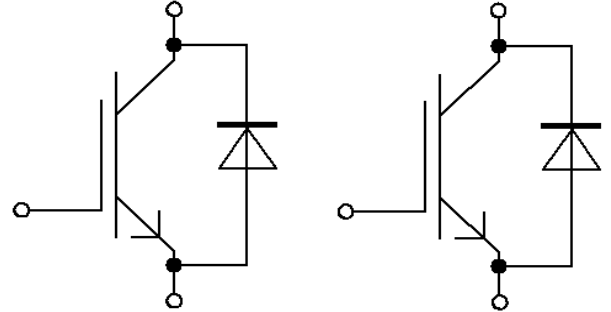
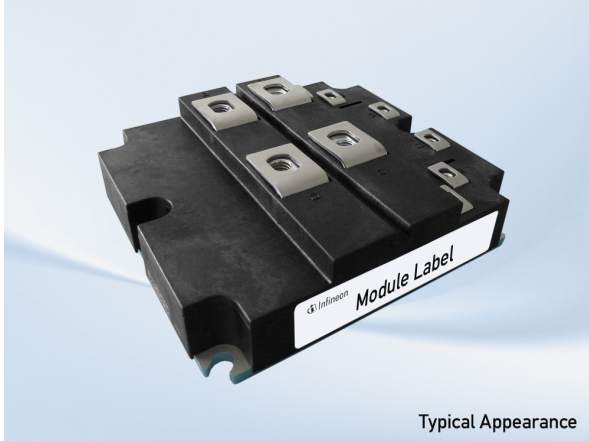


IHM-A 模块 采用第四代沟槽栅/场终止IGBT4和第三代发射极控制二极管
IHM-A module with Trench/Fieldstop IGBT4 and Emitter Controlled 3 diode



$V_{CES} = 1700V$
 $I_{C\ nom} = 800A / I_{CRM} = 1600A$

典型应用

- 大功率变流器
- 中压变流器
- 电机传动
- 牵引变流器
- 风力发电机

Typical Applications

- High power converters
- Medium voltage converters
- Motor drives
- Traction drives
- Wind turbines

电气特性

- 提高工作结温 $T_{vj\ op}$
- 低 V_{CEsat}
- $T_{vj\ op} = 150^{\circ}C$
- 增大的二极管针对反馈运行模式

Electrical Features

- Extended operating temperature $T_{vj\ op}$
- Low V_{CEsat}
- $T_{vj\ op} = 150^{\circ}C$
- Enlarged diode for regenerative operation

机械特性

- 4 kV 交流 1分钟 绝缘
- 碳化硅铝 (AlSiC) 基板提供更高的温度循环能力
- 高功率循环和温度循环能力
- 高功率密度
- 标准封装

Mechanical Features

- 4 kV AC 1min insulation
- AlSiC base plate for increased thermal cycling capability
- High power and thermal cycling capability
- High power density
- Standard housing

Module Label Code

Barcode Code 128



DMX - Code



Content of the Code

| Content of the Code | Digit |
|----------------------------|---------|
| Module Serial Number | 1 - 5 |
| Module Material Number | 6 - 11 |
| Production Order Number | 12 - 19 |
| Datecode (Production Year) | 20 - 21 |
| Datecode (Production Week) | 22 - 23 |

| | | |
|-----------------|---------------------------------|--|
| prepared by: WB | date of publication: 2016-03-09 | |
| approved by: IB | revision: V3.1 | |

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Rated Values

| | | | | |
|--|--|----------------------------|-------------|--------|
| 集电极 - 发射极电压 Collector-emitter voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{CES} | 1700 | V |
| 连续集电极直流电流 Continuous DC collector current | $T_C = 80^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ | $I_{C\text{nom}}$ I_C | 800 1200 | A A |
| 集电极重复峰值电流 Repetitive peak collector current | $t_P = 1\text{ ms}$ | I_{CRM} | 1600 | A |
| 总功率损耗 Total power dissipation | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ | P_{tot} | 4,85 | kW |
| 栅极 - 发射极峰值电压 Gate-emitter peak voltage | | V_{GES} | +/-20 | V |

