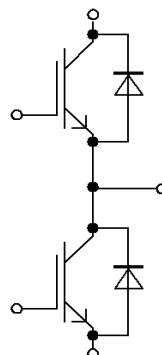
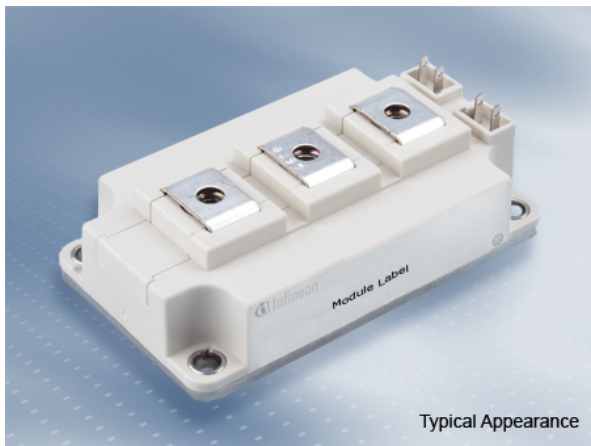


62mm C-Series 模块 采用第四代沟槽栅/场终止IGBT4和第三代发射极控制二极管  
62mm C-Series module with Trench/Fieldstop IGBT4 and Emitter Controlled 3 diode

## 初步数据 / Preliminary Data



$V_{CES} = 1700V$   
 $I_{C\ nom} = 400A / I_{CRM} = 800A$

## 典型应用

- 大功率变流器
- 电机传动
- UPS系统
- 风力发电机

## Typical Applications

- High power converters
- Motor drives
- UPS systems
- Wind turbines

## 电气特性

- 提高工作结温  $T_{vj\ op}$
- 低  $V_{CESat}$
- 无与伦比的坚固性
- $V_{CESat}$  带正温度系数

## Electrical Features

- Extended operating temperature  $T_{vj\ op}$
- Low  $V_{CESat}$
- Unbeatable robustness
- $V_{CESat}$  with positive temperature coefficient

## 机械特性

- 4 kV 交流 1分钟 绝缘
- 封装的 CTI > 400
- 高爬电距离和电气间隙
- 绝缘的基板
- 标准封装

## Mechanical Features

- 4 kV AC 1min insulation
- Package with CTI > 400
- High creepage and clearance distances
- Isolated base plate
- Standard housing

## Module Label Code

### Barcode Code 128



### DMX - Code



### Content of the Code

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

|                  |                                 |  |
|------------------|---------------------------------|--|
| prepared by: AKB | date of publication: 2016-07-13 |  |
| approved by: MK  | revision: V2.0                  |  |

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       | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$          | 1700  | V |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_C = 95^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 400   | A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$          | 800   | 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 | $I_C = 400\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$                                                       | $T_{vj} = 25^{\circ}\text{C}$<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                      | $I_C = 16,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                         |                                                                                                   | $V_{GEth}$          | 5,35                 | 5,80   | 6,25 V                                          |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                   |                                                                                                   | $Q_G$               | 4,10                 |        | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                |                                                                                                   | $R_{Gint}$          | 1,9                  |        | $\Omega$                                        |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                   |                                                                                                   | $C_{ies}$           | 36,0                 |        | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                   |                                                                                                   | $C_{res}$           | 1,15                 |        | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                   |                                                                                                   | $I_{CES}$           |                      | 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    | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 0,82\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{don}$           | 0,24<br>0,26<br>0,27 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 0,82\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,04<br>0,05<br>0,05 |        | $\mu\text{s}$<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   | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 0,82\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{doff}$          | 0,50<br>0,64<br>0,68 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 0,82\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,09<br>0,15<br>0,17 |        | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 8000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 0,82\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 89,0<br>125<br>140   |        | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 400\text{ A}, V_{CE} = 900\text{ V}, L_S = 35\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3200\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 0,82\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 73,0<br>120<br>130   |        | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$<br>$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                 |                                                                                                   | $I_{SC}$            | 1800                 |        | A                                               |
| 结 - 外壳热阻<br>Thermal resistance, junction to case      | 每个 IGBT / per IGBT                                                                                                                                                                           |                                                                                                   | $R_{thJC}$          |                      | 0,0632 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink    | 每个 IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$                                                         |                                                                                                   | $R_{thCH}$          | 0,0271               |        | 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: AKB

