

# 7MBR50XPA065-50

IGBT Modules

**Power Module(X series)**  
650V / 50A / PIM

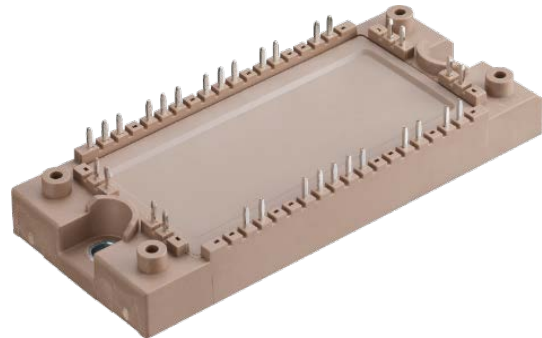
## □ Features

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

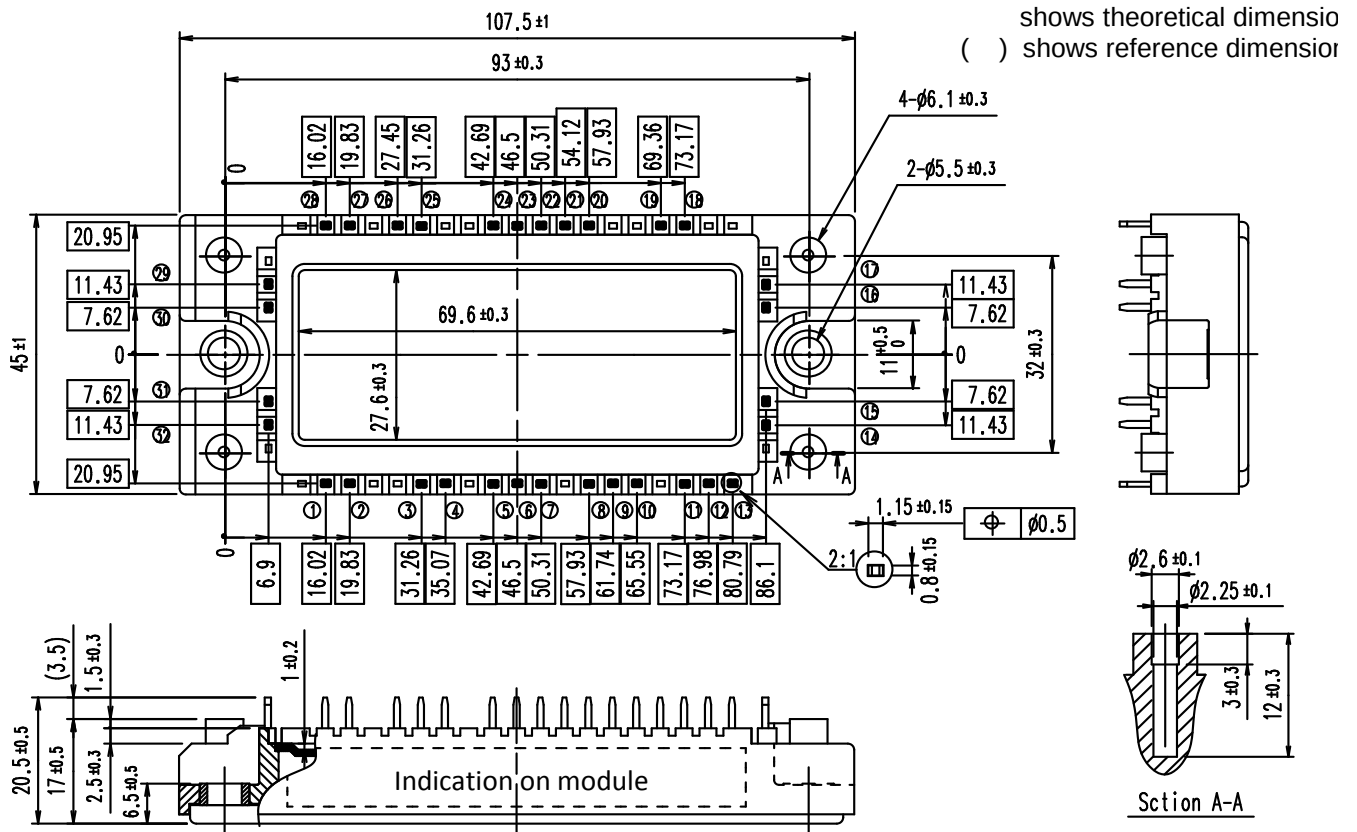
## □ Applications

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

## □ Typical appearance

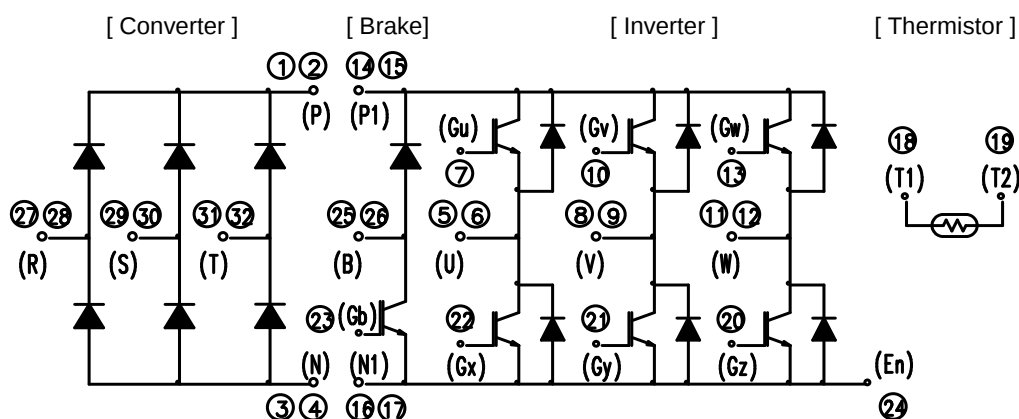


## □ Outline drawing ( Unit : mm )



Weight: 200 g (typ.)

## □ Equivalent circuit



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**IGBT Modules**

□ Maximum ratings ( at  $T_c = 25^\circ\text{C}$  unless otherwise specified )

