



EconoPIM™2 Modul mit Trench/Feldstopp IGBT3 und Emitter Controlled 3 Diode  
EconoPIM™2 module with trench/fieldstop IGBT3 and Emitter Controlled 3 diode

**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>$I_C$ | 40<br>55 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$  | $I_{CRM}$                  | 80       | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150$   | $P_{tot}$                  | 210      | 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  | $I_C = 40\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 40\text{ A}, V_{GE} = 15\text{ V}$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,80<br>2,15 | 2,30 | V<br>V                         |   |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 1,50\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$   |   | $V_{G\text{Eth}}$  | 5,0          | 5,8  | 6,5                            | V |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$   |   | $Q_G$              | 0,33         |      | $\mu\text{C}$                  |   |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$  |   | $R_{G\text{int}}$  | 6,0          |      | $\Omega$                       |   |
| 入力容量<br>Input capacitance                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{ies}$          | 2,50         |      | nF                             |   |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{res}$          | 0,09         |      | nF                             |   |
| コレクタ・エミッタ間遮断電流<br>Collector-emitter cut-off current     | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{CES}$          |              | 1,0  | mA                             |   |
| ゲート・エミッタ間漏れ電流<br>Gate-emitter leakage current           | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{GES}$          |              | 100  | nA                             |   |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 13\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{don}$          | 0,09<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |   |
| ターンオン上昇時間 (誘導負荷)<br>Rise time, inductive load           | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 13\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_r$              | 0,03<br>0,05 |      | $\mu\text{s}$<br>$\mu\text{s}$ |   |
| ターンオフ遅れ時間 (誘導負荷)<br>Turn-off delay time, inductive load | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 13\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{doff}$         | 0,42<br>0,52 |      | $\mu\text{s}$<br>$\mu\text{s}$ |   |
| ターンオフ下降時間 (誘導負荷)<br>Fall time, inductive load           | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 13\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_f$              | 0,07<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |   |
| ターンオンスイッチング損失<br>Turn-on energy loss per pulse          | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}, L_S = 45\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 1400\text{ A}/\mu\text{s}$<br>$R_{Gon} = 13\ \Omega$    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{on}$           | 3,20<br>4,50 |      | mJ<br>mJ                       |   |
| ターンオフスイッチング損失<br>Turn-off energy loss per pulse         | $I_C = 40\text{ A}, V_{CE} = 600\text{ V}, L_S = 45\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4000\text{ V}/\mu\text{s}$<br>$R_{Goff} = 13\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{off}$          | 3,60<br>4,85 |      | mJ<br>mJ                       |   |
| 短絡電流<br>SC data   | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$   | $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$        | $I_{SC}$           | 160          |      | 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   |   | $R_{thJC}$         |              | 0,60 | 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>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |   | $R_{thCH}$         | 0,29         |      | K/W                            |   |
| 動作温度<br>Temperature under switching conditions          |  |   | $T_{vj\text{op}}$  | -40          | 125  | $^{\circ}\text{C}$             |   |

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**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      |  | $I_F$     | 40   | A                    |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$  | $I_{FRM}$ | 80   | A                    |
| 電流二乗時間積<br>$I^2t$ - value                    | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 320  | $\text{A}^2\text{s}$ |

**電気的特性 / Characteristic Values**

|   |   |   | min.               | typ.         | max. |                                |
|---|---|---|--------------------|--------------|------|--------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 40\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 40\text{ A}, V_{GE} = 0\text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_F$              | 1,75<br>1,75 | 2,30 | V<br>V                         |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 40\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $I_{RM}$           | 45,0<br>46,0 |      | A<br>A                         |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 40\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $Q_r$              | 4,40<br>8,40 |      | $\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 40\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{rec}$          | 1,75<br>3,50 |      | 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   |   | $R_{thJC}$         |              | 0,95 | 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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |   | $R_{thCH}$         | 0,46         |      | K/W                            |
| 動作温度<br>Temperature under switching conditions          |   |   | $T_{vj\text{ op}}$ | -40          | 125  | $^{\circ}\text{C}$             |

**Diode、整流器 / Diode, Rectifier**  
**最大定格 / Maximum Rated Values**

|  |   |             |             |  |
|--|---|-------------|-------------|--|
| ピーク繰返し逆電圧<br>Repetitive peak reverse voltage           | $T_{vj} = 25^{\circ}\text{C}$   | $V_{RRM}$   | 1600        | V  |
| 最大実効順電流/chip<br>Maximum RMS forward current per chip   | $T_C = 80^{\circ}\text{C}$  | $I_{FRMSM}$ | 50          | A  |
| 整流出力の最大実効電流<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$  | $I_{RMSM}$  | 60          | A  |
| サージ順電流<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                                       |
| 電流二乗時間積<br>$I^2t$ - 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 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

