

6MBI50VA-060-50

IGBT Modules

IGBT MODULE (V series)

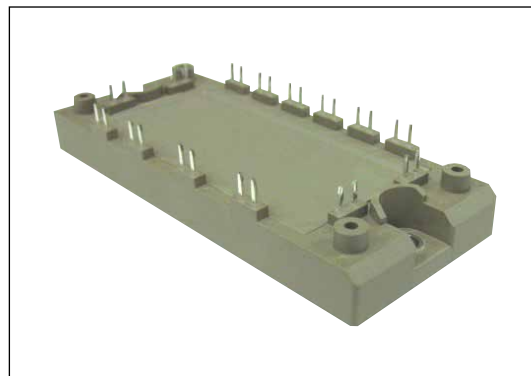
600V / 50A / 6 in one package

■ Features

- Compact Package
- P.C.Board Mount
- Low $V_{CE(sat)}$

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as welding machines



■ 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 =80°C | 50 | A |
| | | I _{C pulse} | 1ms | T _c =80°C | 100 | |
| | | -I _C | | | 50 | |
| | | -I _{C pulse} | 1ms | 100 | | |
| Collector power dissipation | P _C | 1 device | | 200 | W | |
| Junction temperature | | T _J | | | 175 | °C |
| Operating junciton temperature (under switching conditions) | | T _{Jop} | | | 150 | |
| Case temperature | | T _C | | | 125 | |
| Storage temperature | | T _{stg} | | | -40 ~ +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 Tj= 25°C unless otherwise specified)

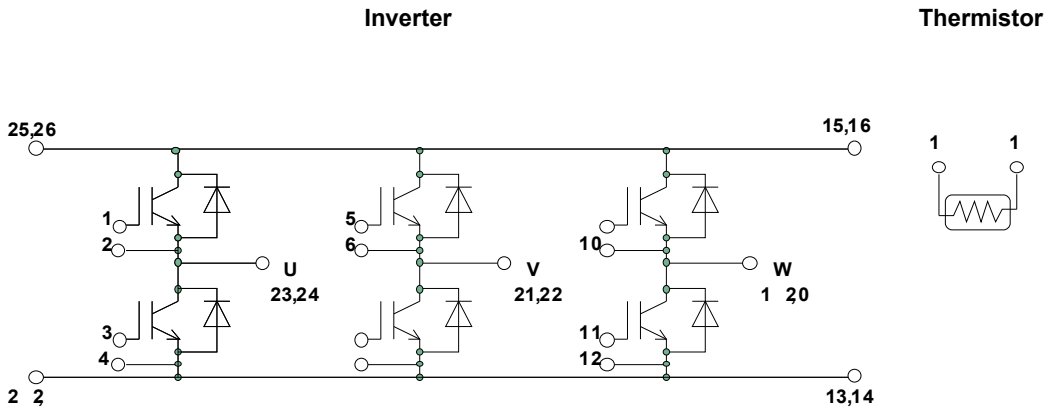
| Items | | Symbols | Conditions | | Characteristics | | | Units |
|--------------------------|--------------------------------------|-------------------------------------|--|-----------------------|-----------------|------|------|-------|
| | | | | | min. | typ. | max. | |
| Inverter | Zero gate voltage 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 = 50mA | | 6.2 | 6.7 | 7.2 | V |
| | Collector-Emitter saturation voltage | V _{CE (sat)} (terminal) | V _{GE} = 15V I _c = 50A | T _j =25°C | - | 1.90 | 2.35 | V |
| | | | | T _j =125°C | - | 2.20 | - | |
| | | | | T _j =150°C | - | 2.40 | - | |
| | | V _{CE (sat)} (chip) | V _{GE} = 15V I _c = 50A | T _j =25°C | - | 1.60 | 2.05 | |
| | | | | T _j =125°C | - | 1.90 | - | |
| | | | | T _j =150°C | - | 2.10 | - | |
| | Internal gate resistance | R _{G (int)} | - | | | 0 | - | Ω |
| | Input capacitance | C _{ies} | V _{CE} = 10V, V _{GE} = 0V, f = 1MHz | | - | 3.3 | - | nF |
| | Turn-on time | t _{on} | V _{CC} = 300V I _c = 50A V _{GE} = +15 / -15V R _e = 43Ω | | - | 0.36 | 1.20 | μs |
| | | t _r | | | - | 0.25 | 0.60 | |
| | | t _{r (l)} | | | - | 0.07 | - | |
| | Turn-off time | t _{off} | | | - | 0.52 | 1.20 | |
| | | t _f | | | - | 0.03 | 0.45 | |
| | Forward on voltage | V _F (terminal) | I _F = 50A | T _j =25°C | - | 1.90 | 2.35 | V |
| T _j =125°C | | | | - | 1.80 | - | | |
| T _j =150°C | | | | - | 1.75 | - | | |
| V _F (chip) | | I _F = 50A | T _j =25°C | - | 1.60 | 2.05 | | |
| | | | T _j =125°C | - | 1.50 | - | | |
| | | | T _j =150°C | - | 1.45 | - | | |
| Reverse recovery time | t _{rr} | I _F = 50A | | - | - | 0.35 | μs | |
| 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 |