特征值 / Characteristic Values

| | | | min. | typ. | max. | |
|---|---|---|--------------------|----------------------|----------------------|---|
| 集电极 - 发射极饱和电压 Collector-emitter saturation voltage | $I_C = 800\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 800\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 800\text{ A}, V_{GE} = 15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,80 2,10 2,20 | 2,20 2,60 2,70 | V V V |
| 栅极阈值电压 Gate threshold voltage | $I_C = 32,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 5,20 | 5,80 | 6,40 V |
| 栅极电荷 Gate charge | $V_{GE} = -15\text{ V} \dots +15\text{ V}$ | | Q_G | 8,30 | | μC |
| 内部栅极电阻 Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 1,9 | | Ω |
| 输入电容 Input capacitance | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{ies} | 65,0 | | nF |
| 反向传输电容 Reverse transfer capacitance | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{res} | 2,10 | | nF |
| 集电极-发射极截止电流 Collector-emitter cut-off current | $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{CES} | | 5,0 | mA |
| 栅极-发射极漏电流 Gate-emitter leakage current | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{GES} | | 400 | nA |
| 开通延迟时间(电感负载) Turn-on delay time, inductive load | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 0,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{on}}$ | 0,59 0,63 0,64 | | μs μs μs |
| 上升时间(电感负载) Rise time, inductive load | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 0,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_r | 0,14 0,16 0,16 | | μs μs μs |
| 关断延迟时间(电感负载) Turn-off delay time, inductive load | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{off}}$ | 1,00 1,15 1,15 | | μs μs μs |
| 下降时间(电感负载) Fall time, inductive load | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_f | 0,32 0,50 0,55 | | μs μs μs |
| 开通损耗能量(每脉冲) Turn-on energy loss per pulse | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}, L_S = 50\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 0,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{on} | 145 215 245 | | mJ mJ mJ |
| 关断损耗能量(每脉冲) Turn-off energy loss per pulse | $I_C = 800\text{ A}, V_{CE} = 900\text{ V}, L_S = 50\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3300\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{off} | 255 330 365 | | mJ mJ mJ |
| 短路数据 SC data | $V_{GE} \leq 15\text{ V}, V_{CE} = 1000\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | | I_{SC} | 3400 | | A |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个 IGBT / per IGBT | | R_{thJC} | | 25,7 | K/kW |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 22,8 | | K/kW |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj\text{op}}$ | -40 | 150 | $^{\circ}\text{C}$ |

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二极管, 逆变器 / Diode, Inverter
最大额定值 / Maximum Rated Values

| | | | | |
|--|--|------------------|------|-------------------|
| 反向重复峰值电压 Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{RRM} | 1700 | V |
| 连续正向直流电流 Continuous DC forward current | | I_F | 800 | A |
| 正向重复峰值电流 Repetitive peak forward current | $t_P = 1\text{ ms}$ | I_{FRM} | 1600 | A |
| I ² t-值 I ² t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | I ² t | 240 | kA ² s |
| | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | | 210 | kA ² s |
| 最大损耗功率 Maximum power dissipation | $T_{vj} = 125^{\circ}\text{C}$ | P_{RQM} | 1200 | kW |
| 最小开通时间 Minimum turn-on time | | $t_{on\ min}$ | 10,0 | μs |

特征值 / Characteristic Values

| | | min. | typ. | max. | |
|--|---|--------------|------|------|--------------------|
| 正向电压 Forward voltage | $I_F = 800\text{ A}, V_{GE} = 0\text{ V}$ | | 1,55 | 2,00 | V |
| | $I_F = 800\text{ A}, V_{GE} = 0\text{ V}$ | | 1,60 | 2,05 | V |
| | $I_F = 800\text{ A}, V_{GE} = 0\text{ V}$ | | 1,65 | 2,10 | V |
| 反向恢复峰值电流 Peak reverse recovery current | $I_F = 800\text{ A}, -di_F/dt = 5600\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ | | 1000 | | A |
| | $V_R = 900\text{ V}$ | | 1150 | | A |
| | $V_{GE} = -15\text{ V}$ | | 1200 | | A |
| 恢复电荷 Recovered charge | $I_F = 800\text{ A}, -di_F/dt = 5600\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ | | 240 | | μC |
| | $V_R = 900\text{ V}$ | | 410 | | μC |
| | $V_{GE} = -15\text{ V}$ | | 450 | | μC |
| 反向恢复损耗 (每脉冲) Reverse recovery energy | $I_F = 800\text{ A}, -di_F/dt = 5600\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ | | 160 | | mJ |
| | $V_R = 900\text{ V}$ | | 280 | | mJ |
| | $V_{GE} = -15\text{ V}$ | | 325 | | mJ |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个二极管 / per diode | R_{thJC} | | 36,8 | K/kW |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个二极管 / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | R_{thCH} | 30,0 | | K/kW |
| 在开关状态下温度 Temperature under switching conditions | | $T_{vj\ op}$ | -40 | 150 | $^{\circ}\text{C}$ |

