



62mm C-Serien Modul mit Trench/Feldstopp IGBT3, Emitter Controlled High Efficiency Diode und M5 Lastanschluss  
62mm C-series module with trench/fieldstop IGBT3 Emitter Controlled High Efficiency diode and M5 power terminals

**IGBT- インバータ / IGBT, Inverter**  
**最大定格 / Maximum Rated Values**

|  |  |                            |            |        |
|--|--|----------------------------|------------|--------|
| コレクタ・エミッタ間電圧<br>Collector-emitter voltage          | $T_{vj} = 25^{\circ}\text{C}$  | $V_{CES}$                  | 1200       | V      |
| 連続DCコレクタ電流<br>Continuous DC collector current      | $T_C = 80^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 400<br>580 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$  | $I_{CRM}$                  | 800        | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150$   | $P_{\text{tot}}$           | 2000       | W      |
| ゲート・エミッタ間ピーク電圧<br>Gate-emitter peak voltage        |  | $V_{GES}$                  | +/-20      | V      |

**電気的特性 / Characteristic Values**

|   |   |   | min.               | typ.          | max.  |                                |
|---|---|---|--------------------|---------------|-------|--------------------------------|
| コレクタ・エミッタ間飽和電圧<br>Collector-emitter saturation voltage  | $I_C = 400\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,70<br>2,00  | 2,15  | V<br>V                         |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 16,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$  |   | $V_{G\text{Eth}}$  | 5,0           | 5,8   | 6,5 V                          |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$  |   | $Q_G$              | 3,70          |       | $\mu\text{C}$                  |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$   |   | $R_{G\text{int}}$  | 1,9           |       | $\Omega$                       |
| 入力容量<br>Input capacitance                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$  |   | $C_{\text{ies}}$   | 28,0          |       | nF                             |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$  |   | $C_{\text{res}}$   | 1,10          |       | nF                             |
| コレクタ・エミッタ間遮断電流<br>Collector-emitter cut-off current     | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$  |   | $I_{CES}$          |               | 5,0   | mA                             |
| ゲート・エミッタ間漏れ電流<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                             |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{on}} = 1,8\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{d\text{on}}$   | 0,25<br>0,30  |       | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオン上昇時間 (誘導負荷)<br>Rise time, inductive load           | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{on}} = 1,8\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_r$              | 0,04<br>0,045 |       | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ遅れ時間 (誘導負荷)<br>Turn-off delay time, inductive load | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{off}} = 1,8\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{d\text{off}}$  | 0,50<br>0,60  |       | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ下降時間 (誘導負荷)<br>Fall time, inductive load           | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{G\text{off}} = 1,8\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_f$              | 0,10<br>0,16  |       | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオンスイッチング損失<br>Turn-on energy loss per pulse          | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}, L_S = 80\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 6000\text{ A}/\mu\text{s}$<br>$R_{G\text{on}} = 1,8\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{\text{on}}$    | 17,0<br>25,0  |       | mJ<br>mJ                       |
| ターンオフスイッチング損失<br>Turn-off energy loss per pulse         | $I_C = 400\text{ A}, V_{CE} = 600\text{ V}, L_S = 80\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4000\text{ V}/\mu\text{s}$<br>$R_{G\text{off}} = 1,8\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{\text{off}}$   | 42,0<br>62,0  |       | mJ<br>mJ                       |
| 短絡電流<br>SC data   | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$  | $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$        | $I_{SC}$           | 1600          |       | A                              |
| ジャンクション・ケース間熱抵抗<br>Thermal resistance, junction to case | IGBT部 (1素子当り) / per IGBT  |   | $R_{thJC}$         |               | 0,062 | K/W                            |
| ケース・ヒートシンク間熱抵抗<br>Thermal resistance, case to heatsink  | IGBT部 (1素子当り) / per IGBT<br>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$          |   | $R_{thCH}$         | 0,031         |       | K/W                            |
| 動作温度<br>Temperature under switching conditions          |   |   | $T_{vj\text{op}}$  | -40           | 125   | $^{\circ}\text{C}$             |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |



**Diode、インバータ / Diode, Inverter**  
**最大定格 / Maximum Rated Values**

|  |  |           |       |                      |
|--|--|-----------|-------|----------------------|
| ピーク繰返し逆電圧<br>Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$  | $V_{RRM}$ | 1200  | V                    |
| 連続DC電流<br>Continuous DC forward current      |  | $I_F$     | 400   | A                    |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1 \text{ ms}$   | $I_{FRM}$ | 800   | A                    |
| 電流二乗時間積<br>$I^2t$ - value                    | $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 34000 | $\text{A}^2\text{s}$ |

