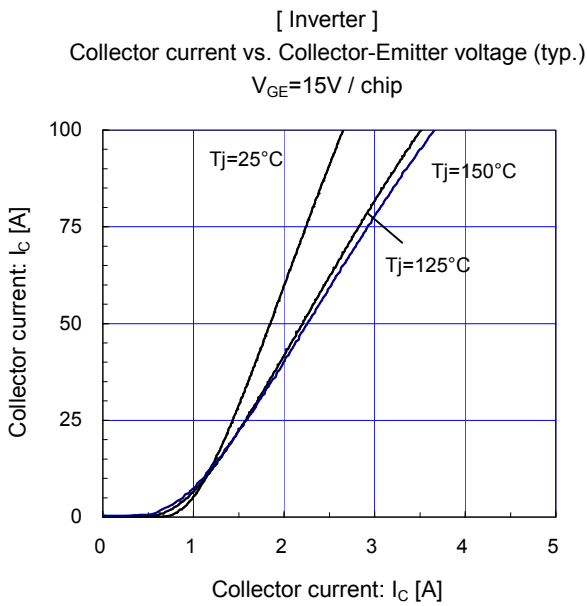
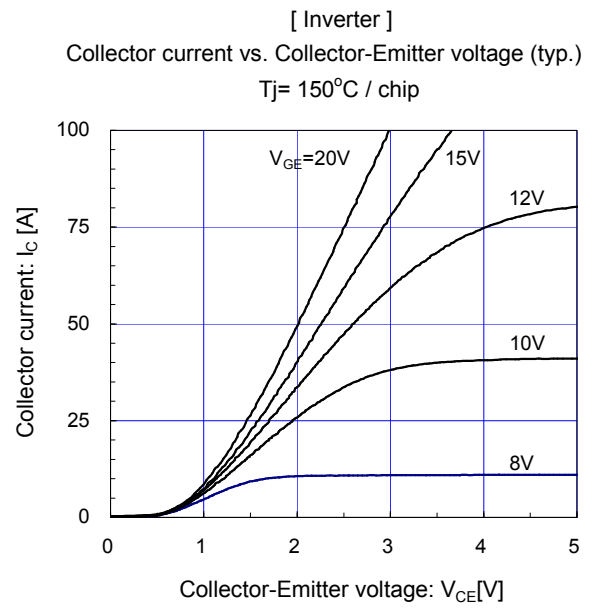
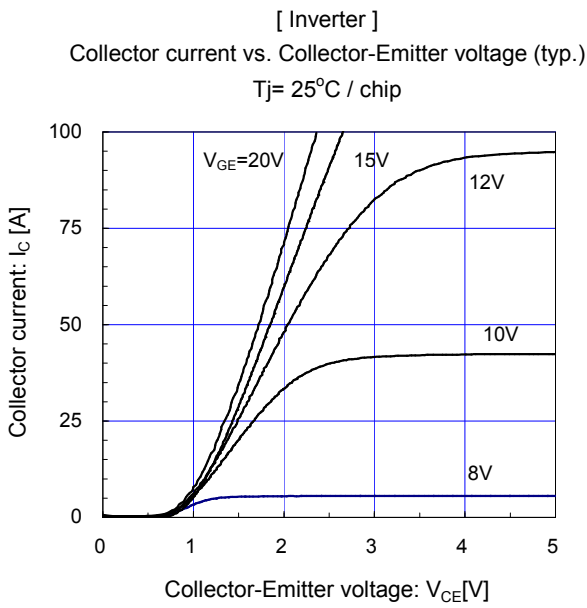
| Items | Symbols | Conditions | Characteristics | | | Units | | |
|------------------------|--------------------------------------|--|---|------------------------|------|-------|------|---|
| | | | min. | typ. | max. | | | |
| Inverter | Zero gate voltage collector current | I _{CES} | V _{GE} = 0V, V _{CE} = 1200V | - | - | 1.0 | mA | |
| | Gate-Emitter leakage current | I _{GES} | V _{GE} = 0V, V _{CE} = ±20V | - | - | 200 | nA | |
| | Gate-Emitter threshold voltage | V _{GE(th)} | V _{CE} = 20V, I _c = 50mA | 6.0 | 6.5 | 7.0 | V | |
| | Collector-Emitter saturation voltage | V _{CE(sat)} (terminal) | V _{GE} = 15V I _c = 50A | T _j = 25°C | - | 2.20 | 2.65 | V |
| | | | | T _j = 125°C | - | 2.55 | - | |
| | | | | T _j = 150°C | - | 2.60 | - | |
| | | V _{CE(sat)} (chip) | V _{GE} = 15V I _c = 50A | T _j = 25°C | - | 1.85 | 2.30 | |
| | | | | T _j = 125°C | - | 2.20 | - | |
| | T _j = 150°C | - | 2.25 | - | | | | |
| | Internal gate resistance | R _{g(int)} | - | - | 4 | - | Ω | |
| | Input capacitance | C _{ies} | V _{CE} = 10V, V _{GE} = 0V, f = 1MHz | - | 4.2 | - | nF | |
| | Turn-on time | ton | V _{CC} = 600V I _c = 50A | - | 0.39 | 1.20 | μs | |
| | | tr | | - | 0.09 | 0.60 | | |
| | | tr(i) | | - | 0.03 | - | | |
