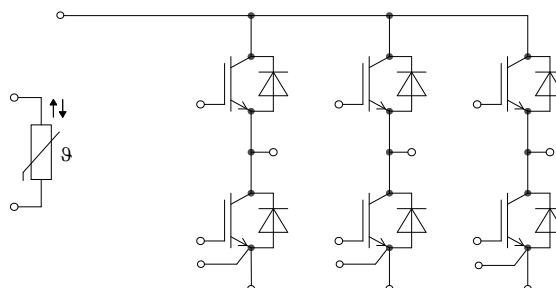


SmartPACK1 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管 带有pressfit压接管脚和温度检测NTC  
SmartPACK1 module with trench/fieldstop IGBT4 and Emitter Controlled Diode and PressFIT / NTC



Typical Appearance



$V_{CES} = 650V$   
 $I_{C\ nom} = 50A / I_{CRM} = 100A$

**典型应用**

- 空调
- 电机传动
- 伺服驱动器
- UPS系统

**电气特性**

- 增加阻断电压至650V
- 高短路能力，自限制短路电流
- 沟槽栅IGBT4
- $T_{vj\ op} = 150^{\circ}C$

**机械特性**

- 低热阻的三氧化二铝 (  $Al_2O_3$  衬底
- 紧凑型设计
- PressFIT 压接技术
- 坚固的双框架结构

**Typical Applications**

- Air Conditioning
- Motor Drives
- Servo Drives
- UPS Systems

**Electrical Features**

- Increased blocking voltage capability to 650V
- High Short Circuit Capability, Self Limiting Short Circuit Current
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$

**Mechanical Features**

- $Al_2O_3$  Substrate with Low Thermal Resistance
- Compact design
- PressFIT Contact Technology
- Rugged Duplex frame construction

**Module Label Code**

Barcode Code 128



DMX - 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: NK | date of publication: 2013-11-11 |                      |
| approved by: MB | revision: 3.0                   | UL approved (E83335) |

**IGBT, 逆变器 / IGBT, Inverter**

**最大额定值 / Maximum Rated Values**

|  |   |                            |          |        |
|--|---|----------------------------|----------|--------|
| 集电极 - 发射极电压<br>Collector-emitter voltage       | $T_{vj} = 25^{\circ}\text{C}$   | $V_{CES}$                  | 650      | V      |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 50<br>75 | A<br>A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$   | $I_{CRM}$                  | 100      | A      |
| 总功率损耗<br>Total power dissipation               | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$  | $P_{\text{tot}}$           | 230      | W      |
| 栅极 - 发射极峰值电压<br>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<br>Collector-emitter saturation voltage | $I_C = 50\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $V_{CE\text{sat}}$ | 1,55<br>1,70<br>1,75    | 1,95 | V<br>V<br>V |   |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 0,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$   |   | $V_{GEth}$         | 5,0                     | 5,8  | 6,5         | V   |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$   |   | $Q_G$              | 0,50                    |      |             | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$  |   | $R_{Gint}$         | 0,0                     |      |             | $\Omega$  |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{ies}$          | 3,10                    |      |             | nF  |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{res}$          | 0,095                   |      |             | nF  |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$  |   | $I_{CES}$          |                         |      | 1,0         | mA  |
| 栅极-发射极漏电流<br>Gate-emitter leakage current             | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{GES}$          |                         |      | 100         | nA  |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load    | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 8,2\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{on}}$   | 0,013<br>0,013<br>0,014 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 8,2\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_r$              | 0,019<br>0,022<br>0,023 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 关断延迟时间(电感负载)<br>Turn-off delay time, inductive load   | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 8,2\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_{d\text{off}}$  | 0,18<br>0,21<br>0,21    |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 8,2\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $t_f$              | 0,053<br>0,063<br>0,064 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 2250\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 8,2\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{\text{on}}$    | 0,55<br>0,80<br>0,90    |      |             | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3300\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 8,2\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                   | $E_{\text{off}}$   | 1,60<br>2,30<br>2,40    |      |             | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$   | $t_P \leq 10\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$           | 240<br>190              |      |             | A<br>A  |
| 结 - 外壳热阻<br>Thermal resistance, junction to case      | 每个 IGBT / per IGBT   |   | $R_{thJC}$         | 0,60                    | 0,65 |             | K/W   |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink    | 每个 IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$   |   | $R_{thCH}$         | 0,60                    |      |             | K/W   |
| 在开关状态下温度<br>Temperature under switching conditions    |  |   | $T_{vj\text{op}}$  | -40                     |      | 150         | $^{\circ}\text{C}$                              |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: NK | date of publication: 2013-11-11 |
| approved by: MB | revision: 3.0                   |