**電気的特性 / Characteristic Values**

|   |   |   | min.                | typ.         | max. |                                |
|---|---|---|---------------------|--------------|------|--------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 400 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 400 \text{ A}, V_{GE} = 0 \text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_F$               | 1,65<br>1,65 | 2,15 | V<br>V                         |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $I_{RM}$            | 490<br>550   |      | A<br>A                         |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $Q_r$               | 44,0<br>80,0 |      | $\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 400 \text{ A}, -di_F/dt = 6000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600 \text{ V}$<br>$V_{GE} = -15 \text{ V}$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{rec}$           | 19,0<br>35,0 |      | mJ<br>mJ                       |
| ジャンクション・ケース間熱抵抗<br>Thermal resistance, junction to case | /Diode ( 1 素子当り ) / per diode   |   | $R_{thJC}$          |              | 0,11 | K/W                            |
| ケース・ヒートシンク間熱抵抗<br>Thermal resistance, case to heatsink  | /Diode ( 1 素子当り ) / per diode<br>$\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |   | $R_{thCH}$          | 0,055        |      | K/W                            |
| 動作温度<br>Temperature under switching conditions          |   |   | $T_{vj \text{ op}}$ | -40          | 125  | $^{\circ}\text{C}$             |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |



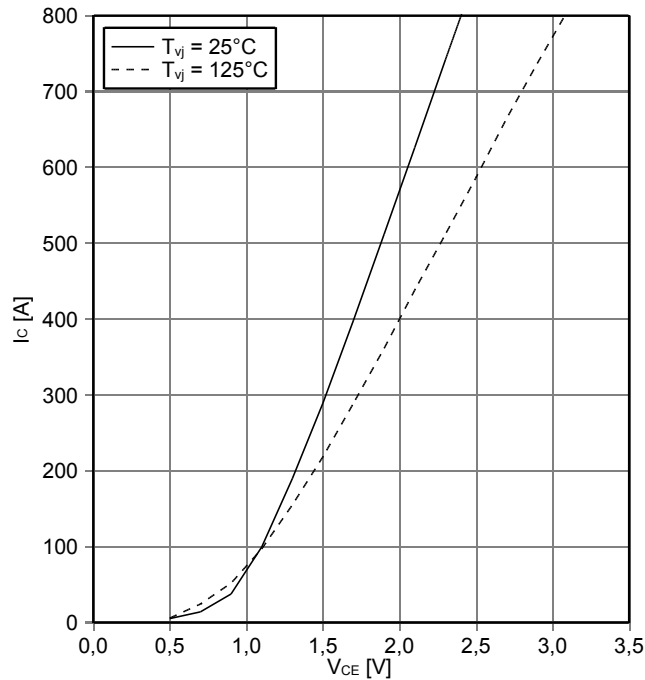
モジュール / Module

|   |   |                     |                                |      |         |
|---|---|---------------------|--------------------------------|------|---------|
| 絶縁耐圧<br>Isolation test voltage                              | RMS, f = 50 Hz, t = 1 min.  | V <sub>ISOL</sub>   | 2,5                            |      | kV      |
| ベースプレート材質<br>Material of module baseplate                   |   |                     | Cu                             |      |         |
| 内部絶縁<br>Internal isolation                                  | 基礎絶縁 (クラス1, IEC 61140)<br>basic insulation (class 1, IEC 61140)   |                     | Al <sub>2</sub> O <sub>3</sub> |      |         |
| 沿面距離<br>Creepage distance                                   | 連絡方法 - ヒートシンク / terminal to heatsink<br>連絡方法 - 連絡方法 / terminal to terminal  |                     | 29,0<br>23,0                   |      | mm      |
| 空間距離<br>Clearance   | 連絡方法 - ヒートシンク / terminal to heatsink<br>連絡方法 - 連絡方法 / terminal to terminal  |                     | 23,0<br>11,0                   |      | mm      |
| 相対トラッキング指数<br>Comperative tracking index                    |   | CTI                 | > 400                          |      |         |
|   |   |                     | min.                           | typ. | max.    |
| ケース・ヒートシンク間熱抵抗<br>Thermal resistance, case to heatsink      | /モジュール / 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>   | 0,01                           |      | K/W     |
| 内部インダクタンス<br>Stray inductance module                        |   | L <sub>sCE</sub>    | 20                             |      | nH      |
| パワーターミナル・チップ間抵抗<br>Module lead resistance, terminals - chip | T <sub>C</sub> = 25°C, /スイッチ / per switch   | R <sub>CC+EE'</sub> | 0,70                           |      | mΩ      |
| 保存温度<br>Storage temperature                                 |   | T <sub>stg</sub>    | -40                            | 125  | °C      |
| 取り付けネジ締め付けトルク<br>Mounting torque for modul mounting         | 取り付けネジ M6<br>適切なアプリケーションノートによるマウンティング<br>Screw M6 - Mounting according to valid application note  | M                   | 3,00                           | -    | 6,00 Nm |
| 主端子ネジ締め付けトルク<br>Terminal connection torque                  | 取り付けネジ M5<br>適切なアプリケーションノートによるマウンティング<br>Screw M5 - Mounting according to valid application note  | M                   | 2,5                            | -    | 5,0 Nm  |
| 質量<br>Weight  |   | G                   | 340                            |      | g       |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |

