

7MBR15VKA060-50

IGBT Modules

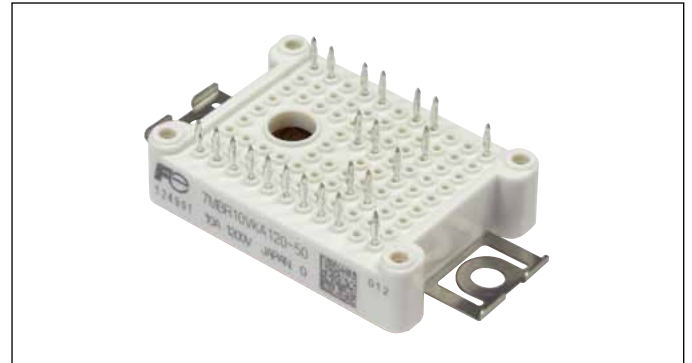
IGBT MODULE (V series) 600V / 10A / PIM

■ 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} | | 600 | V | |
| | Gate-Emitter voltage | V_{GES} | | ± 20 | V | |
| | Collector current | I_c | Continuous | $T_c=100^\circ\text{C}$ | 15 | A |
| | | I_{cp} | 1ms | $T_c=80^\circ\text{C}$ | 30 | |
| | | $-I_c$ | | | 15 | |
| | $-I_{c\ pulse}$ | 1ms | | 30 | | |
| Collector power dissipation | P_c | 1 device | | 85 | W | |
| Brake | Collector-Emitter voltage | V_{CES} | | 600 | V | |
| | Gate-Emitter voltage | V_{GES} | | ± 20 | V | |
| | Collector current | I_c | Continuous | $T_c=80^\circ\text{C}$ | 15 | A |
| | | I_{cp} | 1ms | $T_c=80^\circ\text{C}$ | 30 | |
| | Collector power dissipation | P_c | 1 device | | 85 | W |
| Repetitive peak reverse voltage (Diode) | V_{RRM} | | | 600 | V | |
| Converter | Repetitive peak reverse voltage | V_{RRM} | | 800 | V | |
| | Average output current | I_o | 50Hz/60Hz, sine wave | 15 | 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 | 660 | 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) | - | M4 | 1.7 | Nm | |

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 : 1.3-1.7 Nm (M4)

● 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} = 600V | - | - | 1.0 | mA | |
| | Gate-Emitter leakage current | I _{GES} | V _{CE} = 0V, V _{GE} = ±20V | - | - | 200 | nA | |
| | Gate-Emitter threshold voltage | V _{GE(th)} | V _{CE} = 20V, I _c = 15mA | 6.2 | 6.7 | 7.2 | V | |
| | Collector-Emitter saturation voltage | V _{CE(sat)} (terminal) | V _{GE} = 15V I _c = 15A | T _j = 25°C | - | 1.95 | 2.35 | V |
| | | | | T _j = 125°C | - | 2.35 | - | |
| | | | | T _j = 150°C | - | 2.45 | - | |
| | | V _{CE(sat)} (chip) | V _{GE} = 15V I _c = 15A | T _j = 25°C | - | 1.75 | 2.15 | |
| | | | | T _j = 125°C | - | 2.15 | - | |
| | T _j = 150°C | - | 2.25 | - | | | | |
| | Internal gate resistance | R _{g(int)} | - | - | 0 | - | Ω | |
| | Input capacitance | C _{ies} | V _{CE} = 10V, V _{GE} = 0V, f = 1MHz | - | 0.9 | - | nF | |
| | Turn-on time | ton | V _{CC} = 300V I _c = 15A V _{GE} = +15 / -15V R _G = 22Ω | - | 0.08 | 1.20 | μs | |
| | | tr | | - | 0.06 | 0.60 | | |
| | | tr(i) | | - | 0.02 | - | | |
| | Turn-off time | toff | R _G = 22Ω | - | 0.14 | 1.20 | μs | |
| tf | | - | | 0.02 | 0.45 | | | |
| Forward on voltage | V _F (terminal) | I _F = 15A | T _j = 25°C | - | 1.95 | 2.35 | V | |
| | | | T _j = 125°C | - | 1.90 | - | | |
| | | | T _j = 150°C | - | 1.90 | - | | |
| | V _F (chip) | I _F = 15A | T _j = 25°C | - | 1.75 | 2.15 | | |
| | | | T _j = 125°C | - | 1.70 | - | | |
| T _j = 150°C | - | 1.70 | - | | | | | |
| Reverse recovery time | trr | I _F = 15A | - | - | 0.35 | μs | | |
| Brake | Zero gate voltage collector current | I _{CES} | V _{GE} = 0V V _{CE} = 600V | - | - | 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 = 15A | T _j = 25°C | - | 1.95 | 2.35 | V |
| | | | | T _j = 125°C | - | 2.35 | - | |
| | | | | T _j = 150°C | - | 2.45 | - | |
| | | V _{CE(sat)} (chip) | V _{GE} = 15V I _c = 15A | T _j = 25°C | - | 1.75 | 2.15 | |
| | | | | T _j = 125°C | - | 2.15 | - | |
| | T _j = 150°C | - | 2.25 | - | | | | |
| | Internal gate resistance | R _{g(int)} | - | - | 0 | - | Ω | |
| | Turn-on time | ton | V _{CE} = 300V I _c = 15A V _{GE} = +15 / -15V R _G = 22Ω | - | 0.08 | 1.20 | μs | |
| tr | | - | | 0.06 | 0.60 | | | |
| Turn-off time | toff | R _G = 22Ω | - | 0.14 | 1.20 | μs | | |
| | tf | | - | 0.02 | 0.45 | | | |
| Reverse current | IRRM | V _R = 600V | - | - | 1.00 | mA | | |
| Converter | Forward on voltage | I _F = 15A | terminal | - | 1.20 | 1.65 | V | |
| | | | chip | - | 1.00 | - | | |
| Reverse current | IRRM | V _R = 800V | - | - | 1.00 | mA | | |
| Thermistor | Resistance | 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

