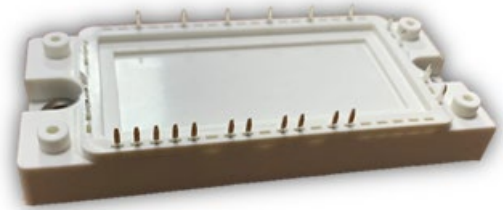


Features

- Trench/Fieldstop IGBT
- Half-bridge
- Low inductance
- Standard package
- High short circuit capability
- Including anti-parallel FWD



Typical Applications

- Motor Drives
- Servo Drives
- Auxiliary Inverters

IGBT, Inverter

| Maximum Rated Values | | | | | | |
|------------------------|--------------------------------------|---|----------|-------|------|----------|
| Symbol | Item | Conditions | Rating | | | Unit |
| IGBT | | | | | | |
| V_{CES} | Collector-emitter voltage | $T_{vj}=25^{\circ}C$ | 1200 | | | V |
| V_{GES} | Gate-emitter voltage | - | ± 20 | | | V |
| I_C | Collector current,DC | $T_C=80^{\circ}C, T_{vj}=175^{\circ}C$ | 25 | | | A |
| I_{CRM} | Repetitive peak collector current | $t_p=1ms$ | 50 | | | A |
| P_{tot} | Total power dissipation | $T_C=25^{\circ}C, T_{vj}=175^{\circ}C$ | 187 | | | W |
| Characteristics Values | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit |
| IGBT | | | Min. | Typ. | Max. | |
| I_{CES} | Collector-emitter cut-off current | $V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$ | - | - | 1 | mA |
| I_{GES} | Gate leakage current | $V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$ | - | - | 100 | nA |
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $I_C=0.8mA, V_{CE}=V_{GE}, T_{vj}=25^{\circ}C$ | 5.2 | 5.61 | 6.6 | V |
| V_{CEsat} | Collector-emitter saturation voltage | $I_C=25A$ $V_{GE}=15V$ $T_{vj}=25^{\circ}C$ | - | 1.98 | - | |
| | | $T_{vj}=125^{\circ}C$ | - | 2.26 | - | |
| | | $T_{vj}=150^{\circ}C$ | - | 2.39 | - | |
| C_{ies} | Input capacitance | $V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$ | - | 1.77 | - | nF |
| C_{oes} | Output capacitance | | - | 0.17 | - | |
| C_{res} | Reverse transfer capacitance | | - | 0.06 | - | |
| Q_G | Gate charge | $V_{CC}=600V, I_C=25A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$ | - | 0.171 | - | μC |
| R_g | Internal gate resistance | $T_{vj}=25^{\circ}C$ | - | - | - | Ω |

| | | | | | | | |
|--------------|--|---|----------------------|------|-------|------------|----|
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}=600V$ $I_C=25A$ $V_{GE}=\pm 15V$ $R_{G(on)}=33\Omega$ $R_{G(off)}=33\Omega$ | $T_{vj}=25^\circ C$ | - | 134 | - | ns |
| | | | $T_{vj}=125^\circ C$ | - | 110 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 96 | - | |
| t_r | Rise time | | $T_{vj}=25^\circ C$ | - | 62 | - | |
| | | | $T_{vj}=125^\circ C$ | - | 55 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 48 | - | |
| $t_{d(off)}$ | Turn-off delay time | | $T_{vj}=25^\circ C$ | - | 213.6 | - | |
| | | | $T_{vj}=125^\circ C$ | - | 227.2 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 232.1 | - | |
| t_f | Fall time | | $T_{vj}=25^\circ C$ | - | 323.2 | - | |
| | | | $T_{vj}=125^\circ C$ | - | 387.2 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 401.1 | - | |
| E_{on} | Turn-on energy (per pulse) | $T_{vj}=25^\circ C$ | - | 2.25 | - | mJ | |
| | | $T_{vj}=125^\circ C$ | - | 3.1 | - | | |
| | | $T_{vj}=150^\circ C$ | - | 3.38 | - | | |
| E_{off} | Turn-off energy (per pulse) | $T_{vj}=25^\circ C$ | - | 1.64 | - | | |
| | | $T_{vj}=125^\circ C$ | - | 2.0 | - | | |
| | | $T_{vj}=150^\circ C$ | - | 2.2 | - | | |
| SC data | Short-circuit current | $V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^\circ C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$ | - | 90 | - | A | |
| R_{thJC} | Thermal resistance, junction to case | Per IGBT | - | - | 0.8 | K/W | |
| T_{vjop} | Temperature under switching conditions | | -40 | | 150 | $^\circ C$ | |

