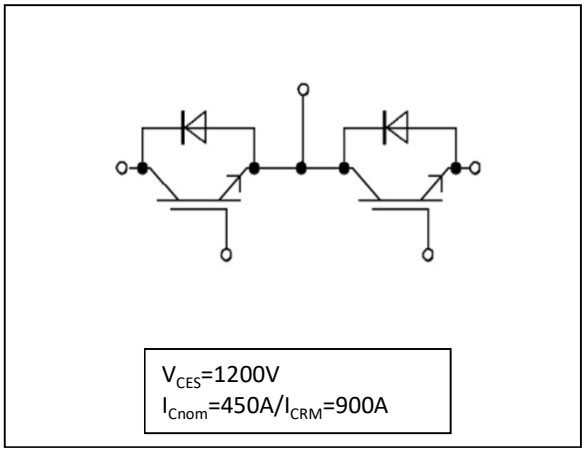
受控文件

# 1200V 450A IGBT Half Bridge Module

# 1200V 450A IGBT 半桥模块




## 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:

- ☐ Inductive heating
- ☐ Welding
- ☐ High frequency switching application

## 典型应用：

- ☐ 感应加热
- ☐ 电焊机
- ☐ 高频开关应用

## Package / 封装



| Item | Symbol | Conditions | Values | Unit |
|---|---|---|---|---|
| 绝缘测试电压<br>Isolation test voltage | $V_{ISOL}$ | RMS, f = 50 Hz, t =1 min | 4.0 | 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 | $d_{Creep}$ | 端子-散热片/terminal to heatsink | 29.0 | mm |
| | $d_{Creep}$ | 端子-端子/terminal to terminal | 23.0 | |
| 电气间隙<br>Clearance | $d_{Clear}$ | 端子-散热片/terminal to heatsink | 23.0 | mm |
| | $d_{Clear}$ | 端子-端子/terminal to terminal | 11.0 | |
| 相对电痕指数<br>Comparative tracking index | CTI | | ＞400 | |

| Item | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| 杂散电感，模块<br>Stray inductance module | $L_{sCE}$ | | | 20 | | nH |
| 模块引线电阻,端子-芯片<br>Module lead resistance, terminals - chip | $R_{CC'+EE'}$ | $T_C$=25℃ | | 0.70 | | mΩ |
| 储存温度<br>Storage temperature | $T_{stg}$ | | -40 | | 125 | ℃ |
| 模块安装的安装扭矩<br>Mounting torque for module mounting | M5 | | 3.0 | | 6.0 | Nm |
| 端子联接扭矩<br>Terminal connection torque | M6 | | 2.5 | | 5.0 | Nm |
| 重量<br>Weight | G | | | 320 | | g |

**IGBT**



**Maximum Rated Values / 最大额定值**

| Item | Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|---|
| 集电极－发射极电压<br>Collector-emitter Voltage | $V_{CES}$ | | $T_{vj}$=25℃ | 1200 | V |
| 栅极－发射极电压<br>Maximum gate-emitter voltage | $V_{GES}$ | | | ±20 | V |
| 瞬态栅极－发射极电压<br>Transient gate-emitter voltage | $V_{GES}$ | $t_p$≤10μs,D=0.01 | | ±30 | V |
| 连续集电极直流电流<br>Continuous DC collector current | $I_C$ | | $T_C$=25℃ | 675 | A |
| | | | $T_C$=100℃ | 450 | |
| 最大脉冲集电极电流<br>Pulsed collector current,tp limited by $T_{jmax}$ | $I_{Cpulse}$ | | | 900 | A |
| 功率损耗<br>Power dissipation | $P_{tot}$ | | | 1875 | W |