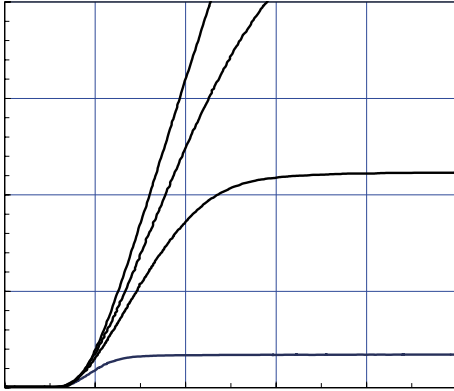
● Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics | | | Units |
|---|---------------|-----------------------|-----------------|------|------|---------------|
| | | | min. | typ. | max. | |
| Thermal resistance (1device) | $R_{th(j-c)}$ | Inverter IGBT | - | - | 0.71 | $^{\circ}C/W$ |
| | | Inverter FWD | - | - | 1.15 | |
| 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.

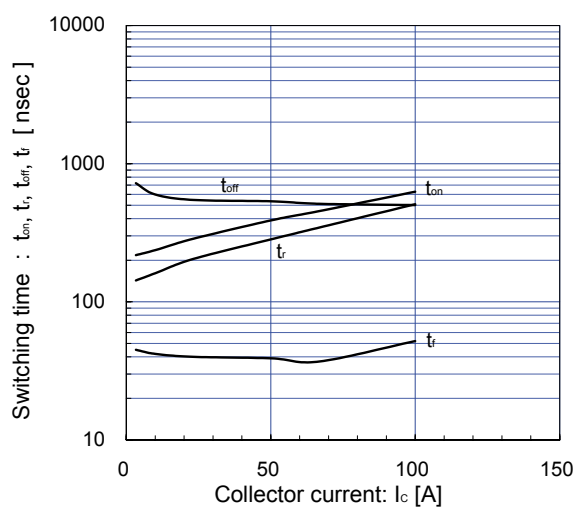
■ Equivalent Circuit Schematic



■ Characteristics (Representative)

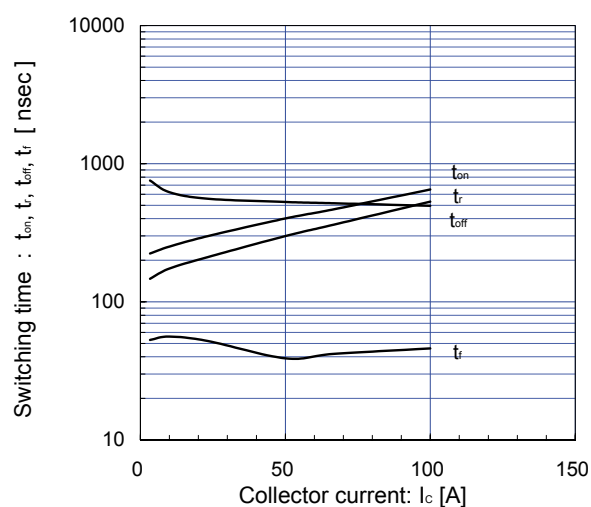
[Inverter]

Switching time vs. Collector current (typ.)

 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=125^\circ C$ 

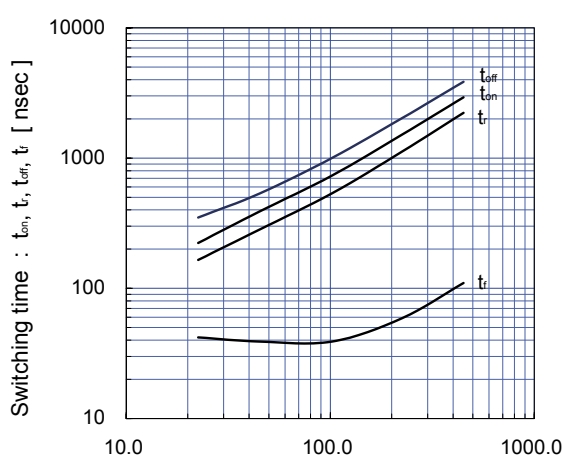
[Inverter]

Switching time vs. Collector current (typ.)