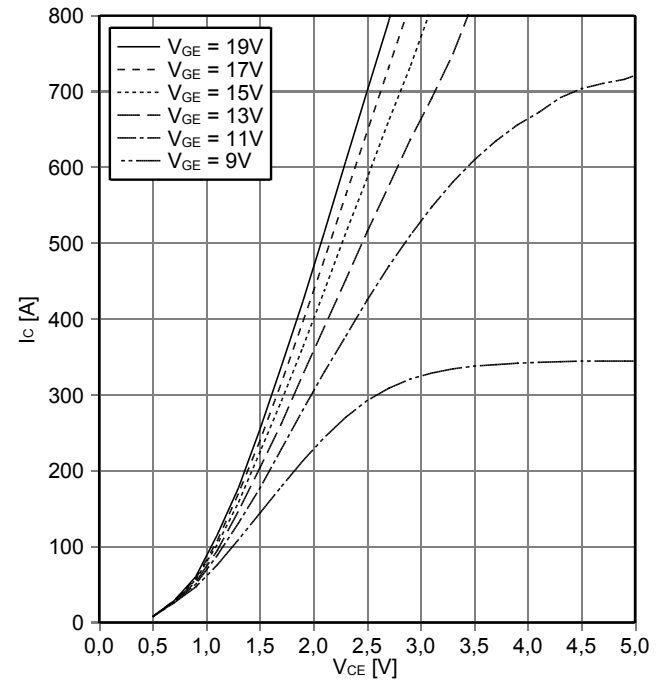
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



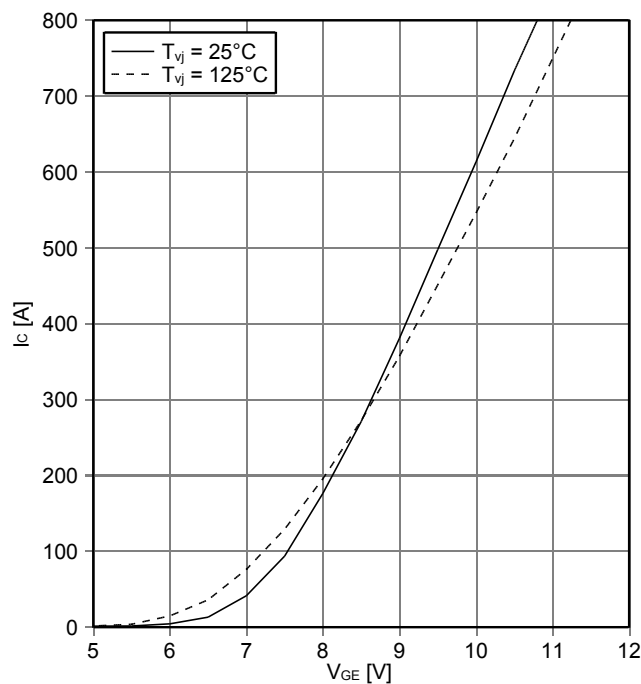
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$   
 $T_{vj} = 125^\circ\text{C}$