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revision: V2.0

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 | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 1700           | V                                            |
| 连续正向直流电流<br>Continuous DC forward current   |                                                                                                                                              | $I_F$     | 400            | A                                            |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 800            | 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>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{2t}$  | 33000<br>28500 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

特征值 / Characteristic Values

|                                                    |                                                                                                                                            |                                                                                                   | min.               | typ. | max.                 |                                                 |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|------|----------------------|-------------------------------------------------|
| 正向电压<br>Forward voltage                            | $I_F = 400\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 400\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 400\text{ A}, V_{GE} = 0\text{ V}$        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              |      | 1,80<br>1,90<br>1,95 | 2,20<br>V<br>V<br>V                             |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F = 400\text{ A}, -di_F/dt = 8000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           |      | 605<br>630<br>640    | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                           | $I_F = 400\text{ A}, -di_F/dt = 8000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              |      | 105<br>170<br>190    | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy            | $I_F = 400\text{ A}, -di_F/dt = 8000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          |      | 55,5<br>97,0<br>110  | mJ<br>mJ<br>mJ                                  |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                          |                                                                                                   | $R_{thJC}$         |      |                      | 0,106 K/W                                       |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$      |                                                                                                   | $R_{thCH}$         |      | 0,0260               | K/W                                             |
| 在开关状态下温度<br>Temperature under switching conditions |                                                                                                                                            |                                                                                                   | $T_{vj\text{ op}}$ | -40  |                      | 150 $^{\circ}\text{C}$                          |

初步数据  
Preliminary Data

模块 / Module

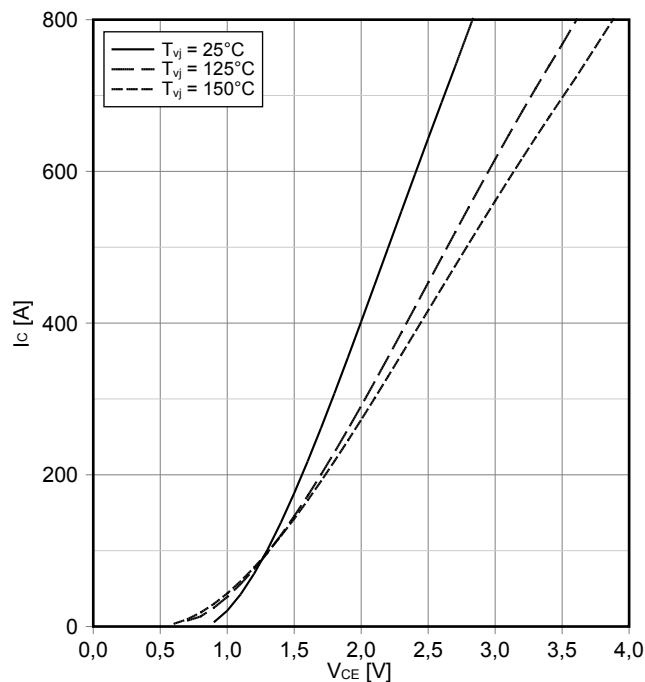
|                                                          |                                                                                |                      |                                |      |      |    |
|----------------------------------------------------------|--------------------------------------------------------------------------------|----------------------|--------------------------------|------|------|----|
| 绝缘测试电压<br>Isolation test voltage                         | RMS, f = 50 Hz, t = 1 min.                                                     | V <sub>ISOL</sub>    | 4,0                            | 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                  |                      | 29,0<br>23,0                   | 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                  |                      | 23,0<br>11,0                   | mm   |      |    |
| 相对电痕指数<br>Comperative tracking index                     |                                                                                | CTI                  | > 400                          |      |      |    |
| 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>C</sub> = 25°C, 每个开关 / per switch                                       | R <sub>CC'+EE'</sub> |                                | 0,41 |      | mΩ |
| 储存温度<br>Storage temperature                              |                                                                                | T <sub>stg</sub>     | -40                            |      | 125  | °C |
| 模块安装的安装扭距<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                    | 3,00                           |      | 6,00 | Nm |
| 端子联接扭距<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                    | 2,5                            | -    | 5,0  | Nm |
| 重量<br>Weight                                             |                                                                                | G                    |                                | 340  |      | g  |

|                  |                                 |
|------------------|---------------------------------|
| prepared by: AKB | date of publication: 2016-07-13 |
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初步数据  
Preliminary Data

