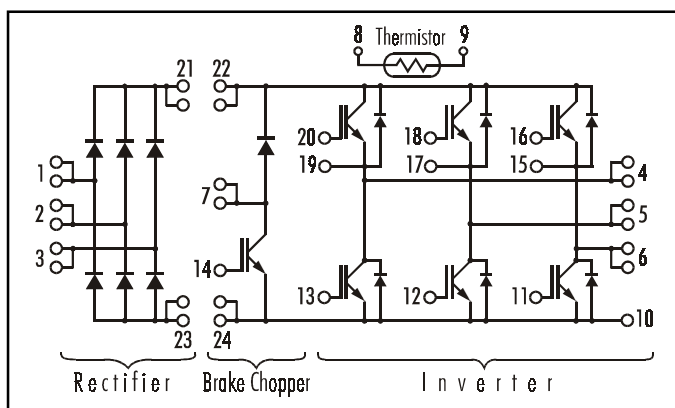


## Power Integrated Module (PIM)

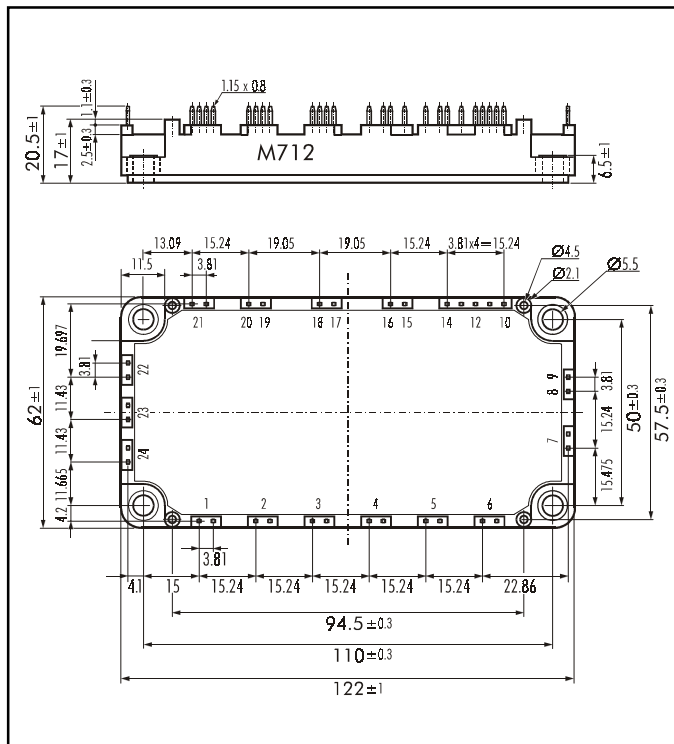
### ■ Features

- NPT-Technology
- Solderable Package
- Square SC SOA at  $10 \times I_C$
- High Short Circuit Withstand-Capability
- Small Temperature Dependence of the Turn-Off Switching Loss
- Low Losses And Soft Switching

### ■ Equivalent Circuit



### ■ Outline Drawing

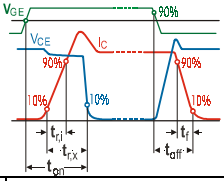


### ■ Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ )

| Items                          |                                   | Symbols               | Test Conditions  |             | Ratings   | Units            |   |
|--------------------------------|-----------------------------------|-----------------------|------------------|-------------|-----------|------------------|---|
| Inverter                       | Collector-Emitter Voltage         | V <sub>CES</sub>      |                  |             | 1200      | V                |   |
|                                | Gate -Emitter Voltage             | V <sub>GES</sub>      |                  |             | ± 20      |                  |   |
|                                | Collector Current                 | I <sub>C</sub>        | Continuous       | 25°C / 80°C | 75 / 50   | A                |   |
|                                |                                   | I <sub>C PULSE</sub>  | 1ms              | 25°C / 80°C | 150 / 100 |                  |   |
|                                |                                   | -I <sub>C PULSE</sub> |                  |             | 50        |                  |   |
| Collector Power Dissipation    |                                   | P <sub>C</sub>        | 1 device         |             | 360       | W                |   |
| Rectifier                      | Repetitive Peak Reverse Voltage   |                       | V <sub>RRM</sub> |             | 1600      | V                |   |
|                                | Average Output Current            |                       | I <sub>O</sub>   |             | 50        | A                |   |
|                                | Surge Current (Non Repetitive)    |                       | I <sub>FSM</sub> |             | 520       |                  |   |
|                                | I <sup>2</sup> t (Non Repetitive) |                       |                  |             | 1352      | A <sup>2</sup> s |   |
| Brake Chopper                  | Collector-Emitter Voltage         |                       | V <sub>CES</sub> |             | 1200      | V                |   |
|                                | Gate –Emitter Voltage             |                       | V <sub>GES</sub> |             | ± 20      |                  |   |
|                                | Collector Current                 | I <sub>C</sub>        | Continuous       | 25°C / 80°C | 35 / 25   | A                |   |
|                                |                                   | I <sub>C PULSE</sub>  | 1ms              | 25°C / 80°C | 70 / 50   |                  |   |
|                                | Collector Power Dissipation       |                       | P <sub>C</sub>   | 1 device    |           | 180              | W |
|                                | Repetitive Peak Reverse Voltage   |                       | V <sub>RRM</sub> |             | 1200      | V                |   |
| Operating Junction Temperature |                                   | T <sub>j</sub>        |                  | +150        | °C        |                  |   |
| Storage Temperature            |                                   | T <sub>Stg</sub>      |                  | -40 ~ +125  |           |                  |   |
| Isolation Voltage              |                                   | V <sub>ISO</sub>      |                  | A.C. 1min.  | 2500      | V                |   |
| Mounting Screw Torque*         |                                   |                       |                  |             | 3.5       | Nm               |   |

