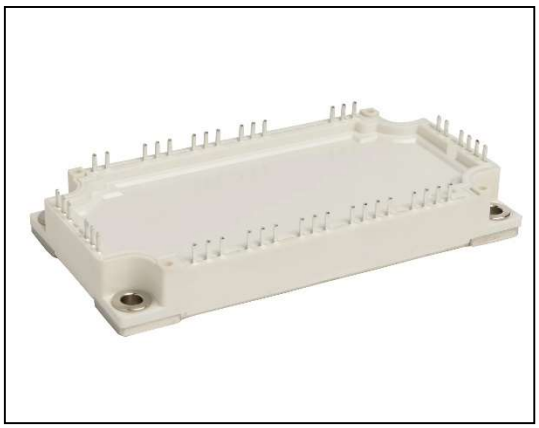
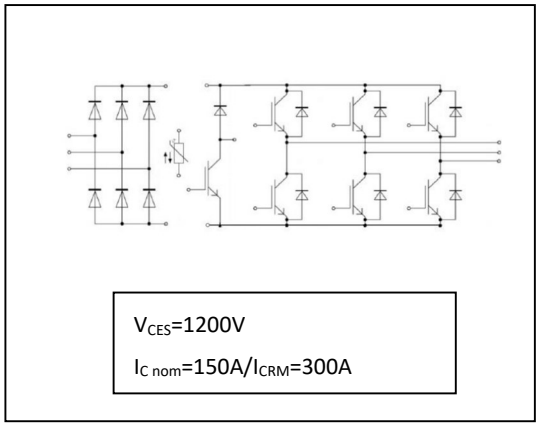
受控文件

# 1200V 150A IGBT PIM Module

# 1200V 150A IGBT PIM 模块





$V_{CES}$=1200V

$I_{C\ nom}$=150A/$I_{CRM}$=300A

## Features：

- 1200V Trench+ Field Stop technology
- Freewheeling diodes with fast and soft reverse recovery
- $V_{CE(sat)}$ with positive temperature coefficient
- Low switching losses
- Short circuit ruggedness

## 产品特性：

- 1200V 沟槽栅+场截止技术
- 快速的软恢复特性续流二极管
- 导通压降具有正温度系数
- 低开关损耗
- 良好的短路稳定性

## Typical Applications：

- Motor drives
- Servo drives

## 典型应用：

- 电机驱动
- 伺服驱动

## IGBT, Inverter / IGBT，逆变器

### Maximum Rated Values / 最大额定值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 集电极－发射极电压<br>Collector-emitter voltage | $V_{CES}$ | $T_{vj}$=25°C | 1200 | V |
| 连续集电极直流电流<br>Continuous DC collector current | $I_C$ | $T_C$=100°C | 150 | A |
| 集电极重复峰值电流<br>Peak repetitive collector current | $I_{CRM}$ | $t_p$=1ms | 300 | A |
| 栅极－发射极峰值电压<br>Maximum gate-emitter voltage | $V_{GES}$ | | ±20 | V |
| 总功率损耗<br>Total power dissipation | $P_{tot}$ | $T_C$=25°C, $T_{vj}$=175°C | 887 | W |

