

EconoPIM™3 Modul mit Trench/Feldstop IGBT³ und Emitter Controlled3 Diode  
EconoPIM™3 module with the trench/fieldstop IGBT³ and Emitter Controlled3 diode

暫定データ  
Preliminary Data

# 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          | $T_{vj} = 25^{\circ}\text{C}$                                                                                                | $V_{CES}$                   | 600      | V      |
| 連続DCコレクタ電流<br>Continuous DC collector current      | $T_C = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{ nom}}$<br>$I_C$ | 75<br>95 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                          | $I_{CRM}$                   | 150      | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175$                                                                                 | $P_{\text{tot}}$            | 250      | 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  | $I_C = 75\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $V_{CE\text{ sat}}$ | 1,45<br>1,60<br>1,70  | 1,90 | V<br>V<br>V                                     |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 1,20\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                      |                                                                                                                   | $V_{GEth}$          | 4,9                   | 5,8  | 6,5 V                                           |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                |                                                                                                                   | $Q_G$               | 0,75                  |      | $\mu\text{C}$                                   |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                                                             |                                                                                                                   | $R_{Gint}$          | 0,0                   |      | $\Omega$                                        |
| 入力容量<br>Input capacitance                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                |                                                                                                                   | $C_{ies}$           | 4,60                  |      | nF                                              |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                |                                                                                                                   | $C_{res}$           | 0,145                 |      | nF                                              |
| コレクタ・エミッタ間遮断電流<br>Collector-emitter cut-off current     | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                 |                                                                                                                   | $I_{CES}$           |                       | 1,0  | mA                                              |
| ゲート・エミッタ間漏れ電流<br>Gate-emitter leakage current           | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                  |                                                                                                                   | $I_{GES}$           |                       | 400  | nA                                              |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 30\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $t_{d\text{ on}}$   | 0,10<br>0,10<br>0,10  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオン上昇時間 (誘導負荷)<br>Rise time, inductive load           | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 30\ \Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $t_r$               | 0,06<br>0,065<br>0,07 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ遅れ時間 (誘導負荷)<br>Turn-off delay time, inductive load | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 30\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $t_{d\text{ off}}$  | 0,60<br>0,65<br>0,70  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ下降時間 (誘導負荷)<br>Fall time, inductive load           | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 30\ \Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $t_f$               | 0,04<br>0,05<br>0,06  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオンスイッチング損失<br>Turn-on energy loss per pulse          | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 1200\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 30\ \Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $E_{on}$            | 3,50<br>4,10<br>4,50  |      | mJ<br>mJ<br>mJ                                  |
| ターンオフスイッチング損失<br>Turn-off energy loss per pulse         | $I_C = 75\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 2300\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 30\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                 | $E_{off}$           | 2,90<br>3,60<br>3,80  |      | mJ<br>mJ<br>mJ                                  |
| 短絡電流<br>SC data                                         | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                   | $t_P \leq 8\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 530<br>380            |      | A<br>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>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$                              |                                                                                                                   | $R_{thCH}$          | 0,16                  |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                                                           |                                                                                                                   | $T_{vj\text{ op}}$  | -40                   | 150  | $^{\circ}\text{C}$                              |

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暫定データ  
Preliminary Data

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 | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                    | $V_{RRM}$ | 600        | V                                            |
| 連続DC電流<br>Continuous DC forward current      |                                                                                                                                                  | $I_F$     | 75         | A                                            |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1 \text{ ms}$                                                                                                                             | $I_{FRM}$ | 150        | A                                            |
| 電流二乗時間積<br>$I^2t$ - value                    | $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 660<br>610 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                     |                                                                                                   | min.        | typ.                 | max. |                                                 |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------|----------------------|------|-------------------------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$       | 1,55<br>1,50<br>1,45 | 1,95 | V<br>V<br>V                                     |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 75 \text{ A}, -di_F/dt = 1200 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$<br>$V_{GE} = -15 \text{ V}$       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$    | 38,0<br>48,0<br>51,0 |      | A<br>A<br>A                                     |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 75 \text{ A}, -di_F/dt = 1200 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$<br>$V_{GE} = -15 \text{ V}$       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$       | 2,30<br>4,60<br>5,60 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 75 \text{ A}, -di_F/dt = 1200 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$<br>$V_{GE} = -15 \text{ V}$       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$   | 0,35<br>0,80<br>1,00 |      | mJ<br>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>$\lambda_{Paste} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$  | 0,255                |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                     |                                                                                                   | $T_{vj op}$ | -40                  | 150  | $^{\circ}\text{C}$                              |

