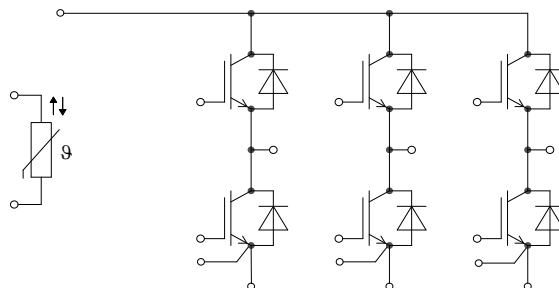
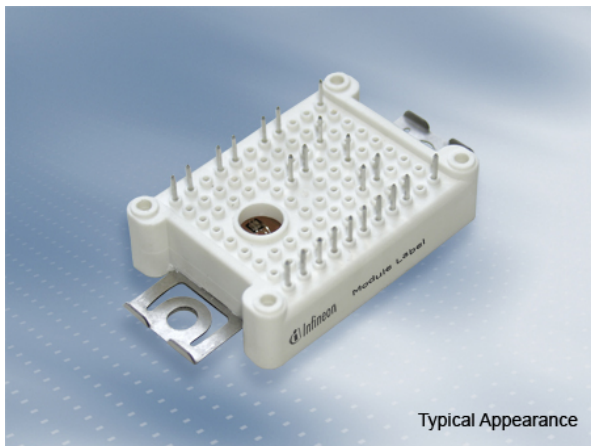


EasyPACK 模块 采用第三代沟槽栅/场终止IGBT3和第三代发射极控制二极管 带有温度检测NTC  
EasyPACK module with Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode and NTC

## 初步数据 / Preliminary Data



$$V_{CES} = 600V$$

$$I_{C\ nom} = 20A / I_{CRM} = 40A$$

## 典型应用

- 空调
- 电机传动
- 伺服驱动器
- UPS系统

## Typical Applications

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

## 电气特性

- 低开关损耗
- 沟槽栅IGBT3
- $V_{CESat}$  带正温度系数
- 低  $V_{CESat}$

## Electrical Features

- Low Switching Losses
- Trench IGBT 3
- $V_{CESat}$  with positive Temperature Coefficient
- Low  $V_{CESat}$

## 机械特性

- 低热阻的三氧化二铝 (  $Al_2O_3$  ) 衬底
- 紧凑型设计
- 焊接技术
- 集成的安装夹使安装坚固

## Mechanical Features

- $Al_2O_3$  Substrate with Low Thermal Resistance
- Compact design
- Solder Contact Technology
- Rugged mounting due to integrated mounting clamps

## 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: DK

date of publication: 2013-10-03

approved by: MB

revision: 2.1

UL approved (E83335)

## 初步数据 Preliminary Data

### 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       | $T_{vj} = 25^{\circ}\text{C}$                                                                                                 | $V_{CES}$                   | 600      | 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>$I_C$ | 20<br>35 | A<br>A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                           | $I_{CRM}$                   | 40       | A      |
| 总功率损耗<br>Total power dissipation               | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175$                                                                                  | $P_{\text{tot}}$            | 135      | 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 | $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$                                                             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $V_{CE\text{ sat}}$ | 1,55<br>1,70<br>1,80    | 2,00 | V<br>V<br>V                                     |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 0,30\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                            |                                                                                                                               | $V_{GEth}$          | 4,9                     | 5,8  | 6,5 V                                           |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                      |                                                                                                                               | $Q_G$               | 0,20                    |      | $\mu\text{C}$                                   |
| 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                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                                               | $C_{ies}$           | 1,10                    |      | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                                               | $C_{res}$           | 0,034                   |      | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                       |                                                                                                                               | $I_{CES}$           |                         | 1,0  | mA                                              |
| 栅极-发射极漏电流<br>Gate-emitter leakage current             | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                                               | $I_{GES}$           |                         | 400  | nA                                              |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load    | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 18\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ on}}$   | 0,023<br>0,023<br>0,023 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 18\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_r$               | 0,029<br>0,033<br>0,034 |      | $\mu\text{s}$<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   | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 18\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ off}}$  | 0,14<br>0,16<br>0,17    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 18\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_f$               | 0,10<br>0,14<br>0,15    |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 900\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 18\text{ }\Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{on}$            | 0,38<br>0,48<br>0,52    |      | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4200\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 18\text{ }\Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{off}$           | 0,44<br>0,57<br>0,60    |      | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                                 | $t_P \leq 8\text{ }\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 140<br>100              |      | A<br>A                                          |
| 结 - 外壳热阻<br>Thermal resistance, junction to case      | 每个 IGBT / per IGBT                                                                                                                                                                              |                                                                                                                               | $R_{thJC}$          | 1,00                    | 1,10 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink    | 每个 IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$                                              |                                                                                                                               | $R_{thCH}$          | 0,90                    |      | 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: DK | date of publication: 2013-10-03 |
| approved by: MB | revision: 2.1                   |