### Characteristic Values / 特征值

| Item | Symbol | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| 集电极－发射极饱和电压<br>Collector-emitter saturation voltage | $V_{CE\ (sat)}$ | $I_C$=150A,$V_{GE}$=15V | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 1.65<br>1.85 | 1.90 | V |
| 栅极阈值电压<br>Gate threshold voltage | $V_{GE(th)}$ | $I_C$=6mA, $V_{CE}$=$V_{GE}$, $T_{vj}$=25°C | | 5.6 | 6.3 | 7.0 | V |
| 内部栅极电阻<br>Internal gate resistor | $R_{Gint}$ | $T_{vj}$=25°C | | | 2.5 | | Ω |
| 输入电容<br>Input capacitance | $C_{ies}$ | f=1MHz, $T_{vj}$=25°C, $V_{CE}$=25V, $V_{GE}$=0V | | | 10.6 | | nF |
| 反向传输电容<br>Reverse transfer capacitance | $C_{res}$ | f=1MHz, $T_{vj}$=25°C, $V_{CE}$=25V, $V_{GE}$=0V | | | 0.54 | | nF |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$=1200V, $V_{GE}$=0V, $T_{vj}$=25°C | | | | 1.00 | mA |
| 栅极-发射极漏电流<br>Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$=0V, $V_{GE}$=20V, $T_{vj}$=25°C | | | | 500 | nA |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load | $t_{d\ (on)}$ | $I_C$=150A, $V_{CE}$=600V<br>$V_{GE}$=-15V…+15V<br>$R_{Gon}$=5.1Ω<br>$R_{Goff}$=5.1Ω<br>Inductive Load | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 72<br>80 | | ns |
| 上升时间(电感负载)<br>Rise time, inductive load | $t_r$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 74<br>78 | | ns |
| 关断延迟时间(电感负载)<br>Turn-off delay time, inductive load | $t_{d\ (off)}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 413<br>480 | | ns |
| 下降时间(电感负载)<br>Fall time, inductive load | $t_f$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 56<br>60 | | ns |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse | $E_{on}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 17.2<br>24.8 | | mJ |
| 关断损耗能量(每脉冲）<br>Turn-off energy loss per pulse | $E_{off}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 12.4<br>18.6 | | mJ |
| 短路数据<br>SC data | $I_{SC}$ | $V_{GE}$=-15V…+15, $V_{CC}$=600V<br>$V_{CEmax}$=$V_{CES}$-$L_{sCE}$·di/dt, $t_p$=10μs, $T_{vj}$=25°C | | | 650 | | A |
| 结－外壳热阻<br>Thermal resistance, junction to case | $R_{thJC}$ | Per IGBT / 每个 IGBT | | | | 0.169 | K/W |
| 工作温度<br>Temperature under switching conditions | $T_{vjop}$ | | | -40 | | 150 | °C |

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## Diode, Inverter / 二极管，逆变器

### Maximum Rated Values /最大额定值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 反向重复峰值电压<br>Peak repetitive reverse voltage | $V_{RRM}$ | $T_{vj}$=25°C | 1200 | V |
| 连续正向直流电流<br>Continuous DC forward current | $I_F$ | | 150 | A |
| 正向重复峰值电流<br>Peak repetitive forward current | $I_{FRM}$ | $t_p$=1ms | 300 | A |

### Characteristic Values / 特征值

| Item | Symbol | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| 正向电压<br>Forward voltage | $V_F$ | $I_F$=150A | $T_{vj}$=25°C<br>$T_{vj}$=125°C<br>$T_{vj}$=150°C | | 1.85<br>1.80<br>1.80 | 2.00 | V |
| 反向恢复峰值电流<br>Peak reverse recovery current | $I_{rm}$ | $I_F$=150A<br>$-di_F/dt_{off}$=1600A/µs<br>$V_R$ = 600 V<br>$V_{GE}$=-15V | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 65<br>80 | | A |
| 反向恢复电荷<br>Reverse recovery charge | $Q_{rr}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 12.4<br>24.5 | | µC |
| 反向恢复损耗（每脉冲）<br>Reverse recovery energy (per pulse) | $E_{rec}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 3.6<br>7.3 | | mJ |
| 结－外壳热阻<br>Thermal resistance, junction to case | $R_{thJC}$ | Per diode / 每个二极管 | | | | 0.30 | K/W |
| 工作温度<br>Temperature under switching conditions | $T_{vjop}$ | | | -40 | | 150 | °C |

受控文件

## IGBT, Brake Chopper / IGBT，刹车

### Maximum Rated Values / 最大额定值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 集电极－发射极电压<br>Collector-emitter voltage | $V_{CES}$ | $T_{vj}$=25°C, $I_C$=1mA, $V_{GE}$=0V | 1200 | V |
| 连续集电极直流电流<br>Continuous DC collector current | $I_C$ | $T_C$=100°C, $T_{vj}$=175°C | 100 | A |
| 集电极重复峰值电流<br>Peak repetitive collector current | $I_{CRM}$ | $t_p$=1ms | 200 | A |
| 栅极－发射极峰值电压<br>Maximum gate-emitter voltage | $V_{GES}$ | | ±20 | V |
| 总功率损耗<br>Total power dissipation | $P_{tot}$ | $T_C$=25°C, $T_{vj}$=175°C | 652 | W |