**Characteristic Values / 特征值**



| Item | Symbol | Conditions | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| 集电极－发射极饱和电压<br>Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$=450A, $V_{GE}$=15V | $T_{vj}$=25℃ | | 1.50 | 1.80 | V |
| | | | $T_{vj}$=125℃ | | 1.65 | | |
| | | | $T_{vj}$=150℃ | | 1.70 | | |
| 栅极阈值电压<br>Gate threshold voltage | $V_{GE(th)}$ | $V_{CE}$=$V_{GE}$, $I_C$=18mA | | 5.0 | 5.8 | 6.5 | V |
| 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℃ | | | 100 | μA |
| | | | $T_{vj}$=150℃ | | | 5 | 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℃ | | -200 | | 200 | nA |
| 栅极电荷<br>Gate Charge | $Q_G$ | $V_{CE}$=600V, $I_C$=450A , $V_{GE}$=±15V | | | 5.0 | | μC |
| 输入电容<br>Input Capacitance | $C_{ies}$ | $V_{CE}$=25V, $V_{GE}$=0V, f =100kHz | | | 90.0 | | nF |
| 输出电容<br>Output Capacitance | $C_{oes}$ | | | | 2.84 | | |
| 反向传输电容<br>Reverse Transfer Capacitance | $C_{res}$ | | | | 0.81 | | |
| 开通延迟时间（电感负载）<br>Turn-on delay time,inductive load | $t_{d(on)}$ | $V_{CC}$=600V,$I_C$=450A<br>$R_G$=1.8Ω,<br>$V_{GE}$=15V | $T_{vj}$=25℃ | | 168 | | ns |
| | | | $T_{vj}$=125℃ | | 172 | | ns |
| | | | $T_{vj}$=150℃ | | 176 | | ns |
| 上升时间（电感负载）<br>Rise Time,inductive load | $t_r$ | | $T_{vj}$=25℃ | | 80 | | ns |
| | | | $T_{vj}$=125℃ | | 88 | | ns |
| | | | $T_{vj}$=150℃ | | 92 | | ns |
| 关断延迟时间（电感负载）<br>Turn-off delay time,inductive load | $t_{d(off)}$ | $V_{CC}$=600V,$I_C$=450A<br>$R_G$=1.8Ω,<br>$V_{GE}$=15V | $T_{vj}$=25℃ | | 624 | | ns |
| | | | $T_{vj}$=125℃ | | 668 | | ns |
| | | | $T_{vj}$=150℃ | | 672 | | ns |
| 下降时间（电感负载）<br>Fall time,inductive load | $t_f$ | | $T_{vj}$=25℃ | | 216 | | ns |
| | | | $T_{vj}$=125℃ | | 348 | | ns |
| | | | $T_{vj}$=150℃ | | 356 | | ns |
| 开通损耗能量（每脉冲）<br>Turn-on energy loss per pulse | $E_{on}$ | $V_{CC}$=600V,$I_C$=450A<br>$R_G$=1.8Ω,<br>$V_{GE}$=15V | $T_{vj}$=25℃ | | 17.2 | | mJ |
| | | | $T_{vj}$=125℃ | | 27.1 | | mJ |
| | | | $T_{vj}$=150℃ | | 30.0 | | mJ |
| 关断损耗能量（每脉冲）<br>Turn off Energy loss per pulse | $E_{off}$ | | $T_{vj}$=25℃ | | 52.3 | | mJ |
| | | | $T_{vj}$=125℃ | | 64.3 | | mJ |
| | | | $T_{vj}$=150℃ | | 67.1 | | mJ |
| 短路数据<br>SC data | $I_{SC}$ | $V_{GE}$≤15V,<br>$V_{CC}$=800V | tp≤10μs<br>$T_{vj}$=150℃ | | | 2000 | A |
| IGBT结-外壳热阻<br>IGBT thermal resistance,junction-case | $R_{thJC}$ | | | | | 0.08 | K /W |
| 工作温度<br>Operating Temperature | $T_{Jop}$ | | | -40 | | 150 | ℃ |

