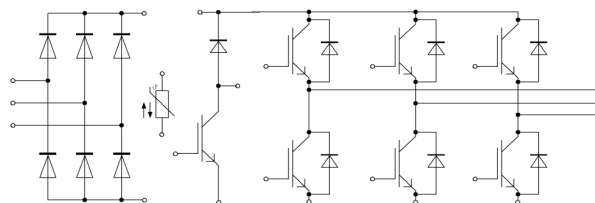
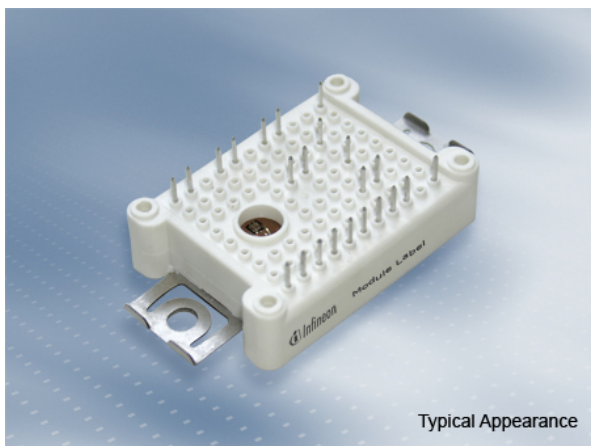


EasyPIM™ モジュール 高速トレンチ/フィールドストップ IGBT3 and エミッターコントロール3 diode内蔵  
and NTCサーミスタ

EasyPIM™ module with Trench/Fieldstop IGBT3 and Emitter Controlled 3 diode and NTC

## 暫定データ / Preliminary Data



$V_{CES} = 600V$

$I_{C\ nom} = 10A / I_{CRM} = 20A$

### 一般応用

- スタティックインバーター
- 空冷
- モーター駆動

### 電気的特性

- 低スイッチング損失
- トレンチ IGBT 3
- 正温度特性を持った  $V_{CEsat}$  飽和電圧
- 低  $V_{CEsat}$  飽和電圧

### 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
- 半田接合技術
- 固定用クランプによる強固なマウンティング

### Typical Applications

- Auxiliary Inverters
- Air Conditioning
- Motor Drives

### Electrical Features

- Low Switching Losses
- Trench IGBT 3
- $V_{CEsat}$  with positive Temperature Coefficient
- Low  $V_{CEsat}$

### Mechanical Features

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

## Module Label Code

### Barcode Code 128



### DMX - Code



### Content of the Code

| 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 |

|                 |                                 |                      |
|-----------------|---------------------------------|----------------------|
| prepared by: DK | date of publication: 2013-10-03 |                      |
| approved by: MB | revision: 2.1                   | 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          | $T_{vj} = 25^{\circ}\text{C}$                                                                                                | $V_{CES}$                   | 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>$I_C$ | 10<br>16 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                          | $I_{CRM}$                   | 20       | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175$                                                                                 | $P_{\text{tot}}$            | 68,0     | 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  | $I_C = 10\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$                                                             | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $V_{CE\text{ sat}}$ | 1,55<br>1,70<br>1,80    | 2,00 | V<br>V<br>V                                     |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 0,30\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                                                                            |                                                                                                                               | $V_{GEth}$          | 4,9                     | 5,8  | 6,5 V                                           |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                                                                      |                                                                                                                               | $Q_G$               | 0,10                    |      | $\mu\text{C}$                                   |
| 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                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                                               | $C_{ies}$           | 0,55                    |      | nF                                              |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                                                                      |                                                                                                                               | $C_{res}$           | 0,017                   |      | 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  | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ on}}$   | 0,012<br>0,012<br>0,012 |      | $\mu\text{s}$<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           | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                                                                        | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_r$               | 0,009<br>0,013<br>0,014 |      | $\mu\text{s}$<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 | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ off}}$  | 0,10<br>0,12<br>0,125   |      | $\mu\text{s}$<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           | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                                                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_f$               | 0,085<br>0,13<br>0,135  |      | $\mu\text{s}$<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          | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}, L_S = 60\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, di/dt = 1500\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Gon} = 27\text{ }\Omega$  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{on}$            | 0,14<br>0,20<br>0,22    |      | 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         | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}, L_S = 60\text{ nH}$<br>$V_{GE} = \pm 15\text{ V}, du/dt = 4100\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$<br>$R_{Goff} = 27\text{ }\Omega$ | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{off}$           | 0,24<br>0,30<br>0,32    |      | mJ<br>mJ<br>mJ                                  |
| 短絡電流<br>SC data                                         | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$                                                                                         | $t_P \leq 8\text{ }\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 70<br>50                |      | 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                                                                                                                                                                      |                                                                                                                               | $R_{thJC}$          | 2,00                    | 2,20 | 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>$\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$                                    |                                                                                                                               | $R_{thCH}$          | 1,35                    |      | 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: 2013-10-03

