



EconoPACK™+ B-Serie Modul mit Trench/Feldstopp IGBT4 und optimierter Emitter Controlled Diode
EconoPACK™+ B-series module with trench/fieldstop IGBT4 and optimized Emitter Controlled 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 Collector-emitter voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{CES} | 1200 | V |
| 連続DCコレクタ電流 Continuous DC collector current | $T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$ I_C | 450 675 | A A |
| 繰り返しピークコレクタ電流 Repetitive peak collector current | $t_P = 1\text{ ms}$ | I_{CRM} | 900 | A |
| トータル損失 Total power dissipation | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | P_{tot} | 2250 | W |
| ゲート・エミッタ間ピーク電圧 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 Collector-emitter saturation voltage | $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 450\text{ A}, V_{GE} = 15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,75 2,00 2,05 | 2,10 | V V V | |
| ゲート・エミッタ間しきい値電圧 Gate threshold voltage | $I_C = 17,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 5,2 | 5,8 | 6,4 | V |
| ゲート電荷量 Gate charge | $V_{GE} = -15\text{ V} \dots +15\text{ V}$ | | Q_G | 3,30 | | μC | |
| 内蔵ゲート抵抗 Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 1,7 | | Ω | |
| 入力容量 Input capacitance | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{ies} | 28,0 | | nF | |
| 帰還容量 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} | 1,55 | | nF | |
| コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current | $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{CES} | | 3,0 | mA | |
| ゲート・エミッタ間漏れ電流 Gate-emitter leakage current | $V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$ | | I_{GES} | | 400 | nA | |
| ターンオン遅れ時間 (誘導負荷) Turn-on delay time, inductive load | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_{don} | 0,19 0,22 0,22 | | μs μs μs | |
| ターンオン上昇時間 (誘導負荷) Rise time, inductive load | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_r | 0,06 0,07 0,07 | | μs μs μs | |
| ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_{doff} | 0,49 0,58 0,62 | | μs μs μs | |
| ターンオフ下降時間 (誘導負荷) Fall time, inductive load | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | t_f | 0,08 0,11 0,12 | | μs μs μs | |
| ターンオンスイッチング損失 Turn-on energy loss per pulse | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 7000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{on} | 15,0 26,0 28,5 | | mJ mJ mJ | |
| ターンオフスイッチング損失 Turn-off energy loss per pulse | $I_C = 450\text{ A}, V_{CE} = 600\text{ V}, L_S = 35\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3100\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{off} | 38,0 55,5 61,5 | | mJ mJ mJ | |
| 短絡電流 SC data | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | | I_{SC} | 1800 | | A | |
| ジャンクション・ケース間熱抵抗 Thermal resistance, junction to case | IGBT部 (1素子当り) / per IGBT | | R_{thJC} | | 0,066 | K/W | |
| ケース・ヒートシンク間熱抵抗 Thermal resistance, case to heatsink | IGBT部 (1素子当り) / per IGBT $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,05 | | K/W | |
| 動作温度 Temperature under switching conditions | | | $T_{vj\text{op}}$ | -40 | 150 | $^{\circ}\text{C}$ | |

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| prepared by: MB | date of publication: 2013-11-04 |
| approved by: WR | revision: 2.2 |



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 Repetitive peak reverse voltage | $T_{vj} = 25^{\circ}\text{C}$ | V_{RRM} | 1200 | V |
| 連続DC電流 Continuous DC forward current | | I_F | 450 | A |
| ピーク繰返し順電流 Repetitive peak forward current | $t_P = 1\text{ ms}$ | I_{FRM} | 900 | A |
| 電流二乗時間積 I^2t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | I^2t | 35000 28500 | A ² s A ² s |