### Characteristic Values / 特征值

| Item | Symbol | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| 集电极－发射极饱和电压<br>Collector-emitter saturation voltage | $V_{CE\ (sat)}$ | $I_C$=100A,$V_{GE}$=15V | $T_{vj}$=25°C<br>$T_{vj}$=125°C<br>$T_{vj}$=150°C | | 1.65<br>1.95<br>2.05 | 2.00 | V |
| 栅极阈值电压<br>Gate threshold voltage | $V_{GE(th)}$ | $I_C$=3.3mA, $V_{CE}$=10V, $T_{vj}$=25°C | | 5.0 | 5.7 | 6.5 | V |
| 栅极电荷<br>Gate charge | $Q_G$ | $V_{GE}$=-15V…+15V | | | 0.90 | | µC |
| 输入电容<br>Input capacitance | $C_{ies}$ | f=1MHz, $T_{vj}$=25°C, $V_{CE}$=25V, $V_{GE}$=0V | | | 6.80 | | nF |
| 反向传输电容<br>Reverse transfer capacitance | $C_{res}$ | f=1MHz, $T_{vj}$=25°C, $V_{CE}$=25V, $V_{GE}$=0V | | | 0.30 | | nF |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$=1200V, $V_{GE}$=0V, $T_{vj}$=25°C | | | | 1.00 | mA |
| 栅极-发射极漏电流<br>Gate-emitter leakage current | $I_{GES}$ | $V_{CE}$=0V, $V_{GE}$=20V, $T_{vj}$=25°C | | | | 500 | nA |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load | $t_{d\ (on)}$ | $I_C$=100A, $V_{CE}$=600V<br>$V_{GE}$=-15V…+15V<br>$R_{Gon}$=1.6 Ω<br>$R_{Goff}$=1.6Ω<br>Inductive Load | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 145<br>155 | | ns |
| 上升时间(电感负载)<br>Rise time, inductive load | $t_r$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 28<br>40 | | ns |
| 关断延迟时间(电感负载)<br>Turn-off delay time, inductive load | $t_{d\ (off)}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 325<br>360 | | ns |
| 下降时间(电感负载)<br>Fall time, inductive load | $t_f$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 110<br>170 | | ns |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse | $E_{on}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 4.9<br>7.2 | | mJ |
| 关断损耗能量(每脉冲）<br>Turn-off energy loss per pulse | $E_{off}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 6.5<br>9.7 | | mJ |
| 短路数据<br>SC data | $I_{SC}$ | $V_{GE}$=-15V…+15, $V_{CC}$=600V<br>$V_{CEmax}$=$V_{CES}$-$L_{sCE}$·di/dt, $t_p$=10µs, $T_{vj}$=25°C | | | 450 | | A |
| 结－外壳热阻<br>Thermal resistance, junction to case | $R_{thJC}$ | Per IGBT / 每个 IGBT | | | | 0.23 | K/W |
| 工作温度<br>Temperature under switching conditions | $T_{vjop}$ | | | -40 | | 150 | °C |

受控文件

## Diode, Brake Chopper / 二极管，刹车

### Maximum Rated Values /最大额定值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 反向重复峰值电压<br>Peak repetitive reverse voltage | $V_{RRM}$ | $T_{vj}$=25°C | 1200 | V |
| 连续正向直流电流<br>Continuous DC forward current | $I_F$ | | 50 | A |
| 正向重复峰值电流<br>Peak repetitive forward current | $I_{FRM}$ | $t_p$=1ms | 100 | A |

