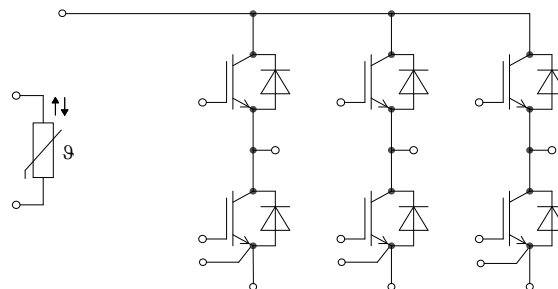
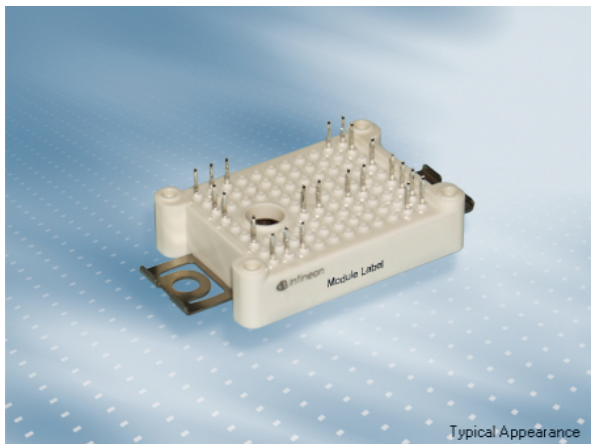


EasyPACK モジュール トレンチ/フィールドストップ IGBT4 and エミッターコントロール4 diode内蔵 and PressFIT / NTCサーミスタ

EasyPACK module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and PressFIT / NTC

**暫定データ / Preliminary Data**



$V_{CES} = 1200V$   
 $I_{C\ nom} = 25A / I_{CRM} = 50A$

**一般応用**

- 空冷
- モーター駆動
- サーボ駆動
- UPSシステム

**Typical Applications**

- Air Conditioning
- Motor Drives
- Servo Drives
- UPS Systems

**電気的特性**

- 低スイッチング損失
- 低  $V_{CEsat}$  飽和電圧
- トレンチ IGBT 4
- 正温度特性を持った  $V_{CEsat}$  飽和電圧

**Electrical Features**

- Low Switching Losses
- Low  $V_{CEsat}$
- Trench IGBT 4
- $V_{CEsat}$  with positive Temperature Coefficient

**機械的特性**

- 低熱インピーダンスの  $Al_2O_3$  DCB
- コンパクトデザイン
- PressFIT 接合 技術
- 固定用クランプによる強固なマウンティング

**Mechanical Features**

- $Al_2O_3$  Substrate with Low Thermal Resistance
- Compact design
- PressFIT Contact Technology
- Rugged mounting due to integrated mounting clamps

**Module Label Code**

Barcode Code 128



**Content of the Code**

**Digit**

|                            |         |
|----------------------------|---------|
| Module Serial Number       | 1 - 5   |
| Module Material Number     | 6 - 11  |
| Production Order Number    | 12 - 19 |
| Datecode (Production Year) | 20 - 21 |
| Datecode (Production Week) | 22 - 23 |

DMX - Code



|                 |                                 |                      |
|-----------------|---------------------------------|----------------------|
| prepared by: DK | date of publication: 2013-11-05 |                      |
| approved by: MB | revision: 2.0                   | UL approved (E83335) |



