

## IGBT Modules



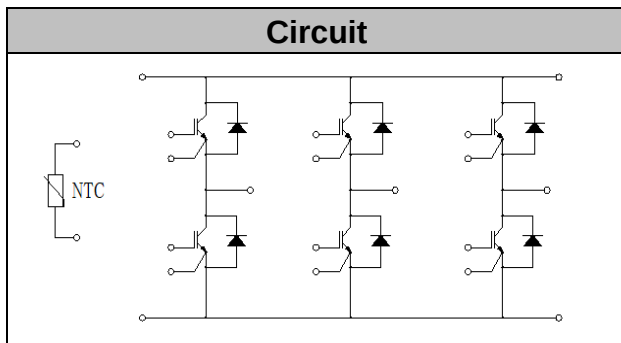
$V_{CES}$  1200V  
 $I_C$  150A

## Applications

- Motor Drivers
- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)

## Features

- Low switching losses
- Low  $V_{ce(sat)}$  with positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- Low inductance case
- High short circuit capability(10us)
- Maximum junction temperature 175°C



## ● IGBT- inverter

### Absolute Maximum Ratings

| Parameter                         | Symbol    | Conditions                                    | Value    | Unit |
|-----------------------------------|-----------|-----------------------------------------------|----------|------|
| Collector-Emitter Voltage         | $V_{CES}$ | $V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$      | 1200     | V    |
| Continuous Collector Current      | $I_C$     | $T_c=100^{\circ}C, T_{vjmax}=175^{\circ}C$    | 150      | A    |
| Repetitive Peak Collector Current | $I_{CRM}$ | $t_p=1ms$                                     | 300      | A    |
| Gate-Emitter Voltage              | $V_{GES}$ | $T_{vj}=25^{\circ}C$                          | $\pm 20$ | V    |
| Total Power Dissipation           | $P_{tot}$ | $T_c=25^{\circ}C$<br>$T_{vjmax}=175^{\circ}C$ | 714      | W    |



## IGBT

### Characteristic values

| Parameter                               | Symbol        | Conditions                                                                                  | Value |      |      | Unit     |
|-----------------------------------------|---------------|---------------------------------------------------------------------------------------------|-------|------|------|----------|
|                                         |               |                                                                                             | Min.  | Typ. | Max. |          |
| Gate-emitter Threshold Voltage          | $V_{GE(th)}$  | $V_{GE}=V_{CE}$ , $I_C=4mA$ , $T_{vj}=25^{\circ}C$                                          | 5.0   | 5.8  | 6.5  | V        |
| Collector-Emitter Cut-off Current       | $I_{CES}$     | $V_{CE}=1200V$ , $V_{GE}=0V$ , $T_{vj}=25^{\circ}C$                                         |       |      | 1.0  | mA       |
| Collector-Emitter Saturation Voltage    | $V_{CE(sat)}$ | $I_C=150A$ , $V_{GE}=15V$ , $T_{vj}=25^{\circ}C$                                            |       | 1.90 |      | V        |
|                                         |               | $I_C=150A$ , $V_{GE}=15V$ , $T_{vj}=125^{\circ}C$                                           |       | 2.25 |      |          |
|                                         |               | $I_C=150A$ , $V_{GE}=15V$ , $T_{vj}=150^{\circ}C$                                           |       | 2.45 |      |          |
|                                         |               | $I_C=150A$ , $V_{GE}=15V$ , $T_{vj}=175^{\circ}C$                                           |       | 2.50 |      |          |
| Gate Charge                             | $Q_G$         |                                                                                             |       | 1.42 |      | uC       |
| Input Capacitance                       | $C_{ies}$     | $V_{CE}=25V$ , $V_{GE}=0V$ ,<br>$f=1MHz$ , $T_{vj}=25^{\circ}C$                             |       | 9.82 |      | nF       |
| Reverse Transfer Capacitance            | $C_{res}$     |                                                                                             |       | 0.49 |      | nF       |
| Internal Gate Resistance                | $R_{gint}$    |                                                                                             |       | 5.0  |      | $\Omega$ |
| Gate-Emitter leakage current            | $I_{GES}$     | $V_{CE}=0V$ , $V_{GE}=20V$ , $T_{vj}=25^{\circ}C$                                           |       |      | 400  | nA       |
| Turn-on Delay Time                      | $t_{d(on)}$   | $I_C=150A$<br>$V_{CE}=600V$<br>$V_{GE}=\pm 15V$<br>$R_G=3.3\Omega$<br>$T_{vj}=25^{\circ}C$  |       | 138  |      | ns       |
| Rise Time                               | $t_r$         |                                                                                             |       | 65   |      | ns       |
| Turn-off Delay Time                     | $t_{d(off)}$  |                                                                                             |       | 280  |      | ns       |
| Fall Time                               | $t_f$         |                                                                                             |       | 237  |      | ns       |
| Energy Dissipation During Turn-on Time  | $E_{on}$      |                                                                                             |       | 13.3 |      | mJ       |
| Energy Dissipation During Turn-off Time | $E_{off}$     |                                                                                             |       | 11.2 |      | mJ       |
| Turn-on Delay Time                      | $t_{d(on)}$   | $I_C=150A$<br>$V_{CE}=600V$<br>$V_{GE}=\pm 15V$<br>$R_G=3.3\Omega$<br>$T_{vj}=125^{\circ}C$ |       | 174  |      | ns       |
| Rise Time                               | $t_r$         |                                                                                             |       | 74   |      | ns       |
| Turn-off Delay Time                     | $t_{d(off)}$  |                                                                                             |       | 313  |      | ns       |
| Fall Time                               | $t_f$         |                                                                                             |       | 322  |      | ns       |
| Energy Dissipation During Turn-on Time  | $E_{on}$      |                                                                                             |       | 18.4 |      | mJ       |
| Energy Dissipation During Turn-off Time | $E_{off}$     |                                                                                             |       | 14.6 |      | mJ       |