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模块 / Module

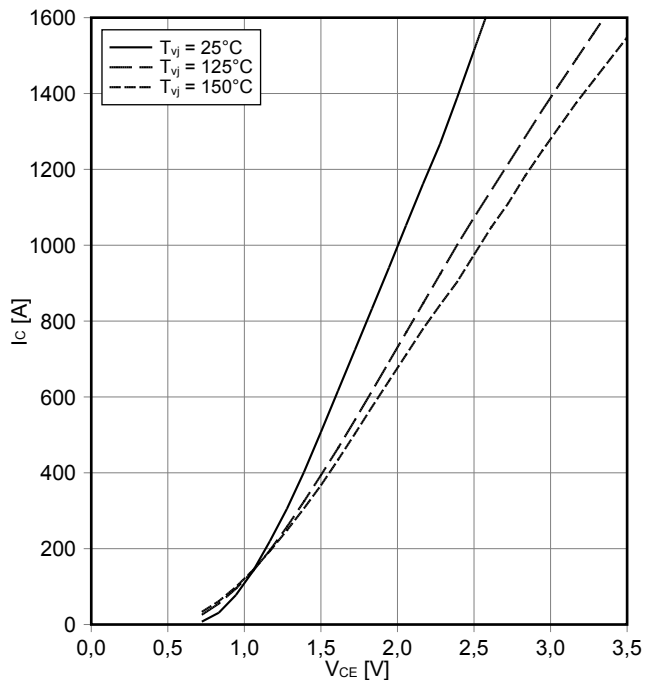
| | | | | | |
|---|--|---------------------|--------------|--------|--------------|
| 绝缘测试电压 Isolation test voltage | RMS, f = 50 Hz, t = 1 min. | V _{ISOL} | 4,0 | | kV |
| 模块基板材料 Material of module baseplate | | | AISiC | | |
| 内部绝缘 Internal isolation | 基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140) | | AIN | | |
| 爬电距离 Creepage distance | 端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal | | 15,0 15,0 | | mm |
| 电气间隙 Clearance | 端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal | | 10,0 10,0 | | mm |
| 相对电痕指数 Comperative tracking index | | CTI | > 250 | | |
| min. typ. max. | | | | | |
| 杂散电感, 模块 Stray inductance module | | L _{sCE} | | 20 | nH |
| 模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip | T _c = 25°C, 每个开关 / per switch | R _{CC+EE'} | | 0,33 | mΩ |
| 储存温度 Storage temperature | | T _{stg} | -40 | | 125 °C |
| 模块安装的安装扭矩 Mounting torque for modul mounting | 螺丝 M6 根据相应的应用手册进行安装 Screw M6 - Mounting according to valid application note | M | 4,25 | | 5,75 Nm |
| 端子联接扭矩 Terminal connection torque | 螺丝 M4 根据相应的应用手册进行安装 Screw M4 - Mounting according to valid application note 螺丝 M8 根据相应的应用手册进行安装 Screw M8 - Mounting according to valid application note | M | 1,8 8,0 | - - | 2,1 10 Nm |
| 重量 Weight | | G | | 1050 | g |

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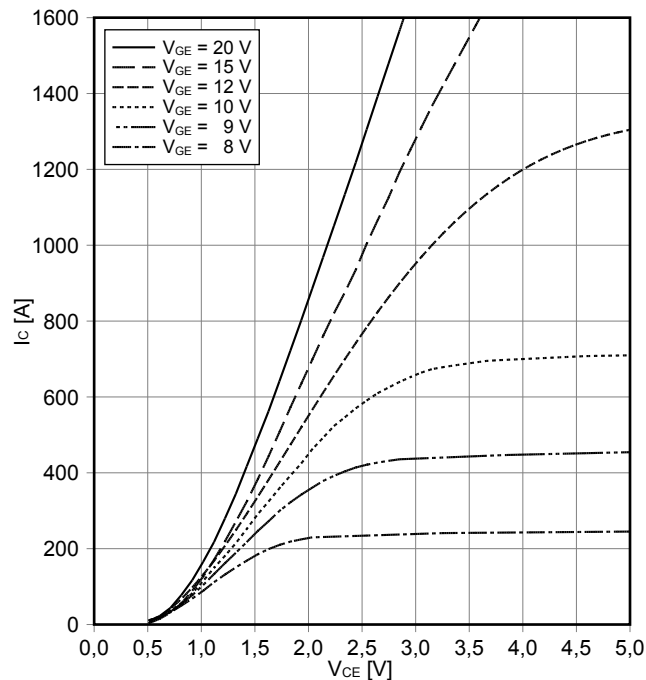
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



