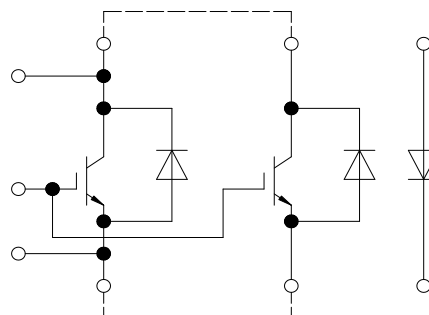


IHM-B 模块 采用第三代沟槽栅/场终止IGBT3和第三代发射极控制二极管
IHM-B module with Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode



$V_{CES} = 3300V$
 $I_{C\ nom} = 1000A / I_{CRM} = 2000A$

典型应用

- 斩波应用
- 中压变流器
- 电机传动
- 牵引变流器
- UPS系统
- 风力发电机

Typical Applications

- Chopper Applications
- Medium Voltage Converters
- Motor Drives
- Traction Drives
- UPS Systems
- Wind Turbines

电气特性

- 高直流电压稳定性
- 高短路能力，自限制短路电流
- 低 V_{CEsat}
- 无与伦比的坚固性
- $T_{vj\ op} = 150^{\circ}C$
- V_{CEsat} 带正温度系数

Electrical Features

- High DC Stability
- High Short Circuit Capability, Self Limiting Short Circuit Current
- Low V_{CEsat}
- Unbeatable Robustness
- $T_{vj\ op} = 150^{\circ}C$
- V_{CEsat} with positive Temperature Coefficient

机械特性

- 碳化硅铝 (AlSiC) 基板提供更高的温度循环能力
- 封装的 CTI > 600
- IHM B 封装
- 绝缘的基板

Mechanical Features

- AlSiC Base Plate for increased Thermal Cycling Capability
- Package with CTI > 600
- IHM B Housing
- Isolated Base Plate

Module Label Code

Barcode Code 128



DMX - 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: SB | date of publication: 2013-12-11 |
| approved by: DTS | revision: 3.1 |

IGBT, 逆变器 / IGBT, Inverter

最大额定值 / Maximum Rated Values

| | | | | |
|--|--|-------------------|--------------|----|
| 集电极 - 发射极电压 Collector-emitter voltage | $T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_{CES} | 3300 3300 | V |
| 连续集电极直流电流 Continuous DC collector current | $T_C = 95^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ | $I_{C\text{nom}}$ | 1000 | A |
| 集电极重复峰值电流 Repetitive peak collector current | $t_P = 1\text{ms}$ | I_{CRM} | 2000 | A |
| 总功率损耗 Total power dissipation | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ | P_{tot} | 11,5 | kW |
| 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 | $I_C = 1000\text{A}, V_{GE} = 15\text{V}$ $I_C = 1000\text{A}, V_{GE} = 15\text{V}$ $I_C = 1000\text{A}, V_{GE} = 15\text{V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 2,40 2,95 3,10 | 2,85 3,50 | V V V |
| 栅极阈值电压 Gate threshold voltage | $I_C = 48,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 5,2 | 5,8 | 6,4 V |
| 栅极电荷 Gate charge | $V_{GE} = -15\text{V} \dots +15\text{V}, V_{CE} = 1800\text{V}$ | | Q_G | 28,0 | | μC |
| 内部栅极电阻 Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 0,63 | | 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} | 190 | | 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} | 4,00 | | nF |
| 集电极-发射极截止电流 Collector-emitter cut-off current | $V_{CE} = 3300\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{CES} | | 5,0 | mA |
| 栅极-发射极漏电流 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 | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,4\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_{don} | 0,50 0,50 0,50 | | μs μs μs |
| 上升时间(电感负载) Rise time, inductive load | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,4\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_r | 0,55 0,55 0,55 | | μs μs μs |
| 关断延迟时间(电感负载) Turn-off delay time, inductive load | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 4,1\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_{doff} | 4,10 4,30 4,30 | | μs μs μs |
| 下降时间(电感负载) Fall time, inductive load | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 4,1\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_f | 0,40 0,40 0,40 | | μs μs μs |
| 开通损耗能量(每脉冲) Turn-on energy loss per pulse | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}, L_S = 85\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 3000\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 0,75\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{on} | 1550 2150 2400 | | mJ mJ mJ |
| 关断损耗能量(每脉冲) Turn-off energy loss per pulse | $I_C = 1000\text{A}, V_{CE} = 1800\text{V}, L_S = 85\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 1550\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 4,1\Omega, C_{GE} = 220\text{nF}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{off} | 1600 1950 2050 | | mJ mJ mJ |
| 短路数据 SC data | $V_{GE} \leq 15\text{V}, V_{CC} = 2500\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | | I_{SC} | 4300 | | A |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个 IGBT / per IGBT | | R_{thJC} | | 11,0 | K/kW |
| 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} | 14,5 | | K/kW |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj\text{op}}$ | -40 | 150 | $^{\circ}\text{C}$ |

