

## PIM with Trench Field-Stop IGBT, Emitter Controlled Diode and NTC

### Features

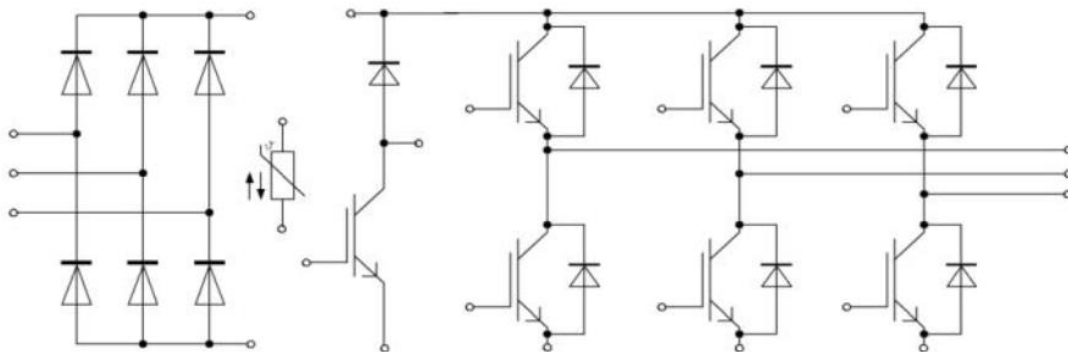
- Trench+ Field Stop Technology
- 1200V Trench Field-Stop IGBT
- Low  $V_{CE(sat)}$  with Low Switching Losses

### Applications

- Frequency Converters
- Motor Drives
- Auxiliary Inverters



### Equivalent Circuit Schematic



### IGBT - Inverter

#### Maximum Rated Values

| Symbol    | Description                       | Conditions                                  | Values   | Unit |
|-----------|-----------------------------------|---------------------------------------------|----------|------|
| $V_{CES}$ | Collector-Emitter Voltage         | $T_{vj}=25^{\circ}C$                        | 1200     | V    |
| $V_{GES}$ | Gate-Emitter Peak Voltage         | $T_{vj}=25^{\circ}C$                        | $\pm 20$ | V    |
| $I_C$     | Continuous DC Collector Current   | $T_C=100^{\circ}C$                          | 35       | A    |
| $I_{CRM}$ | Repetitive Peak Collector Current | $t_p=1ms$                                   | 70       | A    |
| $P_{tot}$ | Total Power Dissipation           | $T_C=25^{\circ}C, T_{vj\ max}=175^{\circ}C$ | 172      | W    |

