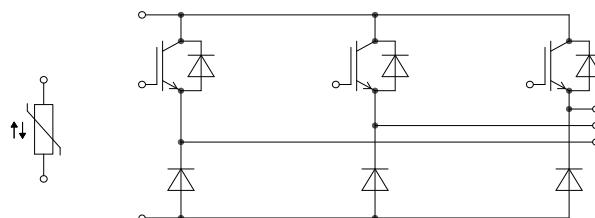
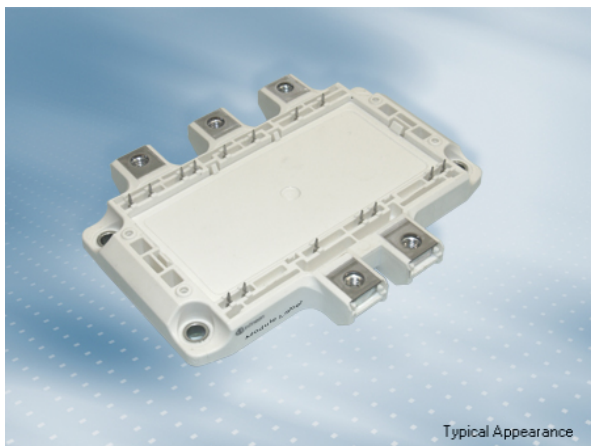


EconoPACK™4 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管 带有温度检测NTC
EconoPACK™4 module with trench/fieldstop IGBT4 and Emitter Controlled Diode and NTC



$V_{CES} = 1200V$
 $I_{C\ nom} = 200A / I_{CRM} = 400A$

典型应用

- 三电平应用
- 高频开关应用
- 斩波应用
- 电机传动
- 太阳能应用
- UPS系统

电气特性

- 提高工作结温 $T_{vj\ op}$
- 沟槽栅IGBT4
- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} 带正温度系数

机械特性

- 2.5 kV 交流 1分钟 绝缘
- 高机械坚固性
- 集成NTC温度传感器
- 绝缘的基板
- 标封装

Typical Applications

- 3-Level-Applications
- High Frequency Switching Application
- Chopper Applications
- Motor Drives
- Solar Applications
- UPS Systems

Electrical Features

- Extended Operation Temperature $T_{vj\ op}$
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} with positive Temperature Coefficient

Mechanical Features

- 2.5 kV AC 1min Insulation
- High mechanical robustness
- Integrated NTC temperature sensor
- 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: KY | date of publication: 2013-11-11 | |
| approved by: MK | revision: 3.0 | UL approved (E83335) |

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 Collector-emitter voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{CES} | 1200 | V |
| 连续集电极直流电流 Continuous DC collector current | $T_C = 95^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ I_C | 200 300 | A A |
| 集电极重复峰值电流 Repetitive peak collector current | $t_P = 1\text{ ms}$ | I_{CRM} | 400 | A |
| 总功率损耗 Total power dissipation | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | P_{tot} | 1100 | W |
| 栅极 - 发射极峰值电压 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 Collector-emitter saturation voltage | $I_C = 200\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 200\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 200\text{ A}, V_{GE} = 15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,75 2,05 2,10 | 2,10 | V V V | |
| 栅极阈值电压 Gate threshold voltage | $I_C = 3,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 5,2 | 5,8 | 6,4 | V |
| 栅极电荷 Gate charge | $V_{GE} = -15\text{ V} \dots +15\text{ V}$ | | Q_G | 1,65 | | | μC |
| 内部栅极电阻 Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 3,8 | | | Ω |
| 输入电容 Input capacitance | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{ies} | 12,5 | | | nF |
| 反向传输电容 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} | 0,54 | | | nF |
| 集电极-发射极截止电流 Collector-emitter cut-off current | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{CES} | | | 0,015 | mA |
| 栅极-发射极漏电流 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) Turn-on delay time, inductive load | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{on}}$ | 0,19 0,20 0,205 | | | μs μs μs |
| 上升时间(电感负载) Rise time, inductive load | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_r | 0,035 0,043 0,044 | | | μs μs μs |
| 关断延迟时间(电感负载) Turn-off delay time, inductive load | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $t_{d\text{off}}$ | 0,365 0,45 0,47 | | | μs μs μs |
| 下降时间(电感负载) Fall time, inductive load | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_f | 0,042 0,072 0,078 | | | μs μs μs |
| 开通损耗能量(每脉冲) Turn-on energy loss per pulse | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 4500\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{on} | 11,0 17,5 20,0 | | | mJ mJ mJ |
| 关断损耗能量(每脉冲) Turn-off energy loss per pulse | $I_C = 200\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3500\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,0\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{off} | 14,0 21,0 23,0 | | | mJ mJ mJ |
| 短路数据 SC data | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | | I_{SC} | 920 | | | A |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个 IGBT / per IGBT | | R_{thJC} | | 0,14 | | K/W |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,071 | | | K/W |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj\text{op}}$ | -40 | 150 | | $^{\circ}\text{C}$ |

| | |
|-----------------|---------------------------------|
| prepared by: KY | date of publication: 2013-11-11 |
| approved by: MK | revision: 3.0 |

