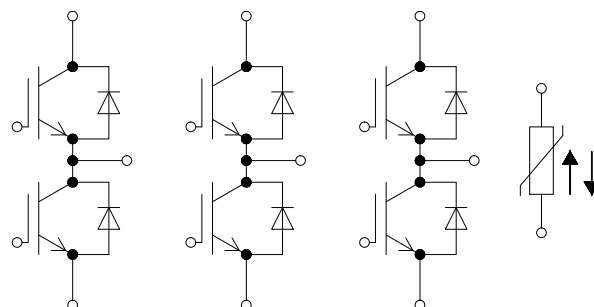


EconoPACK™+ 模块 采用第四代沟槽栅/场终止IGBT4和第三代发射极控制二极管 带有pressfit预涂导热材料  
EconoPACK™+ module with Trench/Fieldstop IGBT4 and Emitter Controlled 3 diode and PressFIT / pre-applied Thermal Interface Material



$V_{CES} = 1700V$

$I_{C\ nom} = 500A / I_{CRM} = 1000A$

## 典型应用

- 辅助逆变器
- 大功率变流器
- 电机传动
- 风力发电机

## 电气特性

- 高短路能力
- 高冲击电流能力
- 无与伦比的坚固性
- $T_{vj\ op} = 150^{\circ}C$
- 沟槽栅IGBT4

## 机械特性

- 高机械坚固性
- 集成NTC温度传感器
- 绝缘的基板
- PressFIT 压接技术
- 符合RoHS
- 预涂导热介质

## Typical Applications

- Auxiliary inverters
- High power converters
- Motor drives
- Wind turbines

## Electrical Features

- High short-circuit capability
- High surge current capability
- Unbeatable robustness
- $T_{vj\ op} = 150^{\circ}C$
- Trench IGBT 4

## Mechanical Features

- High mechanical robustness
- Integrated NTC temperature sensor
- Isolated base plate
- PressFIT contact technology
- RoHS compliant
- Pre-applied Thermal Interface Material

## 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 |

## 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       | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$         | 1700  | V |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_H = 50^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ | 500   | A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$         | 1000  | A |
| 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 | $I_C = 500\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 500\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 500\text{ A}, V_{GE} = 15\text{ V}$                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,95<br>2,35<br>2,45 | 2,30   | V<br>V<br>V                                     |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 20,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                   | $V_{GEth}$         | 5,20                 | 5,80   | 6,40 V                                          |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                  |                                                                                                   | $Q_G$              | 5,10                 |        | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                               |                                                                                                   | $R_{Gint}$         | 1,5                  |        | $\Omega$                                        |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{ies}$          | 40,0                 |        | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{res}$          | 1,30                 |        | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                  |                                                                                                   | $I_{CES}$          |                      | 3,0    | 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    | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,8\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{don}$          | 0,19<br>0,23<br>0,24 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 1,8\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$              | 0,08<br>0,08<br>0,09 |        | $\mu\text{s}$<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   | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,8\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{doff}$         | 0,70<br>0,85<br>0,90 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 1,8\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$              | 0,11<br>0,16<br>0,18 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 6200\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 1,8\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$           | 125<br>165<br>175    |        | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 500\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3100\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 1,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$          | 94,0<br>155<br>175   |        | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                            | $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                          | $I_{SC}$           | 2100                 |        | A                                               |
| 结 - 散热器热阻<br>Thermal resistance, junction to heatsink | 每个 IGBT / per IGBT<br>valid with IFX pre-applied thermal interface material                                                                                                                 |                                                                                                   | $R_{thJH}$         |                      | 0,0852 | K/W                                             |
| 在开关状态下温度<br>Temperature under switching conditions    |                                                                                                                                                                                             |                                                                                                   | $T_{vj\text{op}}$  | -40                  | 150    | $^{\circ}\text{C}$                              |

## 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 | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 1700           | V                                            |
| 连续正向直流电流<br>Continuous DC forward current   |                                                                                                                                              | $I_F$     | 500            | A                                            |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 1000           | 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>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{2t}$  | 41000<br>37000 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