電気的特性 / Characteristic Values

| | | | min. | typ. | max. | |
|---|---|---|--------------------|----------------------|------|---|
| 順電圧 Forward voltage | $I_F = 450\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 450\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 450\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | V_F | 1,65 1,65 1,65 | 2,10 | V V V |
| ピーク逆回復電流 Peak reverse recovery current | $I_F = 450\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | I_{RM} | 450 550 575 | | A A A |
| 逆回復電荷量 Recovered charge | $I_F = 450\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | Q_r | 48,0 92,0 105 | | μC μC μC |
| 逆回復損失 Reverse recovery energy | $I_F = 450\text{ A}, -di_F/dt = 7000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$ | E_{rec} | 26,5 48,5 55,0 | | mJ mJ mJ |
| ジャンクション・ケース間熱抵抗 Thermal resistance, junction to case | /Diode (1 素子当り) / per diode | | R_{thJC} | | 0,10 | K/W |
| ケース・ヒートシンク間熱抵抗 Thermal resistance, case to heatsink | /Diode (1 素子当り) / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | | R_{thCH} | 0,075 | | K/W |
| 動作温度 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 Rated resistance | $T_C = 25^{\circ}\text{C}$ | | R_{25} | 5,00 | | k Ω |
| R100の偏差 Deviation of R100 | $T_C = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$ | | $\Delta R/R$ | -5 | 5 | % |
| 損失 Power dissipation | $T_C = 25^{\circ}\text{C}$ | | P_{25} | | 20,0 | mW |
| B-定数 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 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 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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暫定データ
Preliminary Data

モジュール / Module

| | | | | | |
|---|---|---------------------|--------------------------------|------|---------|
| 絶縁耐圧 Isolation test voltage | RMS, f = 50 Hz, t = 1 min | V _{ISOL} | 2,5 | | kV |
| 内部絶縁 Internal isolation | 基礎絶縁 (クラス1, IEC 61140) basic insulation (class 1, IEC 61140) | | Al ₂ O ₃ | | |
| 沿面距離 Creepage distance | 連絡方法 - ヒートシンク / terminal to heatsink 連絡方法 - 連絡方法 / terminal to terminal | | 14,5 18,0 | | mm |
| 空間距離 Clearance | 連絡方法 - ヒートシンク / terminal to heatsink 連絡方法 - 連絡方法 / terminal to terminal | | 12,5 10,0 | | mm |
| 相対トラッキング指数 Comperative tracking index | | CTI | > 200 | | |
| | | | min. | typ. | max. |
| ケース・ヒートシンク間熱抵抗 Thermal resistance, case to heatsink | /モジュール / per module $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$ | R _{thCH} | 0,005 | | K/W |
| 内部インダクタンス Stray inductance module | | L _{sCE} | 20 | | nH |
| パワーターミナル・チップ間抵抗 Module lead resistance, terminals - chip | T _c = 25°C, /スイッチ / per switch | R _{CC+EE'} | 1,10 | | mΩ |
| 保存温度 Storage temperature | | T _{stg} | -40 | 125 | °C |
| 取り付けネジ締め付けトルク Mounting torque for modul mounting | 取り付けネジ M5 適切なアプリケーションノートによるマウンティング Screw M5 - Mounting according to valid application note | M | 3,00 | - | 6,00 Nm |
| 主端子ネジ締め付けトルク Terminal connection torque | 取り付けネジ M6 適切なアプリケーションノートによるマウンティング Screw M6 - Mounting according to valid application note | M | 3,0 | - | 6,0 Nm |
| 質量 Weight | | G | 930 | | g |