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   | $T_C = 80^{\circ}\text{C}$                                                                                | $I_{FRMSM}$ | 100          | A                                            |
| 整流出力の最大実効電流<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$                                                                                | $I_{RMSM}$  | 100          | A                                            |
| サージ順電流<br>Surge forward current                        | $t_p = 10 \text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 740<br>580   | 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>$t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 2750<br>1700 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                     |  | min.        | typ.  | max. |                    |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------|-------|------|--------------------|
| 順電圧<br>Forward voltage                                  | $T_{vj} = 150^{\circ}\text{C}, I_F = 75 \text{ A}$                                                                                                  |  | $V_F$       | 1,05  |      | 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                                                                                                                       |  | $R_{thJC}$  |       | 0,50 | 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>$\lambda_{Paste} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |  | $R_{thCH}$  | 0,135 |      | K/W                |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                     |  | $T_{vj op}$ | -40   | 150  | $^{\circ}\text{C}$ |

|                 |                                 |
|-----------------|---------------------------------|
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暫定データ  
Preliminary Data

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          | $T_{vj} = 25^{\circ}\text{C}$                                                                                                | $V_{CES}$                  | 600      | V      |
| 連続DCコレクタ電流<br>Continuous DC collector current      | $T_C = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 50<br>60 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                          | $I_{CRM}$                  | 100      | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175$                                                                                 | $P_{\text{tot}}$           | 190      | 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  | $I_C = 50\text{ A}, V_{GE} = 15\text{ V}$<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>$T_{vj} = 150^{\circ}\text{C}$                             | $V_{CE\text{sat}}$ | 1,45<br>1,60<br>1,70  | 1,90 | V<br>V<br>V                                     |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 0,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                          |                                                                                                                               | $V_{GEth}$         | 4,9                   | 5,8  | 6,5 V                                           |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                    |                                                                                                                               | $Q_G$              | 0,50                  |      | $\mu\text{C}$                                   |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                 |                                                                                                                               | $R_{Gint}$         | 0,0                   |      | $\Omega$                                        |
| 入力容量<br>Input capacitance                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                    |                                                                                                                               | $C_{ies}$          | 3,10                  |      | nF                                              |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                    |                                                                                                                               | $C_{res}$          | 0,095                 |      | nF                                              |
| コレクタ・エミッタ間遮断電流<br>Collector-emitter cut-off current     | $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                     |                                                                                                                               | $I_{CES}$          |                       | 1,0  | mA                                              |
| ゲート・エミッタ間漏れ電流<br>Gate-emitter leakage current           | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$                                                                      |                                                                                                                               | $I_{GES}$          |                       | 400  | nA                                              |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 43\text{ }\Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{don}$          | 0,10<br>0,10<br>0,10  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオン上昇時間 (誘導負荷)<br>Rise time, inductive load           | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 43\text{ }\Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_r$              | 0,06<br>0,065<br>0,07 |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ遅れ時間 (誘導負荷)<br>Turn-off delay time, inductive load | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 43\text{ }\Omega$                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{doff}$         | 0,60<br>0,65<br>0,70  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオフ下降時間 (誘導負荷)<br>Fall time, inductive load           | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 43\text{ }\Omega$                                     | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_f$              | 0,04<br>0,05<br>0,06  |      | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| ターンオンスイッチング損失<br>Turn-on energy loss per pulse          | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 43\text{ }\Omega$              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{on}$           | 2,30<br>2,75<br>2,90  |      | mJ<br>mJ<br>mJ                                  |
| ターンオフスイッチング損失<br>Turn-off energy loss per pulse         | $I_C = 50\text{ A}, V_{CE} = 300\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 43\text{ }\Omega$             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{off}$          | 1,75<br>2,10<br>2,15  |      | mJ<br>mJ<br>mJ                                  |
| 短絡電流<br>SC data                                         | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$                                               | $t_P \leq 8\text{ }\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$           | 350<br>250            |      | A<br>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                                                                                                                   |                                                                                                                               | $R_{thJC}$         |                       | 0,80 | 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>$\lambda_{\text{Paste}} = 1\text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1\text{ W/(m}\cdot\text{K)}$ |                                                                                                                               | $R_{thCH}$         | 0,17                  |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                               |                                                                                                                               | $T_{vj\text{op}}$  | -40                   | 150  | $^{\circ}\text{C}$                              |

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暫定データ  
Preliminary Data

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 | $T_{vj} = 25^{\circ}\text{C}$                                                                                                                | $V_{RRM}$ | 600          | V                                            |
| 連続DC電流<br>Continuous DC forward current      |                                                                                                                                              | $I_F$     | 20           | A                                            |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$                                                                                                                          | $I_{FRM}$ | 40           | A                                            |
| 電流二乗時間積<br>$I^2t$ - value                    | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 45,0<br>45,0 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                   |                                                                                                   | min.               | typ.                 | max. |                                                 |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,60<br>1,55<br>1,50 | 2,00 | V<br>V<br>V                                     |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 20\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 36,0<br>38,0<br>42,0 |      | A<br>A<br>A                                     |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 20\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 1,00<br>1,70<br>2,20 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 20\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300\text{ V}$                                    | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,25<br>0,40<br>0,55 |      | mJ<br>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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$         | 0,62                 |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                   |                                                                                                   | $T_{vj\text{ op}}$ | -40                  | 150  | $^{\circ}\text{C}$                              |