## Diode / 二极管



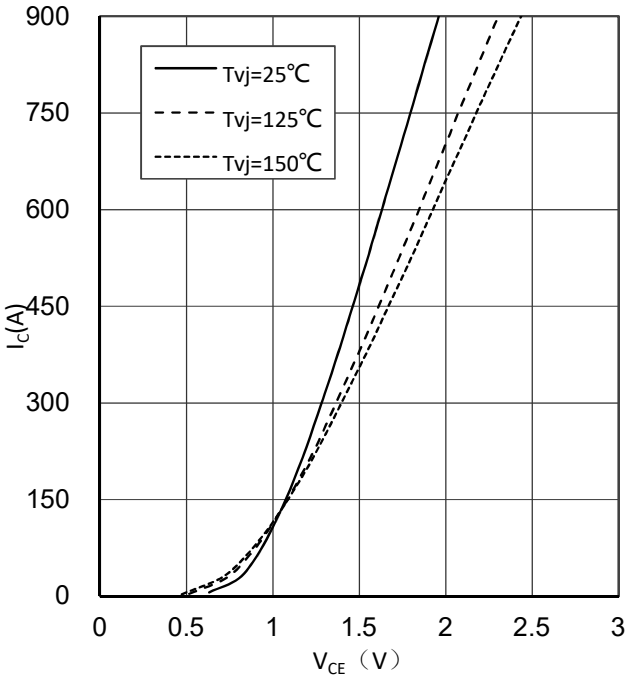
### Maximum Rated Values / 最大额定值

| Item | Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|---|
| 反向重复峰值电压<br>Repetitive reverse voltage | $V_{RRM}$ | | $T_{vj}$=25℃ | 1200 | V |
| 连续正向直流电流<br>Continuous DC forward current | $I_F$ | | | 450 | A |
| 二极管正向不重复峰值电流<br>Diode pulsed current,tp limited by $T_{Jmax}$ | $I_{Fpulse}$ | | | 900 | A |

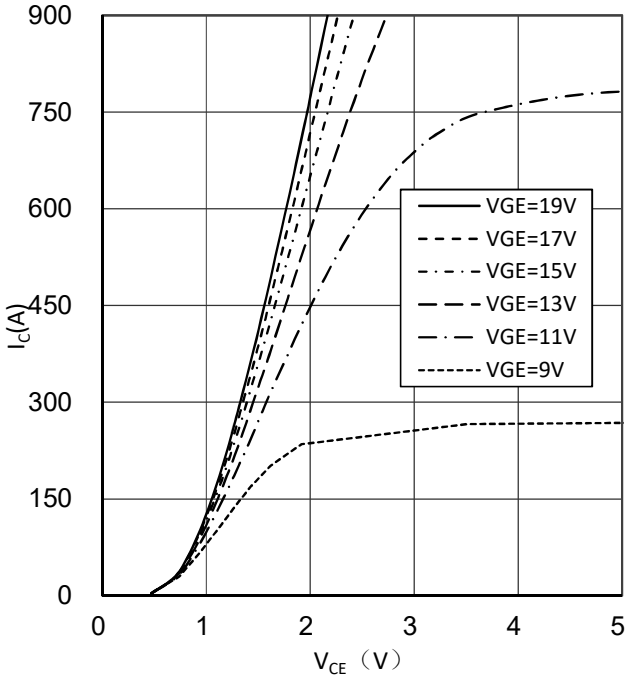
### Characteristic Values / 特征值

| Item | Symbol | Conditions | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| 正向电压<br>Forward voltage | $V_F$ | $I_F$=450A , $V_{GE}$=0V | $T_{vj}$=25℃ | | 2.30 | 2.70 | V |
| | | | $T_{vj}$=125℃ | | 2.50 | | |
| | | | $T_{vj}$=150℃ | | 2.50 | | |
| 反向恢复时间<br>Reverse recovery time | $t_{rr}$ | $I_F$=450A<br>$dI_F/dt$=-5600A/μs<br>($T_{vj}$=150°C)<br>$V_R$=600V,<br>$V_{GE}$=-15V | $T_{vj}$=25℃ | | 134 | | ns |
| | | | $T_{vj}$=125℃ | | 216 | | |
| | | | $T_{vj}$=150℃ | | 227 | | |
| 反向恢复峰值电流<br>Peak reverse recovery current | $I_{RRM}$ | | $T_{vj}$=25℃ | | 317 | | A |
| | | | $T_{vj}$=125℃ | | 376 | | |
| | | | $T_{vj}$=150℃ | | 379 | | |
| 反向恢复电荷<br>Reverse recovery charge | $Q_{RR}$ | | $T_{vj}$=25℃ | | 40.5 | | μC |
| | | | $T_{vj}$=125℃ | | 63.2 | | |
| | | | $T_{vj}$=150℃ | | 65.4 | | |
| 反向恢复损耗（每脉冲）<br>Reverse recovery energy loss per pulse | $E_{rec}$ | | $T_{vj}$=25℃ | | 15.9 | | mJ |
| | | | $T_{vj}$=125℃ | | 27.0 | | |
| | | | $T_{vj}$=150℃ | | 28.1 | | |
| 二极管结-外壳热阻<br>Diode thermal resistance,junction-case | $R_{thJCD}$ | | | | | 0.13 | K /W |
| 工作温度<br>Operating Temperature | $T_{Jop}$ | | | -40 | | 150 | ℃ |

