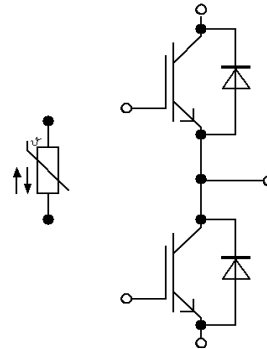
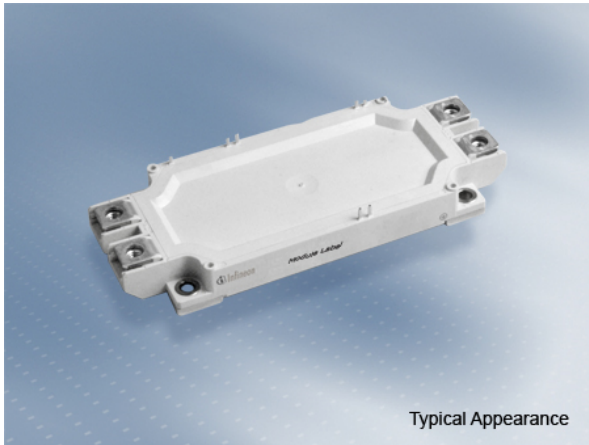


EconoDUAL™3 模块 采用第四代沟槽栅/场终止IGBT4和HE型发射极控制二极管 带有温度检测NTC 和预涂导热介质  
 EconoDUAL™3 module with Trench/Fieldstop IGBT4 and Emitter Controlled HE diode and NTC /  
 pre-applied Thermal Interface Material