初步数据  
Preliminary Data

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 | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 600          | V                                            |
| 连续正向直流电流<br>Continuous DC forward current   |                                                                                                                                              | $I_F$     | 20           | A                                            |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 40           | A                                            |
| $I_{2t}$ -值<br>$I_{2t}$ - value             | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{2t}$  | 49,0<br>45,0 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

特征值 / Characteristic Values

|                                                    |                                                                                                                                          |                                                                                                   | min.               | typ.                 | max. |                                                 |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| 正向电压<br>Forward voltage                            | $I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,60<br>1,55<br>1,50 | 2,00 | V<br>V<br>V                                     |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F = 20\text{ A}, -di_F/dt = 900\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 30,0<br>35,0<br>37,0 |      | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                           | $I_F = 20\text{ A}, -di_F/dt = 900\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 1,25<br>2,30<br>2,70 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy            | $I_F = 20\text{ A}, -di_F/dt = 900\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,21<br>0,42<br>0,52 |      | mJ<br>mJ<br>mJ                                  |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                        |                                                                                                   | $R_{thJC}$         | 1,40                 | 1,55 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$      |                                                                                                   | $R_{thCH}$         | 0,90                 |      | 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 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$      | $\Delta R/R$ | -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: DK | date of publication: 2013-10-03 |
| approved by: MB | revision: 2.1                   |

## 初步数据 Preliminary Data

### 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    |                      | 11,5<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    |                      | 10,0<br>5,0                    | mm           |
| 相对电痕指数<br>Comperative tracking index                              |                                                                    | CTI                  | > 200                          |              |
|                                                                   |                                                                    |                      |                                |              |
| 杂散电感,模块<br>Stray inductance module                                |                                                                    | L <sub>sCE</sub>     | min. 25                        | typ. max. 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> | 4,50                           | mΩ           |
| 储存温度<br>Storage temperature                                       |                                                                    | T <sub>stg</sub>     | -40                            | 125 °C       |
| Anpresskraft für mech. Bef. pro Feder<br>mounting force per clamp |                                                                    | F                    | 20                             | - 50 N       |
| 重量<br>Weight                                                      |                                                                    | G                    | 24                             | g            |

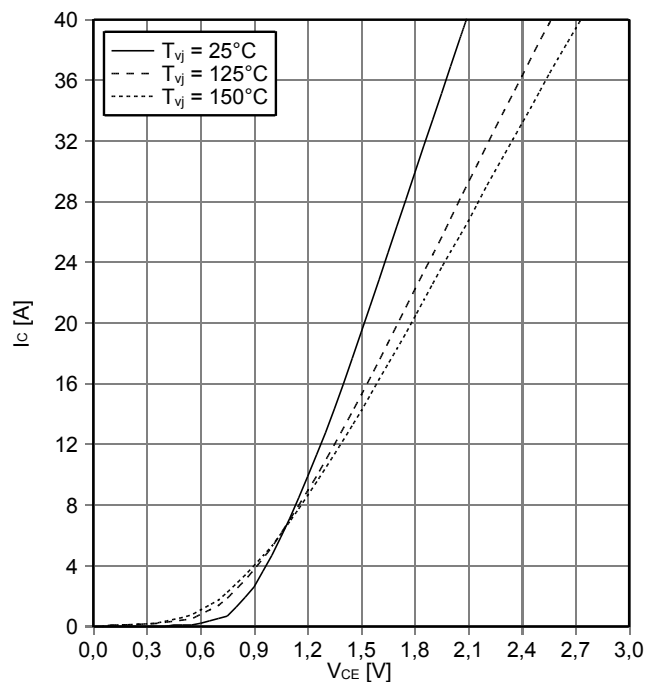
Der Strom im Dauerbetrieb ist auf 30 A effektiv pro Anschlusspin begrenzt  
The current under continuous operation is limited to 30 A rms per connector pin