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 Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{RRM} | 1200 | V |
| 连续正向直流电流 Continuous DC forward current | | I_F | 200 | A |
| 正向重复峰值电流 Repetitive peak forward current | $t_P = 1\text{ ms}$ | I_{FRM} | 400 | A |
| I ² t-值 I ² t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | I^2t | 7500 6500 | A ² s A ² s |

特征值 / Characteristic Values

| | | | min. | typ. | max. | |
|--|---|---|--------------|----------------------|------|---|
| 正向电压 Forward voltage | $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_F | 1,65 1,65 1,65 | 2,10 | V V V |
| 反向恢复峰值电流 Peak reverse recovery current | $I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | I_{RM} | 210 235 240 | | A A A |
| 恢复电荷 Recovered charge | $I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | Q_r | 19,0 34,0 40,5 | | μC μC μC |
| 反向恢复损耗 (每脉冲) Reverse recovery energy | $I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{rec} | 8,65 15,5 18,0 | | mJ mJ mJ |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个二极管 / per diode | | R_{thJC} | | 0,21 | K/W |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个二极管 / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,069 | | K/W |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj\ op}$ | -40 | 150 | $^{\circ}\text{C}$ |

反向二极管 / Diode, Reverse
最大额定值 / Maximum Rated Values

| | | | | |
|--|--|-----------|--------------|--------------------------------------|
| 反向重复峰值电压 Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{RRM} | 1200 | V |
| 连续正向直流电流 Continuous DC forward current | | I_F | 25 | A |
| 正向重复峰值电流 Repetitive peak forward current | $t_P = 1\text{ ms}$ | I_{FRM} | 50 | A |
| I ² t-值 I ² t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | I^2t | 90,0 75,0 | A ² s A ² s |

特征值 / Characteristic Values

| | | | min. | typ. | max. | |
|--|---|---|--------------|----------------------|------|--------------------|
| 正向电压 Forward voltage | $I_F = 25\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 25\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 25\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_F | 1,75 1,75 1,75 | 2,25 | V V V |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个二极管 / per diode | | R_{thJC} | | 1,30 | K/W |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个二极管 / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,125 | | K/W |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj\ op}$ | -40 | 150 | $^{\circ}\text{C}$ |

| | |
|-----------------|---------------------------------|
| prepared by: KY | date of publication: 2013-11-11 |
| approved by: MK | revision: 3.0 |



负温度系数热敏电阻 / NTC-Thermistor
特征值 / Characteristic Values

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

根据应用手册标定
Specification according to the valid application note.

模块 / Module

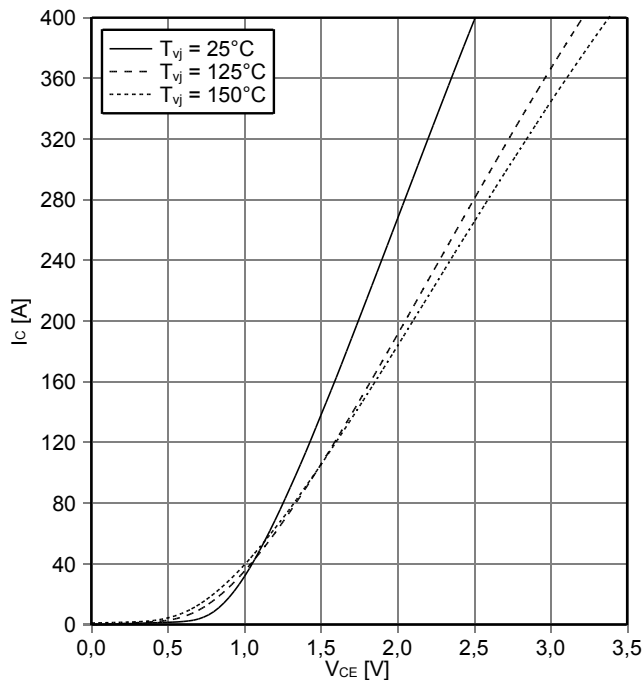
| | | | | | | |
|---|--|----------------------------|------|-------------------------|------|------------------|
| 绝缘测试电压 Isolation test voltage | RMS, f = 50 Hz, t = 1 min. | V_{ISOL} | | 2,5 | | kV |
| 模块基板材料 Material of module baseplate | | | | Cu | | |
| 内部绝缘 Internal isolation | 基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140) | | | Al_2O_3 | | |
| 爬电距离 Creepage distance | 端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal | | | 15,0 12,5 | | mm |
| 电气间隙 Clearance | 端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal | | | 11,0 7,0 | | mm |
| 相对电痕指数 Comperative tracking index | | CTI | | > 200 | | |
| min. typ. max. | | | | | | |
| 杂散电感, 模块 Stray inductance module | | L_{SCE} | | 20 | | nH |
| 模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip | $T_C = 25^\circ\text{C}$, 每个开关 / per switch | $R_{\text{CC}+\text{EE}'}$ | | 1,40 | | m Ω |
| 储存温度 Storage temperature | | T_{stg} | -40 | | 125 | $^\circ\text{C}$ |
| 模块安装的安装扭矩 Mounting torque for modul mounting | 螺丝 M5 根据相应的应用手册进行安装 Screw M5 - Mounting according to valid application note | M | 3,00 | - | 6,00 | Nm |
| 端子联接扭矩 Terminal connection torque | 螺丝 M6 根据相应的应用手册进行安装 Screw M6 - Mounting according to valid application note | M | 3,0 | - | 6,0 | Nm |
| 重量 Weight | | G | | 400 | | g |