| | Turn-off time | toff | V _{GE} = +15 / -15V R _G = 15Ω | - | 0.53 | 1.00 | μs | |
| tf | | - | | 0.06 | 0.30 | | | |
| Forward on voltage | V _F (terminal) | I _F = 50A | T _j = 25°C | - | 2.25 | 2.70 | V | |
| | | | T _j = 125°C | - | 2.50 | - | | |
| | | | T _j = 150°C | - | 2.45 | - | | |
| | V _F (chip) | I _F = 50A | T _j = 25°C | - | 1.90 | 2.35 | | |
| | | | T _j = 125°C | - | 2.15 | - | | |
| T _j = 150°C | - | 2.10 | - | | | | | |
| Reverse recovery time | trr | I _F = 50A | - | - | 0.35 | μs | | |
| Brake | Zero gate voltage collector current | I _{CES} | V _{GE} = 0V V _{CE} = 1200V | - | - | 1.0 | mA | |
| | Gate-Emitter leakage current | I _{GES} | V _{CE} = 0V V _{GE} = +20 / -20V | - | - | 200 | nA | |
| | Collector-Emitter saturation voltage | V _{CE(sat)} (terminal) | V _{GE} = 15V I _c = 35A | T _j = 25°C | - | 2.10 | 2.55 | V |
| | | | | T _j = 125°C | - | 2.45 | - | |
| | | | | T _j = 150°C | - | 2.50 | - | |
| | | V _{CE(sat)} (chip) | V _{GE} = 15V I _c = 35A | T _j = 25°C | - | 1.85 | 2.30 | |
| | | | | T _j = 125°C | - | 2.20 | - | |
| | T _j = 150°C | - | 2.25 | - | | | | |
| | Internal gate resistance | R _{g(int)} | - | - | 0 | - | Ω | |
| | Turn-on time | ton | V _{CE} = 600V I _c = 35A | - | 0.39 | 1.20 | μs | |
| tr | | - | | 0.09 | 0.60 | | | |
| Turn-off time | toff | V _{GE} = +15 / -15V R _G = 27Ω | - | 0.53 | 1.00 | μs | | |
| | tf | | - | 0.06 | 0.30 | | | |