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-10-03 |
| approved by: MB | revision: 2.1                   |

初步数据  
Preliminary Data

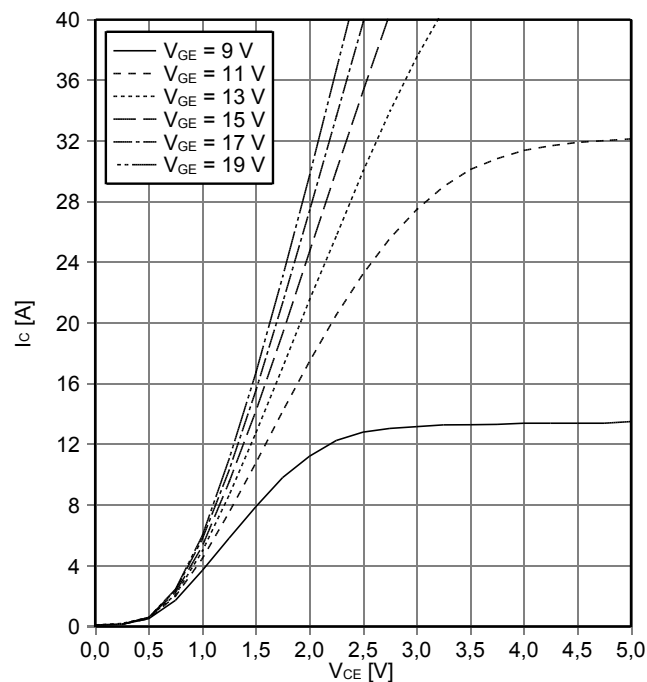
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



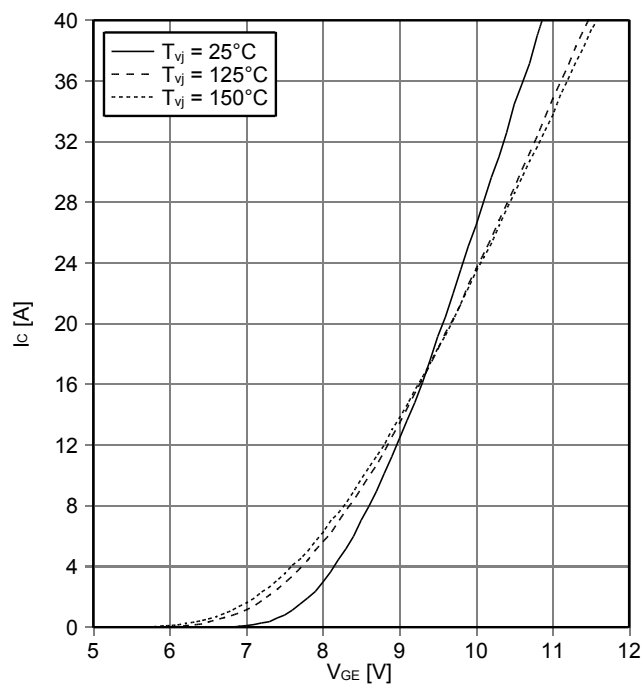
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



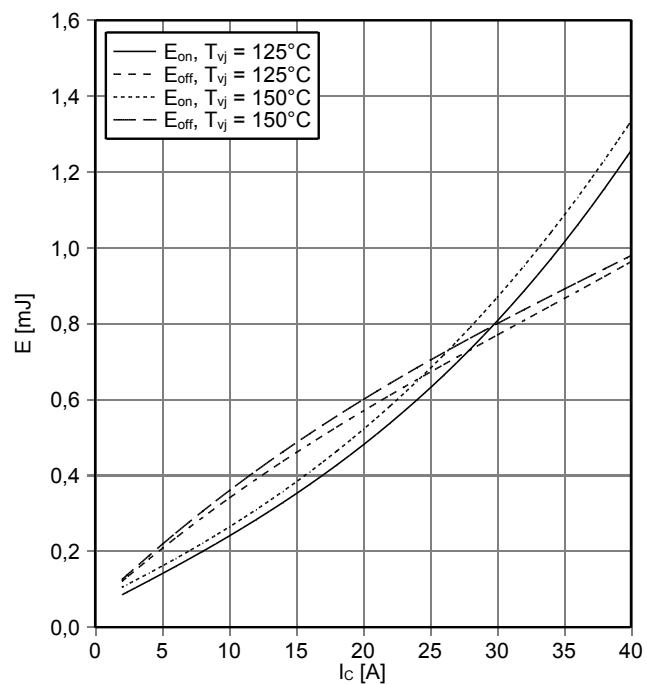
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