| | |
|-----------------|---------------------------------|
| prepared by: KY | date of publication: 2013-11-11 |
| approved by: MK | revision: 3.0 |



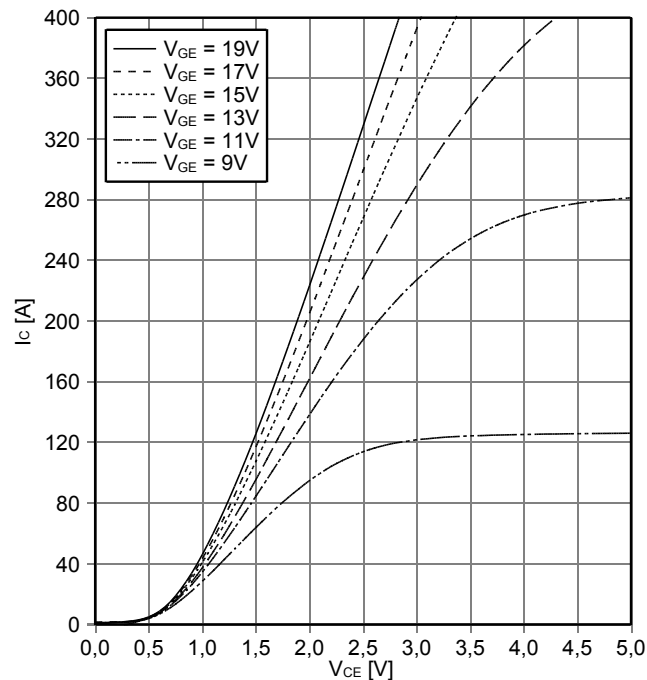
输出特性 IGBT, 制动-斩波器 (典型)
output characteristic IGBT, Brake-Chopper (typical)

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



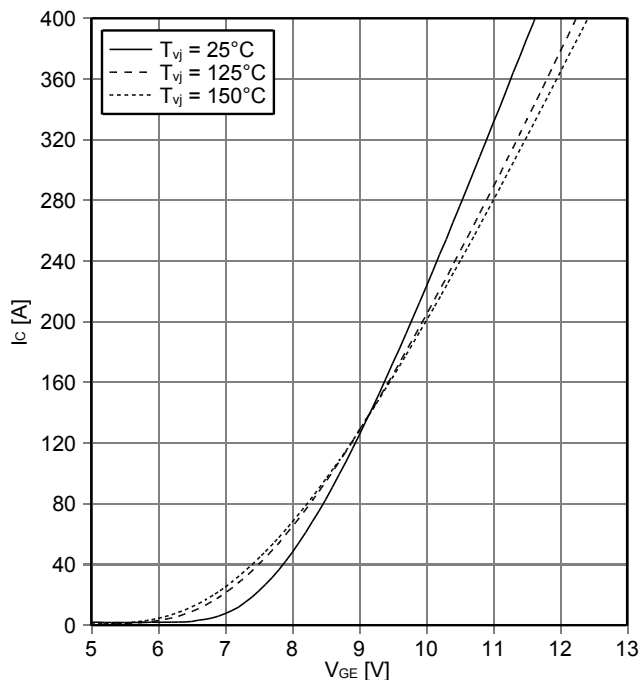
输出特性 IGBT, 制动-斩波器 (典型)
output characteristic IGBT, Brake-Chopper (typical)