Note: \*:Recommendable Value; 2.5 ~ 3.5 Nm (M5)

## ■ Electrical Characteristics( $T_j=25^{\circ}\text{C}$ )

|                  | Items                                | Symbols       | Test Conditions                                                                                                                                                                                    | Min. | Typ.         | Max. | Units         |
|------------------|--------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------|------|---------------|
| Inverter<br>IGBT | Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{GE}=0\text{V}$ $V_{CE}=1200\text{V}$                                                                                                                                                           |      |              | 1.0  | mA            |
|                  | Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0\text{V}$ $V_{GE}=\pm 20\text{V}$                                                                                                                                                         |      |              | 200  | nA            |
|                  | Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $V_{GE}=20\text{V}$ $I_C=50\text{mA}$                                                                                                                                                              | 5.5  | 7.2          | 8.5  | V             |
|                  | Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15\text{V}$<br>$I_C = 50\text{A}$                                                                                                                                                          |      | 2.1<br>2.3   |      |               |
|                  | Input Capacitance                    | $C_{ies}$     | $f=1\text{MHz}$ , $V_{GE}=0\text{V}$ , $V_{CE}=10\text{V}$                                                                                                                                         |      | 6000         |      | pF            |
|                  | Turn-on Time                         | $t_{on}$      | $V_{CC} = 600\text{V}$<br>$I_C = 50\text{A}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_G = 24\Omega$<br>Inductive Load  |      | 0.35         | 1.2  | $\mu\text{s}$ |
|                  |                                      | $t_{r,x}$     |                                                                                                                                                                                                    |      | 0.25         | 0.6  |               |
|                  |                                      | $t_{r,i}$     |                                                                                                                                                                                                    |      | 0.10         |      |               |
|                  | Turn-off Time                        | $t_{off}$     |                                                                                                                                                                                                    |      | 0.45         | 1.0  |               |
|                  |                                      | $t_f$         |                                                                                                                                                                                                    |      | 0.08         | 0.3  |               |
| FRD              | Diode Forward On-Voltage             | $V_F$         | $I_F=50\text{A}$                                                                                                                                                                                   |      | 2.3<br>2.5   |      | V             |
|                  | Reverse Recovery Time                | $t_{rr}$      | $I_F=50\text{A}$                                                                                                                                                                                   |      |              | 350  | ns            |
| Rectifier        | Forward Voltage                      | $V_{FM}$      | $I_F=50\text{A}$                                                                                                                                                                                   |      | 1.1<br>1.2   |      | V             |
|                  | Reverse Current                      | $I_{RRM}$     | $V_R=1600\text{V}$                                                                                                                                                                                 |      |              | 1.0  | mA            |
| Brake Chopper    | Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{GE}=0\text{V}$ $V_{CE}=1200\text{V}$                                                                                                                                                           |      |              | 1.0  | mA            |
|                  | Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0\text{V}$ $V_{GE}=\pm 20\text{V}$                                                                                                                                                         |      |              | 200  | nA            |
|                  | Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15\text{V}$<br>$I_C=50\text{A}$                                                                                                                                                            |      | 2.10<br>2.25 |      | V             |
|                  | Turn-on Time                         | $t_{on}$      | $V_{CC} = 600\text{V}$<br>$I_C = 15\text{A}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_G = 51\Omega$                                                                                                      |      | 0.35         | 1.2  | $\mu\text{s}$ |
|                  |                                      | $t_{r,x}$     |                                                                                                                                                                                                    |      | 0.25         | 0.6  |               |
|                  | Turn-off Time                        | $t_{off}$     |                                                                                                                                                                                                    |      | 0.45         | 1.0  |               |
|                  |                                      | $t_f$         |                                                                                                                                                                                                    |      | 0.08         | 0.3  |               |
|                  | Reverse Current                      | $I_{RRM}$     | $V_R=1200\text{V}$                                                                                                                                                                                 |      |              | 1.0  | mA            |
| NTC              | Resistance                           | R             | $T= 25^{\circ}\text{C}$<br>$T=100^{\circ}\text{C}$                                                                                                                                                 |      | 5000<br>465  |      | $\Omega$      |
|                  | B Value                              | B             | $T=25 / 50^{\circ}\text{C}$                                                                                                                                                                        | 3305 | 3375         | 3450 | K             |

## ■ Thermal Characteristics

| Items                         | Symbols       | Test Conditions       | Min. | Typ. | Max. | Units                |
|-------------------------------|---------------|-----------------------|------|------|------|----------------------|
| Thermal Resistance (1 device) | $R_{th(j-c)}$ | Inverter IGBT         |      |      | 0.35 | $^{\circ}\text{C/W}$ |
|                               |               | Inverter FRD          |      |      | 0.75 |                      |
|                               |               | Brake IGBT            |      |      | 0.69 |                      |
|                               |               | Rectifier Diode       |      |      | 0.50 |                      |
| Contact Thermal Resistance    | $R_{th(c-f)}$ | With Thermal Compound |      | 0.05 |      |                      |

