

### IGBT MODULE (S series) 1200V / 50A / PIM



#### ■ Features

- Low  $V_{CE(sat)}$
- Compact package
- P.C. board mount
- Converter diode bridge, Dynamic brake circuit

#### ■ Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

#### ■ Maximum ratings and characteristics

● Absolute maximum ratings ( $T_c=25^\circ\text{C}$  unless without specified)

| Item                            | Symbol                              | Condition | Rating                         | Unit                   |                      |   |
|---------------------------------|-------------------------------------|-----------|--------------------------------|------------------------|----------------------|---|
| Inverter                        | Collector-Emitter voltage           | $V_{CES}$ | 1200                           | V                      |                      |   |
|                                 | Gate-Emitter voltage                | $V_{GES}$ | $\pm 20$                       | V                      |                      |   |
|                                 | Collector current                   | $I_C$     | Continuous                     | $T_c=25^\circ\text{C}$ | 75                   | A |
|                                 |                                     |           |                                | $T_c=80^\circ\text{C}$ | 50                   |   |
|                                 |                                     | $I_{CP}$  | 1ms                            | $T_c=25^\circ\text{C}$ | 150                  | A |
|                                 |                                     |           |                                | $T_c=80^\circ\text{C}$ | 100                  |   |
|                                 | $-I_C$                              |           | 50                             | A                      |                      |   |
| Collector power dissipation     | $P_C$                               | 1 device  | 360                            | W                      |                      |   |
| Brake                           | Collector-Emitter voltage           | $V_{CES}$ | 1200                           | V                      |                      |   |
|                                 | Gate-Emitter voltage                | $V_{GES}$ | $\pm 20$                       | V                      |                      |   |
|                                 | Collector current                   | $I_C$     | Continuous                     | $T_c=25^\circ\text{C}$ | 35                   | A |
|                                 |                                     |           |                                | $T_c=80^\circ\text{C}$ | 25                   |   |
|                                 |                                     | $I_{CP}$  | 1ms                            | $T_c=25^\circ\text{C}$ | 70                   | A |
|                                 |                                     |           |                                | $T_c=80^\circ\text{C}$ | 50                   |   |
| Collector power dissipation     | $P_C$                               | 1 device  | 180                            | W                      |                      |   |
| Repetitive peak reverse voltage | $V_{RRM}$                           |           | 1200                           | V                      |                      |   |
| Converter                       | Repetitive peak reverse voltage     | $V_{RRM}$ | 1600                           | V                      |                      |   |
|                                 | Average output current              | $I_O$     | 50Hz/60Hz sine wave            | 50                     | A                    |   |
|                                 | Surge current (Non-Repetitive)      | $I_{FSM}$ | $T_j=150^\circ\text{C}$ , 10ms | 520                    | A                    |   |
|                                 | $I^2t$ (Non-Repetitive)             | $I^2t$    | half sine wave                 | 1352                   | $\text{A}^2\text{s}$ |   |
| Operating junction temperature  | $T_j$                               |           | +150                           | $^\circ\text{C}$       |                      |   |
| Storage temperature             | $T_{stg}$                           |           | -40 to +125                    | $^\circ\text{C}$       |                      |   |
| Isolation voltage               | between terminal and copper base *2 | $V_{iso}$ | AC : 1 minute                  | AC 2500                | V                    |   |
|                                 | between thermistor and others *3    |           |                                | AC 2500                |                      |   |
| Mounting screw torque           |                                     |           | 3.5 *1                         | N·m                    |                      |   |

\*1 Recommendable value : 2.5 to 3.5 N·m (M5)

\*2 All terminals should be connected together when isolation test will be done.

\*3 Terminal 8 and 9 should be connected together. Terminal 1 to 7 and 10 to 24 should be connected together and shorted to copper base.