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



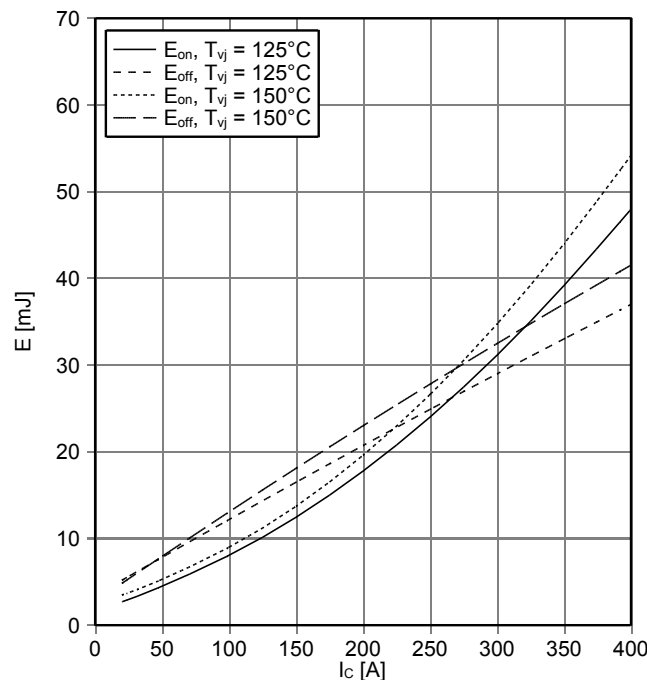
传输特性 IGBT, 制动-斩波器 (典型)
transfer characteristic IGBT, Brake-Chopper (typical)

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



开关损耗 IGBT, 制动-斩波器 (典型)
switching losses IGBT, Brake-Chopper (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1\ \Omega$, $R_{Goff} = 1\ \Omega$, $V_{CE} = 600\text{ V}$

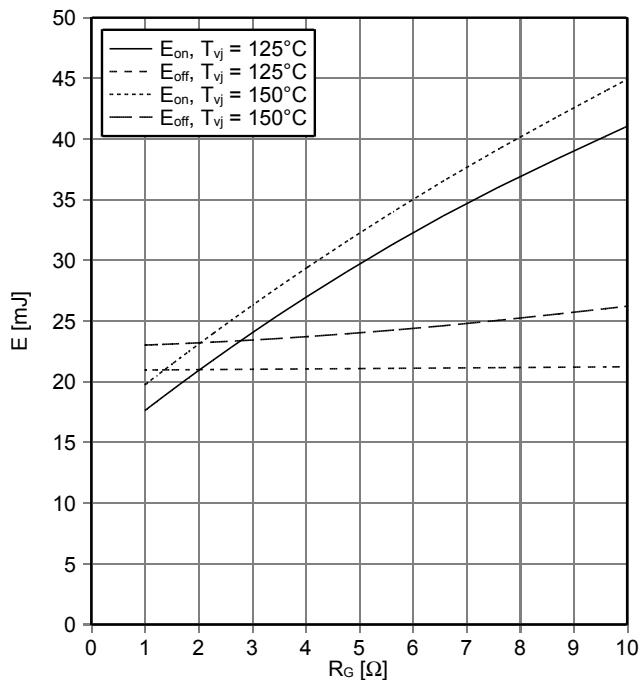


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|-----------------|---------------------------------|
| prepared by: KY | date of publication: 2013-11-11 |
| approved by: MK | revision: 3.0 |



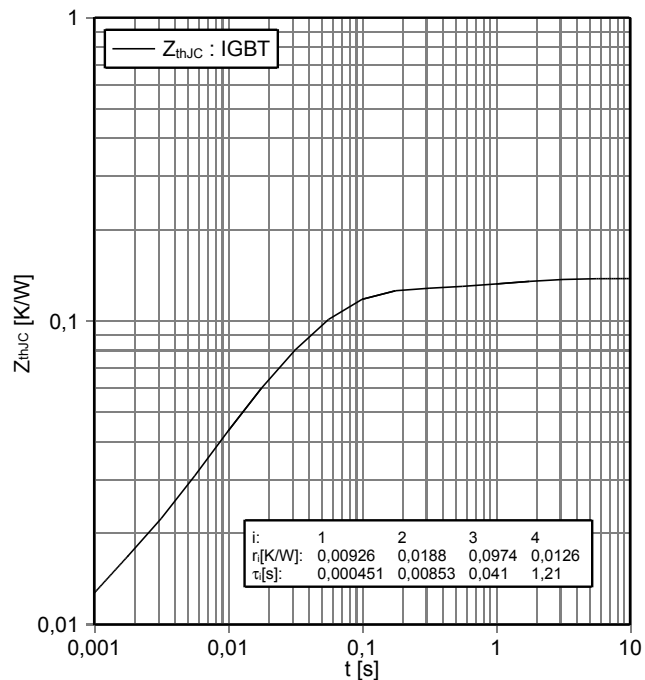
开关损耗 IGBT, 制动-斩波器 (典型)
switching losses IGBT, Brake-Chopper (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 200\text{ A}, V_{CE} = 600\text{ V}$