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   |      | $\text{k}\Omega$ |
| R100の偏差<br>Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\text{ }\Omega$      | $\Delta R/R$ | -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              | $R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$  | $B_{25/80}$  |      | t.b.d. |      | K                |
| B-定数<br>B-value              | $R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | $B_{25/100}$ |      | t.b.d. |      | 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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暫定データ  
Preliminary Data

モジュール / Module

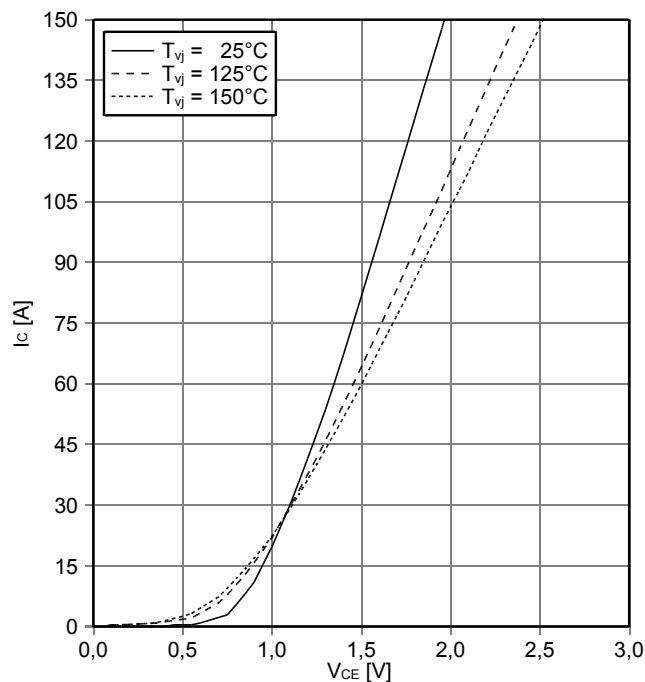
|                                                             |                                                                                                                                         |                                              |                                |                  |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------|------------------|
| 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                                          | > 225                          |                  |
|                                                             |                                                                                                                                         |                                              |                                |                  |
| 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>                            | 0,009                          | 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>2,00                   | 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 / inverter,<br>brake-chopper<br>整流器 / rectifier                                                                          | T <sub>vj max</sub>                          |                                | 175 °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 / inverter,<br>brake-chopper<br>整流器 / rectifier                                                                          | T <sub>vj op</sub>                           | -40<br>-40                     | 150 °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                                            | 300                            | g                |

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暫定データ  
Preliminary Data

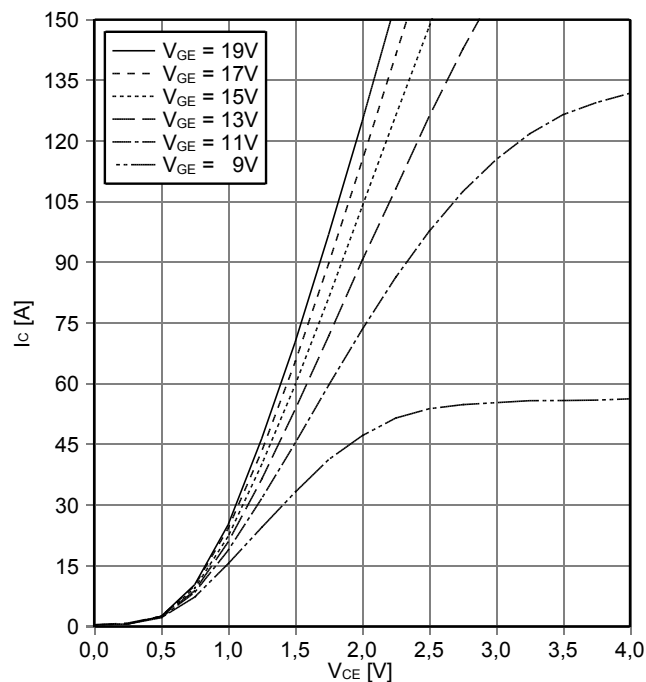
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