$V_{CES} = 1200V$   
 $I_{C\ nom} = 225A / I_{CRM} = 450A$

### 典型应用

- 电机传动
- 伺服驱动器
- UPS系统
- 风力发电机

### 电气特性

- 低  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$

### 机械特性

- 标准封装
- 预涂导热介质

### Typical Applications

- Motor drives
- Servo drives
- UPS systems
- Wind turbines

### Electrical Features

- Low  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$

### Mechanical Features

- Standard housing
- 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       | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$         | 1200  | V |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_H = 70^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ | 225   | A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$         | 450   | 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 | $I_C = 225\text{ A}, V_{GE} = 15\text{ V}$                                                      |                   | 1,85  | 2,15  | V                  |   |
|                                                       | $I_C = 225\text{ A}, V_{GE} = 15\text{ V}$                                                      |                   | 2,10  |       | V                  |   |
|                                                       | $I_C = 225\text{ A}, V_{GE} = 15\text{ V}$                                                      |                   | 2,15  |       | V                  |   |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 7,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                            | $V_{GEth}$        | 5,20  | 5,80  | 6,40               | V |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                      | $Q_G$             | 1,55  |       | $\mu\text{C}$      |   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                   | $R_{Gint}$        | 3,3   |       | $\Omega$           |   |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$      | $C_{ies}$         | 13,0  |       | nF                 |   |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$      | $C_{res}$         | 0,705 |       | nF                 |   |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                      | $I_{CES}$         |       | 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    | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}$                                                     |                   | 0,16  |       | $\mu\text{s}$      |   |
|                                                       | $V_{GE} = \pm 15\text{ V}$                                                                      |                   | 0,17  |       | $\mu\text{s}$      |   |
|                                                       | $R_{Gon} = 1,6\ \Omega$                                                                         |                   | 0,18  |       | $\mu\text{s}$      |   |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}$                                                     |                   | 0,04  |       | $\mu\text{s}$      |   |
|                                                       | $V_{GE} = \pm 15\text{ V}$                                                                      |                   | 0,04  |       | $\mu\text{s}$      |   |
|                                                       | $R_{Gon} = 1,6\ \Omega$                                                                         |                   | 0,04  |       | $\mu\text{s}$      |   |
| 关断延迟时间(电感负载)<br>Turn-off delay time, inductive load   | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}$                                                     |                   | 0,38  |       | $\mu\text{s}$      |   |
|                                                       | $V_{GE} = \pm 15\text{ V}$                                                                      |                   | 0,47  |       | $\mu\text{s}$      |   |
|                                                       | $R_{Goff} = 1,6\ \Omega$                                                                        |                   | 0,50  |       | $\mu\text{s}$      |   |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}$                                                     |                   | 0,07  |       | $\mu\text{s}$      |   |
|                                                       | $V_{GE} = \pm 15\text{ V}$                                                                      |                   | 0,09  |       | $\mu\text{s}$      |   |
|                                                       | $R_{Goff} = 1,6\ \Omega$                                                                        |                   | 0,10  |       | $\mu\text{s}$      |   |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}, L_S = 80\text{ nH}$                                 |                   | 6,80  |       | mJ                 |   |
|                                                       | $V_{GE} = \pm 15\text{ V}, di/dt = 5750\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$    |                   | 12,5  |       | mJ                 |   |
|                                                       | $R_{Gon} = 1,6\ \Omega$                                                                         |                   | 15,0  |       | mJ                 |   |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 225\text{ A}, V_{CE} = 600\text{ V}, L_S = 80\text{ nH}$                                 |                   | 17,0  |       | mJ                 |   |
|                                                       | $V_{GE} = \pm 15\text{ V}, du/dt = 3400\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$    |                   | 26,5  |       | mJ                 |   |
|                                                       | $R_{Goff} = 1,6\ \Omega$                                                                        |                   | 29,5  |       | mJ                 |   |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ | $I_{SC}$          | 900   |       | 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                     | $R_{thJH}$        |       | 0,175 | 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    | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                    | $V_{RRM}$ | 1200          | V                                    |
| 连续正向直流电流<br>Continuous DC forward current      |                                                                                                                                                  | $I_F$     | 225           | A                                    |
| 正向重复峰值电流<br>Repetitive peak forward current    | $t_P = 1 \text{ ms}$                                                                                                                             | $I_{FRM}$ | 450           | A                                    |
| I <sup>2</sup> t-值<br>I <sup>2</sup> t - value | $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 10000<br>8100 | A <sup>2</sup> s<br>A <sup>2</sup> s |

### 特征值 / Characteristic Values

|                                                       |                                                                                                                                                |                                                                                                   | min.        | typ.                 | max.  |                                                 |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------|----------------------|-------|-------------------------------------------------|
| 正向电压<br>Forward voltage                               | $I_F = 225 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 225 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 225 \text{ A}, V_{GE} = 0 \text{ V}$      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$       | 1,65<br>1,65<br>1,65 | 2,10  | V<br>V<br>V                                     |
| 反向恢复峰值电流<br>Peak reverse recovery current             | $I_F = 225 \text{ A}, -di_F/dt = 5750 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$    | 300<br>320<br>340    |       | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                              | $I_F = 225 \text{ A}, -di_F/dt = 5750 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$       | 22,5<br>43,0<br>49,5 |       | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy               | $I_F = 225 \text{ A}, -di_F/dt = 5750 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$   | 12,0<br>22,0<br>25,0 |       | 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                                                                     |                                                                                                   | $R_{thJH}$  |                      | 0,197 | K/W                                             |
| 在开关状态下温度<br>Temperature under switching conditions    |                                                                                                                                                |                                                                                                   | $T_{vj op}$ | -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 | $T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493 \Omega$          | $\Delta R/R$ | -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.