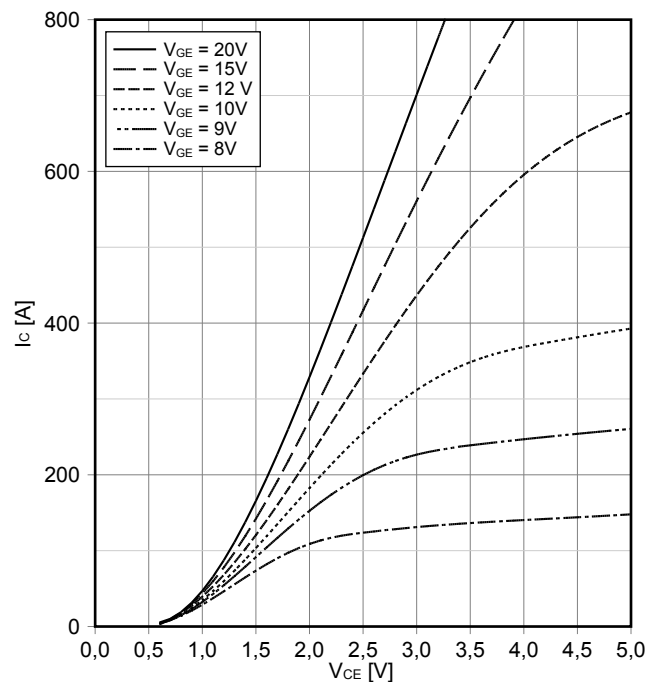
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



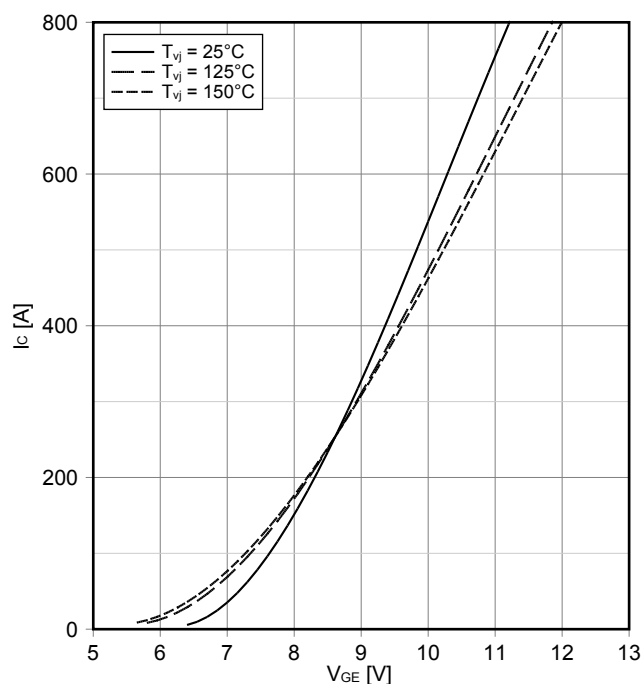
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



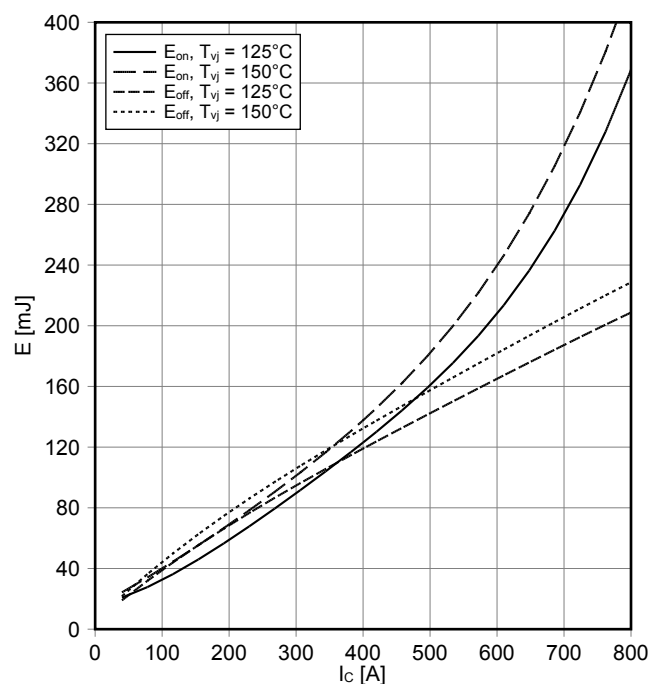
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 0.82\ \Omega$ ,  $R_{Goff} = 0.82\ \Omega$ ,  $V_{CE} = 900\text{ V}$