**YZPST-P035P JE120AT1B2**
**Characteristic Values**

| Symbol        | Description                          | Conditions                                                                                                 | Values |      |      | Unit        |
|---------------|--------------------------------------|------------------------------------------------------------------------------------------------------------|--------|------|------|-------------|
|               |                                      |                                                                                                            | Min.   | Typ. | Max. |             |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}=15V, I_C=35A, T_{vj}=25^{\circ}C$                                                                  | ---    | 2.15 | ---  | V           |
|               |                                      | $V_{GE}=15V, I_C=35A, T_{vj}=125^{\circ}C$                                                                 | ---    | 2.57 | --   | V           |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE}=V_{CE}, I_C=1.2mA$                                                                                 | ---    | 5.6  | ---  | V           |
| $I_{CES}$     | Collector-Emitter Cut-Off Current    | $V_{CE}=1200V, V_{GE}=0V$                                                                                  | ---    | ---  | 1    | mA          |
| $I_{GES}$     | Gate-Emitter Leakage Current         | $V_{GE}=20V, V_{CE}=0V$                                                                                    | ---    | ---  | 100  | nA          |
| $C_{ies}$     | Input Capacitance                    | $V_{CE}=25V, V_{GE}=0V, f=1MHz$                                                                            | ---    | 2590 | ---  | pF          |
| $C_{oes}$     | Output Capacitance                   |                                                                                                            | ---    | 180  | ---  | pF          |
| $C_{res}$     | Reverse Transfer Capacitance         |                                                                                                            | ---    | 86   | ---  | pF          |
| $t_{d(on)}$   | Turn-on Delay Time                   | $V_{CE}=600V$<br>$V_{GE}=\pm 15V$<br>$I_C=35A$<br>$R_G=12\Omega$<br>Inductive Load<br>$T_{vj}=25^{\circ}C$ | ---    | 34   | ---  | ns          |
| $t_r$         | Turn-on Rise Time                    |                                                                                                            | ---    | 20   | ---  | ns          |
| $t_{d(off)}$  | Turn-off Delay Time                  |                                                                                                            | ---    | 230  | ---  | ns          |
| $t_f$         | Turn-off Fall Time                   |                                                                                                            | ---    | 160  | ---  | ns          |
| $E_{on}$      | Turn-on Switching Loss               |                                                                                                            | ---    | 2.5  | ---  | mJ          |
| $E_{off}$     | Turn-off Switching Loss              |                                                                                                            | ---    | 2.5  | ---  | mJ          |
| $I_{SC}$      | Short Circuit Data                   | $V_{GE}\leq 15V, V_{CC}=800V$<br>$t_p\leq 10\mu s, T_{vj}=150^{\circ}C$                                    | ---    | 151  | ---  | A           |
| $R_{thJC}$    | Thermal Resistance, Junction to Case | Per IGBT                                                                                                   | ---    | ---  | 0.87 | K/W         |
| $T_{VJ OP}$   | Virtual Junction Temperature         | Under Switching                                                                                            | -40    | ---  | 150  | $^{\circ}C$ |

**Diode - Inverter**  
**Maximum Rated Values**

| Symbol    | Description                       | Conditions           | Values | Unit |
|-----------|-----------------------------------|----------------------|--------|------|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage   | $T_{vj}=25^{\circ}C$ | 1200   | V    |
| $I_F$     | Continuous DC Forward Current     |                      | 30     | A    |
| $I_{FRM}$ | Repetitive Peak Collector Current | $t_p=1ms$            | 60     | A    |

**YZPST-P035P JE120AT1B2**
**Characteristic Values**

| Symbol      | Description                          | Conditions                                           | Values |      |      | Unit        |
|-------------|--------------------------------------|------------------------------------------------------|--------|------|------|-------------|
|             |                                      |                                                      | Min.   | Typ. | Max. |             |
| $V_F$       | Forward Voltage                      | $I_F=30A, V_{GE}=0V, T_{vj}=25^{\circ}C$             | ---    | 2.4  | ---  | V           |
|             |                                      | $I_F=30A, V_{GE}=0V, T_{vj}=125^{\circ}C$            | ---    | 2.0  | ---  | V           |
| $I_{RM}$    | Peak Reverse Recovery Current        | $I_F=30A, V_R=600V, V_{GE}=-15V, T_{vj}=25^{\circ}C$ | ---    | 61   | ---  | A           |
| $Q_r$       | Recovered Charge                     |                                                      | ---    | 1.8  | ---  | uC          |
| $E_{rec}$   | Reverse Recovery Energy              |                                                      | ---    | 0.35 | ---  | mJ          |
| $R_{thJC}$  | Thermal Resistance, Junction to Case | Per Diode                                            | ---    | ---  | 1.3  | K/W         |
| $T_{VJ OP}$ | Virtual Junction Temperature         | Under Switching                                      | -40    | ---  | 150  | $^{\circ}C$ |

**Diode - Rectifier**
**Maximum Rated Values**

| Symbol     | Description                     | Conditions                                    | Values | Unit   |
|------------|---------------------------------|-----------------------------------------------|--------|--------|
| $V_{RRM}$  | Repetitive Peak Reverse Voltage | $T_{vj}=25^{\circ}C$                          | 1600   | V      |
| $I_F (AV)$ | Average Output Current          | $T_{vj}=25^{\circ}C$                          | 30     | A      |
| $I_{FSM}$  | Surge Forward Current           | $t_p=10ms, \sin 180^{\circ}, T_j=25^{\circ}C$ | 360    | A      |
| $I^2t$     | $I^2t$ Value                    | $t_p=10ms, \sin 180^{\circ}, T_j=25^{\circ}C$ | 648    | $A^2s$ |