### 特征值 / Characteristic Values

|                                                       |                                                                                                                                            |                                                                                                   | min.               | typ. | max.                 |                                                 |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|-------------------------------------------------|
| 正向电压<br>Forward voltage                               | $I_F = 500\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 500\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 500\text{ A}, V_{GE} = 0\text{ V}$        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              |      | 1,70<br>1,75<br>1,80 | 2,05<br>V<br>V<br>V                             |
| 反向恢复峰值电流<br>Peak reverse recovery current             | $I_F = 500\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 700<br>815<br>855    | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                              | $I_F = 500\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 145<br>240<br>265    | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy               | $I_F = 500\text{ A}, -di_F/dt = 6200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 82,0<br>150<br>170   | mJ<br>mJ<br>mJ                                  |
| 结 - 散热器热阻<br>Thermal resistance, junction to heatsink | 每个二极管 / per diode<br>valid with IFX pre-applied thermal interface material                                                                 |                                                                                                   | $R_{thJH}$         |      |                      | 0,119 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    | $T_{NTC} = 25^{\circ}\text{C}$                                | $R_{25}$     |      | 5,00 |      | k $\Omega$ |
| R100 偏差<br>Deviation of R100 | $T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$  | $\Delta R/R$ | -5   |      | 5    | %          |
| 耗散功率<br>Power dissipation    | $T_{NTC} = 25^{\circ}\text{C}$                                | $P_{25}$     |      |      | 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.

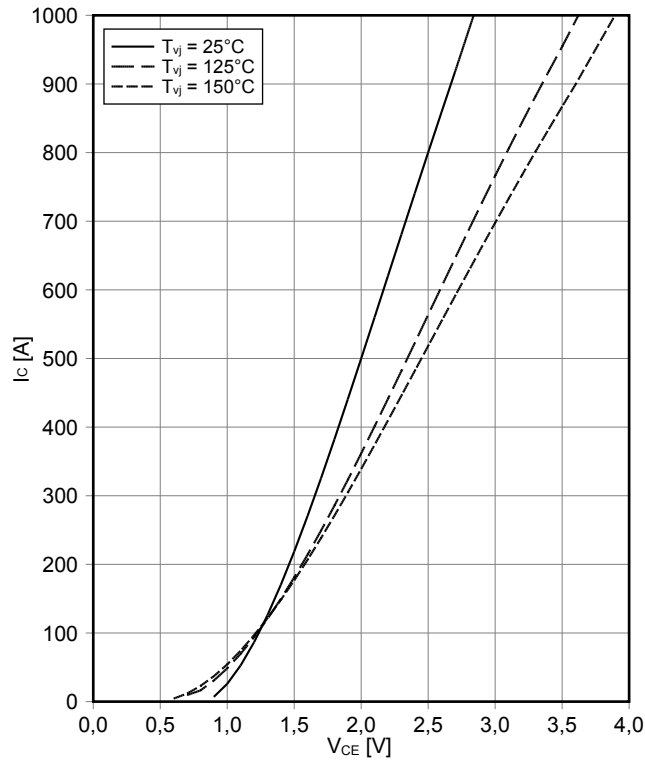
## 模块 / Module

|                                                           |                                                                                |                      |                                |         |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|----------------------|--------------------------------|---------|
| 绝缘测试电压<br>Isolation test voltage                          | RMS, f = 50 Hz, t = 1 min.                                                     | V <sub>ISOL</sub>    | 3,4                            | 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 <sub>2</sub> O <sub>3</sub> |         |
| 爬电距离<br>Creepage distance                                 | 端子至散热器 / terminal to heatsink<br>端子至端子 / terminal to terminal                  |                      | 18,5<br>12,6                   | mm      |
| 电气间隙<br>Clearance                                         | 端子至散热器 / terminal to heatsink<br>端子至端子 / terminal to terminal                  |                      | 16,0<br>10,0                   | 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>     |                                | 20 nH   |
| 模块引线电阻, 端子-芯片<br>Module lead resistance, terminals - chip | T <sub>H</sub> = 25°C, 每个开关 / per switch                                       | R <sub>CC'+EE'</sub> | 1,10                           | mΩ      |
| 储存温度<br>Storage temperature                               |                                                                                | T <sub>stg</sub>     | -40                            | 125 °C  |
| 最高基板工作温度<br>Maximum baseplate operation temperature       |                                                                                | T <sub>BPmax</sub>   |                                | 125 °C  |
| 模块安装的安装扭矩<br>Mounting torque for modul mounting           | 螺丝 M5 根据相应的应用手册进行安装<br>Screw M5 - Mounting according to valid application note | M                    | 3,00                           | 6,00 Nm |
| 端子联接扭矩<br>Terminal connection torque                      | 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                    | 3,0                            | 6,0 Nm  |
| 重量<br>Weight                                              |                                                                                | G                    | 924                            | g       |