Diode, Inverter
Maximum Rated Values

| Symbol | Item | Conditions | Rating | Unit |
|-----------|---------------------------------|--|--------|--------|
| V_{RRM} | Repetitive peak reverse voltage | $T_{vj}=25^\circ C$ | 1200 | V |
| I_F | Forward current, DC | $T_C=80^\circ C, T_{vj}=175^\circ C$ | 25 | A |
| I_{FRM} | Repetitive peak forward current | $t_p=1ms$ | 50 | A |
| I^2t | I^2t -value | $V_R=0V, t_p=10ms, T_{vj}=125^\circ C$ | 170 | A^2s |

Characteristic Values

| | | | Min. | Typ. | Max. | | |
|----------|-------------------------------|--|----------------------|------|------|---------|----|
| V_F | Continuous forward voltage | $I_F=25A$ $V_{GE}=0V$ | $T_{vj}=25^\circ C$ | - | 2.29 | - | V |
| | | | $T_{vj}=125^\circ C$ | - | 1.83 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 1.72 | - | |
| I_{RM} | Peak reverse recovery current | $V_R=600V$ $I_F=25A$ $V_{GE}=-15V$ | $T_{vj}=25^\circ C$ | - | 17 | - | A |
| | | | $T_{vj}=125^\circ C$ | - | 20 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 21 | - | |
| t_{rr} | Reverse recovery time | | $T_{vj}=25^\circ C$ | - | 237 | - | ns |
| | | | $T_{vj}=125^\circ C$ | - | 528 | - | |
| | | | $T_{vj}=150^\circ C$ | - | 601 | - | |
| Q_r | Recovered charge | $T_{vj}=25^\circ C$ | - | 0.71 | - | μC | |
| | | $T_{vj}=125^\circ C$ | - | 4.03 | - | | |
| | | $T_{vj}=150^\circ C$ | - | 4.6 | - | | |

| | | | | | | | |
|-------------------|--|-----------|------------------------|---|------|---|-----|
| E _{rec} | Reverse recovery energy | | T _{vj} =25°C | - | 0.03 | - | mJ |
| | | | T _{vj} =125°C | - | 1.07 | - | |
| | | | T _{vj} =150°C | - | 2.4 | - | |
| R _{thJC} | Thermal resistance, junction to case | per diode | - | - | 1.35 | | K/W |
| T _{vjop} | Temperature under switching conditions | | -40 | | 150 | | °C |

Diode, Rectifier

| Maximum Rated Values | | | | | | | |
|-----------------------|--|--|------------------------|--------|------|------|------------------|
| Symbol | Item | Conditions | | Rating | | | Unit |
| V _{RRM} | Repetitive peak reverse voltage | T _{vj} =25°C | | 1800 | | | V |
| I _{FRMSM} | Maximum RMS forward current per chip | T _C =80°C, T _{vj} =175°C | | 50 | | | A |
| I _{FRM} | Repetitive peak forward current | t _p =1ms | | 60 | | | A |
| I ² t | I ² t-value | V _R =0V, t _p =10ms, T _{vj} =150°C | | 340 | | | A ² s |
| Characteristic Values | | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit | |
| | | | Min. | Typ. | Max. | | |
| V _F | Continuous forward voltage | I _F =25A V _{GE} =0V | T _{vj} =25°C | - | 1.1 | - | V |
| | | | T _{vj} =125°C | - | 1.52 | - | |
| | | | T _{vj} =150°C | - | 1.40 | - | |
| I _R | Reverse current | V _R =1800V | T _{vj} =25°C | - | - | 10 | uA |
| | | | T _{vj} =125°C | - | - | - | |
| | | | T _{vj} =150°C | - | - | - | |
| R _{thJC} | Thermal resistance, junction to case | per diode | - | - | 1 | | K/W |
| T _{vjop} | Temperature under switching conditions | | -40 | | 150 | | °C |