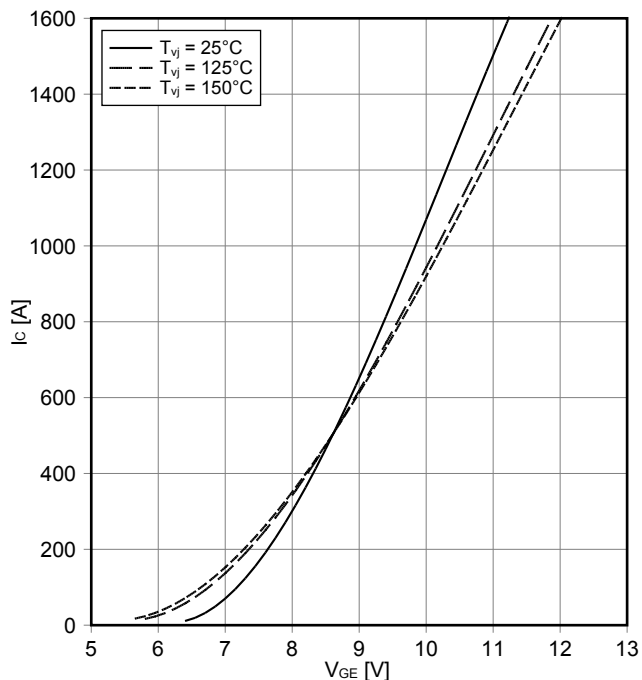
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



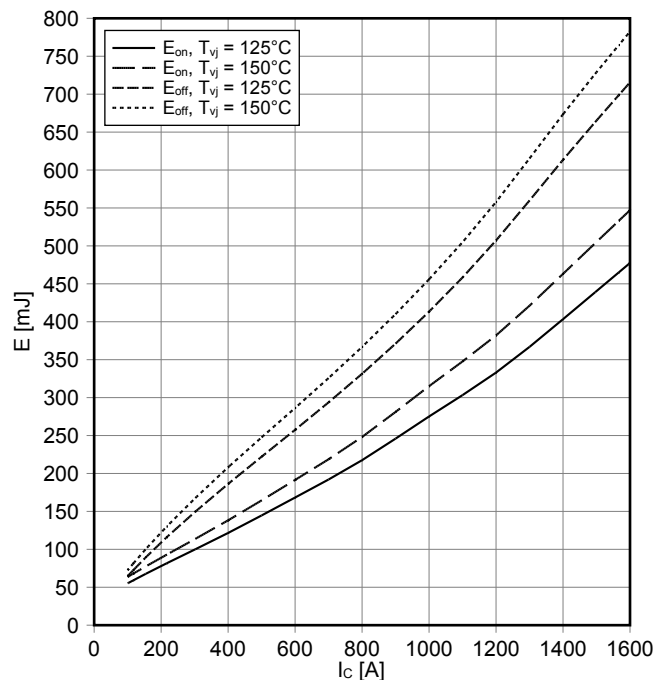
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 0.8\ \Omega, R_{Goff} = 1.8\ \Omega, V_{CE} = 900\text{ V}$