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

|  |  |                  |     |                  |
|--|--|------------------|-----|------------------|
| 反向重复峰值电压<br>Repetitive peak reverse voltage    | $T_{vj} = 25^{\circ}\text{C}$  | $V_{RRM}$        | 650 | 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>Repetitive peak forward current    | $t_P = 1\text{ ms}$  | $I_{FRM}$        | 100 | A                |
| I <sup>2</sup> t-值<br>I <sup>2</sup> t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | I <sup>2</sup> t | 330 | A <sup>2</sup> s |
|  | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ |                  | 300 | A <sup>2</sup> s |

**特征值 / Characteristic Values**

|  |   |                                | min. | typ. | max. |                    |
|--|---|--------------------------------|------|------|------|--------------------|
| 正向电压<br>Forward voltage                            | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$  |      | 1,55 | 1,95 | V                  |
|  | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$  | $T_{vj} = 125^{\circ}\text{C}$ |      | 1,50 |      | V                  |
|  | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$  | $T_{vj} = 150^{\circ}\text{C}$ |      | 1,45 |      | V                  |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F = 50\text{ A}, -di_F/dt = 2250\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 50,0 |      | A                  |
|  |   | $T_{vj} = 125^{\circ}\text{C}$ |      | 63,0 |      | A                  |
|  |   | $T_{vj} = 150^{\circ}\text{C}$ |      | 66,0 |      | A                  |
| 恢复电荷<br>Recovered charge                           | $I_F = 50\text{ A}, -di_F/dt = 2250\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 2,00 |      | $\mu\text{C}$      |
|  |   | $T_{vj} = 125^{\circ}\text{C}$ |      | 4,00 |      | $\mu\text{C}$      |
|  |   | $T_{vj} = 150^{\circ}\text{C}$ |      | 4,60 |      | $\mu\text{C}$      |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy            | $I_F = 50\text{ A}, -di_F/dt = 2250\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 0,50 |      | mJ                 |
|  |   | $T_{vj} = 125^{\circ}\text{C}$ |      | 1,00 |      | mJ                 |
|  |   | $T_{vj} = 150^{\circ}\text{C}$ |      | 1,15 |      | mJ                 |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode   | $R_{thJC}$                     |      | 0,90 | 1,00 | K/W                |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$       | $R_{thCH}$                     |      | 0,80 |      | K/W                |
| 在开关状态下温度<br>Temperature under switching conditions |   | $T_{vj\text{ op}}$             | -40  |      | 150  | $^{\circ}\text{C}$ |

**负温度系数热敏电阻 / NTC-Thermistor**

**特征值 / Characteristic Values**

|                              |   |              | min. | typ. | max. |            |
|------------------------------|---|--------------|------|------|------|------------|
| 额定电阻值<br>Rated resistance    | $T_C = 25^{\circ}\text{C}$                                    | $R_{25}$     |      | 5,00 |      | k $\Omega$ |
| R100 偏差<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$            | $\Delta R/R$ | -5   |      | 5    | %          |
| 耗散功率<br>Power dissipation    | $T_C = 25^{\circ}\text{C}$                                    | $P_{25}$     |      |      | 20,0 | mW         |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/50}$  |      | 3375 |      | K          |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/80}$  |      | 3411 |      | K          |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ |      | 3433 |      | K          |

根据应用手册标定

Specification according to the valid application note.