 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=150^\circ C$ 

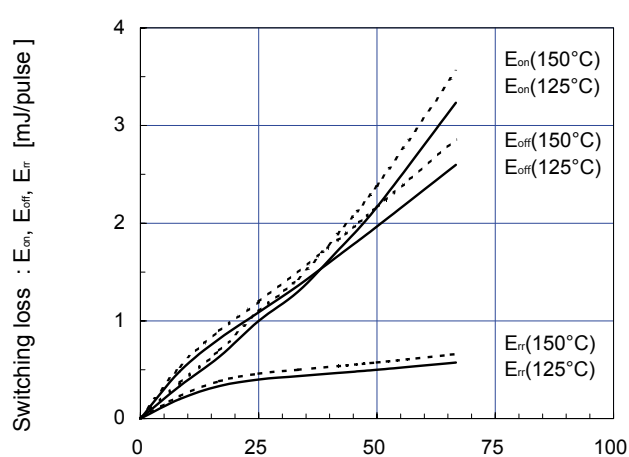
[Inverter]

Switching time vs. gate resistance (typ.)

 $V_{CC}=300V, I_C=50A, V_{GE}=\pm 15V, T_J=125^\circ C$ Gate resistance : R_G [Ω]

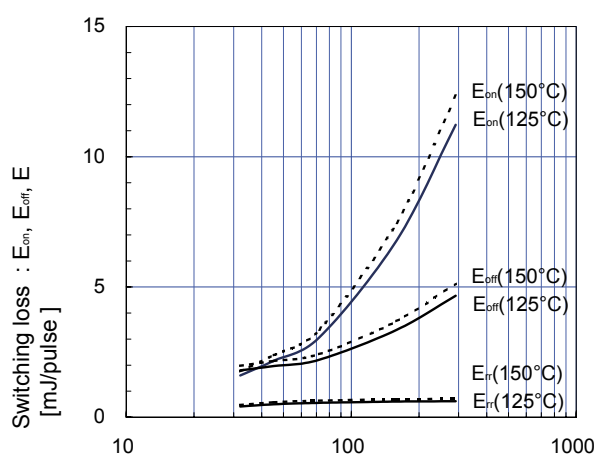
[Inverter]

Switching loss vs. Collector current (typ.)

 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega$ Collector current: I_C [A]

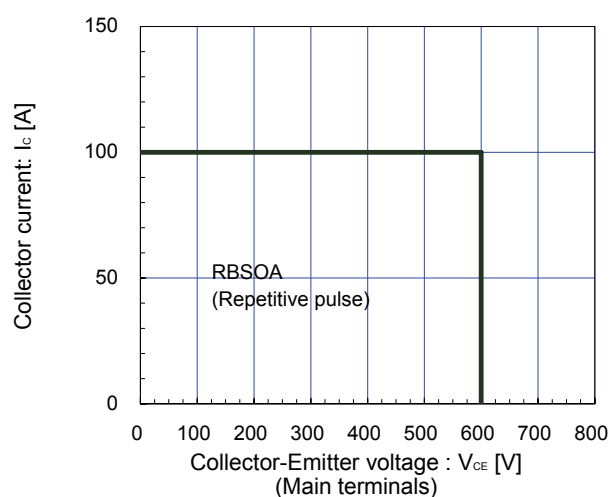
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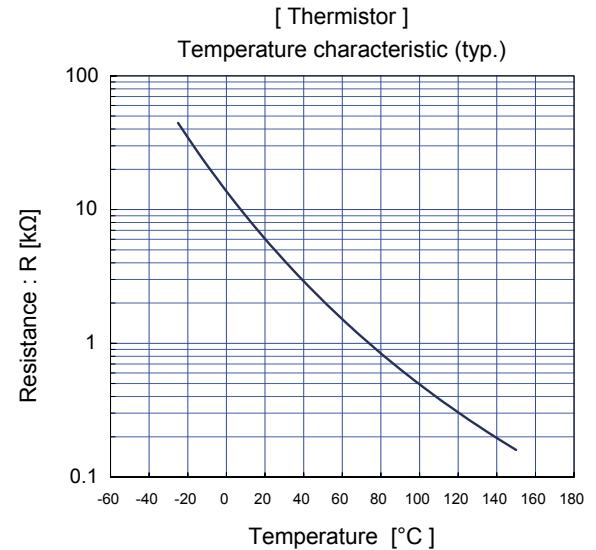
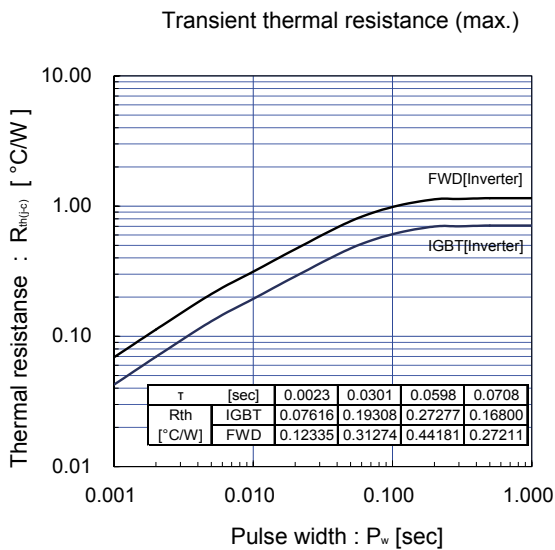
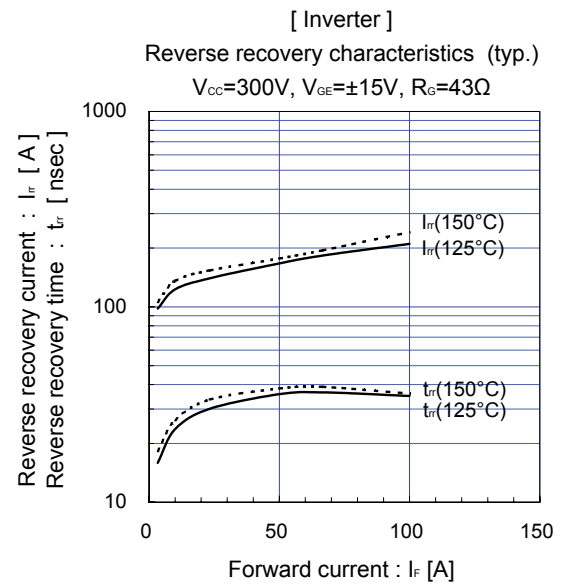
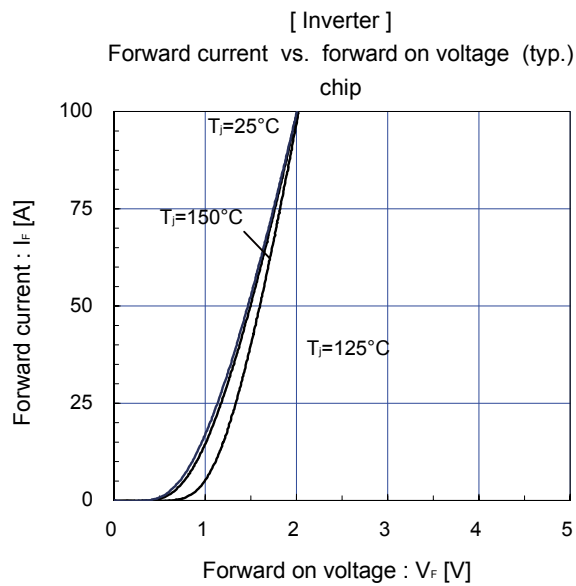
Switching loss vs. gate resistance (typ.)