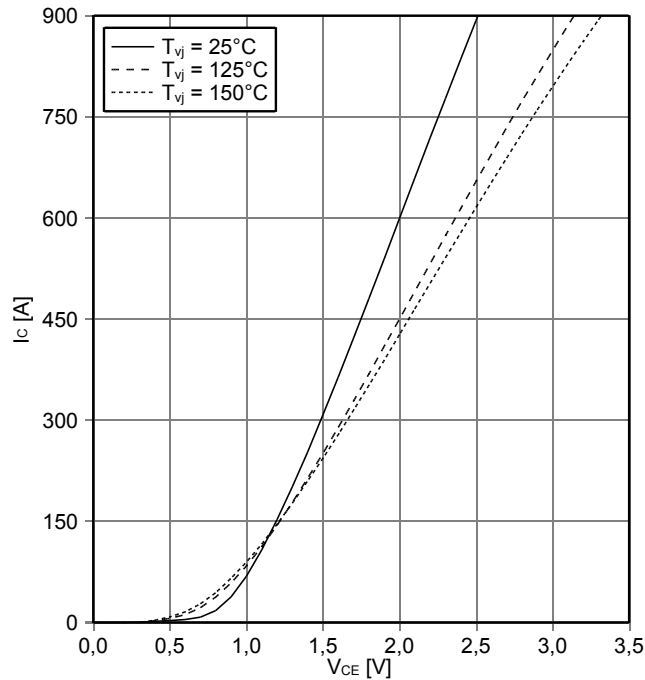
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暫定データ
Preliminary Data

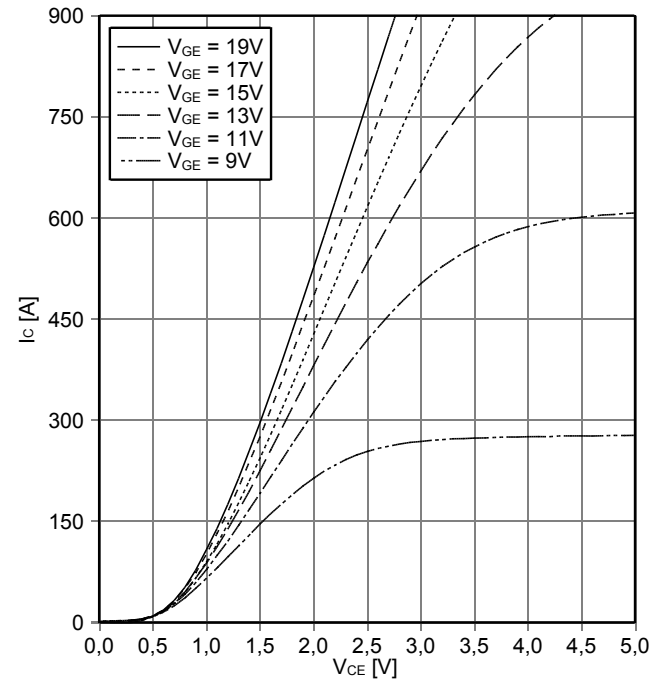
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



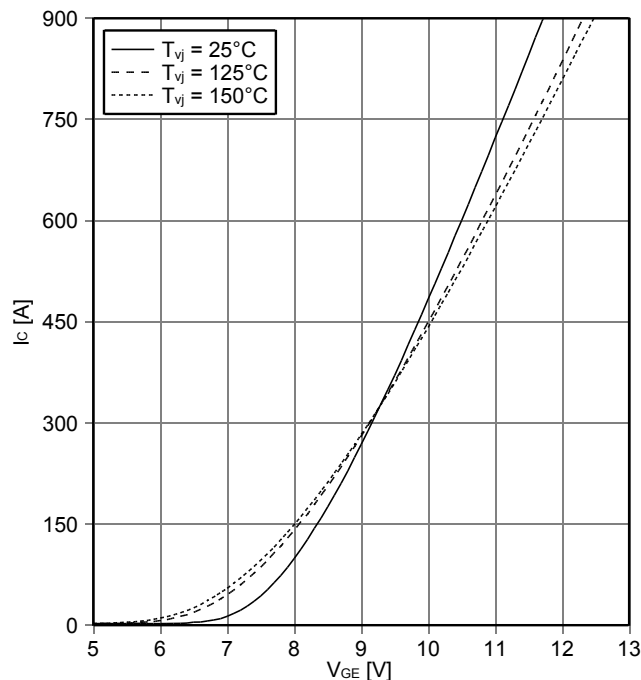
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