IGBT, Brake-Chopper

| Maximum Rated Values | | | | | | | |
|-----------------------|--------------------------------------|---|------------------------|--------|------|------|------|
| Symbol | Item | Conditions | | Values | | | Unit |
| V _{CES} | Collector-emitter voltage | T _{vj} =25°C | | 1200 | | | V |
| V _{GES} | Gate-emitter voltage | - | | ±20 | | | V |
| I _C | Collector current, DC | T _C =80°C, T _{vj} =175°C | | 15 | | | A |
| I _{CRM} | Repetitive peak collector current | t _p =1ms | | 30 | | | A |
| P _{tot} | Total power dissipation | T _C =25°C, T _{vj} =175°C | | 125 | | | W |
| Characteristic Values | | | | | | | |
| Symbol | Item | Conditions | Values | | | Unit | |
| | | | Min. | Typ. | Max. | | |
| IGBT | | | | | | | |
| I _{CES} | Collector-emitter cut-off current | V _{CE} =1200V, V _{GE} =0V, T _{vj} =25°C | | - | - | 1 | mA |
| I _{GES} | Gate leakage current | V _{CE} =0V, V _{GE} =20V, T _{vj} =25°C | | - | - | 100 | nA |
| V _{GE(th)} | Gate-emitter threshold voltage | I _C =0.5mA, V _{CE} =V _{GE} , T _{vj} =25°C | | 5.2 | 5.83 | 6.6 | V |
| V _{CESat} | Collector-emitter saturation voltage | I _C =15A V _{GE} =15V | T _{vj} =25°C | - | 1.97 | 2.25 | |
| | | | T _{vj} =125°C | - | 2.29 | - | |
| | | | T _{vj} =150°C | - | 2.39 | - | |

| | | | | | | | |
|--------------|--|---|-----------------------|-------|-------|-------------|----|
| C_{ies} | Input capacitance | $V_{CE}=25V, V_{GE}=0V$ $f=1MHz, T_{vj}=25^{\circ}C$ | - | 1.19 | - | nF | |
| C_{oes} | Output capacitance | | - | 0.08 | - | | |
| C_{res} | Reverse transfer capacitance | | - | 0.04 | - | | |
| Q_G | Gate charge | $V_{CC}=600V, I_C=15A$ $V_{GE}=-15...+15V, T_{vj}=25^{\circ}C$ | - | 0.094 | - | μC | |
| R_g | Internal gate resistance | $T_{vj}=25^{\circ}C$ | - | - | - | Ω | |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}=600V$ $I_C=15A$ $V_{GE}=\pm 15V$ $R_{G(on)}=33\Omega$ $R_{G(off)}=33\Omega$ | $T_{vj}=25^{\circ}C$ | - | 114.4 | - | ns |
| | | | $T_{vj}=125^{\circ}C$ | - | 91.2 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 81.1 | - | |
| t_r | Rise time | | $T_{vj}=25^{\circ}C$ | - | 35.2 | - | |
| | | | $T_{vj}=125^{\circ}C$ | - | 39.2 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 46.4 | - | |
| $t_{d(off)}$ | Turn-off delay time | | $T_{vj}=25^{\circ}C$ | - | 184 | - | |
| | | | $T_{vj}=125^{\circ}C$ | - | 99.8 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 88.0 | - | |
| t_f | Fall time | | $T_{vj}=25^{\circ}C$ | - | 388 | - | |
| | | | $T_{vj}=125^{\circ}C$ | - | 412 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 502 | - | |
| E_{on} | Turn-on energy (per pulse) | $T_{vj}=25^{\circ}C$ | - | 0.92 | - | mJ | |
| | | $T_{vj}=125^{\circ}C$ | - | 1.69 | - | | |
| | | $T_{vj}=150^{\circ}C$ | - | 1.99 | - | | |
| E_{off} | Turn-off energy (per pulse) | $T_{vj}=25^{\circ}C$ | - | 1.36 | - | | |
| | | $T_{vj}=125^{\circ}C$ | - | 1.2 | - | | |
| | | $T_{vj}=150^{\circ}C$ | - | 0.74 | - | | |
| SC data | Short-circuit current | $V_{CC}=600V, V_{GE}\leq 15V, T_{vj}=125^{\circ}C$ $V_{CES}\leq 1200V, t_p\leq 10\mu s$ | - | 55 | - | A | |
| R_{thJC} | Thermal resistance, junction to case | Per IGBT | - | - | 1.2 | K/W | |
| T_{vjop} | Temperature under switching conditions | | -40 | | 150 | $^{\circ}C$ | |

Diode, Brake-Chopper
Maximum Rated Values

| Symbol | Item | Conditions | Rating | Unit |
|-----------|---------------------------------|---|--------|--------|
| V_{RRM} | Repetitive peak reverse voltage | $T_{vj}=25^{\circ}C$ | 1200 | V |
| I_F | Forward current, DC | $T_C=80^{\circ}C, T_{vj}=175^{\circ}C$ | 10 | A |
| I_{FRM} | Repetitive peak forward current | $t_p=1ms$ | 20 | A |
| I^2t | I^2t -value | $V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$ | 20 | A^2s |