# MG150TF12E2A

**RoHS**  
COMPLIANT

|                                         |          |                                                                                                |  |      |  |    |
|-----------------------------------------|----------|------------------------------------------------------------------------------------------------|--|------|--|----|
| Turn-on Delay Time                      |          | $I_C=150A$<br>$V_{CE}=600V$<br>$V_{GE} = \pm 15V$<br>$R_G = 3.3\Omega$<br>$T_{vj}=150^\circ C$ |  | 175  |  | ns |
| Rise Time                               |          |                                                                                                |  | 77   |  | ns |
| Turn-off Delay Time                     |          |                                                                                                |  | 327  |  | ns |
| Fall Time                               |          |                                                                                                |  | 370  |  | ns |
| Energy Dissipation During Turn-on Time  |          |                                                                                                |  | 20.2 |  | mJ |
| Energy Dissipation During Turn-off Time |          |                                                                                                |  | 15.9 |  | mJ |
| Turn-on Delay Time                      |          | $I_C=150A$<br>$V_{CE}=600V$<br>$V_{GE} = \pm 15V$<br>$R_G = 3.3\Omega$<br>$T_{vj}=175^\circ C$ |  | 177  |  | ns |
| Rise Time                               |          |                                                                                                |  | 78   |  | ns |
| Turn-off Delay Time                     |          |                                                                                                |  | 338  |  | ns |
| Fall Time                               |          |                                                                                                |  | 398  |  | ns |
| Energy Dissipation During Turn-on Time  |          |                                                                                                |  | 21.8 |  | mJ |
| Energy Dissipation During Turn-off Time |          |                                                                                                |  | 17   |  | mJ |
| SC Data                                 | $I_{sc}$ | $t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^\circ C,$<br>$V_{cc}=900V, V_{CEM} \leq 1200V$       |  | 675  |  | A  |



## ● Diode

### Absolute Maximum Ratings

| Parameter                       | Symbol    | Conditions                                                   | Value | Unit                 |
|---------------------------------|-----------|--------------------------------------------------------------|-------|----------------------|
| Repetitive Peak Reverse Voltage | $V_{RRM}$ | $T_{vj}=25^{\circ}\text{C}$                                  | 1200  | V                    |
| Continuous DC Forward Current   | $I_F$     |                                                              | 150   | A                    |
| Repetitive Peak Forward Current | $I_{FRM}$ | $t_p=1\text{ms}$                                             | 300   | A                    |
| $I^2t$ -value                   | $I^2t$    | $V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$ | 4550  | $\text{A}^2\text{s}$ |