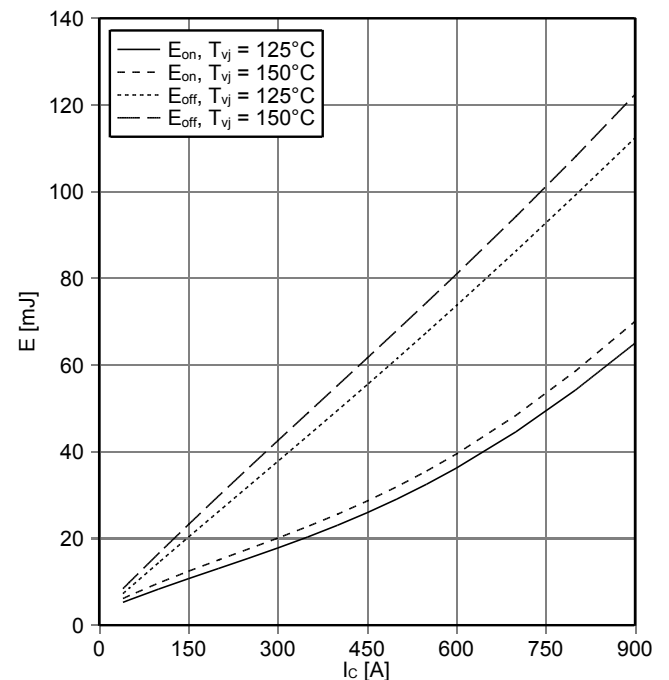
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.3\ \Omega$, $R_{Goff} = 1.3\ \Omega$, $V_{CE} = 600\text{ V}$



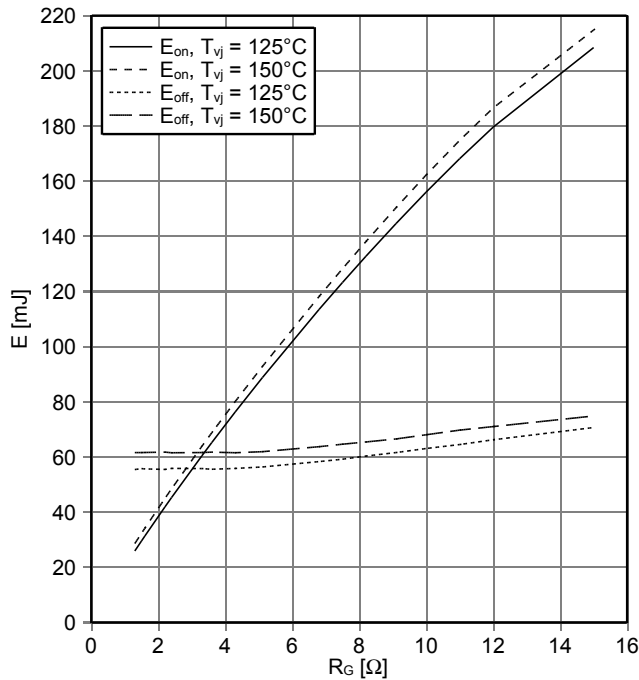
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暫定データ
Preliminary Data