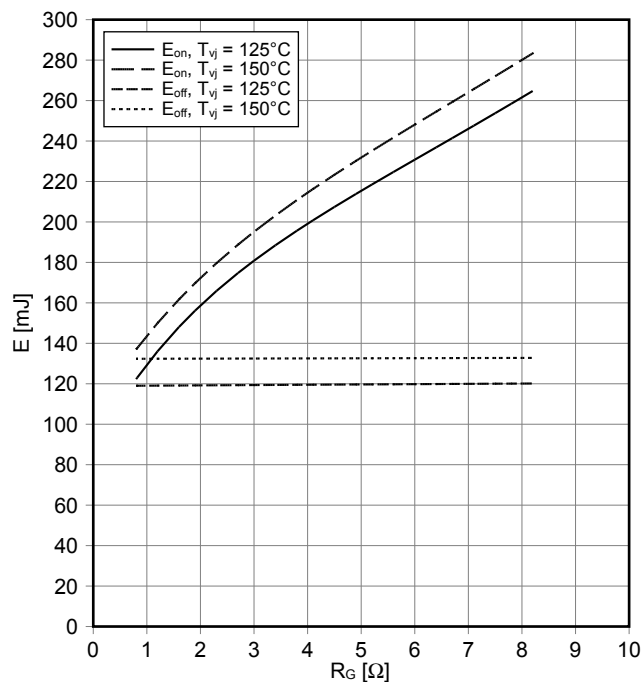


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|------------------|---------------------------------|
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| approved by: MK  | revision: V2.0                  |

初步数据  
Preliminary Data

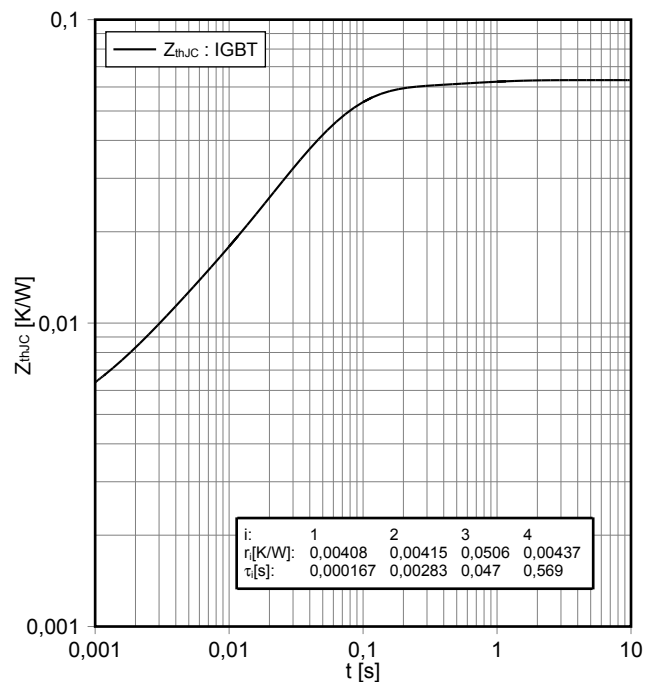
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 400 \text{ A}$ ,  $V_{CE} = 900 \text{ V}$