### Characteristic values

| Parameter                     | Symbol    | Conditions                                                                                                   | Value |      |      | Unit          |
|-------------------------------|-----------|--------------------------------------------------------------------------------------------------------------|-------|------|------|---------------|
|                               |           |                                                                                                              | Min.  | Typ. | Max. |               |
| Forward Voltage               | $V_F$     | $I_F=150\text{A}, T_{vj}=25^{\circ}\text{C}$                                                                 |       | 2.45 |      | V             |
|                               |           | $I_F=150\text{A}, T_{vj}=125^{\circ}\text{C}$                                                                |       | 2.10 |      |               |
|                               |           | $I_F=150\text{A}, T_{vj}=150^{\circ}\text{C}$                                                                |       | 1.90 |      |               |
|                               |           | $I_F=150\text{A}, T_{vj}=175^{\circ}\text{C}$                                                                |       | 1.85 |      |               |
| Recovered Charge              | $Q_{rr}$  | $I_F=150\text{A}$<br>$V_R=600\text{V}$<br>$-di_F/dt=900\text{A}/\mu\text{s}$<br>$T_{vj}=25^{\circ}\text{C}$  |       | 1.6  |      | $\mu\text{C}$ |
| Peak Reverse Recovery Current | $I_{rr}$  |                                                                                                              |       | 49   |      | A             |
| Reverse Recovery Energy       | $E_{rec}$ |                                                                                                              |       | 0.6  |      | mJ            |
| Recovered Charge              | $Q_{rr}$  | $I_F=150\text{A}$<br>$V_R=600\text{V}$<br>$-di_F/dt=900\text{A}/\mu\text{s}$<br>$T_{vj}=125^{\circ}\text{C}$ |       | 8.5  |      | $\mu\text{C}$ |
| Peak Reverse Recovery Current | $I_{rr}$  |                                                                                                              |       | 69   |      | A             |
| Reverse Recovery Energy       | $E_{rec}$ |                                                                                                              |       | 2.3  |      | mJ            |
| Recovered Charge              | $Q_{rr}$  | $I_F=150\text{A}$<br>$V_R=600\text{V}$<br>$-di_F/dt=900\text{A}/\mu\text{s}$<br>$T_{vj}=150^{\circ}\text{C}$ |       | 11.4 |      | $\mu\text{C}$ |
| Peak Reverse Recovery Current | $I_{rr}$  |                                                                                                              |       | 77   |      | A             |
| Reverse Recovery Energy       | $E_{rec}$ |                                                                                                              |       | 3.2  |      | mJ            |
| Recovered Charge              | $Q_{rr}$  | $I_F=150\text{A}$<br>$V_R=600\text{V}$<br>$-di_F/dt=900\text{A}/\mu\text{s}$<br>$T_{vj}=175^{\circ}\text{C}$ |       | 14.3 |      | $\mu\text{C}$ |
| Peak Reverse Recovery Current | $I_{rr}$  |                                                                                                              |       | 84   |      | A             |
| Reverse Recovery Energy       | $E_{rec}$ |                                                                                                              |       | 4.2  |      | mJ            |



