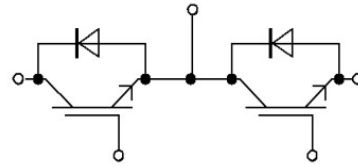


K package: 1200V 200A IGBT module



Equivalent Circuit Schematic

Features:

- 1200V 200A, $V_{CE(sat)} = 2.40V$
- planar field-stop technology
- High RBSOA capability
- Low turn-off losses

产品特性:

- 1200V 200A, $V_{CE(sat)} = 2.40V$
- 平面栅场终止技术
- 高 RBSOA 性能
- 低关断损耗

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

IGBT, Inverter / IGBT, 逆变部分

Maximum Rated Values / 最大标称参数

| | | | | |
|---|---|--------------------|----------|---|
| Collector-emitter Voltage 集电极-发射极电压 | $T_{vj}=25^{\circ}\text{C}$ | V_{CES} | 1200 | V |
| Continuous DC collector current 集电极连续直流电流 | | $I_{C\text{ nom}}$ | 200 | A |
| | $T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$ | I_C | 220 | A |
| Repetitive Peak collector current 集电极可重复峰值电流 | $I_{CRM}=2 \times I_{C\text{ nom}}$ | I_{CRM} | 400 | A |
| Total power dissipation 总功率损耗 | $T_C=25^{\circ}\text{C}, T_{vj\text{ max}}=150^{\circ}\text{C}$ | P_{tot} | 1135 | W |
| Gate-emitter peak voltage 门极-发射极峰值电压 | | V_{GES} | ± 20 | V |

Characteristic Values / 性能参数

| | | | | min. | typ. | max. | |
|---|---|------------------------------|-------------|------|------|-----------|----------|
| Collector-emitter saturation Voltage ¹⁾ 集电极-发射极饱和压降 | $I_C=200\text{A}, V_{GE}=15\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ | V_{CESat} | | 2.40 | 3.00 | V |
| | $I_C=200\text{A}, V_{GE}=15\text{V}$ | $T_{vj}=125^{\circ}\text{C}$ | | | 2.90 | | |
| | $I_C=200\text{A}, V_{GE}=15\text{V}$ | $T_{vj}=150^{\circ}\text{C}$ | | | 3.00 | | |
| Gate Threshold Voltage 门极阈值电压 | $V_{CE}=V_{GE}, I_C=2\text{mA}$ | $T_{vj}=25^{\circ}\text{C}$ | V_{GEth} | 5.0 | 6.0 | 7.0 | V |
| Gate Charge 门极电荷 | $V_{GE}=-8\text{V}/15\text{V}, V_{CE}=600\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ | Q_G | | 0.58 | | nC |
| Internal Gate Resistor 内置门极电阻 | | $T_{vj}=25^{\circ}\text{C}$ | R_{Gint} | | 4 | | Ω |
| Input Capacitance 输入电容 | $V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=100\text{KHz}, T_{vj}=25^{\circ}\text{C}$ | | C_{ies} | | 8.45 | | nF |
| Reverse Transfer Capacitance 反向传输电容 | | | C_{res} | | 0.38 | | nF |
| Collector-emitter Cutoff Current 集电极-发射极关断漏电流 | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ | I_{CES} | | | 2 | mA |
| Gate-emitter Leakage Current 门极-发射极漏电流 | $V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ | I_{GES} | | | ± 200 | nA |
| Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=2.4\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | t_{don} | | 58.5 | | ns |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 60 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 60 | | |
| Rise Time, Inductive Load 上升时间, 感性负载 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=2.4\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | t_r | | 50 | | ns |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 55 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 60 | | |
| Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Goff}=10\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | t_{doff} | | 415 | | ns |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 480 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 485 | | |
| Fall Time, Inductive Load 下降时间, 感性负载 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Goff}=10\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | t_f | | 32 | | ns |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 40 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 45 | | |
| Turn-on energy loss per pulse 开通损耗 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}=\pm 15\text{V}, R_{Gon}=2.4\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | E_{on} | | 19.0 | | mJ |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 27.0 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 29.5 | | |
| Turn-off energy loss per pulse 关断损耗 | $I_C=200\text{A}, V_{CE}=600\text{V}$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}=\pm 15\text{V}, R_{Goff}=10\Omega$ | $T_{vj}=25^{\circ}\text{C}$ | E_{off} | | 6.0 | | mJ |
| | | $T_{vj}=125^{\circ}\text{C}$ | | | 10.5 | | |
| | | $T_{vj}=150^{\circ}\text{C}$ | | | 12.0 | | |

| | | | | | | |
|---|------------------|--------------|-----|------|-----|-----|
| Thermal Resistance, Junction to Case 结-壳热阻 | Per IGBT/单个 IGBT | R_{thJC} | | 0.11 | | K/W |
| Temperature under switching conditions 工作温度 | | $T_{vj\ op}$ | -40 | | 150 | °C |