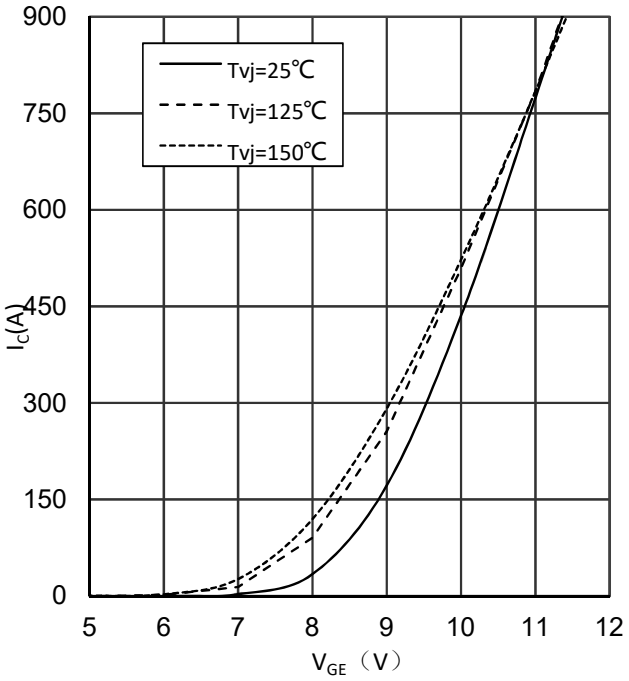
**输出特性（典型）**
**Output characteristic(typical)**
$I_C = f(V_{CE})$