## NTC-Thermistor

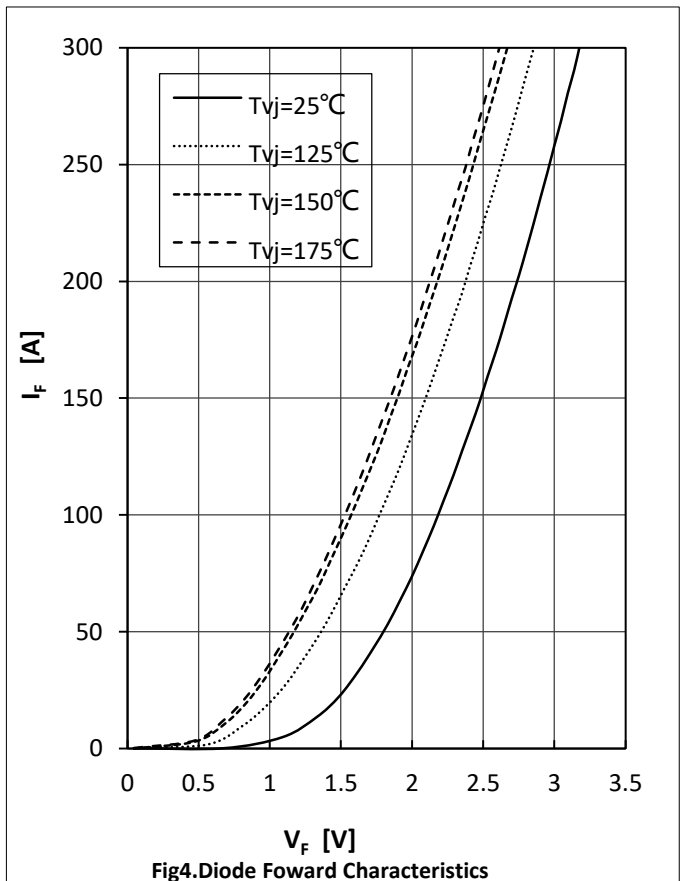
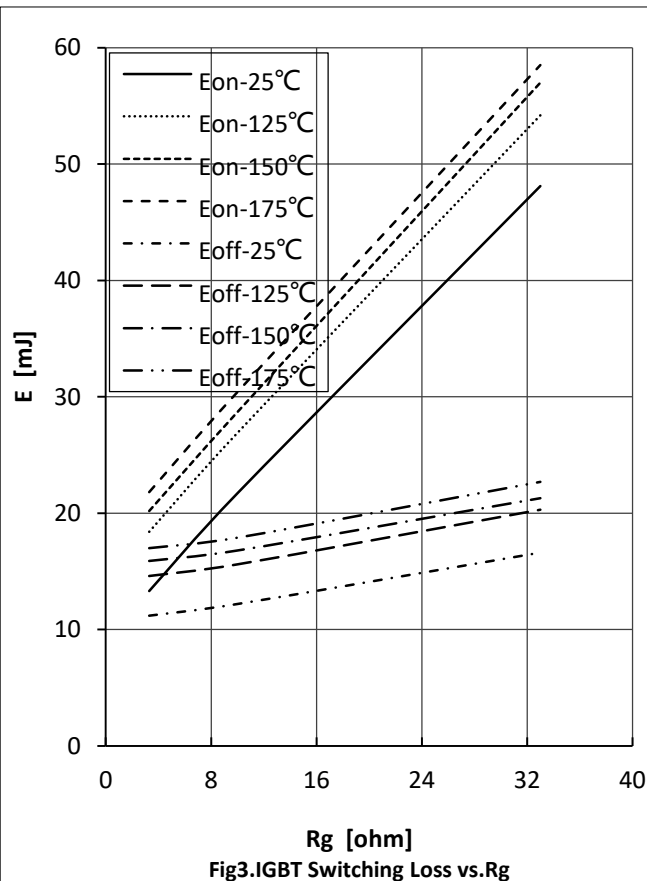
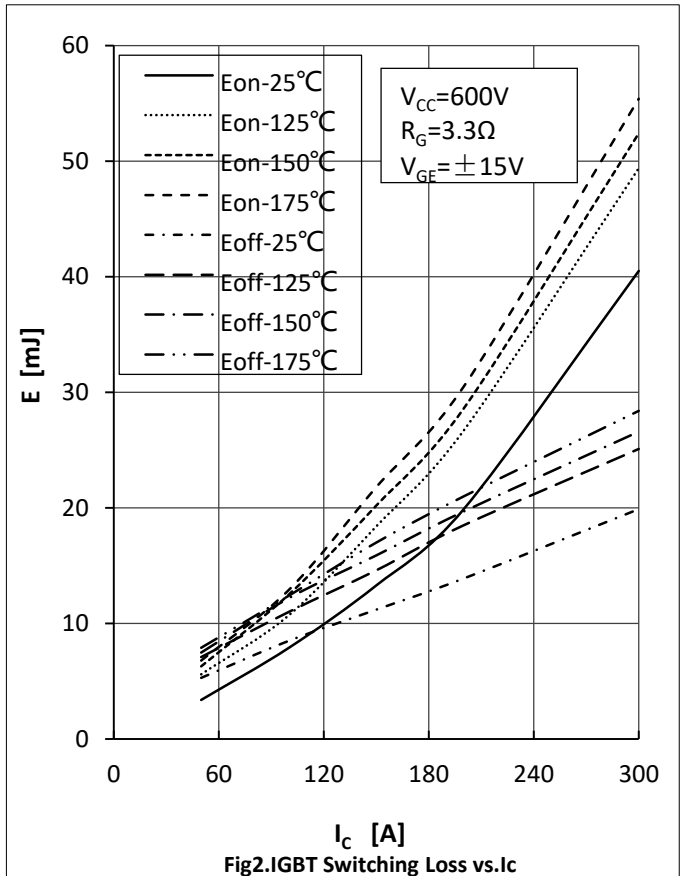
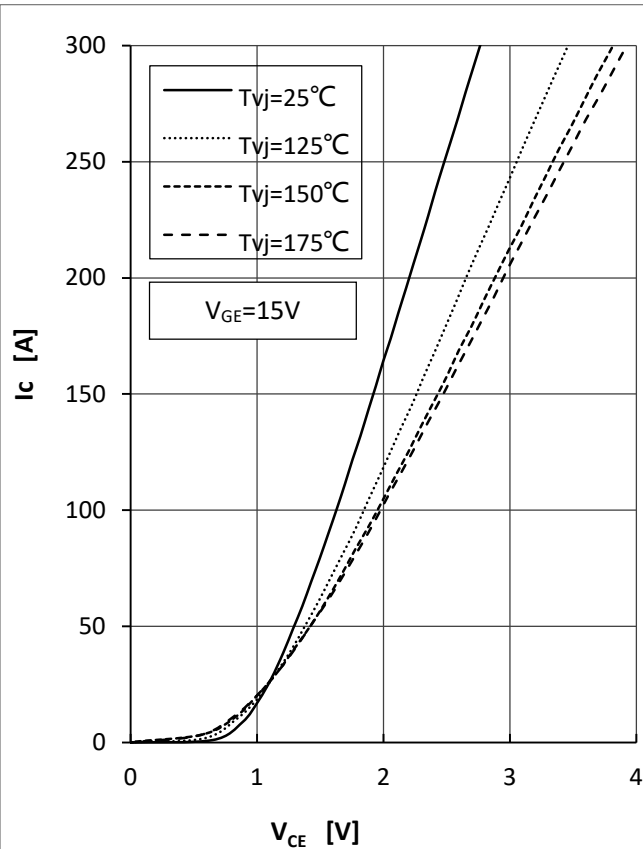
### Characteristic Values