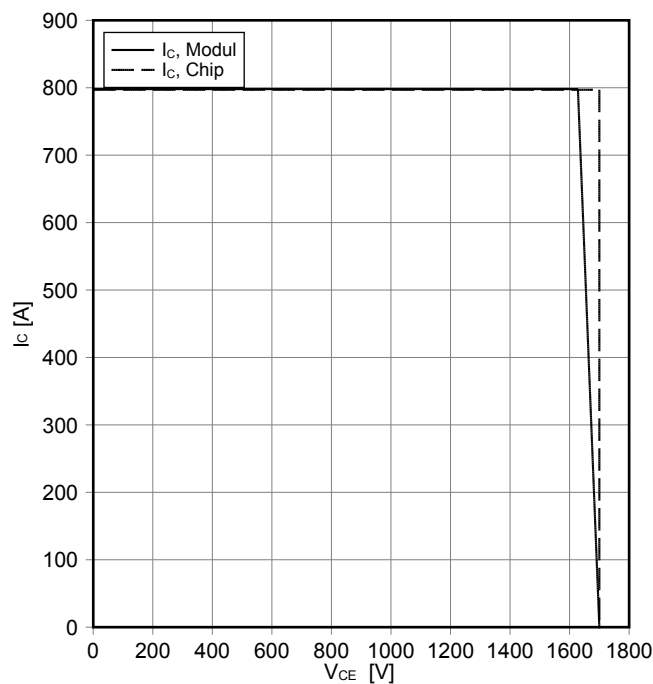
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



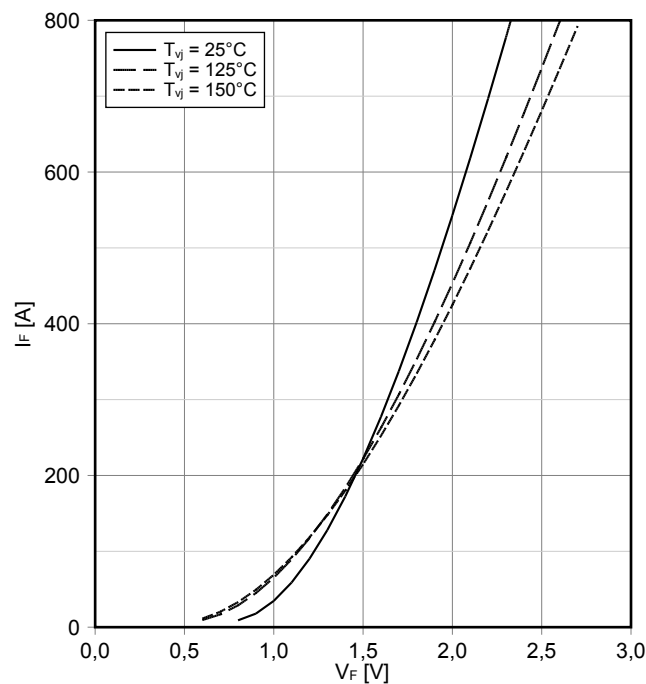
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 0.82 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$

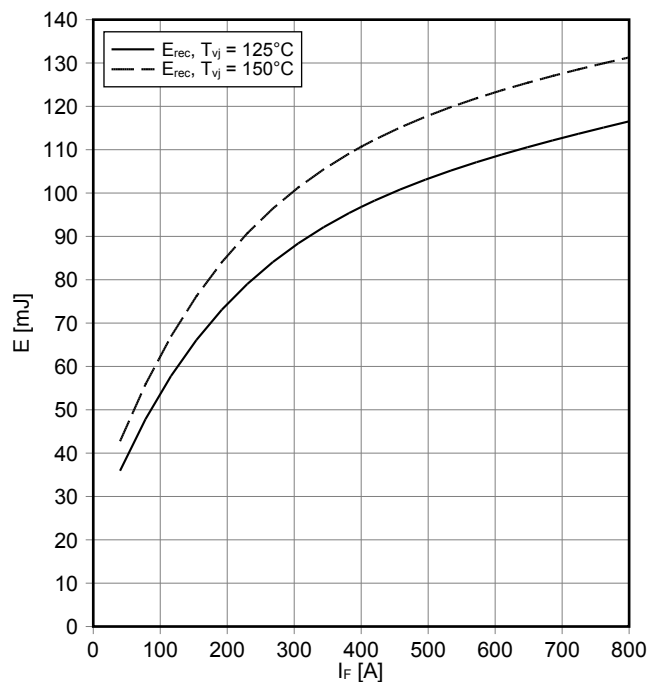


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|------------------|---------------------------------|
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初步数据  
Preliminary Data