approved by: MB

revision: 2.1

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      |                                                                                                                                              | $I_F$     | 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                    | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 12,5<br>9,50 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                   |                                                                                                   | min.               | typ.                 | max. |                                                 |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------|----------------------|------|-------------------------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$<br>$I_F = 10\text{ A}, V_{GE} = 0\text{ V}$                  | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<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               | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$           | 18,0<br>19,0<br>21,0 |      | A<br>A<br>A                                     |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$              | 0,50<br>0,85<br>1,10 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 10\text{ A}, -di_F/dt = 1500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<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>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$          | 0,11<br>0,20<br>0,26 |      | 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                                                                                                                     |                                                                                                   | $R_{thJC}$         | 2,90                 | 3,20 | 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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$         | 1,40                 |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                   |                                                                                                   | $T_{vj\text{ op}}$ | -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   | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{FRMSM}$ | 30         | A                                            |
| 整流出力の最大実効電流<br>Maximum RMS current at rectifier output | $T_C = 80^{\circ}\text{C}$                                                                              | $I_{RMSM}$  | 30         | A                                            |
| サージ順電流<br>Surge forward current                        | $t_P = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I_{FSM}$   | 300<br>245 | 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>$t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$      | 450<br>300 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                   |                    | min. | typ. | max. |                    |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------|------|------|--------------------|
| 順電圧<br>Forward voltage                                  | $T_{vj} = 150^{\circ}\text{C}, I_F = 10\text{ A}$                                                                                                 | $V_F$              |      | 0,80 |      | V                  |
| 逆電流<br>Reverse current                                  | $T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$                                                                                               | $I_R$              |      | 2,00 |      | 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                                                                                                                     | $R_{thJC}$         |      | 1,20 | 1,35 | 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>$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$ | $R_{thCH}$         |      | 1,15 |      | K/W                |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                   | $T_{vj\text{ op}}$ |      |      |      | $^{\circ}\text{C}$ |

|                 |                                 |
|-----------------|---------------------------------|
| prepared by: DK | date of publication: 2013-10-03 |
| approved by: MB | revision: 2.1                   |

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>$I_C$ | 10<br>16 | A<br>A |
| 繰り返しピークコレクタ電流<br>Repetitive peak collector current | $t_P = 1\text{ ms}$                                                                                                          | $I_{CRM}$                   | 20       | A      |
| トータル損失<br>Total power dissipation                  | $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175$                                                                                 | $P_{\text{tot}}$            | 68,0     | 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  | $I_C = 10\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$<br>$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$            | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $V_{CE\text{ sat}}$ | 1,55<br>1,70<br>1,80    | 2,00 | V<br>V<br>V                                     |
| ゲート・エミッタ間しきい値電圧<br>Gate threshold voltage               | $I_C = 0,30\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$                                                                           |                                                                                                                               | $V_{GEth}$          | 4,9                     | 5,8  | 6,5 V                                           |
| ゲート電荷量<br>Gate charge                                   | $V_{GE} = -15\text{ V} \dots +15\text{ V}$                                                                                                     |                                                                                                                               | $Q_G$               | 0,10                    |      | $\mu\text{C}$                                   |
| 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                               | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                     |                                                                                                                               | $C_{ies}$           | 0,55                    |      | nF                                              |
| 帰還容量<br>Reverse transfer capacitance                    | $f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$                                                     |                                                                                                                               | $C_{res}$           | 0,017                   |      | 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  | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ on}}$   | 0,012<br>0,012<br>0,012 |      | $\mu\text{s}$<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           | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$                                       | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_r$               | 0,009<br>0,013<br>0,014 |      | $\mu\text{s}$<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 | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_{d\text{ off}}$  | 0,10<br>0,12<br>0,125   |      | $\mu\text{s}$<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           | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$                                      | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $t_f$               | 0,085<br>0,13<br>0,135  |      | $\mu\text{s}$<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          | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Gon} = 27\text{ }\Omega$               | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{on}$            | 0,14<br>0,20<br>0,22    |      | 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         | $I_C = 10\text{ A}, V_{CE} = 300\text{ V}, L_S = \text{t.b.d. nH}$<br>$V_{GE} = \pm 15\text{ V}$<br>$R_{Goff} = 27\text{ }\Omega$              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$                             | $E_{off}$           | 0,24<br>0,30<br>0,32    |      | mJ<br>mJ<br>mJ                                  |
| 短絡電流<br>SC data                                         | $V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$<br>$V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$                                        | $t_P \leq 8\text{ }\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$<br>$t_P \leq 6\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ | $I_{SC}$            | 70<br>50                |      | 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                                                                                                                     |                                                                                                                               | $R_{thJC}$          | 2,00                    | 2,20 | 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>$\lambda_{\text{Paste}} = 1\text{ W/(m}\cdot\text{K)}$ / $\lambda_{\text{grease}} = 1\text{ W/(m}\cdot\text{K)}$ |                                                                                                                               | $R_{thCH}$          | 1,35                    |      | 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      |                                                                                                                                                  | $I_F$     | 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                    | $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$<br>$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$ | $I^2t$    | 12,5<br>9,50 | $\text{A}^2\text{s}$<br>$\text{A}^2\text{s}$ |