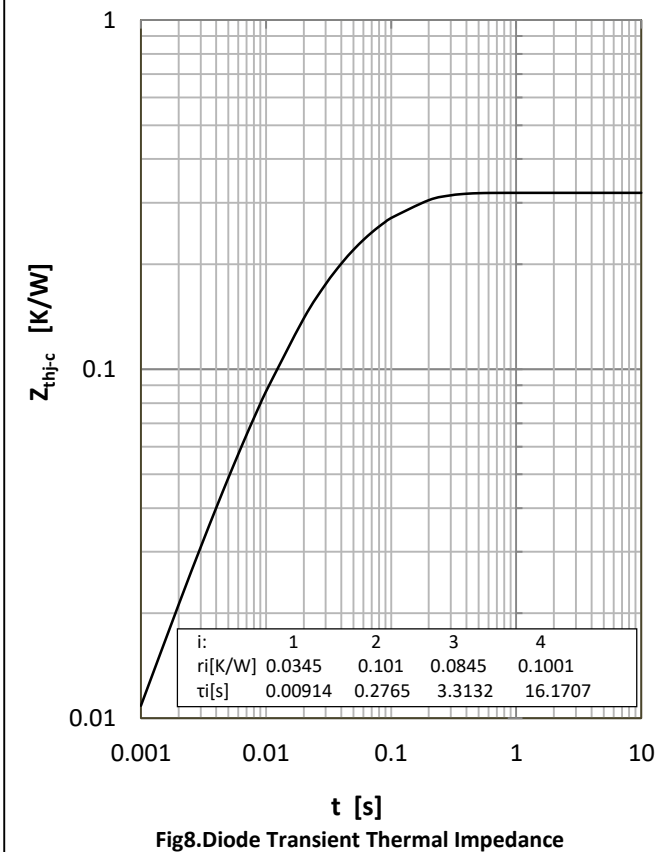
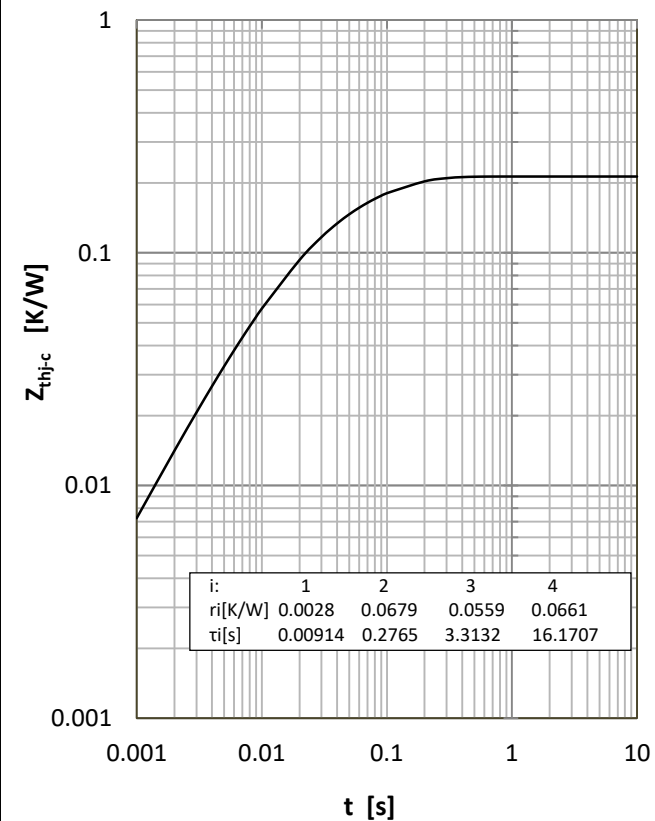
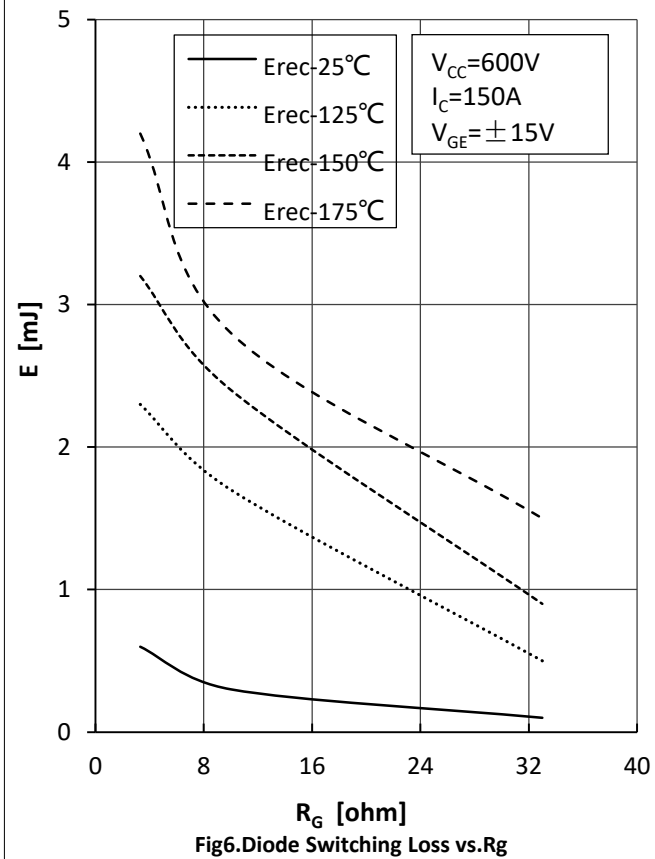
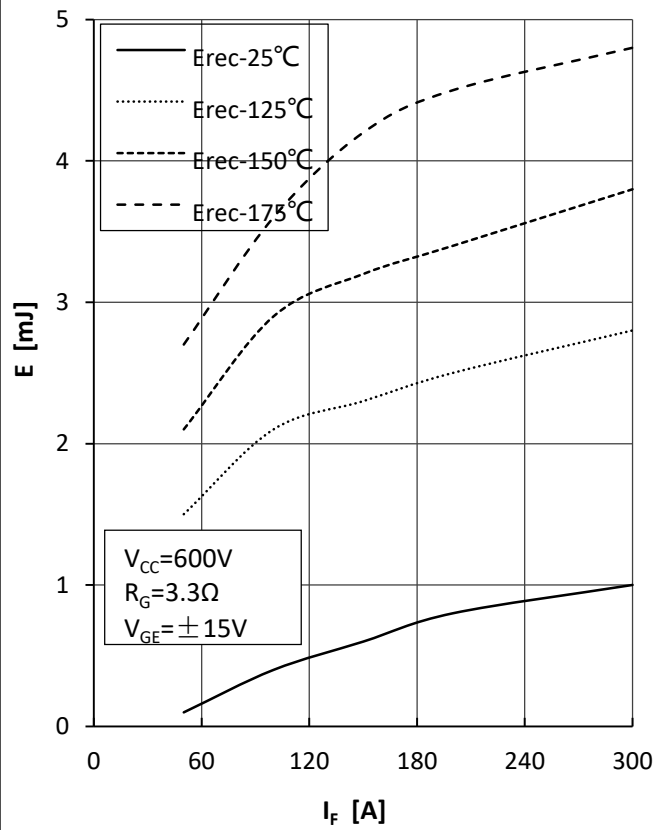
| Parameter         | Symbol       | Conditions                                      | Value |      |      | Unit       |
|-------------------|--------------|-------------------------------------------------|-------|------|------|------------|
|                   |              |                                                 | Min.  | Typ. | Max. |            |
| Rated Resistance  | $R_{25}$     |                                                 |       | 5.0  |      | k $\Omega$ |
| Deviation of R100 | $\Delta R/R$ | $T_C=100, R_{100}=493.3 \Omega$                 | -5    |      | 5    | %          |
| Power Dissipation | $P_{25}$     |                                                 |       |      | 20.0 | mW         |
| B-value           | $B_{25/50}$  | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15 K))]$ |       | 3375 |      | K          |