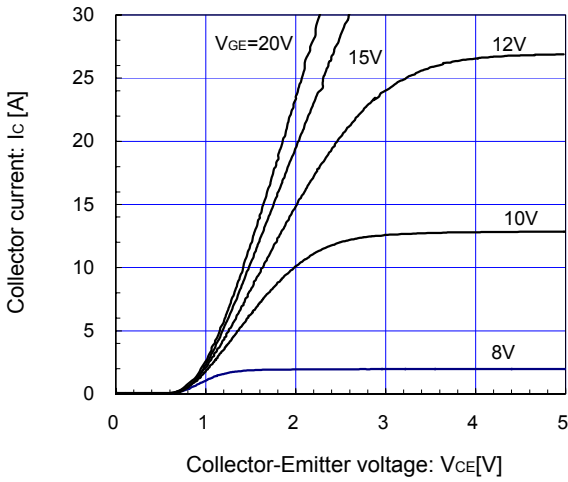
| Items | Symbols | Conditions | Characteristics | | | Units |
|---|----------------------|-----------------------|-----------------|------|------|-------|
| | | | min. | typ. | max. | |
| Thermal resistance (1device) | R _{th(j-c)} | Inverter IGBT | - | - | 1.80 | °C/W |
| | | Inverter FWD | - | - | 2.31 | |
| | | Brake IGBT | - | - | 1.80 | |
| | | Converter Diode | - | - | 1.35 | |
| 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)

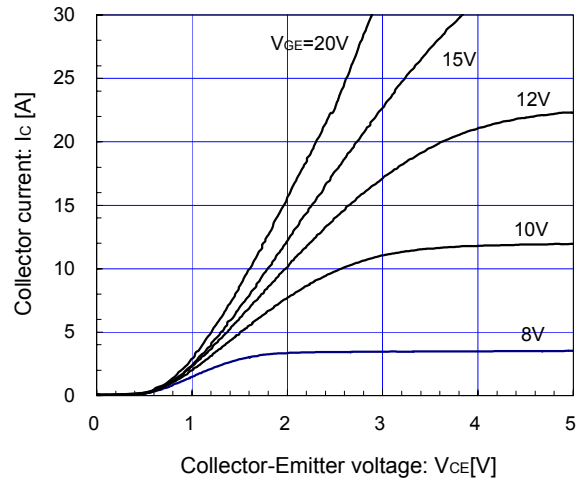
[Inverter]