| Reverse current | IRRM | V _R = 1200V | - | - | 1.00 | mA | | |
| Converter | Forward on voltage | V _{FM} (chip) | terminal | - | 1.70 | 2.15 | V | |
| | | | chip | - | 1.35 | - | | |
| Reverse current | IRRM | V _R = 1600V | - | - | 1.0 | mA | | |
| Thermistor | Resistance | R | T = 25°C | - | 5000 | - | Ω | |
| | | | T = 100°C | 465 | 495 | 520 | | |
| | B value | B | T = 25 / 50°C | 3305 | 3375 | 3450 | K | |

● Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics | | | Units |
|---|----------------------|-----------------------|-----------------|------|------|-------|
| | | | min. | typ. | max. | |
| Thermal resistance (1device) | R _{th(j-c)} | Inverter IGBT | - | - | 0.54 | °C/W |
| | | Inverter FWD | - | - | 0.91 | |
| | | Brake IGBT | - | - | 0.72 | |
| | | Converter Diode | - | - | 0.54 | |
| Contact thermal resistance (1device) (*4) | R _{th(c-f)} | with Thermal Compound | - | 0.05 | - | |

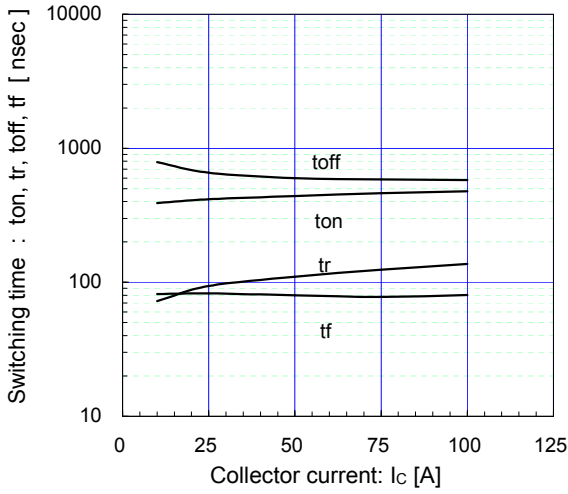
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



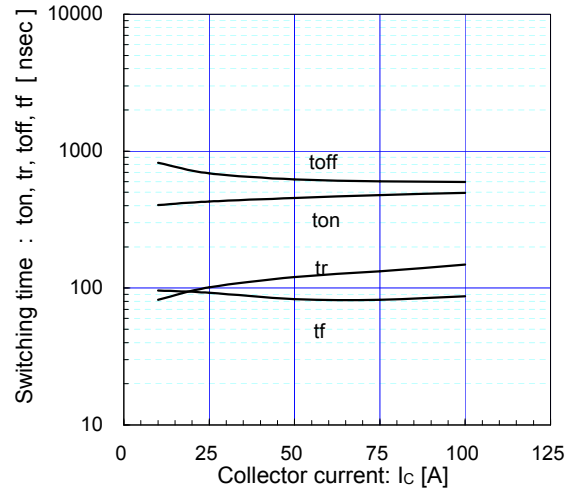
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=15\Omega, T_j=125^\circ C$



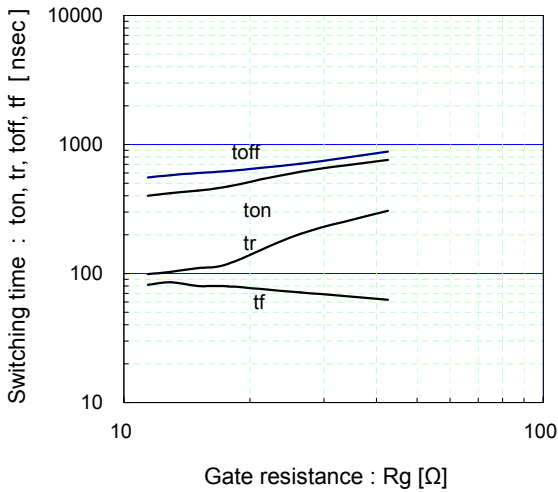
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=15\Omega, T_j=150^\circ C$



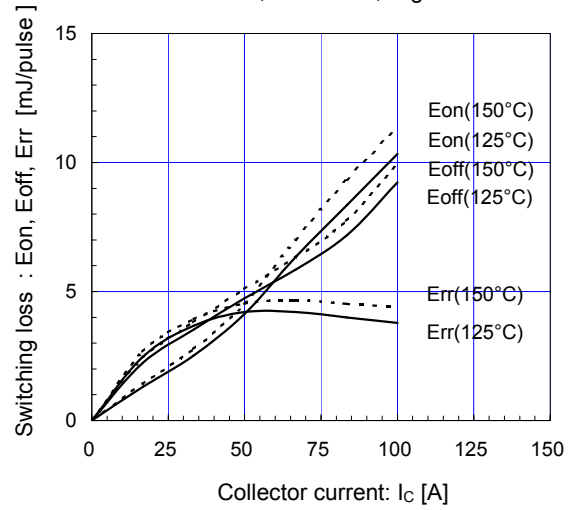
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Switching time vs. gate resistance (typ.)