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: NK | date of publication: 2013-11-11 |
| approved by: MB | revision: 3.0                   |

**模块 / Module**

|  |  |  |                                |              |         |
|--|--|--|--------------------------------|--------------|---------|
| 绝缘测试电压<br>Isolation test voltage                         | RMS, f = 50 Hz, t = 1 min.   | V <sub>ISOL</sub>                            | 2,5                            |              | kV      |
| 内部绝缘<br>Internal isolation                               | 基本绝缘 (class 1, IEC 61140)<br>basic insulation (class 1, IEC 61140)             |  | Al <sub>2</sub> O <sub>3</sub> |              |         |
| 爬电距离<br>Creepage distance                                | 端子- 散热片 / terminal to heatsink<br>端子- 端子 / terminal to terminal                |  | 12,7<br>6,3                    |              | mm      |
| 电气间隙<br>Clearance  | 端子- 散热片 / terminal to heatsink<br>端子- 端子 / terminal to terminal                |  | 8,5<br>5,0                     |              | mm      |
| 相对电痕指数<br>Comperative tracking index                     |  | CTI  | > 200                          |              |         |
|  |  |  | min.                           | typ.         | max.    |
| 杂散电感,模块<br>Stray inductance module                       |  | L <sub>sCE</sub>                             |                                | 35           | nH      |
| 模块引线电阻,端子-芯片<br>Module lead resistance, terminals - chip | T <sub>c</sub> = 25°C, 每个开关 / per switch                                       | R <sub>CC'+EE'</sub><br>R <sub>AA'+CC'</sub> |                                | 4,00<br>6,00 | mΩ      |
| 储存温度<br>Storage temperature                              |  | T <sub>stg</sub>                             | -40                            |              | 125 °C  |
| 模块安装的安装扭矩<br>Mounting torque for modul mounting          | 螺丝 M6 根据相应的应用手册进行安装<br>Screw M6 - Mounting according to valid application note | M  | 8,00                           | -            | 9,00 Nm |
| 重量<br>Weight   |  | G  |                                | 34           | g       |

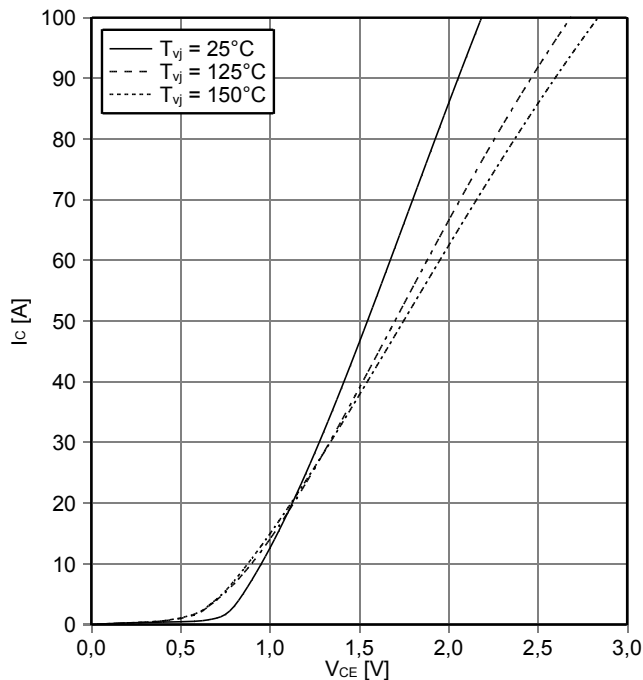
Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25A rms per connector pin.

