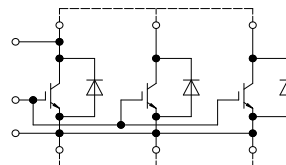


IHM-B 模块  
IHM-B module

初步数据 / Preliminary Data



external connection  
(to be done)

$V_{CES} = 1700V$   
 $I_{C\ nom} = 1800A / I_{CRM} = 3600A$

典型应用

- 大功率变流器
- 电机传动

Typical Applications

- High Power Converters
- Motor Drives

电气特性

- 提高工作结温  $T_{vj\ op}$
- 低开关损耗
- 低  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$

Electrical Features

- Extended Operation Temperature  $T_{vj\ op}$
- Low Switching Losses
- Low  $V_{CEsat}$
- $T_{vj\ op} = 150^{\circ}C$

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
- 高功率密度
- IHM B 封装
- 铜基板

Mechanical Features

- 4 kV AC 1min Insulation
- Package with CTI > 400
- High Creepage and Clearance Distances
- High Power Density
- IHM B Housing
- Copper Base Plate

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: WB | date of publication: 2013-03-09 |                      |
| approved by: PL | 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       | $T_{vj} = 25^{\circ}\text{C}$                             | $V_{CES}$          | 1700  | V  |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_C = 100^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 1800  | A  |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                       | $I_{CRM}$          | 3600  | A  |
| 总损耗<br>Total power dissipation                 | $T_C = 25^{\circ}\text{C}, T_{vj} = 175^{\circ}\text{C}$  | $P_{tot}$          | 11,5  | kW |
| 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 | $I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$                                                   | $T_{vj} = 25^{\circ}\text{C}$<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                      | $I_C = 72,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                   | $V_{GEth}$          | 5,2                  | 5,8  | 6,4         | V                                               |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                  |                                                                                                   | $Q_G$               | 19,0                 |      |             | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                               |                                                                                                   | $R_{Gint}$          | 1,1                  |      |             | $\Omega$                                        |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{ies}$           | 145                  |      |             | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                  |                                                                                                   | $C_{res}$           | 4,75                 |      |             | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                  |                                                                                                   | $I_{CES}$           |                      |      | 5,0         | 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    | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 0,68\ \Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{don}$           | 0,66<br>0,72<br>0,73 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 0,68\ \Omega$                                                                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,16<br>0,17<br>0,17 |      |             | $\mu\text{s}$<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   | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 0,68\ \Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{doff}$          | 1,20<br>1,35<br>1,40 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 0,68\ \Omega$                                                                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,18<br>0,43<br>0,52 |      |             | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗(每脉冲)<br>Turn-on energy loss per pulse            | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 11000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Gon} = 0,68\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 390<br>510<br>560    |      |             | mJ<br>mJ<br>mJ                                  |
| 关断损耗(每脉冲)<br>Turn-off energy loss per pulse           | $I_C = 1800\text{ A}, V_{CE} = 900\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 2650\text{ V}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$R_{Goff} = 0,68\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 410<br>620<br>680    |      |             | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                                   |                                                                                                   | $I_{SC}$            | 7500                 |      |             | A                                               |
| 结 - 壳热阻<br>Thermal resistance, junction to case       | 每个 IGBT / per IGBT                                                                                                                                                                          |                                                                                                   | $R_{thJC}$          |                      |      | 13,0        | K/kW                                            |
| 壳 - 散热器热阻<br>Thermal resistance, case to heatsink     | 每个 IGBT / per IGBT<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$                                                      |                                                                                                   | $R_{thCH}$          | 6,80                 |      |             | K/kW                                            |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: WB | date of publication: 2013-03-09 |
| approved by: PL | 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    | $T_{vj} = 25^{\circ}\text{C}$                                        | $V_{RRM}$        | 1700 | V                 |
| 连续正向直流电流<br>Continuous DC forward current      |                                                                      | $I_F$            | 1800 | A                 |
| 正向重复峰值电流<br>Repetitive peak forward current    | $t_P = 1\text{ ms}$                                                  | $I_{FRM}$        | 3600 | A                 |
| I <sup>2</sup> t-值<br>I <sup>2</sup> t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | I <sup>2</sup> t | 590  | kA <sup>2</sup> s |
|                                                | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ |                  | 555  | kA <sup>2</sup> s |