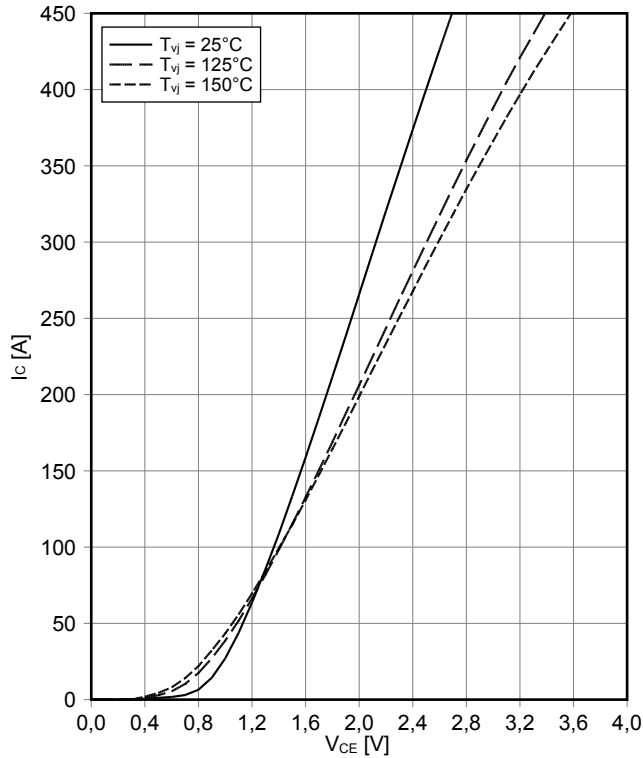
## 模块 / Module

|                                                           |                                                                                |                     |                                |      |         |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|---------------------|--------------------------------|------|---------|
| 绝缘测试电压<br>Isolation test voltage                          | RMS, f = 50 Hz, t = 1 min                                                      | V <sub>ISOL</sub>   | 2,5                            |      | 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                  |                     | 14,5<br>13,0                   |      | 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                  |                     | 12,5<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> |                                | 1,30 | 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                   |                                | 345  | g       |

Lagerung und Transport von Modulen mit TIM => siehe AN2012-07  
Storage and shipment of modules with TIM => see AN2012-07

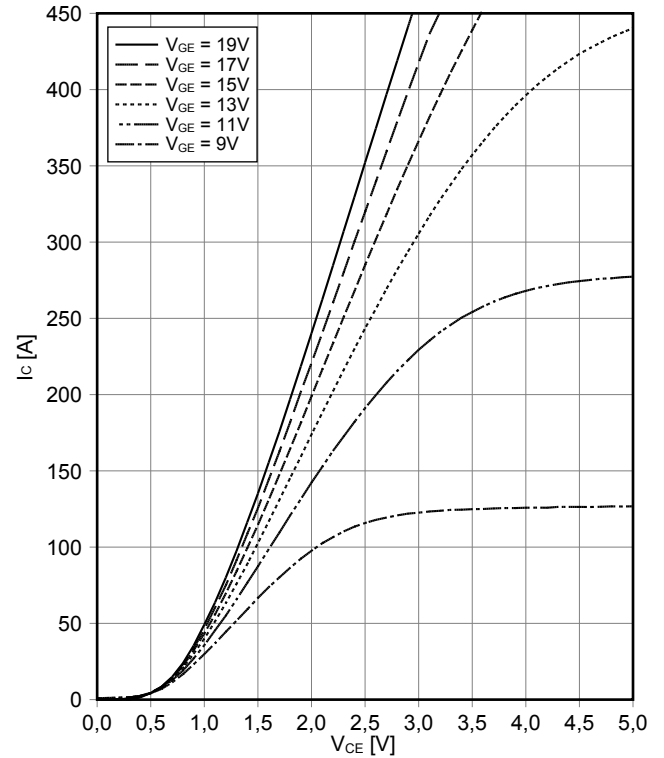
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