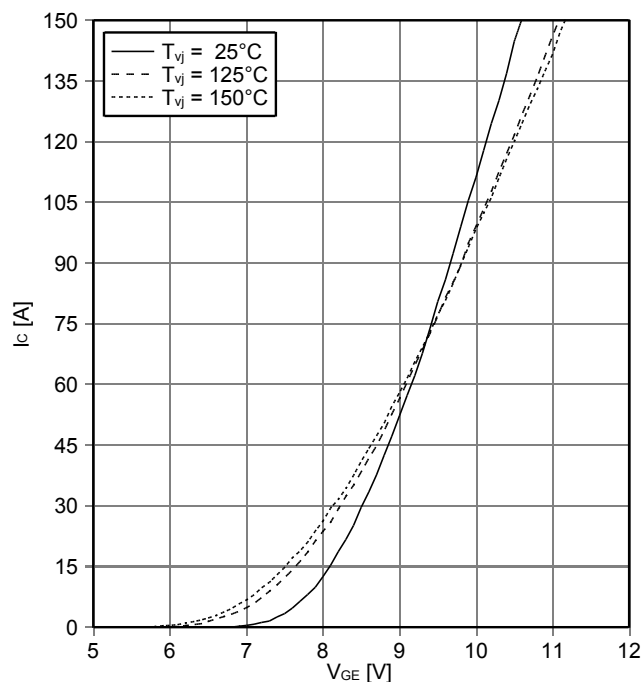
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



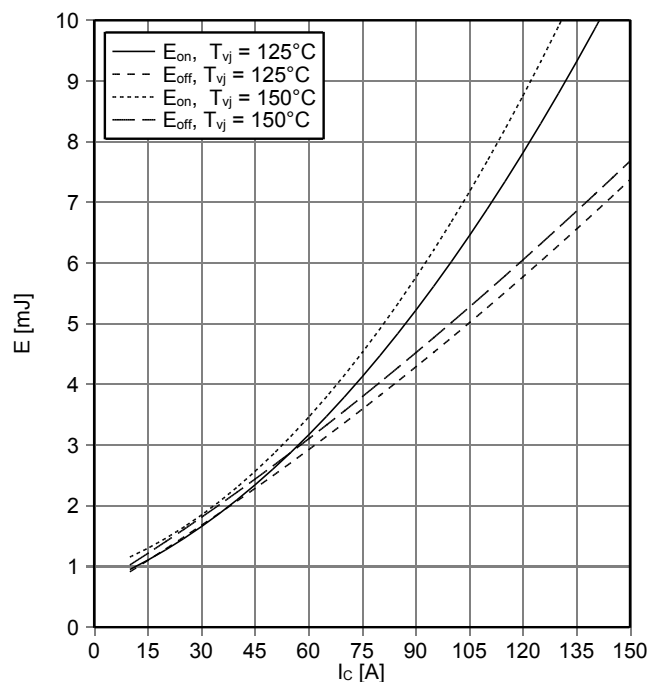
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

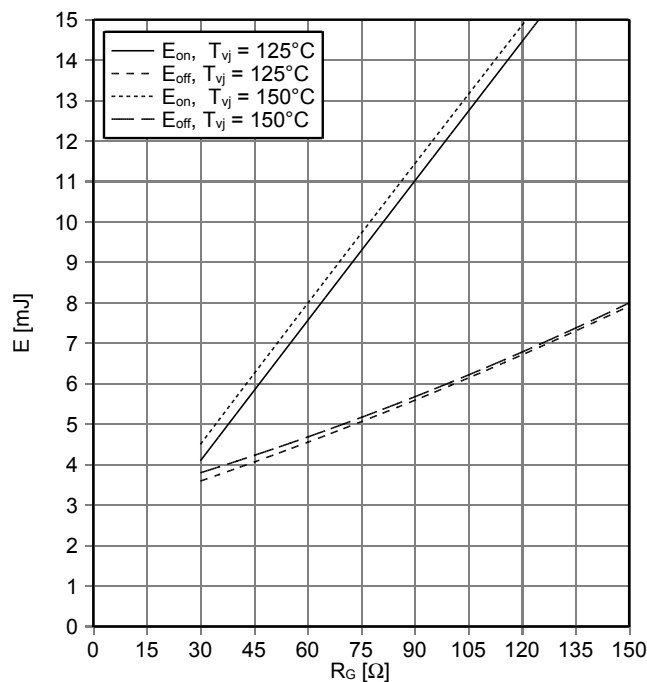
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 30\ \Omega$ ,  $R_{Goff} = 30\ \Omega$ ,  $V_{CE} = 300\text{ V}$