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

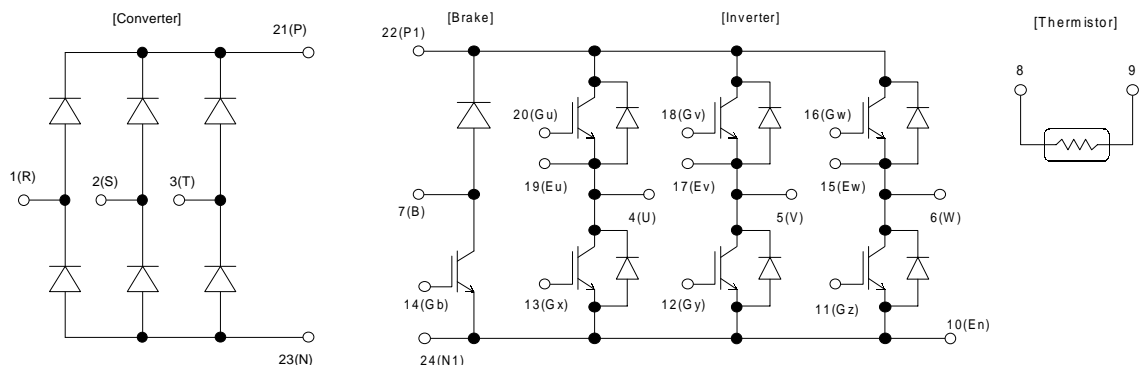
| Item                         | Symbol                               | Condition        | Characteristics         |          |      | Unit |      |      |     |
|------------------------------|--------------------------------------|------------------|-------------------------|----------|------|------|------|------|-----|
|                              |                                      |                  | Min.                    | Typ.     | Max. |      |      |      |     |
| Inverter                     | Zero gate voltage collector current  | ICES             | VCE=1200V, VGE=0V       |          |      | 1.0  | mA   |      |     |
|                              | Gate-Emitter leakage current         | IGES             | VCE=0V, VGE=±20V        |          |      | 0.2  | µA   |      |     |
|                              | Gate-Emitter threshold voltage       | VGE(th)          | VCE=20V, Ic=50mA        |          |      | 5.5  | 7.2  | 8.5  | V   |
|                              | Collector-Emitter saturation voltage | VCE(sat)         | VGE=15V, Ic=50A         | chip     | 2.1  |      | V    |      |     |
|                              |                                      |                  |                         | terminal | 2.3  | 2.7  |      |      |     |
|                              | Input capacitance                    | Cies             | VGE=0V, VCE=10V, f=1MHz |          |      | 6000 |      | pF   |     |
|                              | Turn-on time                         | ton              | VCC=600V                |          |      | 0.35 | 1.2  | µs   |     |
|                              |                                      | tr               | Ic=50A                  |          |      | 0.25 | 0.6  |      |     |
|                              |                                      | tr(i)            | VGE=±15V                |          |      | 0.1  |      |      |     |
|                              | Turn-off                             | toff             | RG=24Ω                  |          |      | 0.45 | 1.0  |      |     |
| tf                           |                                      |                  |                         |          | 0.08 | 0.3  |      |      |     |
| Forward on voltage           | VF                                   | IF=50A           | chip                    | 2.3      |      | V    |      |      |     |
|                              |                                      |                  | terminal                | 2.5      | 3.3  |      |      |      |     |
| Reverse recovery time of FRD | trr                                  | IF=50A           |                         |          |      | 0.35 | µs   |      |     |
| Brake                        | Zero gate voltage collector current  | ICES             | VCEs=1200V, VGE=0V      |          |      | 1.0  | mA   |      |     |
|                              | Gate-Emitter leakage current         | IGES             | VCE=0V, VGE=±20V        |          |      | 0.2  | µA   |      |     |
|                              | Collector-Emitter saturation voltage | VCE(sat)         | Ic=25A, VGE=15V         | chip     | 2.1  |      | V    |      |     |
|                              |                                      |                  |                         | terminal | 2.25 | 2.7  |      |      |     |
|                              | Turn-on time                         | ton              | VCC=600V                |          |      | 0.35 | 1.2  | µs   |     |
|                              |                                      | tr               | Ic=25A                  |          |      | 0.25 | 0.6  |      |     |
|                              | Turn-off time                        | toff             | VGE=±15V                |          |      | 0.45 | 1.0  |      |     |
|                              |                                      | tf               | RG=51Ω                  |          |      | 0.08 | 0.3  |      |     |
|                              | Reverse current                      | I <sub>RRM</sub> | VR=1200V                |          |      |      | 1.0  | mA   |     |
|                              | Forward on voltage                   | VFM              | IF=50A                  | chip     | 1.1  |      | V    |      |     |
| terminal                     |                                      |                  |                         | 1.2      | 1.5  |      |      |      |     |
| Reverse current              | I <sub>RRM</sub>                     | VR=1600V         |                         |          |      | 1.0  | mA   |      |     |
| Thermistor                   | Resistance                           | R                | T=25°C                  |          |      | 5000 |      | Ω    |     |
|                              |                                      |                  | T=100°C                 |          |      | 465  | 495  |      | 520 |
|                              | B value                              | B                | T=25/50°C               |          |      | 3305 | 3375 | 3450 | K   |

● Thermal resistance Characteristics

| Item                            | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------|-----------------------|-----------------|------|------|------|
|                                 |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | Rth(j-c) | Inverter IGBT         |                 |      | 0.35 | °C/W |
|                                 |          | Inverter FWD          |                 |      | 0.75 |      |
|                                 |          | Brake IGBT            |                 |      | 0.69 |      |
|                                 |          | Converter Diode       |                 |      | 0.50 |      |
| Contact thermal resistance *    | Rth(c-f) | With thermal compound |                 | 0.05 |      |      |

\* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Equivalent Circuit Schematic



## Characteristics (Representative)