Collector current vs. Collector-Emittor voltage (typ.)
Tj= 25°C / chip



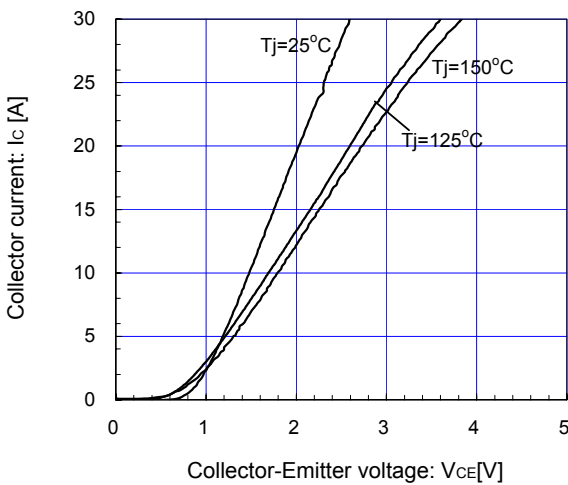
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Collector current vs. Collector-Emittor voltage (typ.)
Tj= 150°C / chip



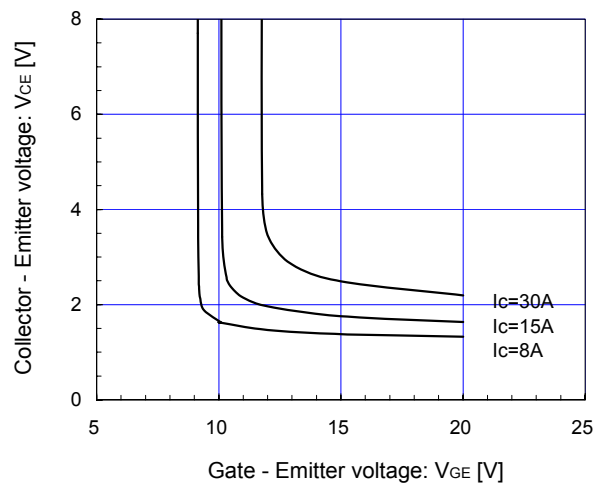
[Inverter]

Collector current vs. Collector-Emittor voltage (typ.)
VGE=15V / chip



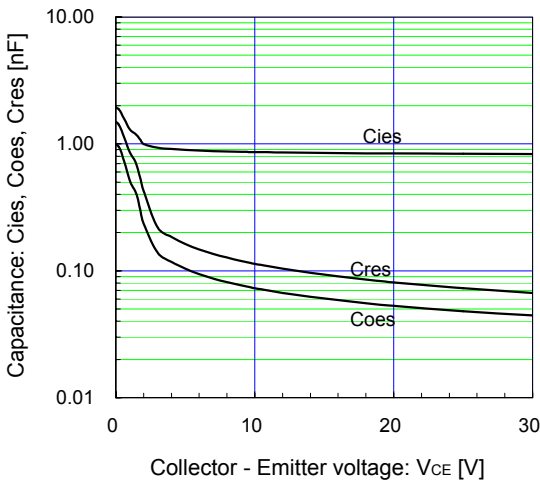
[Inverter]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
Tj= 25°C / chip



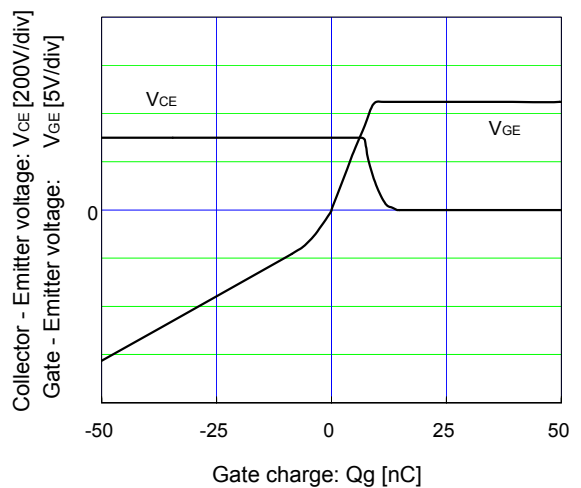
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Capacitance vs. Collector-Emittor voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