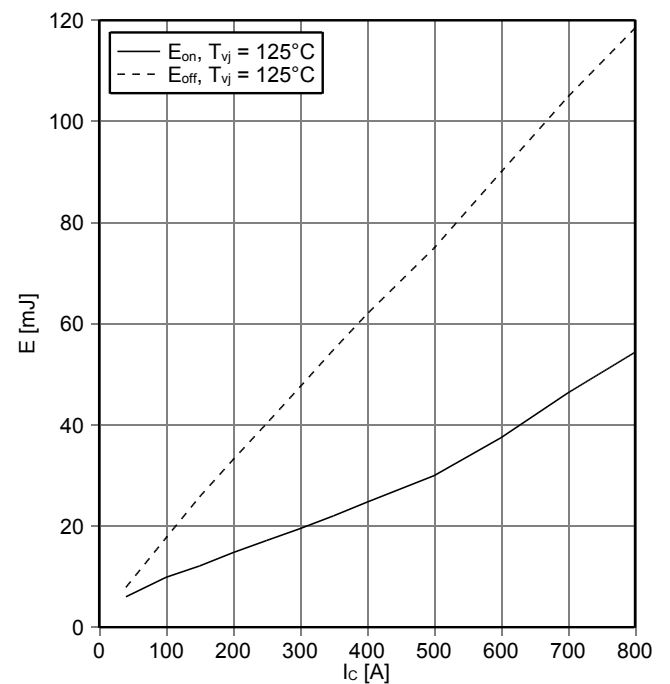
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 1.8\ \Omega, R_{Goff} = 1.8\ \Omega, V_{CE} = 600\text{ V}$

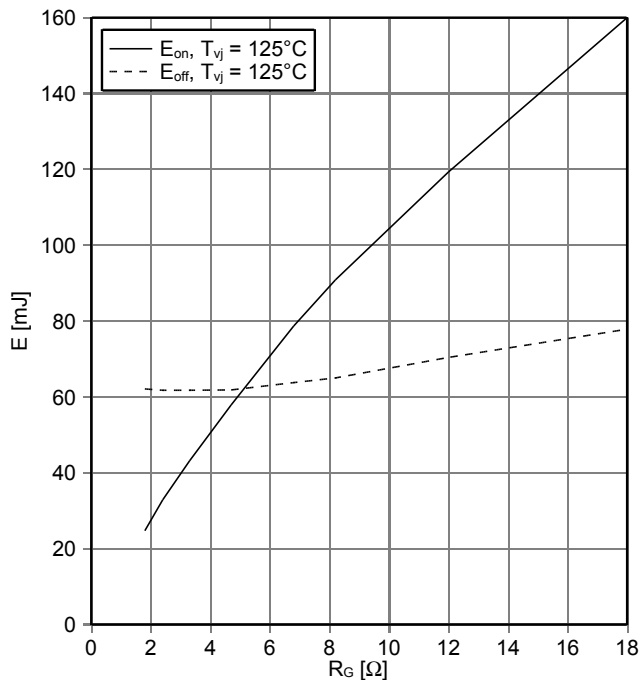


|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |



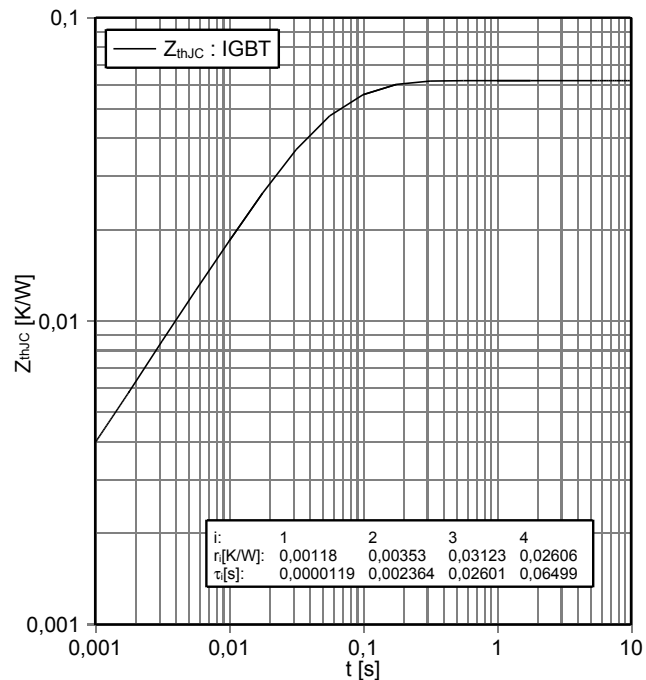
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 400\text{ A}, V_{CE} = 600\text{ V}$