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          | $T_{vj} = 25^{\circ}\text{C}$   | $V_{CES}$                  | 1200     | V      |
| 連続DCコレクタ電流<br>Continuous DC collector current      | $T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$<br>$T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | $I_{C\text{nom}}$<br>$I_C$ | 25<br>45 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ms}$  | $I_{CRM}$                  | 50       | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$  | $P_{\text{tot}}$           | 205      | 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  | $I_C = 25\text{A}, V_{GE} = 15\text{V}$<br>$I_C = 25\text{A}, V_{GE} = 15\text{V}$<br>$I_C = 25\text{A}, V_{GE} = 15\text{V}$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_{CE\text{sat}}$ | 1,85<br>2,15<br>2,25   | 2,25 | V<br>V<br>V                                     |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 0,80\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$  |   | $V_{GEth}$         | 5,0<br>5,8             | 6,5  | V   |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{V} \dots +15\text{V}$   |   | $Q_G$              | 0,20                   |      | $\mu\text{C}$                                   |
| 内蔵ゲート抵抗<br>Internal gate resistor                       | $T_{vj} = 25^{\circ}\text{C}$  |   | $R_{Gint}$         |                        |      | $\Omega$  |
| 入力容量<br>Input capacitance                               | $f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$  |   | $C_{ies}$          | 1,45                   |      | nF  |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$  |   | $C_{res}$          | 0,05                   |      | 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           | $V_{CE} = 0\text{V}, V_{GE} = 20\text{V}, T_{vj} = 25^{\circ}\text{C}$   |   | $I_{GES}$          |                        | 400  | nA  |
| ターンオン遅れ時間 (誘導負荷)<br>Turn-on delay time, inductive load  | $I_C = 25\text{A}, V_{CE} = 600\text{V}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_{Gon} = 20\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{don}$          | 0,05<br>0,05<br>0,05   |      | $\mu\text{s}$<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           | $I_C = 25\text{A}, V_{CE} = 600\text{V}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_{Gon} = 20\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_r$              | 0,027<br>0,029<br>0,03 |      | $\mu\text{s}$<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 | $I_C = 25\text{A}, V_{CE} = 600\text{V}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_{Goff} = 20\Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_{doff}$         | 0,18<br>0,27<br>0,29   |      | $\mu\text{s}$<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           | $I_C = 25\text{A}, V_{CE} = 600\text{V}$<br>$V_{GE} = \pm 15\text{V}$<br>$R_{Goff} = 20\Omega$   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $t_f$              | 0,16<br>0,195<br>0,215 |      | $\mu\text{s}$<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          | $I_C = 25\text{A}, V_{CE} = 600\text{V}, L_S = 60\text{nH}$<br>$V_{GE} = \pm 15\text{V}, di/dt = 1200\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 20\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{on}$           | 1,90<br>2,65<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         | $I_C = 25\text{A}, V_{CE} = 600\text{V}, L_S = 60\text{nH}$<br>$V_{GE} = \pm 15\text{V}, du/dt = 3500\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 20\Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{off}$          | 1,40<br>2,00<br>2,20   |      | mJ<br>mJ<br>mJ                                  |
| 短絡電流<br>SC data   | $V_{GE} \leq 15\text{V}, V_{CC} = 800\text{V}$<br>$V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$                        |   | $I_{SC}$           | 90                     |      | 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   |   | $R_{thJC}$         | 0,66                   | 0,74 | 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>$\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$                         |   | $R_{thCH}$         | 0,80                   |      | K/W   |
| 動作温度<br>Temperature under switching conditions          |  |   | $T_{vj\text{op}}$  | -40                    | 150  | $^{\circ}\text{C}$                              |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |



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 | $T_{vj} = 25^{\circ}\text{C}$  | $V_{RRM}$ | 1200         | V                                    |
| 連続DC電流<br>Continuous DC forward current      |  | $I_F$     | 25           | A                                    |
| ピーク繰返し順電流<br>Repetitive peak forward current | $t_P = 1\text{ ms}$  | $I_{FRM}$ | 50           | 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>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 90,0<br>80,0 | A <sup>2</sup> s<br>A <sup>2</sup> s |