| Items                                                       |                                        | Symbols                   | Conditions                               |                           | Maximum ratings  | Units |   |
|-------------------------------------------------------------|----------------------------------------|---------------------------|------------------------------------------|---------------------------|------------------|-------|---|
| Inverter                                                    | Collector-Emitter voltage              | $V_{CES}$                 |                                          |                           | 650              | V     |   |
|                                                             | Gate-Emitter voltage                   | $V_{GES}$                 |                                          |                           | ±20              | V     |   |
|                                                             | Collector current                      | $I_C$                     | Continuous                               | $T_c=80^{\circ}\text{C}$  | 50               | A     |   |
|                                                             |                                        | $I_C$ pulse               | 1ms                                      |                           | 100              |       |   |
|                                                             | Forward current                        | $I_F$                     | Continuous                               |                           | 50               |       |   |
|                                                             |                                        | $I_F$ pulse               | 1ms                                      |                           | 100              |       |   |
| Collector power dissipation                                 |                                        | $P_C$                     | 1 device                                 |                           | 210              | W     |   |
| Brake IGBT                                                  | Collector-Emitter voltage              | $V_{CES}$                 |                                          |                           | 650              | V     |   |
|                                                             | Gate-Emitter voltage                   | $V_{GES}$                 |                                          |                           | ±20              | V     |   |
|                                                             | Collector current                      | $I_C$                     | Continuous                               | $T_c=80^{\circ}\text{C}$  | 30               | A     |   |
|                                                             |                                        | $I_C$ pulse               | 1ms                                      |                           | 60               |       |   |
|                                                             | Collector power dissipation            |                           | $P_C$                                    | 1 device                  |                  | 160   | W |
| Brake FWD                                                   | Forward current                        | $I_F$                     | Continuous                               |                           | 20               | A     |   |
|                                                             |                                        | $I_{FRM}$                 | 1ms                                      |                           | 40               |       |   |
|                                                             | Repetitive peak reverse voltage        |                           | $V_{RRM}$                                |                           |                  | 650   | V |
| Converter                                                   | Repetitive peak reverse voltage        |                           | $V_{RRM}$                                |                           |                  | 800   | V |
|                                                             | Average output current                 | $I_O$                     | Three-phase full wave rectified          | $T_c=80^{\circ}\text{C}$  | 50               | A     |   |
|                                                             |                                        |                           |                                          |                           |                  |       |   |
|                                                             | Surge current (Non-Repetitive) (*1)    | $I_{FSM}$                 | $t=10\text{ms}$ ,<br>Half sine wave form | $T_j=25^{\circ}\text{C}$  | 620              | A     |   |
|                                                             |                                        |                           |                                          | $T_j=150^{\circ}\text{C}$ | 545              |       |   |
| $I^2t$ (Non-Repetitive) (*1)                                | $I^2t$                                 | $T_j=25^{\circ}\text{C}$  |                                          | 1950                      | A <sup>2</sup> s |       |   |
|                                                             |                                        | $T_j=150^{\circ}\text{C}$ |                                          | 1500                      |                  |       |   |
| Junction temperature                                        |                                        | $T_j$                     | Inverter, Brake                          |                           | 175              | °C    |   |
|                                                             |                                        |                           | Converter                                |                           | 150              |       |   |
| Operating junction temperature (under switching conditions) |                                        | $T_{jop}$                 | Inverter, Brake                          |                           | 175              |       |   |
|                                                             |                                        |                           | Converter                                |                           | 150              |       |   |
| Case temperature                                            |                                        | $T_c$                     |                                          |                           | 125              |       |   |
| Storage temperature                                         |                                        | $T_{stg}$                 |                                          |                           | -40 ~ 125        |       |   |
| Isolation voltage                                           | between terminals and copper base (*2) | $V_{iso}$                 | A.C. : 1min.                             |                           | 2500             | Vrms  |   |
|                                                             | between thermistor and others (*3)     |                           |                                          |                           |                  |       |   |
| Screw torque (*4)                                           | Mounting                               | -                         | M5                                       |                           | 6.0              | N·m   |   |

(\*1)  $T_j$  : Temperature at test start.

(\*2) All terminals should be connected together during the test.

(\*3) Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

(\*4) Recommendable value : Mounting 2.5 ~ 6.0 N·m (M5)

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□ Electrical characteristics ( at  $T_j = 25^\circ\text{C}$  unless otherwise specified)

| Items                              |                                                                                                                                                                              | Symbols                                                                                                                                                                      | Conditions                                                                                                                                                                   |                                   | Characteristics |      |      | Units         |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------|------|------|---------------|
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                   | min.            | typ. | max. |               |
| Inverter                           | Zero Gate voltage collector current                                                                                                                                          | $I_{\text{CES}}$                                                                                                                                                             | $V_{\text{GE}} = 0\text{V}$<br>$V_{\text{CE}} = 650\text{V}$                                                                                                                 |                                   | -               | -    | 50   | $\mu\text{A}$ |
|                                    | Gate-Emitter leakage current                                                                                                                                                 | $I_{\text{GES}}$                                                                                                                                                             | $V_{\text{CE}} = 0\text{V}$ $V_{\text{GE}} = +20/-20\text{V}$                                                                                                                |                                   | -               | -    | 100  | nA            |
|                                    | Gate-Emitter threshold voltage                                                                                                                                               | $V_{\text{GE(th)}}$                                                                                                                                                          | $V_{\text{CE}} = 20\text{V}$<br>$I_{\text{C}} = 50\text{mA}$                                                                                                                 |                                   | 6.0             | 6.5  | 7.0  | V             |
|                                    | Collector-Emitter saturation voltage                                                                                                                                         | $V_{\text{CE(sat)}}$<br>(terminal)                                                                                                                                           | $V_{\text{GE}} = 15\text{V}$<br>$I_{\text{C}} = 50\text{A}$                                                                                                                  | $T_{\text{j}}=25^{\circ}\text{C}$ | -               | 1.50 | 2.00 | V             |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=25^{\circ}\text{C}$ | -               | 1.30 | 1.75 |               |
|                                    |                                                                                                                                                                              | $V_{\text{CE(sat)}}$<br>(chip)                                                                                                                                               | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.45            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.50            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.55            | -    |      |               |
|                                    | Internal Gate resistance                                                                                                                                                     | $r_{\text{g}}$                                                                                                                                                               | -                                                                                                                                                                            |                                   | -               | 0    | -    | $\Omega$      |
|                                    | Capacitance                                                                                                                                                                  | $C_{\text{ies}}$                                                                                                                                                             | $V_{\text{CE}} = 10\text{V}, V_{\text{GE}} = 0\text{V}, f = 1\text{MHz}$                                                                                                     |                                   | -               | 5.7  | -    | nF            |
|                                    |                                                                                                                                                                              | $C_{\text{oes}}$                                                                                                                                                             |                                                                                                                                                                              |                                   | -               | 0.22 | -    |               |
|                                    |                                                                                                                                                                              | $C_{\text{res}}$                                                                                                                                                             |                                                                                                                                                                              |                                   | -               | 0.08 | -    |               |
|                                    | Gate charge                                                                                                                                                                  | $Q_{\text{G}}$                                                                                                                                                               | $V_{\text{CC}} = 300\text{V}$ $V_{\text{GE}} = -15 \rightarrow +15\text{V}$<br>$I_{\text{C}} = 50\text{A}$                                                                   |                                   | -               | 420  | -    | nC            |
|                                    | Forward voltage                                                                                                                                                              | $V_{\text{F}}$ (terminal)                                                                                                                                                    | $V_{\text{GE}} = 15\text{V}$<br>$I_{\text{F}} = 50\text{A}$                                                                                                                  | $T_{\text{j}}=25^{\circ}\text{C}$ | -               | 1.75 | 2.25 | V             |
|                                    |                                                                                                                                                                              | $V_{\text{F}}$<br>(chip)                                                                                                                                                     |                                                                                                                                                                              | $T_{\text{j}}=25^{\circ}\text{C}$ | -               | 1.55 | 2.00 |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.50            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.50            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                 | 1.45            | -    |      |               |
|                                    | Switching time (*1)                                                                                                                                                          | $t_{\text{d(on)}}$                                                                                                                                                           | $V_{\text{CC}} = 300\text{V}$<br>$I_{\text{C}}, I_{\text{F}} = 50\text{A}$ $L_{\text{s}} = 30\text{nH}$<br>$V_{\text{GE}} = +15/-15\text{ V}$<br>$R_{\text{G}} = 68\ \Omega$ | $T_{\text{j}}=25^{\circ}\text{C}$ | -               | 0.35 | -    | $\mu\text{s}$ |
| $T_{\text{j}}=125^{\circ}\text{C}$ |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              | -                                 | 0.36            | -    |      |               |
| $T_{\text{j}}=150^{\circ}\text{C}$ |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              | -                                 | 0.36            | -    |      |               |
| $T_{\text{j}}=175^{\circ}\text{C}$ |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              | -                                 | 0.35            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                   |                 |      |      |               |
| $t_{\text{r}}$                     |                                                                                                                                                                              | $V_{\text{CC}} = 300\text{V}$<br>$I_{\text{C}}, I_{\text{F}} = 50\text{A}$ $L_{\text{s}} = 30\text{nH}$<br>$V_{\text{GE}} = +15/-15\text{ V}$<br>$R_{\text{G}} = 68\ \Omega$ | $T_{\text{j}}=25^{\circ}\text{C}$                                                                                                                                            | -                                 | 0.10            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.13            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.14            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.14            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                   |                 |      |      |               |
| $t_{\text{d(off)}}$                |                                                                                                                                                                              | $V_{\text{CC}} = 300\text{V}$<br>$I_{\text{C}}, I_{\text{F}} = 50\text{A}$ $L_{\text{s}} = 30\text{nH}$<br>$V_{\text{GE}} = +15/-15\text{ V}$<br>$R_{\text{G}} = 68\ \Omega$ | $T_{\text{j}}=25^{\circ}\text{C}$                                                                                                                                            | -                                 | 0.52            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.50            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.55            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.56            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                   |                 |      |      |               |
| $t_{\text{f}}$                     | $V_{\text{CC}} = 300\text{V}$<br>$I_{\text{C}}, I_{\text{F}} = 50\text{A}$ $L_{\text{s}} = 30\text{nH}$<br>$V_{\text{GE}} = +15/-15\text{ V}$<br>$R_{\text{G}} = 68\ \Omega$ | $T_{\text{j}}=25^{\circ}\text{C}$                                                                                                                                            | -                                                                                                                                                                            | 0.04                              | -               |      |      |               |
|                                    |                                                                                                                                                                              | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                                                                                                                                                            | 0.04                              | -               |      |      |               |
|                                    |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                                                                                                                                                            | 0.04                              | -               |      |      |               |
|                                    |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                                                                                                                                                            | 0.04                              | -               |      |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                   |                 |      |      |               |
| Reverse recovery time              | $t_{\text{rr}}$                                                                                                                                                              | $V_{\text{CC}} = 300\text{V}$<br>$I_{\text{C}}, I_{\text{F}} = 50\text{A}$ $L_{\text{s}} = 30\text{nH}$<br>$V_{\text{GE}} = +15/-15\text{ V}$<br>$R_{\text{G}} = 68\ \Omega$ | $T_{\text{j}}=25^{\circ}\text{C}$                                                                                                                                            | -                                 | 0.08            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=125^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.25            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=150^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.27            | -    |      |               |
|                                    |                                                                                                                                                                              |                                                                                                                                                                              | $T_{\text{j}}=175^{\circ}\text{C}$                                                                                                                                           | -                                 | 0.28            | -    |      |               |