### Characteristic Values / 特征值

| Item | Symbol | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| 正向电压<br>Forward voltage | $V_F$ | $I_F$=50A | $T_{vj}$=25°C<br>$T_{vj}$=125°C<br>$T_{vj}$=150°C | | 1.85<br>1.80<br>1.80 | | V |
| 反向恢复峰值电流<br>Peak reverse recovery current | $I_{rr}$ | $I_F$=50A<br>$-di_F/dt_{off}$=2300A/μs<br>$V_R$ = 600 V<br>$V_{GE}$=-15V | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 7.00<br>11.2 | | A |
| 反向恢复电荷<br>Reverse recovery charge | $Q_r$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 80<br>85 | | μC |
| 反向恢复损耗（每脉冲）<br>Reverse recovery energy (per pulse) | $E_{rec}$ | | $T_{vj}$=25°C<br>$T_{vj}$=125°C | | 2.8<br>4.9 | | mJ |
| 结－外壳热阻<br>Thermal resistance, junction to case | $R_{thJC}$ | Per diode / 每个二极管 | | | | 0.68 | K/W |
| 工作温度<br>Temperature under switching conditions | $T_{vjop}$ | | | -40 | | 150 | °C |

受控文件

## Diode, Rectifier / 二极管，整流

### Maximum Rated Values /最大额定值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 反向重复峰值电压<br>Peak repetitive reverse voltage | $V_{RRM}$ | $T_{vj}$=25°C | 1600 | V |
| 最大正向均方根电流(每芯片)<br>Maximum RMS forward current per chip | $I_{FRMSM}$ | $T_H$ = 100°C | 150 | A |
| 最大整流器输出均方根电流<br>Maximum RMS current at rectifier output | $I_{RMSM}$ | $T_H$ = 100°C | 150 | A |
| 正向浪涌电流<br>Surge forward current | $I_{FSM}$ | $t_p$=10ms, $T_{vj}$=25°C, sin180° | 1600 | A |
| $I^2t$-值<br>$I^2t$-value | $I^2t$ | $t_p$=10ms, $T_{vj}$=25°C, sin180° | 13000 | $A^2S$ |

### Characteristic Values / 特征值

| Item | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| 正向电压<br>Forward voltage | $V_F$ | $T_{vj}$=150°C, $I_F$=100A | | 1.0 | | V |
| 反向电流<br>Reverse current | $I_R$ | $T_{vj}$=125°C, $V_R$=1600V | | | 2.0 | mA |
| 结－外壳热阻<br>Thermal resistance, junction to case | $R_{thJC}$ | Per diode / 每个二极管 | | | 0.28 | K/W |
| 工作温度<br>Temperature under switching conditions | $T_{vjop}$ | | -40 | | 150 | °C |

## NTC-Thermistor / 负温度系数热敏电阻

### Characteristic Values /特征值

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 额定电阻值<br>Rated resistance | $R_{25}$ | $T_C$=25°C | 5.00 | kΩ |
| B-值<br>B-value | $B_{25/50}$ | $R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$ | 3375 | K |

受控文件

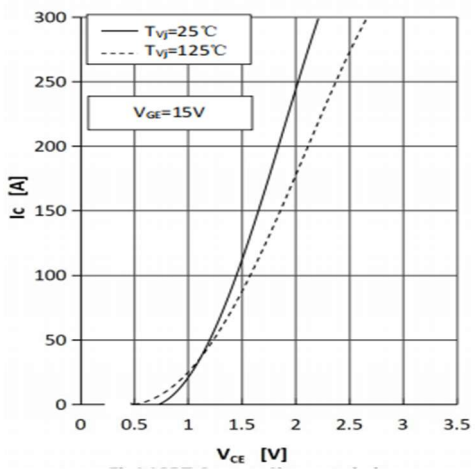
## Module / 模块

| Item | Symbol | Conditions | Value | Units |
|---|---|---|---|---|
| 绝缘测试电压<br>Isolation test voltage | $V_{ISOL}$ | RMS, f=50Hz, t=1min | 2.5 | kV |
| 模块基板材料<br>Material of module baseplate | | | Cu | |
| 内部绝缘<br>Internal isolation | | 基本绝缘 (class 1, IEC 61140)<br>Basic insulation (class 1, IEC 61140) | $Al_2O_3$ | |
| 爬电距离<br>Creepage distance | | | 10 | mm |
| 电气间隙<br>Clearance | | | 7.5 | mm |
| 相对电痕指数<br>Comperative tracking index | CTI | | > 200 | |