暫定データ  
Preliminary Data

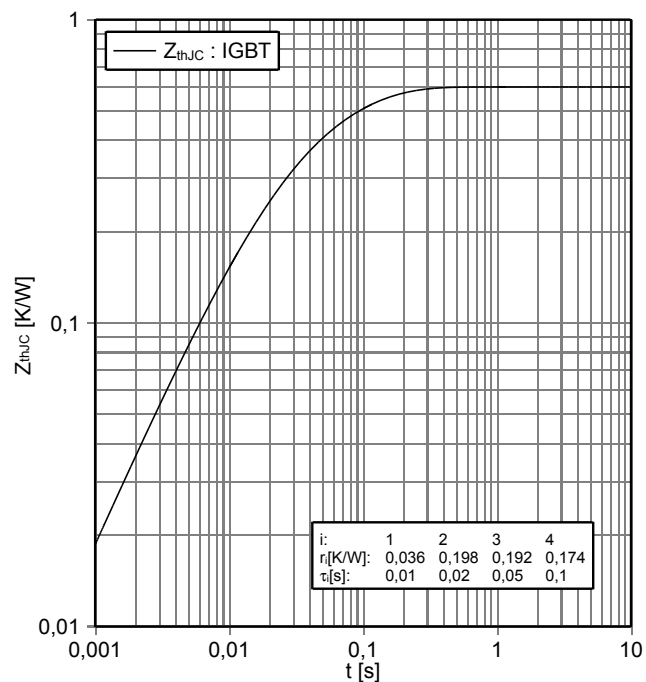
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 75\text{ A}$ ,  $V_{CE} = 300\text{ V}$



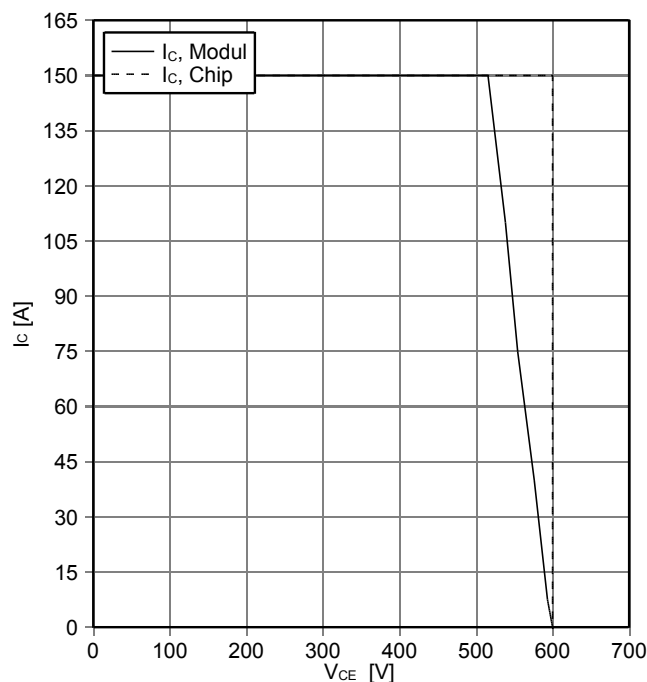
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



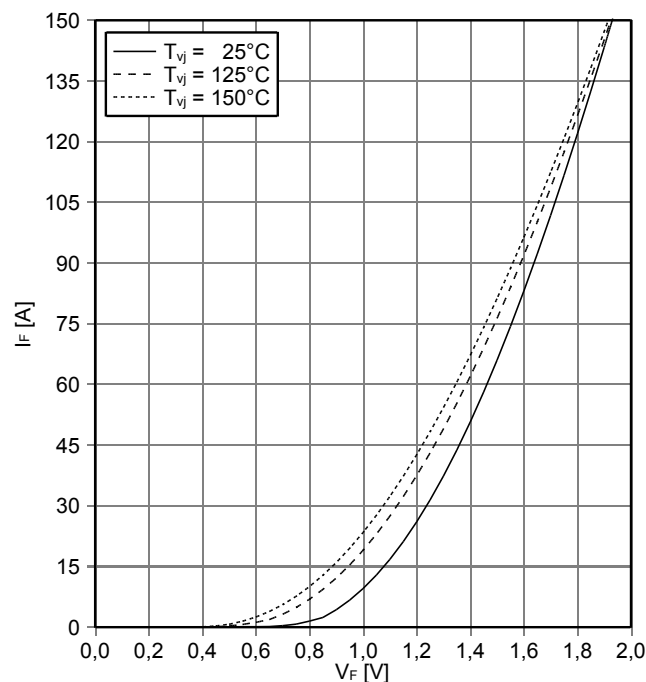
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 30\text{ Ω}$ ,  $T_{vj} = 150\text{ °C}$