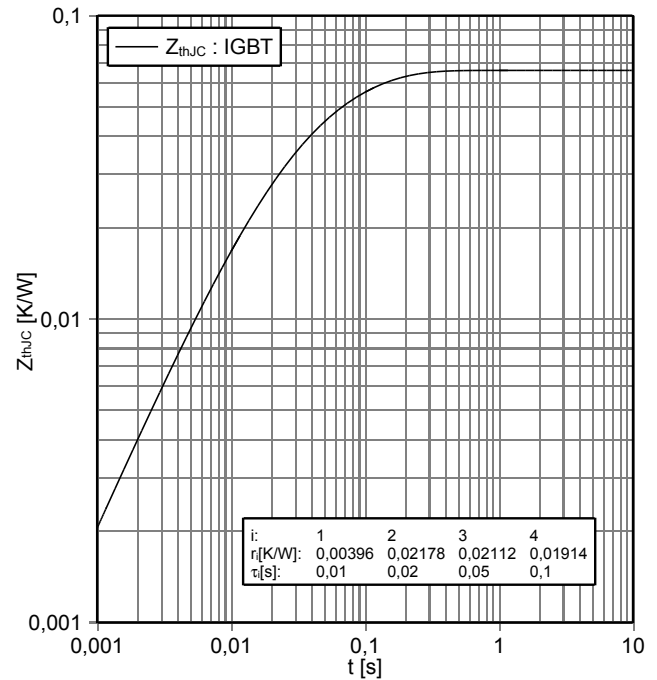
スイッチング損失 IGBT- インバータ (Typical)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 450\text{ A}, V_{CE} = 600\text{ V}$



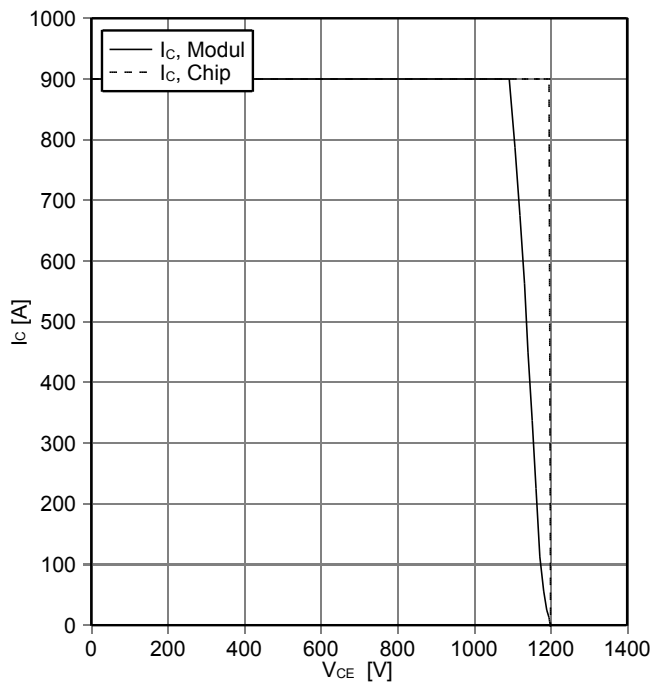
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



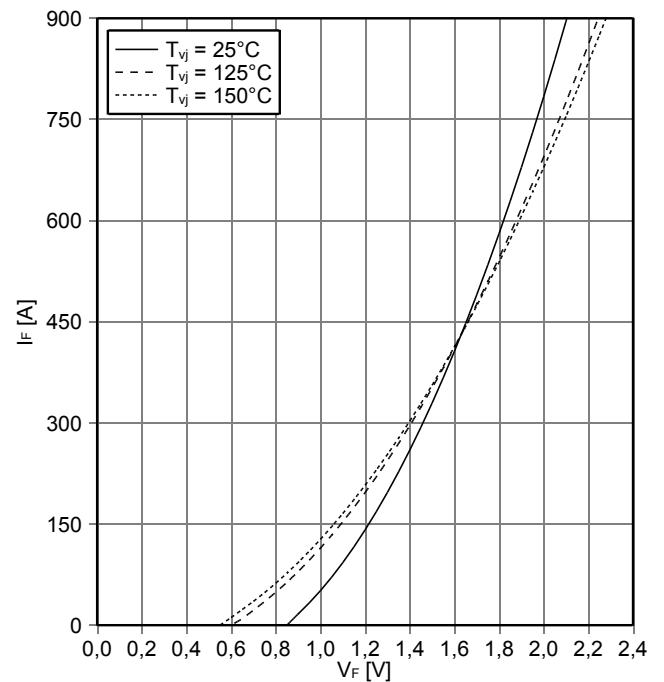
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.3\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



