

EconoPIM™2 Modul mit Trench/Feldstopp IGBT4 und Emitter Controlled4 Diode  
EconoPIM™2 module with trench/fieldstop IGBT4 and Emitter Controlled4 diode

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       | $T_{vj} = 25^{\circ}\text{C}$                                | $V_{CES}$          | 1200  | V |
| 连续集电极直流电流<br>Continuous DC collector current   | $T_C = 95^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 50    | A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                          | $I_{CRM}$          | 100   | A |
| 总功率损耗<br>Total power dissipation               | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $P_{\text{tot}}$   | 280   | W |
| 栅极 - 发射极峰值电压<br>Gate-emitter peak voltage      |                                                              | $V_{GES}$          | +/-20 | V |

特征值 / Characteristic Values

|                                                       |                                                                                                                                                                                                 |                                                                                                   | min.                | typ.                 | max. |                                                 |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------|----------------------|------|-------------------------------------------------|
| 集电极 - 发射极饱和电压<br>Collector-emitter saturation voltage | $I_C = 50\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$                                                             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,85<br>2,15<br>2,25 | 2,25 | V<br>V<br>V                                     |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 1,70\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                            |                                                                                                   | $V_{GEth}$          | 5,2                  | 5,8  | 6,4 V                                           |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                      |                                                                                                   | $Q_G$               | 0,38                 |      | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                                   |                                                                                                   | $R_{Gint}$          | 4,0                  |      | $\Omega$                                        |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                   | $C_{ies}$           | 2,80                 |      | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                   | $C_{res}$           | 0,10                 |      | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                      |                                                                                                   | $I_{CES}$           |                      | 1,0  | mA                                              |
| 栅极-发射极漏电流<br>Gate-emitter leakage current             | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                        |                                                                                                   | $I_{GES}$           |                      | 100  | nA                                              |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load    | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 15\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,16<br>0,17<br>0,17 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 15\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,03<br>0,04<br>0,04 |      | $\mu\text{s}$<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   | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 15\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,33<br>0,43<br>0,45 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 15\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,08<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          | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L_S = 20\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 1400\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 15\text{ }\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$            | 5,70<br>7,70<br>8,40 |      | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L_S = 20\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 3600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 15\text{ }\Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$           | 2,80<br>4,30<br>4,80 |      | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$<br>$t_P \leq 10\text{ }\mu\text{s}, T_{vj} = 125^{\circ}\text{C}$                               |                                                                                                   | $I_{SC}$            | 180                  |      | A                                               |
| 结 - 外壳热阻<br>Thermal resistance, junction to case      | 每个 IGBT / per IGBT                                                                                                                                                                              |                                                                                                   | $R_{thJC}$          |                      | 0,54 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink    | 每个 IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$                                              |                                                                                                   | $R_{thCH}$          | 0,295                |      | 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: AS

date of publication: 2013-11-04

approved by: RS

revision: 2.0

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 | $T_{vj} = 25^{\circ}\text{C}$                                        | $V_{RRM}$ | 1200 | V                |
| 连续正向直流电流<br>Continuous DC forward current   |                                                                      | $I_F$     | 50   | A                |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                  | $I_{FRM}$ | 100  | A                |
| I2t-值<br>I <sup>2</sup> t - value           | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 560  | A <sup>2</sup> s |

特征值 / Characteristic Values

|                                                    |                                                                                                                                           |                                                                                                   | min.               | typ.                 | max. |                                                 |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| 正向电压<br>Forward voltage                            | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$          | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,70<br>1,65<br>1,65 | 2,15 | V<br>V<br>V                                     |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 54,0<br>60,0<br>63,0 |      | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                           | $I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 5,50<br>8,80<br>10,0 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy            | $I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 1,70<br>3,00<br>3,70 |      | mJ<br>mJ<br>mJ                                  |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                         |                                                                                                   | $R_{thJC}$         |                      | 0,81 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$       |                                                                                                   | $R_{thCH}$         | 0,44                 |      | 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, 整流器 / Diode, Rectifier  
最大额定值 / Maximum Rated Values

|                                                         |                                                                                                         |             |             |                                      |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------|-------------|--------------------------------------|
| 反向重复峰值电压<br>Repetitive peak reverse voltage             | $T_{vj} = 25^{\circ}\text{C}$                                                                           | $V_{RRM}$   | 1600        | V                                    |
| 最大正向均方根电流(每芯片)<br>Maximum RMS forward current per chip  | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{FRMSM}$ | 70          | A                                    |
| 最大整流器输出均方根电流<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{RMSM}$  | 80          | A                                    |
| 正向浪涌电流<br>Surge forward current                         | $t_P = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 450<br>370  | A<br>A                               |
| I2t-值<br>I <sup>2</sup> t - value                       | $t_P = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 1000<br>685 | 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                            | $T_{vj} = 150^{\circ}\text{C}, I_F = 50\text{ A}$                                                                                   | $V_F$              |      | 1,05  |      | V                  |
| 反向电流<br>Reverse current                            | $T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$                                                                                 | $I_R$              |      | 1,00  |      | mA                 |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                   | $R_{thJC}$         |      |       | 0,85 | K/W                |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | $R_{thCH}$         |      | 0,465 |      | 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: AS | date of publication: 2013-11-04 |
| approved by: RS | revision: 2.0                   |