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|------------------|---------------------------------|
| prepared by: SB | date of publication: 2013-12-11 |
| approved by: DTS | revision: 3.1 |

二极管, 逆变器 / Diode, Inverter
最大额定值 / Maximum Rated Values

| | | | | |
|---|--|----------------------|--------------|--|
| 反向重复峰值电压 Repetitive peak reverse voltage | $T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_{RRM} | 3300 3300 | V |
| 连续正向直流电流 Continuous DC forward current | | I_F | 1000 | A |
| 正向重复峰值电流 Repetitive peak forward current | $t_P = 1 \text{ ms}$ | I_{FRM} | 2000 | A |
| I^2t -值 I^2t - 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 | 375 325 | kA^2s kA^2s |
| 最大损耗功率 Maximum power dissipation | $T_{vj} = 125^{\circ}\text{C}$ | P_{RQM} | 1600 | kW |
| 最小开通时间 Minimum turn-on time | | $t_{on \text{ min}}$ | 10,0 | μs |

特征值 / Characteristic Values

| | | | | min. | typ. | max. | |
|--|---|---|---------------------|------|----------------------|--------------|---|
| 正向电压 Forward voltage | $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_F | | 2,25 2,20 2,20 | 2,85 2,75 | V V V |
| 反向恢复峰值电流 Peak reverse recovery current | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | I_{RM} | | 1100 1200 1250 | | A A A |
| 恢复电荷 Recovered charge | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | Q_r | | 1000 1750 1950 | | μC μC μC |
| 反向恢复损耗 (每脉冲) Reverse recovery energy | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{rec} | | 1100 2100 2500 | | mJ mJ mJ |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个二极管 / per diode | | R_{thJC} | | | 20,0 | K/kW |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | | 16,5 | | K/kW |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj \text{ op}}$ | -40 | | 150 | $^{\circ}\text{C}$ |

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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 | $T_{vj} = -40^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_{RRM} | 3300 3300 | V |
| 连续正向直流电流 Continuous DC forward current | | I_F | 1000 | A |
| 正向重复峰值电流 Repetitive peak forward current | $t_P = 1 \text{ ms}$ | I_{FRM} | 2000 | 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 ² t | 375 325 | kA ² s kA ² s |
| 最大损耗功率 Maximum power dissipation | $T_{vj} = 125^{\circ}\text{C}$ | P_{RQM} | 1600 | kW |
| 最小开通时间 Minimum turn-on time | | $t_{on \text{ min}}$ | 10,0 | μs |

特征值 / Characteristic Values

| | | | | min. | typ. | max. | |
|--|---|---|---------------------|------|----------------------|--------------|----------------|
| 正向电压 Forward voltage | $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1000 \text{ A}, V_{GE} = 0 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_F | | 2,25 2,20 2,20 | 2,85 2,75 | V V V |
| 反向恢复峰值电流 Peak reverse recovery current | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | I_{RM} | | 1100 1200 1250 | | A A A |
| 恢复电荷 Recovered charge | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | Q_r | | 1000 1750 1950 | | μC μC μC |
| 反向恢复损耗 (每脉冲) Reverse recovery energy | $I_F = 1000 \text{ A}, -di_F/dt = 3000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{rec} | | 1100 2100 2500 | | mJ mJ mJ |
| 结 - 外壳热阻 Thermal resistance, junction to case | 每个二极管 / per diode | | R_{thJC} | | | 21,5 | K/kW |
| 外壳 - 散热器热阻 Thermal resistance, case to heatsink | 每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | | 16,5 | | K/kW |
| 在开关状态下温度 Temperature under switching conditions | | | $T_{vj \text{ op}}$ | -40 | | 150 | °C |