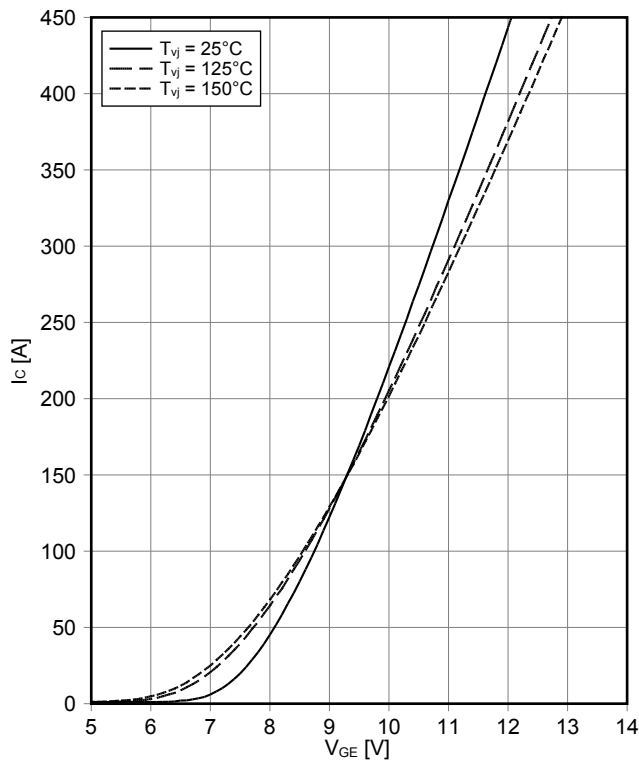
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



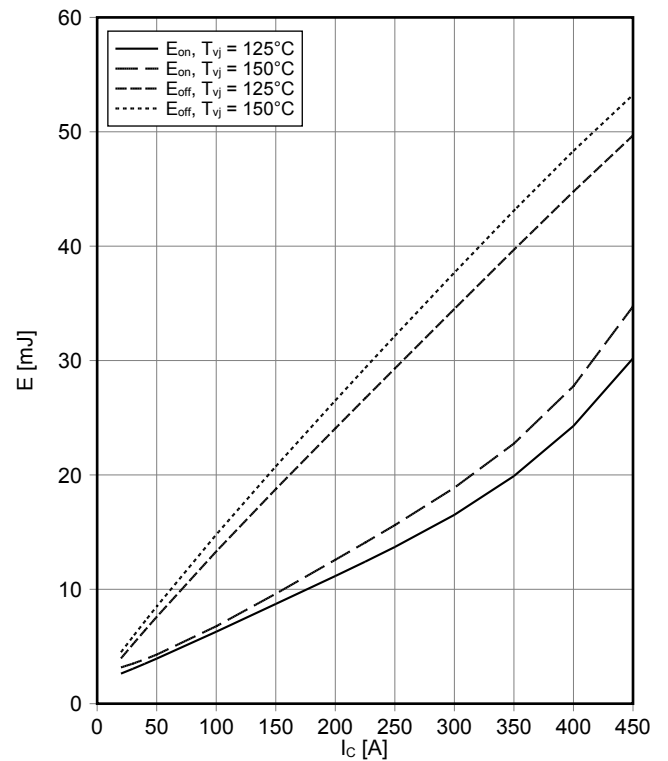
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



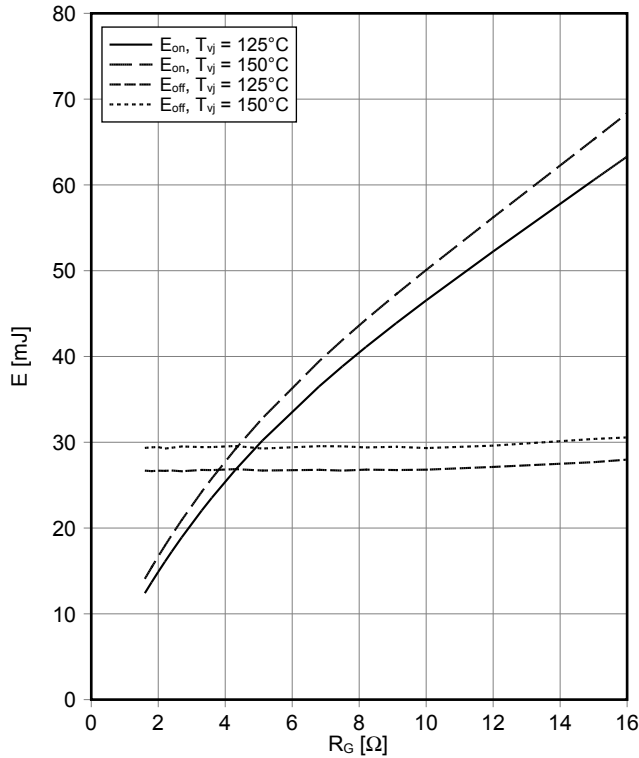
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 1.6\ \Omega$ ,  $R_{Goff} = 1.6\ \Omega$ ,  $V_{CE} = 600\text{ V}$