Lagerung und Transport von Modulen mit TIM => siehe AN 2012-07  
Storage and shipment of modules with TIM => see AN 2012-07

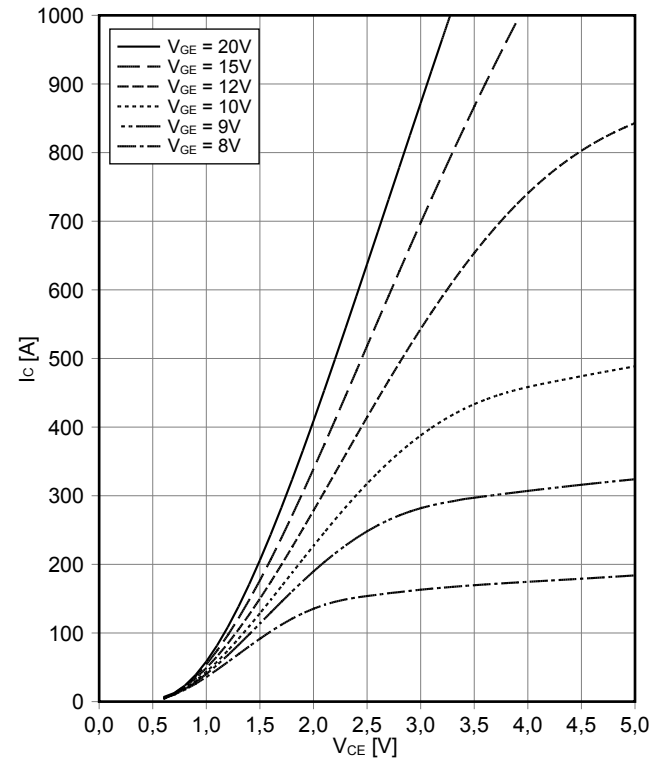
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



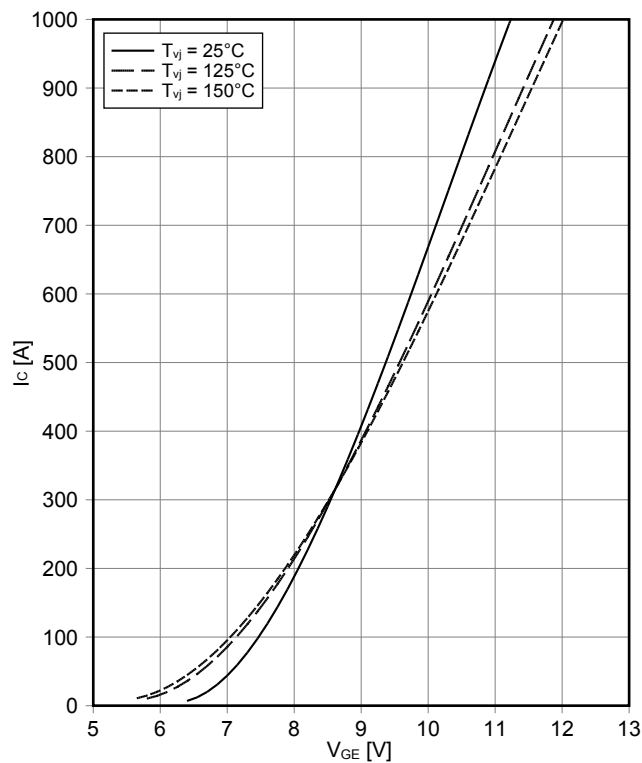
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