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模块 / Module

| | | | | | |
|--|--|--|------------|--------------|--------------|
| 绝缘测试电压 Isolation test voltage | RMS, f = 50 Hz, t = 1 min. | V _{ISOL} | 6,0 | | kV |
| 局部放电停止电压 Partial discharge extinction voltage | RMS, f = 50 Hz, Q _{PD} ≤ 10 pC (acc. to IEC 1287) | V _{ISOL} | 2,6 | | kV |
| DC 稳定性 DC stability | T _{vj} = 25°C, 100 fit | V _{CE D} | 2100 | | V |
| 模块基板材料 Material of module baseplate | | | AISiC | | |
| 爬电距离 Creepage distance | 端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal | | 32,2 | | mm |
| 电气间隙 Clearance | 端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal | | 19,1 | | mm |
| 相对电痕指数 Comperative tracking index | | CTI | > 600 | | |
| | | | min. | typ. | max. |
| 杂散电感,模块 Stray inductance module | | L _{sCE} | | 9,0 | nH |
| 模块引线电阻,端子-芯片 Module lead resistance, terminals - chip | T _C = 25°C, 每个开关 / per switch | R _{CC'+EE'} R _{AA'+CC'} | | 0,19 0,28 | mΩ |
| 储存温度 Storage temperature | | T _{stg} | -40 | | 150 °C |
| 模块安装的安装扭矩 Mounting torque for modul mounting | 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 | 4,25 | - | 5,75 Nm |
| 端子联接扭矩 Terminal connection torque | 螺丝 M4 根据相应的应用手册进行安装 Screw M4 - Mounting according to valid application note 螺丝 M8 根据相应的应用手册进行安装 Screw M8 - Mounting according to valid application note | M | 1,8 8,0 | - | 2,1 10 Nm |
| 重量 Weight | | G | | 1200 | g |

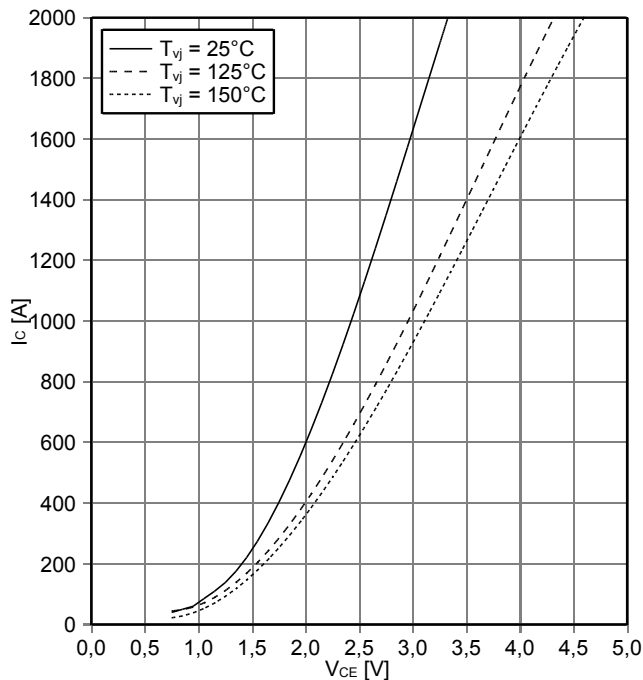
Modulinduktivität: IGBT (Zweig 1+2 parallel): 9nH; Diode (Zweig 3): 18nH
stray inductance module: IGBT (arm 1+2 parallel): 9nH; Diode (arm 3): 18nH

| | |
|------------------|---------------------------------|
| prepared by: SB | date of publication: 2013-12-11 |
| approved by: DTS | revision: 3.1 |



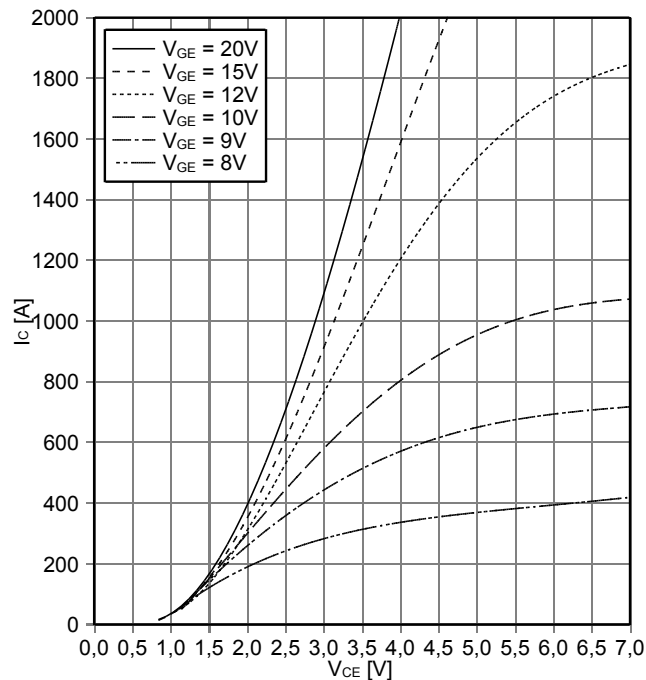
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