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V, T_j=125^\circ C$



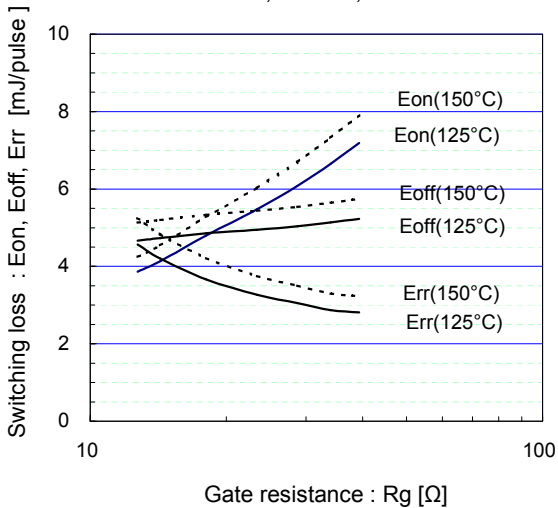
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Switching loss vs. Collector current (typ.)
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=15\Omega$



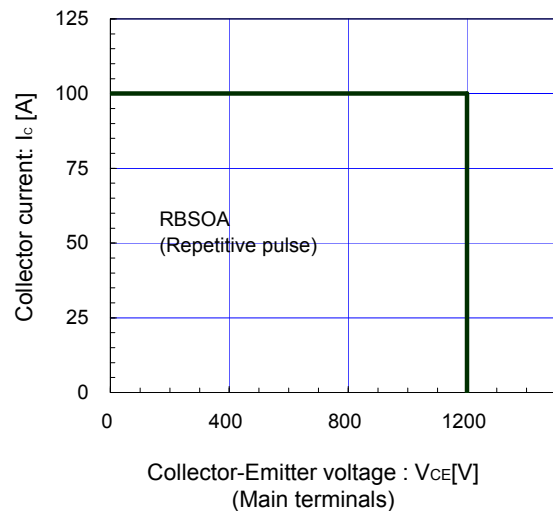