**電気的特性 / Characteristic Values**

|   |   |                    | min. | typ.  | max. |                    |
|---|---|--------------------|------|-------|------|--------------------|
| 順電圧<br>Forward voltage                                  | $T_{vj} = 150^{\circ}\text{C}, I_F = 40\text{ A}$   | $V_F$              |      | 1,00  |      | V                  |
| 逆電流<br>Reverse current                                  | $T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$   | $I_R$              |      | 1,00  |      | mA                 |
| 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   | $R_{thJC}$         |      |       | 0,90 | 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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | $R_{thCH}$         |      | 0,435 |      | K/W                |
| 動作温度<br>Temperature under switching conditions          |   | $T_{vj\text{ op}}$ | -40  |       | 150  | $^{\circ}\text{C}$ |

|                 |                                 |
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**IGBT-ブレーキチョッパー / IGBT, Brake-Chopper**  
**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      | $T_C = 80^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 15<br>25 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$  | $I_{CRM}$                  | 30       | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150$   | $P_{tot}$                  | 105      | 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  | $I_C = 15\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 15\text{ A}, V_{GE} = 15\text{ V}$   | $T_{vj} = 25^{\circ}\text{C}$<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               | $I_C = 0,50\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$   |   | $V_{G\text{Eth}}$  | 5,0          | 5,8  | 6,5 V                          |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$   |   | $Q_G$              | 0,15         |      | $\mu\text{C}$                  |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$  |   | $R_{G\text{int}}$  | 0,0          |      | $\Omega$                       |
| 入力容量<br>Input capacitance                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{ies}$          | 1,10         |      | nF                             |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$   |   | $C_{res}$          | 0,04         |      | nF                             |
| コレクタ・エミッタ間遮断電流<br>Collector-emitter cut-off current     | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{CES}$          |              | 1,0  | mA                             |
| ゲート・エミッタ間漏れ電流<br>Gate-emitter leakage current           | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{GES}$          |              | 100  | nA                             |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 75\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{don}$          | 0,09<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオン上昇時間 (誘導負荷)<br>Rise time, inductive load           | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 75\ \Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_r$              | 0,03<br>0,05 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ遅れ時間 (誘導負荷)<br>Turn-off delay time, inductive load | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 75\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_{doff}$         | 0,42<br>0,52 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ下降時間 (誘導負荷)<br>Fall time, inductive load           | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 75\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $t_f$              | 0,07<br>0,09 |      | $\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオンスイッチング損失<br>Turn-on energy loss per pulse          | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 75\ \Omega$                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{on}$           | 1,50<br>2,10 |      | mJ<br>mJ                       |
| ターンオフスイッチング損失<br>Turn-off energy loss per pulse         | $I_C = 15\text{ A}, V_{CE} = 600\text{ V}, L_S = 50\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 75\ \Omega$                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{off}$          | 1,10<br>1,50 |      | mJ<br>mJ                       |
| 短絡電流<br>SC data   | $V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$                                     | $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$        | $I_{SC}$           | 60           |      | 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   |   | $R_{thJC}$         |              | 1,20 | 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>$\lambda_{\text{Paste}} = 1\text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1\text{ W/(m}\cdot\text{K)}$ |   | $R_{thCH}$         | 0,58         |      | K/W                            |
| 動作温度<br>Temperature under switching conditions          |  |   | $T_{vj\text{op}}$  | -40          | 125  | $^{\circ}\text{C}$             |

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**Diode、ブレーキチョッパー / Diode, Brake-Chopper**  
**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      |  | $I_F$     | 10   | A                    |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$  | $I_{FRM}$ | 20   | A                    |
| 電流二乗時間積<br>$I^2t$ - value                    | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ | $I^2t$    | 20,0 | $\text{A}^2\text{s}$ |

**電気的特性 / Characteristic Values**

|   |   |   | min.               | typ.         | max. |                                |
|---|---|---|--------------------|--------------|------|--------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $V_F$              | 1,80<br>1,85 | 2,25 | V<br>V                         |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $I_{RM}$           | 14,0<br>15,0 |      | A<br>A                         |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $Q_r$              | 1,00<br>1,80 |      | $\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$<br>$V_R = 600\text{ V}$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$ | $E_{rec}$          | 0,26<br>0,56 |      | 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   |   | $R_{thJC}$         |              | 2,30 | 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>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ |   | $R_{thCH}$         | 1,10         |      | K/W                            |
| 動作温度<br>Temperature under switching conditions          |   |   | $T_{vj\text{ op}}$ | -40          | 125  | $^{\circ}\text{C}$             |

**NTC-サーミスタ / NTC-Thermistor**

**電気的特性 / Characteristic Values**

|                              |   |  | min.         | typ. | max. |            |
|------------------------------|---|--|--------------|------|------|------------|
| 定格抵抗値<br>Rated resistance    | $T_C = 25^{\circ}\text{C}$                                    |  | $R_{25}$     | 5,00 |      | k $\Omega$ |
| R100の偏差<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$            |  | $\Delta R/R$ | -5   | 5    | %          |
| 損失<br>Power dissipation      | $T_C = 25^{\circ}\text{C}$                                    |  | $P_{25}$     |      | 20,0 | mW         |
| B-定数<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-定数<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-定数<br>B-value              | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ |  | $B_{25/100}$ | 3433 |      | K          |

適切なアプリケーションノートによる仕様  
Specification according to the valid application note.