(\*1) Turn on time ( $t_{on}$ ) =  $t_{d(on)} + t_r$ , Turn off time ( $t_{off}$ ) =  $t_{d(off)} + t_f$

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**IGBT Modules**

| Items                               |                                      | Symbols                                | Conditions                    |                    | Characteristics |      |         | Units    |
|-------------------------------------|--------------------------------------|----------------------------------------|-------------------------------|--------------------|-----------------|------|---------|----------|
|                                     |                                      |                                        |                               |                    | min.            | typ. | max.    |          |
| Inverter                            | Switching loss<br>(per pulse)        | $E_{on}$                               | $V_{CC} = 300V$               | $T_j=25^{\circ}C$  | -               | 2.28 | -       | mJ       |
|                                     |                                      |                                        | $I_C,I_F=50A \quad L_s= 30nH$ | $T_j=125^{\circ}C$ | -               | 3.18 | -       |          |
|                                     |                                      |                                        | $V_{GE} = +15/-15 V$          | $T_j=150^{\circ}C$ | -               | 3.53 | -       |          |
|                                     |                                      |                                        | $R_G = 68 \Omega$             | $T_j=175^{\circ}C$ | -               | 3.84 | -       |          |
|                                     |                                      | $E_{off}$                              | $V_{CC} = 300V$               | $T_j=25^{\circ}C$  | -               | 1.47 | -       |          |
|                                     |                                      |                                        | $I_C,I_F=50A \quad L_s= 30nH$ | $T_j=125^{\circ}C$ | -               | 1.94 | -       |          |
|                                     |                                      |                                        | $V_{GE} = +15/-15 V$          | $T_j=150^{\circ}C$ | -               | 2.02 | -       |          |
|                                     |                                      |                                        | $R_G = 68 \Omega$             | $T_j=175^{\circ}C$ | -               | 2.11 | -       |          |
|                                     |                                      | $E_{rr}$                               | $V_{CC} = 300V$               | $T_j=25^{\circ}C$  | -               | 0.18 | -       |          |
|                                     |                                      |                                        | $I_C,I_F=50A \quad L_s= 30nH$ | $T_j=125^{\circ}C$ | -               | 0.30 | -       |          |
|                                     |                                      |                                        | $V_{GE} = +15/-15 V$          | $T_j=150^{\circ}C$ | -               | 0.37 | -       |          |
|                                     |                                      |                                        | $R_G = 68 \Omega$             | $T_j=175^{\circ}C$ | -               | 0.42 | -       |          |
| Zero Gate voltage collector current | $I_{CES}$                            | $V_{GE} = 0V$<br>$V_{CE} = 650V$       |                               | -                  | -               | 50   | $\mu A$ |          |
| Gate-Emitter leakage current        | $I_{GES}$                            | $V_{CE} = 0V, \quad V_{GE} = +20/-20V$ |                               | -                  | -               | 100  | nA      |          |
| Brake                               | Collector-Emitter saturation voltage | $V_{CE(sat)}$<br>(terminal)            | $V_{GE} = 15V$<br>$I_C = 30A$ | $T_j=25^{\circ}C$  | -               | 1.45 | 1.90    | V        |
|                                     |                                      | $V_{CE(sat)}$<br>(chip)                | $T_j=25^{\circ}C$             | -                  | 1.30            | 1.75 |         |          |
|                                     |                                      |                                        | $T_j=125^{\circ}C$            | -                  | 1.45            | -    |         |          |
|                                     |                                      |                                        | $T_j=150^{\circ}C$            | -                  | 1.50            | -    |         |          |
|                                     |                                      |                                        | $T_j=175^{\circ}C$            | -                  | 1.55            | -    |         |          |
|                                     | Internal Gate resistance             | $r_g$                                  | -                             |                    | -               | 0    | -       | $\Omega$ |
|                                     | Switching time (*1)                  | $t_{d(on)}$                            | $V_{CC} = 300V$               | $T_j=25^{\circ}C$  | -               | 0.36 | -       | $\mu s$  |
|                                     |                                      |                                        | $I_C = 30A \quad L_s= 30nH$   | $T_j=125^{\circ}C$ | -               | 0.37 | -       |          |
|                                     |                                      |                                        | $V_{GE} = +15/-15 V$          | $T_j=150^{\circ}C$ | -               | 0.36 | -       |          |
|                                     |                                      |                                        | $R_G = 120 \Omega$            | $T_j=175^{\circ}C$ | -               | 0.35 | -       |          |
| $t_r$                               |                                      | $V_{CC} = 300V$                        | $T_j=25^{\circ}C$             | -                  | 0.12            | -    |         |          |
|                                     |                                      | $I_C = 30A \quad L_s= 30nH$            | $T_j=125^{\circ}C$            | -                  | 0.15            | -    |         |          |
|                                     |                                      | $V_{GE} = +15/-15 V$                   | $T_j=150^{\circ}C$            | -                  | 0.15            | -    |         |          |
|                                     |                                      | $R_G = 120 \Omega$                     | $T_j=175^{\circ}C$            | -                  | 0.16            | -    |         |          |
| $t_{d(off)}$                        |                                      | $V_{CC} = 300V$                        | $T_j=25^{\circ}C$             | -                  | 0.49            | -    |         |          |
|                                     |                                      | $I_C = 30A \quad L_s= 30nH$            | $T_j=125^{\circ}C$            | -                  | 0.52            | -    |         |          |
|                                     |                                      | $V_{GE} = +15/-15 V$                   | $T_j=150^{\circ}C$            | -                  | 0.53            | -    |         |          |
|                                     |                                      | $R_G = 120 \Omega$                     | $T_j=175^{\circ}C$            | -                  | 0.54            | -    |         |          |
| $t_f$                               |                                      | $V_{CC} = 300V$                        | $T_j=25^{\circ}C$             | -                  | 0.03            | -    |         |          |
|                                     |                                      | $I_C = 30A \quad L_s= 30nH$            | $T_j=125^{\circ}C$            | -                  | 0.03            | -    |         |          |
|                                     | $V_{GE} = +15/-15 V$                 | $T_j=150^{\circ}C$                     | -                             | 0.03               | -               |      |         |          |
|                                     | $R_G = 120 \Omega$                   | $T_j=175^{\circ}C$                     | -                             | 0.03               | -               |      |         |          |
| Reverse current                     | $I_{RRM}$                            | $V_R = 650V$                           |                               | -                  | -               | 50   | $\mu A$ |          |
| Forward voltage                     | $V_F$ (terminal)                     | $I_F = 20A$                            | $T_j=25^{\circ}C$             | -                  | 1.70            | 2.15 | V       |          |
|                                     | $V_F$<br>(chip)                      | $I_F = 20A$                            | $T_j=25^{\circ}C$             | -                  | 1.55            | 2.00 |         |          |
|                                     |                                      |                                        | $T_j=125^{\circ}C$            | -                  | 1.50            | -    |         |          |
|                                     |                                      |                                        | $T_j=150^{\circ}C$            | -                  | 1.50            | -    |         |          |
|                                     |                                      |                                        | $T_j=175^{\circ}C$            | -                  | 1.45            | -    |         |          |
| Reverse current                     | $I_{RRM}$                            | $V_R = 800V$                           |                               | -                  | -               | 50   | $\mu A$ |          |
| Forward voltage                     | $V_{FM}$                             | $I_F = 50A$                            | terminal                      | -                  | 1.25            | 1.75 | V       |          |
|                                     |                                      |                                        | chip                          | -                  | 1.05            | 1.50 |         |          |
| Thermistor                          | Resistance                           | $R$                                    | $T = 25^{\circ}C$             |                    | -               | 5000 | -       | $\Omega$ |
|                                     |                                      |                                        | $T = 100^{\circ}C$            |                    | 465             | 495  | 520     |          |
| B value                             | $B$                                  | $T = 25/ 50^{\circ}C$                  |                               |                    | 3305            | 3375 | 3450    | K        |