初步数据  
Preliminary Data

IGBT, 制动-斩波器 / IGBT, Brake-Chopper

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   | $T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$ | 25    | A |
| 集电极重复峰值电流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                           | $I_{CRM}$          | 50    | A |
| 总功率损耗<br>Total power dissipation               | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$  | $P_{\text{tot}}$   | 160   | W |
| 栅极 - 发射极峰值电压<br>Gate-emitter peak voltage      |                                                               | $V_{GES}$          | +/-20 | V |

特征值 / Characteristic Values

|                                                       |                                                                                                                                                                           |                                                                                                   | min.                | typ.                 | max. |                                                 |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------|----------------------|------|-------------------------------------------------|
| 集电极 - 发射极饱和电压<br>Collector-emitter saturation voltage | $I_C = 25\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 25\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 25\text{ A}, V_{GE} = 15\text{ V}$                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,85<br>2,15<br>2,25 | 2,25 | V<br>V<br>V                                     |
| 栅极阈值电压<br>Gate threshold voltage                      | $I_C = 0,85\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                      |                                                                                                   | $V_{GEth}$          | 5,2                  | 5,8  | 6,4 V                                           |
| 栅极电荷<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                |                                                                                                   | $Q_G$               | 0,20                 |      | $\mu\text{C}$                                   |
| 内部栅极电阻<br>Internal gate resistor                      | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                             |                                                                                                   | $R_{Gint}$          | 0,0                  |      | $\Omega$                                        |
| 输入电容<br>Input capacitance                             | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                |                                                                                                   | $C_{ies}$           | 1,45                 |      | nF                                              |
| 反向传输电容<br>Reverse transfer capacitance                | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                |                                                                                                   | $C_{res}$           | 0,05                 |      | nF                                              |
| 集电极-发射极截止电流<br>Collector-emitter cut-off current      | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                |                                                                                                   | $I_{CES}$           |                      | 1,0  | mA                                              |
| 栅极-发射极漏电流<br>Gate-emitter leakage current             | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                  |                                                                                                   | $I_{GES}$           |                      | 100  | nA                                              |
| 开通延迟时间(电感负载)<br>Turn-on delay time, inductive load    | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 37\text{ }\Omega$                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ on}}$   | 0,05<br>0,06<br>0,06 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 上升时间(电感负载)<br>Rise time, inductive load               | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 37\text{ }\Omega$                                                                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$               | 0,03<br>0,04<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   | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 37\text{ }\Omega$                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{ off}}$  | 0,34<br>0,43<br>0,45 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 下降时间(电感负载)<br>Fall time, inductive load               | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 37\text{ }\Omega$                                                                 | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$               | 0,05<br>0,07<br>0,08 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| 开通损耗能量(每脉冲)<br>Turn-on energy loss per pulse          | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 37\text{ }\Omega$                                          | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{\text{on}}$     | 2,00<br>2,65<br>2,90 |      | mJ<br>mJ<br>mJ                                  |
| 关断损耗能量(每脉冲)<br>Turn-off energy loss per pulse         | $I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 37\text{ }\Omega$                                         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{\text{off}}$    | 1,40<br>2,20<br>2,40 |      | mJ<br>mJ<br>mJ                                  |
| 短路数据<br>SC data                                       | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$<br>$t_P \leq 10\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ |                                                                                                   | $I_{SC}$            | 90                   |      | A                                               |
| 结 - 外壳热阻<br>Thermal resistance, junction to case      | 每个 IGBT / per IGBT                                                                                                                                                        |                                                                                                   | $R_{thJC}$          |                      | 0,95 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink    | 每个 IGBT / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1\text{ W/(m}\cdot\text{K)}$                                      |                                                                                                   | $R_{thCH}$          | 0,52                 |      | 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: AS

date of publication: 2013-11-04

approved by: RS

revision: 2.0

初步数据  
Preliminary Data

二极管，制动-斩波器 / Diode, Brake-Chopper

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   |                                                                            | $I_F$     | 15   | A                |
| 正向重复峰值电流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                        | $I_{FRM}$ | 30   | A                |
| $I^2t$ -值<br>$I^2t$ - value                 | $V_R = 0\text{ V}$ , $t_P = 10\text{ ms}$ , $T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 48,0 | A <sup>2</sup> s |

特征值 / Characteristic Values

|                                                    |                                                                                                                                           |                                                                                                   | min.               | typ.                 | max. |                                                 |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| 正向电压<br>Forward voltage                            | $I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$<br>$I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,75<br>1,75<br>1,75 | 2,25 | V<br>V<br>V                                     |
| 反向恢复峰值电流<br>Peak reverse recovery current          | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 20,0<br>22,0<br>23,0 |      | A<br>A<br>A                                     |
| 恢复电荷<br>Recovered charge                           | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 1,50<br>2,50<br>2,70 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 反向恢复损耗 (每脉冲)<br>Reverse recovery energy            | $I_F = 15\text{ A}$ , $-di_F/dt = 1000\text{ A}/\mu\text{s}$ ( $T_{vj}=150^{\circ}\text{C}$ )<br>$V_R = 600\text{ V}$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,55<br>0,90<br>1,00 |      | mJ<br>mJ<br>mJ                                  |
| 结 - 外壳热阻<br>Thermal resistance, junction to case   | 每个二极管 / per diode                                                                                                                         |                                                                                                   | $R_{thJC}$         |                      | 1,50 | K/W                                             |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个二极管 / per diode<br>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$     |                                                                                                   | $R_{thCH}$         | 0,82                 |      | K/W                                             |
| 在开关状态下温度<br>Temperature under switching conditions |                                                                                                                                           |                                                                                                   | $T_{vj\text{ op}}$ | -40                  | 150  | $^{\circ}\text{C}$                              |