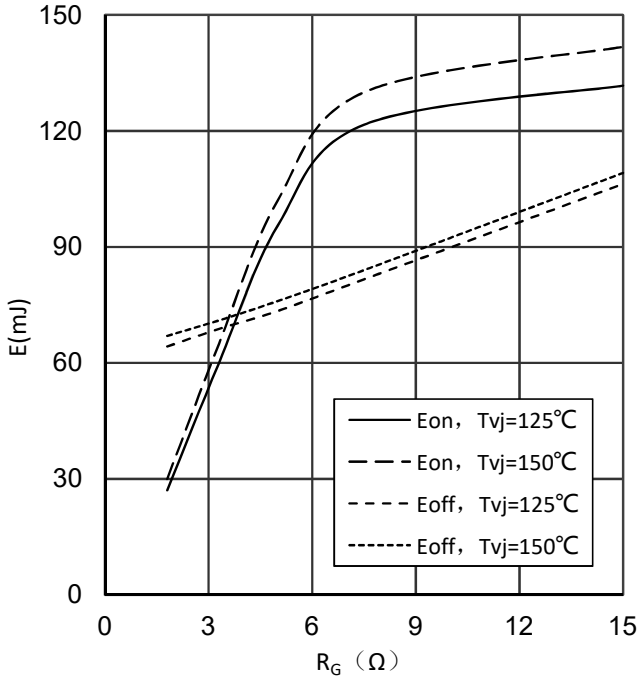

**输出特性（典型）**
**Output characteristic(typical)**
$I_C = f(V_{CE})$
$T_{vj}$= 150°C



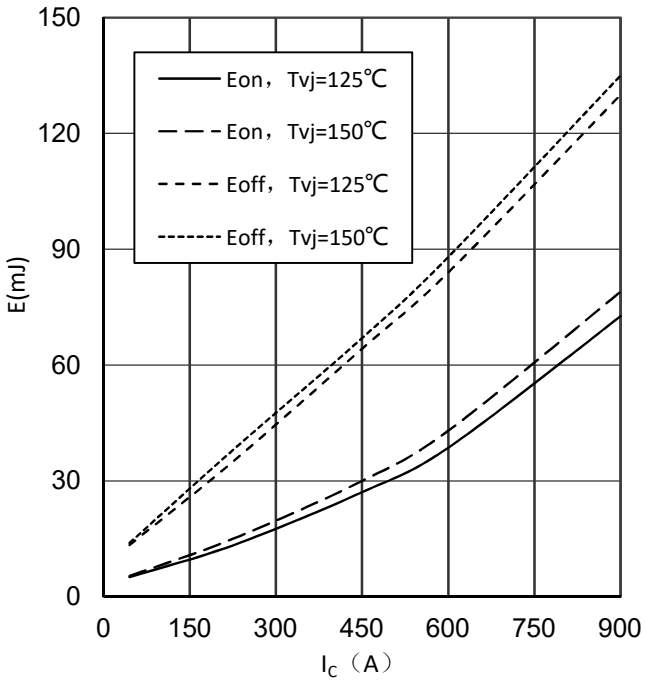

**传输特性（典型）**
**Transfer characteristic(typical)**
$I_C = f(V_{GE})$
$V_{CE}$ = 20V



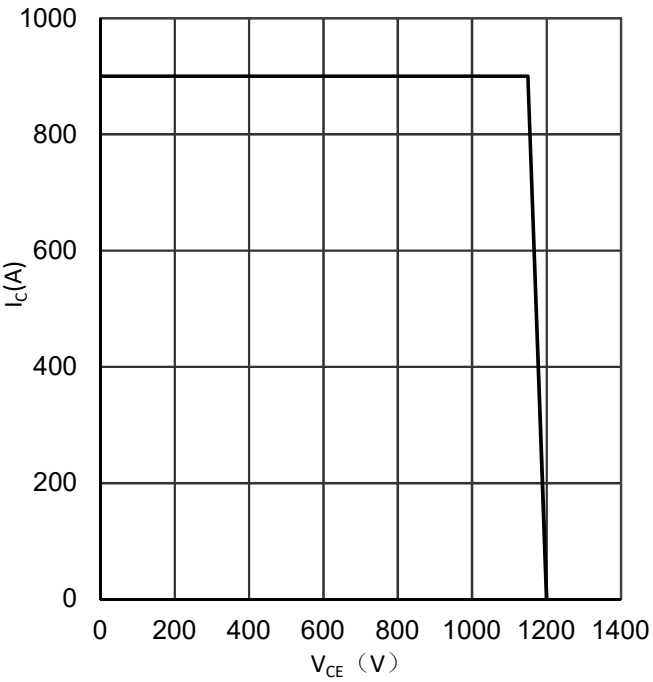

**IGBT开关损耗（典型）**
**Switching losses IGBT (typical)**
$E = f(R_G)$
$V_{GE}$ = ±15V, $I_C$ = 450A, $V_{CE}$ = 600V



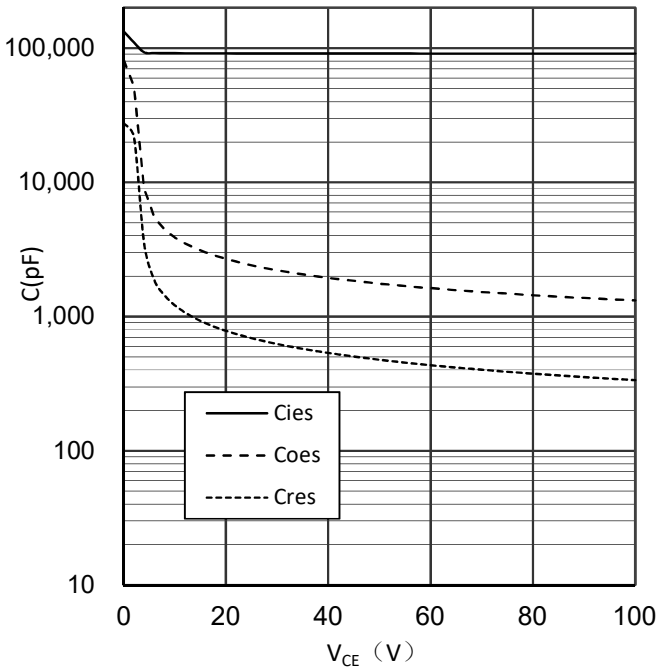
**IGBT开关损耗（典型）**
**Switching losses IGBT (typical)**
E = f ($I_C$)
$V_{GE}$ = ±15V, $R_G$ = 1.8Ω , $V_{CE}$ = 600V