電気的特性 / Characteristic Values

|   |   |   | min.               | typ.                 | max. |   |
|---|---|---|--------------------|----------------------|------|---|
| 順電圧<br>Forward voltage                                  | $I_F = 25\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 25\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 25\text{ A}, V_{GE} = 0\text{ V}$                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $V_F$              | 1,75<br>1,75<br>1,75 | 2,25 | V<br>V<br>V                                     |
| ピーク逆回復電流<br>Peak reverse recovery current               | $I_F = 25\text{ A}, -di_F/dt = 1200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 39,0<br>40,0<br>41,0 |      | A<br>A<br>A                                     |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 25\text{ A}, -di_F/dt = 1200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 2,40<br>4,10<br>4,40 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 25\text{ A}, -di_F/dt = 1200\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 600\text{ V}$<br>$V_{GE} = -15\text{ V}$         | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,90<br>1,50<br>1,70 |      | 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                 | 1,05 | 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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |   | $R_{thCH}$         | 0,85                 |      | 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 |      | 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.

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |



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     |
| 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 |                     | 11,5<br>6,3                    |      | 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 |                     | 10,0<br>5,0                    |      | mm     |
| 相対トラッキング指数<br>Comperative tracking index                    |  | CTI                 | > 200                          |      |        |
|   |  |                     | min.                           | typ. | max.   |
| 内部インダクタンス<br>Stray inductance module                        |  | L <sub>sCE</sub>    |                                | 25   | 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> |                                | 4,50 | mΩ     |
| 保存温度<br>Storage temperature                                 |  | T <sub>stg</sub>    | -40                            |      | 125 °C |
| 質量<br>Weight  |  | G                   |                                | 24   | g      |

Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25A rms per connector pin.

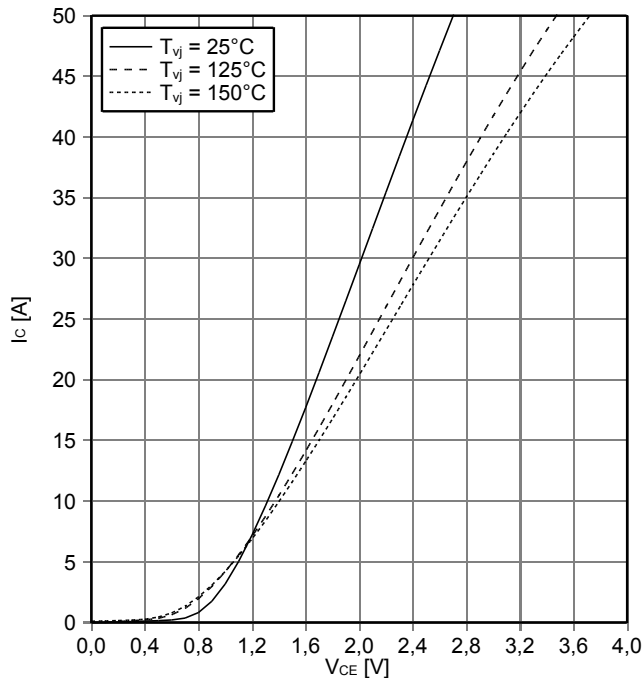
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|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |



暫定データ  
Preliminary Data

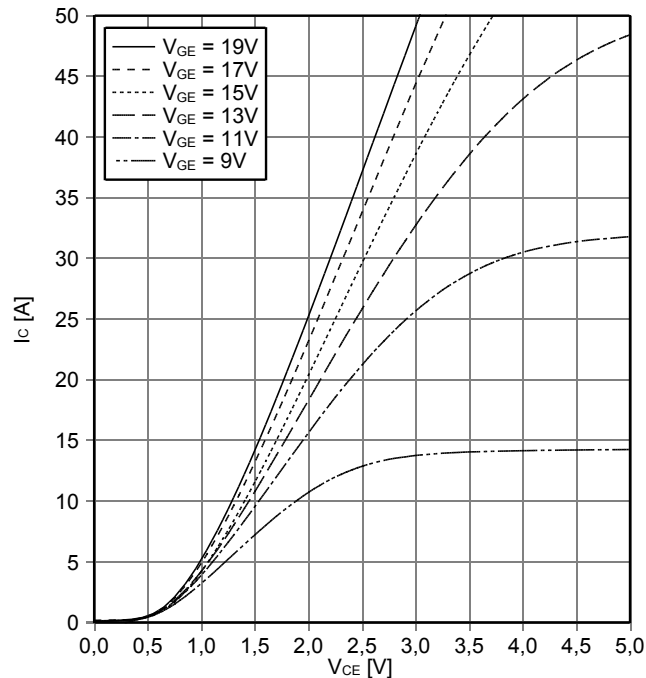
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