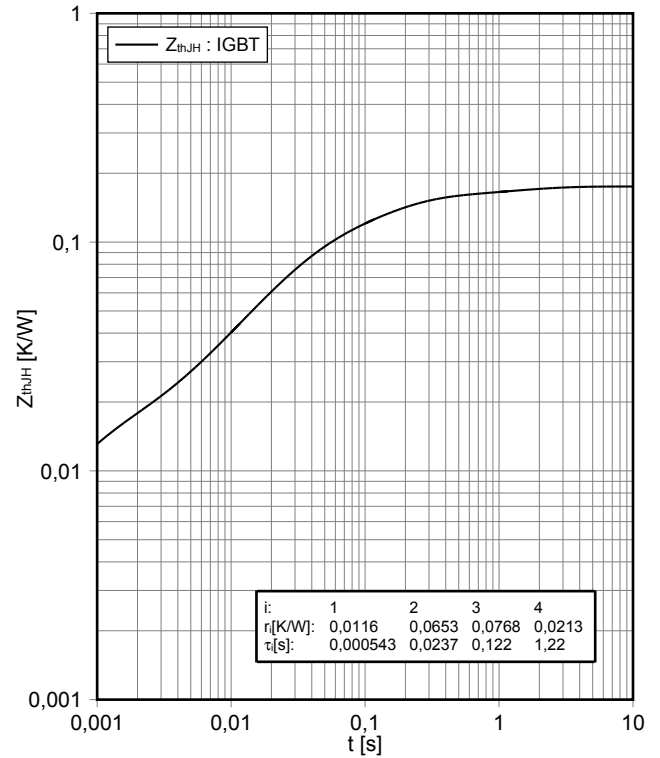


**开关损耗 IGBT, 逆变器 (典型)**  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 225\text{ A}, V_{CE} = 600\text{ V}$

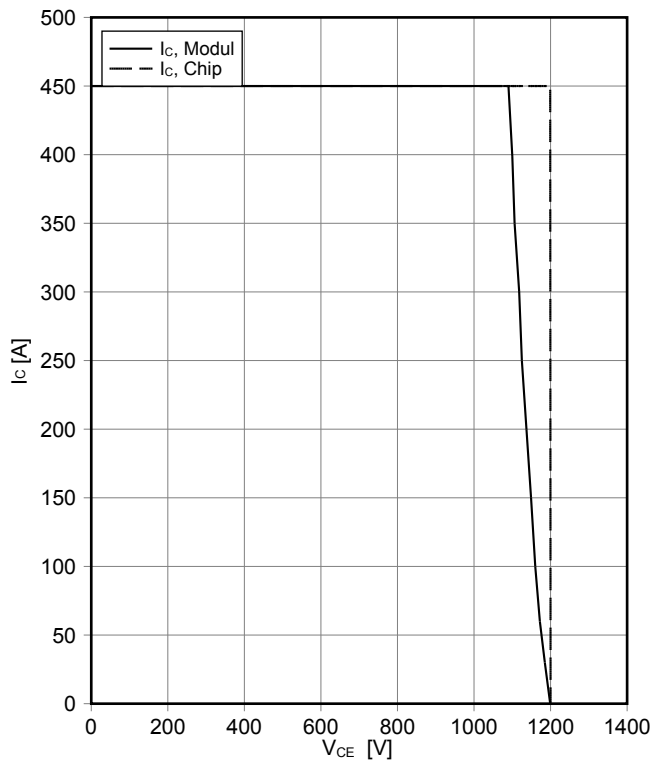


**瞬态热阻抗 IGBT, 逆变器**  
**transient thermal impedance IGBT, Inverter**  
 $Z_{thJH} = f(t)$

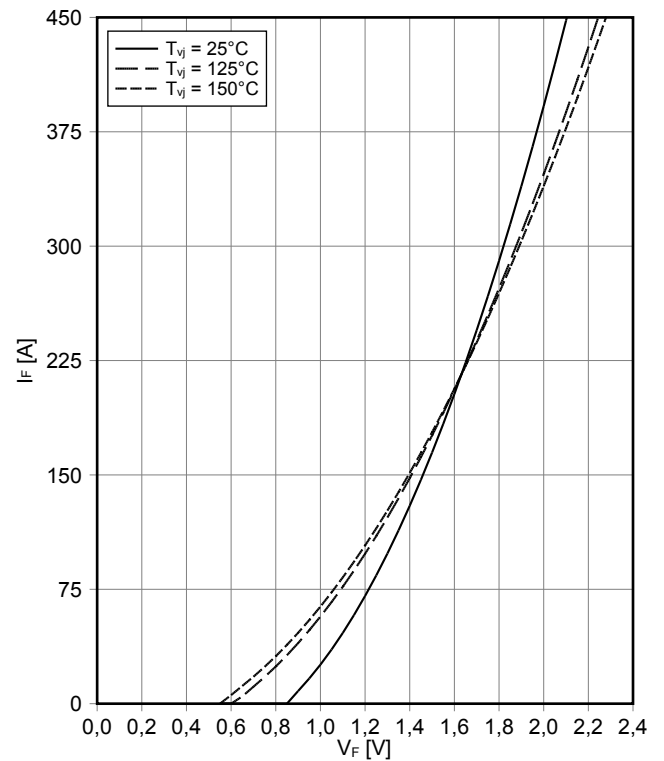


**反偏安全工作区 IGBT, 逆变器 (RBSOA)**  
**reverse bias safe operating area IGBT, Inverter (RBSOA)**

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.6\ \Omega, T_{vj} = 150^\circ\text{C}$