特征值 / Characteristic Values

|                                                   |                                                                                                                                              |                                | min. | typ. | max. |               |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------|------|------|---------------|
| 正向电压<br>Forward voltage                           | $I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$                                                                                                   | $T_{vj} = 25^{\circ}\text{C}$  |      | 1,80 | 2,20 | V             |
|                                                   | $I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$                                                                                                   | $T_{vj} = 125^{\circ}\text{C}$ |      | 1,90 |      | V             |
|                                                   | $I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$                                                                                                   | $T_{vj} = 150^{\circ}\text{C}$ |      | 1,95 |      | V             |
| 反向恢复峰值电流<br>Peak reverse recovery current         | $I_F = 1800\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 1800 |      | A             |
|                                                   |                                                                                                                                              | $T_{vj} = 125^{\circ}\text{C}$ |      | 2100 |      | A             |
|                                                   |                                                                                                                                              | $T_{vj} = 150^{\circ}\text{C}$ |      | 2250 |      | A             |
| 恢复电荷<br>Recovered charge                          | $I_F = 1800\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 430  |      | $\mu\text{C}$ |
|                                                   |                                                                                                                                              | $T_{vj} = 125^{\circ}\text{C}$ |      | 725  |      | $\mu\text{C}$ |
|                                                   |                                                                                                                                              | $T_{vj} = 150^{\circ}\text{C}$ |      | 830  |      | $\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy           | $I_F = 1800\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 900\text{ V}$<br>$V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$  |      | 250  |      | mJ            |
|                                                   |                                                                                                                                              | $T_{vj} = 125^{\circ}\text{C}$ |      | 470  |      | mJ            |
|                                                   |                                                                                                                                              | $T_{vj} = 150^{\circ}\text{C}$ |      | 540  |      | mJ            |
| 结 - 壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                            | $R_{thJC}$                     |      |      | 21,5 | K/kW          |
| 壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$          | $R_{thCH}$                     |      | 7,40 |      | K/kW          |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: WB | date of publication: 2013-03-09 |
| approved by: PL | revision: 2.1                   |



初步数据  
Preliminary Data

模块 / Module

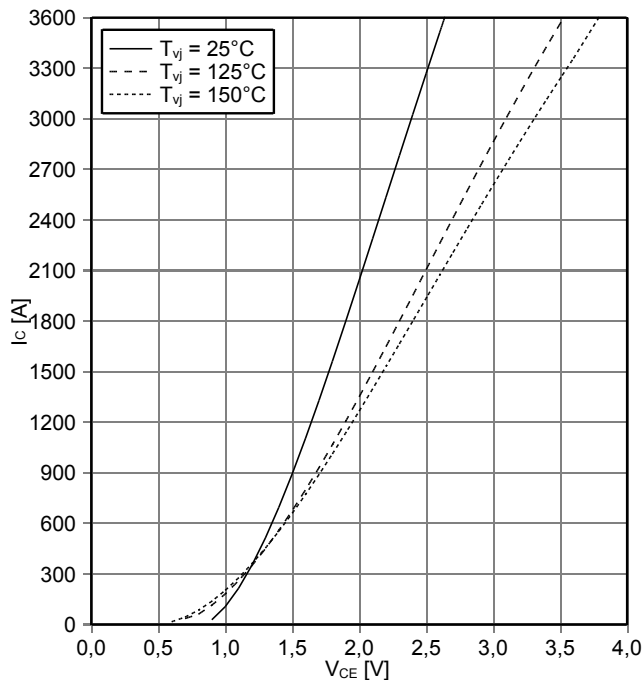
|                                                           |                                                                                |                     |                                |      |              |
|-----------------------------------------------------------|--------------------------------------------------------------------------------|---------------------|--------------------------------|------|--------------|
| 绝缘测试电压<br>Isolation test voltage                          | RMS, f = 50 Hz, t = 1 min.                                                     | V <sub>ISOL</sub>   | 4,0                            |      | kV           |
| 模块基板材料<br>Material of module baseplate                    |                                                                                |                     | Cu                             |      |              |
| 内部绝缘材料<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                                 | 如何与取得联系- 散热片 / terminal to heatsink<br>如何与取得联系- 如何与取得联系 / terminal to terminal |                     | 32,2<br>32,2                   |      | mm           |
| 电气间隙<br>Clearance                                         | 如何与取得联系- 散热片 / terminal to heatsink<br>如何与取得联系- 如何与取得联系 / terminal to terminal |                     | 19,1<br>19,1                   |      | 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>    | 6,0                            |      | 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> | 0,12                           |      | mΩ           |
| 最大结温<br>Maximum junction temperature                      | 逆变器, 制动-斩波器 / inverter, brake-chopper                                          | T <sub>vj max</sub> |                                |      | 175 °C       |
| 在开关状态下温度<br>Temperature under switching conditions        | 逆变器, 制动-斩波器 / inverter, brake-chopper                                          | T <sub>vj op</sub>  | -40                            |      | 150 °C       |
| 储存温度<br>Storage temperature                               |                                                                                | T <sub>stg</sub>    | -40                            |      | 150 °C       |
| 模块安装的安装扭矩<br>Mounting torque for modul mounting           | 螺丝 M6 根据相应的应用手册进行安装<br>Screw M6 - Mounting according to valid application note | M                   | 4,25                           | -    | 5,75 Nm      |
| 端子联接扭矩<br>Terminal connection torque                      | 螺丝 M8 根据相应的应用手册进行安装<br>Screw M8 - Mounting according to valid application note | M                   | 1,8<br>8,0                     | -    | 2,1<br>10 Nm |
| 重量<br>Weight                                              |                                                                                | G                   |                                | 1900 | g            |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: WB | date of publication: 2013-03-09 |
| approved by: PL | revision: 2.1                   |

