

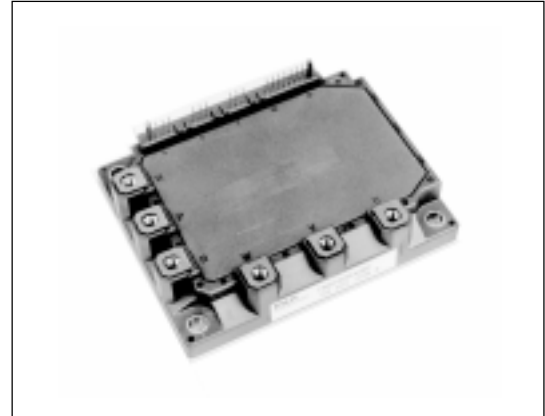
6MBP75RA060

IGBT-IPM R series

600V / 75A 6 in one-package

Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- High performance and high reliability IGBT with overheating protection
- Higher reliability because of a big decrease in number of parts in built-in control circuit



Maximum ratings and characteristics

- Absolute maximum ratings(at $T_c=25^\circ\text{C}$ unless otherwise specified)

| Item | Symbol | Rating | | Unit | | |
|--|-----------------------------|----------------|-----------------|------|-----|---|
| | | Min. | Max. | | | |
| DC bus voltage | V _{DC} | 0 | 450 | V | | |
| DC bus voltage (surge) | V _{DC(surge)} | 0 | 500 | V | | |
| DC bus voltage (short operating) | V _{SC} | 200 | 400 | V | | |
| Collector-Emitter voltage | V _{CES} | 0 | 600 | V | | |
| INV | Collector current | DC | I _C | - | 75 | A |
| | | 1ms | I _{CP} | - | 150 | A |
| | | Duty=61.7% | -I _C | - | 75 | A |
| | Collector power dissipation | One transistor | P _C | - | 320 | W |
| Junction temperature | T _j | - | 150 | °C | | |
| Input voltage of power supply for Pre-Driver | V _{CC} *1 | 0 | 20 | V | | |
| Input signal voltage | V _{in} *2 | 0 | V _Z | V | | |
| Input signal current | I _{in} | - | 1 | mA | | |
| Alarm signal voltage | V _{ALM} *3 | 0 | V _{CC} | V | | |
| Alarm signal current | I _{ALM} *4 | - | 15 | mA | | |
| Storage temperature | T _{stg} | -40 | 125 | °C | | |
| Operating case temperature | T _{op} | -20 | 100 | °C | | |
| Isolating voltage (Case-Terminal) | V _{iso} *5 | - | AC2.5 | kV | | |
| Screw torque | Mounting (M5) | - | 3.5 *6 | N·m | | |
| | Terminal (M5) | - | 3.5 *6 | N·m | | |

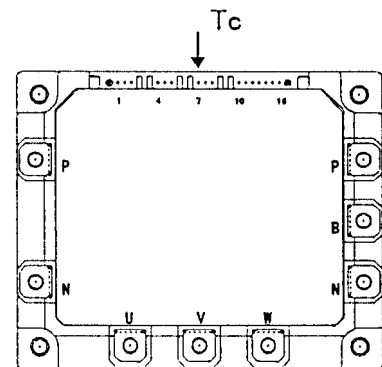


Fig.1 Measurement of case temperature

*1 Apply V_{CC} between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.

*2 Apply V_{in} between terminal No. 2 and 1, 5 and 4, 8 and 7, 13,14,15 and 10.

*3 Apply V_{ALM} between terminal No. 16 and 10.

*4 Apply I_{ALM} to terminal No. 16.

*5 50Hz/60Hz sine wave 1 minute.