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モジュール / Module

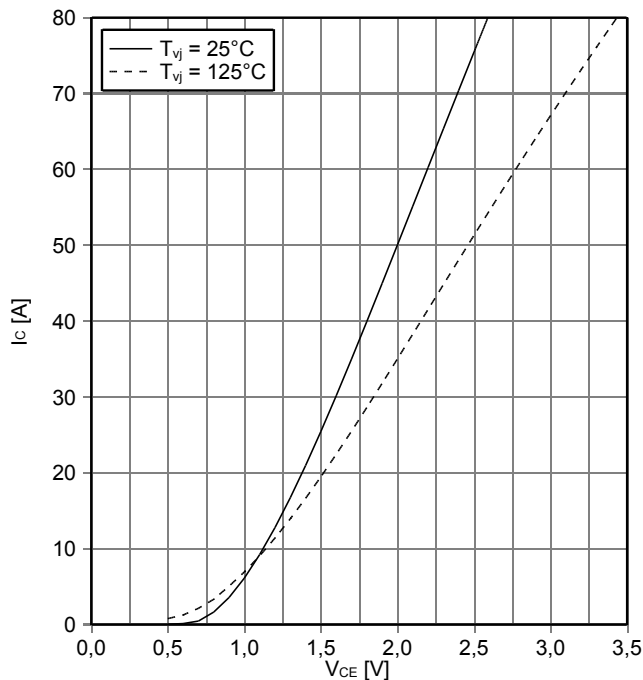
|   |  |  |                                |     |                  |
|---|--|--|--------------------------------|-----|------------------|
| 絶縁耐圧<br>Isolation test voltage                              | RMS, f = 50 Hz, t = 1 min  | V <sub>ISOL</sub>                          | 2,5                            |     | 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                       |  | 10,0                           |     | 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                       |  | 7,5                            |     | mm               |
| 相対トラッキング指数<br>Comperative tracking index                    |  | CTI  | > 200                          |     |                  |
| 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>λ <sub>Paste</sub> = 1 W/(m·K) / λ <sub>grease</sub> = 1 W/(m·K)          | R <sub>thCH</sub>                          | 0,02                           |     | K/W              |
| 内部インダクタンス<br>Stray inductance module                        |  | L <sub>sCE</sub>                           | 60                             |     | 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><br>R <sub>AA+CC'</sub> | 4,00<br>3,00                   |     | mΩ               |
| 最大ジャンクション温度<br>Maximum junction temperature                 | インバータ、ブレーキチョッパー / inverter,<br>brake-chopper<br>整流器 / rectifier                                  | T <sub>vj max</sub>                        |                                |     | 150 °C<br>150 °C |
| 動作温度<br>Temperature under switching conditions              | インバータ、ブレーキチョッパー / inverter,<br>brake-chopper<br>整流器 / rectifier                                  | T <sub>vj op</sub>                         | -40<br>-40                     |     | 125 °C<br>150 °C |
| 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 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  | 3,00                           | -   | 6,00 Nm          |
| 質量<br>Weight  |  | G  |                                | 180 | g                |

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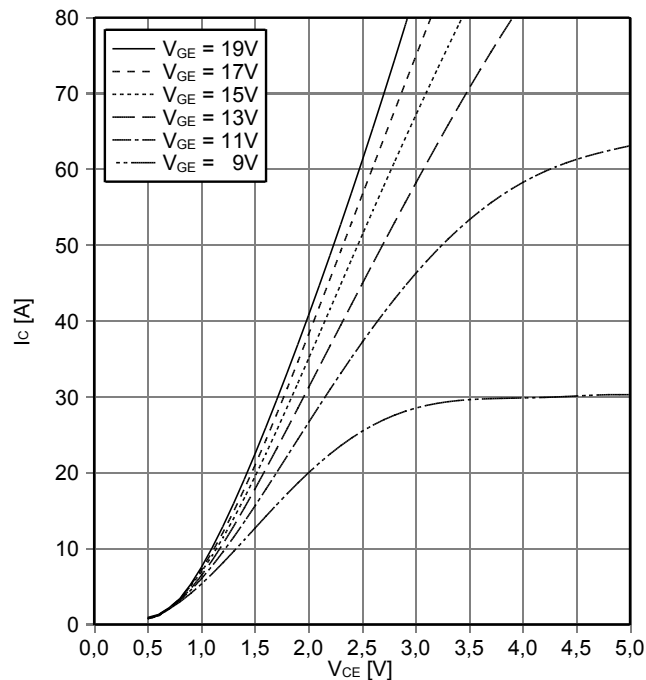
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