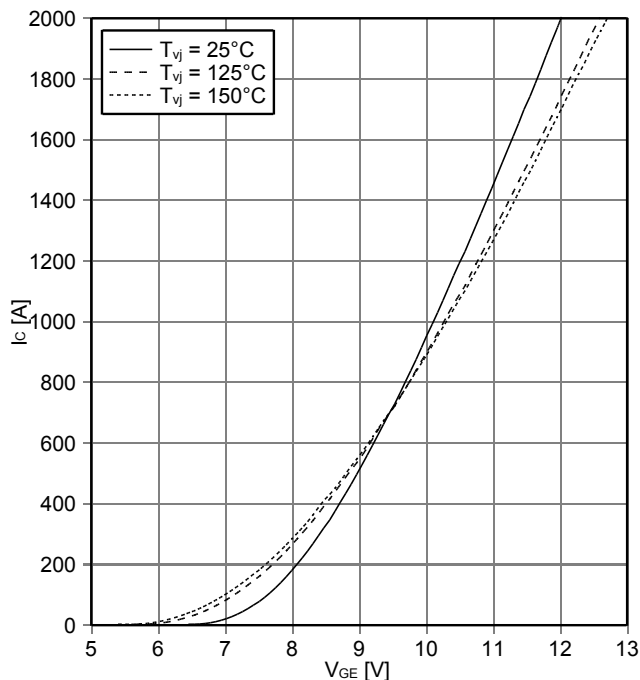
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



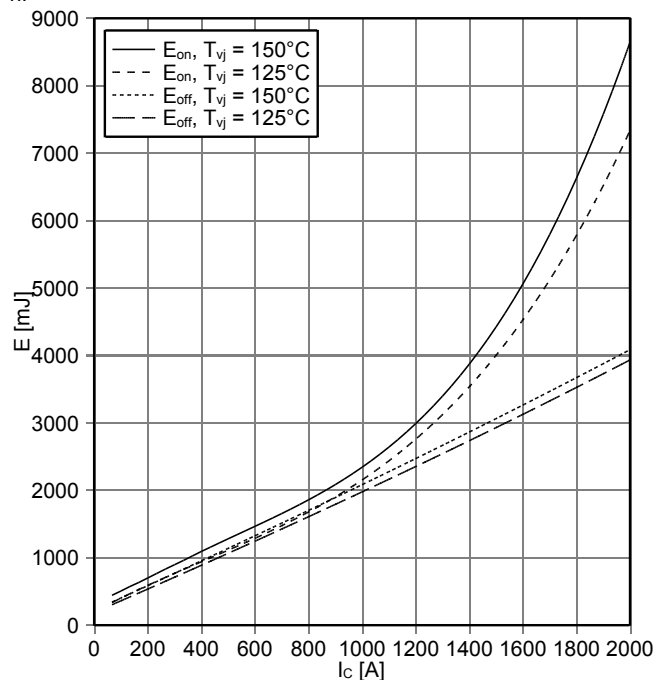
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 0.75\ \Omega, R_{Goff} = 4.1\ \Omega, V_{CE} = 1800\text{ V}, C_{GE} = 220\text{ nF}$