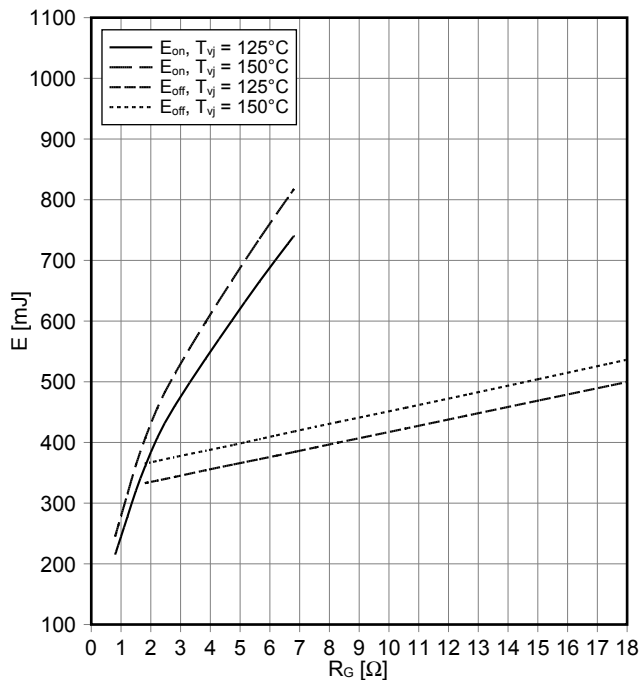


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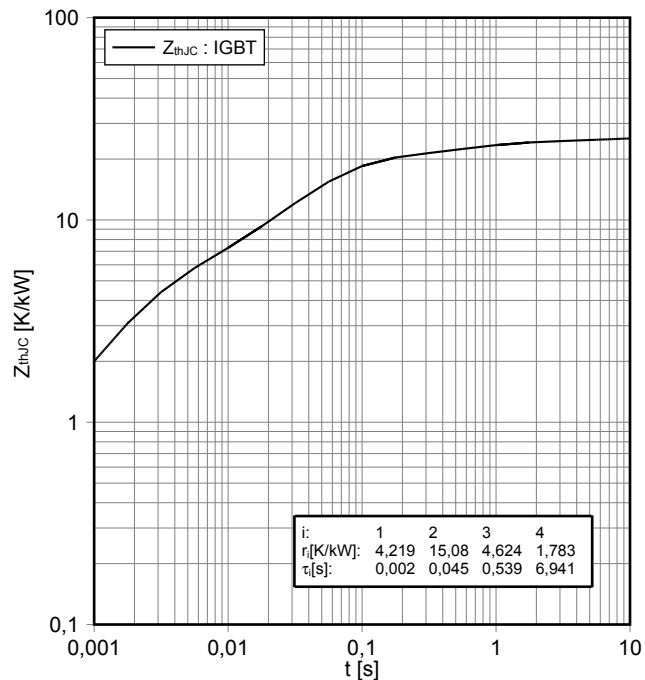
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 800\text{ A}, V_{CE} = 900\text{ V}$



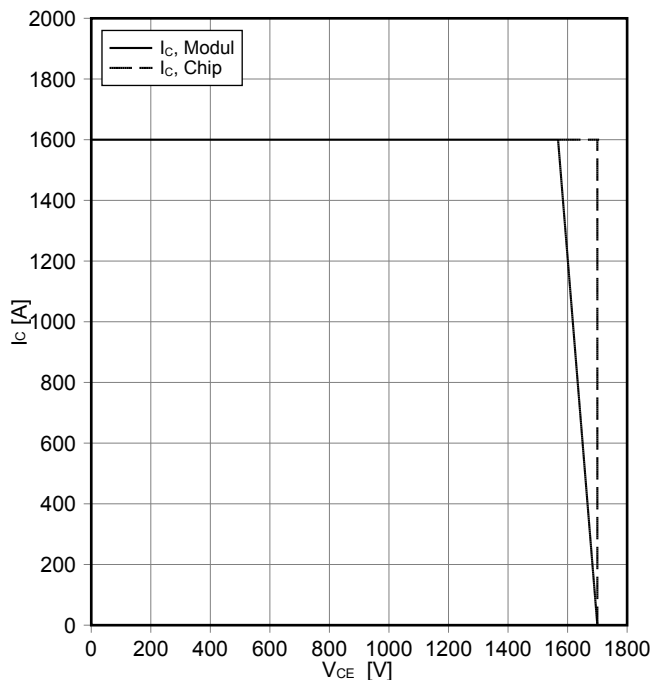
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



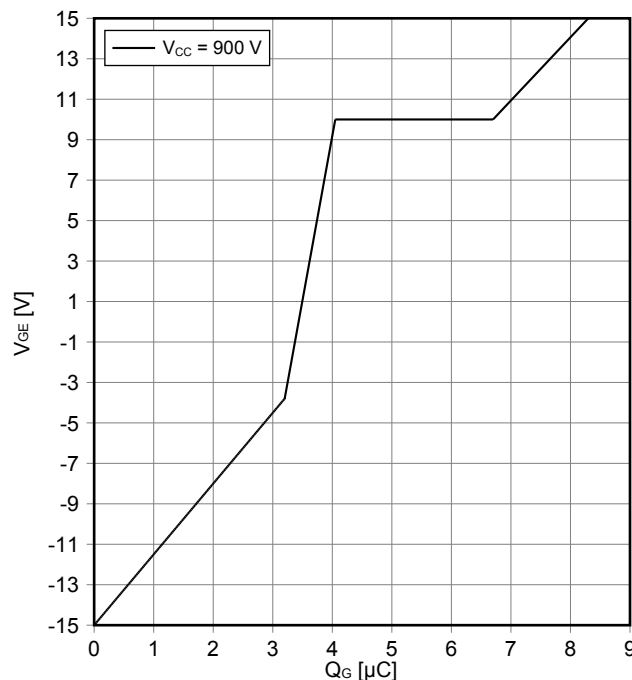
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.8\ \Omega, T_{vj} = 150^\circ\text{C}$