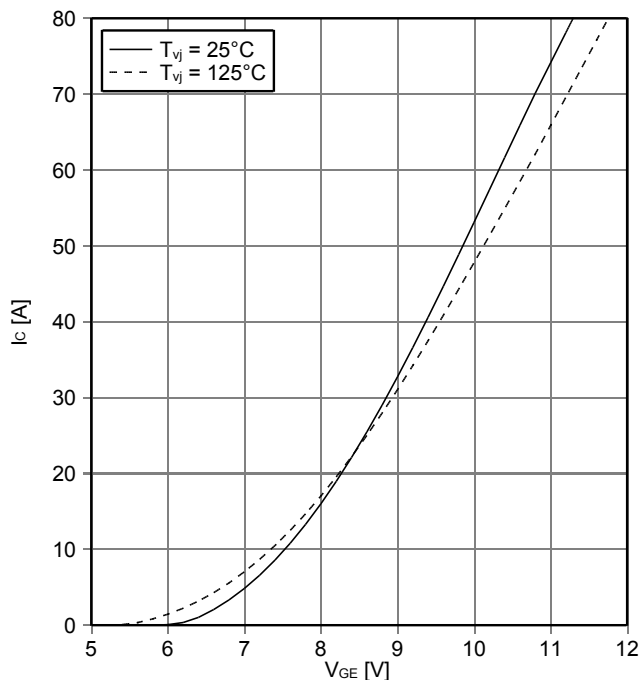
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



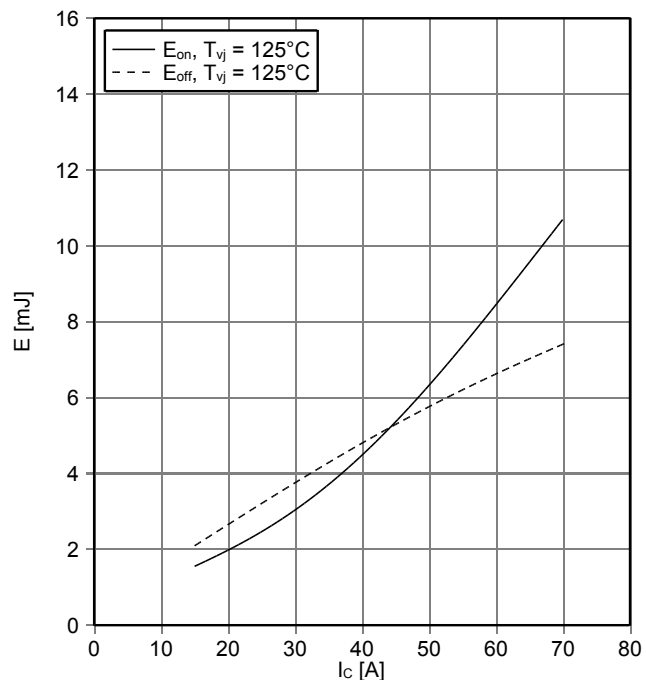
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 13\ \Omega$ ,  $R_{Goff} = 13\ \Omega$ ,  $V_{CE} = 600\text{ V}$