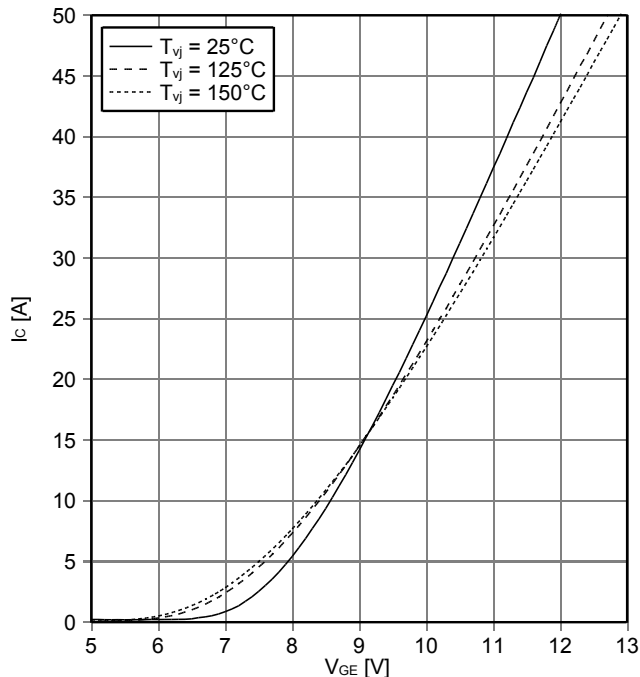
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



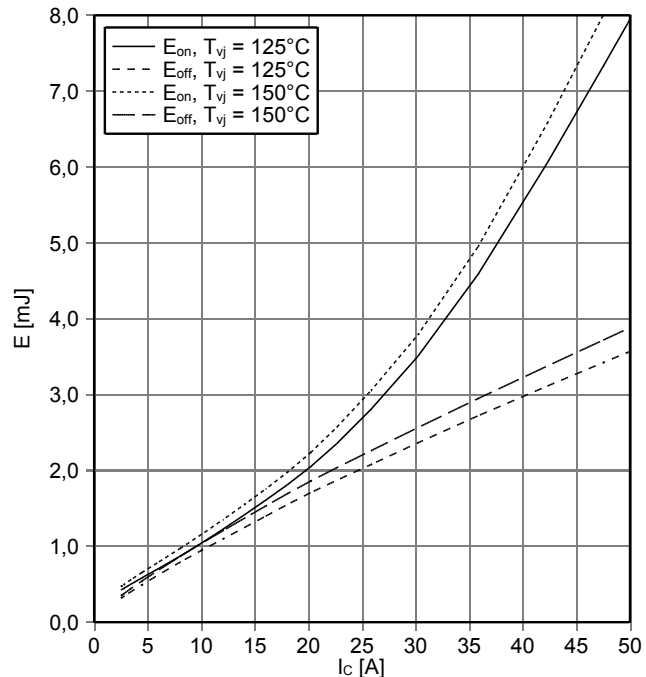
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 20\ \Omega$ ,  $R_{Goff} = 20\ \Omega$ ,  $V_{CE} = 600\text{ V}$