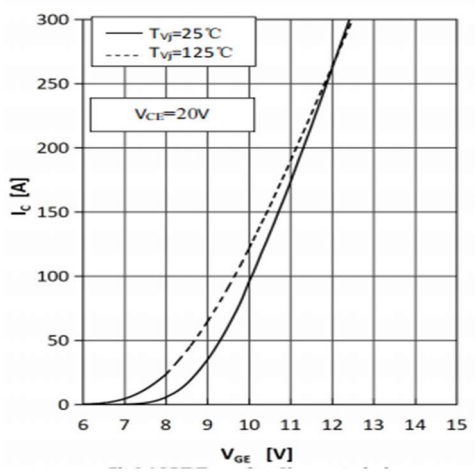
| Item | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| 杂散电感，模块<br>Stray inductance module | $L_{sCE}$ | | | 25 | | nH |
| 模块引脚电阻，端子-芯片<br>Module Lead Resistance，Terminals-Chip | $R_{CC'+EE'}$ | $T_H$=25°C,每个开关/perswitch | | 1.1 | | mΩ |
| 储存温度<br>Storage temperature | $T_{stg}$ | | -40 | | 125 | °C |
| 模块安装的安装扭距<br>Mounting torque for module mounting | M | | 3.00 | | 6.00 | Nm |
| 重量<br>Weight | G | | | 300 | | g |

受控文件

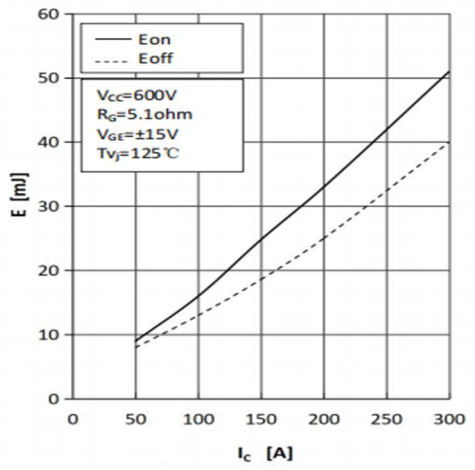
输出特性 IGBT，逆变器（典型）
Output characteristic IGBT, Inverter (typical)
$I_C=f(V_{CE})$



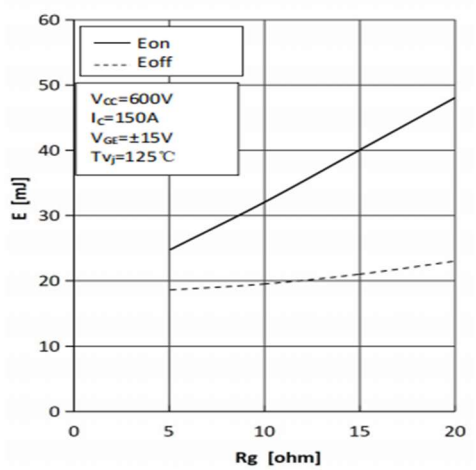

转移特性 IGBT，逆变器（典型）
Transfer characteristic IGBT, Inverter (typical)
$I_C=f(V_{GE})$