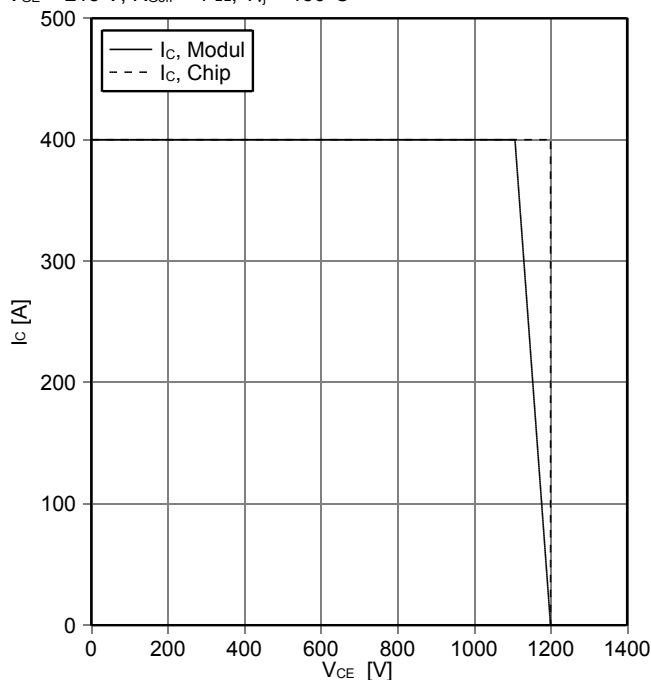
瞬态热阻抗 IGBT, 制动-斩波器
transient thermal impedance IGBT, Brake-Chopper

$Z_{thJC} = f(t)$



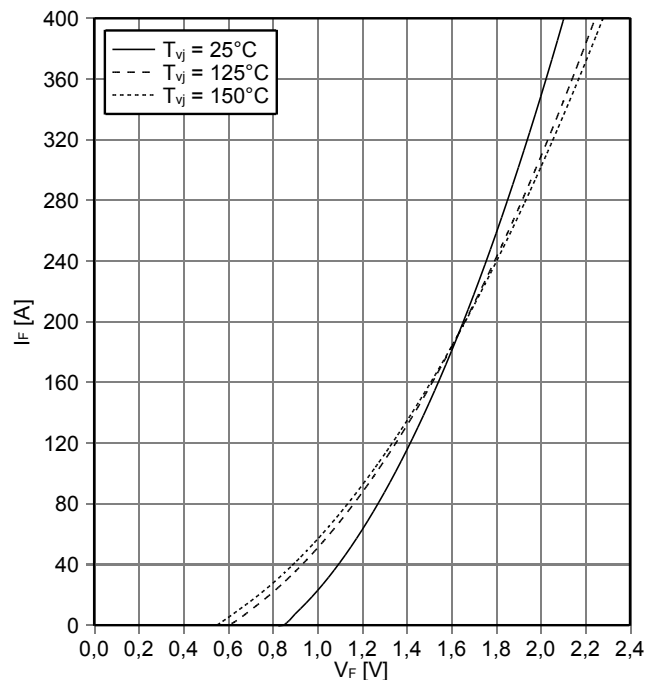
反偏安全工作区 IGBT, 制动-斩波器 (RBSOA)
reverse bias safe operating area IGBT, Brake-Chopper (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$