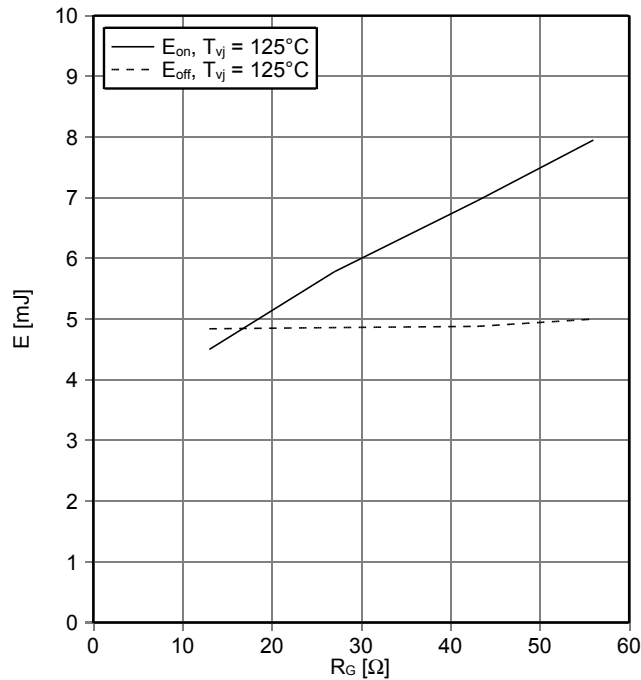


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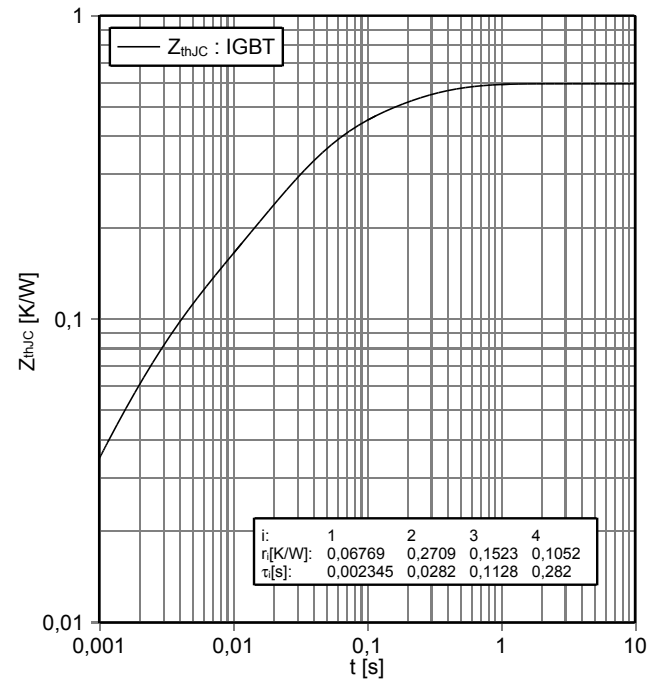
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 40\text{ A}$ ,  $V_{CE} = 600\text{ V}$



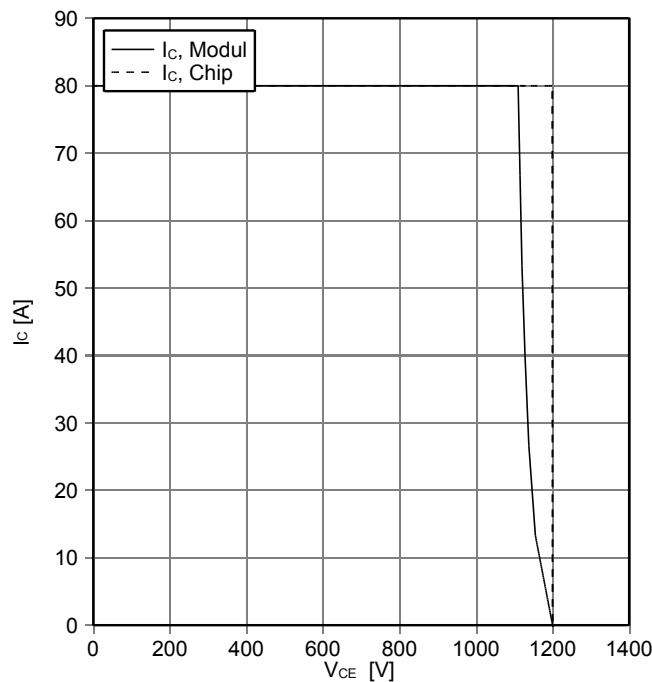
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



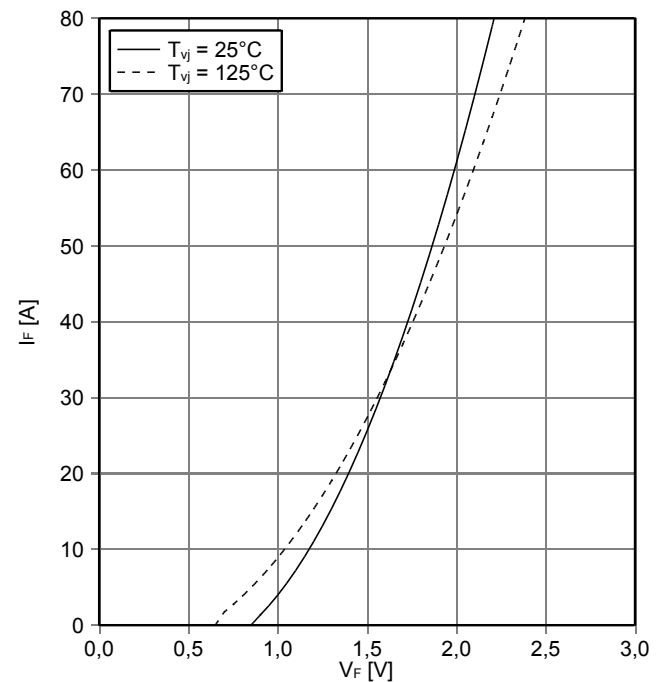
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 13\ \Omega$ ,  $T_{vj} = 125^\circ\text{C}$