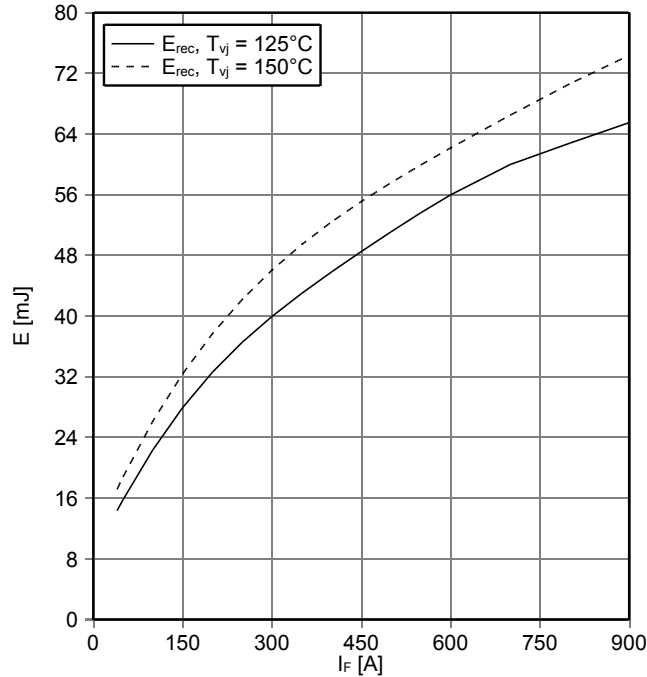
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暫定データ
Preliminary Data

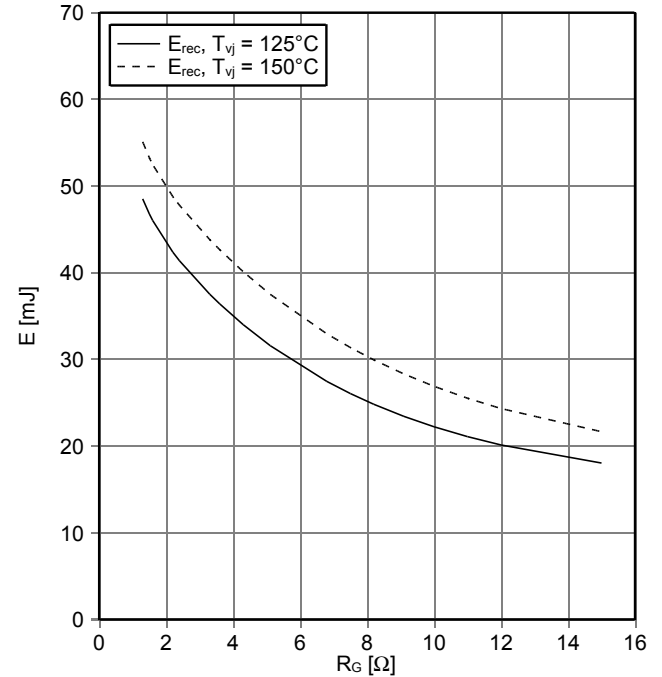
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.3 \Omega, V_{CE} = 600 V$