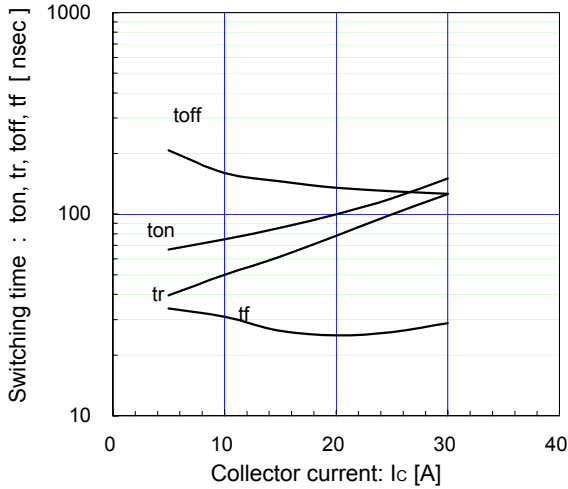
[Inverter]

Dynamic gate charge (typ.)
Vcc=300V, Ic=15A, Tj= 25°C



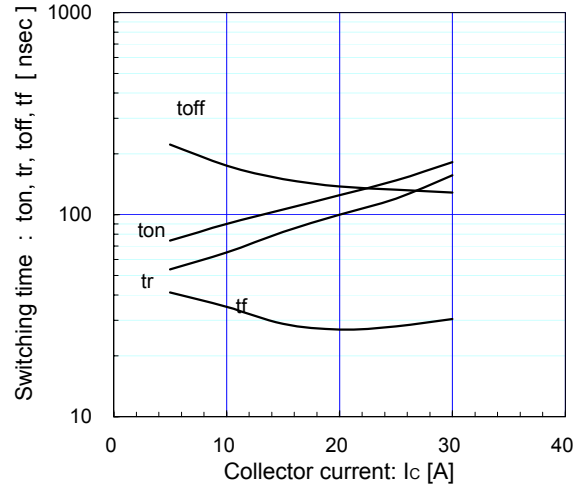
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_g=22\Omega, T_j=125^\circ C$



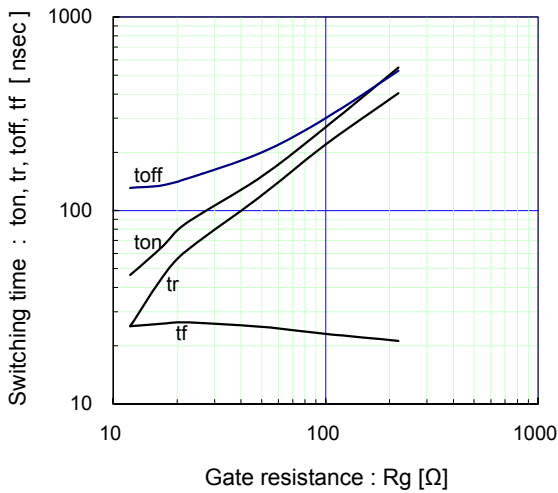
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_g=22\Omega, T_j=150^\circ C$



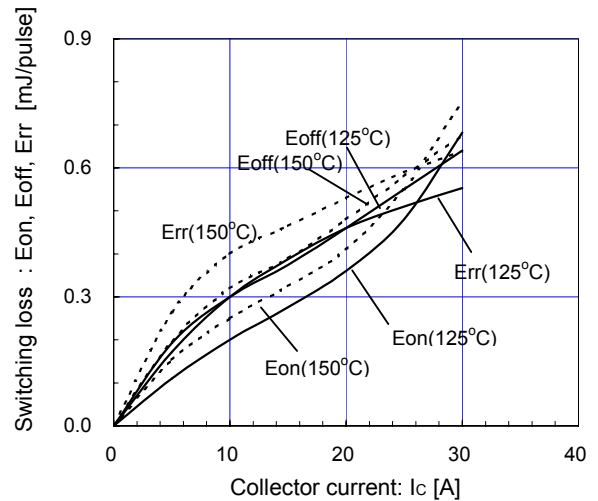
[Inverter]

Switching time vs. gate resistance (typ.)
 $V_{CC}=300V, I_c=15A, V_{GE}=\pm 15V, T_j=125^\circ C$



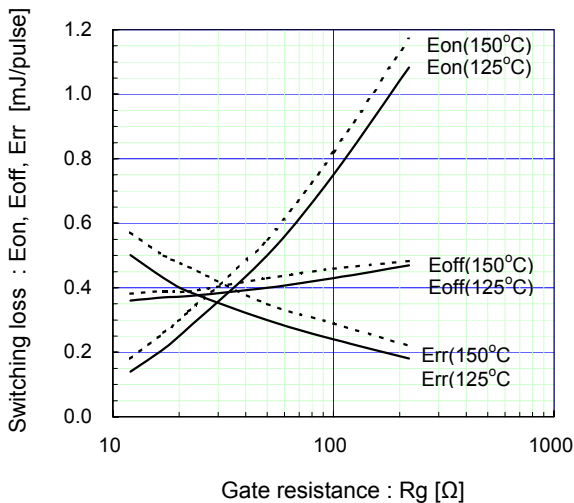
[Inverter]