初步数据  
Preliminary Data

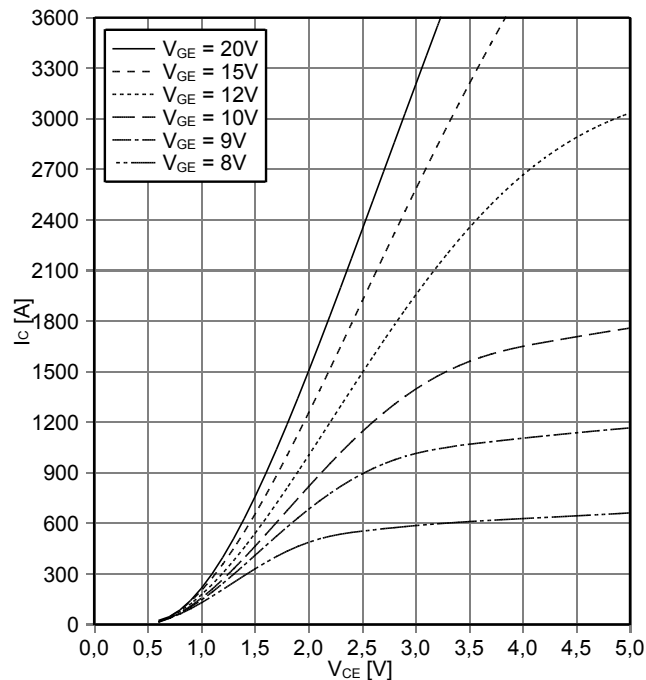
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



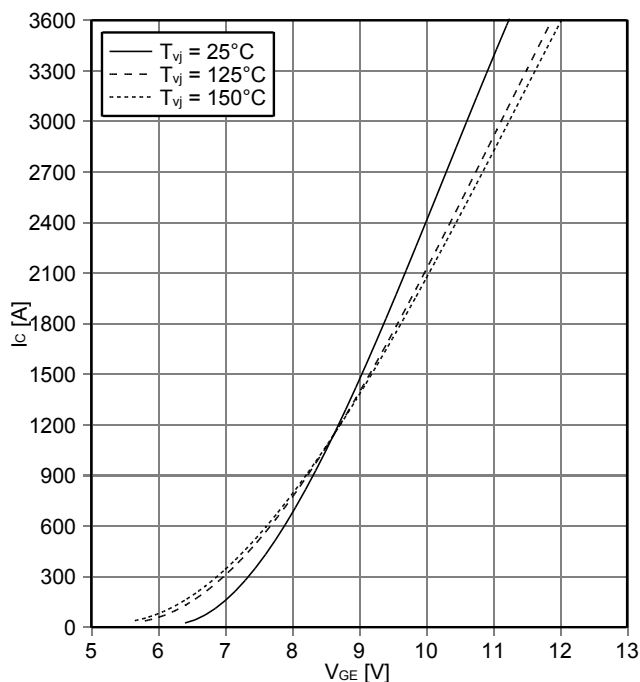
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