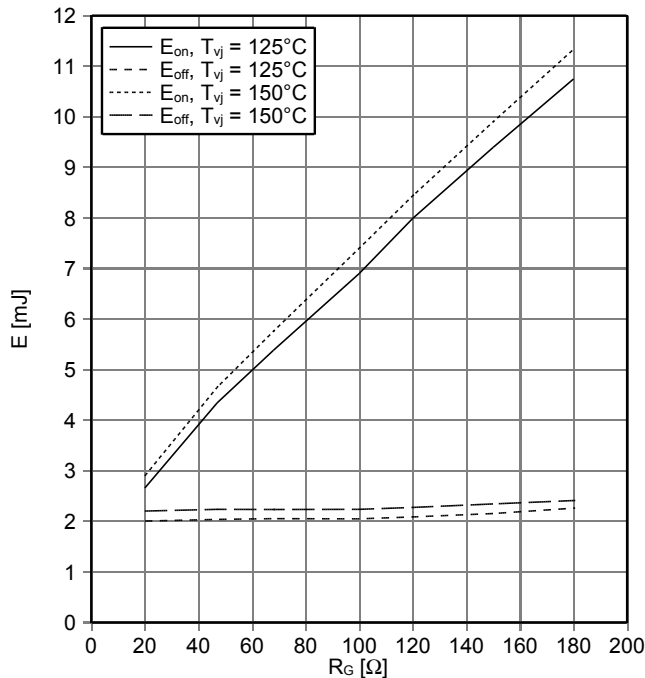
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|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |



暫定データ  
Preliminary Data

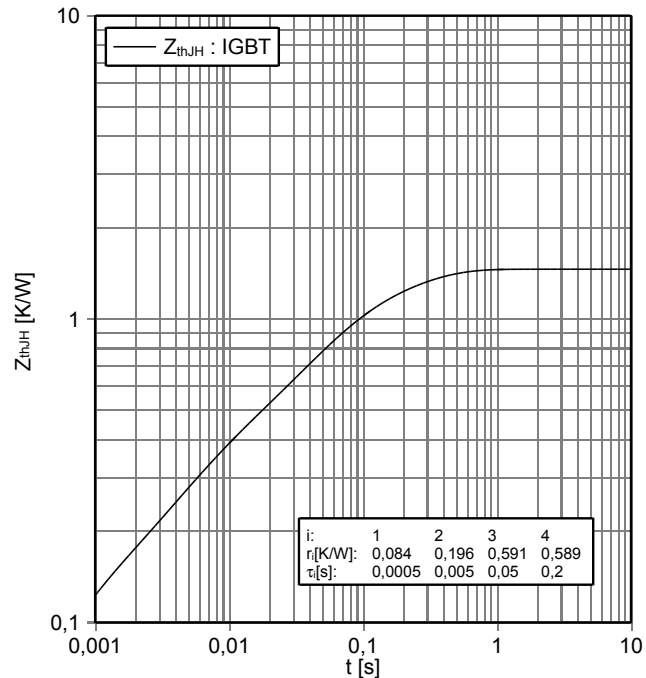
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 25\text{ A}$ ,  $V_{CE} = 600\text{ V}$



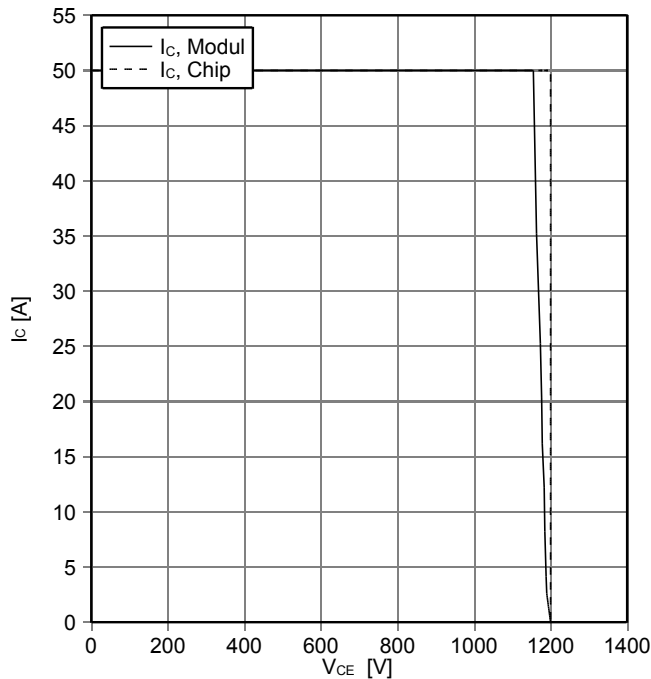
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