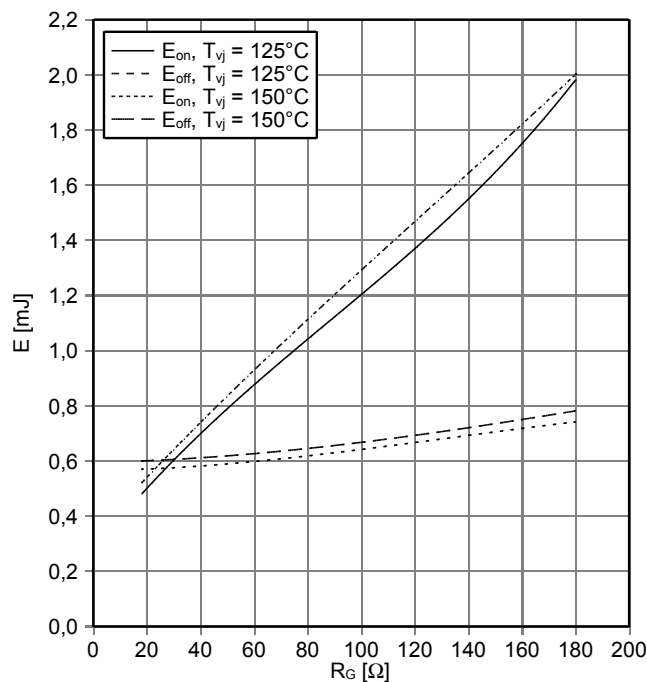
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 18 \Omega$ ,  $R_{Goff} = 18 \Omega$ ,  $V_{CE} = 300 \text{ V}$



初步数据  
Preliminary Data

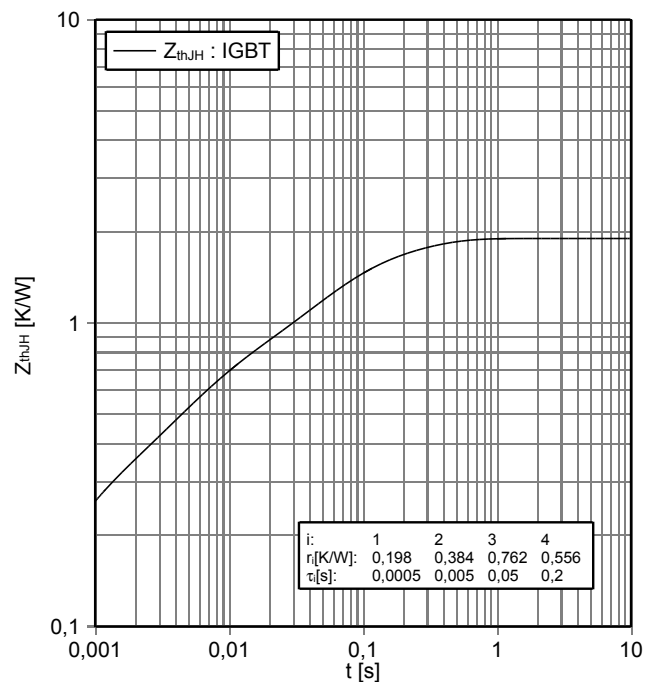
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 20\text{ A}$ ,  $V_{CE} = 300\text{ V}$