**Characteristic Values**

| Symbol      | Description                  | Conditions                               | Values |      |      | Unit        |
|-------------|------------------------------|------------------------------------------|--------|------|------|-------------|
|             |                              |                                          | Min.   | Typ. | Max. |             |
| $V_F$       | Forward Voltage              | $I_F=30A, V_{GE}=0V, T_{vj}=25^{\circ}C$ | ---    | 1.0  | ---  | V           |
| $I_R$       | Recovery Current             | $V_R=1600V, T_{vj}=25^{\circ}C$          | ---    | 5    | ---  | uA          |
| $T_{VJ OP}$ | Virtual Junction Temperature | Under Switching                          | -40    | ---  | 150  | $^{\circ}C$ |

**YZPST-P035P JE120AT1B2**
**IGBT – Brake**
**Maximum Rated Values**

| Symbol    | Description                       | Conditions                  | Values   | Unit |
|-----------|-----------------------------------|-----------------------------|----------|------|
| $V_{CES}$ | Collector-Emitter Voltage         | $T_{vj}=25^{\circ}\text{C}$ | 1200     | V    |
| $V_{GES}$ | Gate-Emitter Peak Voltage         | $T_{vj}=25^{\circ}\text{C}$ | $\pm 20$ | V    |
| $I_C$     | Continuous DC Collector Current   | $T_C=100^{\circ}\text{C}$   | 35       | A    |
| $I_{CRM}$ | Repetitive Peak Collector Current | $t_p=1\text{ms}$            | 70       | A    |

**Characteristic Values**

| Symbol        | Description                          | Conditions                                                                                                                             | Values |      |      | Unit               |
|---------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|--------------------|
|               |                                      |                                                                                                                                        | Min.   | Typ. | Max. |                    |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}=15\text{V}, I_C=35\text{A}, T_{vj}=25^{\circ}\text{C}$                                                                         | ---    | 2.09 | --   | V                  |
|               |                                      | $V_{GE}=15\text{V}, I_C=35\text{A}, T_{vj}=125^{\circ}\text{C}$                                                                        | ---    | 2.45 | --   | V                  |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE}=V_{CE}, I_C=1.2\text{mA}$                                                                                                      | ---    | 5.3  | ---  | V                  |
| $I_{CES}$     | Collector-Emitter Cut-Off Current    | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}$                                                                                                | ---    | ---  | 1    | mA                 |
| $I_{GES}$     | Gate-Emitter Leakage Current         | $V_{GE}=20\text{V}, V_{CE}=0\text{V}$                                                                                                  | ---    | ---  | 100  | nA                 |
| $C_{ies}$     | Input Capacitance                    | $V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$                                                                                   | ---    | 2537 | ---  | pF                 |
| $C_{oes}$     | Output Capacitance                   |                                                                                                                                        | ---    | 123  | ---  | pF                 |
| $C_{res}$     | Reverse Transfer Capacitance         |                                                                                                                                        | ---    | 88   | ---  | pF                 |
| $t_{d(on)}$   | Turn-on Delay Time                   | $V_{CC}=600\text{V}$<br>$V_{GE}=\pm 15\text{V}$<br>$I_C=35\text{A}$<br>$R_G=12\Omega$<br>Inductive Load<br>$T_{vj}=25^{\circ}\text{C}$ | ---    | 35   | ---  | ns                 |
| $t_r$         | Turn-on Rise Time                    |                                                                                                                                        | ---    | 26   | ---  | ns                 |
| $t_{d(off)}$  | Turn-off Delay Time                  |                                                                                                                                        | ---    | 215  | ---  | ns                 |
| $t_f$         | Turn-off Fall Time                   |                                                                                                                                        | ---    | 145  | ---  | ns                 |
| $E_{on}$      | Turn-on Switching Loss               |                                                                                                                                        | ---    | 2.21 | ---  | mJ                 |
| $E_{off}$     | Turn-off Switching Loss              |                                                                                                                                        | ---    | 2.34 | ---  | mJ                 |
| $I_{SC}$      | Short Circuit Data                   | $V_{GE}\leq 15\text{V}, V_{CC}=800\text{V}$<br>$t_p\leq 10\mu\text{s}, T_{vj}=25^{\circ}\text{C}$                                      | ---    | 151  | ---  | A                  |
| $T_{VJ OP}$   | Virtual Junction Temperature         | Under Switching                                                                                                                        | -40    | ---  | 150  | $^{\circ}\text{C}$ |