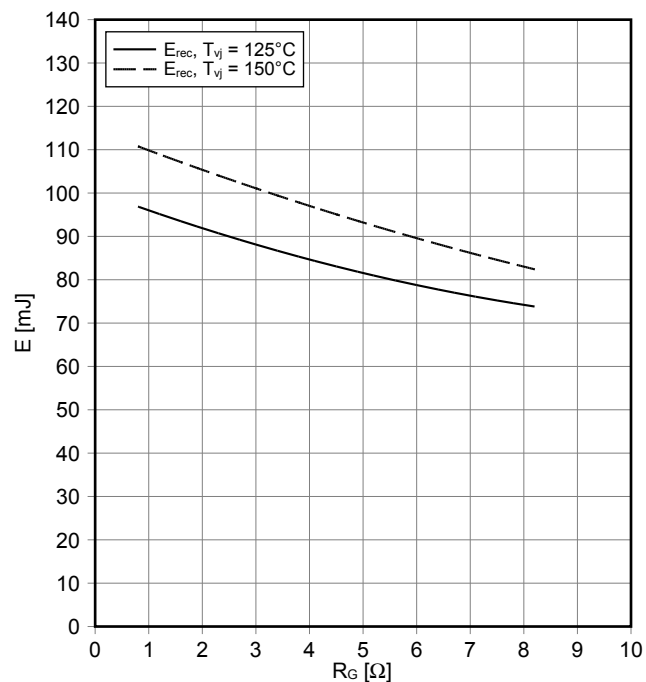
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 0.82 \Omega$ ,  $V_{CE} = 900 V$



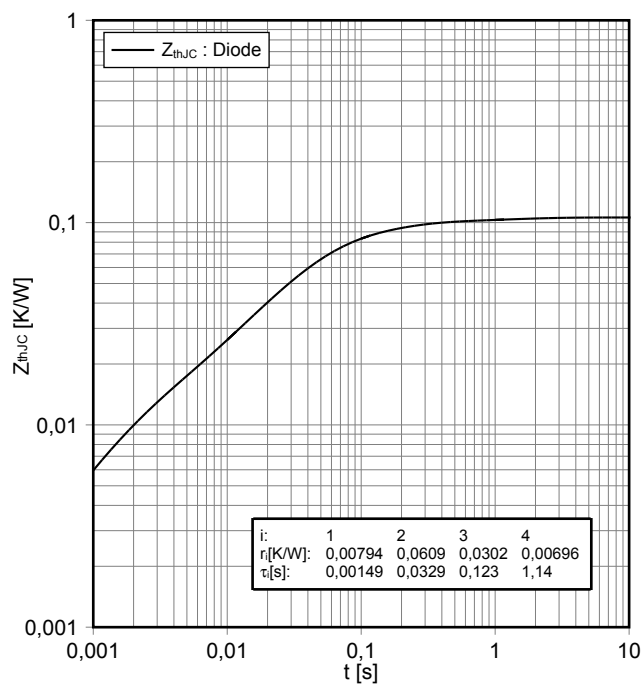
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 400 A$ ,  $V_{CE} = 900 V$