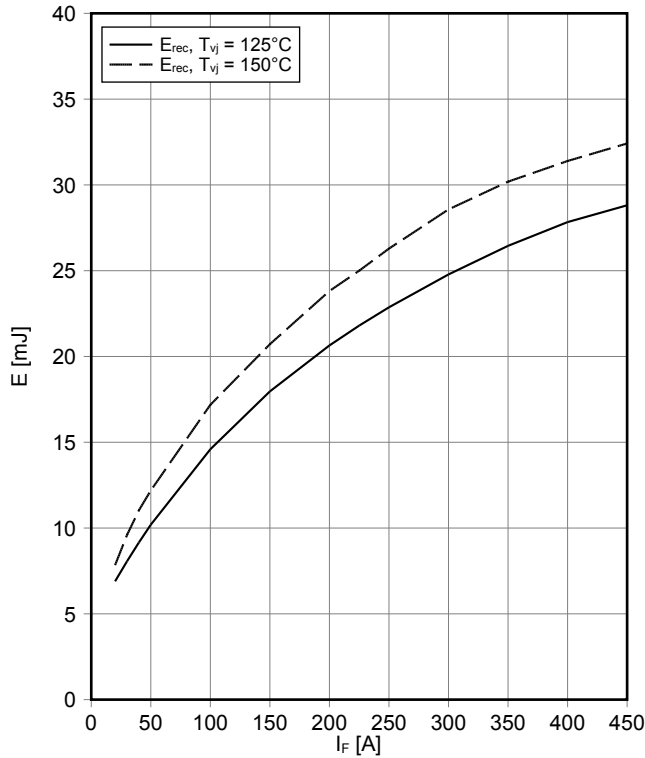


**正向偏压特性 二极管, 逆变器 (典型)**  
**forward characteristic of Diode, Inverter (typical)**  
 $I_F = f(V_F)$



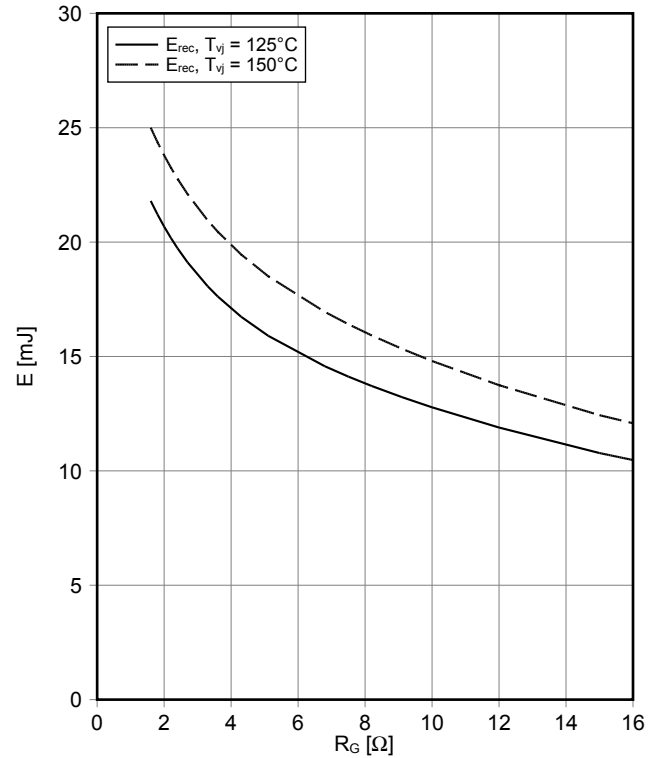
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1.6 \Omega, V_{CE} = 600 V$