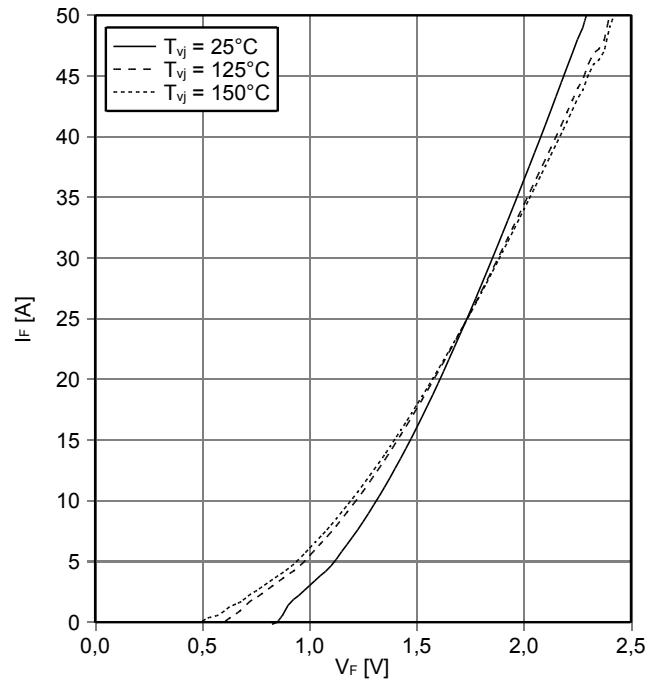
逆バイアス安全動作領域 IGBT- インバータ ( RBSOA )  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 20\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



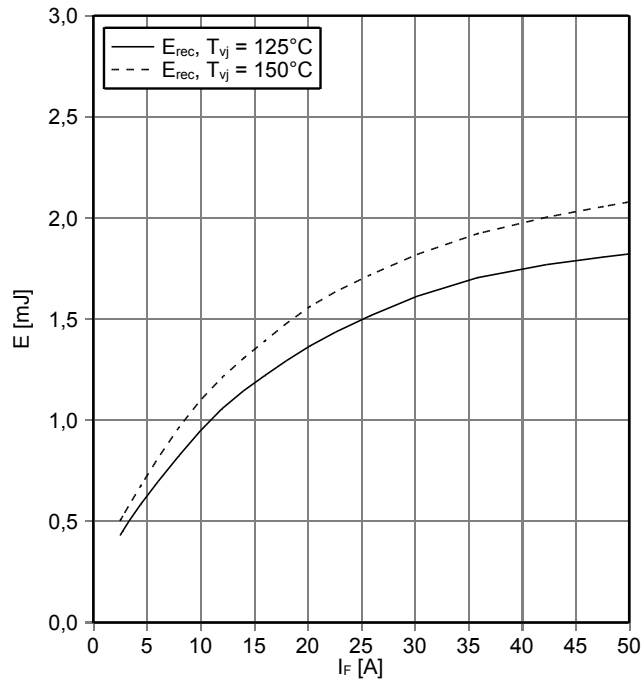
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|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |