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

$I_F = f(V_F)$

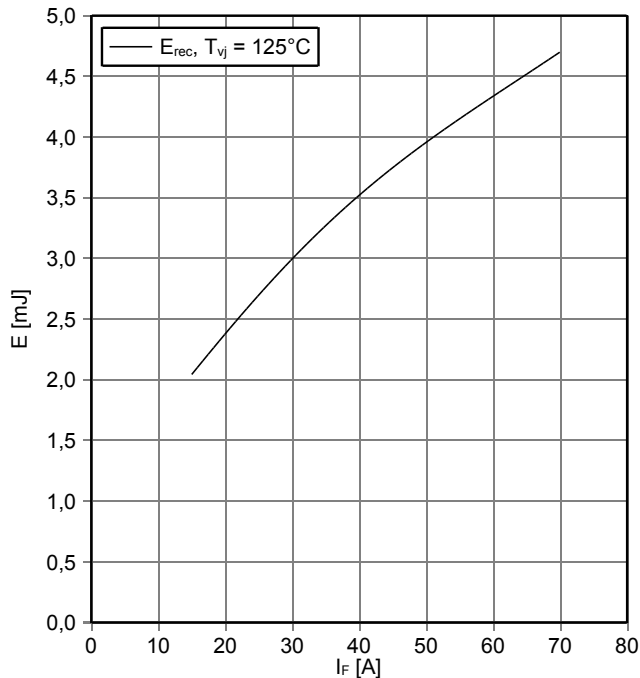


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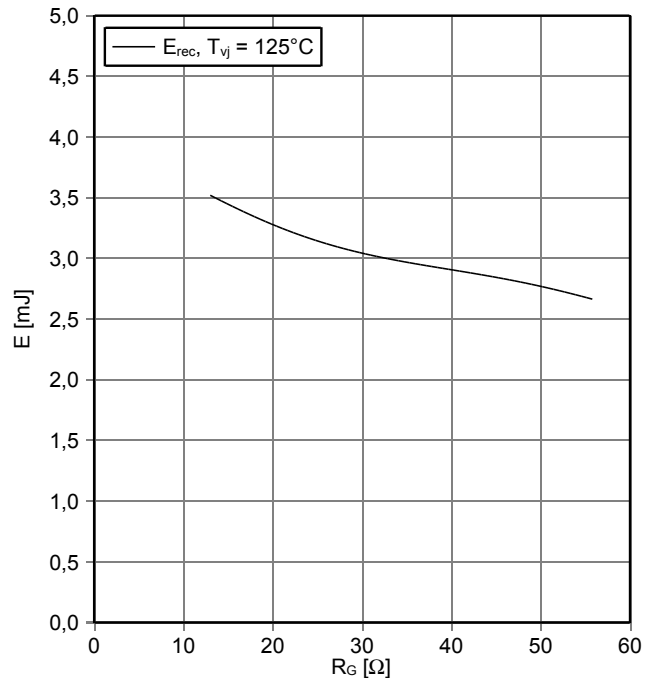
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 13 \Omega, V_{CE} = 600 V$



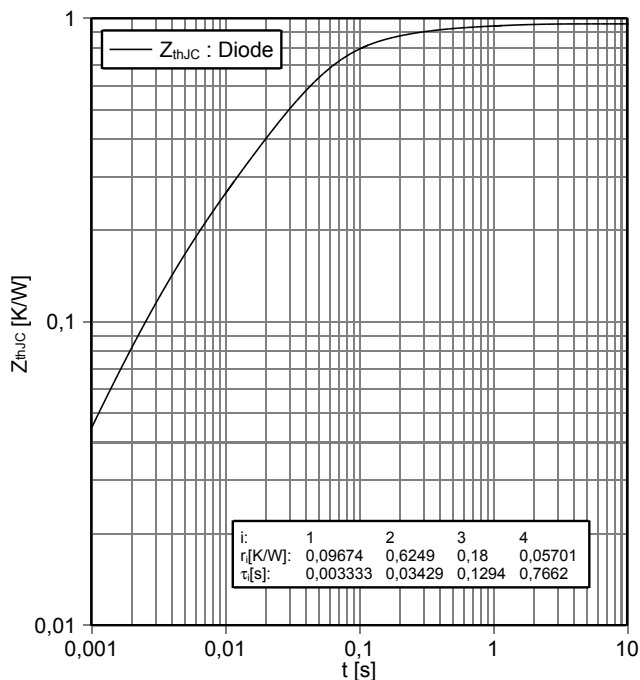
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 40 A, V_{CE} = 600 V$



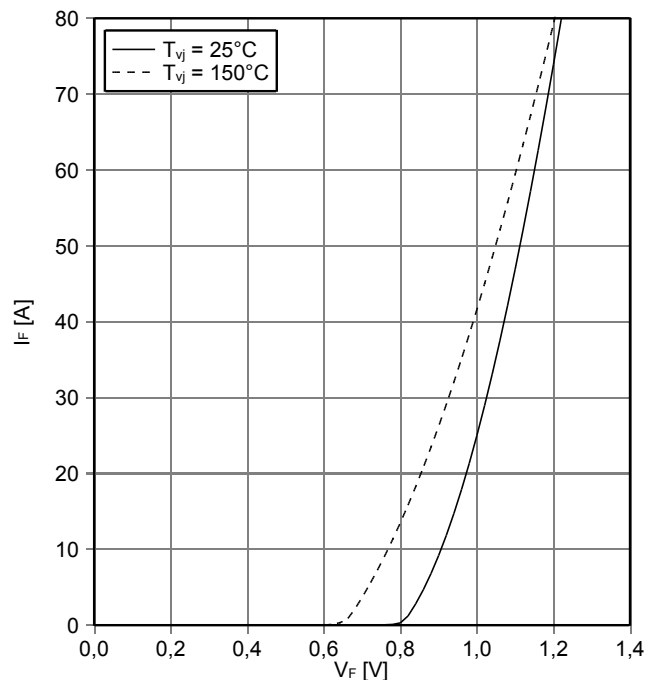
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