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

|                              |                                                               |              | min. | typ. | max. |            |
|------------------------------|---------------------------------------------------------------|--------------|------|------|------|------------|
| 额定电阻值<br>Rated resistance    | $T_C = 25^{\circ}\text{C}$                                    | $R_{25}$     |      | 5,00 |      | k $\Omega$ |
| R100 偏差<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}$ , $R_{100} = 493\text{ }\Omega$   | $\Delta R/R$ | -5   |      | 5    | %          |
| 耗散功率<br>Power dissipation    | $T_C = 25^{\circ}\text{C}$                                    | $P_{25}$     |      |      | 20,0 | mW         |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/50}$  |      | 3375 |      | K          |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/80}$  |      | 3411 |      | K          |
| B-值<br>B-value               | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ |      | 3433 |      | K          |

根据应用手册标定

Specification according to the valid application note.

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: AS | date of publication: 2013-11-04 |
| approved by: RS | revision: 2.0                   |

初步数据  
Preliminary Data

模块 / Module

|                                                    |                                                                                                                                       |                     |                                |                  |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------|------------------|
| 绝缘测试电压<br>Isolation test voltage                   | RMS, f = 50 Hz, t = 1 min.                                                                                                            | V <sub>ISOL</sub>   | 2,5                            | kV               |
| 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- 散热片 / terminal to heatsink<br>端子- 端子 / terminal to terminal                                                                       |                     | 10,0                           | mm               |
| 电气间隙<br>Clearance                                  | 端子- 散热片 / terminal to heatsink<br>端子- 端子 / terminal to terminal                                                                       |                     | 7,5                            | mm               |
| 相对电痕指数<br>Comperative tracking index               |                                                                                                                                       | CTI                 | > 200                          |                  |
|                                                    |                                                                                                                                       |                     |                                |                  |
| 外壳 - 散热器热阻<br>Thermal resistance, case to heatsink | 每个模块 / per module<br>$\lambda_{\text{Paste}} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1 \text{ W/(m}\cdot\text{K)}$ | R <sub>thCH</sub>   | min. 0,02                      | typ. max. K/W    |
| 杂散电感, 模块<br>Stray inductance module                |                                                                                                                                       | L <sub>sCE</sub>    | 35                             | nH               |
| 最大结温<br>Maximum junction temperature               | 逆变器, 制动-斩波器 / inverter, brake-chopper<br>整流器 / rectifier                                                                              | T <sub>vj max</sub> |                                | 175 °C<br>150 °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<br>整流器 / rectifier                                                                              | T <sub>vj op</sub>  | -40<br>-40                     | 150 °C<br>150 °C |
| 储存温度<br>Storage temperature                        |                                                                                                                                       | T <sub>stg</sub>    | -40                            | 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        |
| 重量<br>Weight                                       |                                                                                                                                       | G                   | 180                            | g                |

prepared by: AS

date of publication: 2013-11-04

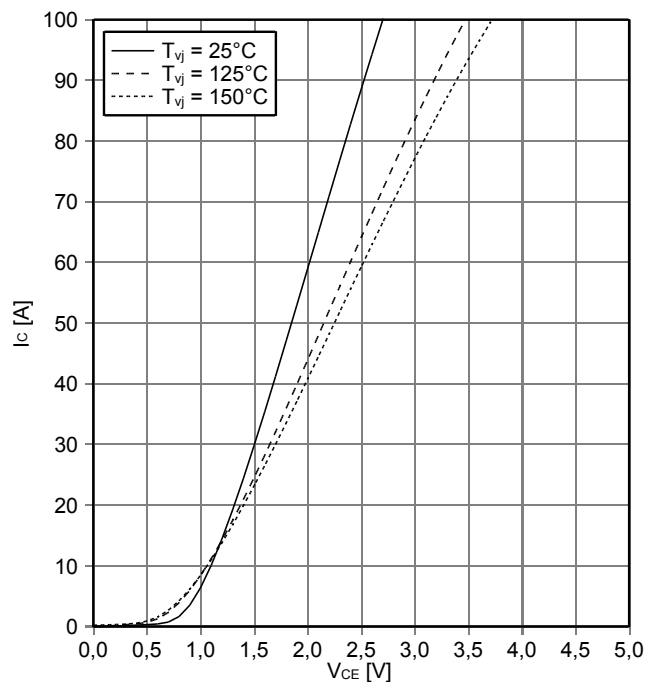
approved by: RS

revision: 2.0

初步数据  
Preliminary Data

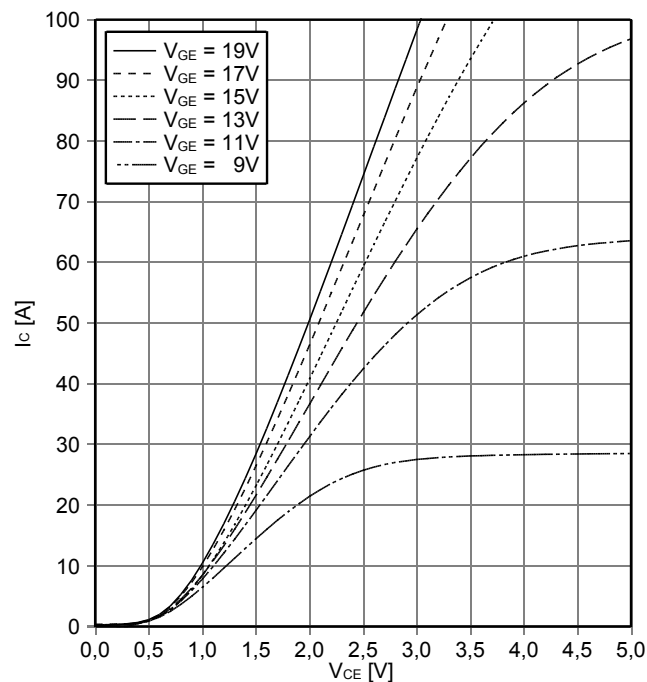
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