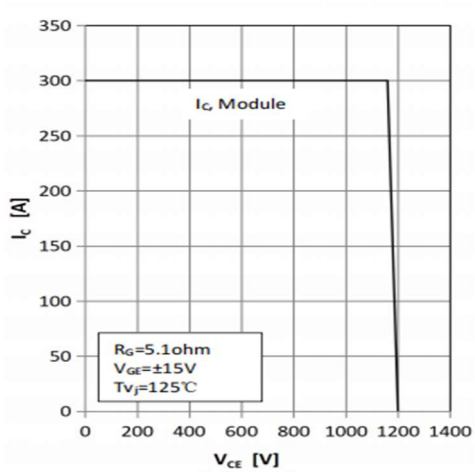

开关损耗 IGBT，逆变器（典型）
Switching losses IGBT, Inverter (typical)
$E=f(I_C)$



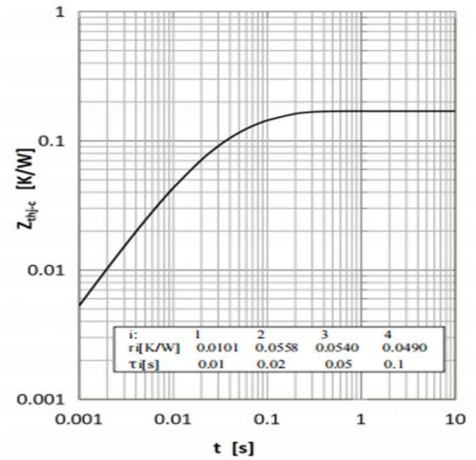

开关损耗 IGBT，逆变器（典型）
Switching losses IGBT, Inverter (typical)
$E=f(R_G)$




反偏安全工作区 IGBT，逆变器 （RBSOA）
Reverse bias safe operating area IGBT, Inverter (RBSOA)
$I_C=f(V_{CE})$




瞬态热阻抗 IGBT，逆变器
Transient thermal impedance IGBT, Inverter
$Z_{thJC}=f(t)$



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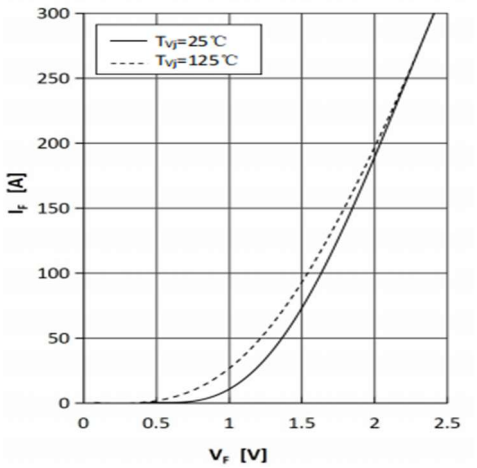
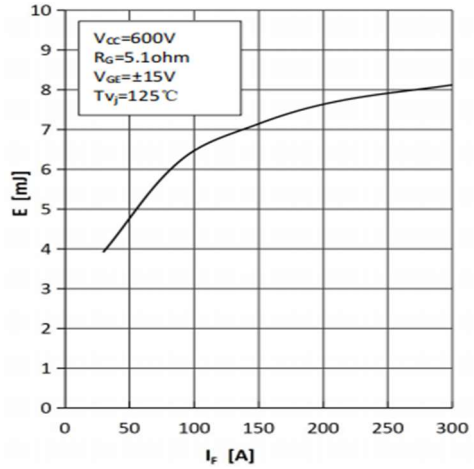
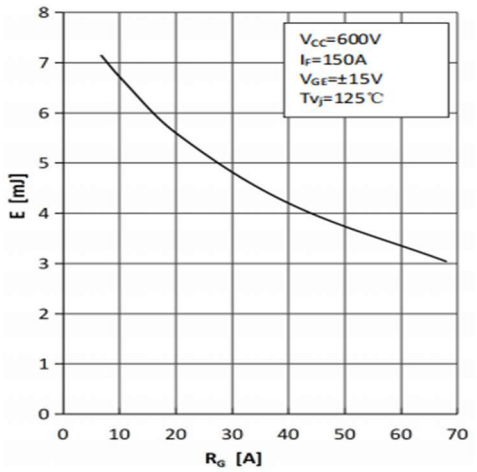
输出特性 FRD，逆变器（典型）
Output characteristic FRD, Inverter (typical)
$I_F=f(V_F)$