(\*1) Turn on time ( $t_{on}$ ) =  $t_{d(on)} + t_r$ , Turn off time ( $t_{off}$ ) =  $t_{d(off)} + t_f$ 
**FM6M01759**

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**IGBT Modules**
**NOTICE:**

The external gate resistance ( $R_G$ ) shown above is one of our recommended value for the purpose of minimum switching loss. However the optimum  $R_G$  depends on circuit configuration and/or environment. We recommend that the  $R_G$  has to be carefully chosen based on consideration if IGBT module matches design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

**□ Thermal resistance characteristics**

| Items                                          | Symbols       | Conditions                    | Characteristics |      |      | Units |
|------------------------------------------------|---------------|-------------------------------|-----------------|------|------|-------|
|                                                |               |                               | min.            | typ. | max. |       |
| Thermal resistance (1device)                   | $R_{th(j-c)}$ | Inverter IGBT                 | -               | -    | 0.71 | °C/W  |
|                                                |               | Inverter FWD                  | -               | -    | 0.86 |       |
|                                                |               | Brake IGBT                    | -               | -    | 0.93 |       |
|                                                |               | Brake FWD                     | -               | -    | 1.60 |       |
|                                                |               | Converter Diode               | -               | -    | 0.67 |       |
| Contact thermal resistance (1 IGBT+1 FWD) (*1) | $R_{th(c-f)}$ | with 1 W/(m·K) thermal grease | -               | 0.05 | -    |       |

(\*1) This is the value which is defined mounting on the additional cooling fin with thermal grease.

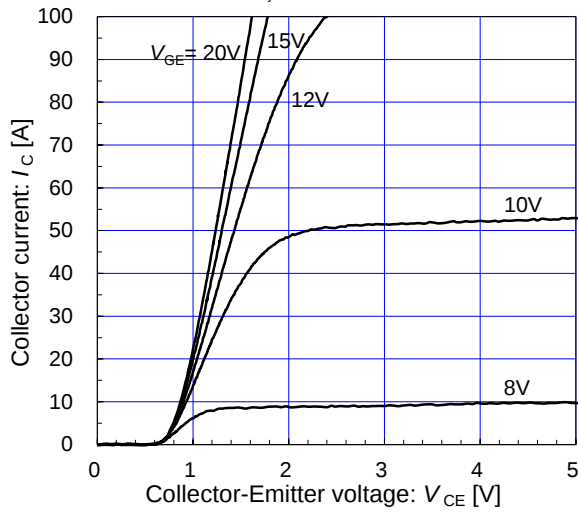
# 7MBR50XPA065-50

IGBT Modules

[ Inverter ]

Collector current vs. Collector-Emittter voltage (typ.)

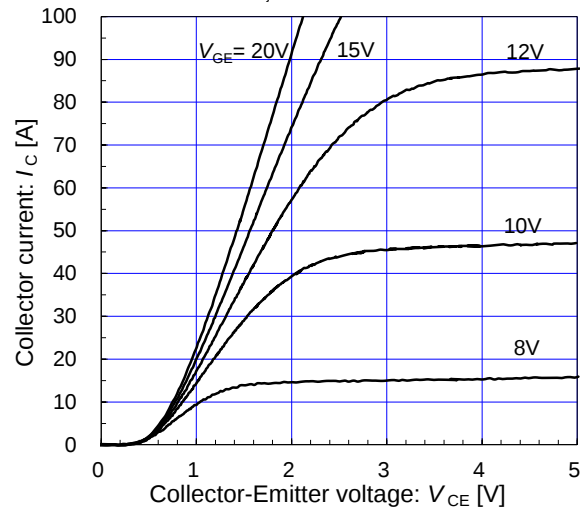
$T_j = 25^\circ\text{C}$  / chip



[ Inverter ]

Collector current vs. Collector-Emittter voltage (typ.)

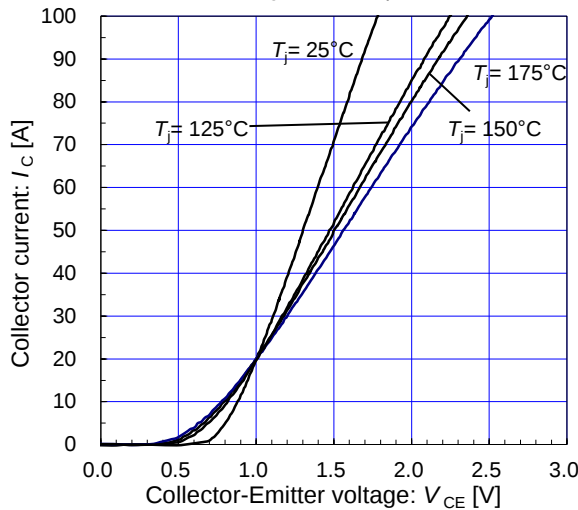
$T_j = 175^\circ\text{C}$  / chip



[ Inverter ]

Collector current vs. Collector-Emittter voltage (typ.)