電気的特性 / Characteristic Values

|                                                         |                                                                                                                                                     |                                                                                                   | min.        | typ.                 | max. |                                                 |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------|----------------------|------|-------------------------------------------------|
| 順電圧<br>Forward voltage                                  | $I_F = 10 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 10 \text{ A}, V_{GE} = 0 \text{ V}$<br>$I_F = 10 \text{ A}, V_{GE} = 0 \text{ V}$              | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<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               | $I_F = 10 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$                                   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $I_{RM}$    | 18,0<br>19,0<br>21,0 |      | A<br>A<br>A                                     |
| 逆回復電荷量<br>Recovered charge                              | $I_F = 10 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$                                   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $Q_r$       | 0,50<br>0,85<br>1,10 |      | $\mu\text{C}$<br>$\mu\text{C}$<br>$\mu\text{C}$ |
| 逆回復損失<br>Reverse recovery energy                        | $I_F = 10 \text{ A}, -di_F/dt = 1500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$<br>$V_R = 300 \text{ V}$                                   | $T_{vj} = 25^{\circ}\text{C}$<br>$T_{vj} = 125^{\circ}\text{C}$<br>$T_{vj} = 150^{\circ}\text{C}$ | $E_{rec}$   | 0,11<br>0,20<br>0,26 |      | 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                                                                                                                       |                                                                                                   | $R_{thJC}$  | 2,90                 | 3,20 | 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>$\lambda_{Paste} = 1 \text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$ |                                                                                                   | $R_{thCH}$  | 1,40                 |      | K/W                                             |
| 動作温度<br>Temperature under switching conditions          |                                                                                                                                                     |                                                                                                   | $T_{vj op}$ | -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.

|                 |                                 |
|-----------------|---------------------------------|
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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           |
| 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                          |              |
|                                                                   |                                                                            |                                              |                                |              |
| 内部インダクタンス<br>Stray inductance module                              |                                                                            | L <sub>sCE</sub>                             | min. 30                        | typ. max. 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> | 8,00<br>6,00                   | mΩ           |
| 保存温度<br>Storage temperature                                       |                                                                            | T <sub>stg</sub>                             | -40                            | 125 °C       |
| Anpresskraft für mech. Bef. pro Feder<br>mounting force per clamp |                                                                            | F                                            | 20                             | - 50 N       |
| 質量<br>Weight                                                      |                                                                            | G                                            | 24                             | g            |

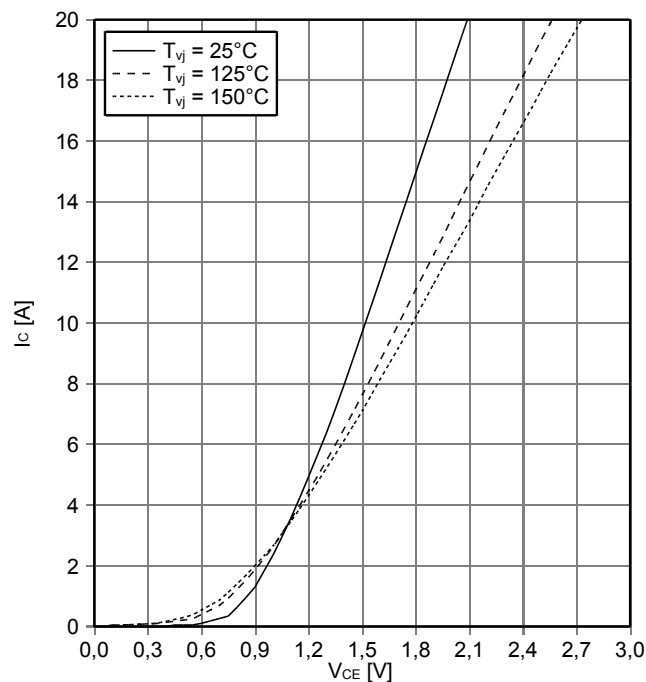
Der Strom im Dauerbetrieb ist auf 30 A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 30 A rms per connector pin.