### ● Module Characteristics

$T_C=25^\circ\text{C}$  unless otherwise specified

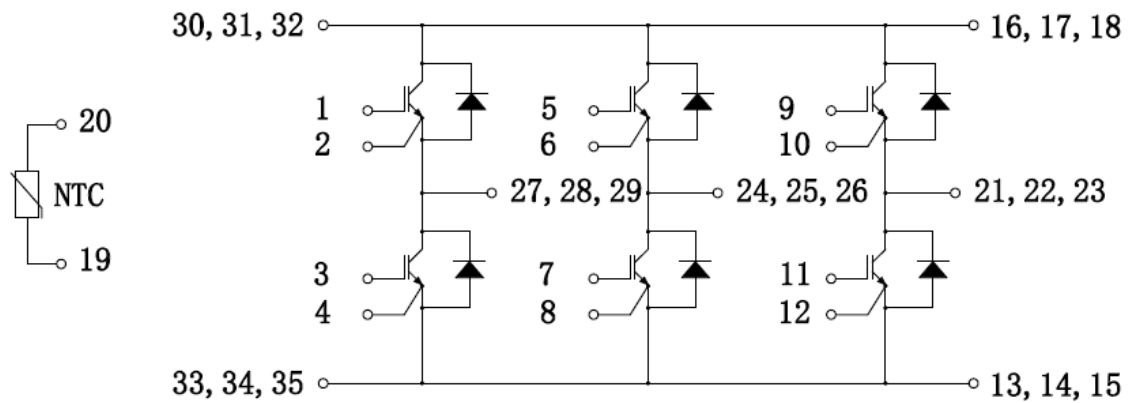
| Parameter                                 | Symbol                      | Conditions                          | Value |      |      | Unit             |
|-------------------------------------------|-----------------------------|-------------------------------------|-------|------|------|------------------|
|                                           |                             |                                     | Min.  | Typ. | Max. |                  |
| Isolation Voltage                         | $V_{\text{isol}}$           | $t=1\text{min}, f=50\text{Hz}$      | 2500  |      |      | V                |
| Maximum Junction Temperature              | $T_{j\text{max}}$           |                                     |       |      | 175  | $^\circ\text{C}$ |
| Operating Junction Temperature            | $T_{vj\text{op}}$           |                                     | -40   |      | 150  | $^\circ\text{C}$ |
| Storage Temperature                       | $T_{\text{stg}}$            |                                     | -40   |      | 125  | $^\circ\text{C}$ |
| Stray-inductance-module                   | $L_{\text{SCE}}$            |                                     |       | 21   |      | nH               |
| Module lead resistance,<br>terminals-chip | $R_{\text{CC}'+\text{EE}'}$ | $T_C=25^\circ\text{C}$ , per switch |       | 1.9  |      | m $\Omega$       |
|                                           | $R_{\text{AA}'+\text{CC}'}$ |                                     |       | 1.5  |      |                  |
| Thermal Resistance<br>Junction to Case    | $R_{\theta\text{JC}}$       | per IGBT-inverter                   |       |      | 0.21 | K/W              |
|                                           |                             | per Diode-inverter                  |       |      | 0.32 |                  |
| Thermal Resistance<br>Case to Sink        | $R_{\theta\text{CS}}$       | per IGBT-inverter                   |       | 0.09 |      | K/W              |
|                                           |                             | per Diode-inverter                  |       | 0.15 |      |                  |
| Mounting Force Per Clamp                  | F                           |                                     | 3.0   |      | 6.0  | N                |
| Weight of Module                          | G                           |                                     |       | 300  |      | g                |