## YZPST-P035P JE120AT1B2

### Diode - Brake

#### Maximum Rated Values

| Symbol    | Description                       | Conditions           | Values | Unit |
|-----------|-----------------------------------|----------------------|--------|------|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage   | $T_{vj}=25^{\circ}C$ | 1200   | V    |
| $I_C$     | Continuous DC Collector Current   |                      | 15     | A    |
| $I_{FRM}$ | Repetitive Peak Collector Current | $t_p=1ms$            | 30     | A    |

#### Characteristic Values

| Symbol      | Description                   | Conditions                                | Values |      |      | Unit        |
|-------------|-------------------------------|-------------------------------------------|--------|------|------|-------------|
|             |                               |                                           | Min.   | Typ. | Max. |             |
| $V_F$       | Forward Voltage               | $I_F=15A, V_{GE}=0V, T_{vj}=125^{\circ}C$ | ---    | 2.1  | ---  | V           |
| $I_{RM}$    | Peak Reverse Recovery Current | $I_F=15A, di/dt=1000A/us$                 | ---    | 20   | ---  | A           |
| $Q_r$       | Recovered Charge              | $V_R=600V, V_{GE}=-15V$                   | ---    | 0.5  | ---  | uC          |
| $E_{rec}$   | Reverse Recovery Energy       | $T_{vj}=25^{\circ}C$                      | ---    | 0.05 | ---  | mJ          |
| $T_{VJ OP}$ | Virtual Junction Temperature  | Under Switching                           | -40    | ---  | 150  | $^{\circ}C$ |