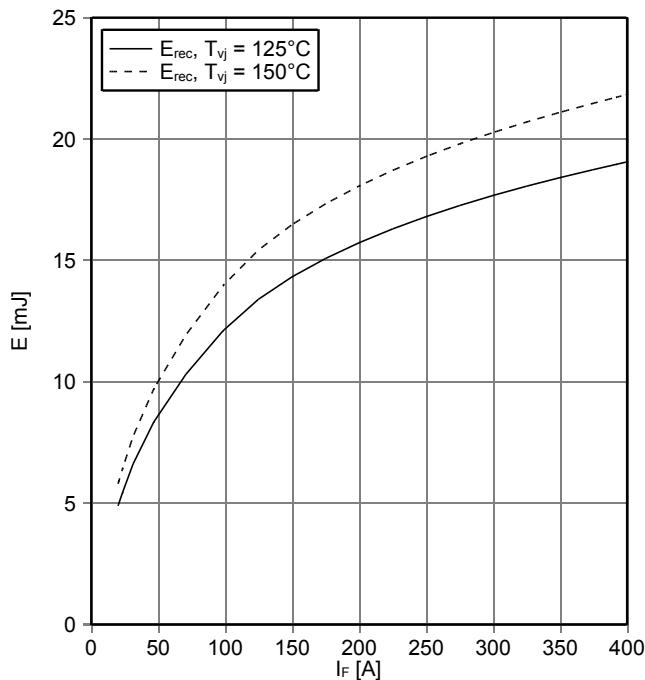


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|-----------------|---------------------------------|
| prepared by: KY | date of publication: 2013-11-11 |
| approved by: MK | revision: 3.0 |



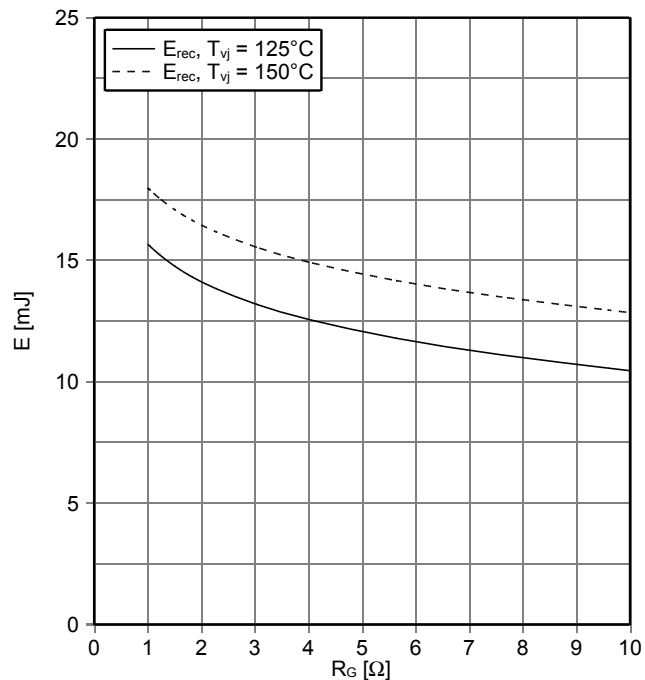
开关损耗 二极管，制动-斩波器 (典型)
switching losses Diode, Brake-Chopper (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1 \Omega, V_{CE} = 600 V$



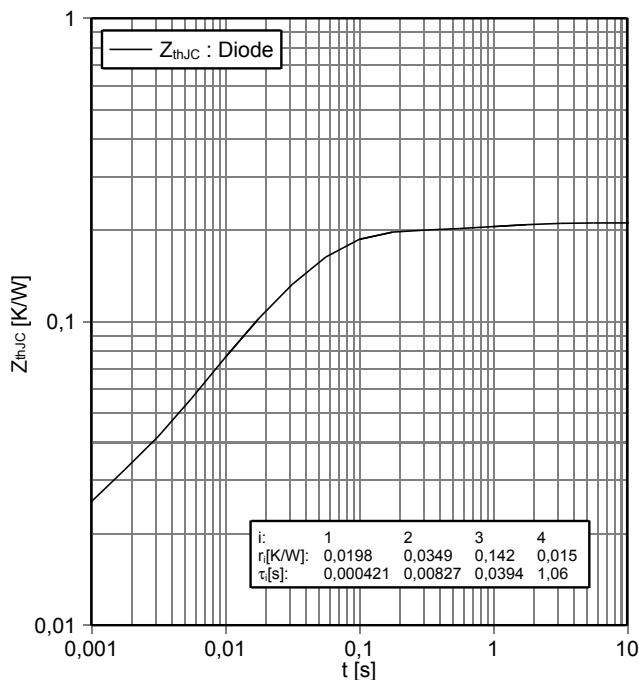
开关损耗 二极管，制动-斩波器 (典型)
switching losses Diode, Brake-Chopper (typical)