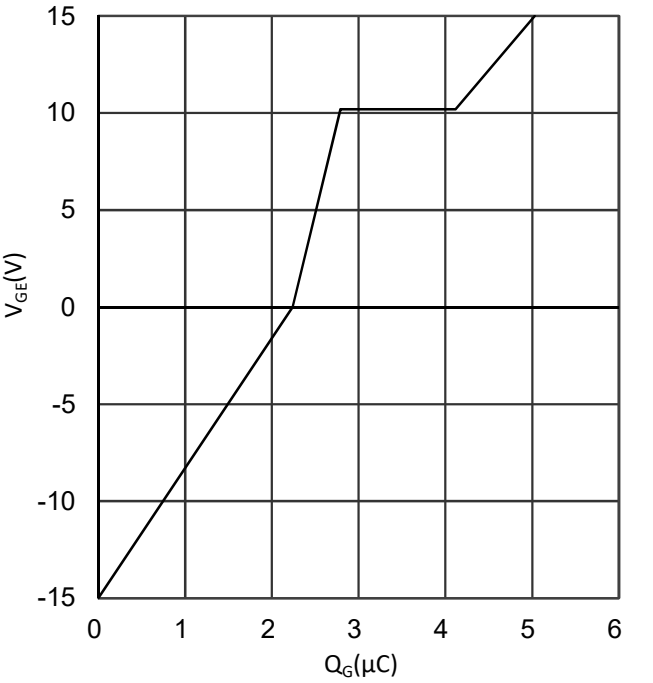

**反偏安全工作区（RBSOA）**
**Reverse bias safe operating area(RBSOA)**
$I_C$ =f ($V_{CE}$)
$V_{GE}$ = ±15V, $R_{goff}$ = 3.3Ω, $T_{vj}$ = 150°C



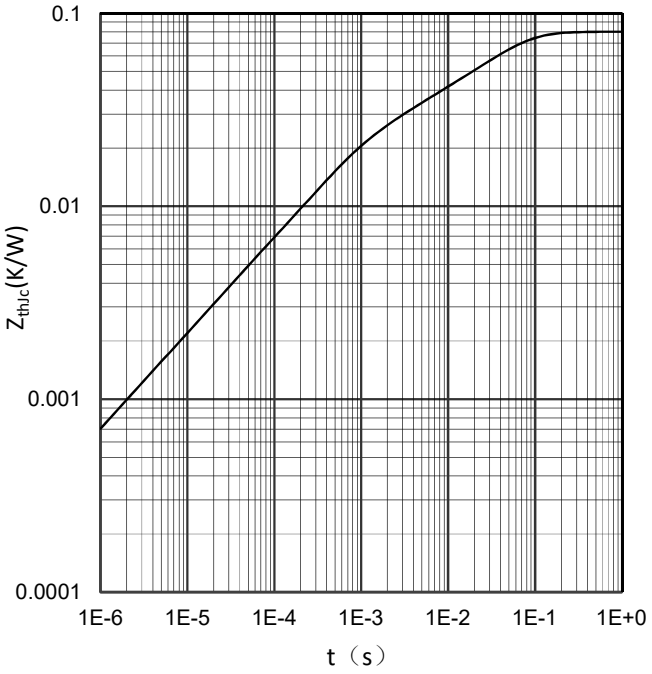

**电容（典型）**
**Typical capacitance as a function of collector-emitter voltage**
C = f ($V_{CE}$)
f = 100 kHz, $V_{GE}$ = 0V