### NTC-Thermistor

#### Characteristic Values

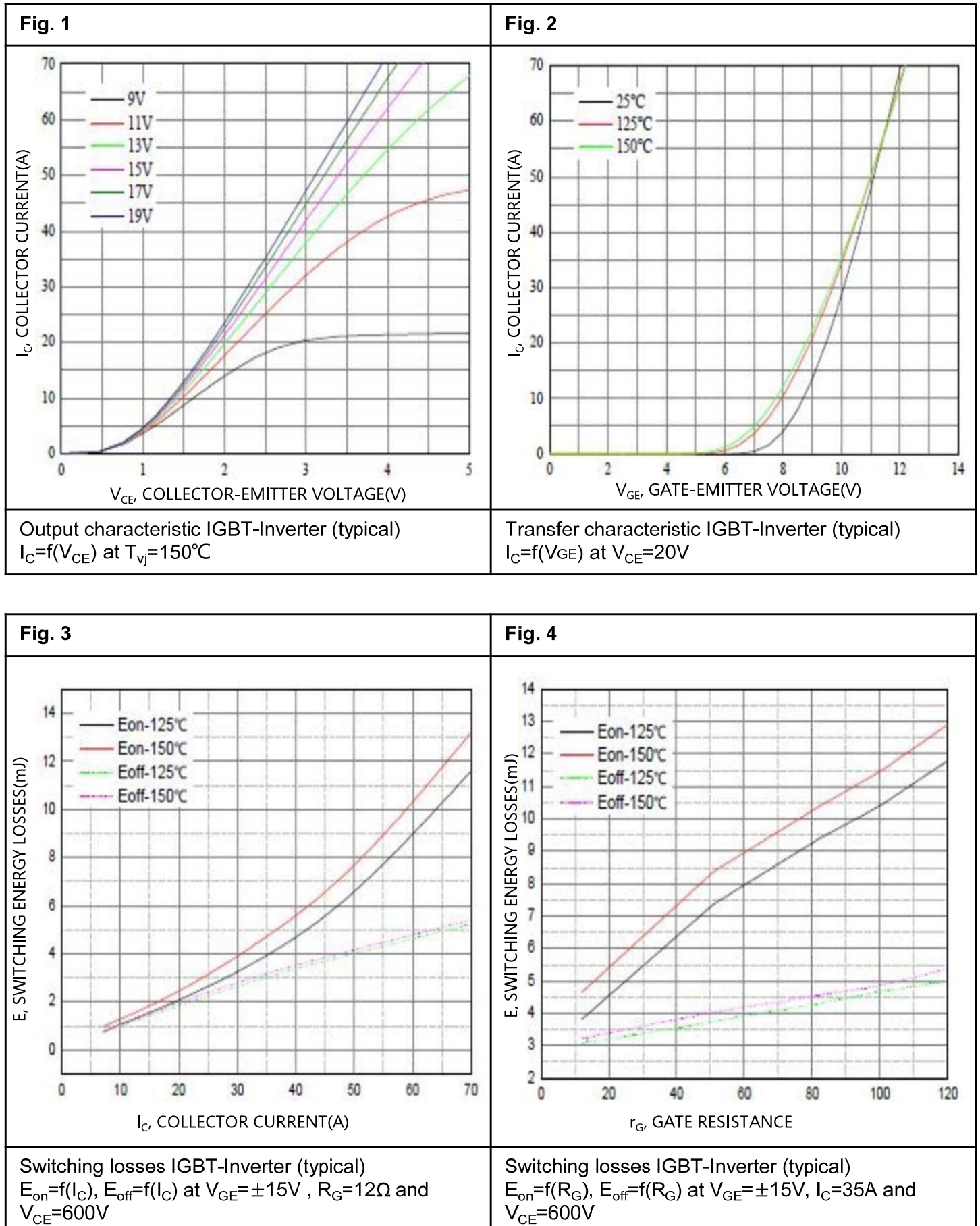
| Symbol      | Description      | Conditions                                         | Values |      |      | Unit       |
|-------------|------------------|----------------------------------------------------|--------|------|------|------------|
|             |                  |                                                    | Min.   | Typ. | Max. |            |
| $R_{25}$    | Rated Resistance | $T_C=25^{\circ}C$                                  | ---    | 5    | ---  | K $\Omega$ |
| $B_{25/50}$ | B Value          | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298 K))]$ | ---    | 3380 | ---  | K          |