暫定データ  
Preliminary Data

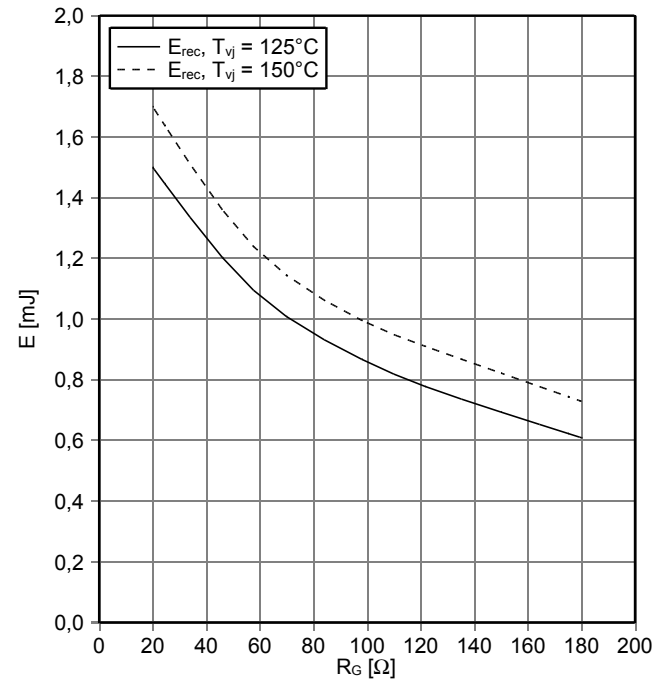
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 20 \Omega, V_{CE} = 600 V$



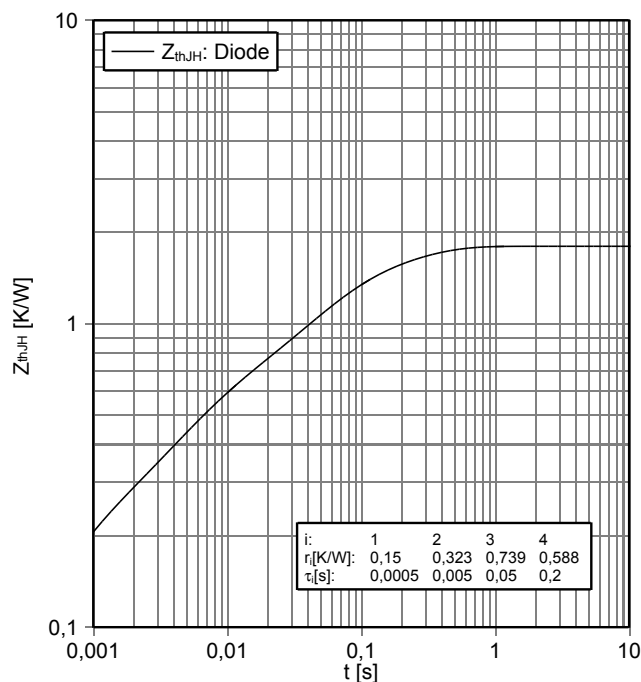
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 25 A, V_{CE} = 600 V$



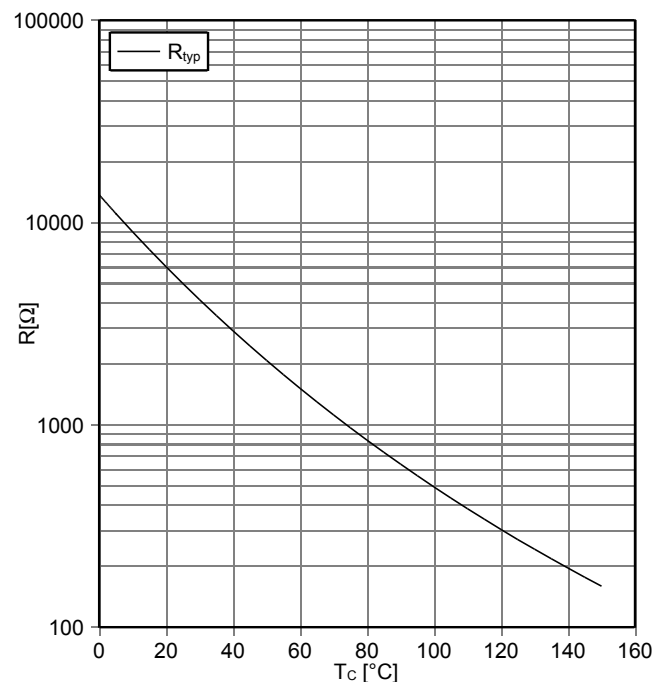
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