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

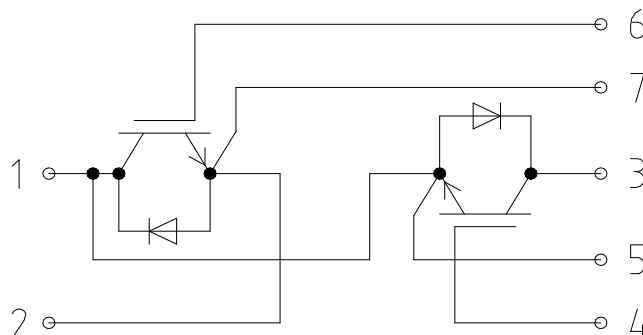
$Z_{thJC} = f(t)$



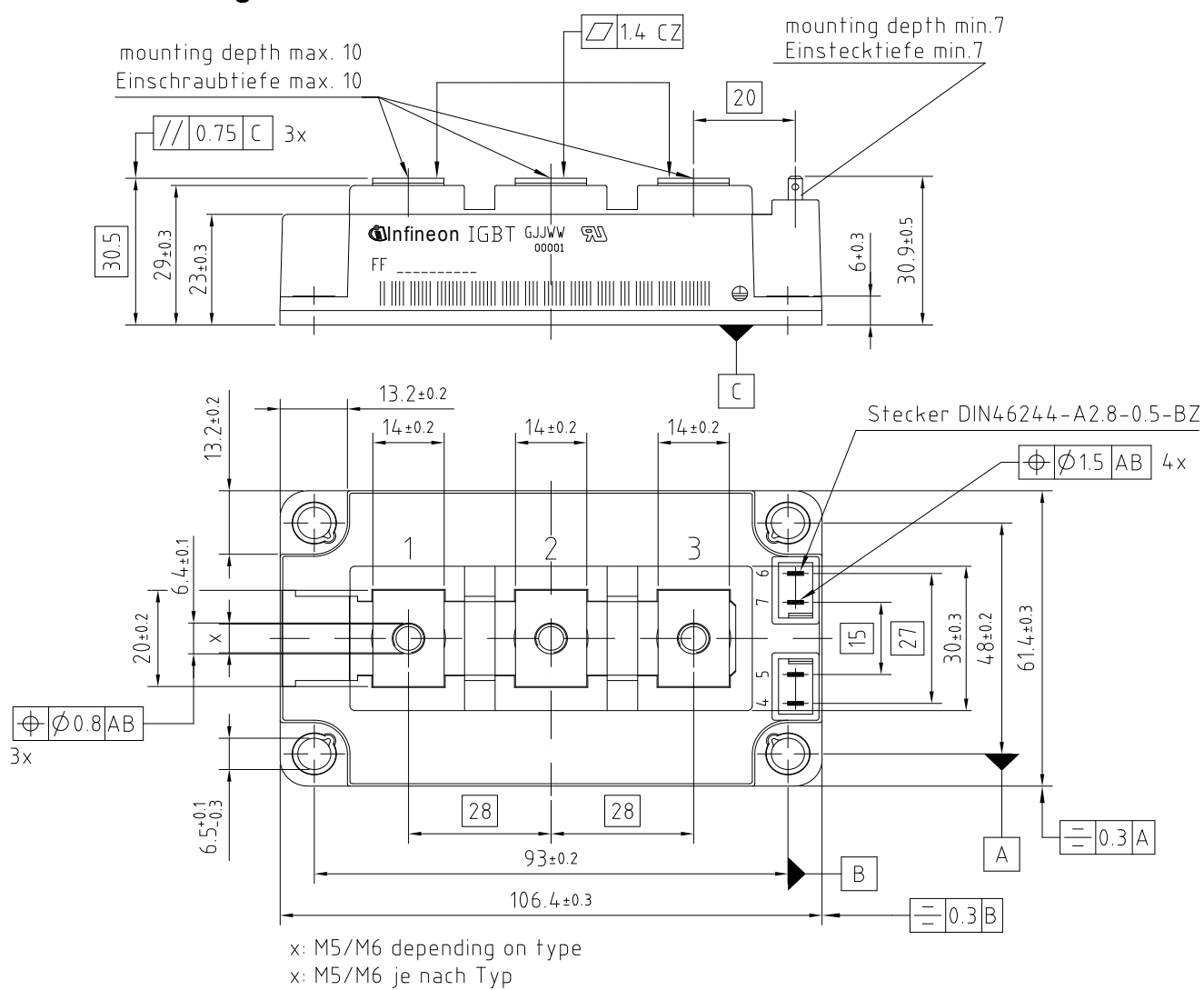
|         |         |        |        |         |
|---------|---------|--------|--------|---------|
| i:      | 1       | 2      | 3      | 4       |
| r[K/W]: | 0,00794 | 0,0609 | 0,0302 | 0,00696 |
| τ[s]:   | 0,00149 | 0,0329 | 0,123  | 1,14    |

|                  |                                 |
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### 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



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