*6 Recommendable Value : 2.5 to 3.0 N·m

- Electrical characteristics of power circuit (at $T_c=T_j=25^\circ\text{C}$, $V_{CC}=15\text{V}$)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | |
|------|---------------------------------------|----------------------|---|------|------|------|----|
| INV | Collector current at off signal input | I _{CES} | V _{CE} =600V input terminal open | - | - | 1.0 | mA |
| | Collector-Emitter saturation voltage | V _{CE(sat)} | I _C =75A | - | - | 2.8 | V |
| | Forward voltage of FWD | V _F | -I _C =75A | - | - | 3.0 | V |

● Electrical characteristics of control circuit(at Tc=Tj=25°C, Vcc=15V)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--|---------------------|---|-----------------------|------|------|------|
| Power supply current of P-line side Pre-driver(one unit) | I _{ccp} | fsw=0 to 15kHz Tc=-20 to 100°C *7 | 3 | - | 18 | mA |
| Power supply current of N-line side three Pre-driver | I _{ccn} | fsw=0 to 15kHz Tc=-20 to 100°C *7 | 10 | - | 65 | mA |
| Input signal threshold voltage (on/off) | V _{in(th)} | ON | 1.00 | 1.35 | 1.70 | V |
| | | OFF | 1.25 | 1.60 | 1.95 | V |
| Input zener voltage | V _Z | R _{in} =20k ohm | - | 8.0 | - | V |
| Over heating protection temperature level | T _{COH} | VDC=0V, I _c =0A, Case temperature, Fig.1 | 110 | - | 125 | °C |
| Hysteresis | T _{CH} | | - | 20 | - | °C |
| IGBT chips over heating protection temperature level | T _{JOH} | surface of IGBT chips | 150 | - | - | °C |
| Hysteresis | T _{JH} | | - | 20 | - | °C |
| Collector current protection level | INV | I _{oc} | T _j =125°C | 113 | - | A |
| Over current protection delay time | t _{DOC} | T _j =25°C Fig.2 | - | 10 | - | μs |
| Under voltage protection level | V _{UV} | | 11.0 | - | 12.5 | V |
| Hysteresis | V _H | | 0.2 | - | - | V |
| Alarm signal hold time | t _{ALM} | | 1.5 | 2 | - | ms |
| SC protection delay time | t _{SC} | T _j =25°C Fig.3 | - | - | 12 | μs |
| Limiting resistor for alarm | R _{ALM} | | 1425 | 1500 | 1575 | ohm |

*7 Switching frequency of IPM

● Dynamic characteristics(at Tc=Tj=125°C, Vcc=15V)

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------|-----------------|-------------------------------|------|------|------|------|
| Switching time (IGBT) | ton | I _C =75A, VDC=300V | 0.3 | - | - | μs |
| | toff | | - | - | 3.6 | μs |
| Switching time (FWD) | t _{rr} | I _F =75A, VDC=300V | - | - | 0.4 | μs |