Characteristic Values

| | | | | | | | |
|----------|-------------------------------|--|-----------------------|---|------|-----|---|
| V_F | Continuous forward voltage | $I_F=10A$ $V_{GE}=0V$ | $T_{vj}=25^{\circ}C$ | - | 2.15 | 2.3 | V |
| | | | $T_{vj}=125^{\circ}C$ | - | 1.99 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 1.92 | - | |
| I_{RM} | Peak reverse recovery current | $V_R=600V$ $I_F=10A$ $V_{GE}=-15V$ | $T_{vj}=25^{\circ}C$ | - | 15 | - | A |
| | | | $T_{vj}=125^{\circ}C$ | - | 13 | - | |
| | | | $T_{vj}=150^{\circ}C$ | - | 13 | - | |

| | | | | | | | |
|-------------------|--|--|------------------------|-----|------|-----|----|
| t _{rr} | Reverse recovery time | V _R =600V I _F =10A V _{GE} =-15V | T _{vj} =25°C | - | 84.4 | - | ns |
| | | | T _{vj} =125°C | - | 292 | - | |
| | | | T _{vj} =150°C | - | 331 | - | |
| Q _r | Recovered charge | | T _{vj} =25°C | - | 0.72 | - | μC |
| | | | T _{vj} =125°C | - | 2.94 | - | |
| | | | T _{vj} =150°C | - | 3.2 | - | |
| E _{rec} | Reverse recovery energy | | T _{vj} =25°C | - | 0.07 | - | mJ |
| | | | T _{vj} =125°C | - | 0.78 | - | |
| | | | T _{vj} =150°C | - | 1.01 | - | |
| R _{thJC} | Thermal resistance, junction to case | per diode | - | - | 2.3 | K/W | |
| T _{vjop} | Temperature under switching conditions | | | -40 | 150 | °C | |

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

NTC Thermistor Characteristics

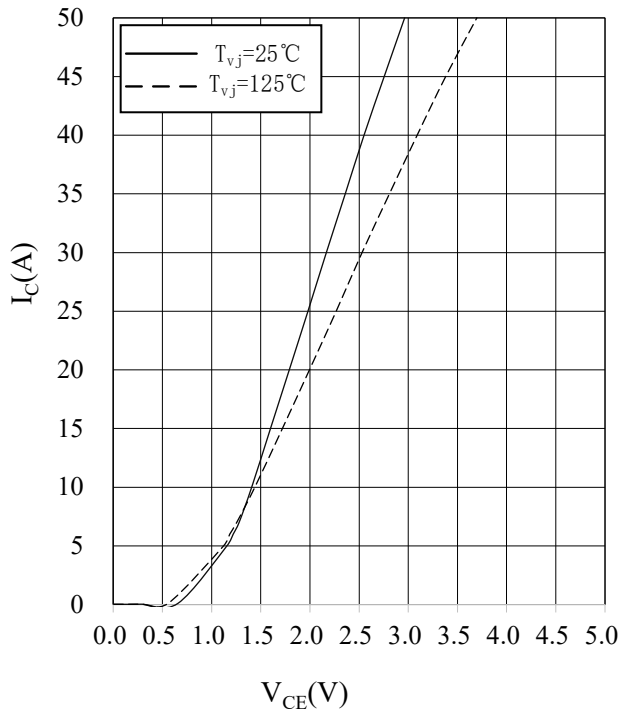
| Symbol | Item | Conditions | Values | | | Unit |
|---------------------|-------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| R ₂₅ | Rated resistance | T _C =25°C | - | 5 | - | kΩ |
| ΔR/R | Deviation of resistance | T _C =100°C,R ₁₀₀ =493Ω | -5 | - | 5 | % |
| P ₂₅ | Power dissipation | T _C =25°C | - | - | 20 | mW |
| B _{25/50} | B-constant | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$ | - | 3375 | - | K |
| B _{25/80} | B-constant | $R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$ | - | 3411 | - | |
| B _{25/100} | B-constant | $R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$ | - | 3433 | - | |

Module

| Symbol | Item | Conditions | Rating | | | Unit |
|---------------------|--------------------------------|--|---------|------|------|------|
| V _{ISOL} | Isolation voltage | Terminals to baseplate, RMS,f=50Hz,t=1min | 2500 | | | V |
| T _{vj max} | Maximum junction temperature | - | 175 | | | °C |
| T _{vj op} | Operating junction temperature | Continuous operationg(under switching) | -40~150 | | | °C |
| T _{stg} | Storage temperature | - | -40~125 | | | °C |
| Symbol | Item | Conditions | Values | | | Unit |
| | | | Min. | Typ. | Max. | |
| Ms | Mounting torque | Mounting to heat sink,M5 screw | 3 | - | 6 | Nm |
| ds | Creepage distance | Terminal to terminal | - | - | - | mm |
| | | Terminal to base plate | - | 10 | - | |
| da | Clearance | Terminal to terminal | - | - | - | mm |
| | | Terminal to base plate | - | 7.5 | - | |
| m | Weight | - | - | 175 | - | g |