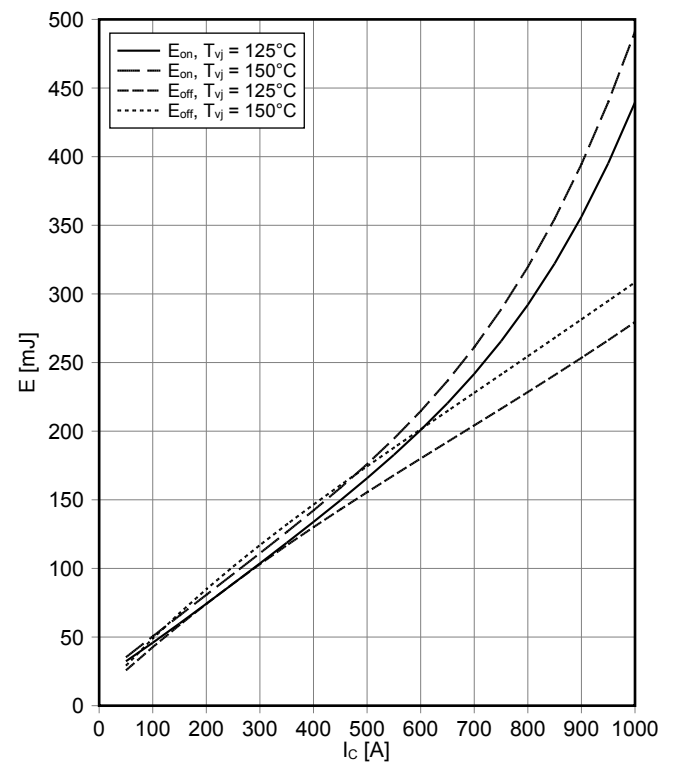
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



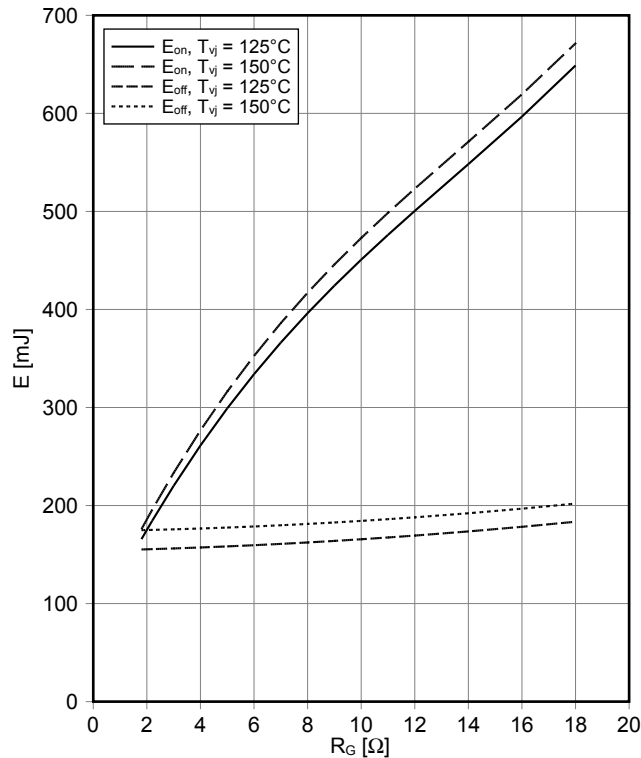
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

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



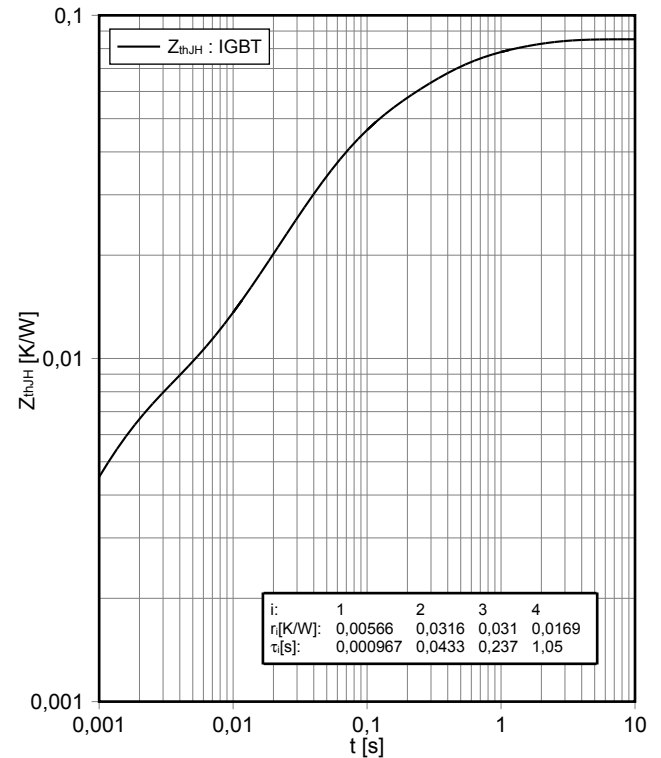
## 开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 500 \text{ A}$ ,  $V_{CE} = 900 \text{ V}$