Switching loss vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_g=22\Omega$



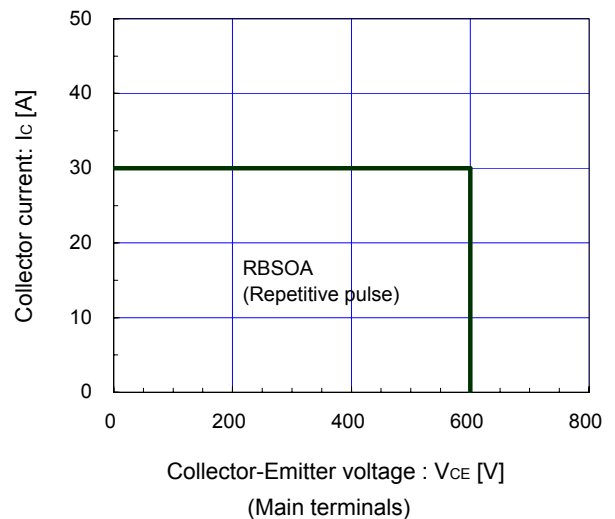
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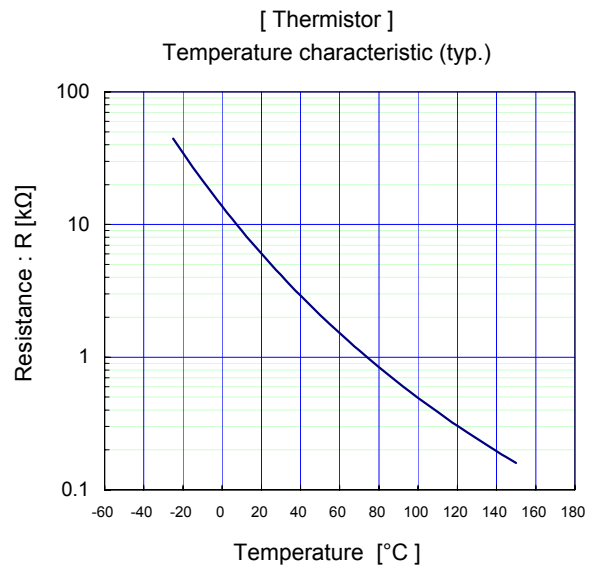