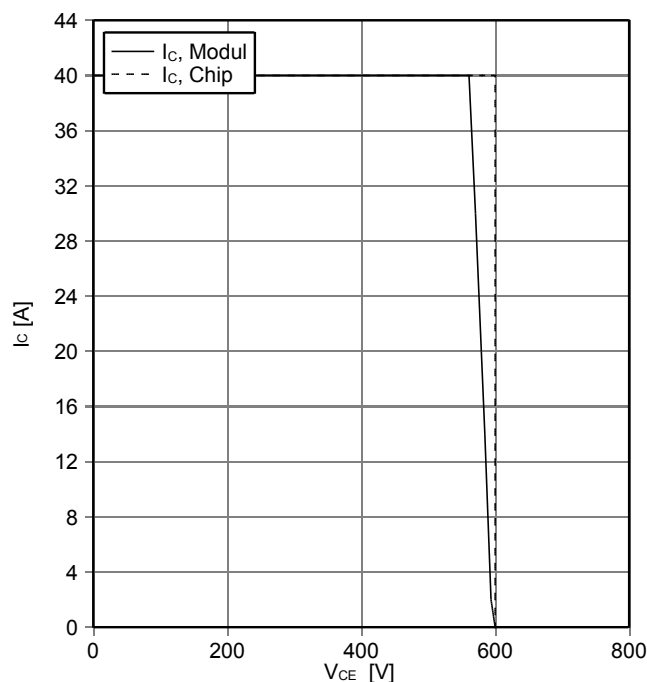
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



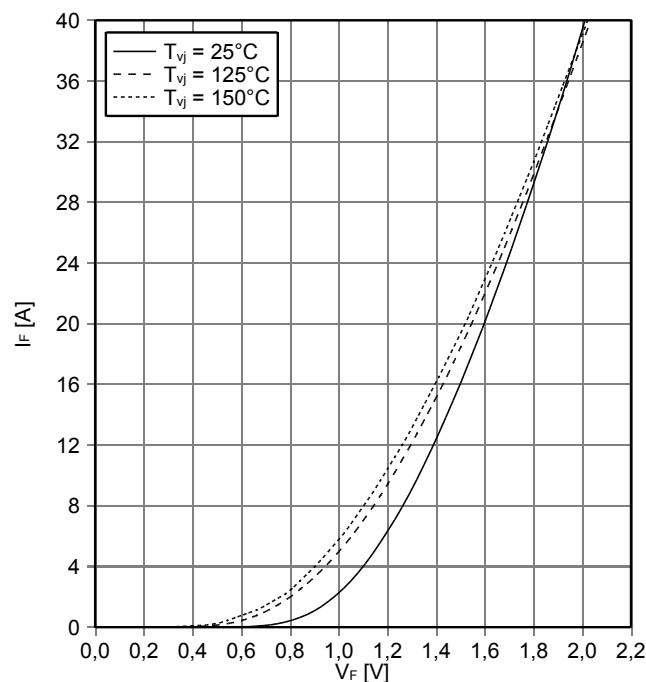
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 18\text{ Ω}$ ,  $T_{vj} = 150^\circ\text{C}$