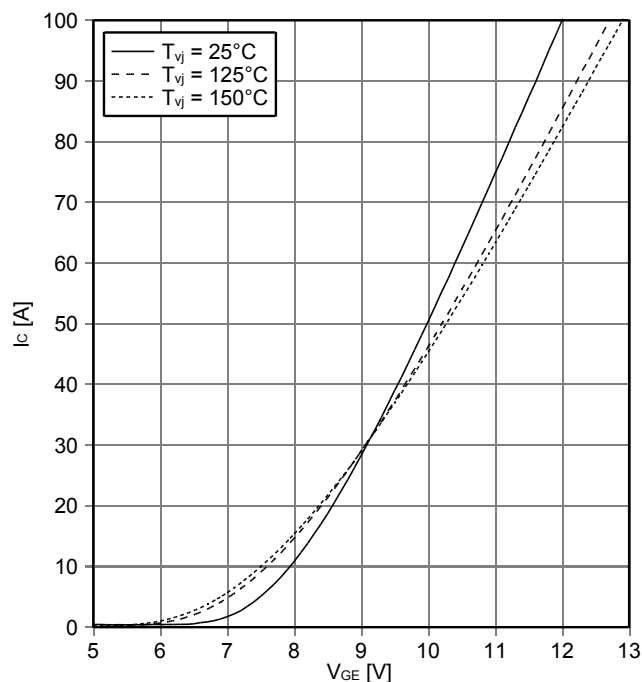
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



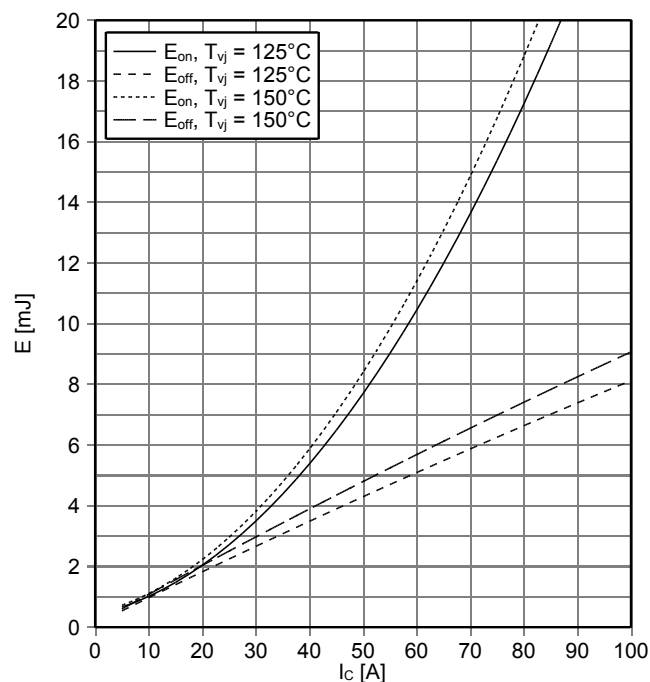
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

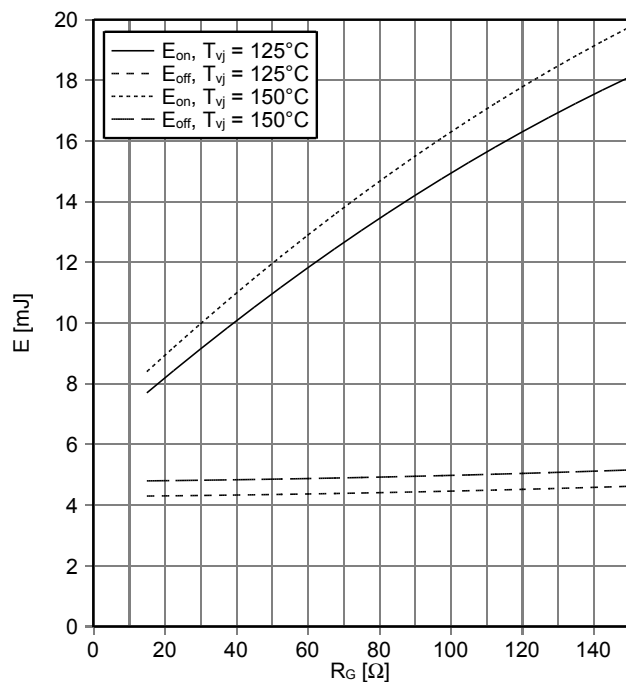
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 15\ \Omega$ ,  $R_{Goff} = 15\ \Omega$ ,  $V_{CE} = 600\text{ V}$