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: NK | date of publication: 2013-11-11 |
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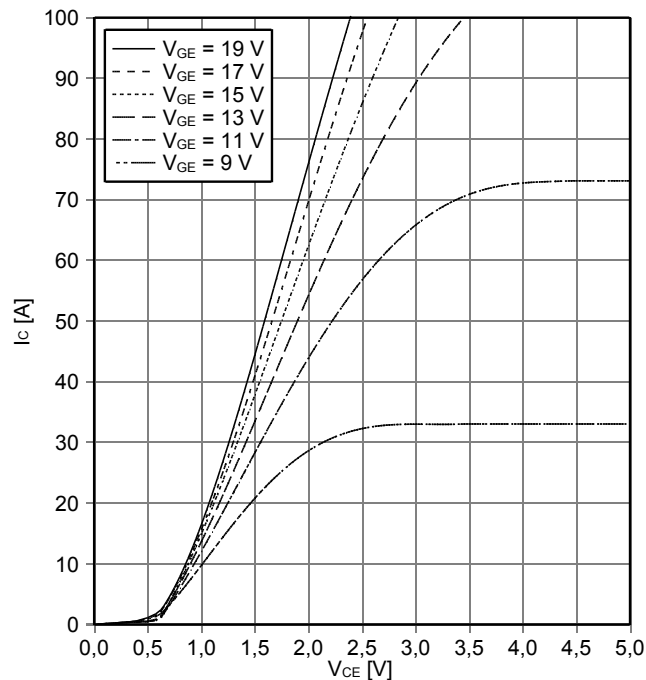
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



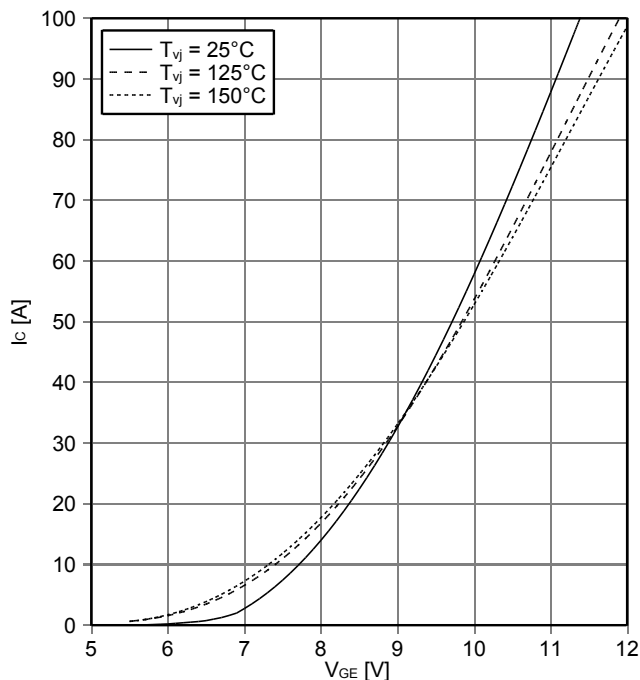
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



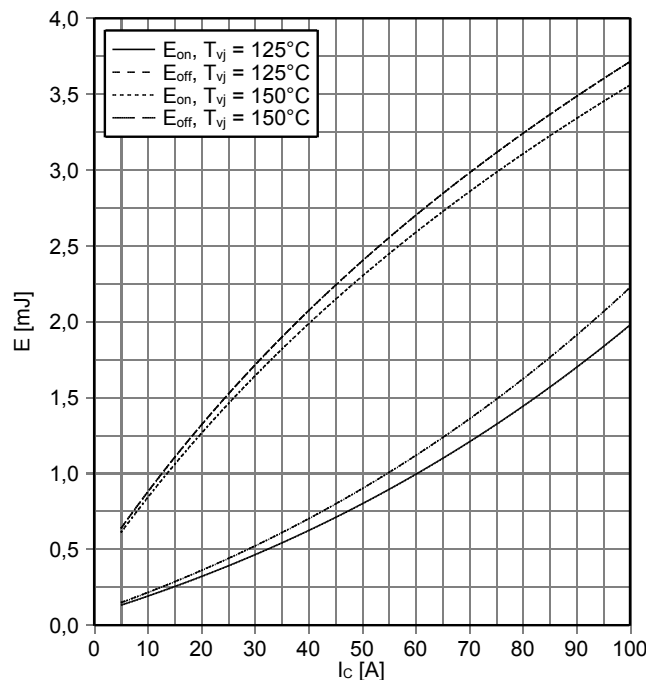
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