## Module

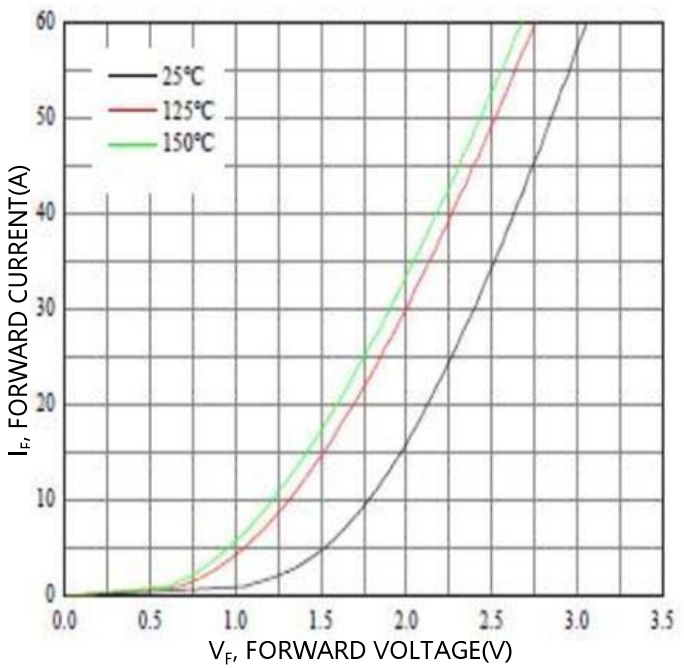
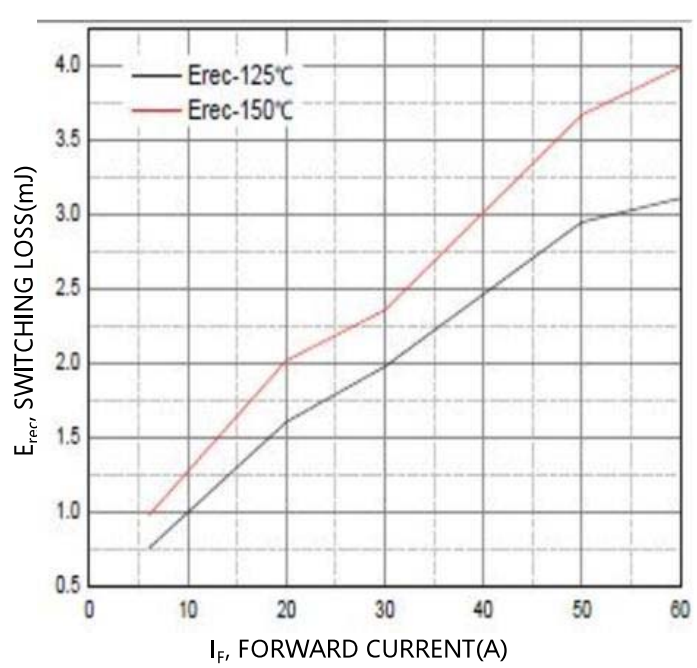
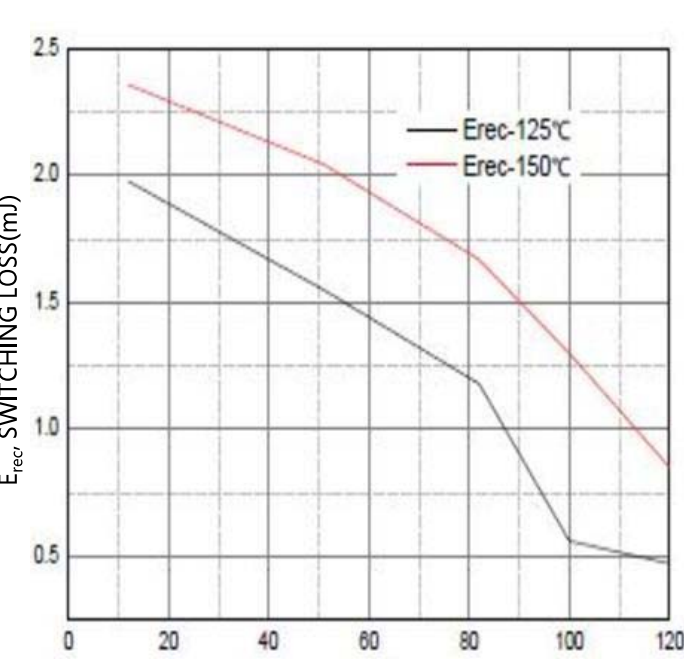
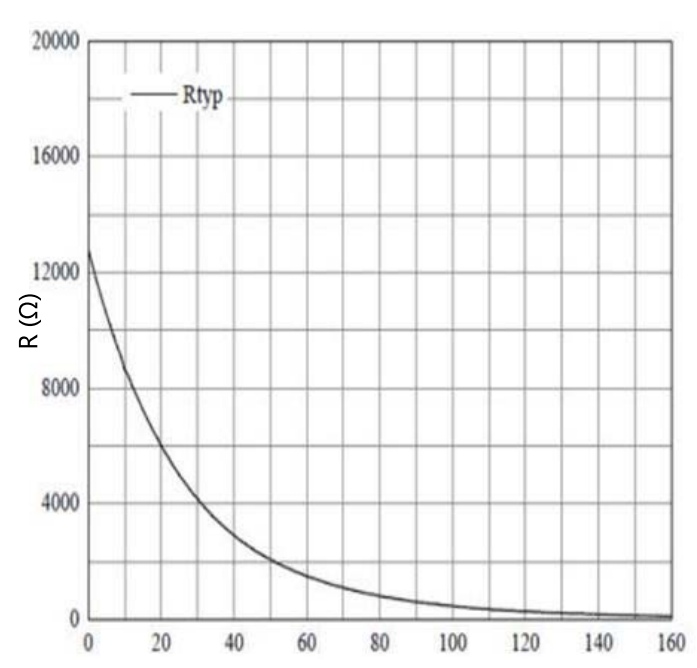
| Symbol            | Description            | Conditions                                   | Values                         | Unit |
|-------------------|------------------------|----------------------------------------------|--------------------------------|------|
| V <sub>ISOL</sub> | Isolation Test Voltage | RMS, f=50Hz, t=1min                          | 3                              | KV   |
|                   | Internal Isolation     | Basic Insulation (Class 1, IEC 61140)        | Al <sub>2</sub> O <sub>3</sub> |      |
|                   | Creepage Distance      | Terminal to Heatsink<br>Terminal to Terminal | 11.8<br>6                      | mm   |
|                   | Clearance              | Terminal to Heatsink<br>Terminal to Terminal | 10.2<br>5.1                    | mm   |