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

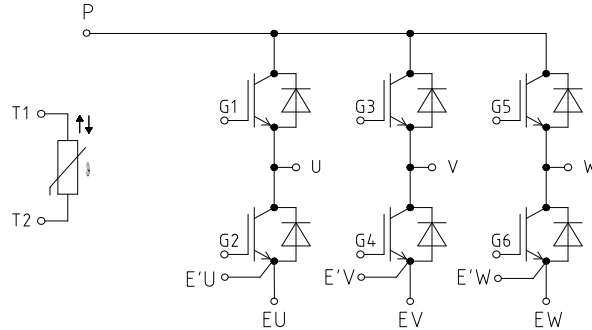
$R = f(T)$



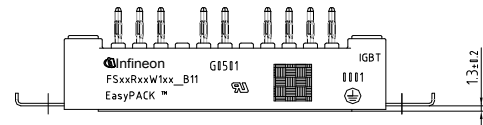
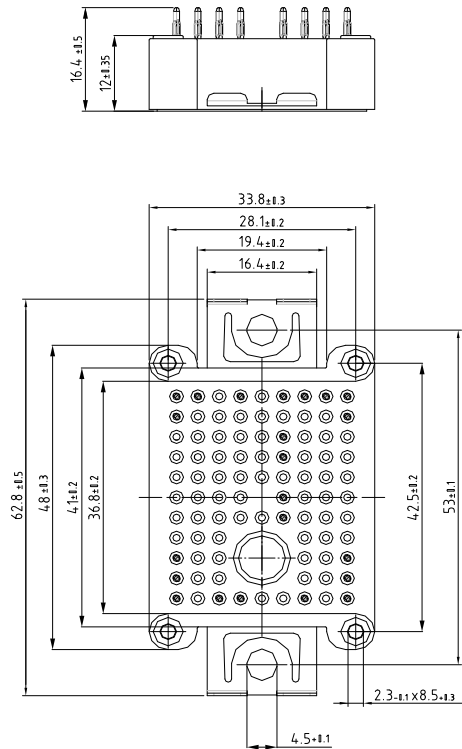
|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-11-05 |
| approved by: MB | revision: 2.0                   |

暫定データ  
Preliminary Data

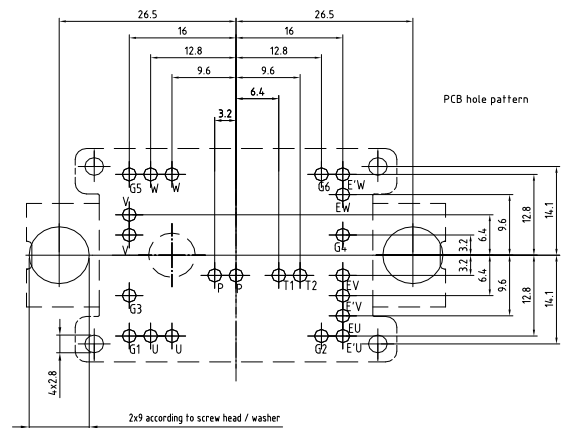
回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern  $\varnothing \pm 0.1$
- Hole specification for contacts see AN 2109-01:  
Diameters of drill  $\varnothing 1.15$ mm  
and copper thickness in hole 25-51 $\mu$ m



prepared by: DK  
approved by: MB

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