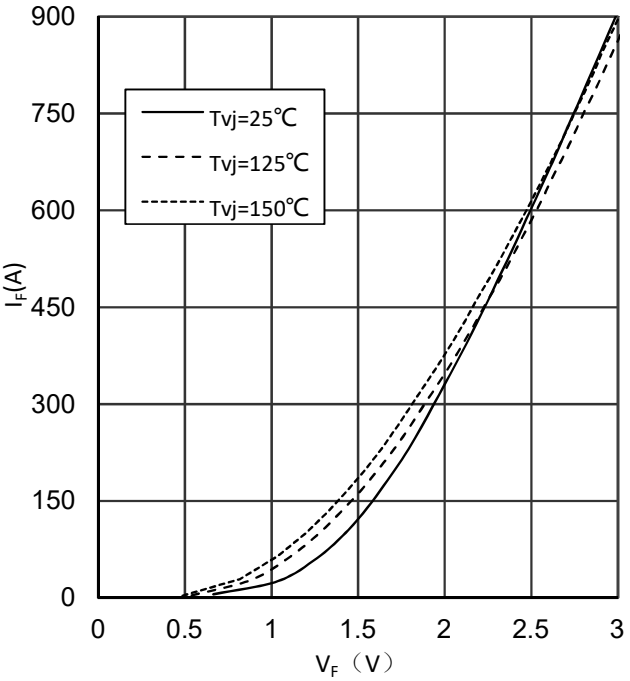

**门极电荷（典型）**
**Gate charge (typical)**
$V_{GE}$ = f ($Q_G$)
$I_C$ = 450A, $V_{CE}$ = 600V



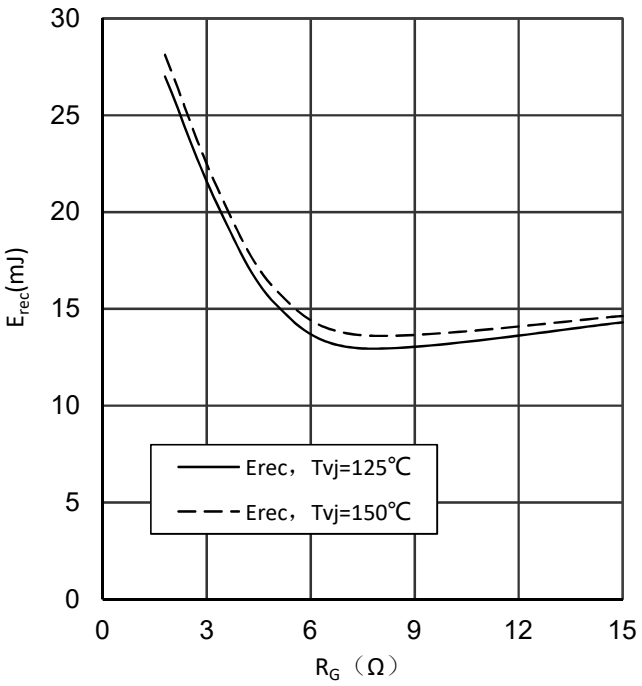
**IGBT瞬态热阻抗**
**IGBT transient thermal impedance as a function of pulse width**
$Z_{th(j-c)} = f(t)$