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

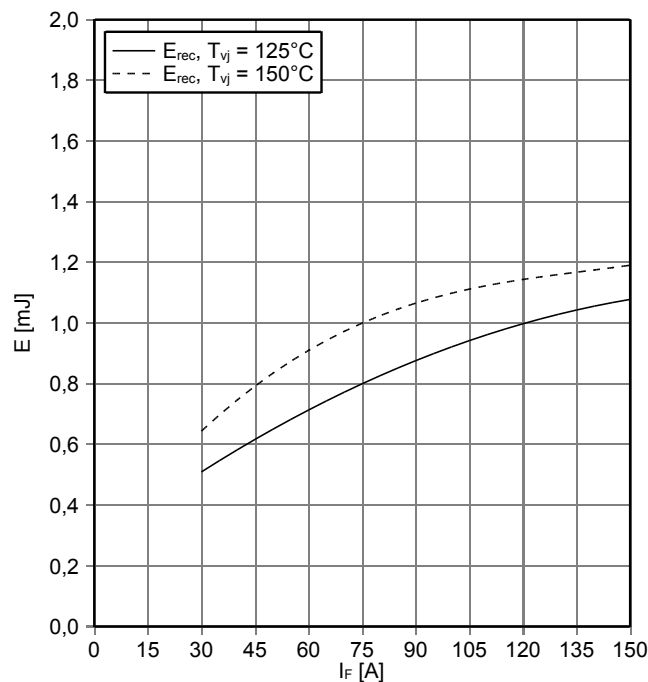
$I_F = f(V_F)$



暫定データ  
Preliminary Data

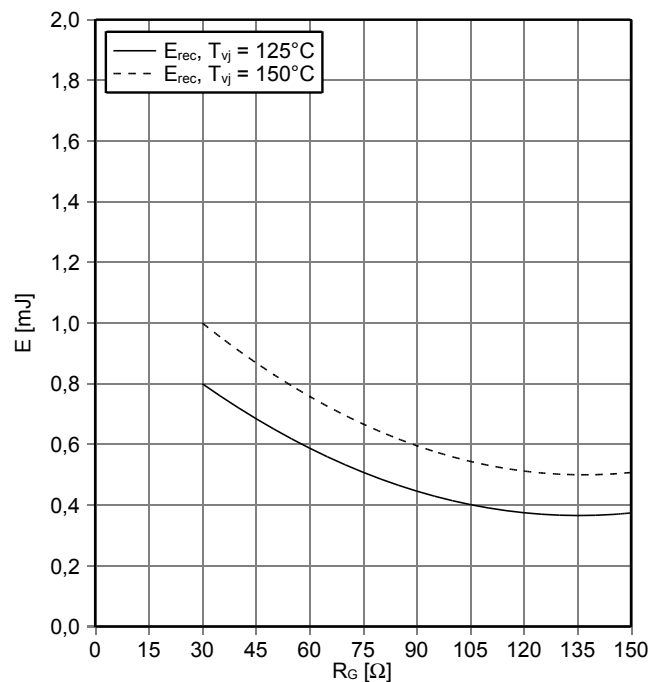
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 30 \Omega$ ,  $V_{CE} = 300 V$



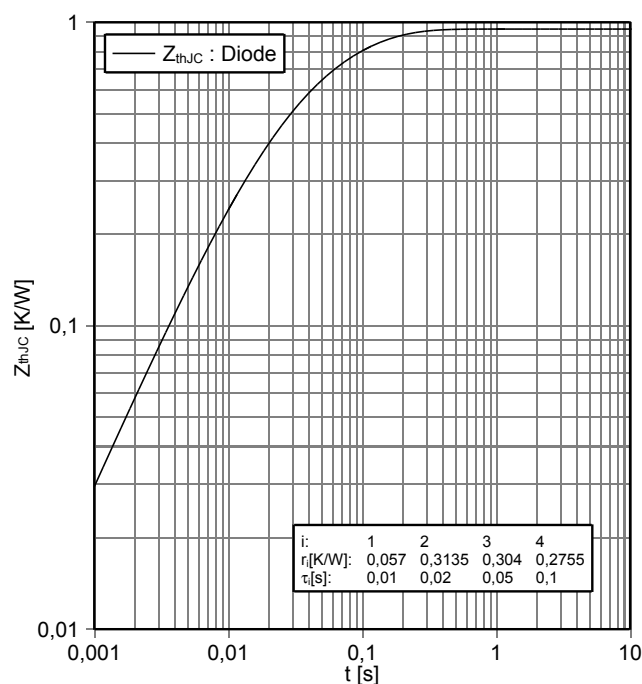
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 75 A$ ,  $V_{CE} = 300 V$