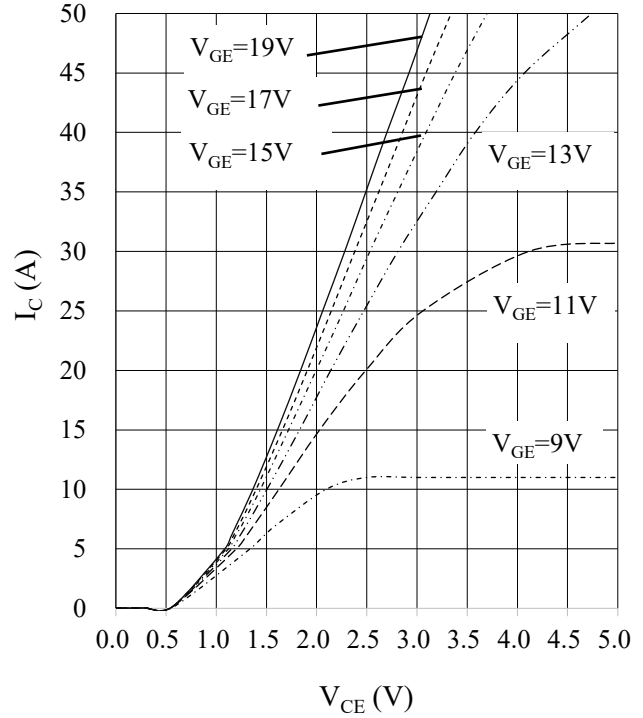
output characteristic IGBT,Inverter (typical)

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



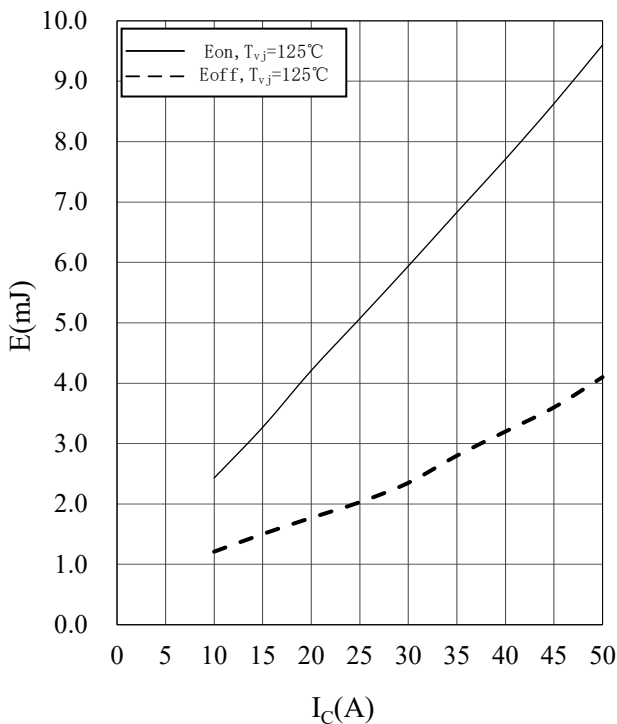
output characteristic IGBT,Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



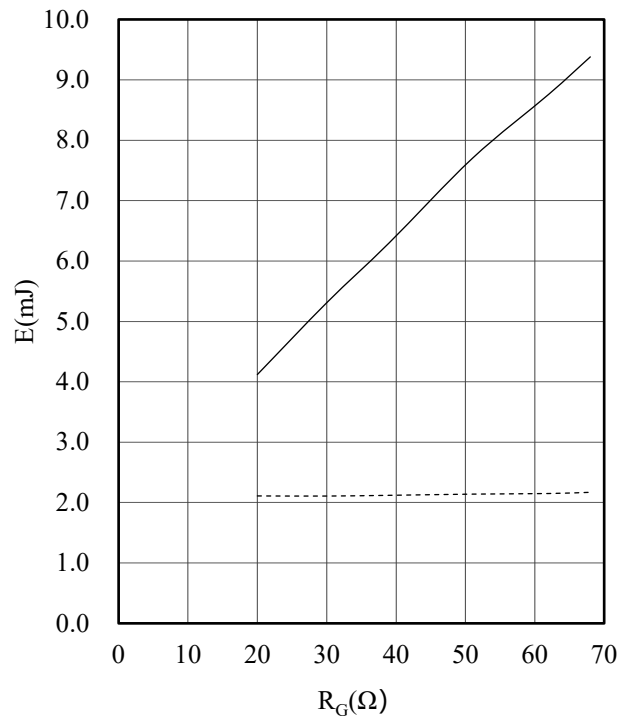
switching losses IGBT,Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{V}$, $R_{Gon} = 33\ \Omega$, $R_{Goff} = 33\ \Omega$, $V_{CE} = 600\text{ V}$