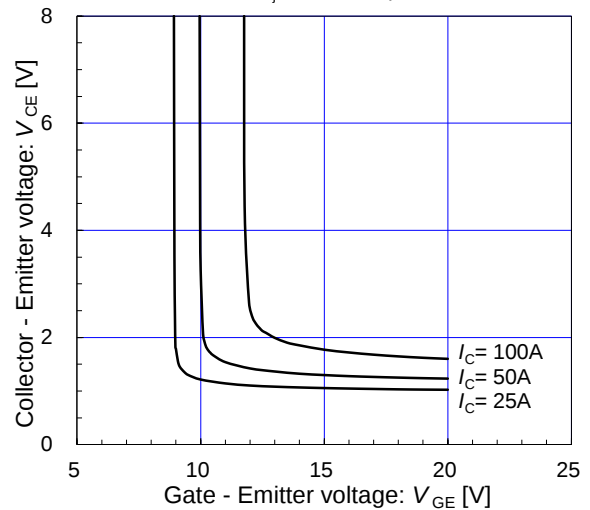
$V_{GE} = 15\text{V}$  / chip



[ Inverter ]

Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)

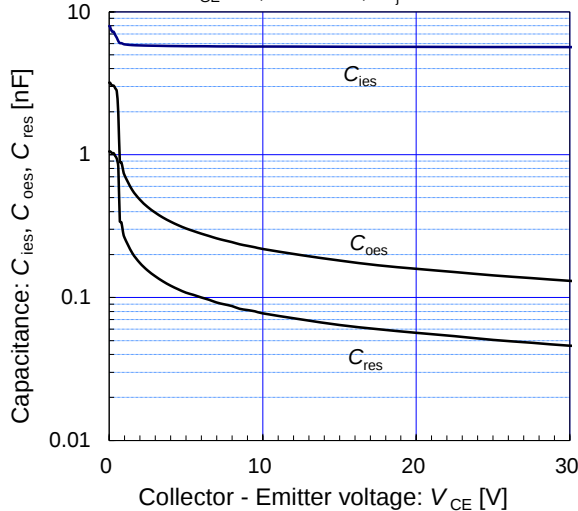
$T_j = 25^\circ\text{C}$  / chip



[ Inverter ]

Capacitance vs. Collector-Emittter voltage (typ.)

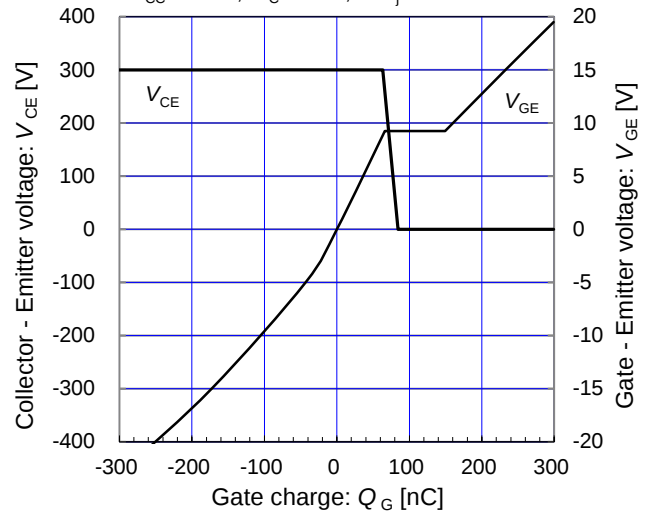
$V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



[ Inverter ]

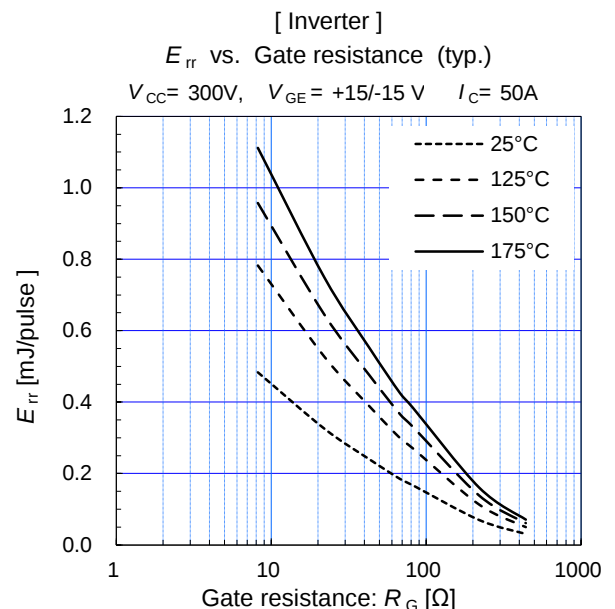
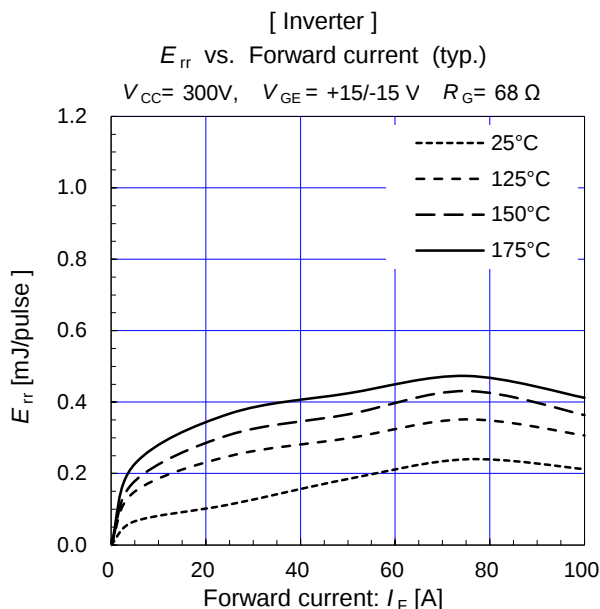
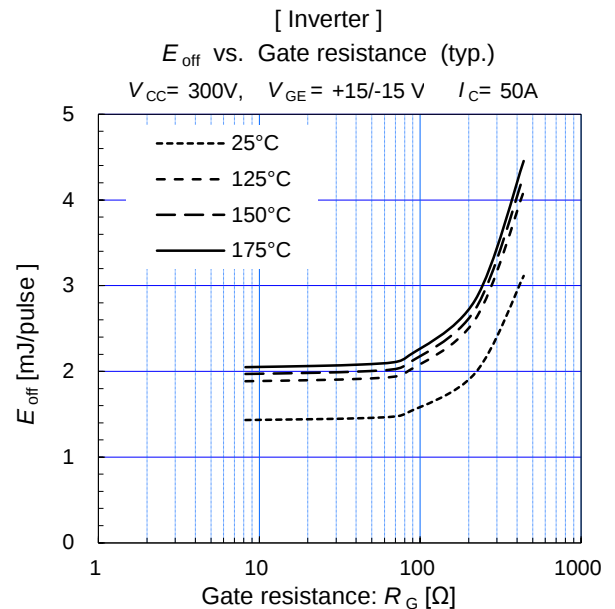
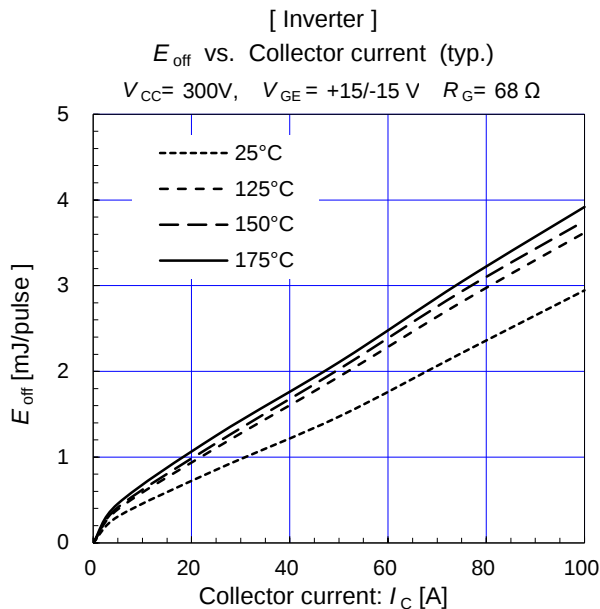
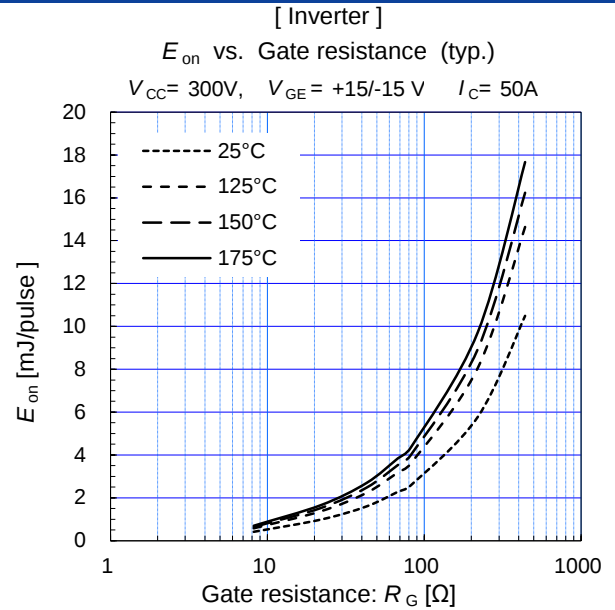
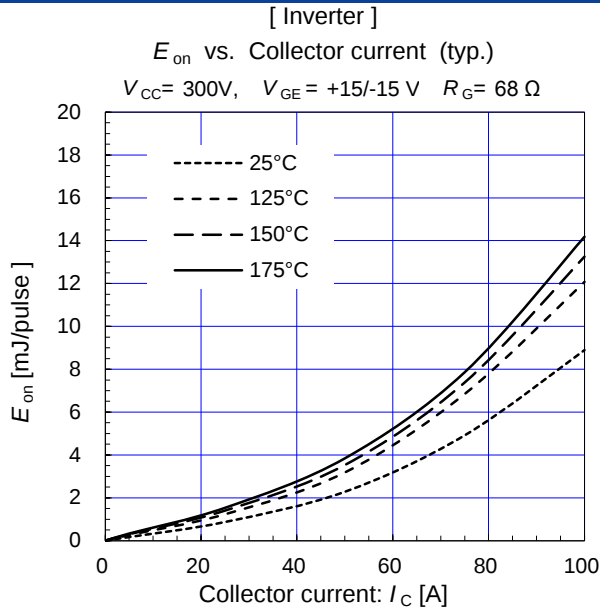
Dynamic Gate charge (typ.)