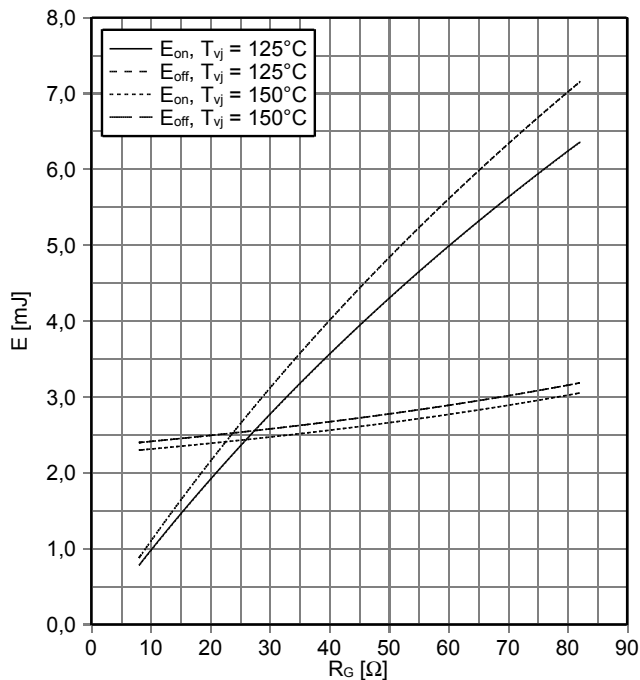
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 8.2\ \Omega$ ,  $R_{Goff} = 8.2\ \Omega$ ,  $V_{CE} = 300\text{ V}$



|                 |                                 |
|-----------------|---------------------------------|
| prepared by: NK | date of publication: 2013-11-11 |
| approved by: MB | revision: 3.0                   |

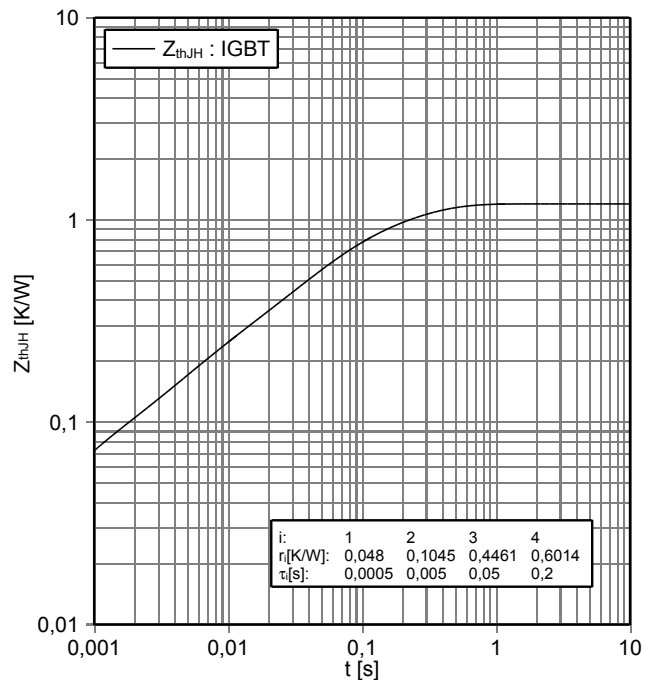
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 50\text{ A}, V_{CE} = 300\text{ V}$



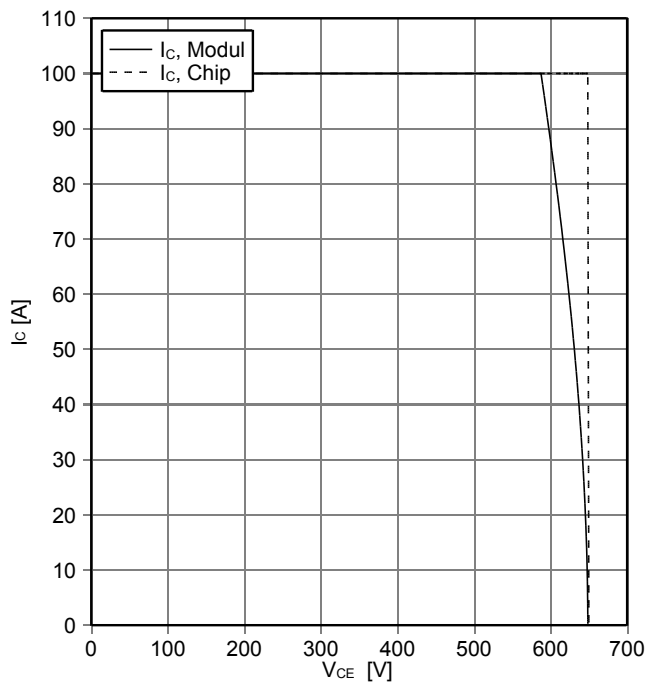
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