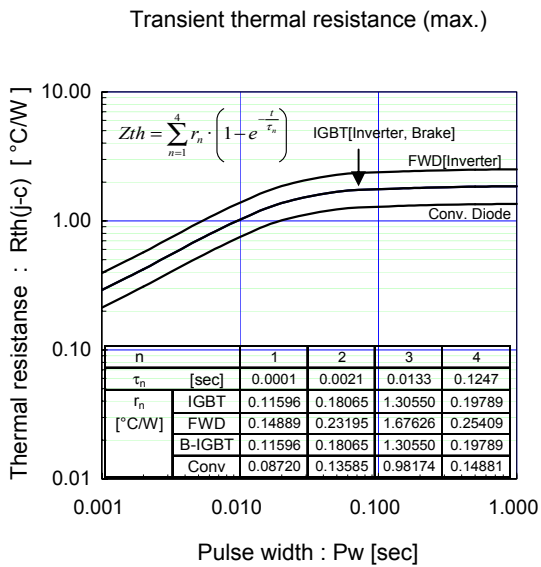
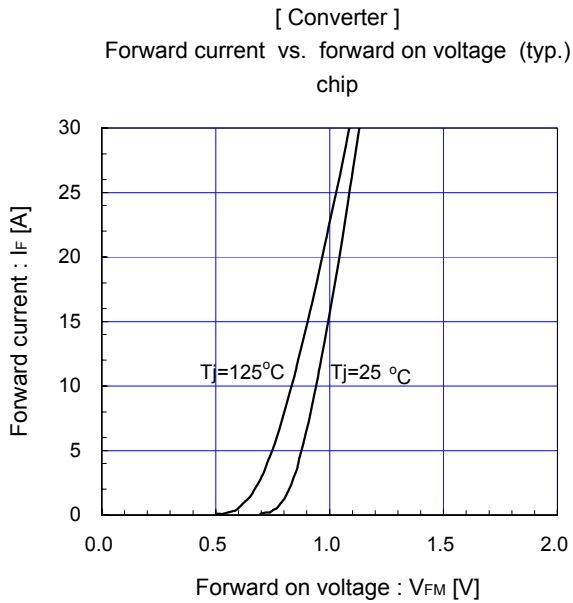
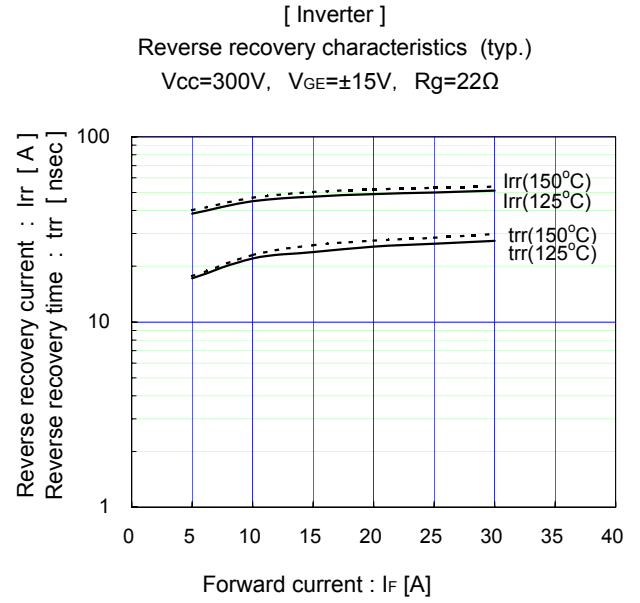
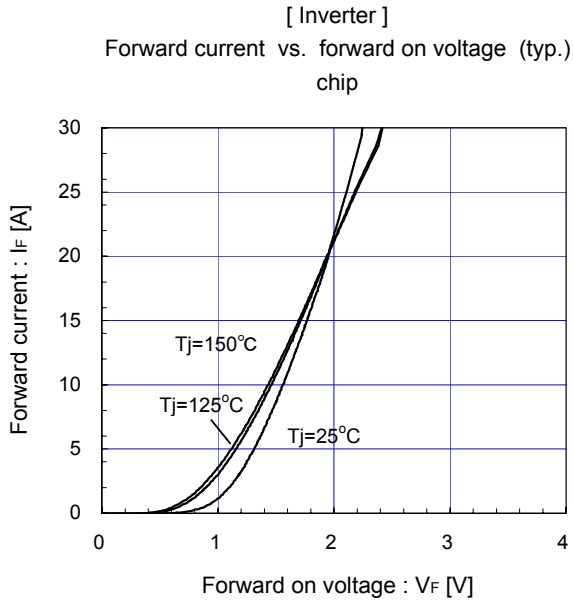
Switching loss vs. gate resistance (typ.)
 $V_{CC}=300V, I_c=15A, V_{GE}=\pm 15V$