|                 |                                 |
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暫定データ  
Preliminary Data

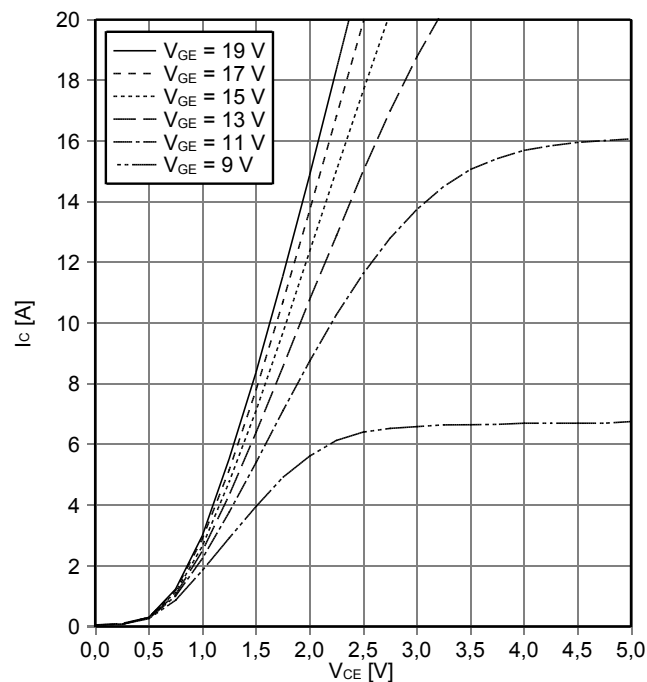
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



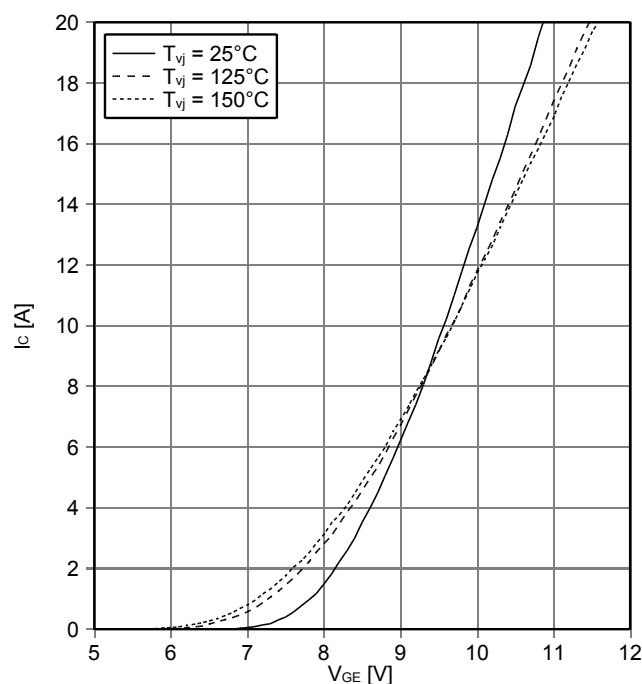
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



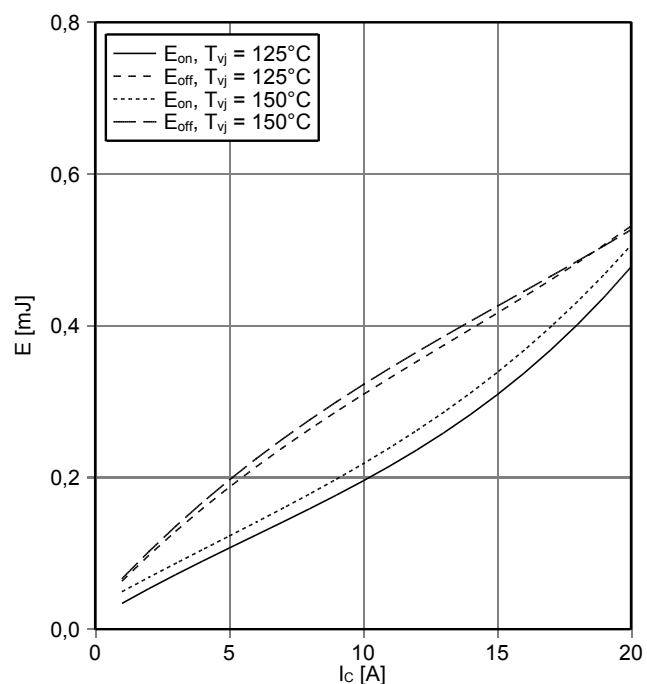
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