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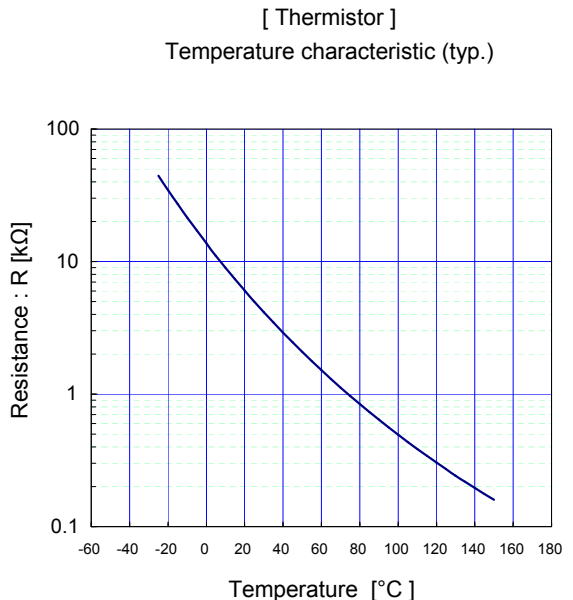
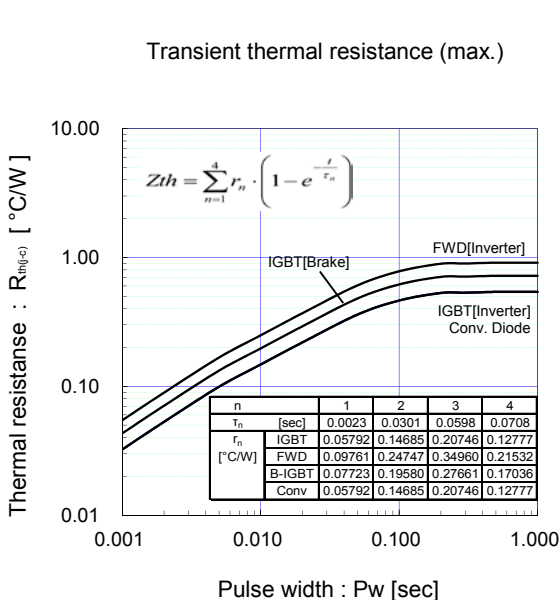
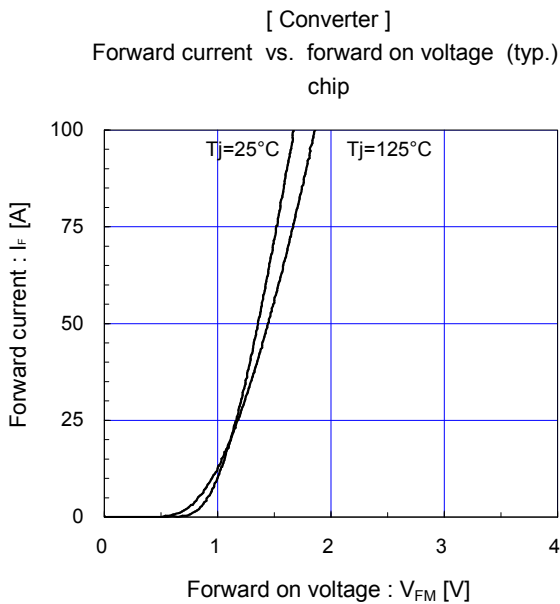
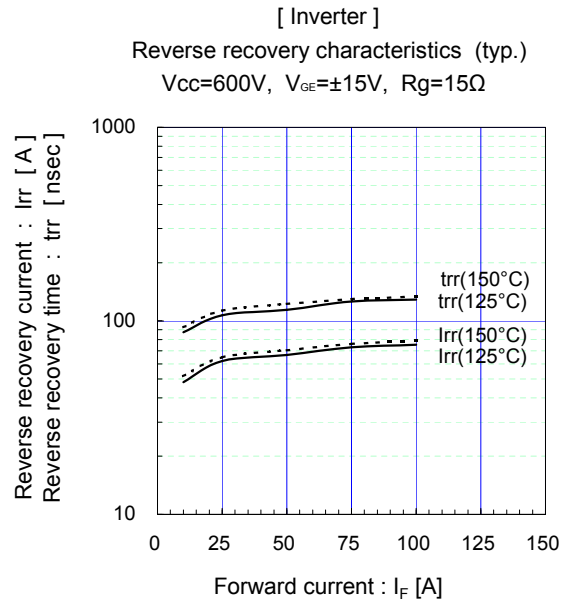
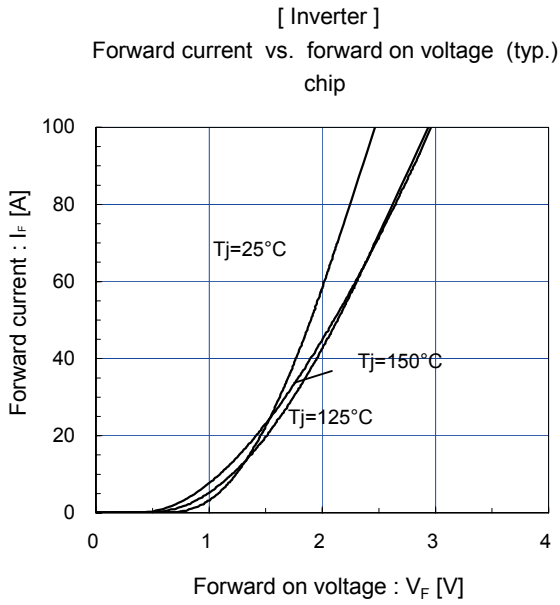
Switching loss vs. gate resistance (typ.)