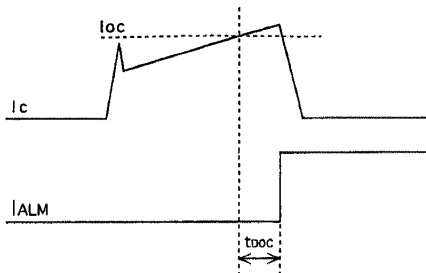


Fig.2 Definition of OC delay time

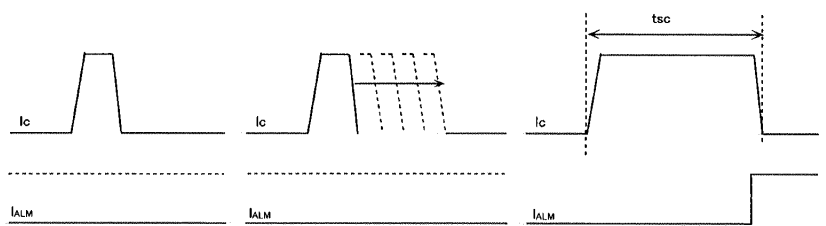


Fig.3 Definition of tsc

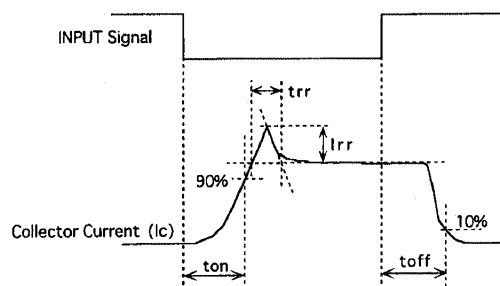


Fig.4 Definition of switching time

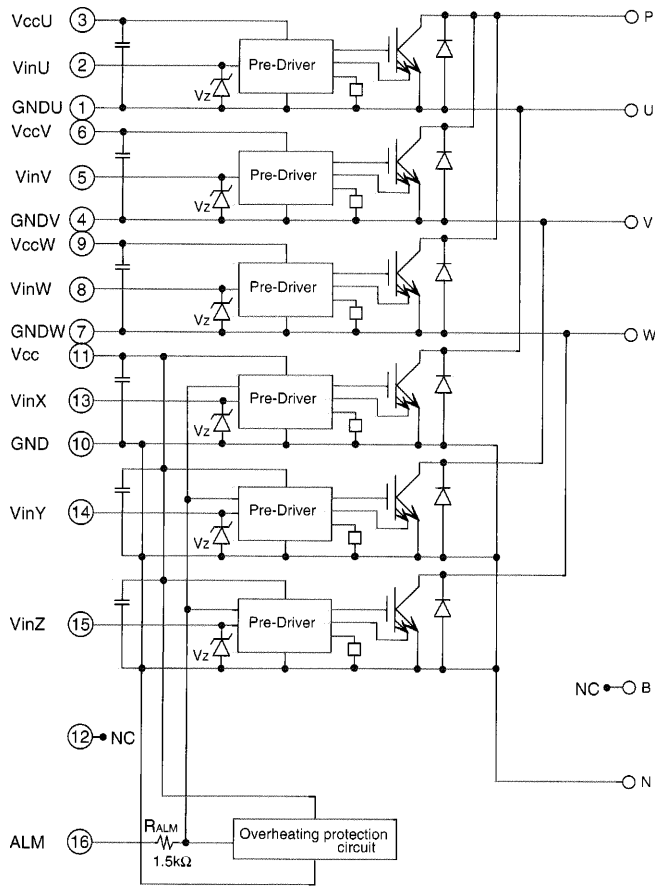
● Thermal characteristics(Tc=25°C)

| Item | Symbol | Typ. | Max. | Unit | |
|--|----------------------|----------------------|------|------|------|
| Junction to Case thermal resistance | INV | | | | |
| | IGBT | R _{th(j-c)} | - | 0.39 | °C/W |
| | FWD | R _{th(j-c)} | - | 0.90 | °C/W |