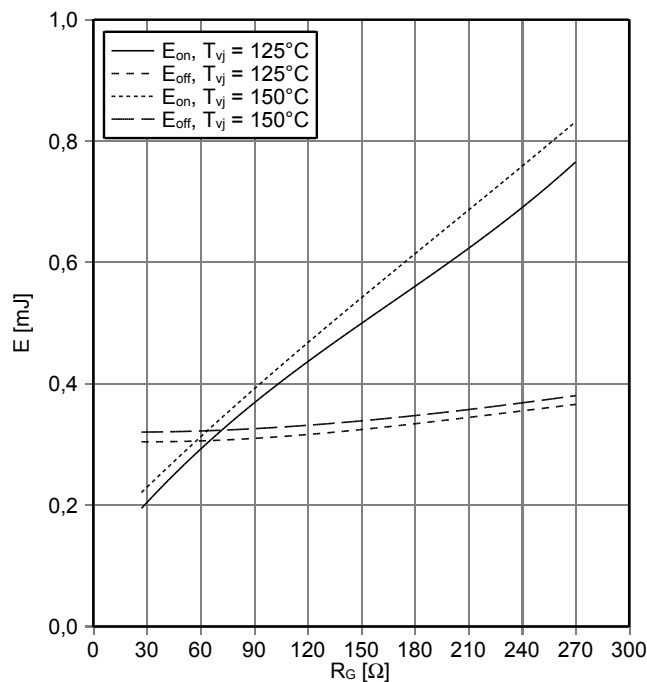
$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Gon} = 27 \Omega$ ,  $R_{Goff} = 27 \Omega$ ,  $V_{CE} = 300 \text{ V}$



暫定データ  
Preliminary Data

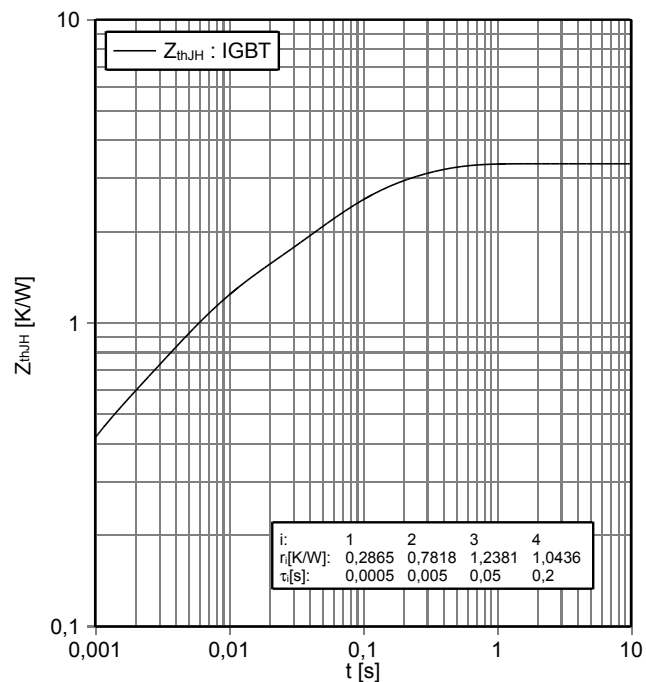
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $I_C = 10 \text{ A}$ ,  $V_{CE} = 300 \text{ V}$



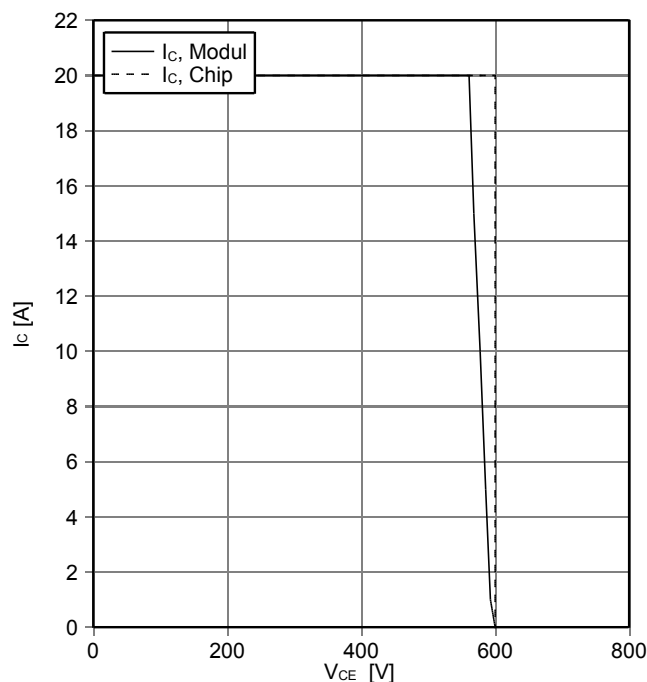
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