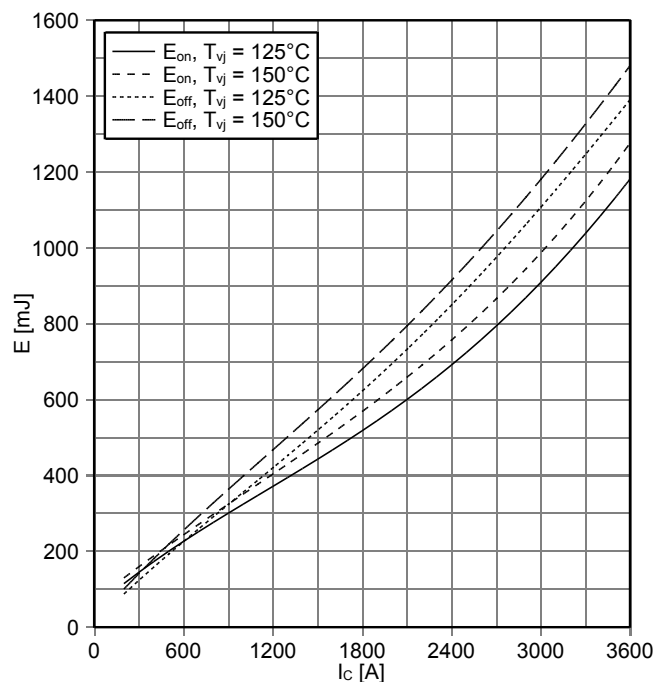
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 0.68\ \Omega$ ,  $R_{Goff} = 0.68\ \Omega$ ,  $V_{CE} = 900\text{ V}$

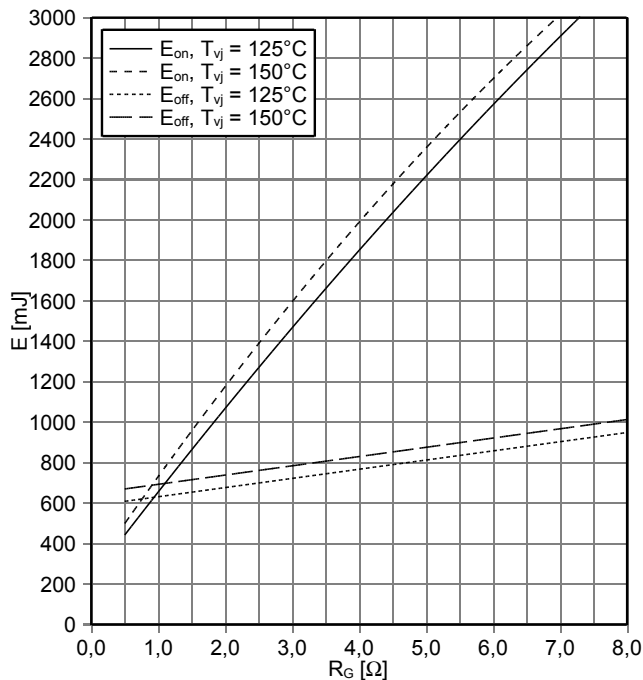


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| prepared by: WB | date of publication: 2013-03-09 |
| approved by: PL | revision: 2.1                   |