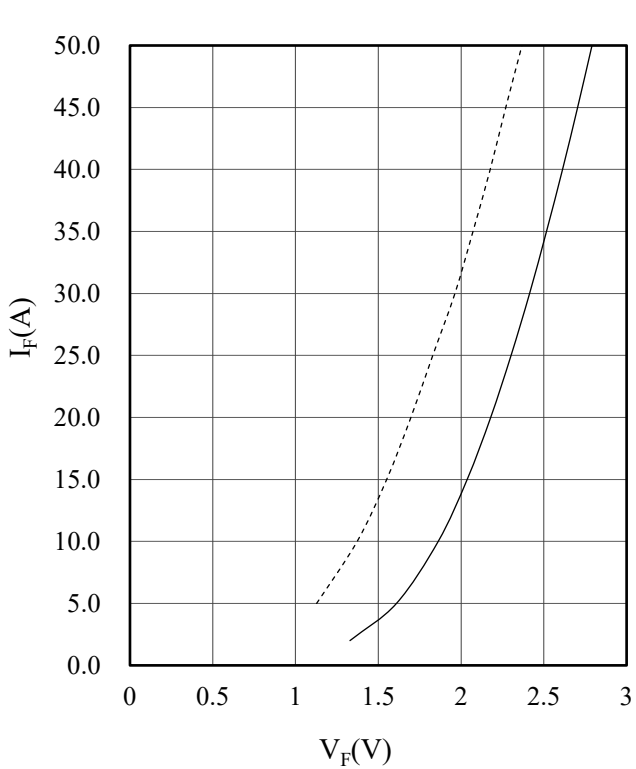
switching losses IGBT,Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{V}$, $I_C = 25\text{ A}$, $V_{CE} = 600\text{ V}$



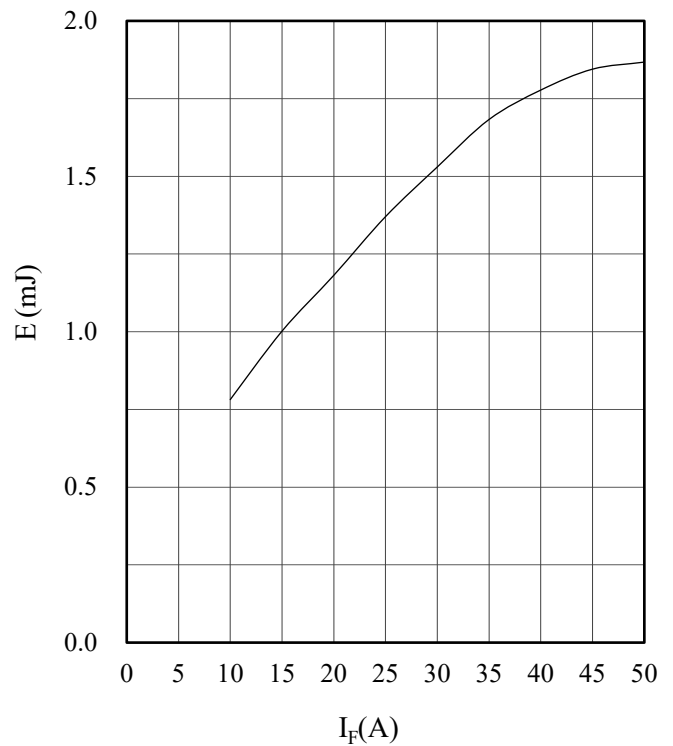
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