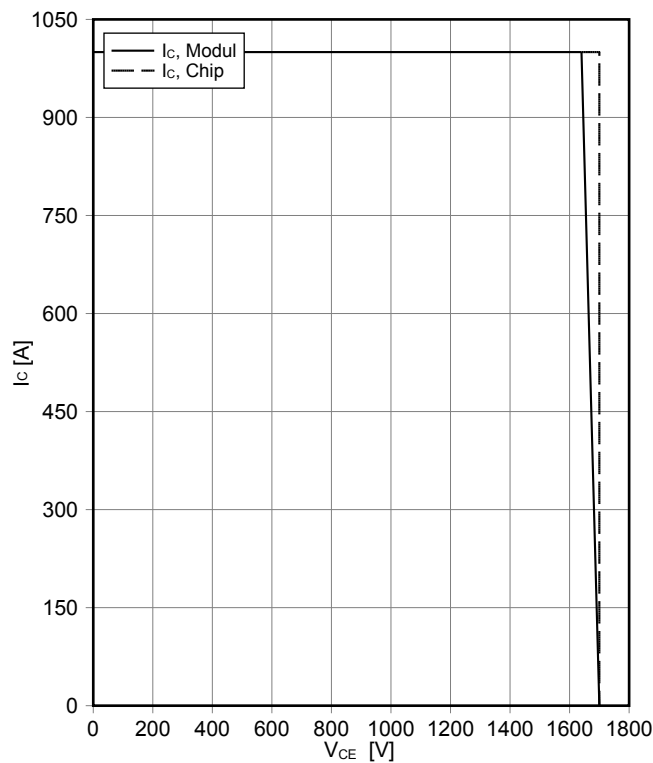
## 瞬态热阻抗 IGBT, 逆变器 transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



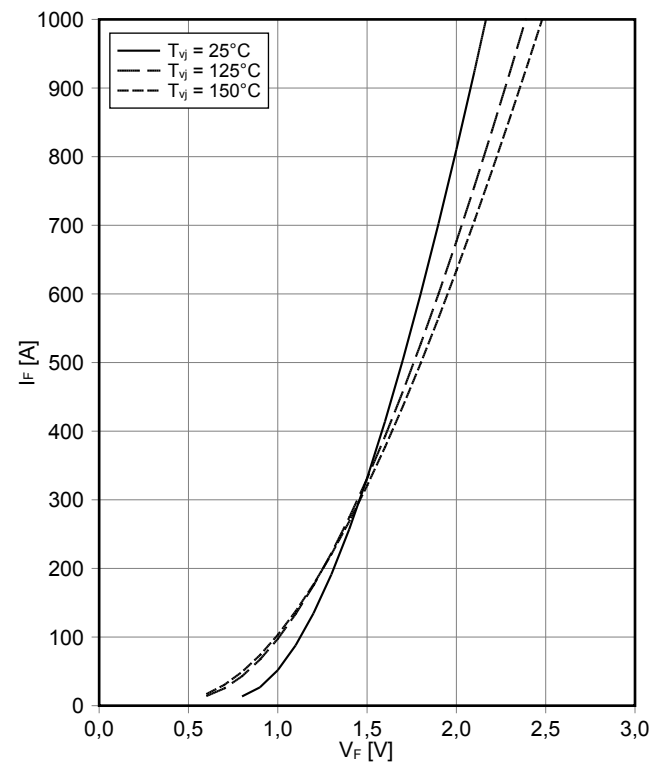
## 反偏安全工作区 IGBT, 逆变器 (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