初步数据  
Preliminary Data

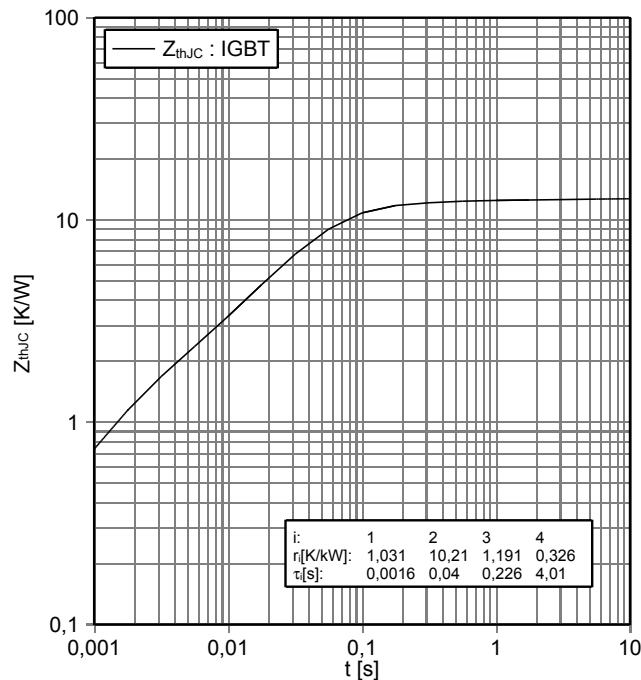
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$



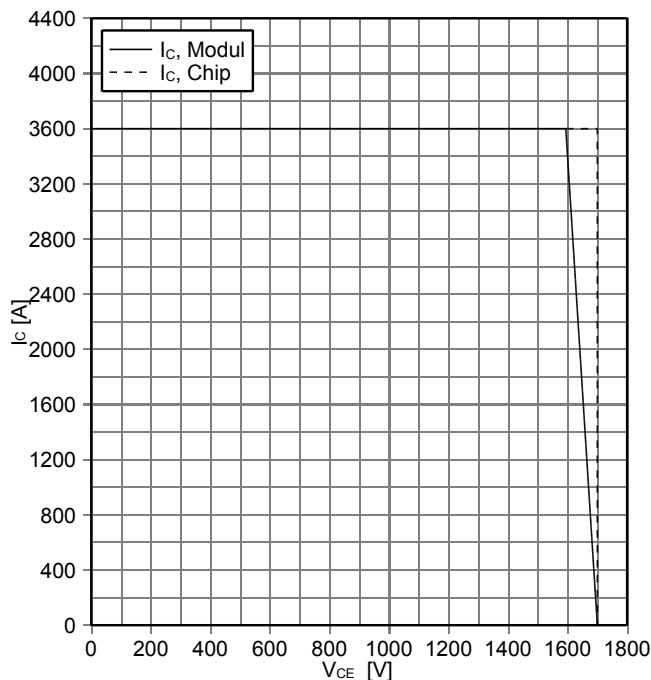
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



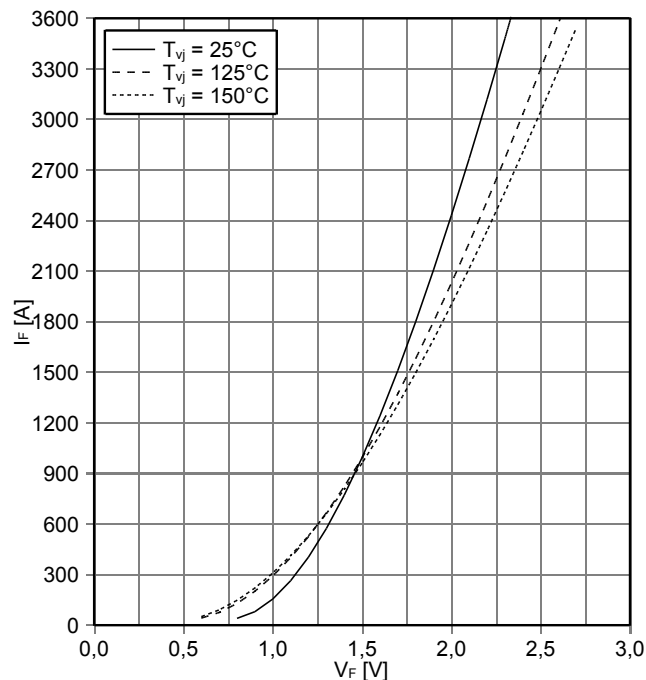
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 0.68\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