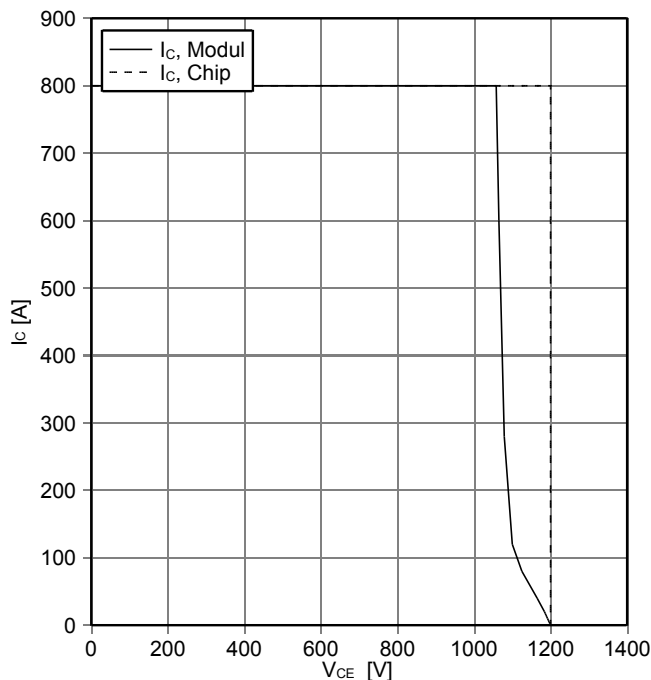
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



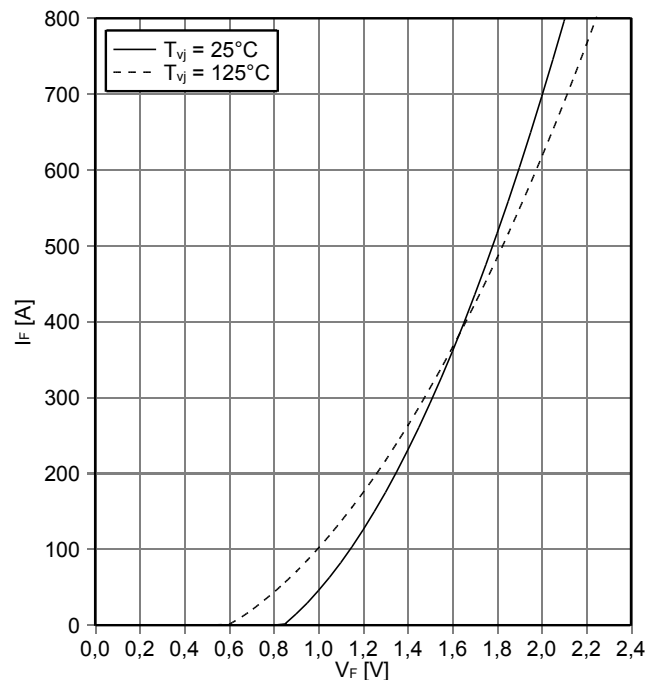
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.8\ \Omega, T_{vj} = 125^\circ\text{C}$



順電圧特性 Diode、インバータ (typical)  
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$