初步数据  
Preliminary Data

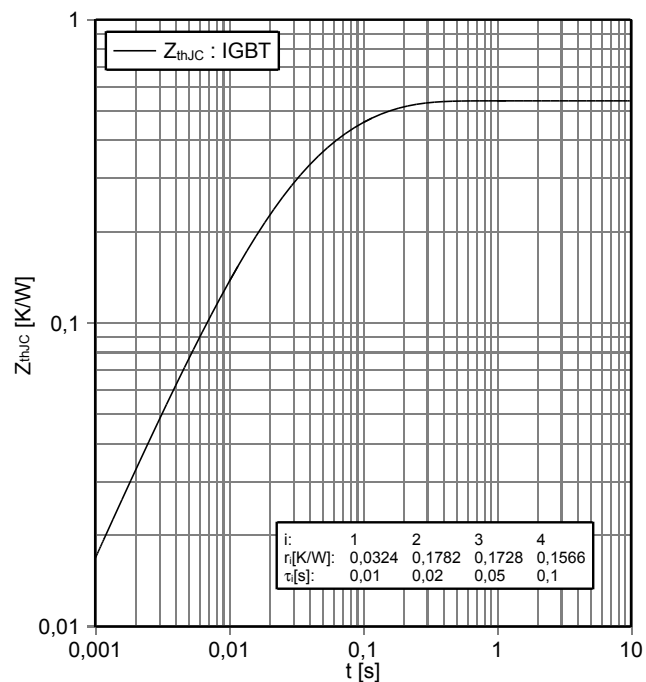
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 50\text{ A}$ ,  $V_{CE} = 600\text{ V}$



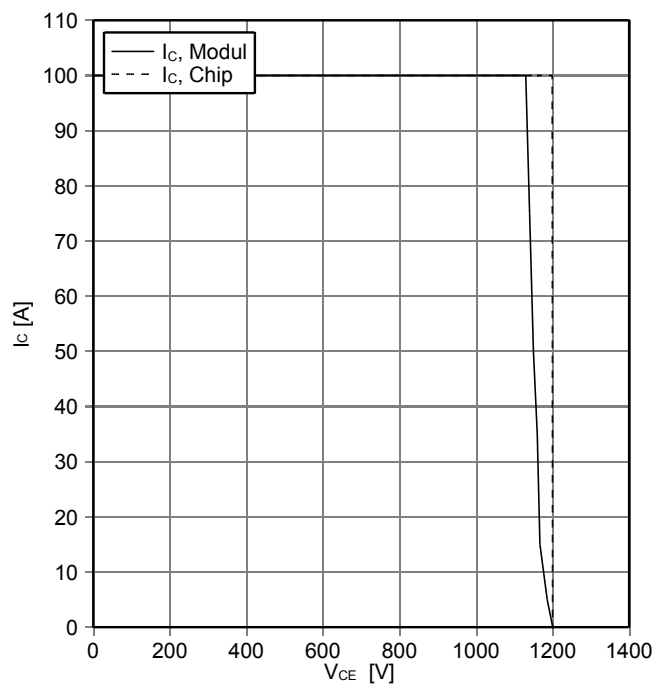
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



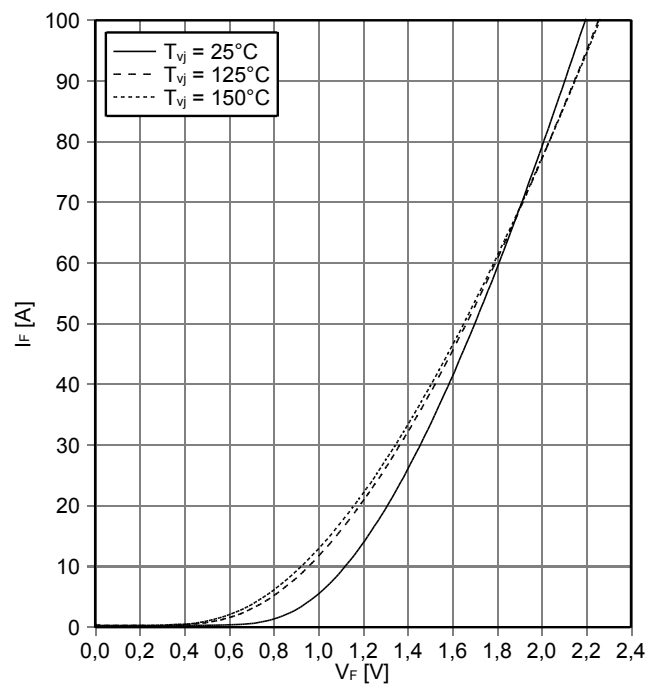
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