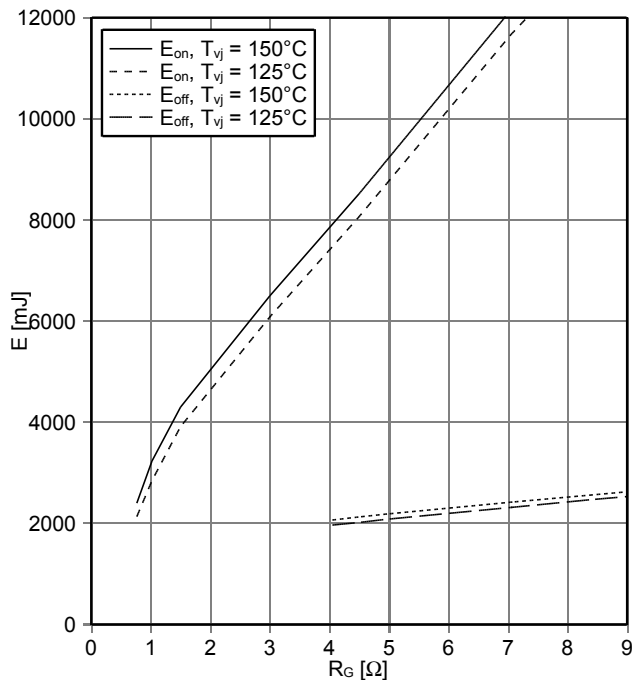


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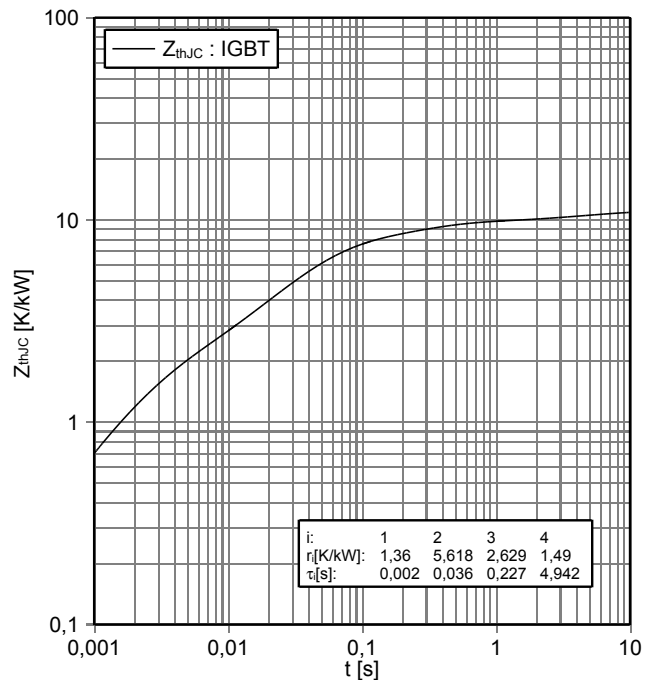
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 1000\text{ A}, V_{CE} = 1800\text{ V}, C_{GE} = 220\text{ nF}$



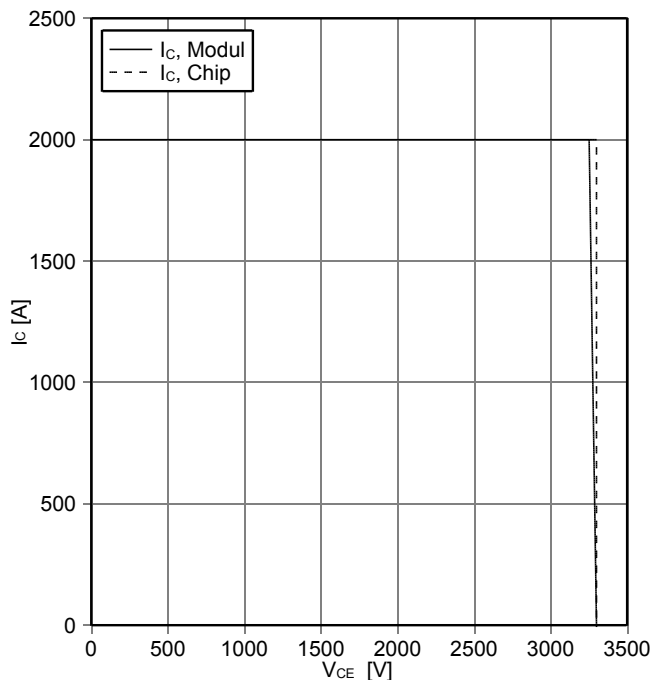
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



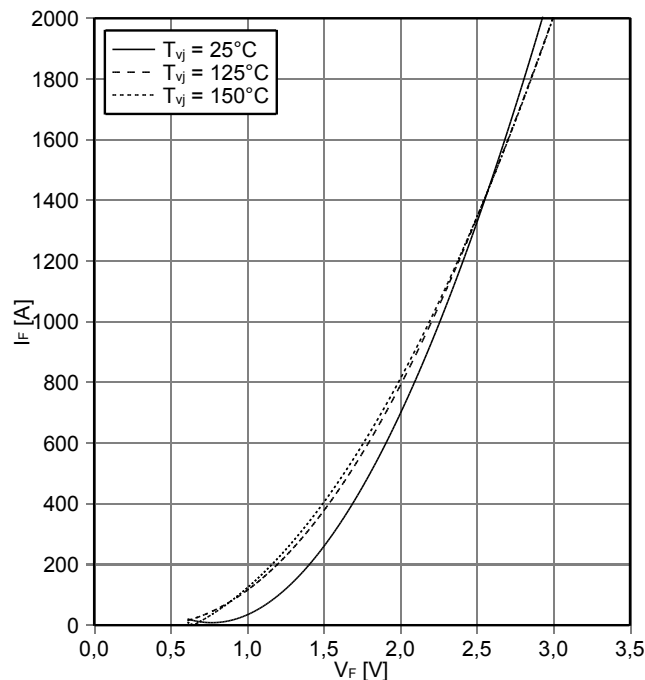
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 4.1\ \Omega, T_{vj} = 150^\circ\text{C}, C_{GE} = 220\text{ nF}$