Diode, Inverter / 二极管, 逆变部分

Maximum Rated Values / 最大标称参数

| | | | | |
|---|--------------------------------|-----------|------|---|
| Repetitive peak reverse voltage 可重复反向峰值电压 | $T_{vj}=25^{\circ}\text{C}$ | V_{RRM} | 1200 | V |
| Continuous DC Forward Current 可连续正向直流电流 | | I_F | 200 | A |
| Repetitive Peak Forward Current 可重复正向峰值电流 | $I_{CRM}=2 \times I_{C_{nom}}$ | I_{FRM} | 400 | A |

Characteristic Values / 性能参数

| | | | min. | typ. | max. | |
|---|--|---|-----------|----------------------|------|---------------|
| Forward Voltage 正向通态压降 | $I_F=200\text{A}, V_{GE}=0\text{V}$ $I_F=200\text{A}, V_{GE}=0\text{V}$ $I_F=200\text{A}, V_{GE}=0\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ | V_F | 2.40 2.45 2.50 | 2.80 | V |
| Peak Reverse Recovery Current 反向恢复峰值电流 | $I_F=200\text{A}, V_R=600\text{V}$ $-di_F/dt=2800\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ | I_{RM} | 80 90 90 | | A |
| Recovery Charge 反向恢复电荷 | $I_F=200\text{A}, V_R=600\text{V}$ $-di_F/dt=2800\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ | Q_R | 5.5 12.5 15.0 | | μC |
| Reverse Recovery Energy 反向恢复损耗 | $I_F=200\text{A}, V_R=600\text{V}$ $-di_F/dt=2800\text{A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $V_{GE}=-15\text{V}$ | $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ | E_{rec} | 1.90 5.50 7.00 | | mJ |
| Thermal Resistance, Junction to Case 结-壳热阻 | Per Diode / 单个 Diode | R_{thJC} | | 0.25 | | K/W |
| Temperature under switching conditions 工作温度 | | $T_{vj\ op}$ | -40 | | 150 | °C |

注：1) Terminal impedance is not included.

不包含端子阻抗。

Module / 模块

| | | | | |
|--|--|-------------------|--------------------------------|----|
| Isolation Test Voltage 绝缘测试电压 | RMS, f=50Hz, t=1min | V _{ISOL} | 3.0 | KV |
| Material of Module Baseplate 模块底板材料 | | | Cu | |
| Internal Isolation 内部绝缘 | 基本绝缘 (class 1, IEC 61140) Basic insulation (class1,IEC 61140) | | Al ₂ O ₃ | |
| Creepage Distance 爬电距离 | 端子-散热片 terminal to heatsink 端子-端子 terminal to terminal | | 29.0 23.0 | mm |
| Clearance 电气间隙 | 端子-散热片 terminal to heatsink 端子-端子 terminal to terminal | | 23.0 11.0 | mm |
| Comparative Tracking Index 相对漏电起痕指数 | | CTI | >200 | |