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



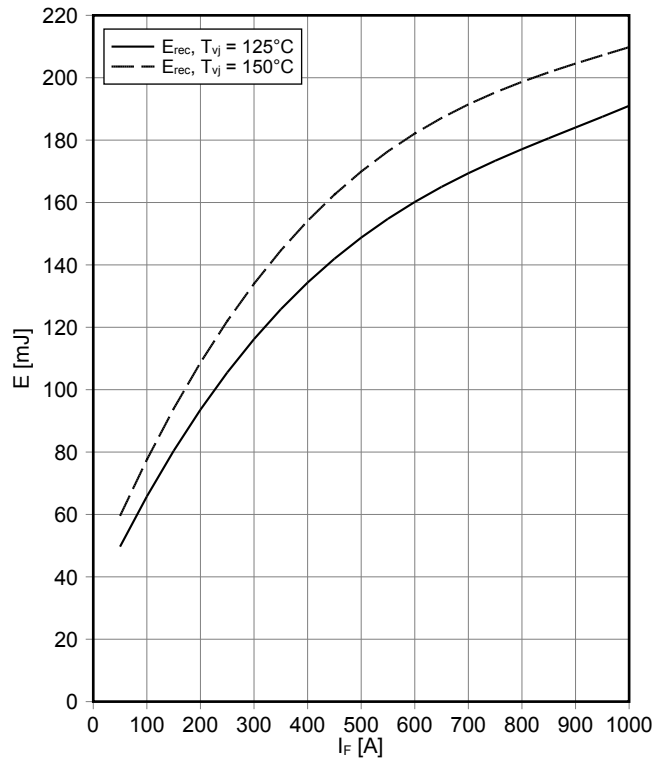
## 正向偏压特性 二极管, 逆变器 (典型) forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



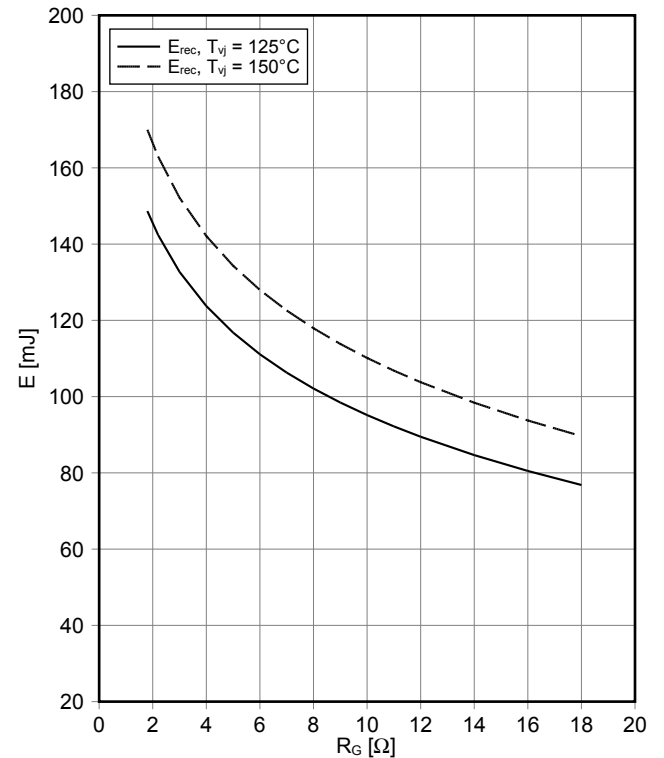
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1.8 \Omega$ ,  $V_{CE} = 900 V$