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

$I_F = f(V_F)$

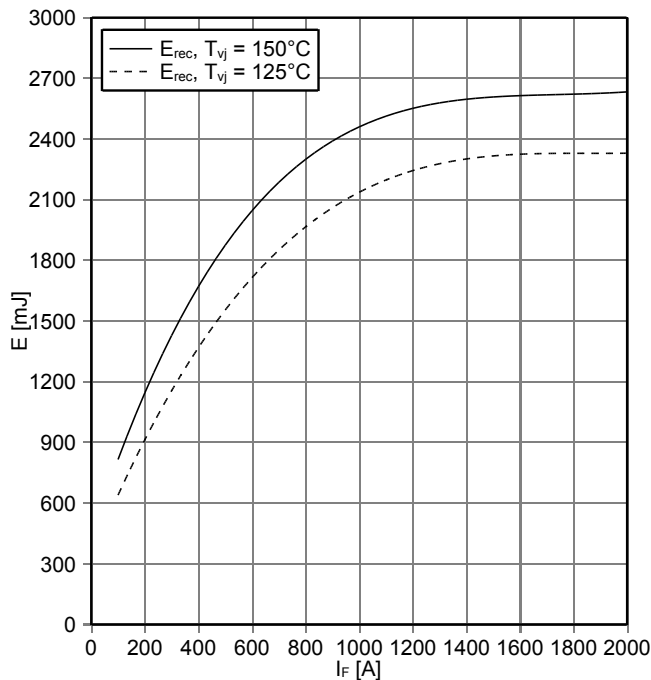


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|------------------|---------------------------------|
| prepared by: SB | date of publication: 2013-12-11 |
| approved by: DTS | revision: 3.1 |



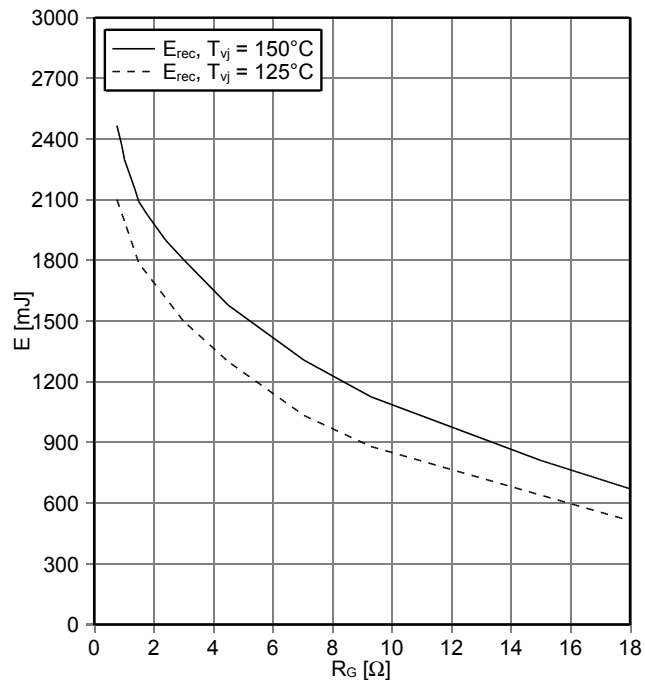
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 0.75 \Omega, V_{CE} = 1800 V$



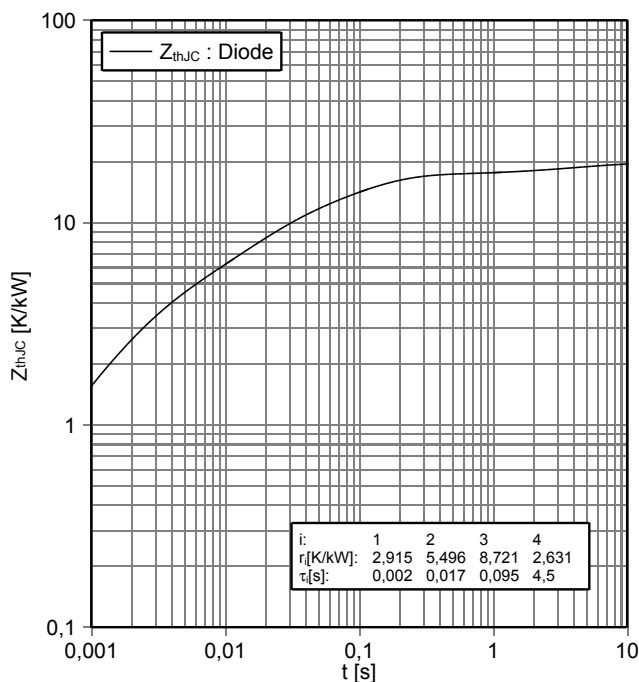
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 1000 A, V_{CE} = 1800 V$