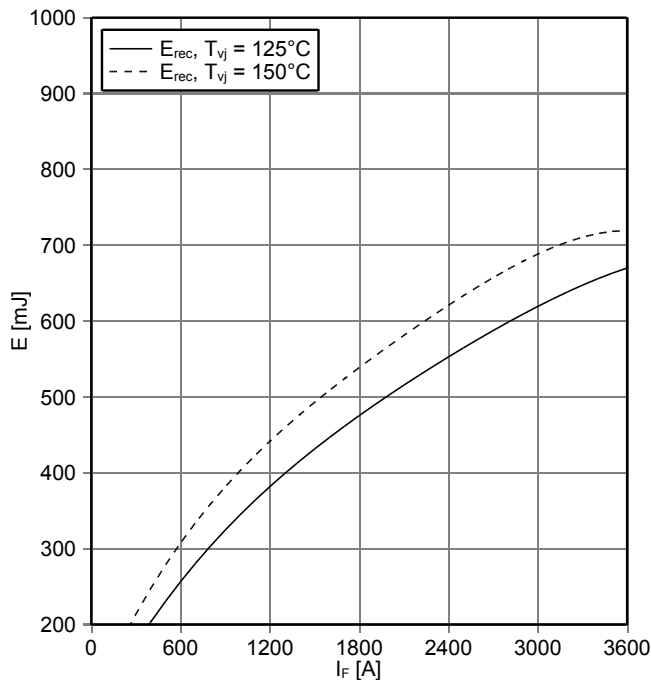
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| prepared by: WB | date of publication: 2013-03-09 |
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初步数据  
Preliminary Data

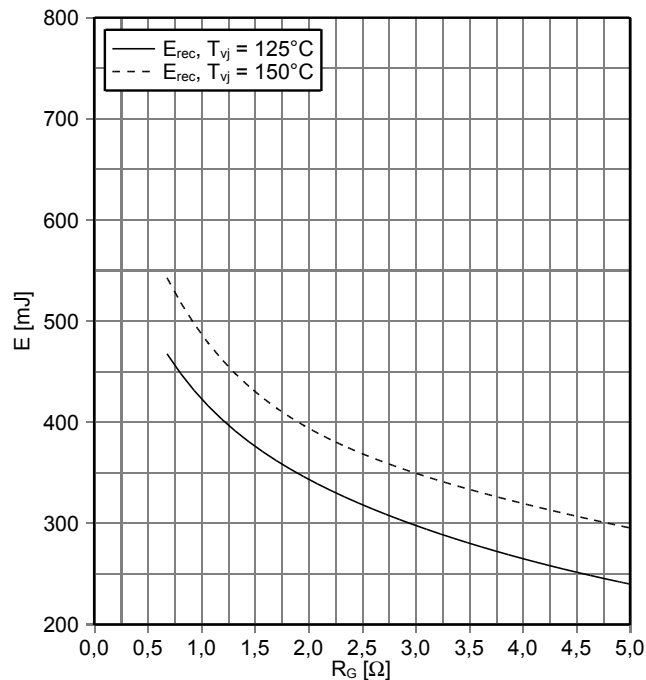
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 0.68 \Omega, V_{CE} = 900 V$



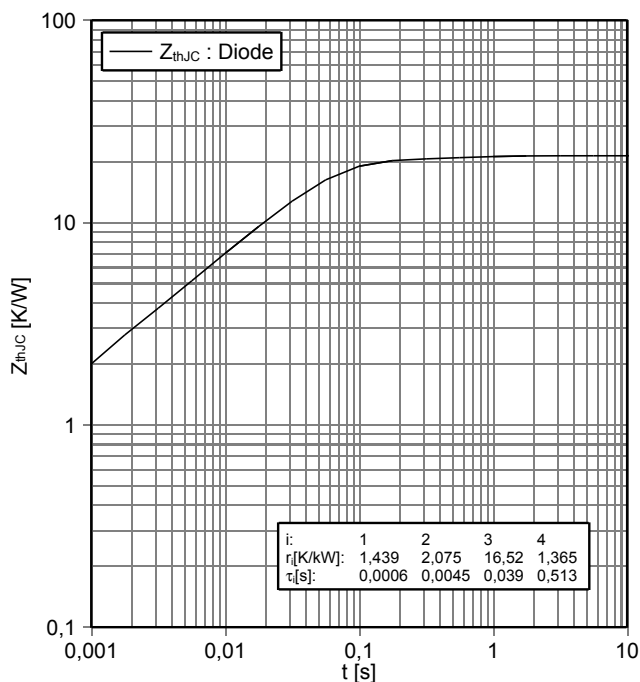
开关损耗 二极管,逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 1800 A, V_{CE} = 900 V$