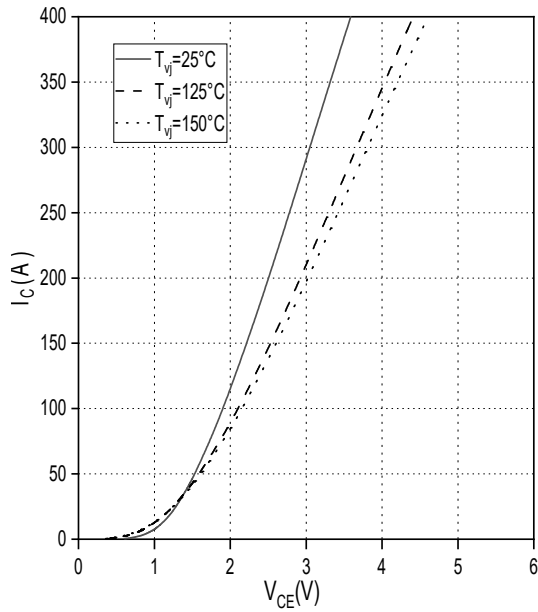
| | | min. typ. max. | | | |
|---|--|----------------------|-----|------|--------|
| Thermal resistance, case to heatsink 外壳-散热器热阻 | 每个模块/per module $\lambda_{\text{Paste}} = 1W/(m \cdot K) / \lambda \text{ grease} = 1W/(m \cdot K)$ | R _{thCH} | | 0.01 | K/W |
| Stray Inductance Module 模块杂散电感 | | L _{sCE} | | 20 | nH |
| Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片 | T _c =25°C,每个开关 per switch | R _{CC'+EE'} | | 0.70 | mΩ |
| Storage Temperature 贮存温度 | | T _{stg} | -40 | | 125 °C |
| Modul Mounting torque 模块安装扭距 | M6 | M | 4.0 | | 6.0 Nm |
| Terminal Mounting torque 端子安装扭距 | M6 | M | 4.0 | | 6.0 Nm |
| Weight 重量 | | G | | 320 | g |

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

$I_C = f(V_{CE})$,

$V_{GE} = 15V$

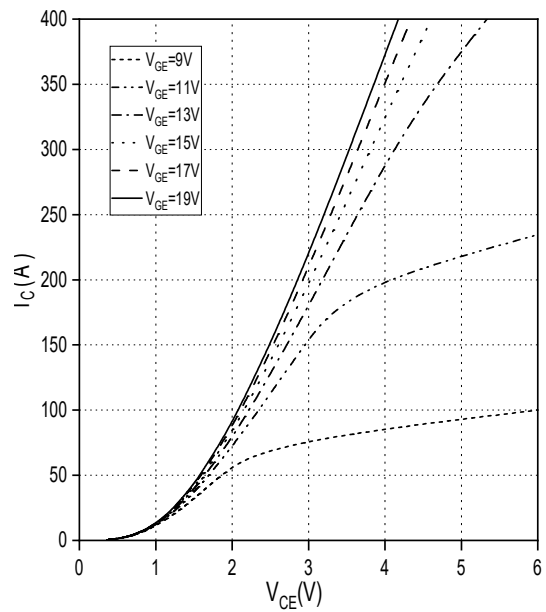


输出特性 IGBT, 逆变器(典型值)

output characteristic IGBT Inverter (typical)

$I_C = f(V_{CE})$,

$T_{vj} = 150^\circ\text{C}$

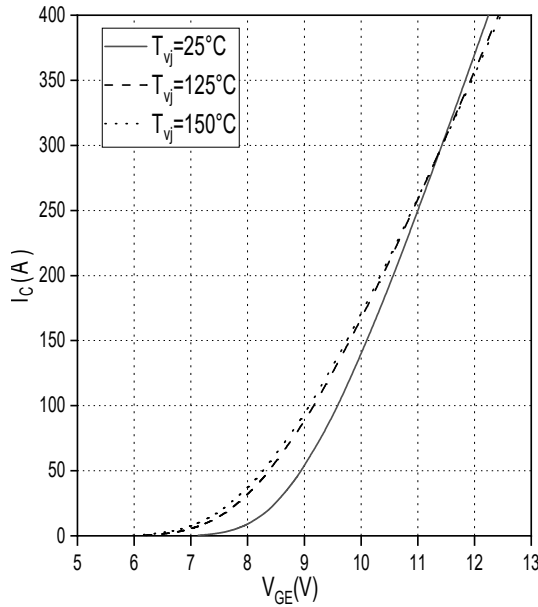


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$,

$V_{CE} = 20V$

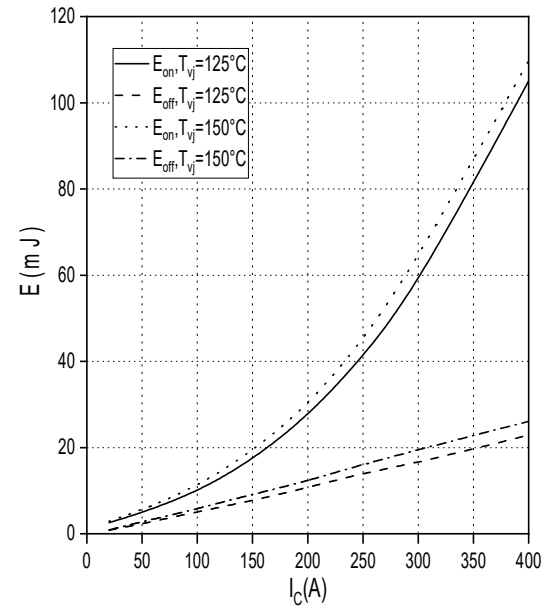


开关损耗 IGBT, 逆变器 (典型值)