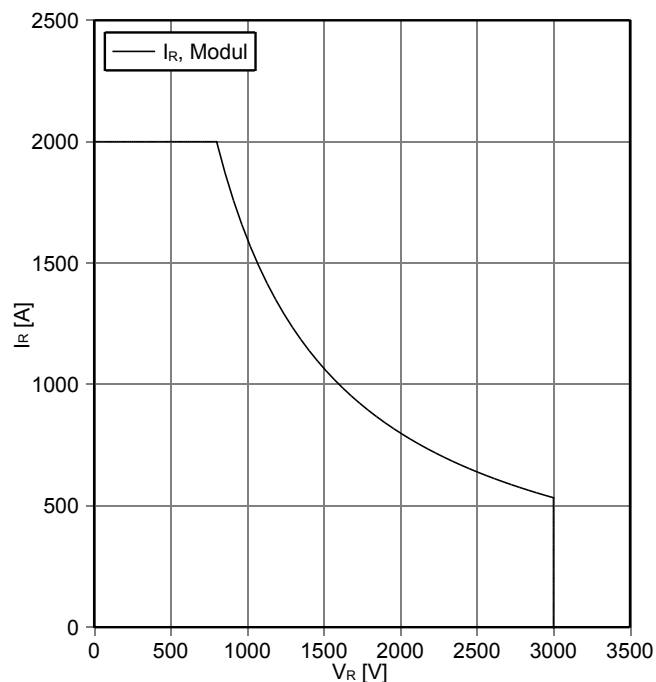
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



安全工作区 二极管,逆变器 (SOA)
safe operation area Diode, Inverter (SOA)

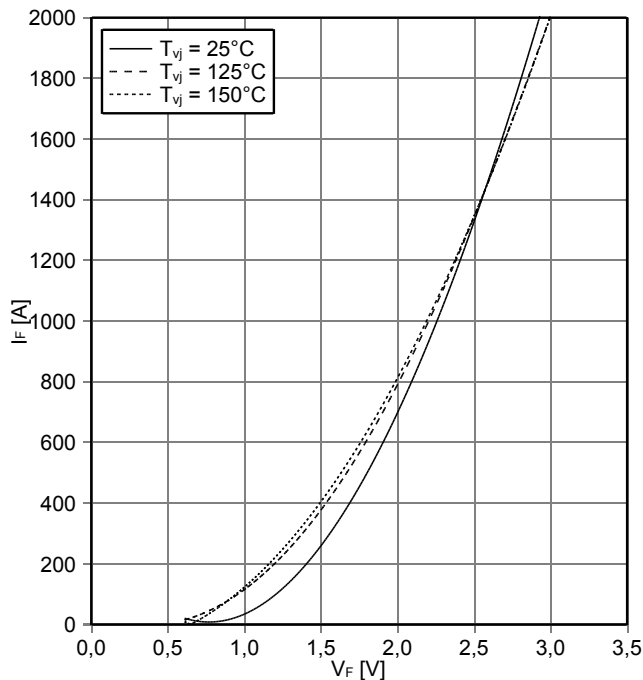
$I_R = f(V_R)$
 $T_{vj} = 150^\circ C$



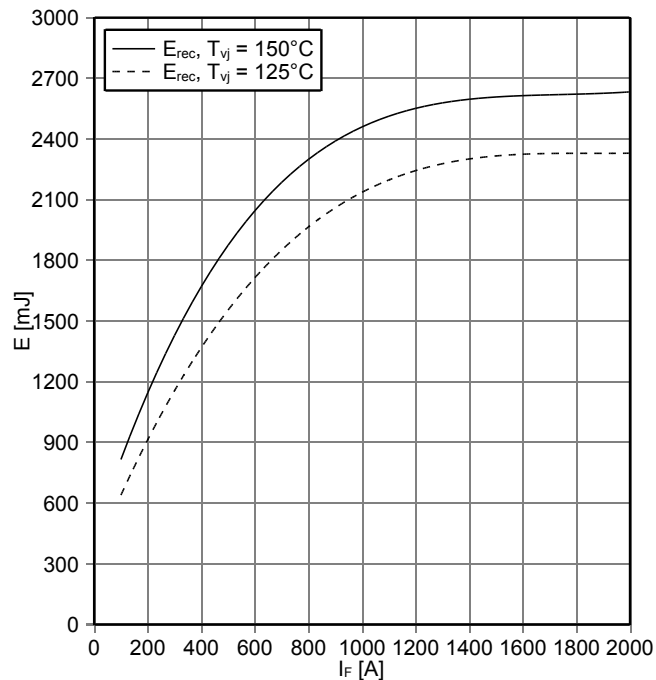
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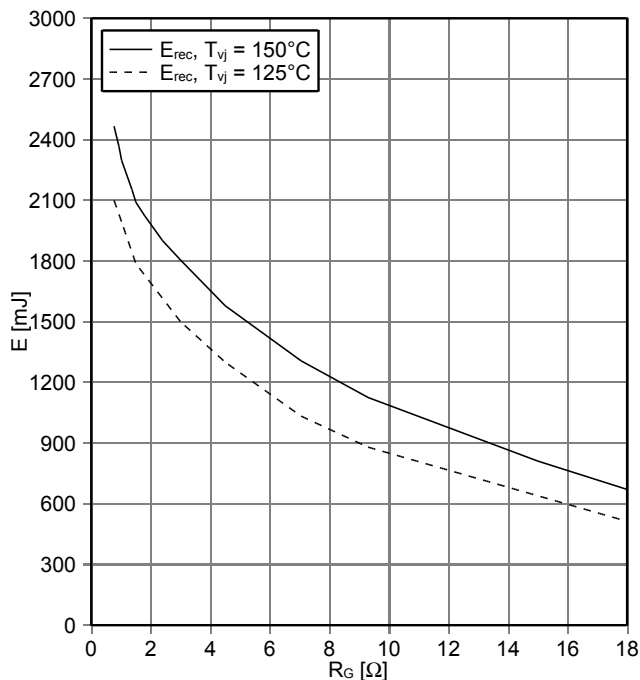
正向偏压特性 二极管, 制动-斩波器 (典型)
forward characteristic of Diode, Brake-Chopper (typical)
 $I_F = f(V_F)$