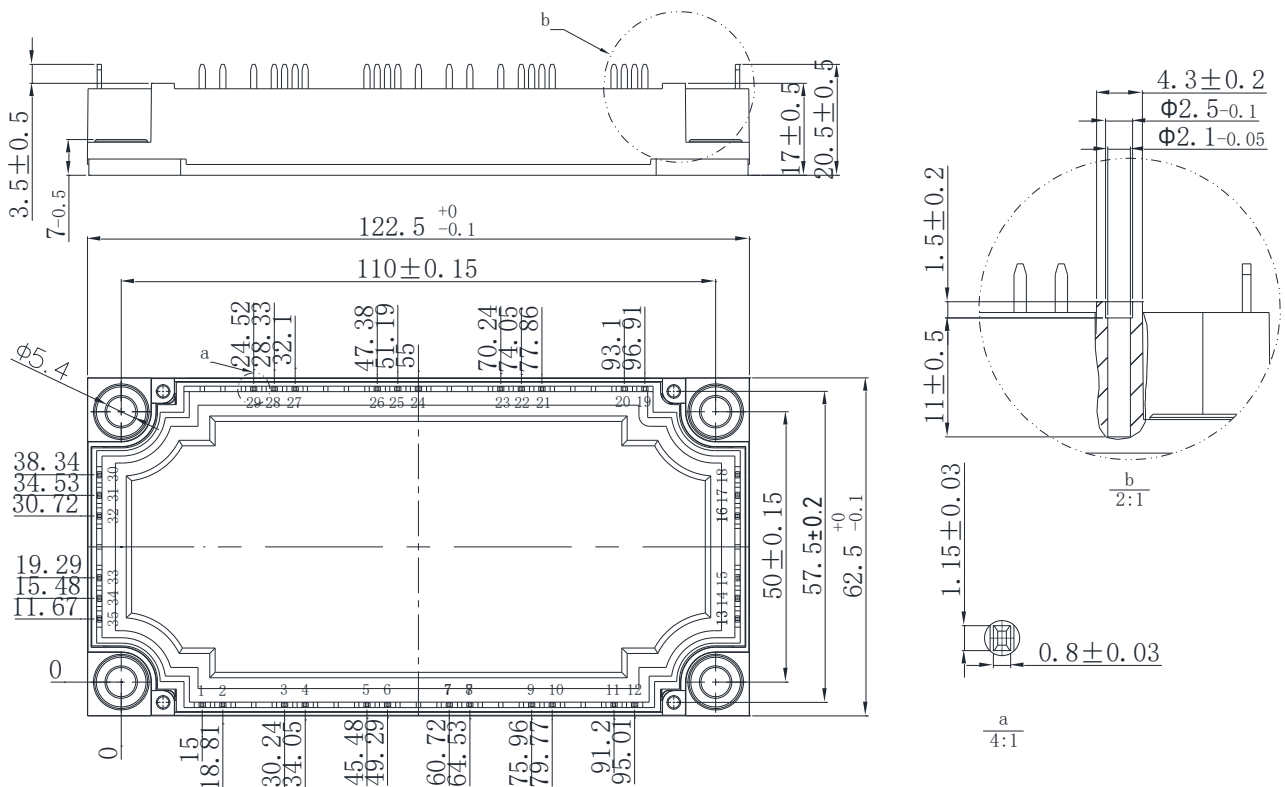




## ● Circuit Diagram



## ● Package Outline Information





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IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.

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