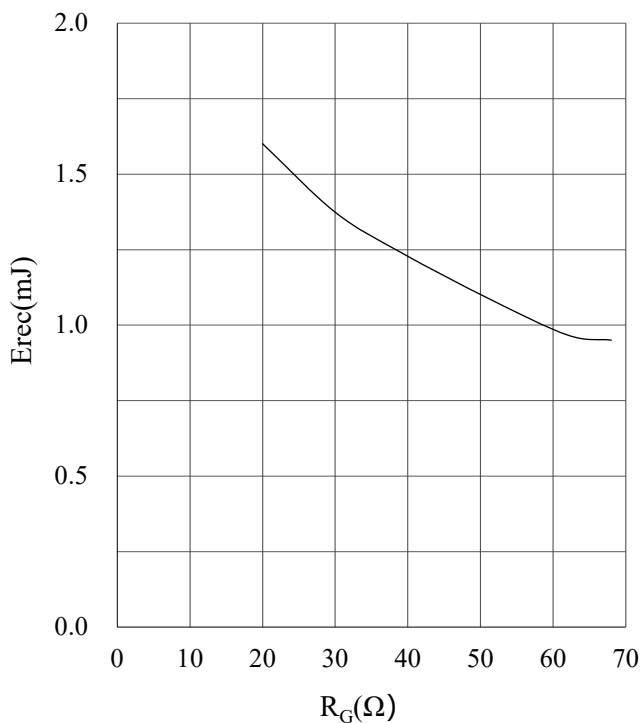
$E_{rec} = f(I_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

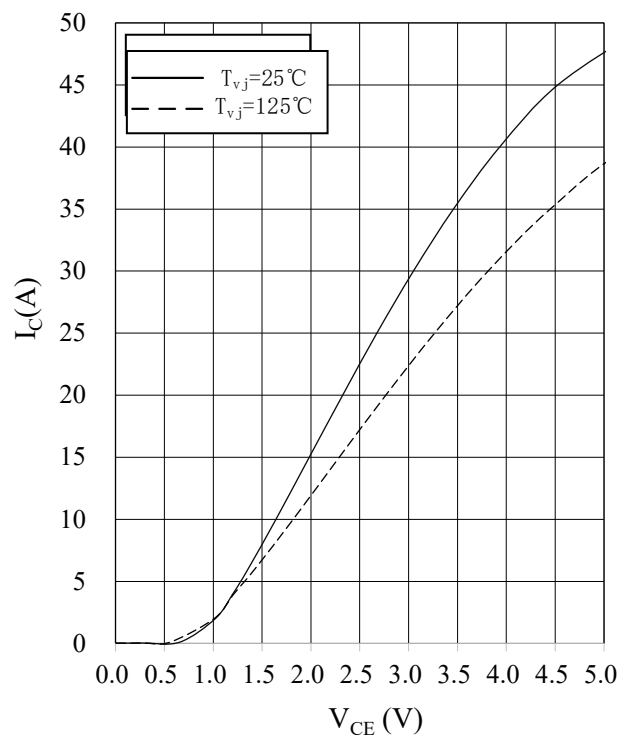
$I_F = 25 A$, $V_{CE} = 600 V$, $T_{vj} = 125^\circ C$



output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

$V_{GE} = 15 V$

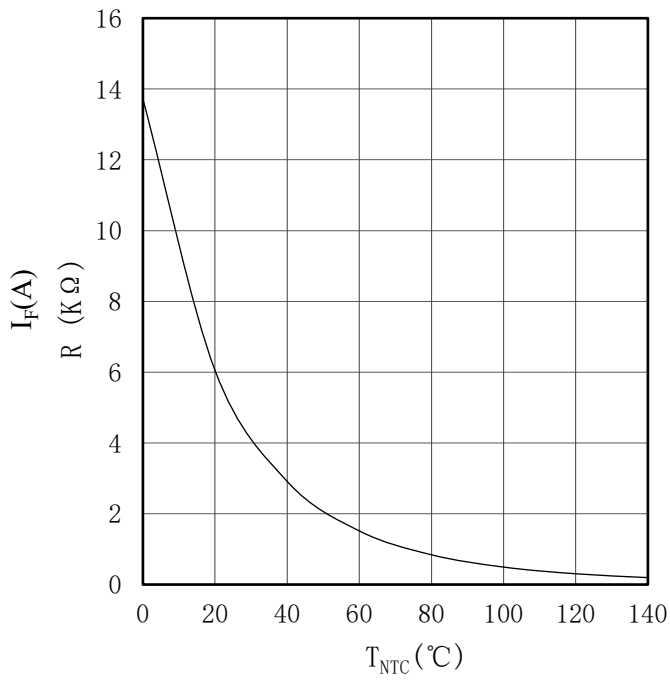


forward characteristic of Diode, Brake-Chopper (typical)