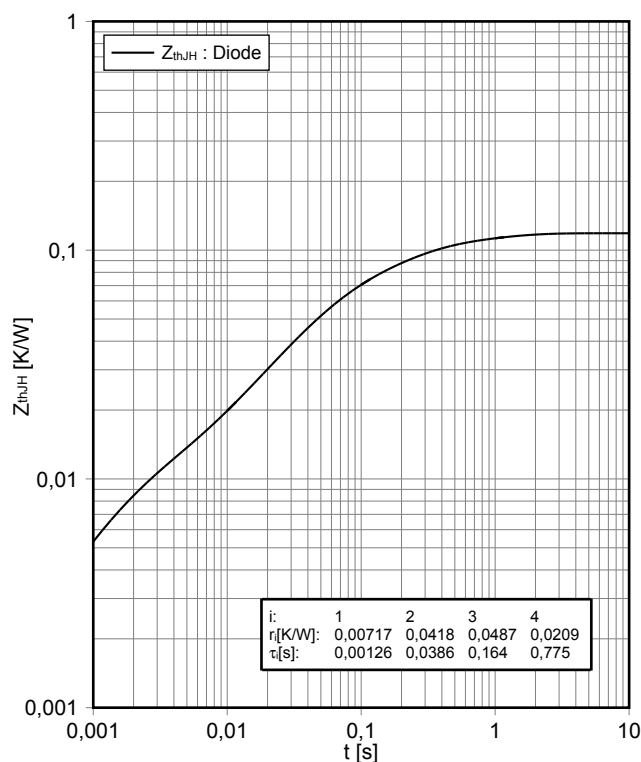
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 500 A$ ,  $V_{CE} = 900 V$



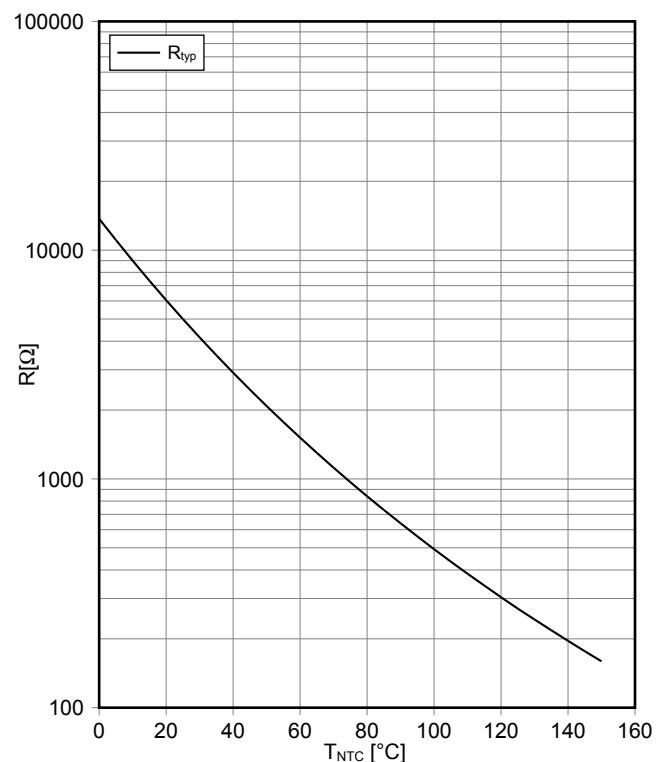
瞬态热阻抗 二极管,逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$

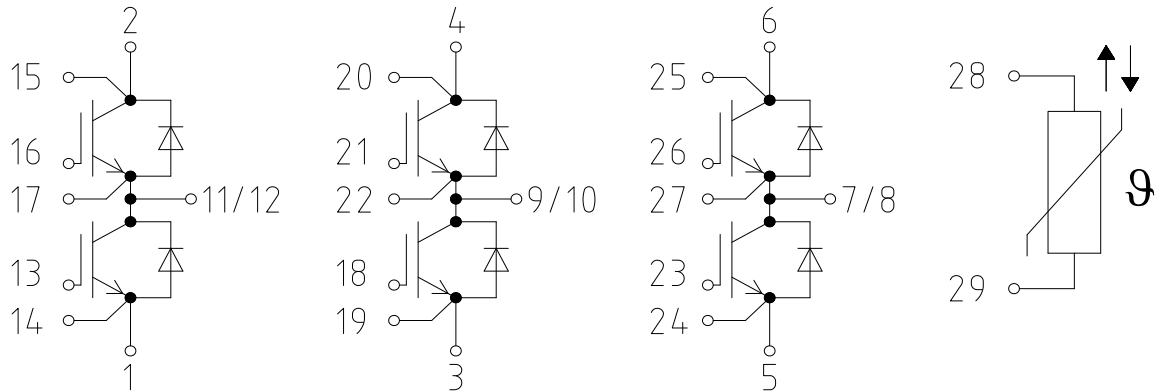


负温度系数热敏电阻 温度特性  
NTC-Thermistor-temperature characteristic (typical)