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

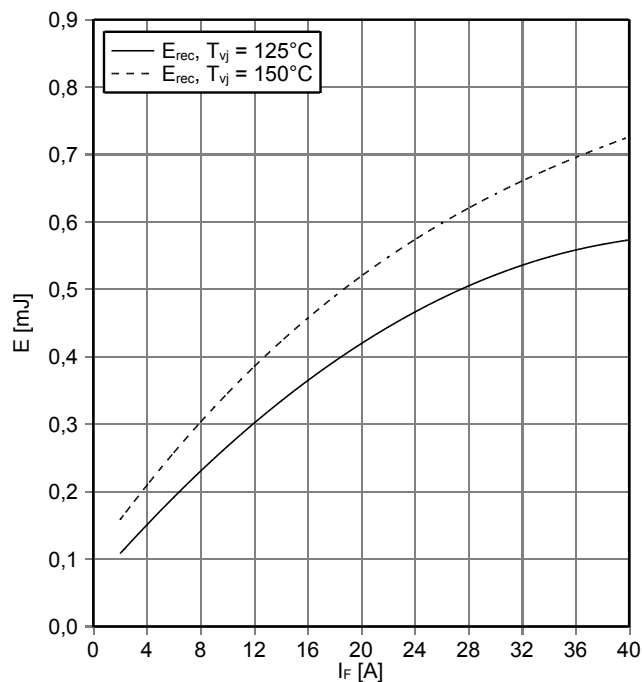
$I_F = f(V_F)$



初步数据  
Preliminary Data

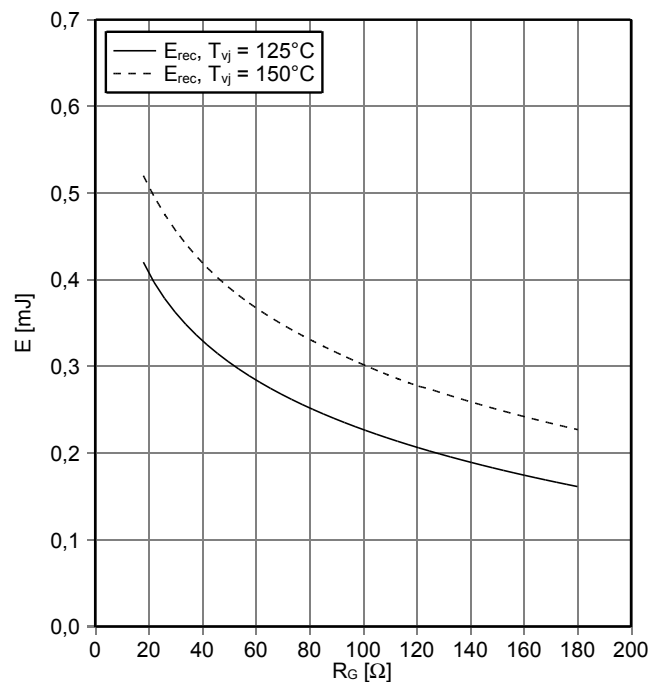
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 18 \Omega$ ,  $V_{CE} = 300 V$



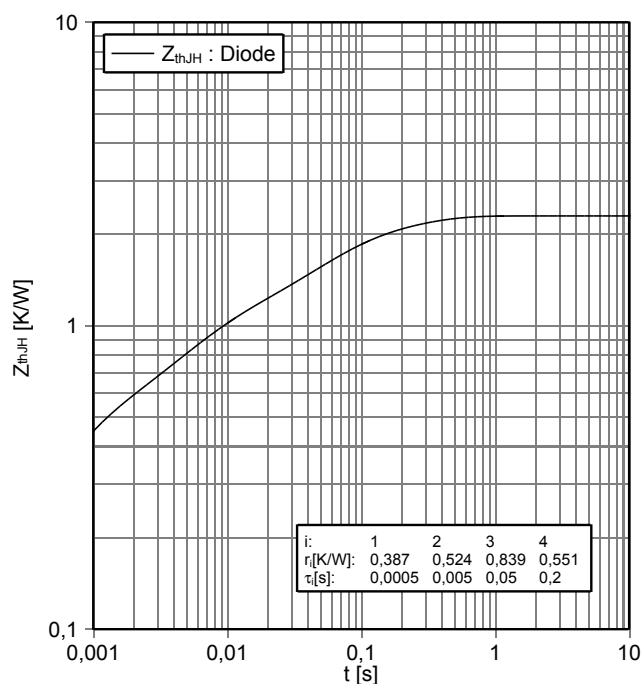
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 20 A$ ,  $V_{CE} = 300 V$



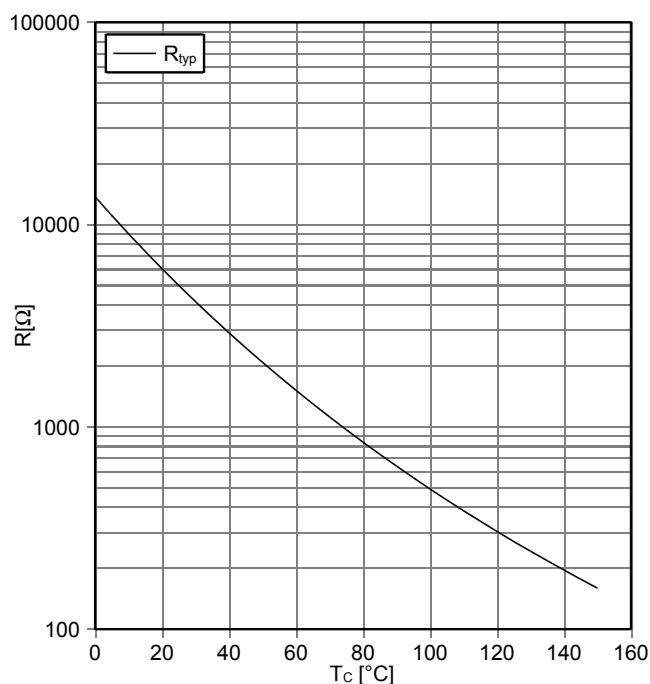
瞬态热阻抗 二极管, 逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