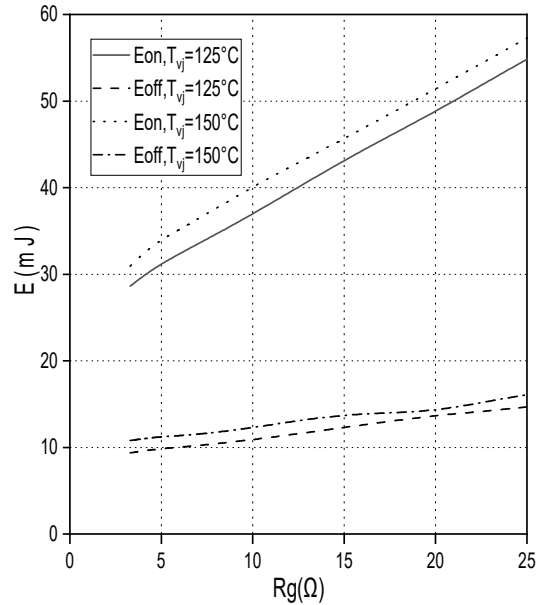
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C), V_{GE} = \pm 15V$,

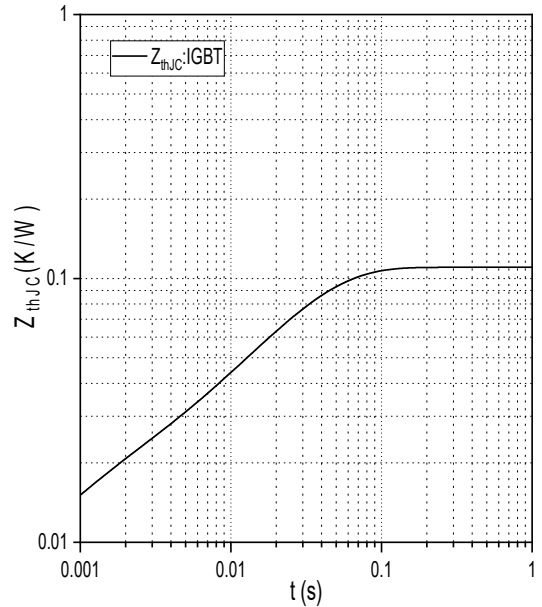
$R_{Gon} = 2.4\Omega, R_{Goff} = 10\Omega, V_{CE} = 600V$



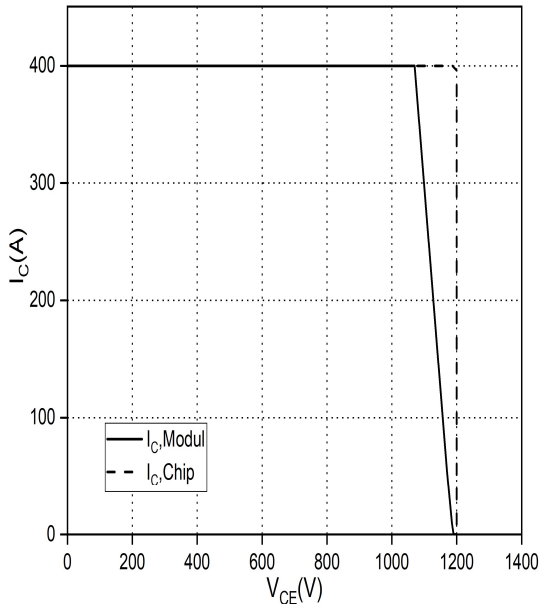
开关损耗 IGBT, 逆变器 (典型值)
Switching losses IGBT, Inverter (typical)
 $V_{GE} = \pm 15V, I_C = 200A, V_{CE} = 600V$