[Inverter]

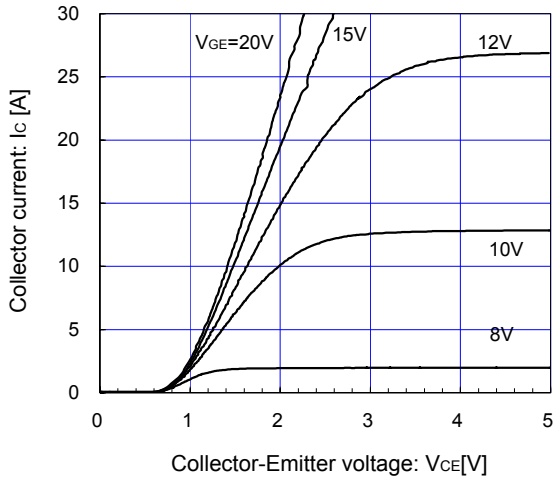
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 22\Omega, T_j = 150^\circ C$





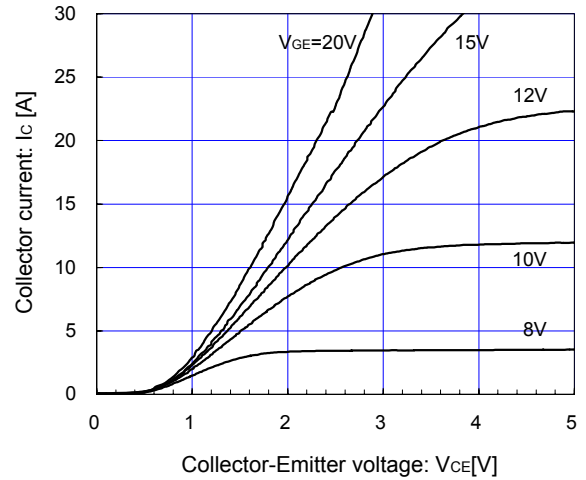
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)
T_j= 25°C / chip



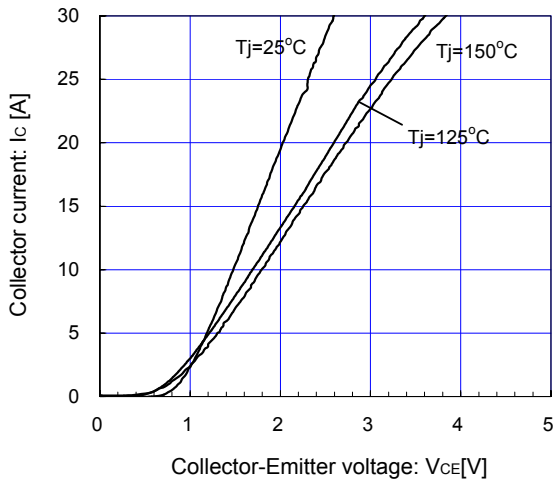
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)
T_j= 150°C / chip



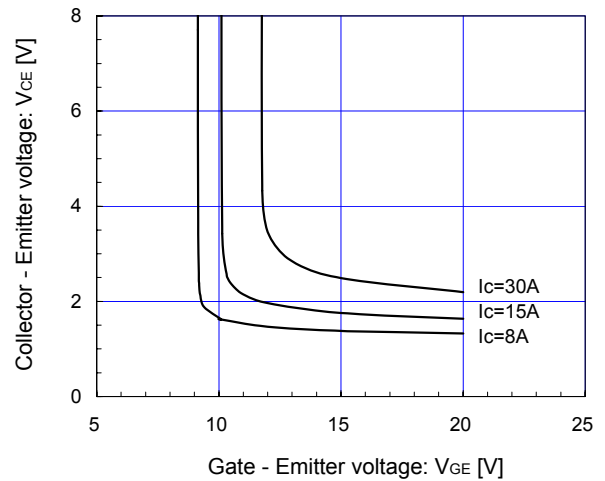
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)
V_{GE}=15V / chip



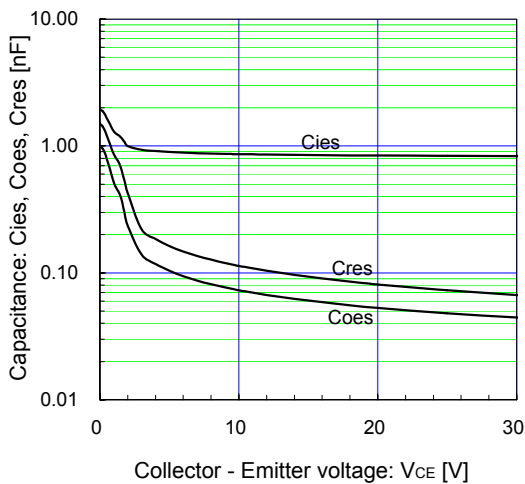
[Brake]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
T_j= 25°C / chip



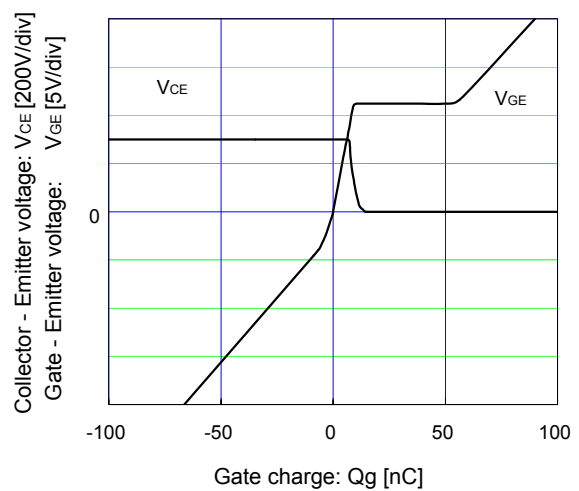
[Brake]