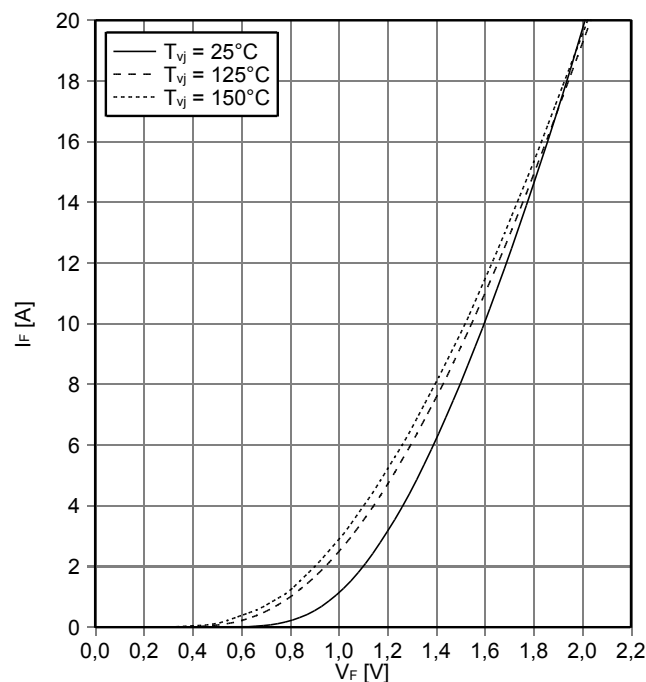
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15 \text{ V}$ ,  $R_{Goff} = 27 \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



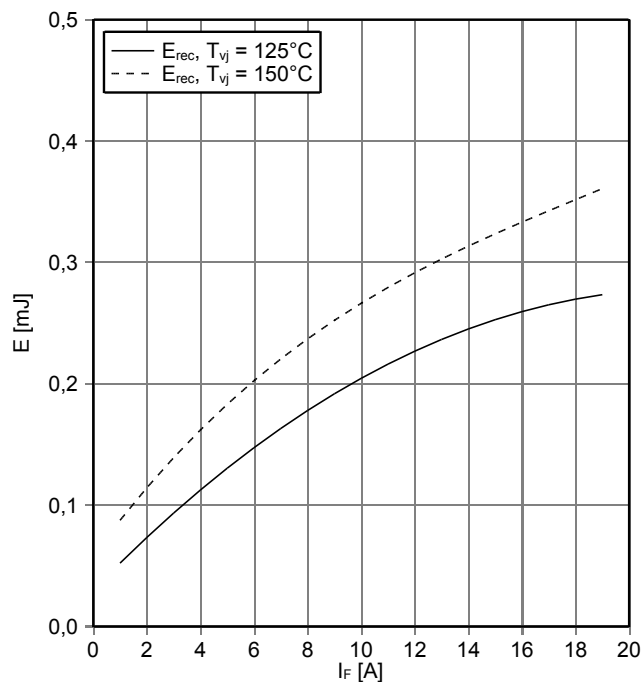


暫定データ  
Preliminary Data

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

$$E_{rec} = f(I_F)$$

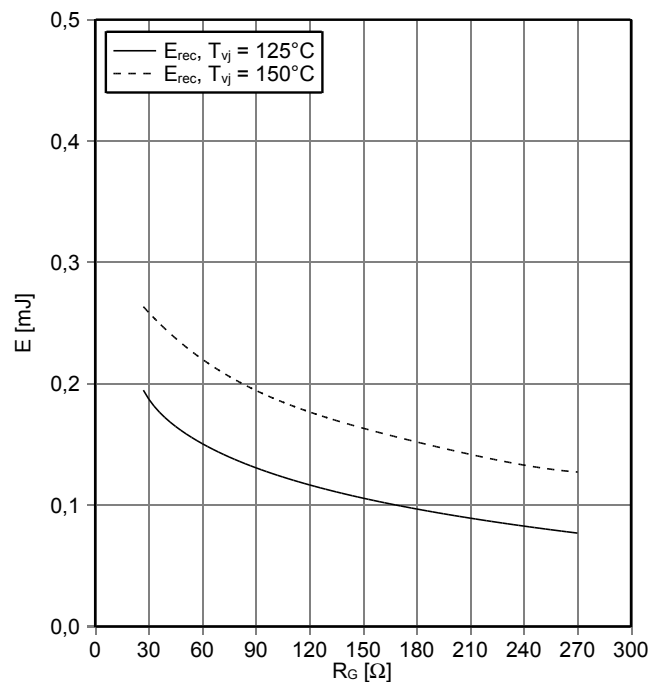
$R_{Gon} = 27 \Omega$ ,  $V_{CE} = 300 V$