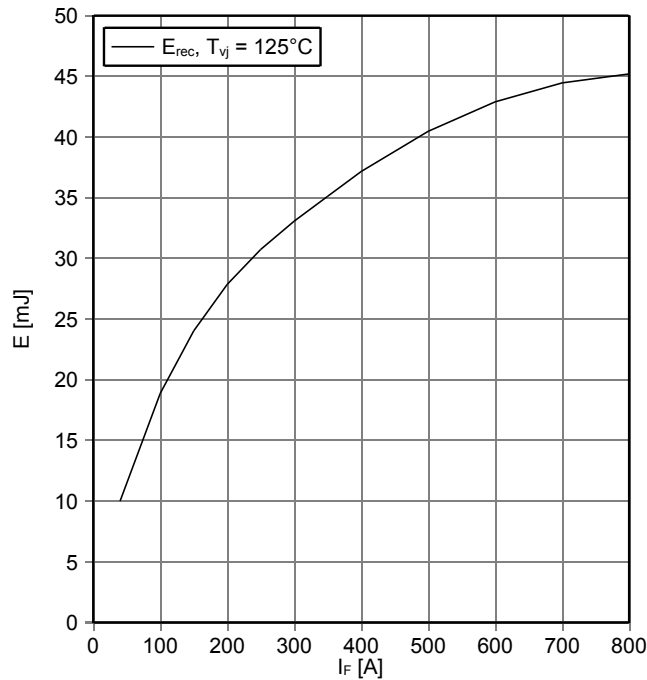


|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |



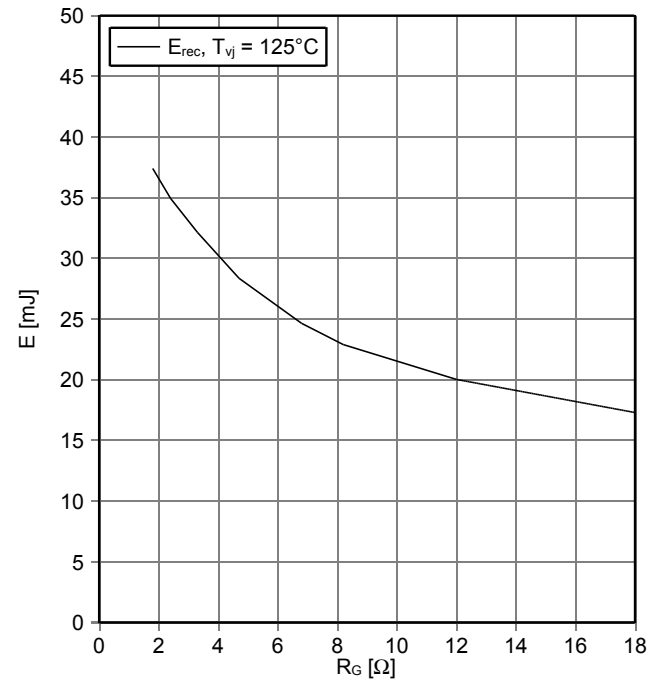
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1.8 \Omega, V_{CE} = 600 V$



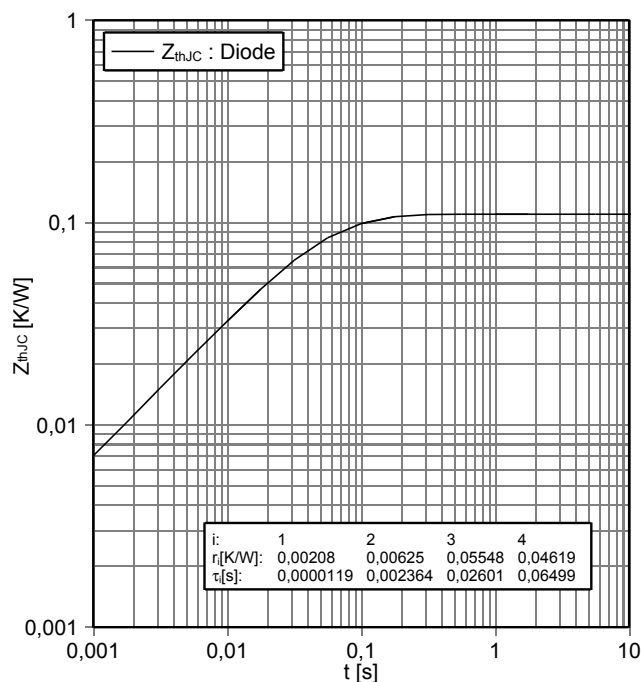
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 400 A, V_{CE} = 600 V$