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



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

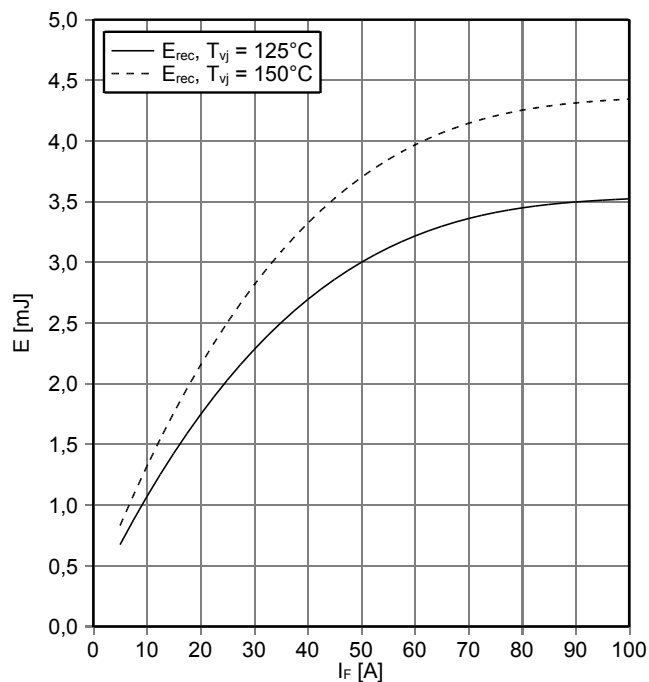
$I_F = f(V_F)$



初步数据  
Preliminary Data

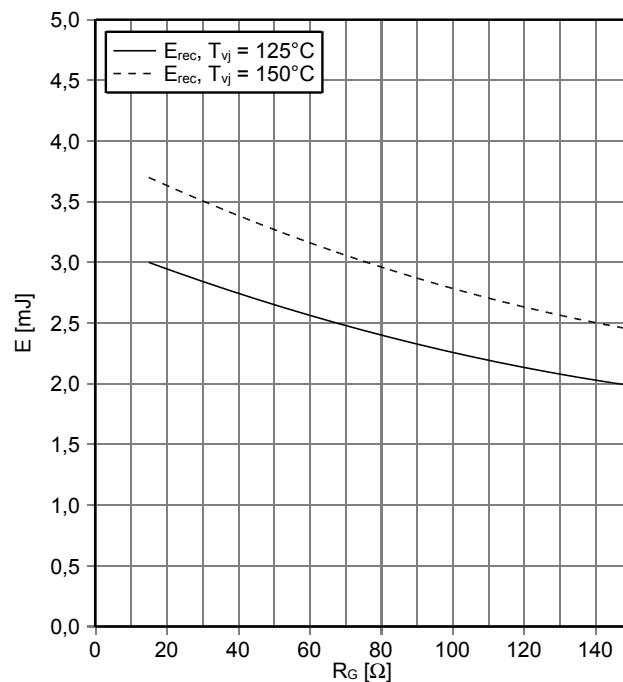
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 15 \Omega$ ,  $V_{CE} = 600 V$



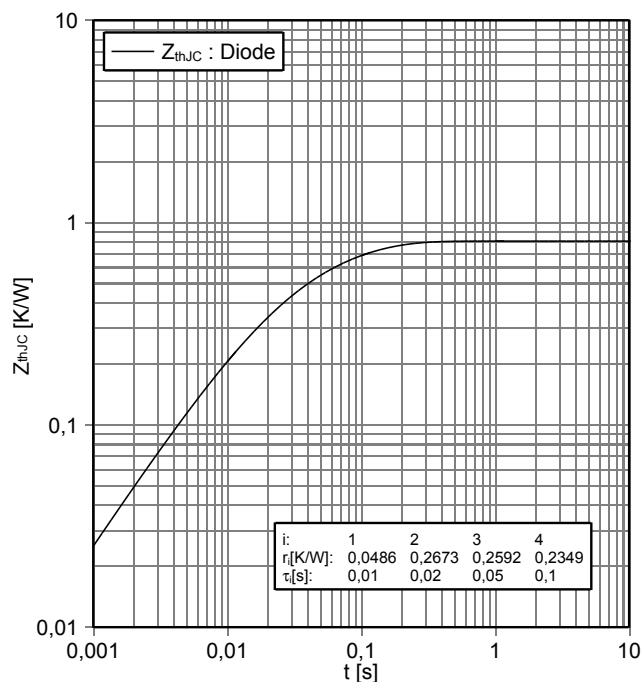
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 50 A$ ,  $V_{CE} = 600 V$



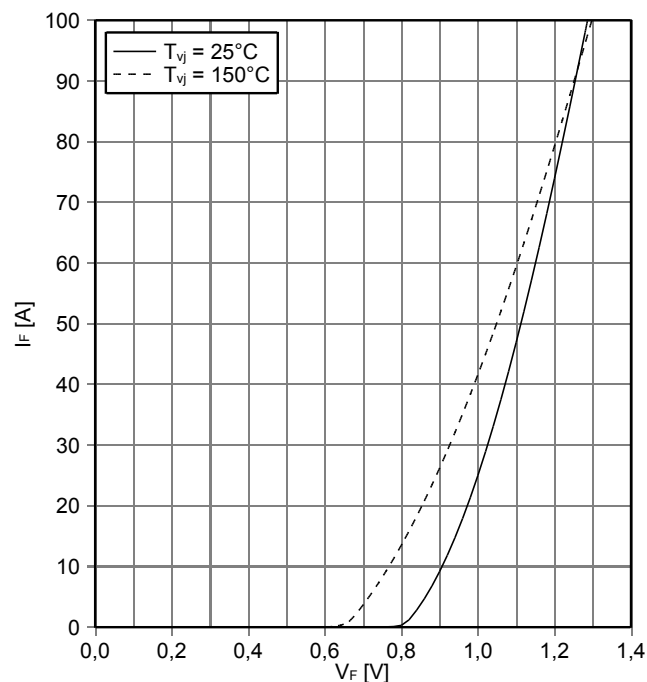
瞬态热阻抗 二极管, 逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



正向偏压特性 二极管, 整流器 (典型)  
forward characteristic of Diode, Rectifier (typical)