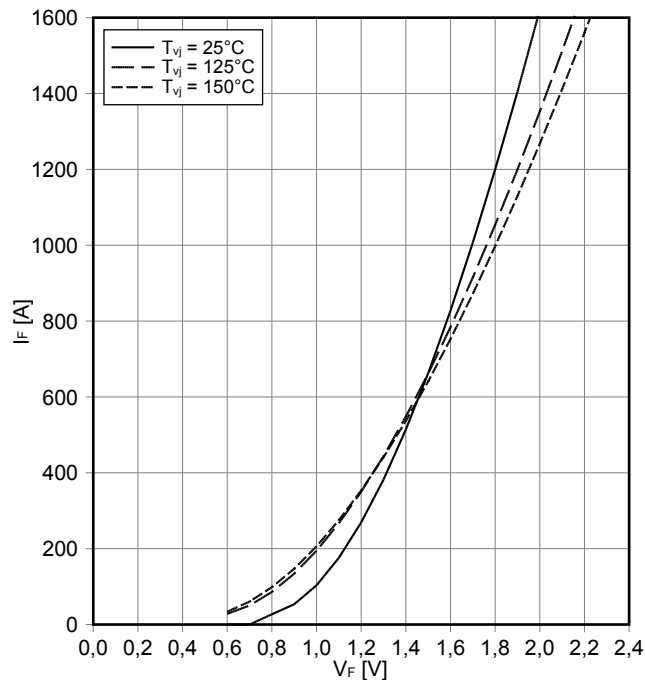
栅极电荷特性 IGBT, 逆变器 (典型)
gate charge characteristic IGBT, Inverter (typical)