 $V_{CC}=600V, I_c=50A, V_{GE}=\pm 15V$

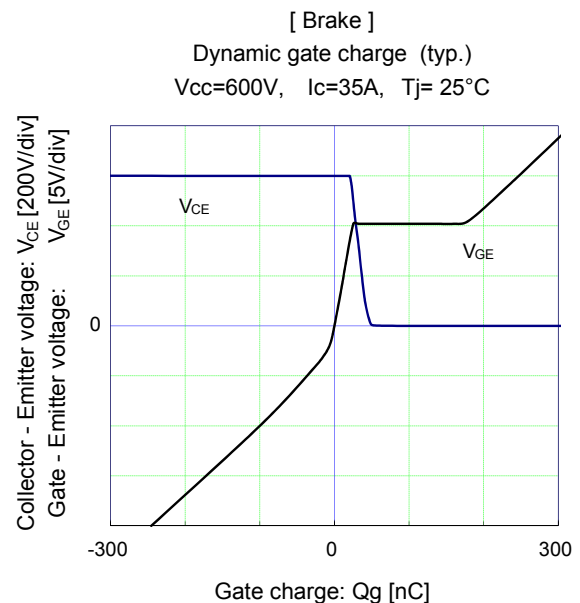
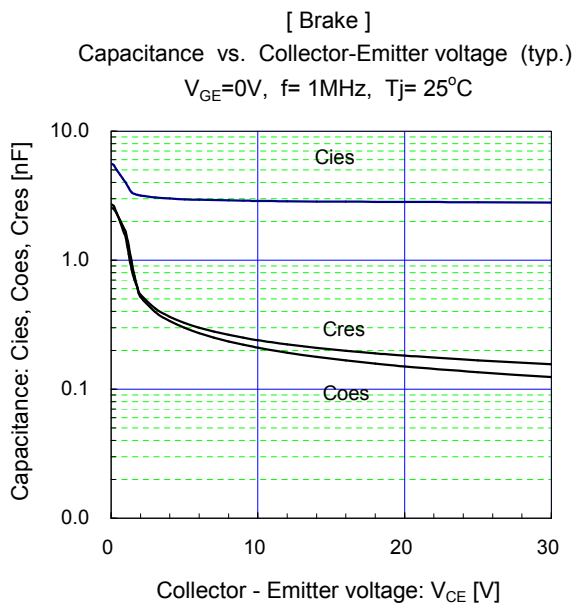
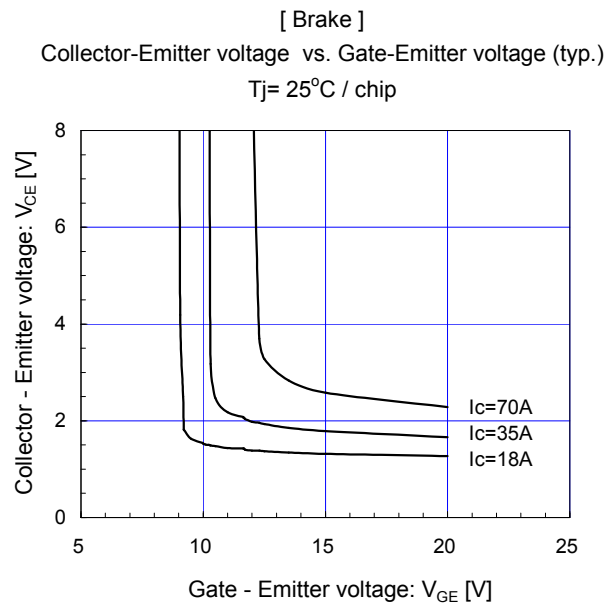
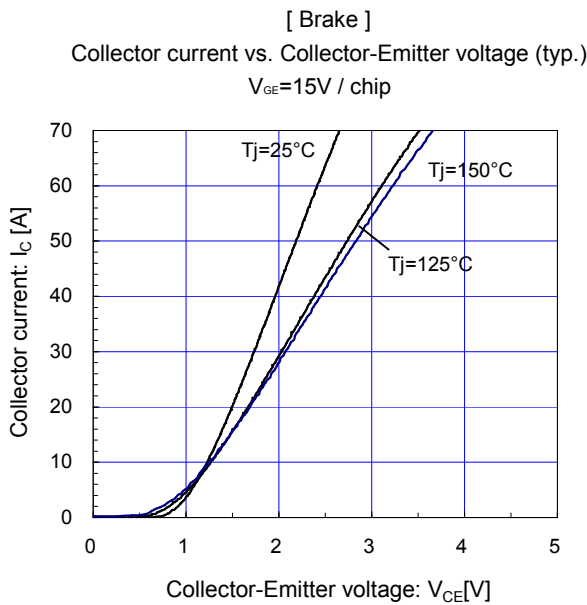