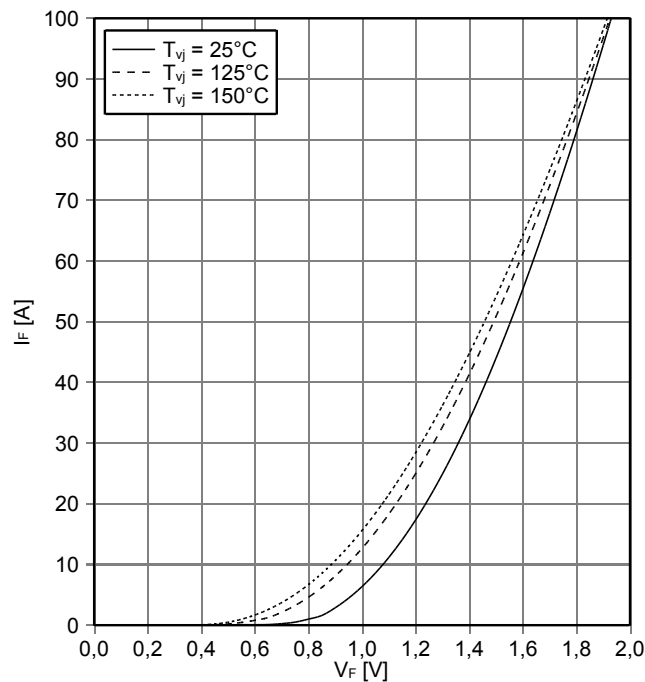
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 8.2\ \Omega, T_{vj} = 150^\circ\text{C}$



正向偏压特性 二极管, 逆变器 (典型)  
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$

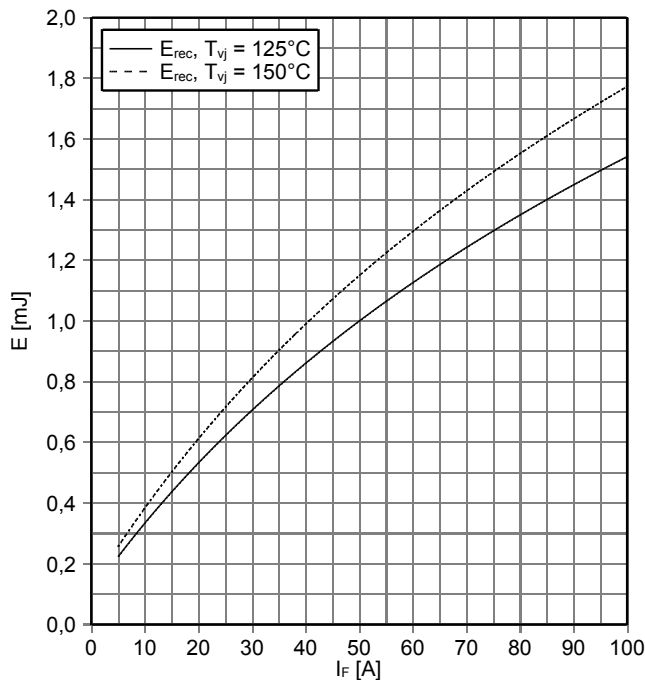


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|-----------------|---------------------------------|
| prepared by: NK | date of publication: 2013-11-11 |
| approved by: MB | revision: 3.0                   |