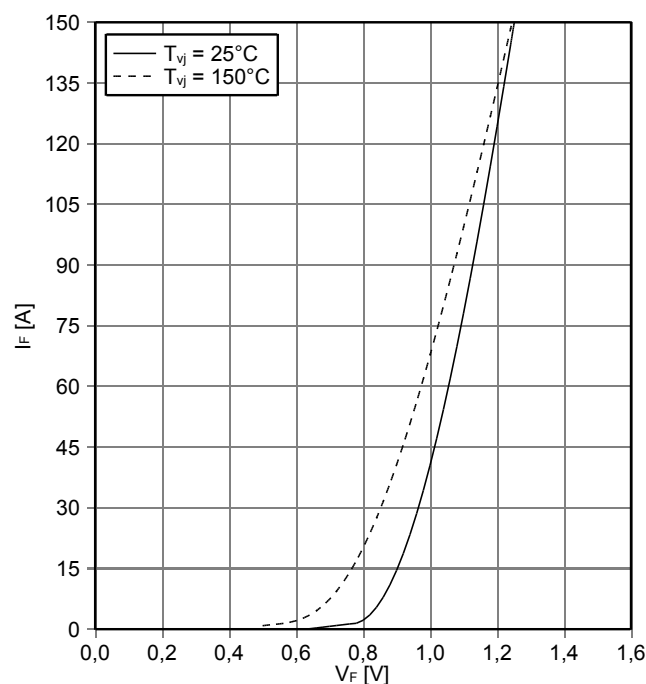
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



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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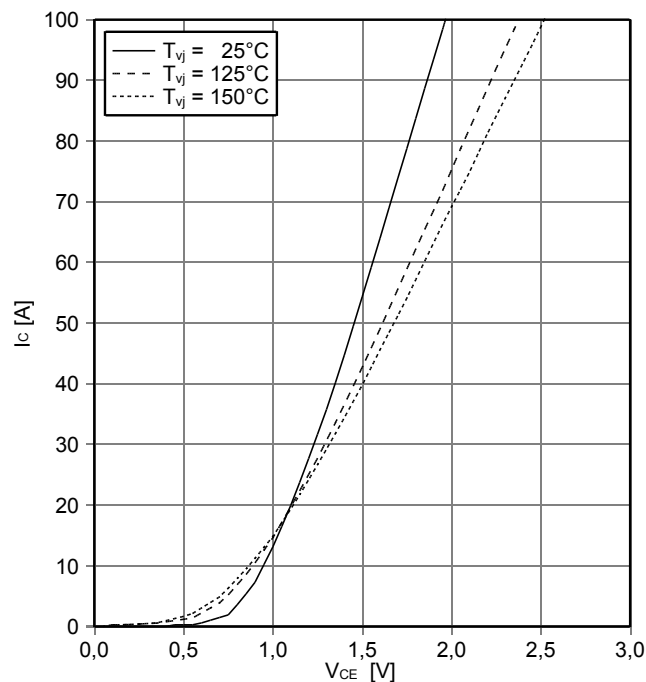
approved by: RS

revision: 2.0

暫定データ  
Preliminary Data

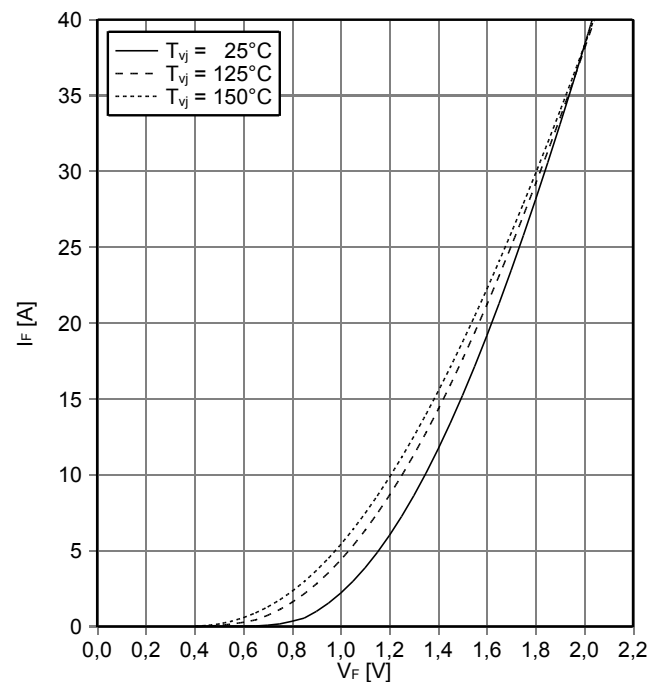
出力特性 IGBT-ブレーキチョッパー (Typical)  
output characteristic IGBT, Brake-Chopper (typical)