$V_{CC} = 300\text{V}$ ,  $I_C = 50\text{A}$ ,  $T_j = 25^\circ\text{C}$



# 7MBR50XPA065-50

IGBT Modules



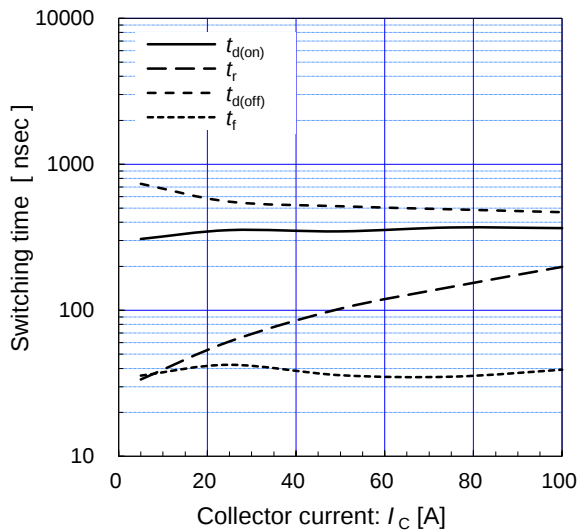
# 7MBR50XPA065-50

IGBT Modules

[ Inverter ]

Switching time vs. Collector current (typ.)

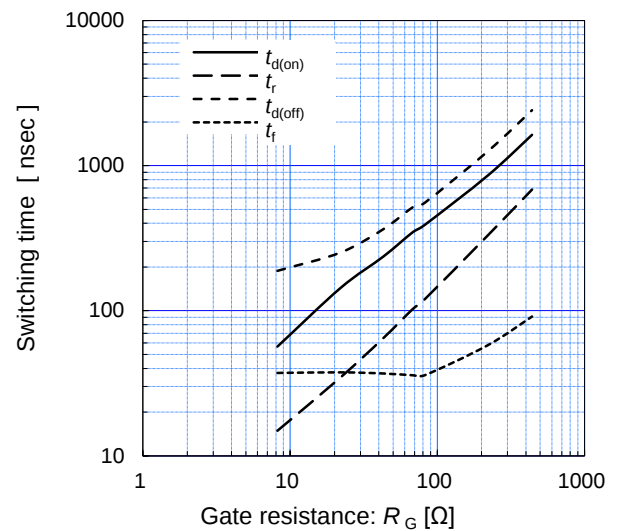
$V_{CC} = 300V$ ,  $R_G = 68\Omega$   $V_{GE} = +15/-15V$ ,  $T_J = 25^\circ C$



[ Inverter ]

Switching time vs. Gate resistance (typ.)

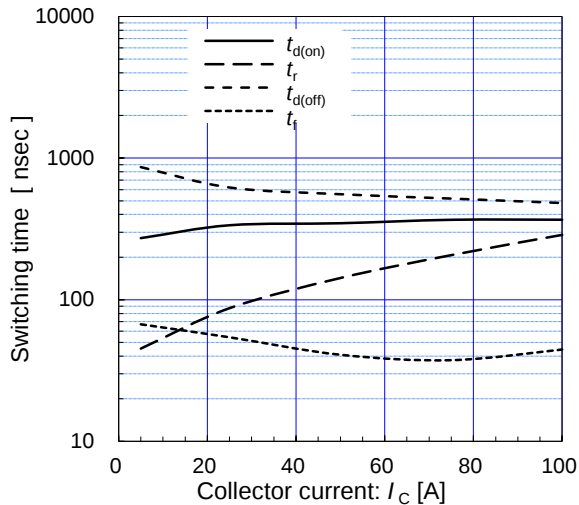
$V_{CC} = 300V$ ,  $I_C = 50A$ ,  $V_{GE} = +15/-15V$ ,  $T_J = 25^\circ C$



[ Inverter ]

Switching time vs. Collector current (typ.)

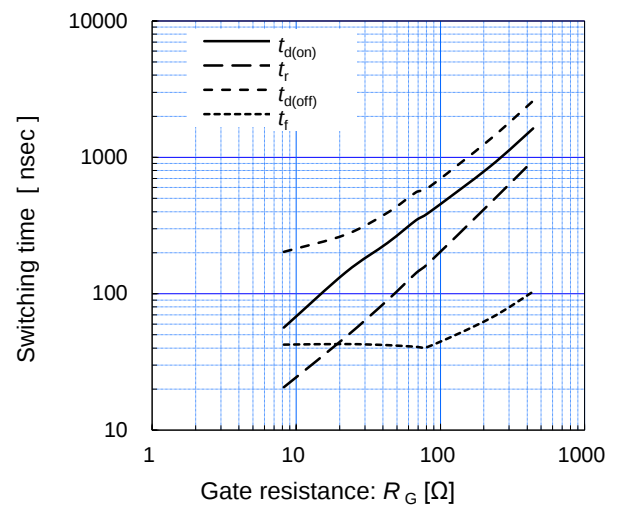
$V_{CC} = 300V$ ,  $R_G = 68\Omega$   $V_{GE} = +15/-15V$ ,  $T_J = 175^\circ C$



[ Inverter ]

Switching time vs. Gate resistance (typ.)