$E_{rec} = f(R_G)$
 $I_F = 200 A, V_{CE} = 600 V$



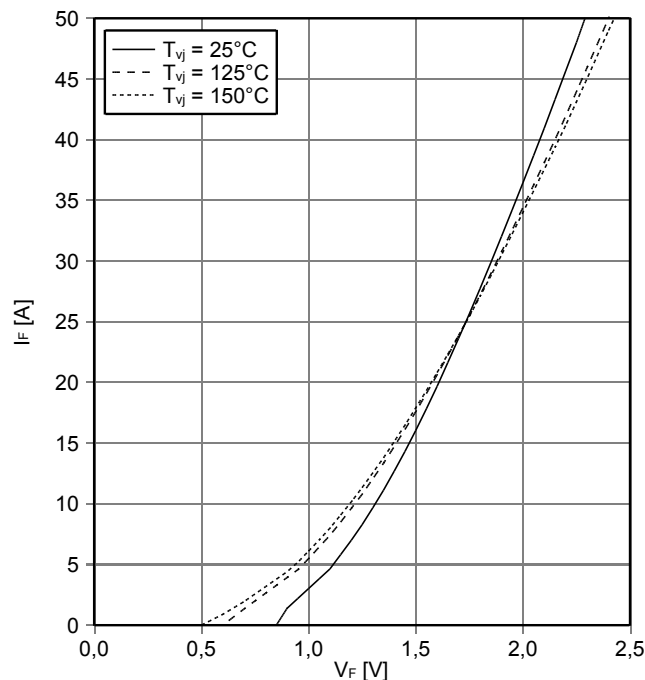
瞬态热阻抗 二极管，制动-斩波器
transient thermal impedance Diode, Brake-Chopper

$Z_{thJC} = f(t)$



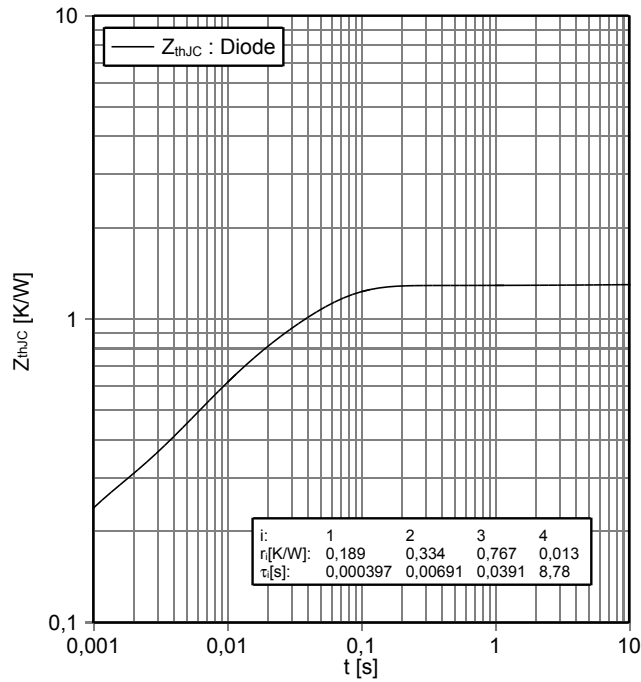
正向偏压特性 反向二极管 (典型)
forward characteristic of Diode, Reverse (typical)

$I_F = f(V_F)$

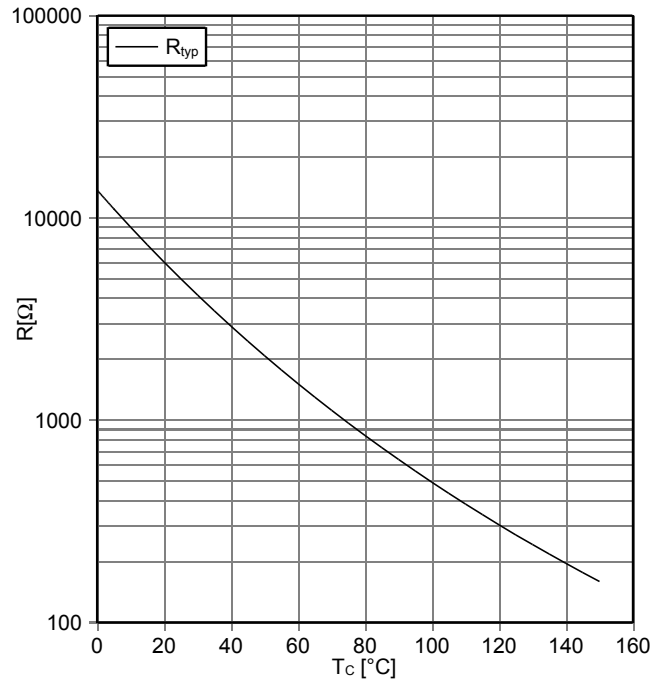


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瞬态热阻抗 反向二极管
transient thermal impedance Diode, Reverse
 $Z_{thJC} = f(t)$