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

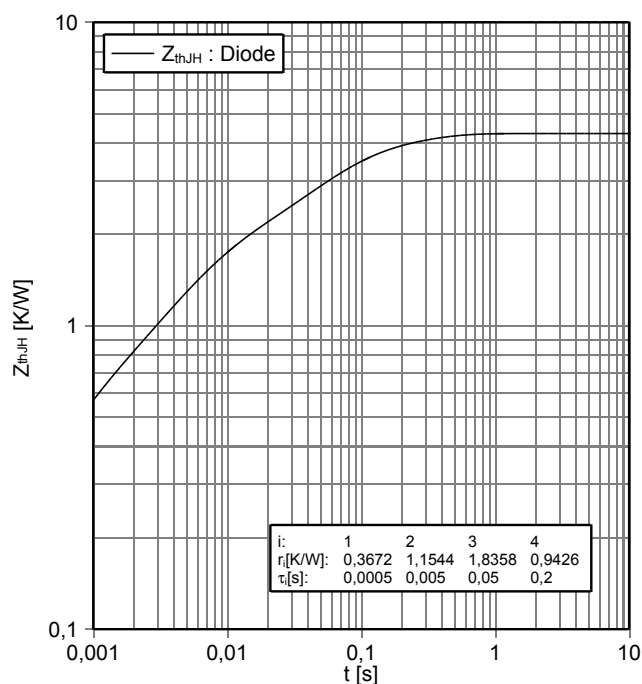
$$E_{rec} = f(R_G)$$

$I_F = 10 A$ ,  $V_{CE} = 300 V$



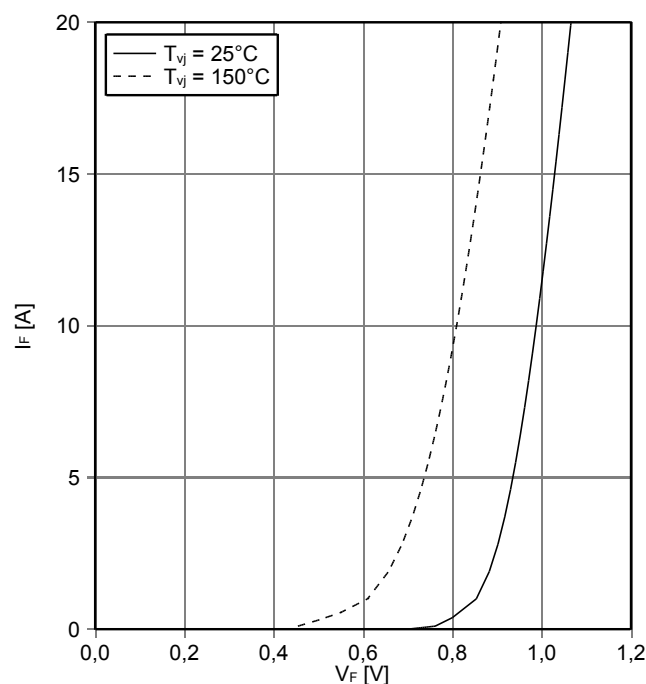
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$$Z_{thJH} = f(t)$$



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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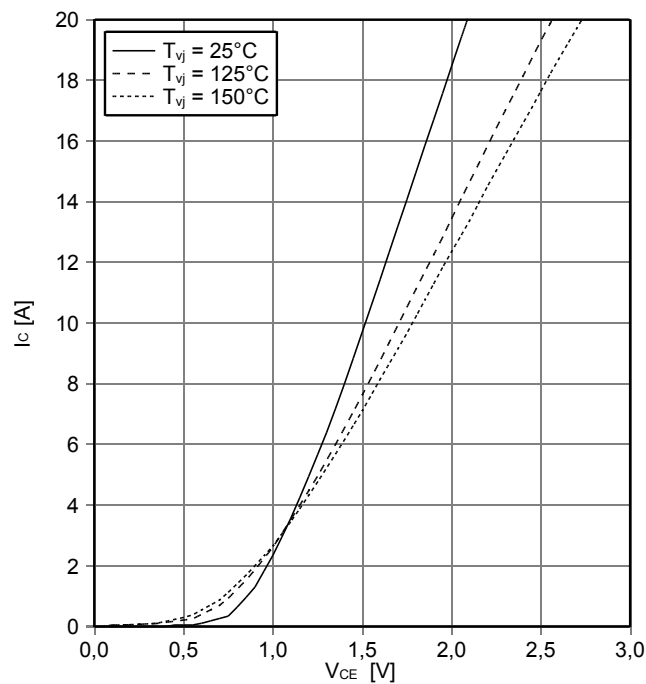
approved by: MB