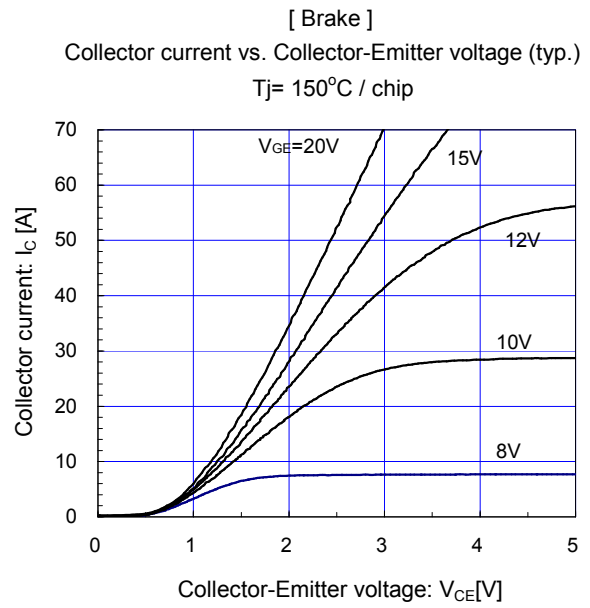
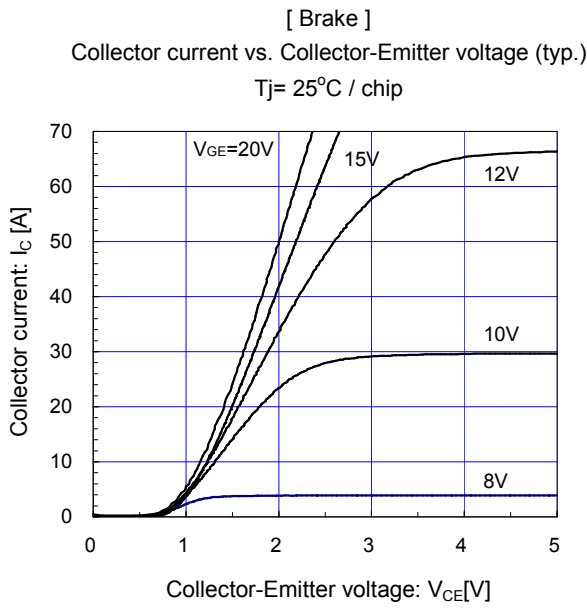


[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_g \geq 15\Omega, T_j = 150^\circ C$







WARNING

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