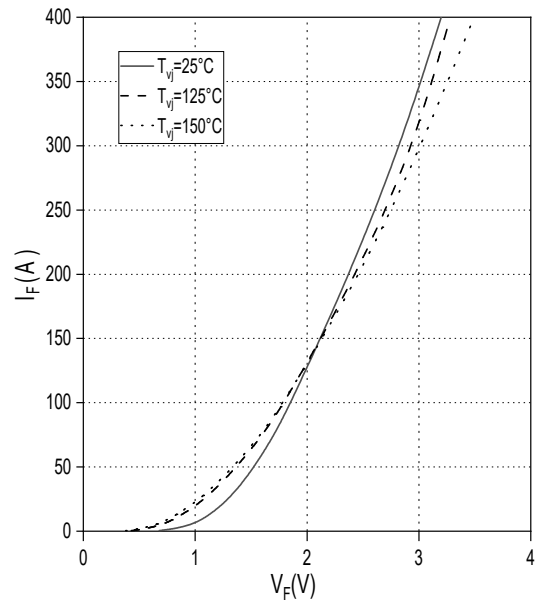
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



反偏安全工作区 IGBT, 逆变器 (RBSOA)
Reverse bias safe operating area IGBT, Inverter (RBSOA) $I_C = f(V_{CE})$
 $V_{GE} = \pm 15V, R_{Goff} = 10\Omega, T_{vj} = 150^\circ C$

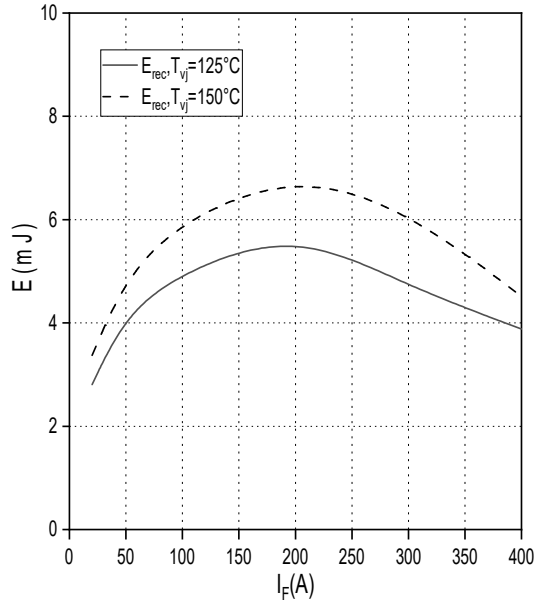


正向偏压特性二极管, 逆变器 (典型值)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



开关损耗二极管,逆变器 开关损耗 (典型值)
Switching losses Diode, Inverter (typical)

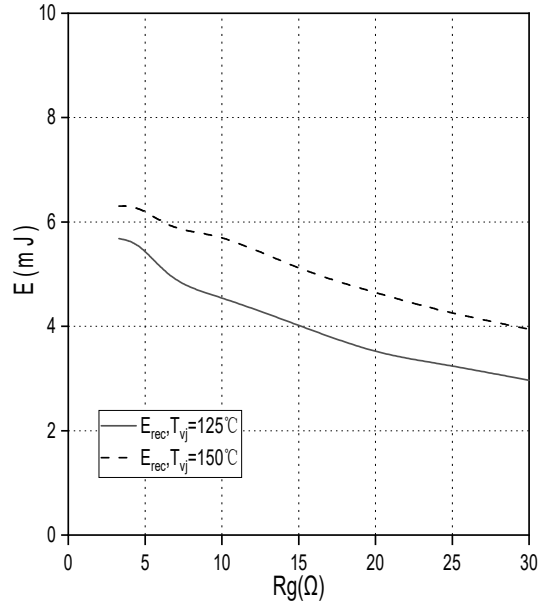
$E_{rec} = f(I_F)$
 $R_{Gon} = 2.4\Omega, V_{CE} = 600V$



二极管,逆变器 (典型值)

Switching losses Diode, Inverter (typical)