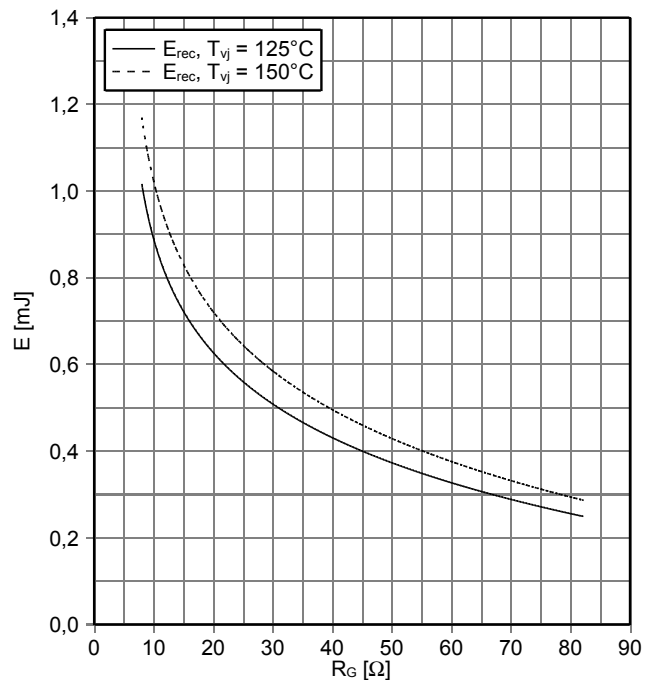
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 8.2 \Omega, V_{CE} = 300 V$



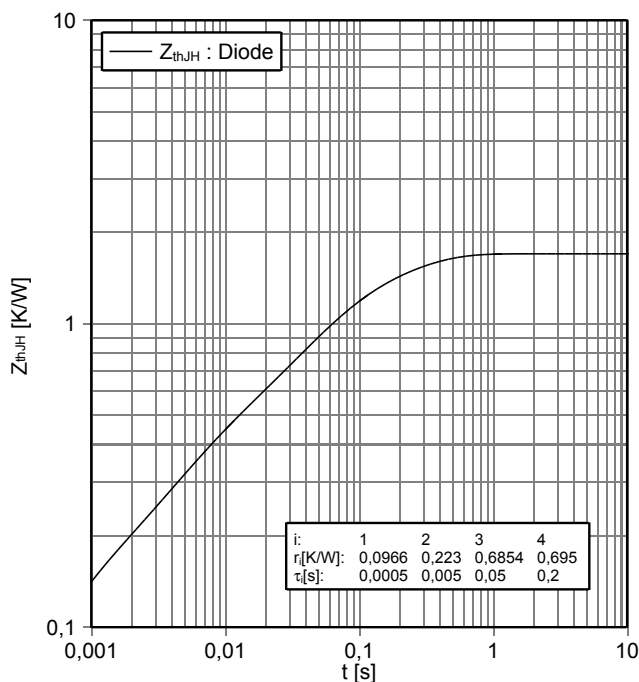
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 50 A, V_{CE} = 300 V$