順方向特性 Diode、整流器 (典型)  
forward characteristic of Diode, Rectifier (typical)

$I_F = f(V_F)$



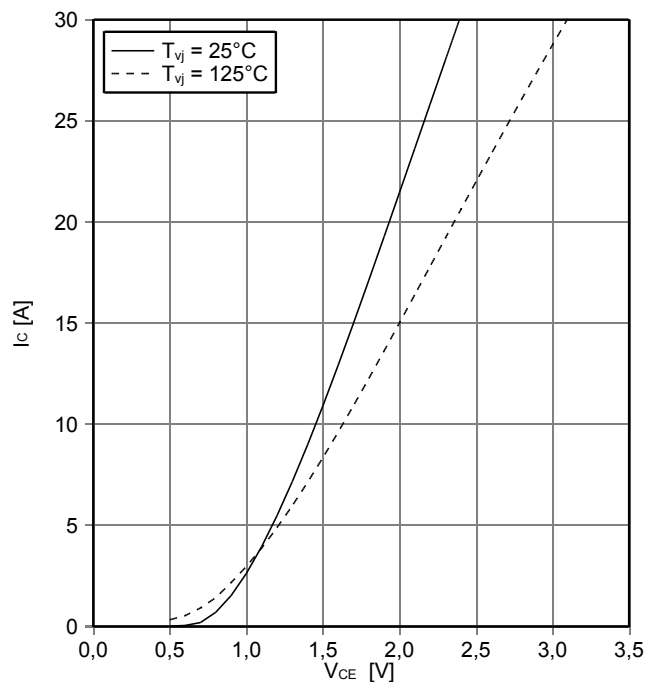
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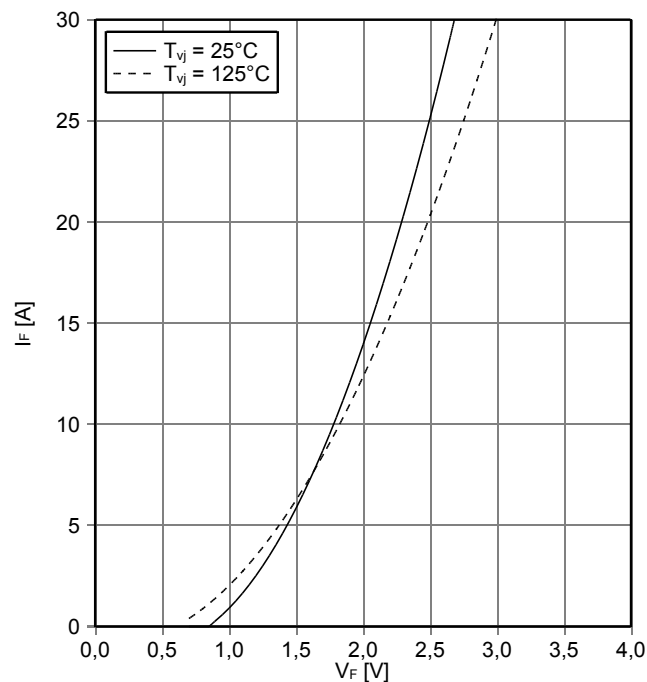
**出力特性 IGBT-ブレーキチョッパー (Typical)**  
**output characteristic IGBT, Brake-Chopper (typical)**

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



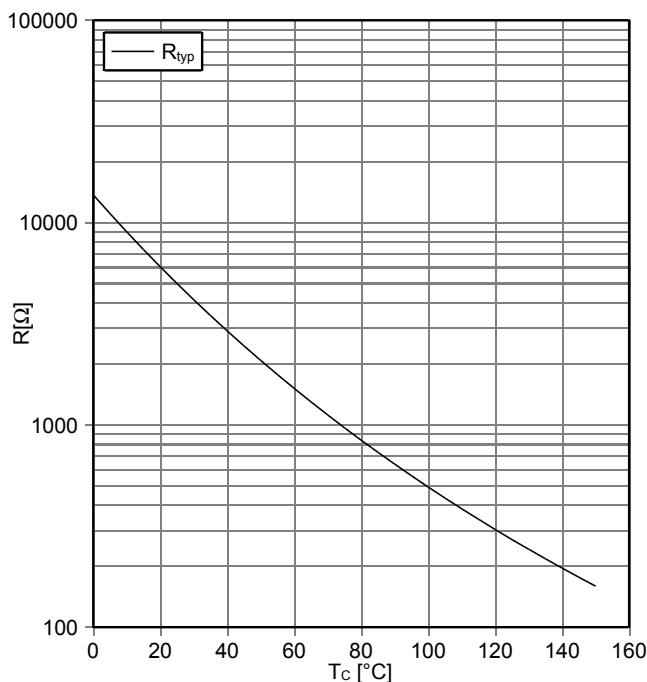
**順電圧特性 Diode、ブレーキチョッパー ( typical)**  
**forward characteristic of Diode, Brake-Chopper (typical)**