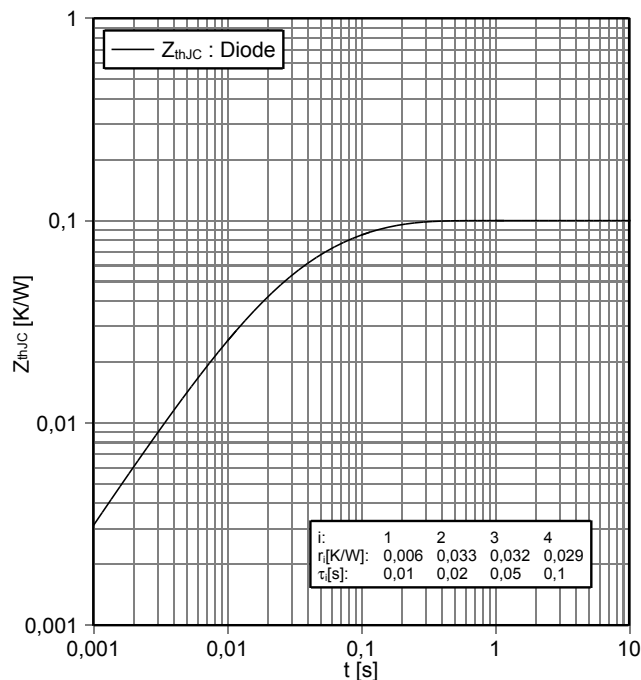
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 450 A, V_{CE} = 600 V$



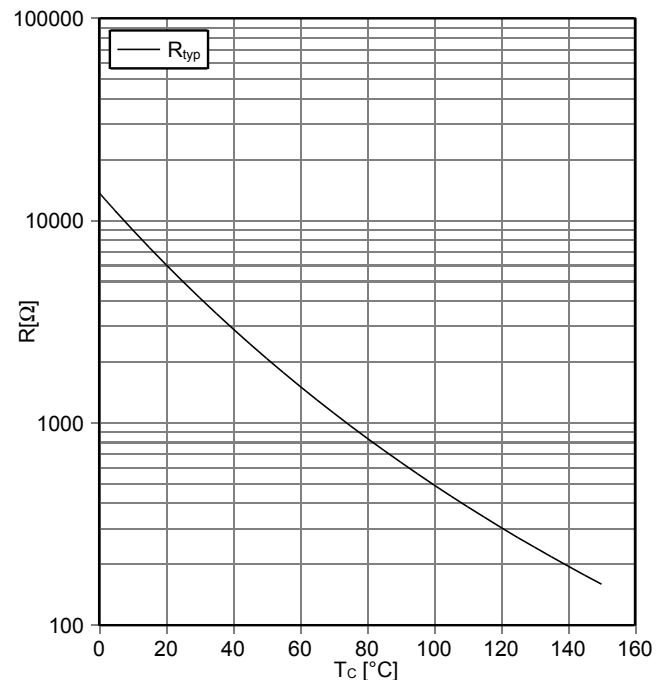
過渡熱インピーダンス Diode、インバータ
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



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

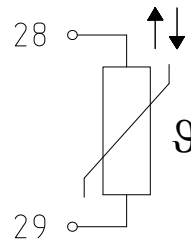
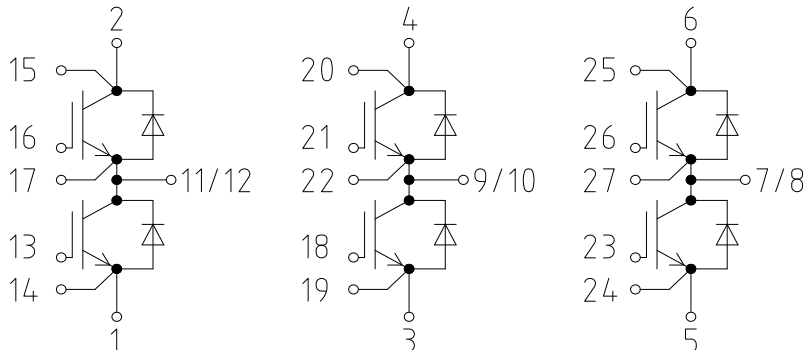
$R = f(T)$