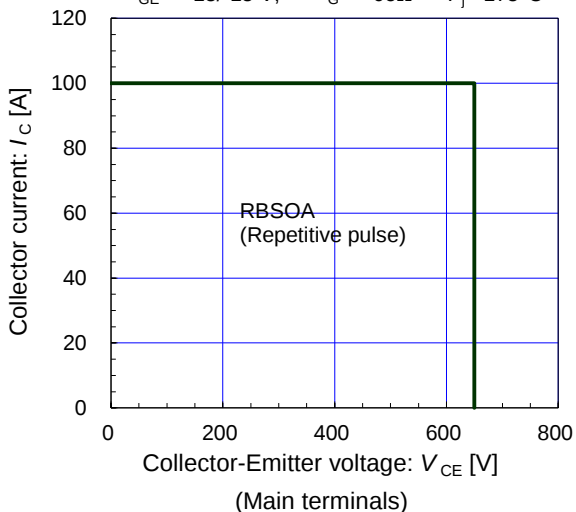
$V_{CC} = 300V$ ,  $I_C = 50A$ ,  $V_{GE} = +15/-15V$ ,  $T_J = 175^\circ C$



[ Inverter ]

Reverse bias safe operating area (max.)

$V_{GE} = +15/-15V$ ,  $R_G \geq 68\Omega$   $T_J = 175^\circ C$

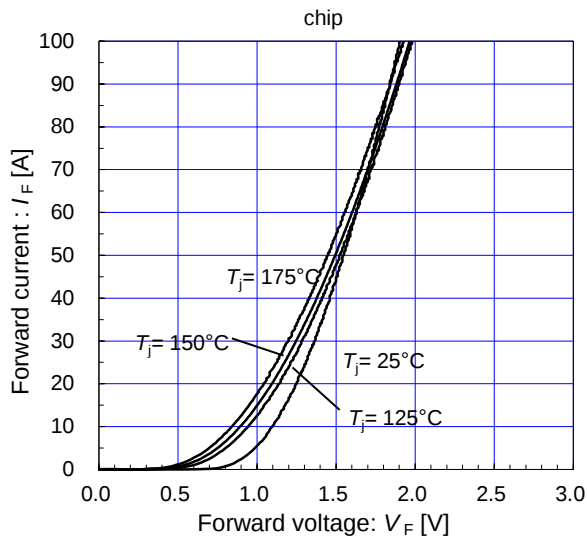


# 7MBR50XPA065-50

IGBT Modules

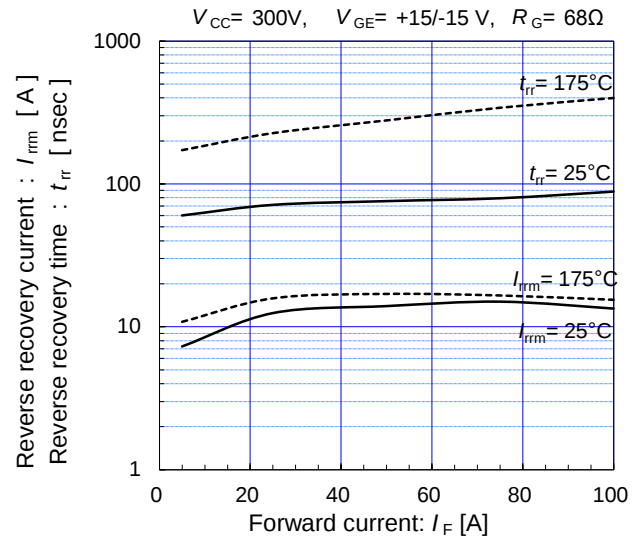
[ Inverter ]

Forward current vs. Forward voltage (typ.)



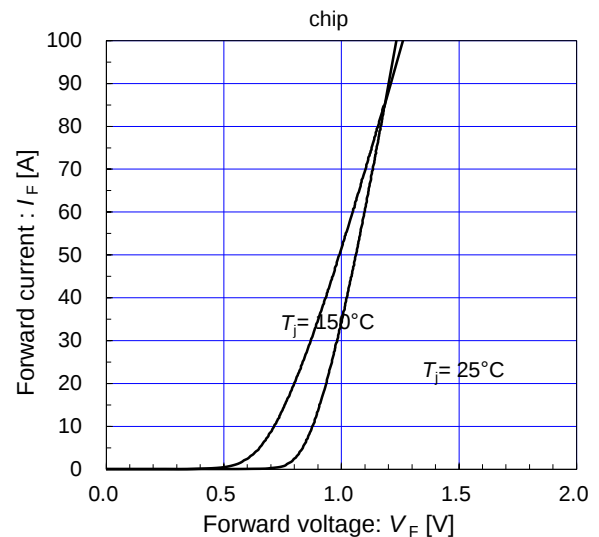
[ Inverter ]

Reverse recovery characteristics (typ.)

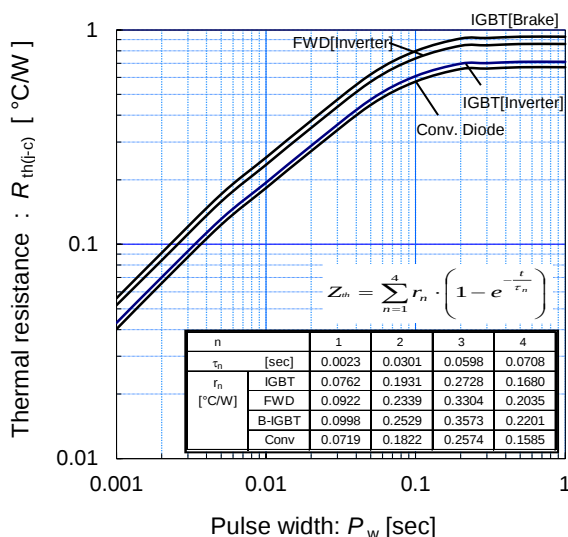


[ Converter ]

Forward current vs. Forward voltage (typ.)

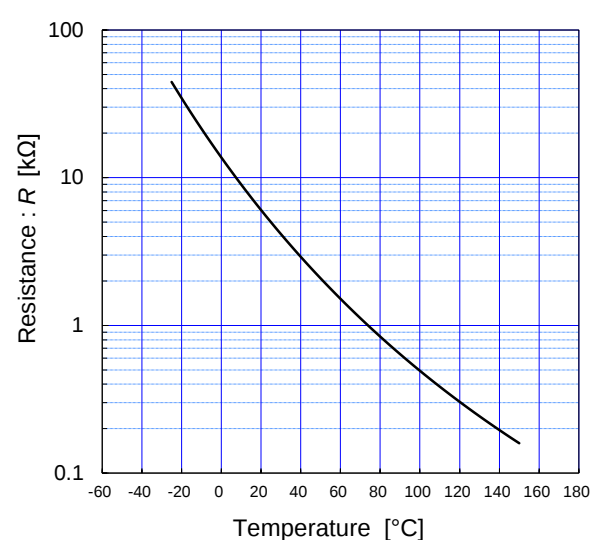


Transient thermal resistance (max.)



[ Thermistor ]

Temperature characteristic (typ.)