| Case to fin thermal resistance with compound | R _{th(c-f)} | 0.05 | - | °C/W | |

● Recommendable value

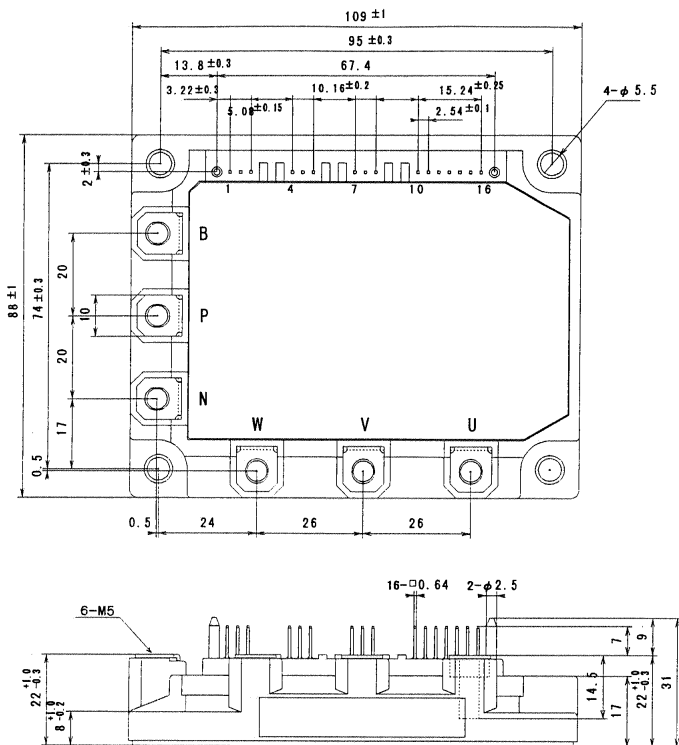
| Item | Symbol | Min. | Typ. | Max. | Unit | |
|--|---------------|------|------|------|------|-----|
| DC bus voltage | VDC | 200 | - | 400 | V | |
| Operating power supply voltage range of Pre-driver | VCC | 13.5 | 15 | 16.5 | V | |
| Switching frequency of IPM | fsw | 1 | - | 20 | kHz | |
| Screw torque | Mounting (M5) | - | 2.5 | - | 3.0 | N·m |
| | Terminal (M5) | - | 2.5 | - | 3.0 | N·m |