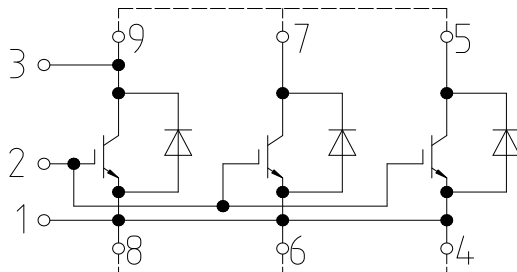
瞬态热阻抗 二极管,逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



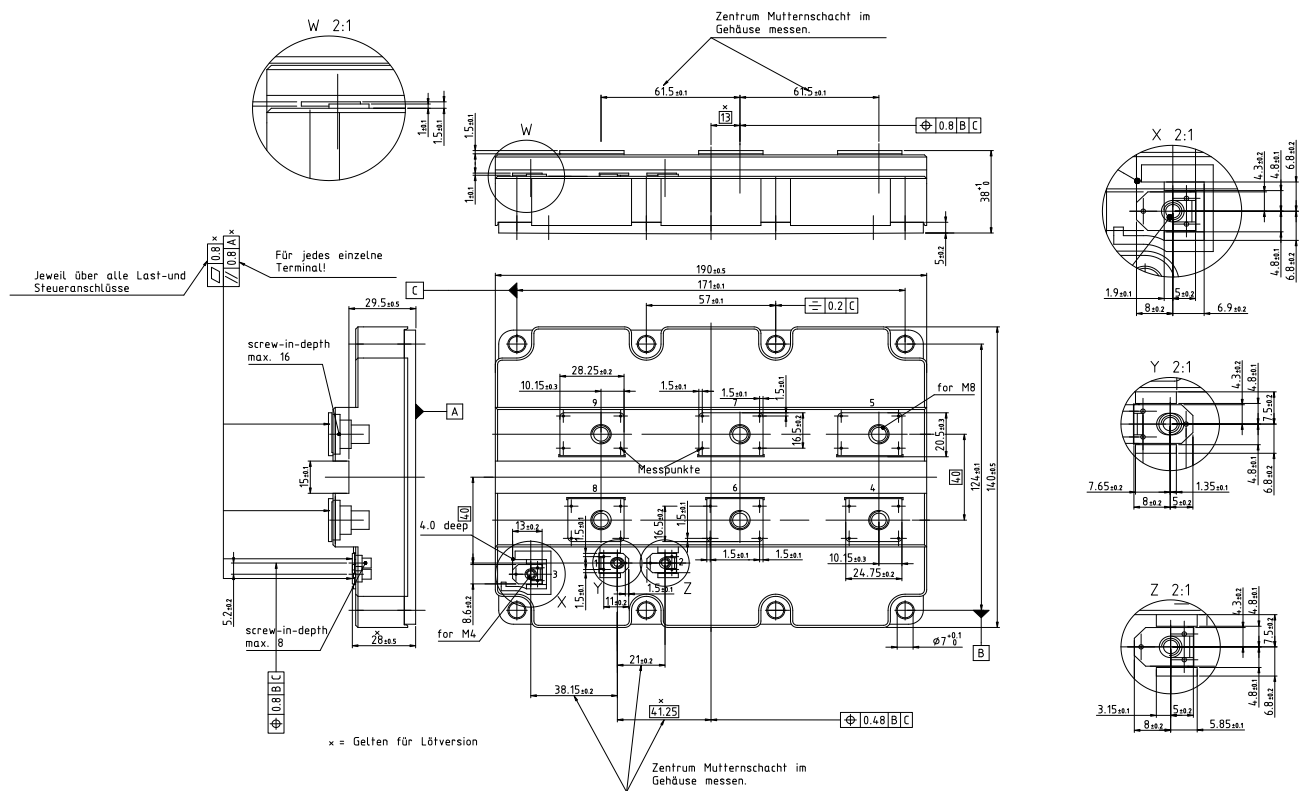
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|-----------------|---------------------------------|
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接线图 / circuit\_diagram\_headline



external connection  
(to be done)

封装尺寸 / package outlines



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**使用条件和条款**

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