 $V_{CC}=300V, I_C=50A, V_{GE}=\pm 15V$ Gate resistance : R_G [Ω]

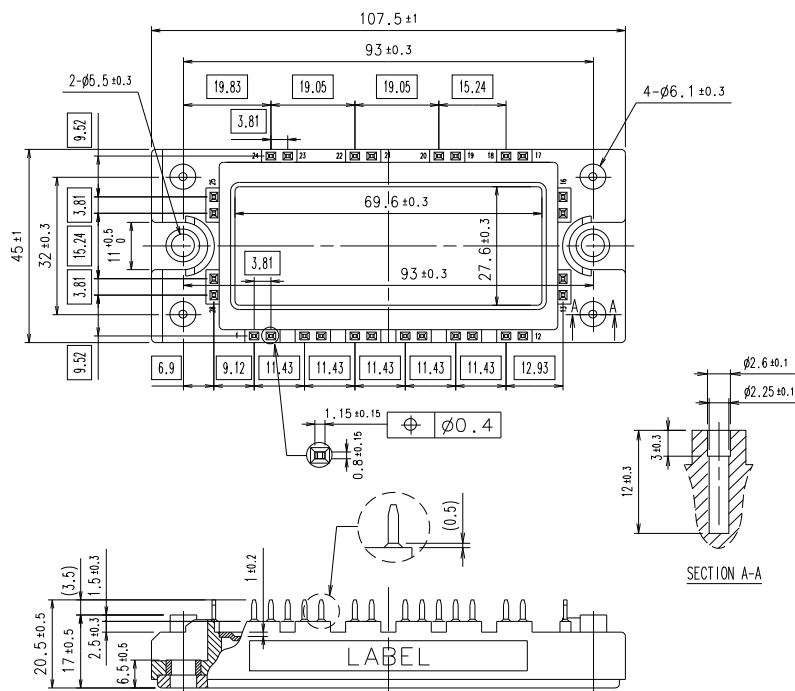
[Inverter]

Reverse bias safe operating area (max.)

 $+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 43\Omega, T_J \leq 150^\circ C$ 



Outline Drawings, mm



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IGBT Modules

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