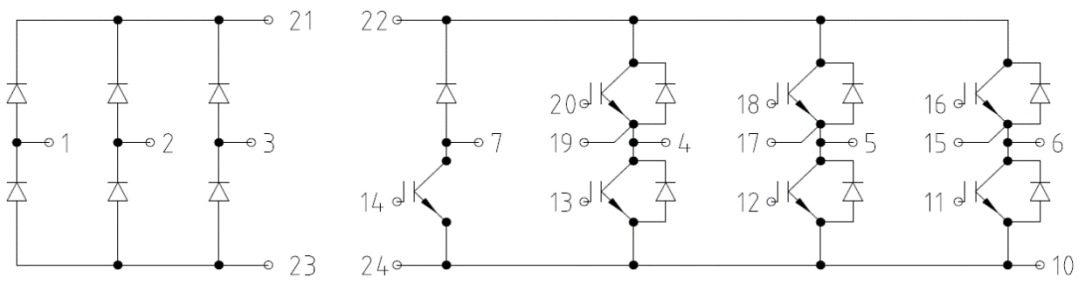
NTC-Thermistor-temperature characteristic(typical)

$I_F = f(V_F)$

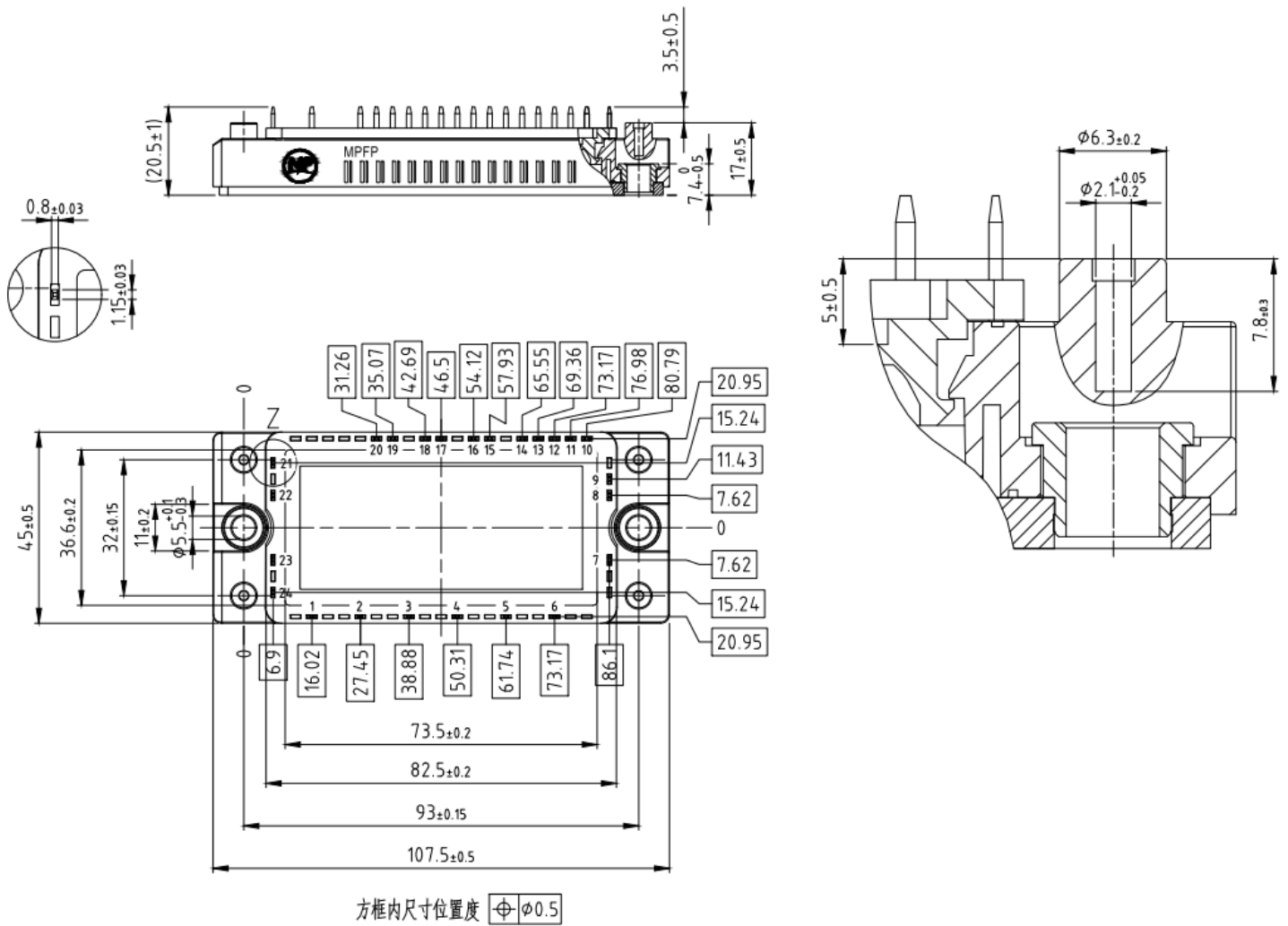
$R = f(T)$



Circuit Diagram



Package Outlines



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