$I_F = f(V_F)$



prepared by: AS

approved by: RS

date of publication: 2013-11-04

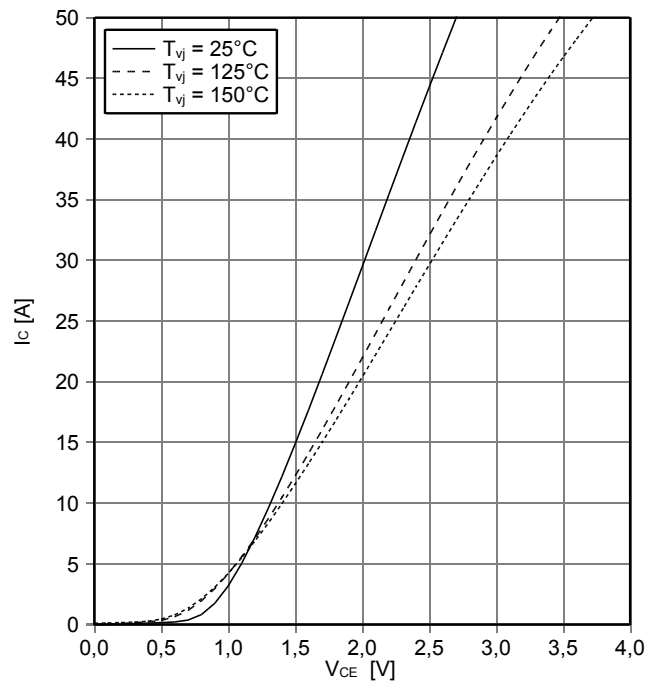
revision: 2.0



初步数据  
Preliminary Data

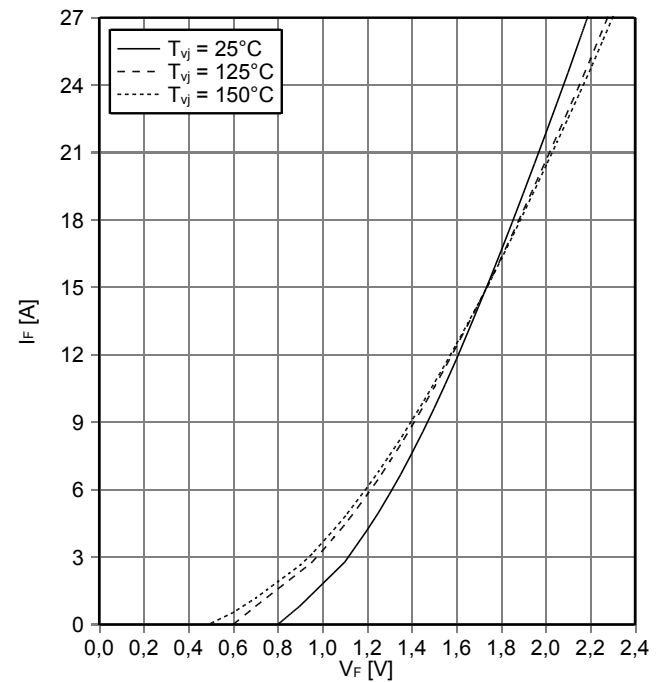
输出特性 IGBT, 制动-斩波器 (典型)  
output characteristic IGBT, Brake-Chopper (typical)

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



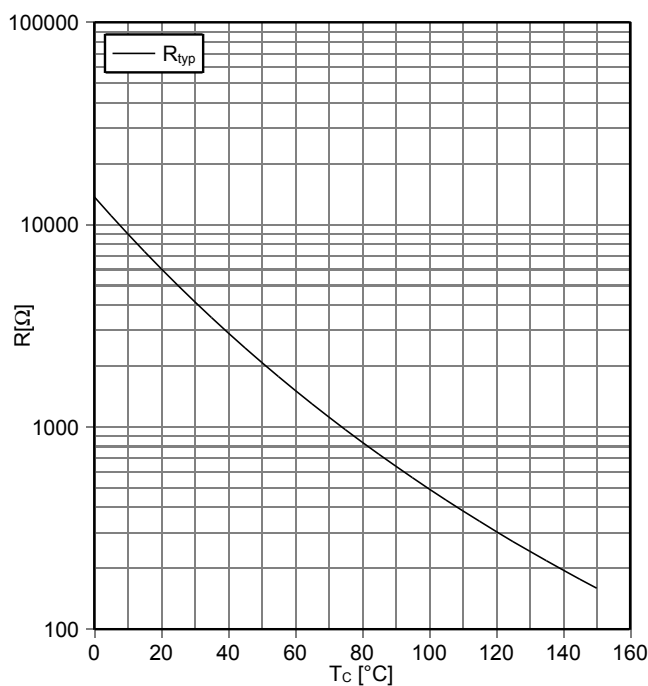
正向偏压特性 二极管, 制动-斩波器 (典型)  
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$