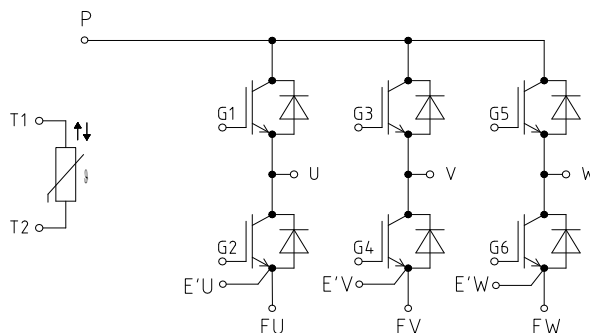
负温度系数热敏电阻 温度特性  
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

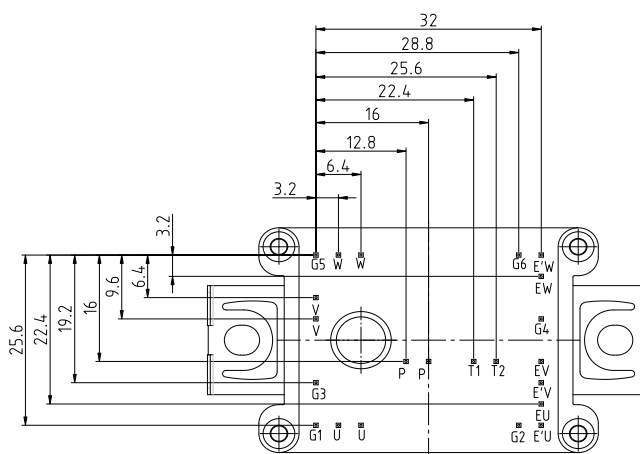
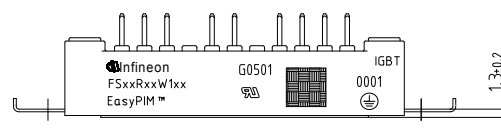
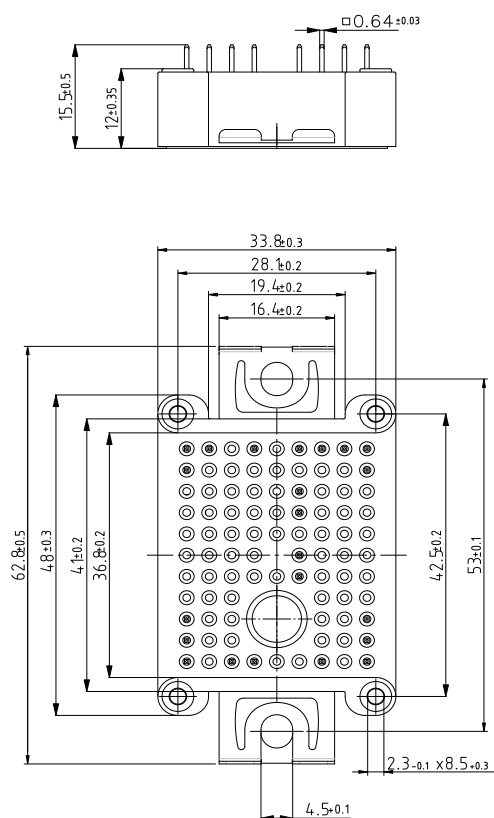


## 初步数据 Preliminary Data

### 接线图 / circuit\_diagram\_headline



## 封装尺寸 / package outlines



Pinpositions with tolerance  $\begin{array}{|c|c|} \hline \oplus & \phi 0.4 \\ \hline \end{array}$

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-10-03 |
| approved by: MB | revision: 2.1                   |

### 初步数据 Preliminary Data

#### 使用条件和条款

##### 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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- the conclusion of Quality Agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

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