Capacitance vs. Collector-Emittor voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25°C

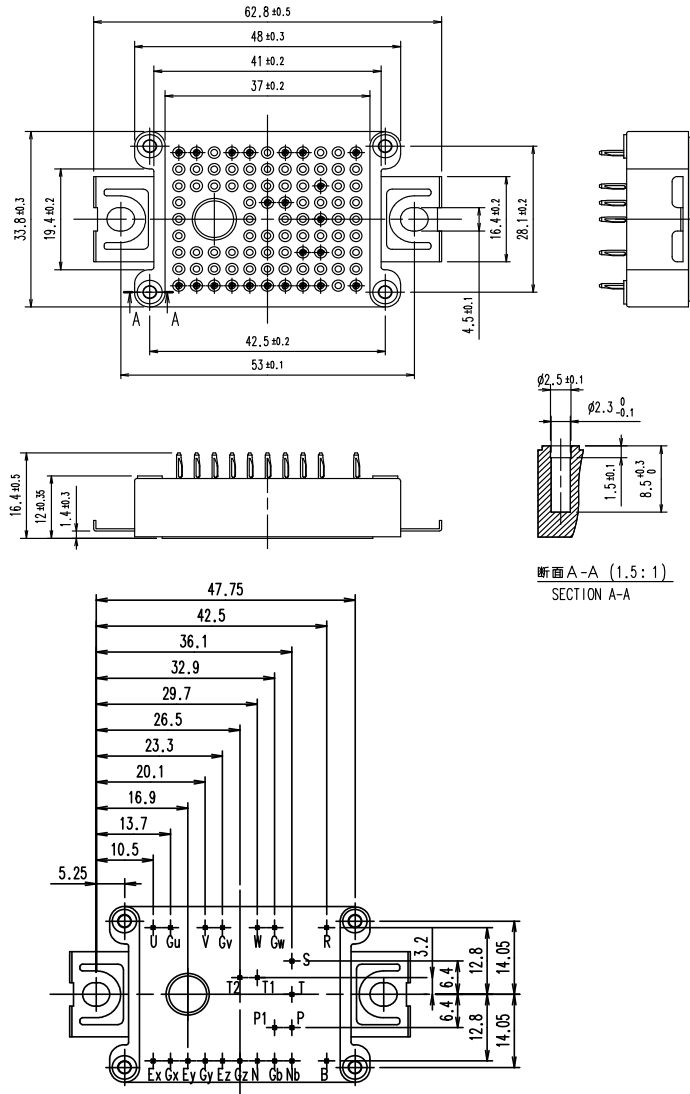


[Brake]

Dynamic gate charge (typ.)
V_{CC}=300V, I_c=15A, T_j= 25°C



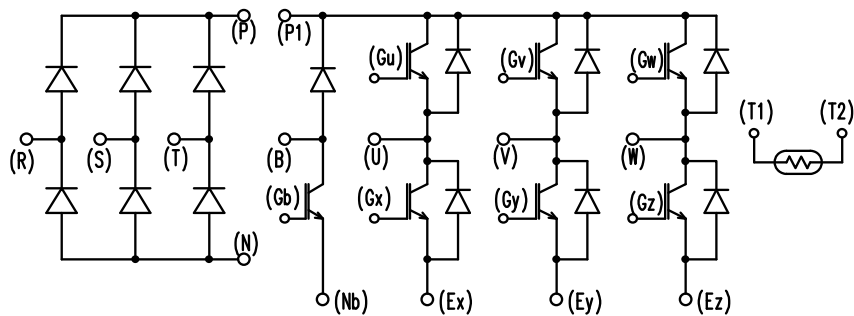
Outline Drawings, mm



Weight: 25g(typ.)

Equivalent Circuit Schematic

[Converter] [Brake] [Inverter] [Thermistor]



WARNING

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| | | | |
|-----------------|-------------------------|---|--------------------------|
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| • Machine tools | • Audiovisual equipment | • Electrical home appliances | • Personal equipment |
| | | | • Industrial robots etc. |
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|---|---|
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| | | |
|--------------------------------|------------------------|-----------------------------|
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