Block diagram



- Pre-drivers include following functions
- a) Amplifier for driver
 - b) Short circuit protection
 - c) Undervoltage lockout circuit
 - d) Over current protection
 - e) IGBT chip over heating protection

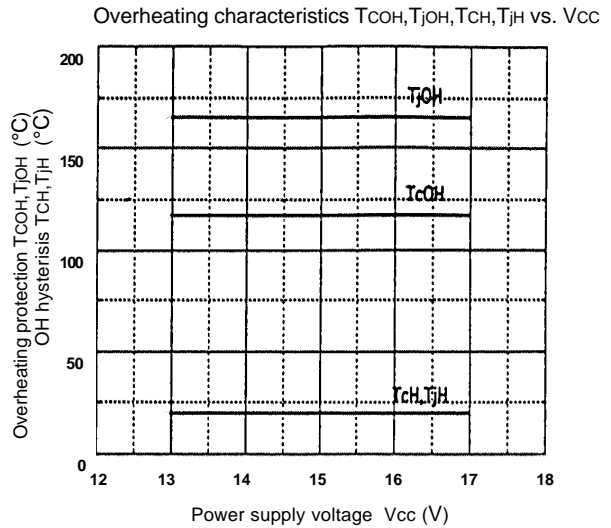
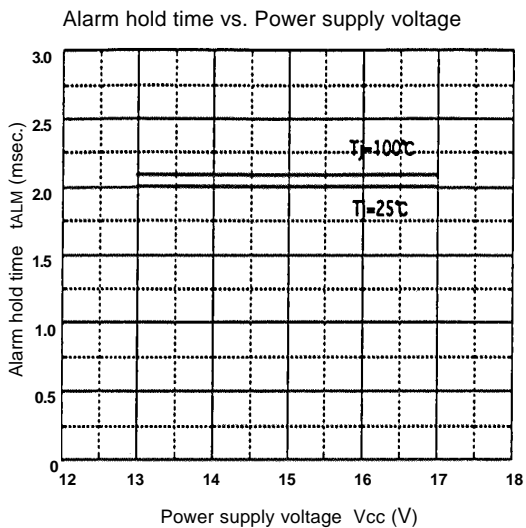
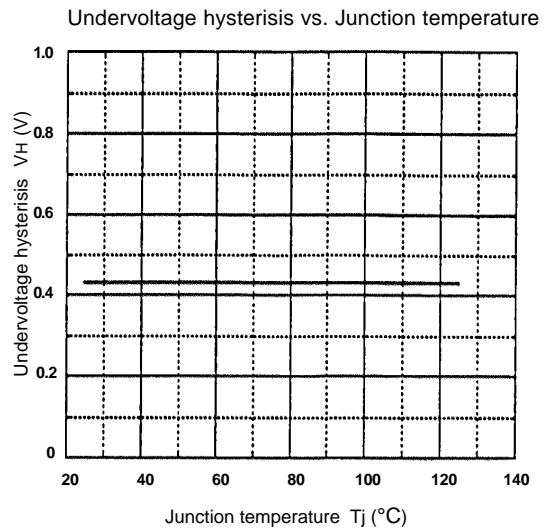
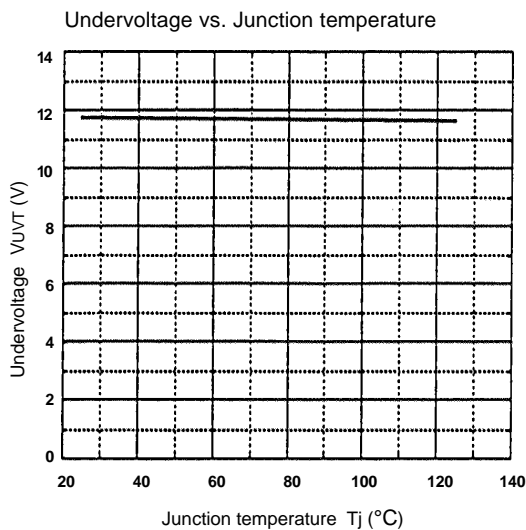
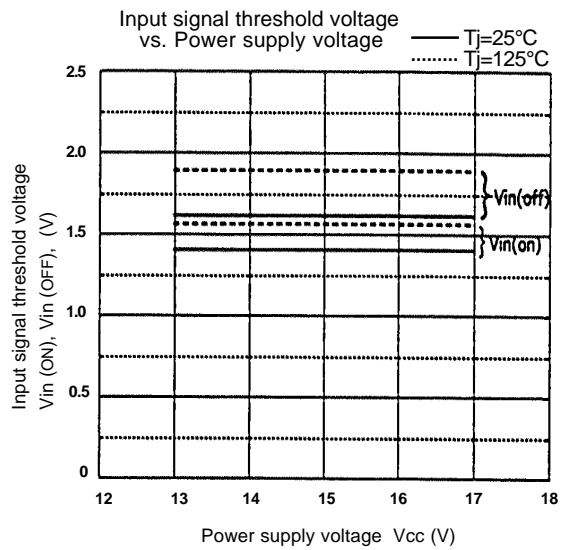
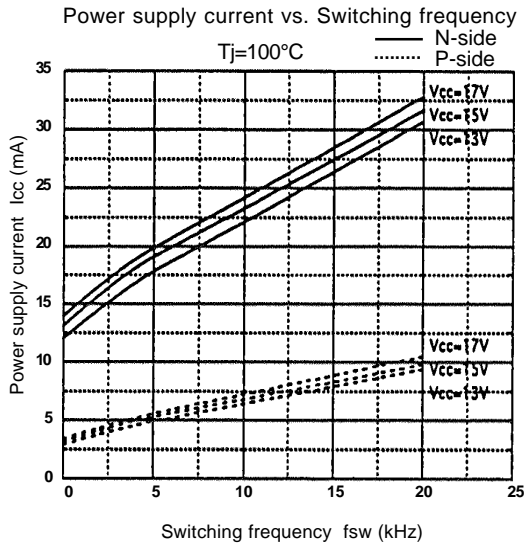
Outline drawings, mm