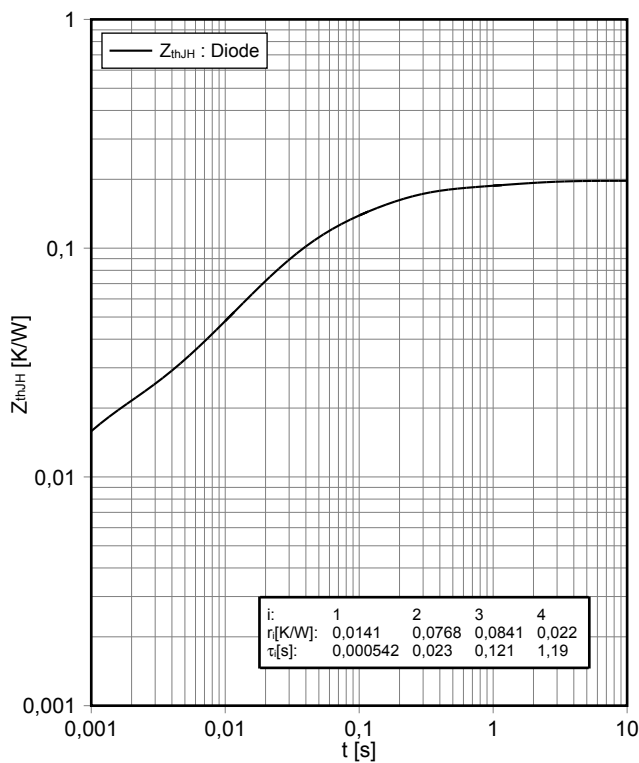
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 225 A, V_{CE} = 600 V$



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

$Z_{thJH} = f(t)$

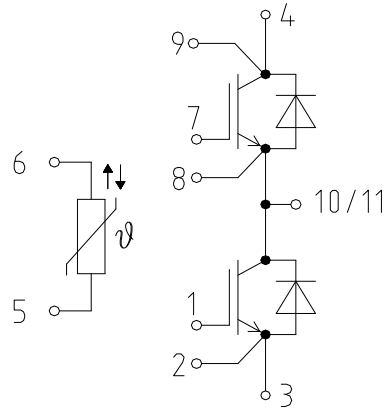


负温度系数热敏电阻 温度特性  
NTC-Thermistor-temperature characteristic (typical)