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

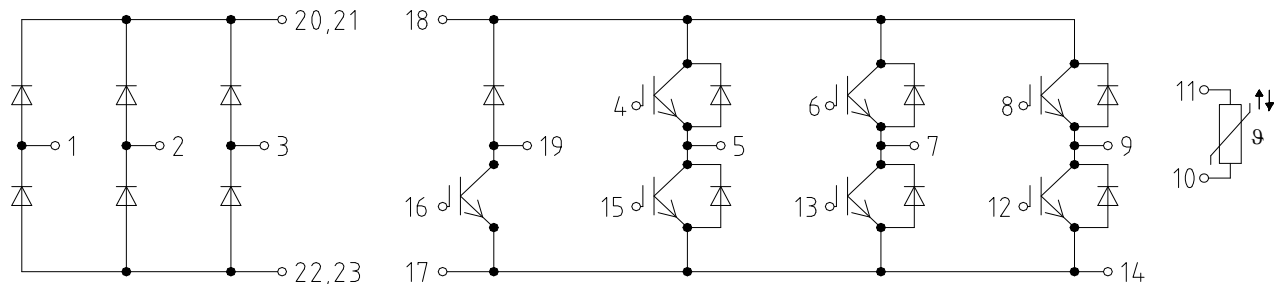
$R = f(T)$



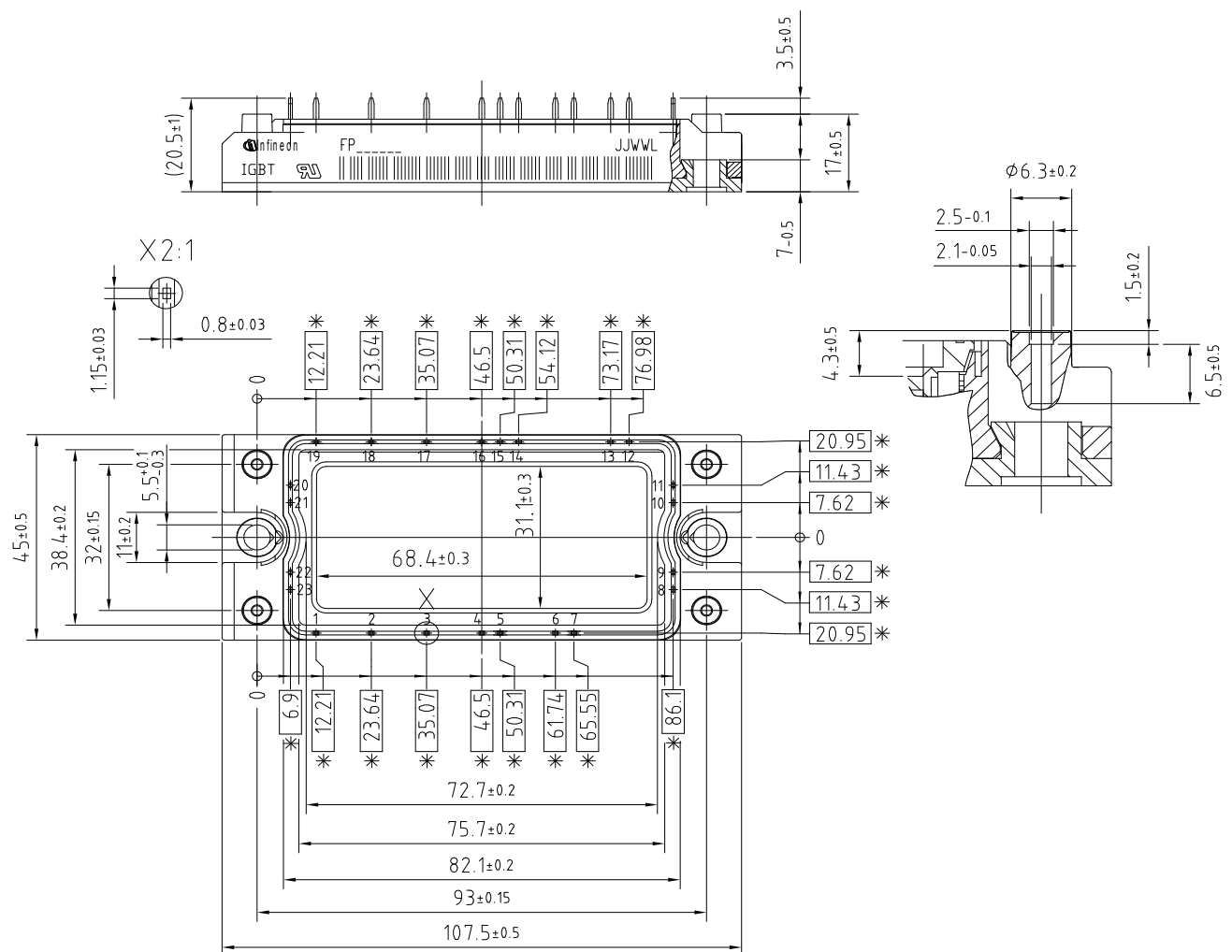
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| prepared by: AS | date of publication: 2013-11-04 |
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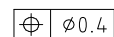
### 接线图 / circuit\_diagram\_headline



## 封裝尺寸 / package outlines



\* = alle Maße mit einer Toleranz von  
\* = all dimensions with tolerance of



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|-----------------|---------------------------------|
| prepared by: AS | date of publication: 2013-11-04 |
| approved by: RS | revision: 2.0                   |

### 初步数据 Preliminary Data

#### 使用条件和条款

##### 使用条件和条款

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-得到质量协议的结论

-建立联合的测试和出厂产品检查，我们可以根据测试的实际情况供货

如果有必要，请根据实际需要将类似的说明给你的客户

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- the conclusion of Quality Agreements;

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

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prepared by: AS

date of publication: 2013-11-04

approved by: RS

revision: 2.0