Mass : 440g

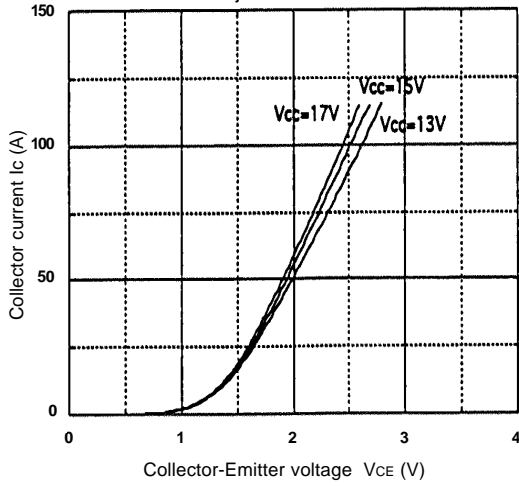
■ Characteristics (Representative)

● Control circuit

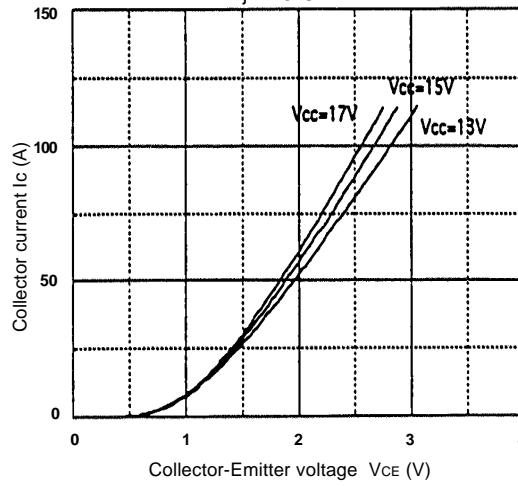


● Inverter

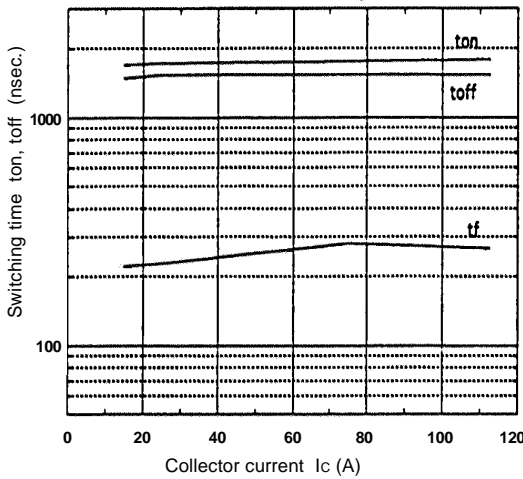
Collector current vs. Collector-Emitter voltage
T_j=25°C



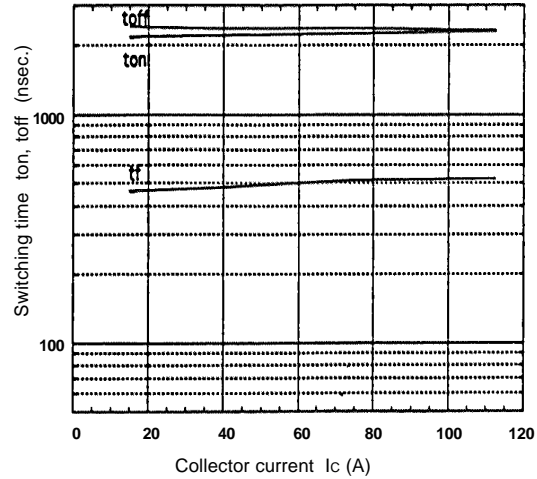
Collector current vs. Collector-Emitter voltage
T_j=125°C



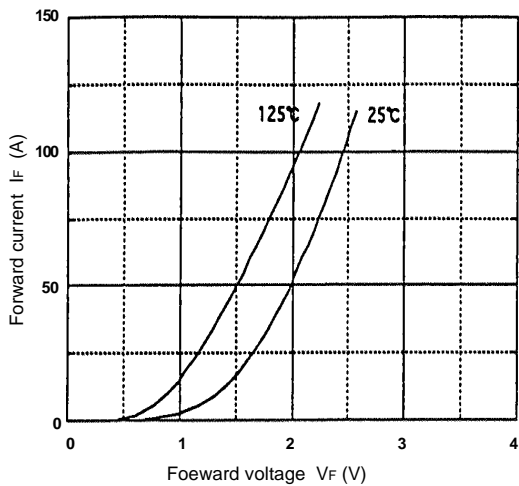
Switching time vs. Collector current
E_{dc}=300V, V_{cc}=15V, T_j=25°C



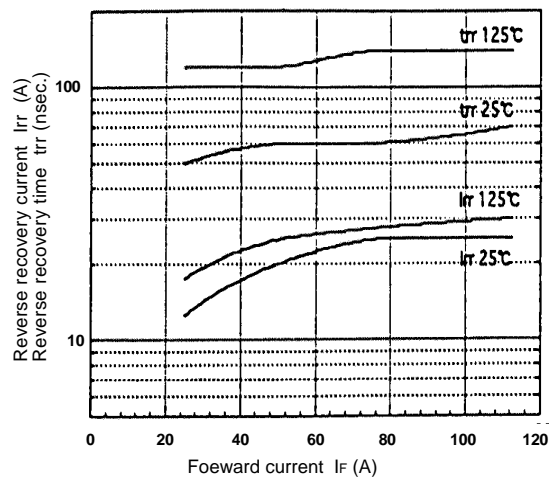
Switching time vs. Collector current
E_{dc}=300V, V_{cc}=15V, T_j=125°C



Forward current vs. Forward voltage



Reverse recovery characteristics trr, Irr, vs. If



● Inverter