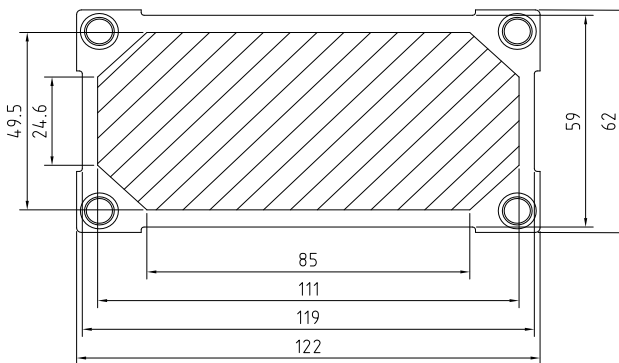
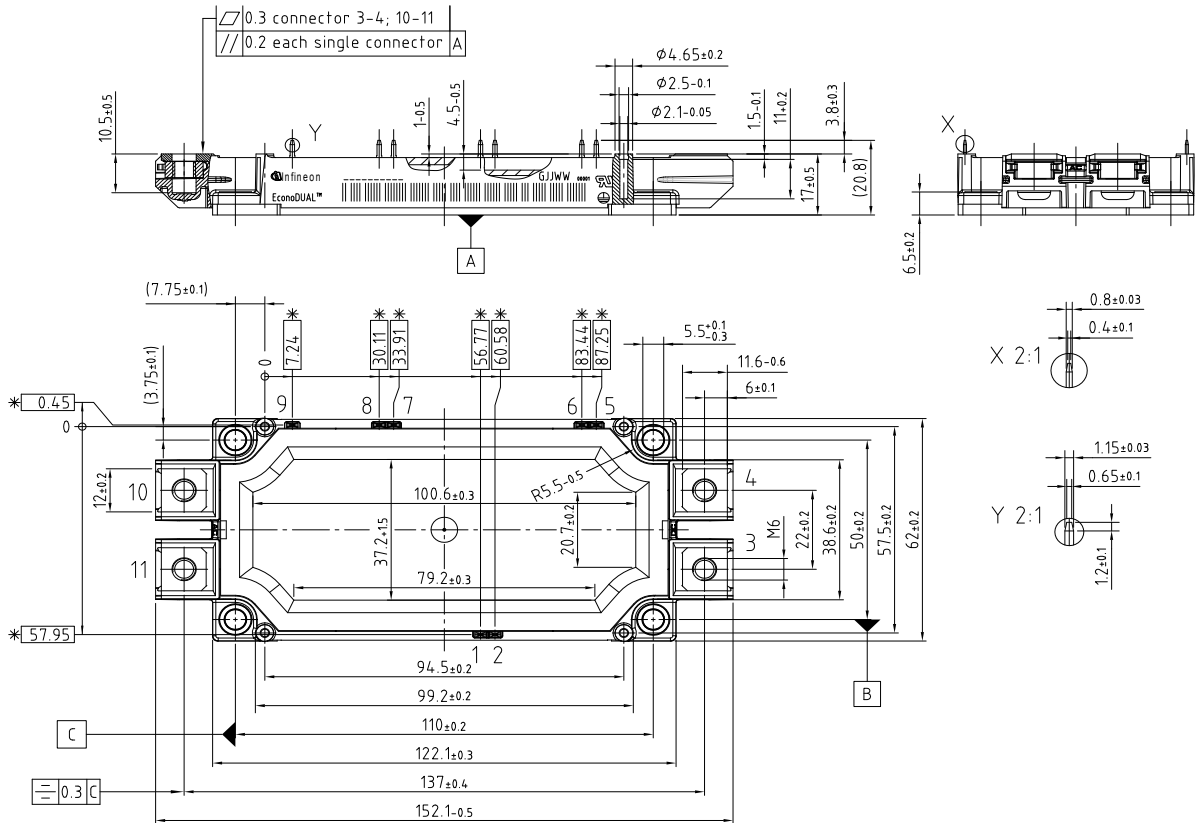
$R = f(T)$



## 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



restricted area for Thermal Interface Material