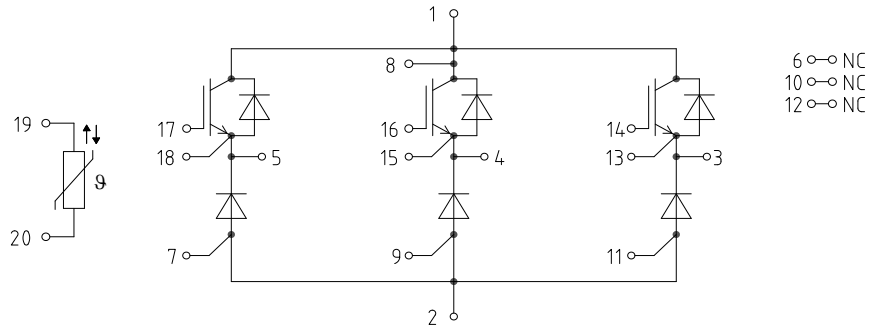


负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T)$

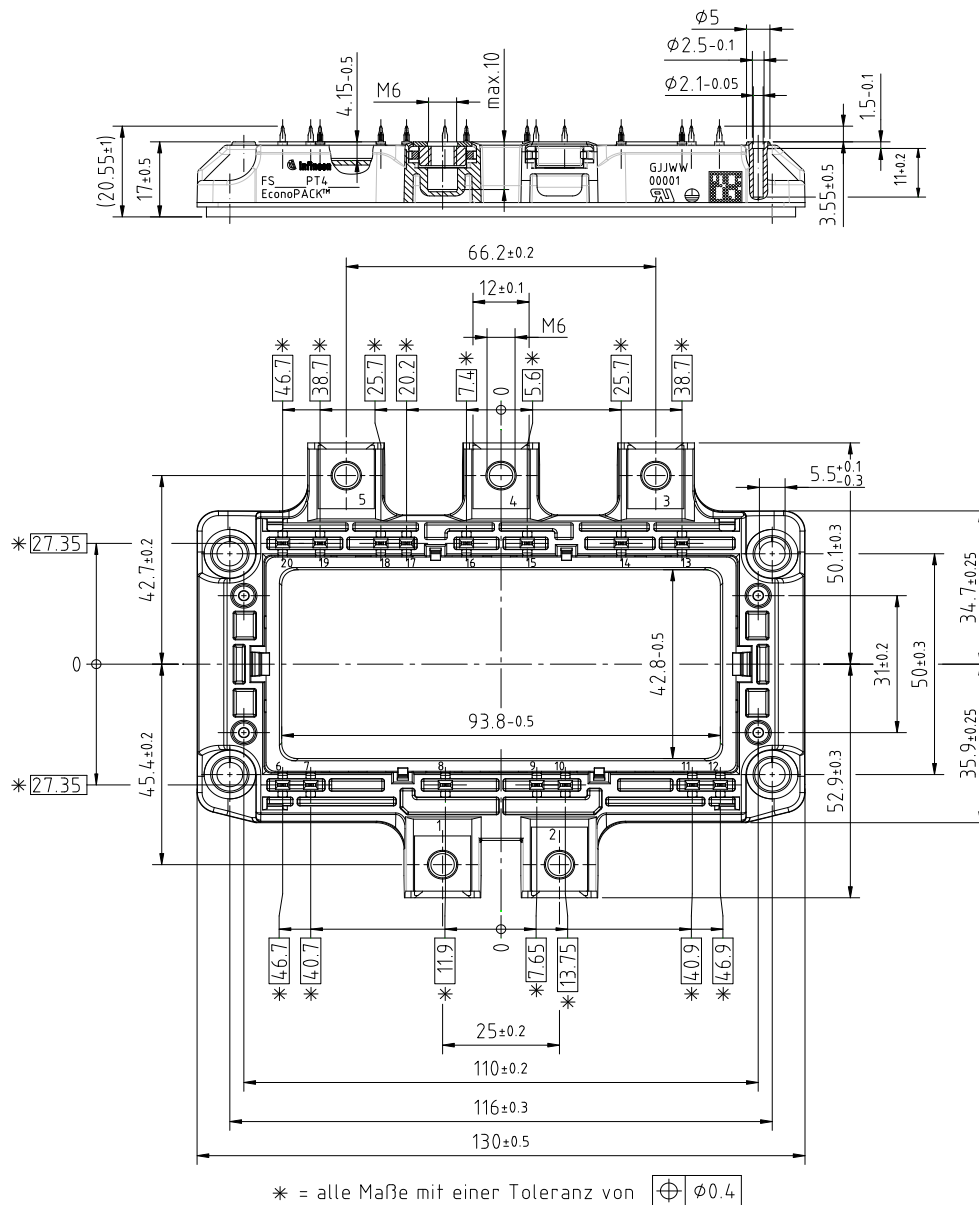


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接线图 / circuit_diagram_headline



封装尺寸 / package outlines



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