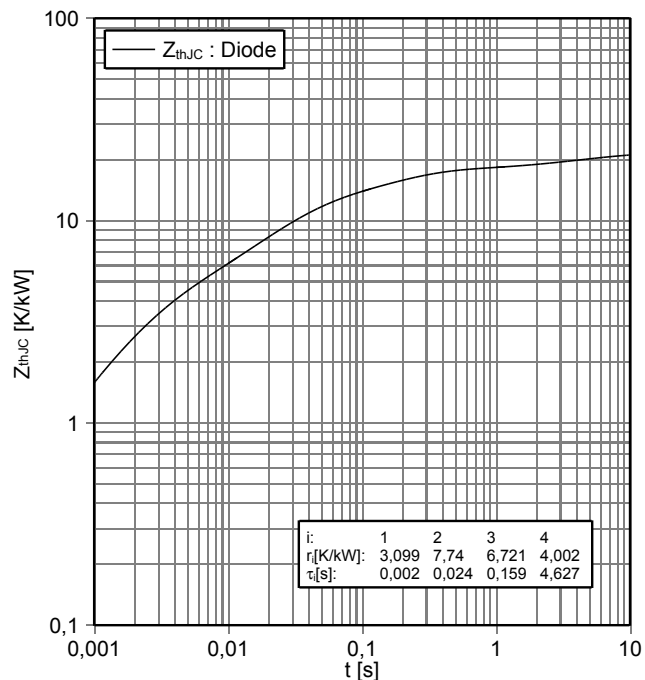
开关损耗 二极管, 制动-斩波器 (典型)
switching losses Diode, Brake-Chopper (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.75 \Omega, V_{CE} = 1800 V$



开关损耗 二极管, 制动-斩波器 (典型)
switching losses Diode, Brake-Chopper (typical)
 $E_{rec} = f(R_G)$
 $I_F = 1000 A, V_{CE} = 1800 V$



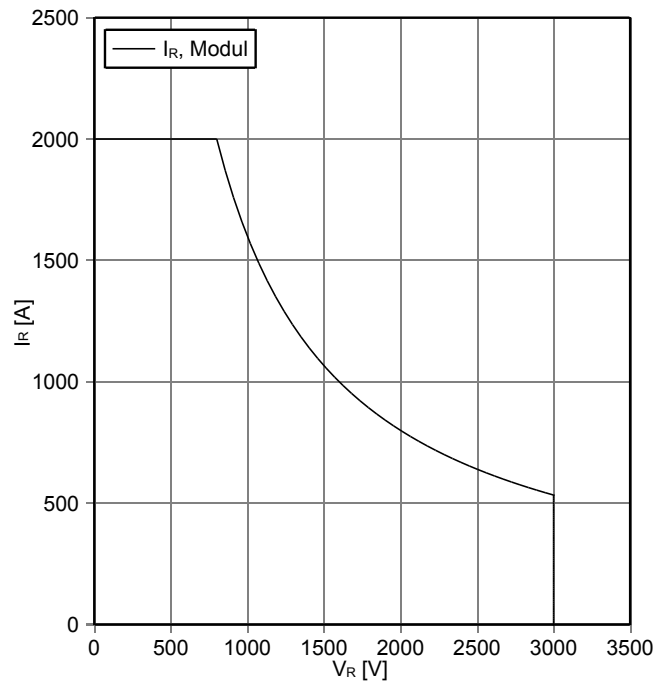
瞬态热阻抗 二极管, 制动-斩波器
transient thermal impedance Diode, Brake-Chopper
 $Z_{thJC} = f(t)$



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安全工作区 二极管, 制动-斩波器 (SOA)
safe operation area Diode, Brake-Chopper (SOA)

$I_R = f(V_R)$
 $T_{vj} = 150^\circ\text{C}$



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使用条件和条款

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