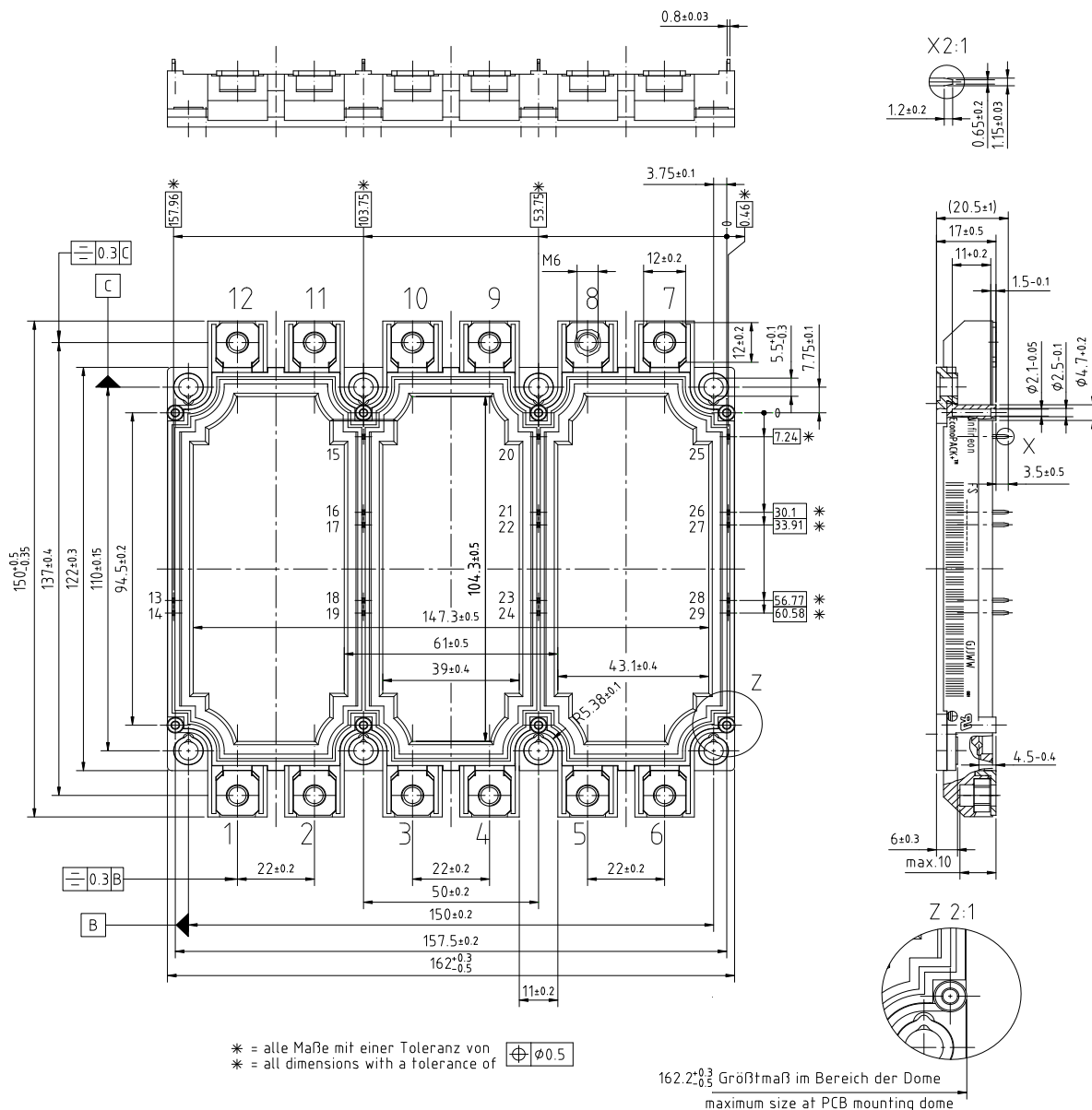
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暫定データ
Preliminary Data

回路図 / circuit_diagram_headline



パッケージ概要 / package outlines



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