$V_{GE} = f(Q_G)$
 $I_C = 800\text{ A}, T_{vj} = 25^\circ\text{C}$

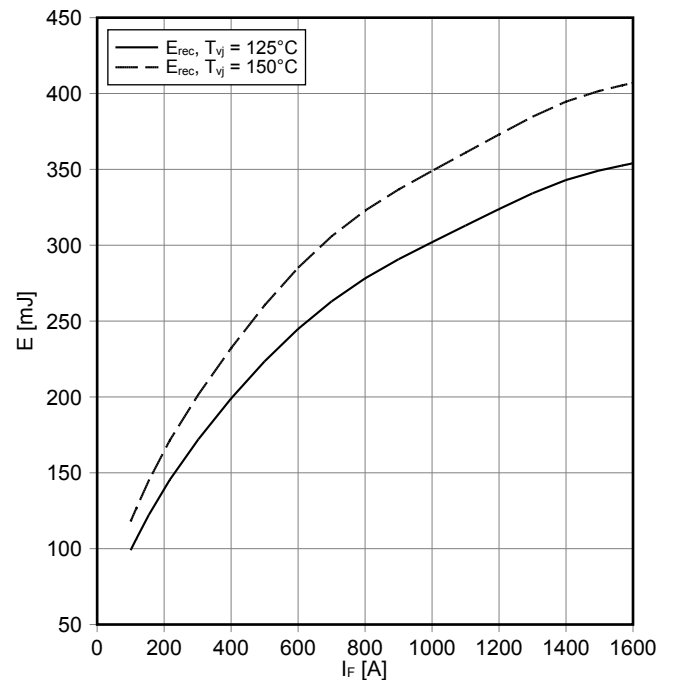


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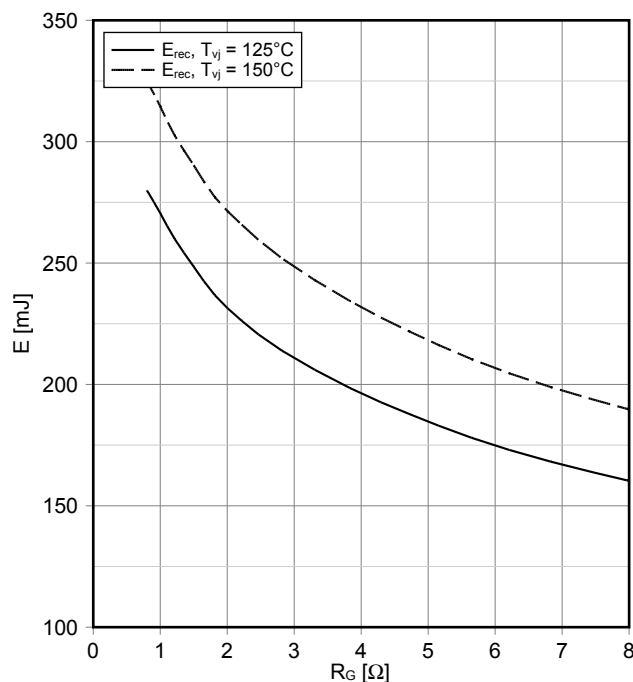
正向偏压特性 二极管,逆变器 (典型)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



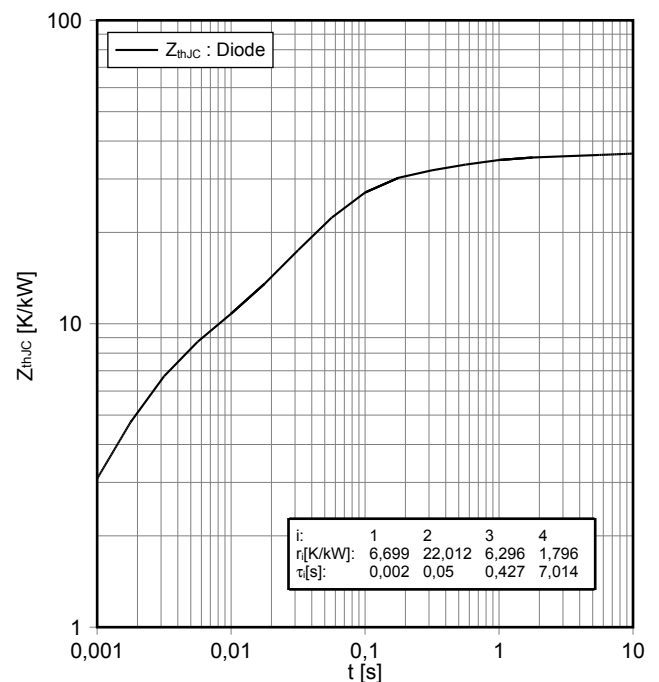
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.8 \Omega, V_{CE} = 900 V$



开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 800 A, V_{CE} = 900 V$



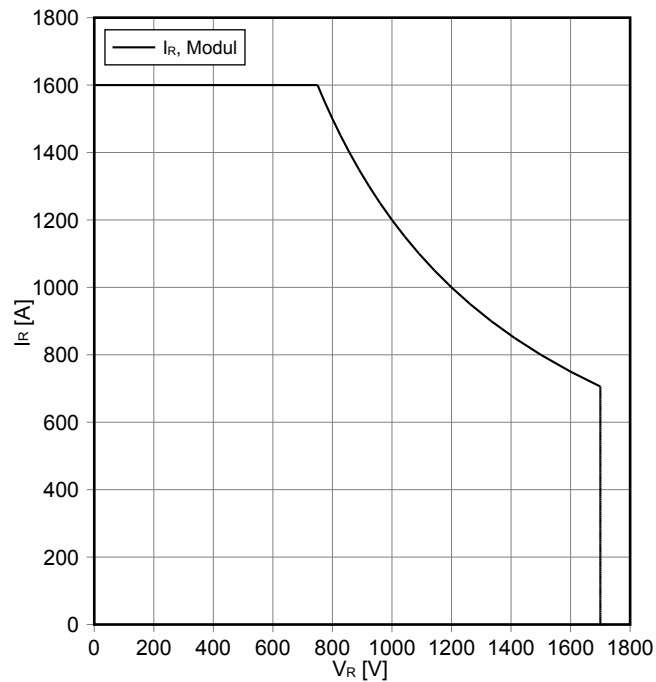
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter
 $Z_{thJC} = f(t)$



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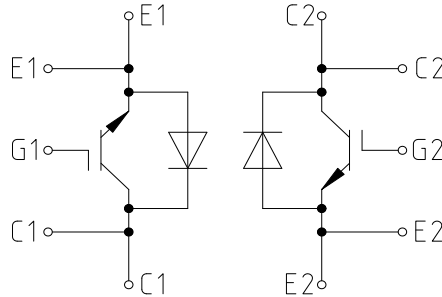
安全工作区 二极管, 逆变器 (SOA)
safe operation area Diode, Inverter (SOA)