| Symbol               | Description                            | Conditions | Values |      |      | Unit |
|----------------------|----------------------------------------|------------|--------|------|------|------|
|                      |                                        |            | Min.   | Typ. | Max. |      |
| L <sub>sCE</sub>     | Stray Inductance Module                |            | ---    | 30   | ---  | nH   |
| T <sub>stg</sub>     | Storage Temperature                    |            | -40    | ---  | 125  | °C   |
| R <sub>CC'+EE'</sub> | Module lead resistance, terminals-chip |            | ---    | 8.0  | ---  | mΩ   |
| G                    | Weight                                 |            | ---    | 39   | ---  | g    |

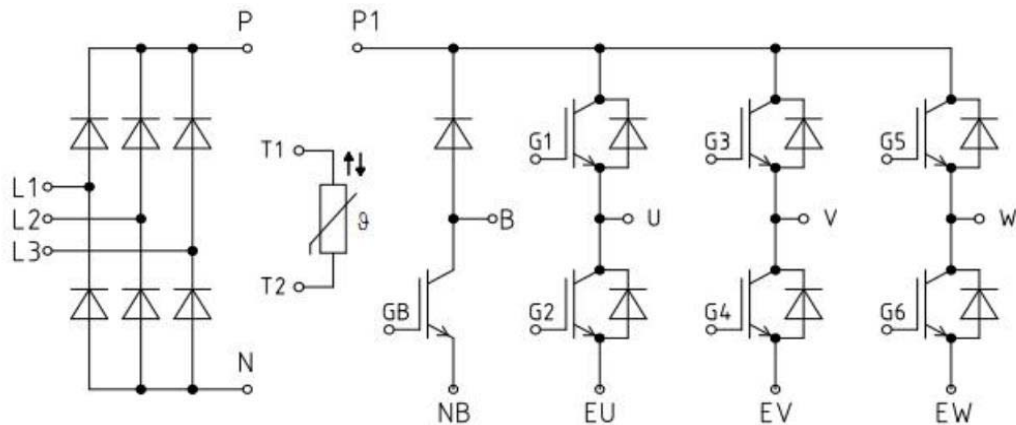
## Typical Characteristics



## Typical Characteristics

|                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Fig. 5</b></p>  <p>Forward characteristic of Diode-Inverter (typical)<br/> <math>I_F = f(V_F)</math></p>                                                      | <p><b>Fig. 6</b></p>  <p>Switching losses Diode-Inverter (typical)<br/> <math>E_{rec} = f(I_F)</math> at <math>R_G = 12\Omega</math> and <math>V_{CE} = 600V</math></p> |
| <p><b>Fig. 7</b></p>  <p>Switching losses Diode-Inverter (typical)<br/> <math>E_{rec} = f(I_F)</math> at <math>I_F = 35A</math> and <math>V_{CE} = 600V</math></p> | <p><b>Fig. 8</b></p>  <p>NTC-Thermistor-Temperature Characteristic (typical), <math>R = f(T)</math></p>                                                                |

## Circuit Diagram



## Package Outlines (mm)