過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

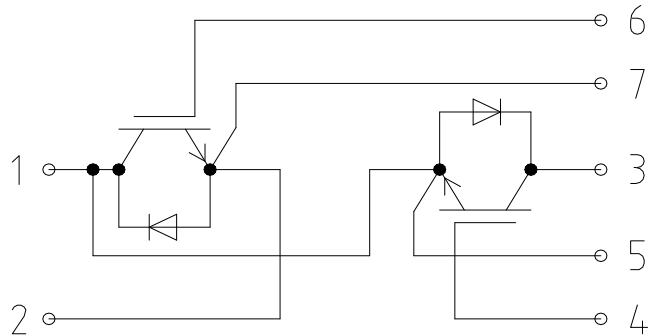
$Z_{thJC} = f(t)$



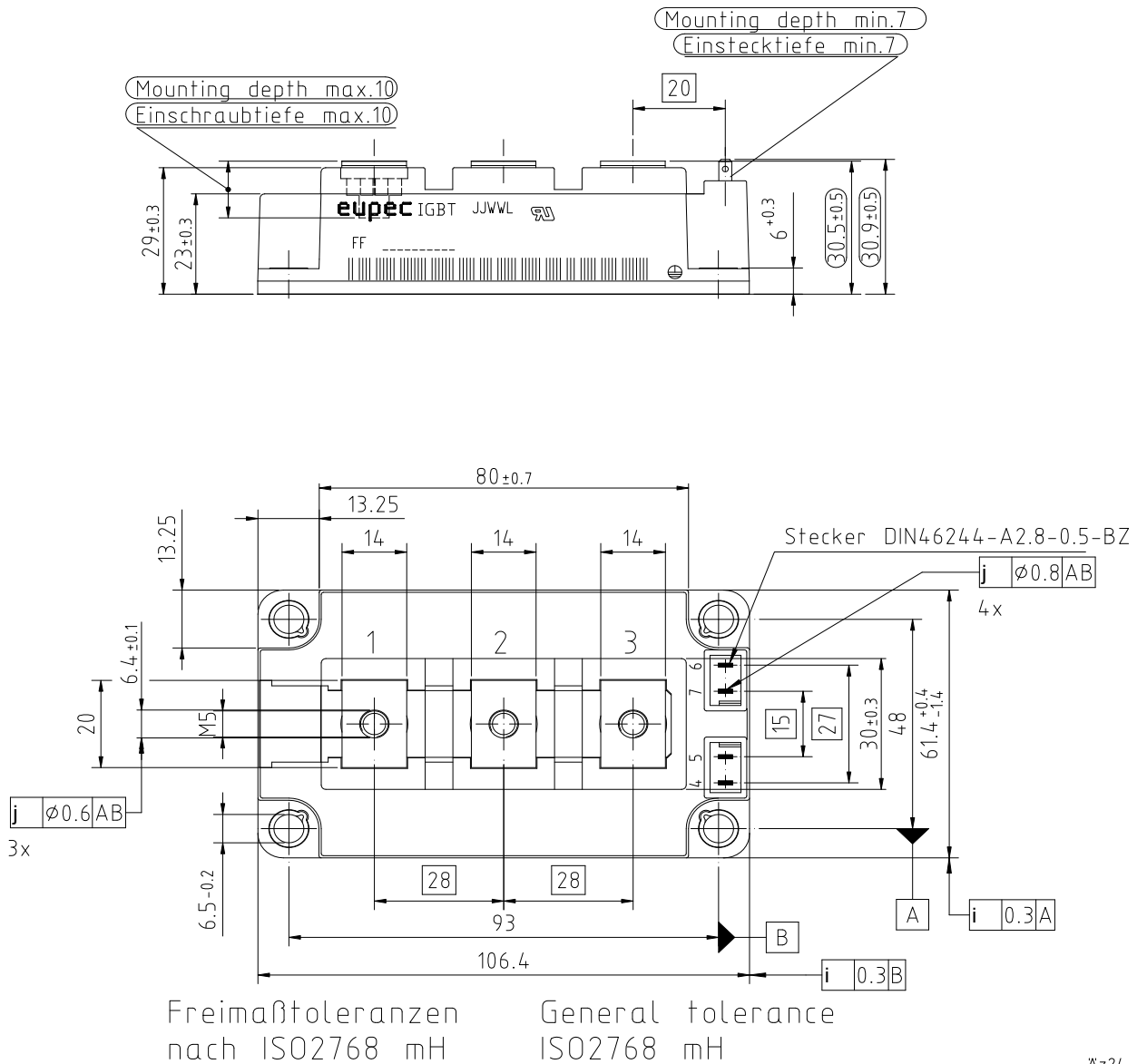
| i:      | 1         | 2        | 3       | 4       |
|---------|-----------|----------|---------|---------|
| r[K/W]: | 0,00208   | 0,00625  | 0,05548 | 0,04619 |
| τ[s]:   | 0,0000119 | 0,002364 | 0,02601 | 0,06499 |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |

回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



Az24

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: MK | date of publication: 2013-10-03 |
| approved by: WR | revision: 3.0                   |