瞬态热阻抗 二极管,逆变器  
transient thermal impedance Diode, Inverter

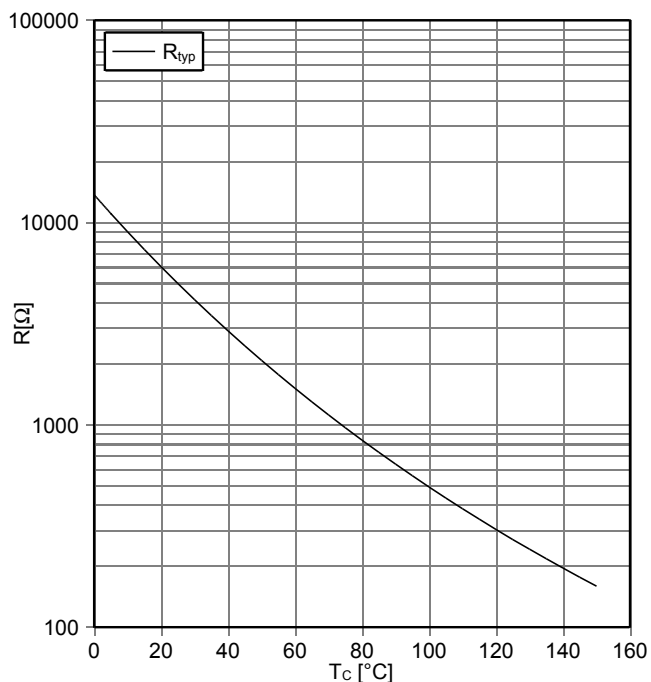
$Z_{thJH} = f(t)$



负温度系数热敏电阻 温度特性

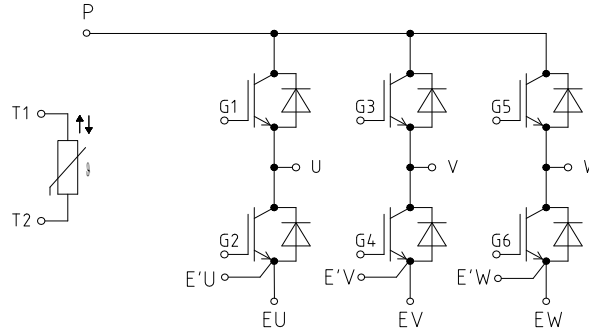
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

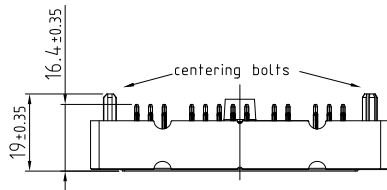
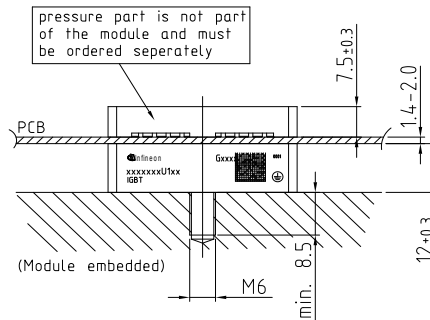
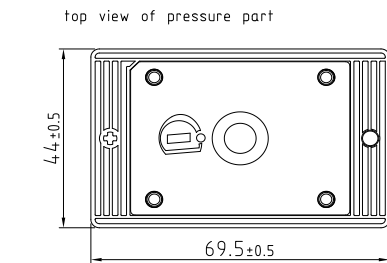


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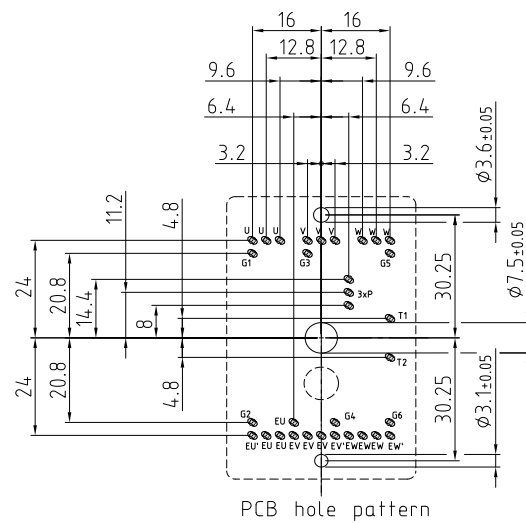
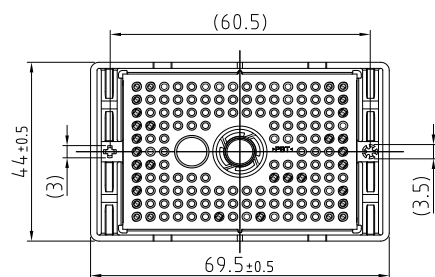
接线图 / circuit\_diagram\_headline



封装尺寸 / package outlines



- Recommended screw:  
M6 counter sunk (acc. to ISO14581 or DIN7991)
- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern  $\pm 0.1$
- Hole specification for contacts see AN 2009-09  
Diameters of plated holes  $\phi 1.0\text{mm}^{+0.09}_{-0.06}$   
Diameters of drill  $\phi 1.15\text{mm}$



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**使用条件和条款**

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-得到质量协议的结论

-建立联合的测试和出厂产品检查，我们可以根据测试的实际情况供货

如果有必要，请根据实际需要将类似的说明给你的客户

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