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

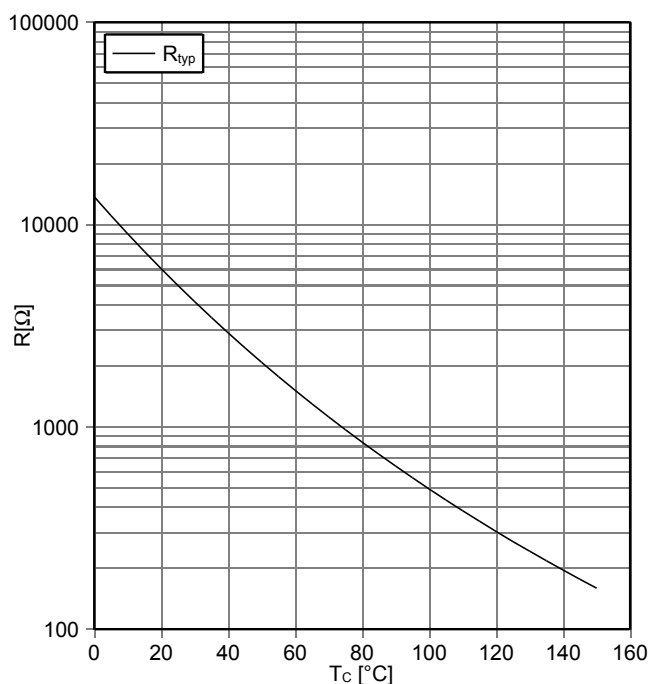


順電圧特性 Diode、ブレーキチョッパー ( typical)  
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$



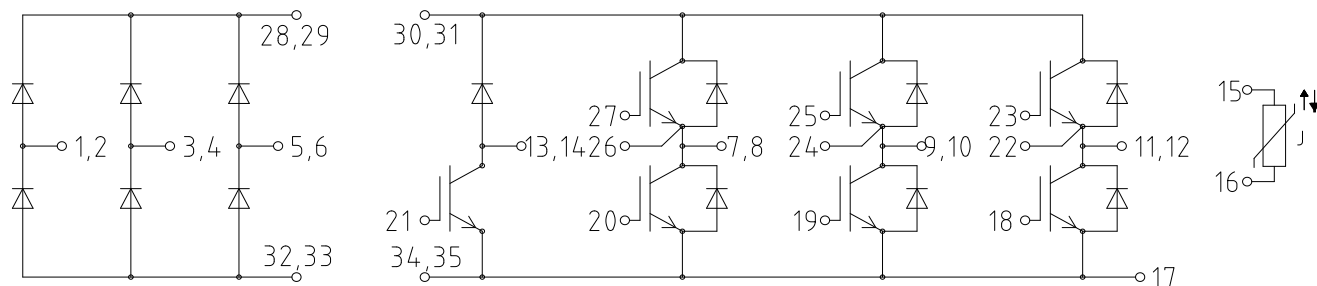
NTC-サーミスタ サーミスタの温度特性  
NTC-Thermistor-temperature characteristic (typical)  
 $R = f(T)$



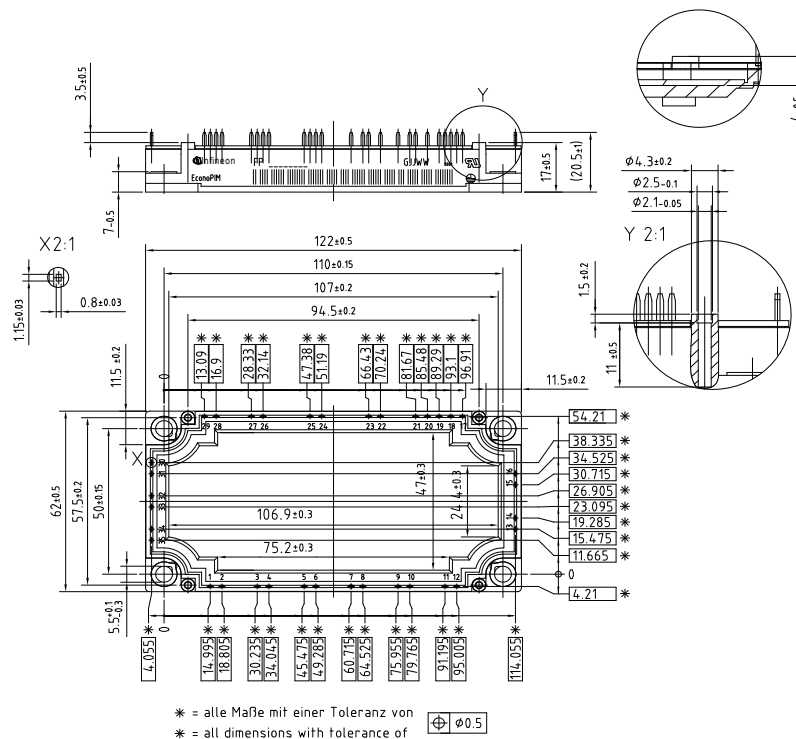
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暫定データ  
Preliminary Data

回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



|                 |                                 |
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**暫定データ  
Preliminary Data**

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- アプリケーションの共同評価

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- to perform joint Risk and Quality Assessments;
- 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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