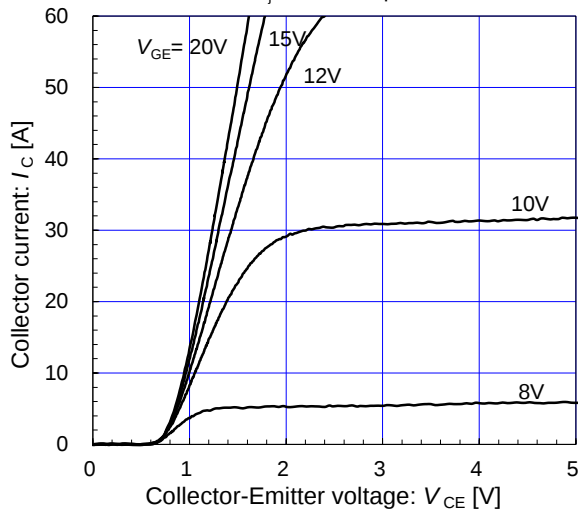
# 7MBR50XPA065-50

IGBT Modules

[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

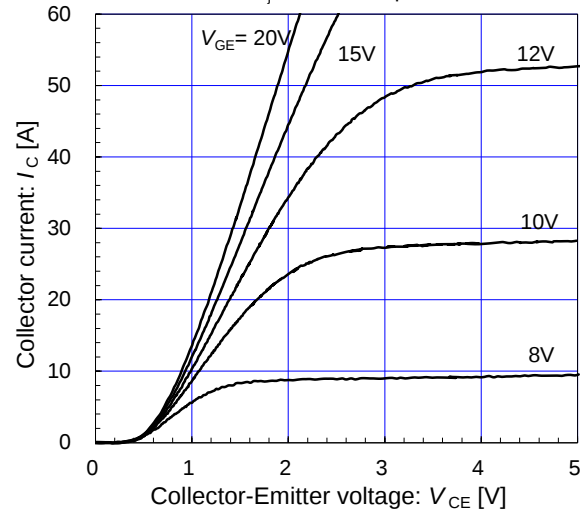
$T_j = 25^\circ\text{C}$  / chip



[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

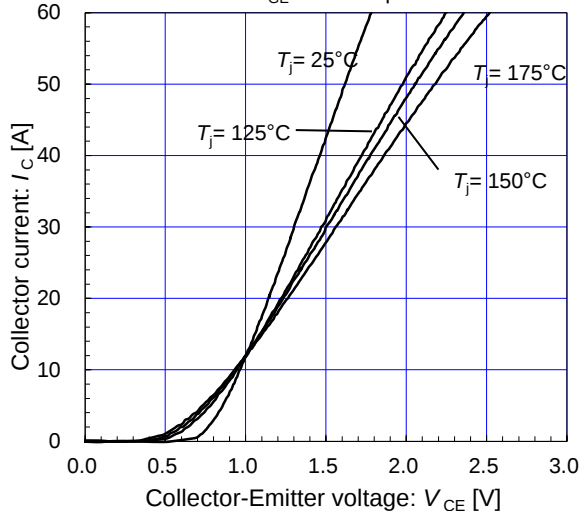
$T_j = 175^\circ\text{C}$  / chip



[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

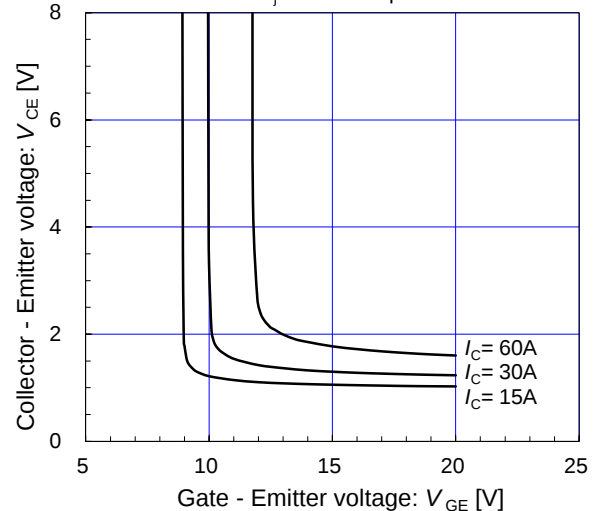
$V_{GE} = 15\text{V}$  / chip



[ Brake ]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

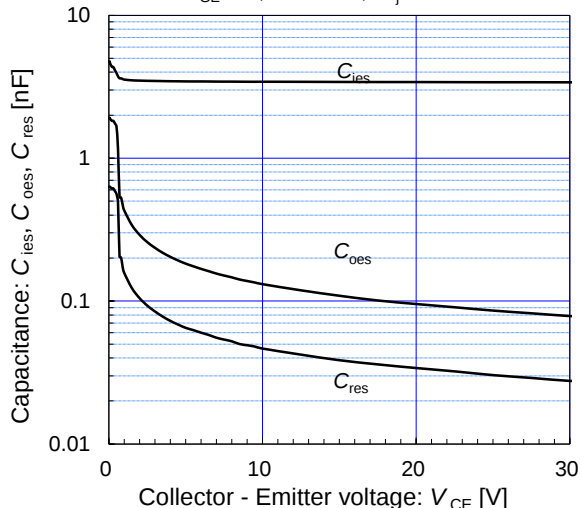
$T_j = 25^\circ\text{C}$  / chip



[ Brake ]

Capacitance vs. Collector-Emittor voltage (typ.)

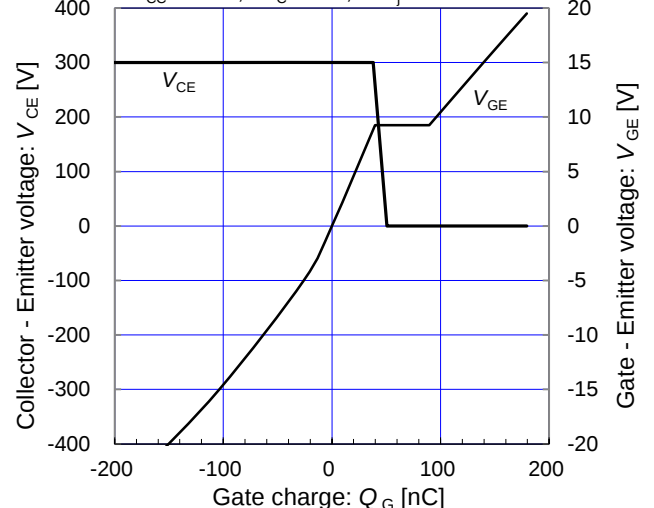
$V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



[ Brake ]

Dynamic Gate charge (typ.)

$V_{CC} = 300\text{V}$ ,  $I_C = 30\text{A}$ ,  $T_j = 25^\circ\text{C}$



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## IGBT Modules

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| 中国            | <a href="http://www.fujielectric.com.cn/products/semiconductor/">www.fujielectric.com.cn/products/semiconductor/</a>                   |
| Europe        | <a href="http://www.fujielectric-europe.com/en/power_semiconductor/">www.fujielectric-europe.com/en/power_semiconductor/</a>           |
| North America | <a href="http://www.americas.fujielectric.com/components/semiconductors/">www.americas.fujielectric.com/components/semiconductors/</a> |

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| 3 アプリケーションマニュアル      | <a href="http://www.fujielectric.co.jp/products/semiconductor/model/igbt/application/">www.fujielectric.co.jp/products/semiconductor/model/igbt/application/</a> |
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| 5 マウンティングインストラクション   | <a href="http://www.fujielectric.co.jp/products/semiconductor/model/igbt/mounting/">www.fujielectric.co.jp/products/semiconductor/model/igbt/mounting/</a>       |
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| 7 Fuji Electric Journal                        | <a href="http://www.fujielectric.com/products/semiconductor/journal/">www.fujielectric.com/products/semiconductor/journal/</a>                               |
| 8 Contact                                      | <a href="http://www.fujielectric.com/products/semiconductor/contact/">www.fujielectric.com/products/semiconductor/contact/</a>                               |
| 9 Revised and discontinued product information | <a href="http://www.fujielectric.com/products/semiconductor/discontinued/">www.fujielectric.com/products/semiconductor/discontinued/</a>                     |

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