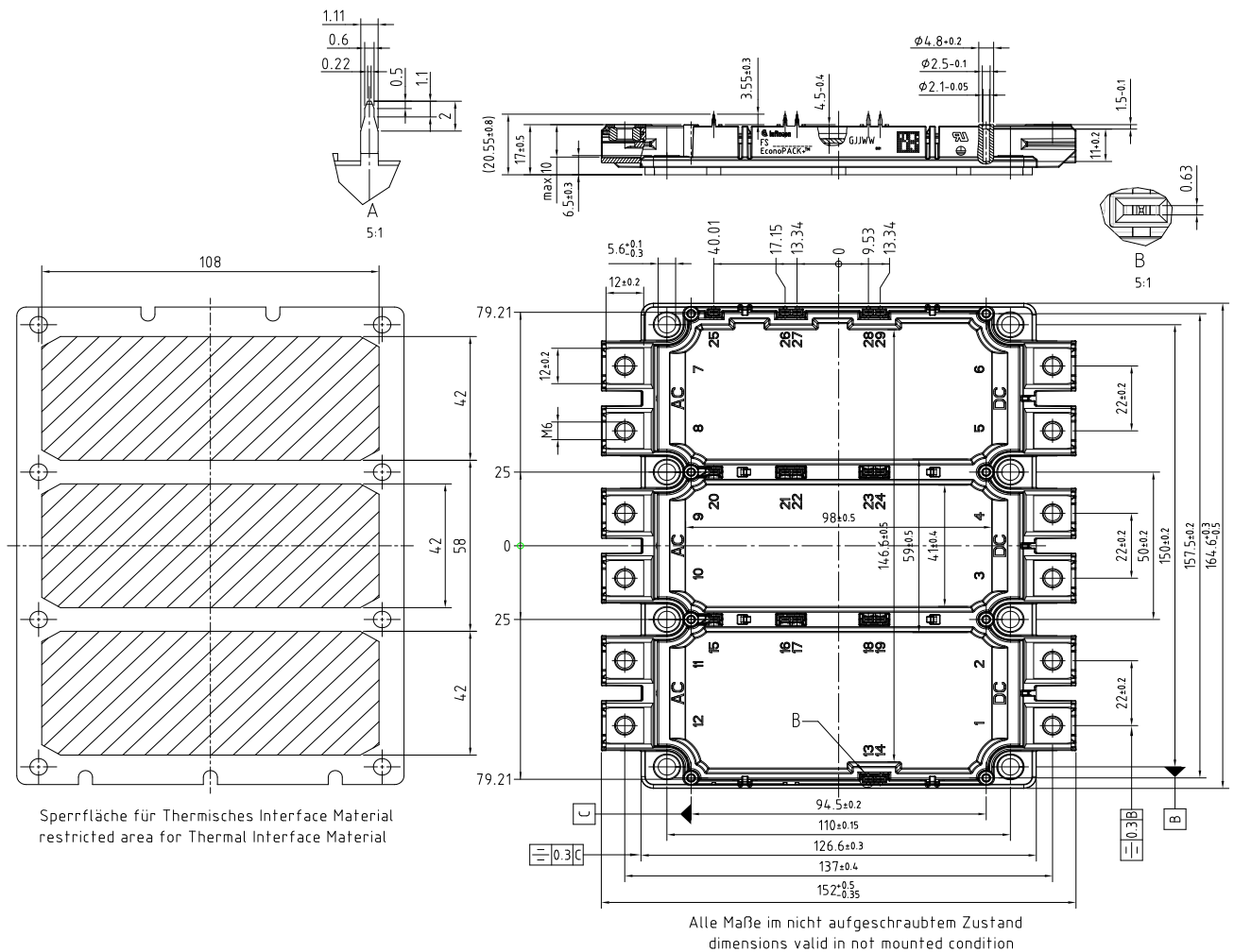
$R = f(T)$



## 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



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