$I_F = f(V_F)$



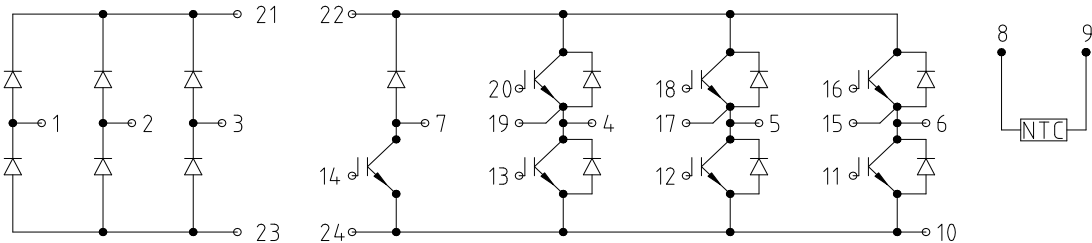
**NTC-サーミスタ サーミスタの温度特性**  
**NTC-Thermistor-temperature characteristic (typical)**

$R = f(T)$

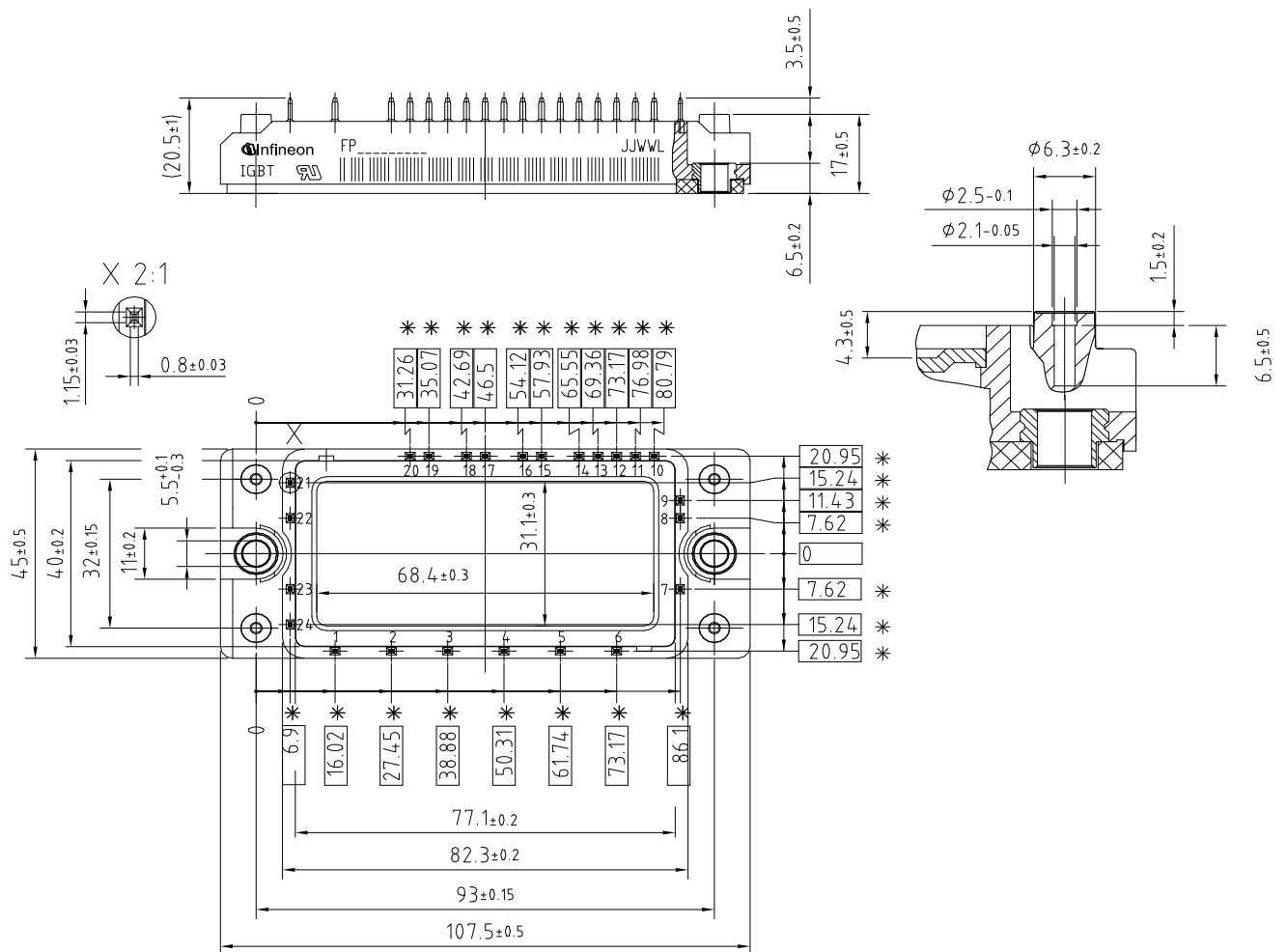


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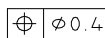
回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



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



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