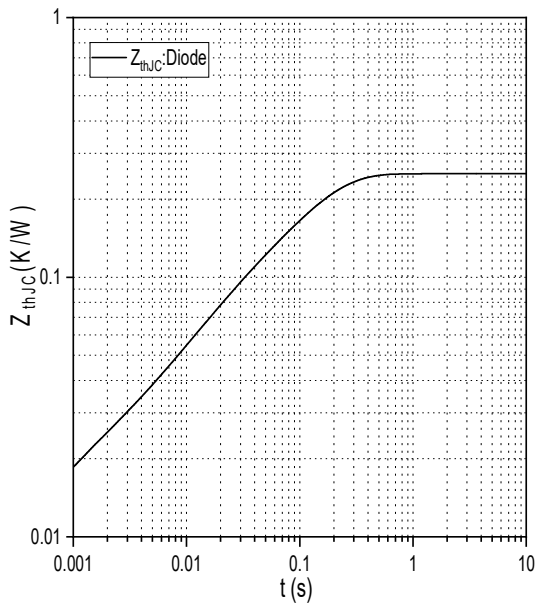
$E_{rec} = f(R_G)$
 $I_F = 200A, V_{CE} = 600V$



瞬态热阻抗二极管,逆变器

transient thermal impedance Diode, Inverter

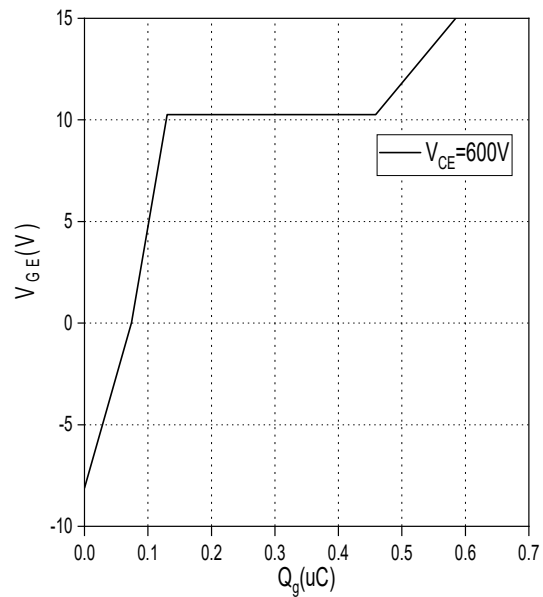
$Z_{thJC} = f(t)$



栅极电荷特性, IGBT, 逆变器 (典型)

Gate charge characteristic, IGBT, Inverter (typical)

$V_{GE} = f(Q_g)$
 $I_C = 200A, T_{vj} = 25^\circ C$

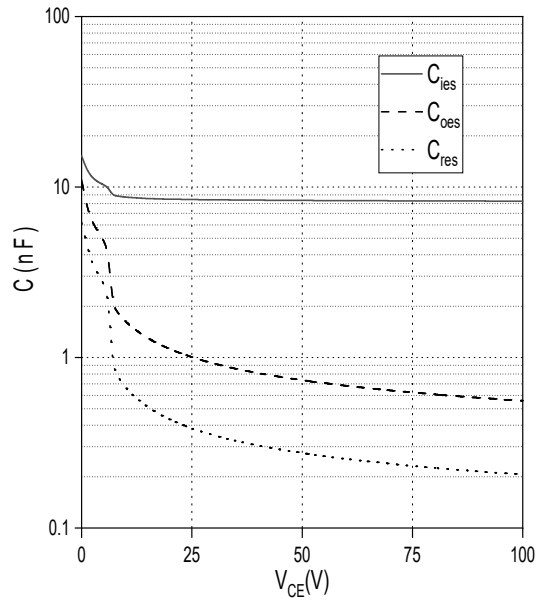


电容特性, IGBT, 逆变器 (典型)

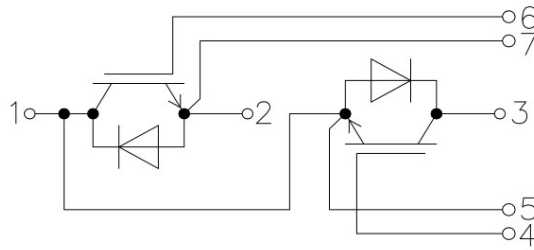
Capacity characteristic, IGBT, Inverter (typical)

$C = f(V_{CE})$

$f = 100\text{kHz}$, $V_{GE} = 0\text{V}$, $T_{vj} = 25\text{ }^\circ\text{C}$



Internal Circuit:



**Package Dimension
Dimensions in Millimeters**