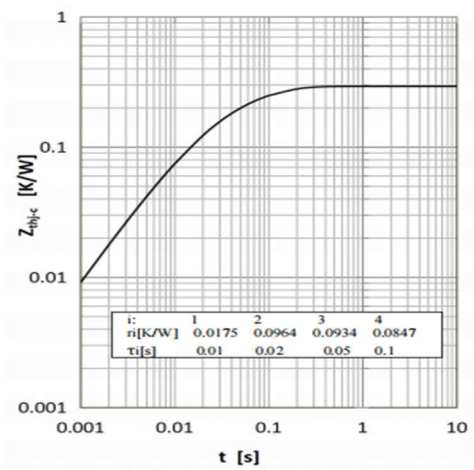

开关损耗 FRD，逆变器（典型）
Switching losses FRD, Inverter (typical)
$E=f(I_F)$



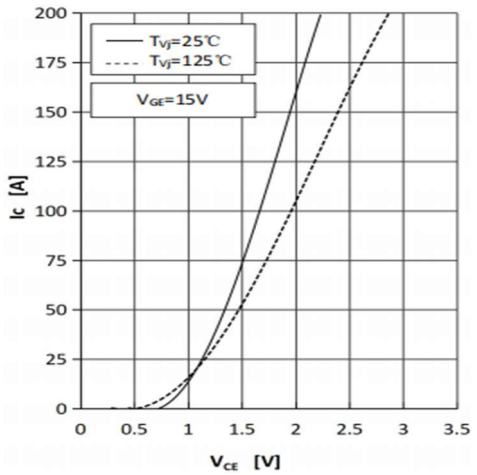

开关损耗 FRD，逆变器（典型）
Switching losses FRD, Inverter (typical)
$E=f(R_G)$



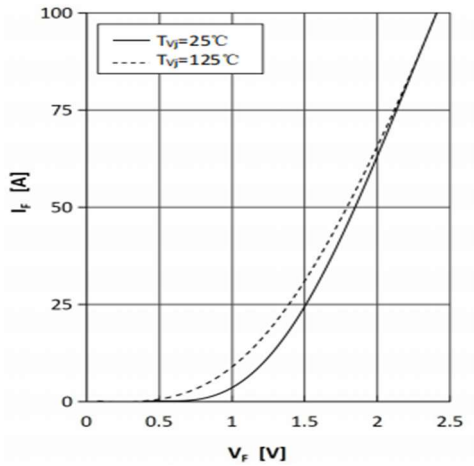

瞬态热阻抗 FRD，逆变器
Transient thermal impedance FRD, Inverter
$Z_{thJC}=f(t)$



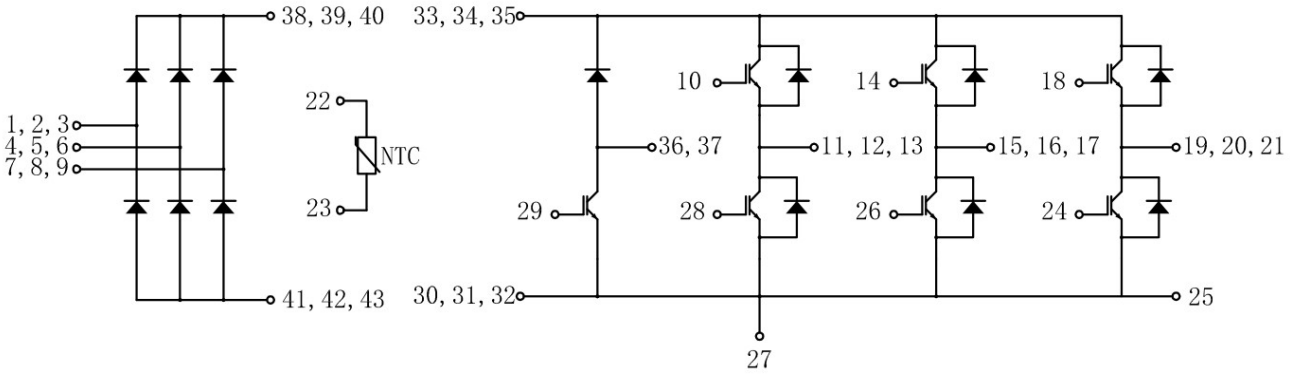

输出特性 IGBT，刹车（典型）
Output characteristic IGBT, Brake Chopper (typical)
$I_C=f(V_{CE})$




正向偏压特性 FRD，刹车（典型）
Forward characteristic of FRD, Brake Chopper (typical)
$I_F=f(V_F)$



**Circuit diagram headline / 接线图**




**Package outlines / 封装尺寸**