$I_R = f(V_R)$
 $T_{vj} = 150^\circ\text{C}$

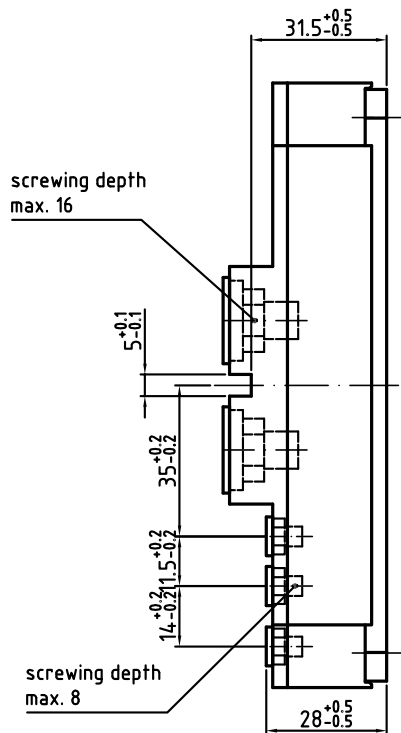
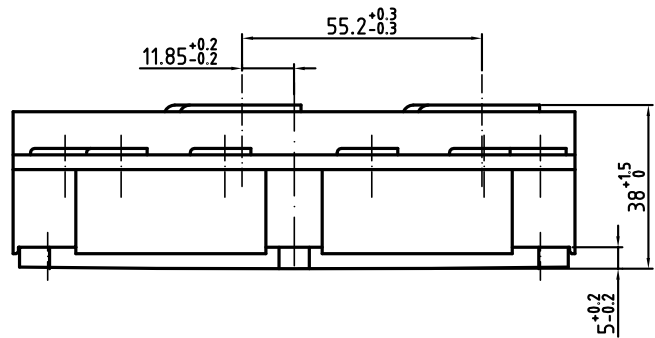


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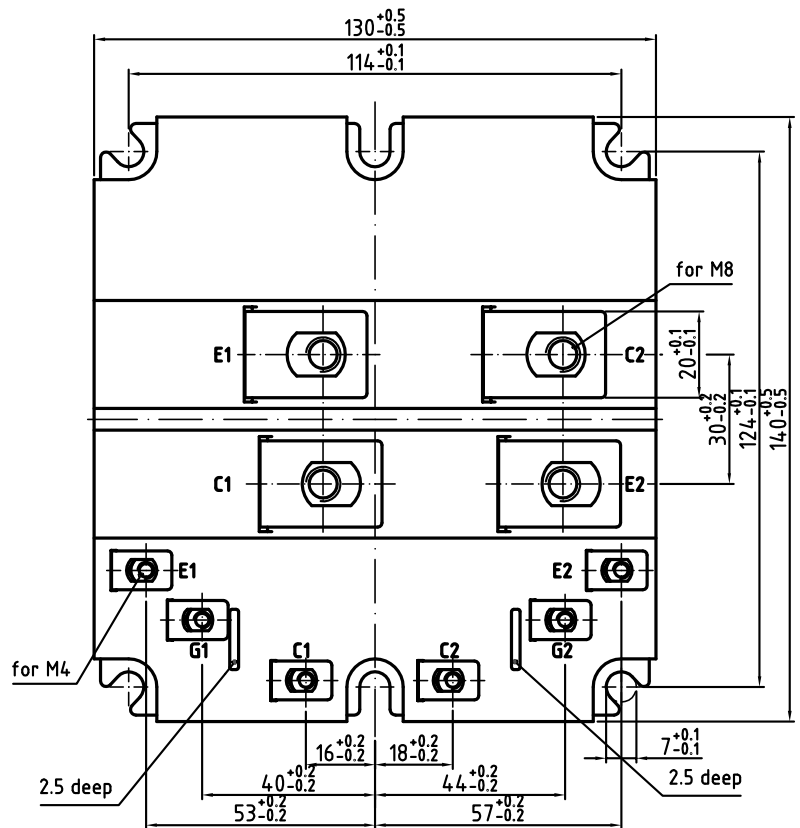
接线图 / Circuit diagram



封装尺寸 / Package outlines



IH2



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|-----------------|---------------------------------|
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