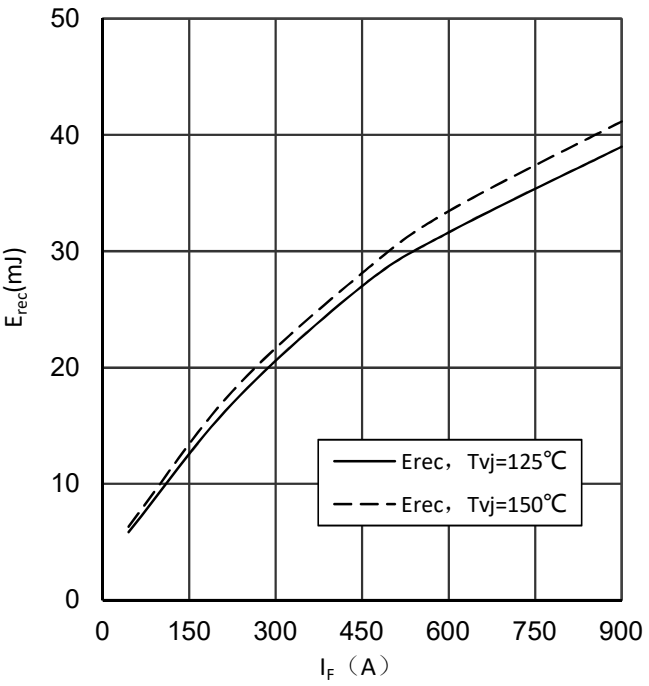

**正向偏压特性二极管（典型）**
**Forward characteristic of Diode (typical)**
$I_F = f(V_F)$




**开关损耗 二极管（典型）**
**Switching losses Diode(typical)**
$E_{rec} = f(R_G)$
$I_F$ = 450A, $V_{CE}$ = 600V



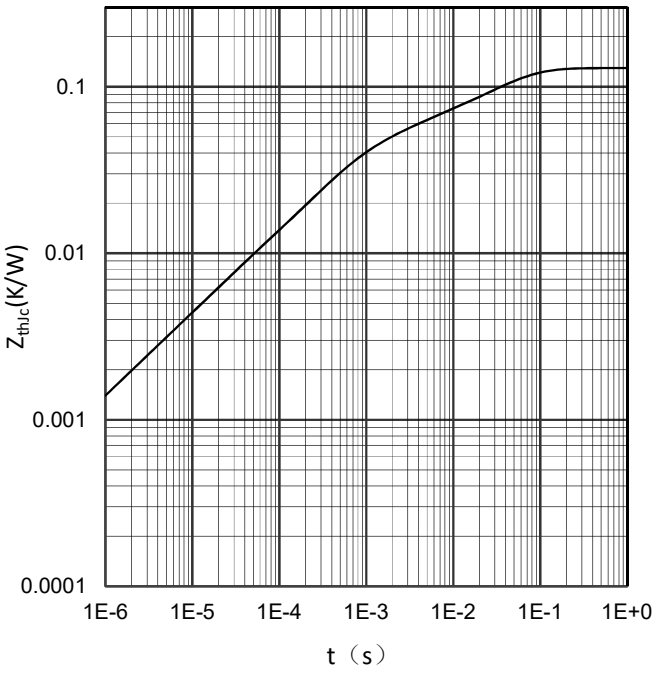

**开关损耗 二极管（典型）**
**Switching losses Diode(typical)**
$E_{rec} = f(I_F)$
$R_G$ = 1.8Ω, $V_{CE}$ = 600V



**二极管瞬态热阻抗**

**Diode transient thermal impedance as a function of pulse width**

$Z_{th(j-c)} = f(t)$



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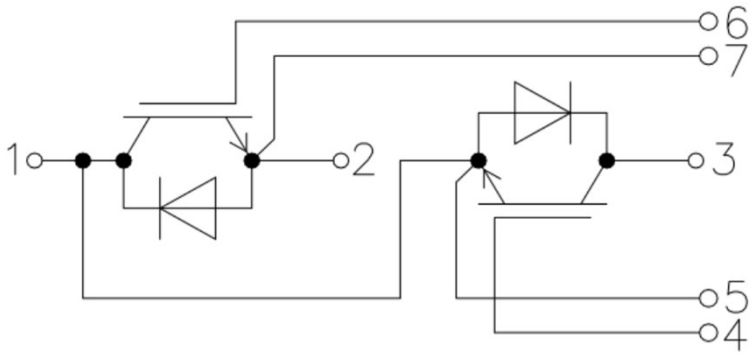
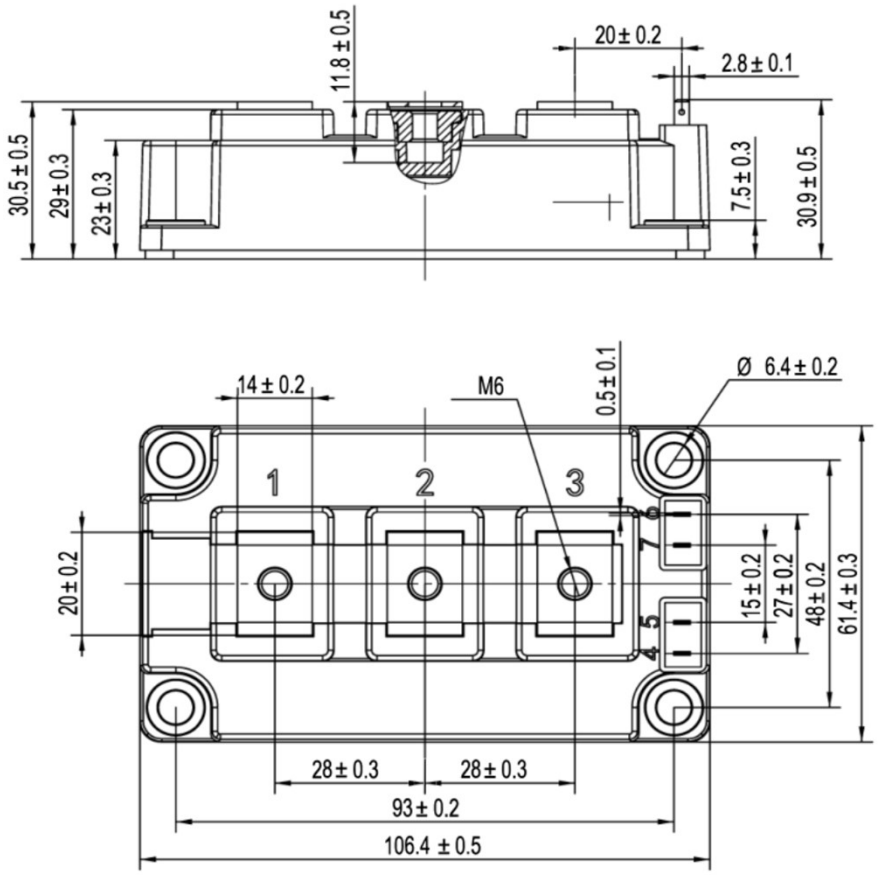
**Circuit diagram headline / 接线图**




**Package outlines / 封装尺寸**




Dimensions in (mm)
单位：mm