revision: 2.1

暫定データ  
Preliminary Data

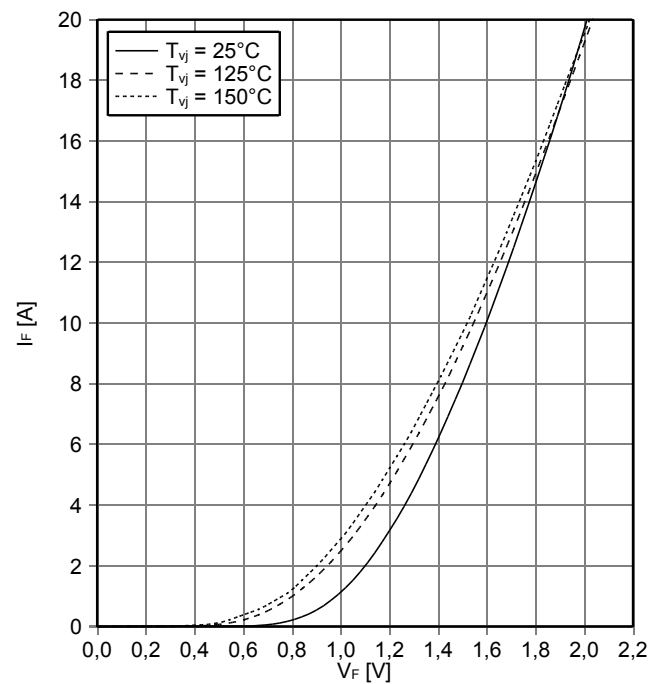
出力特性 IGBT-ブレーキチョッパー (Typical)  
output characteristic IGBT, Brake-Chopper (typical)

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

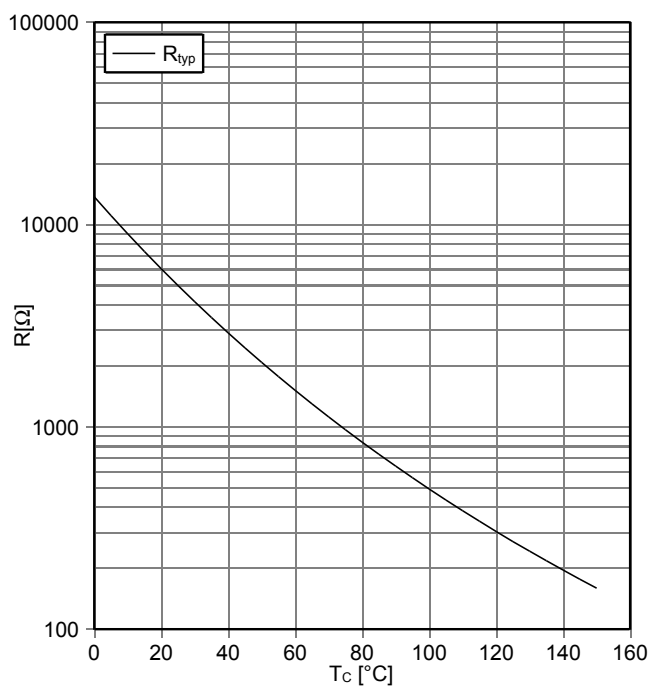


順電圧特性 Diode、ブレーキチョッパー ( typical)  
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$



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

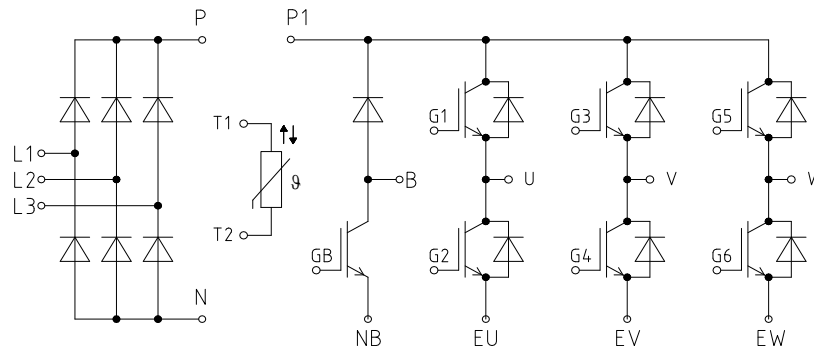


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approved by: MB

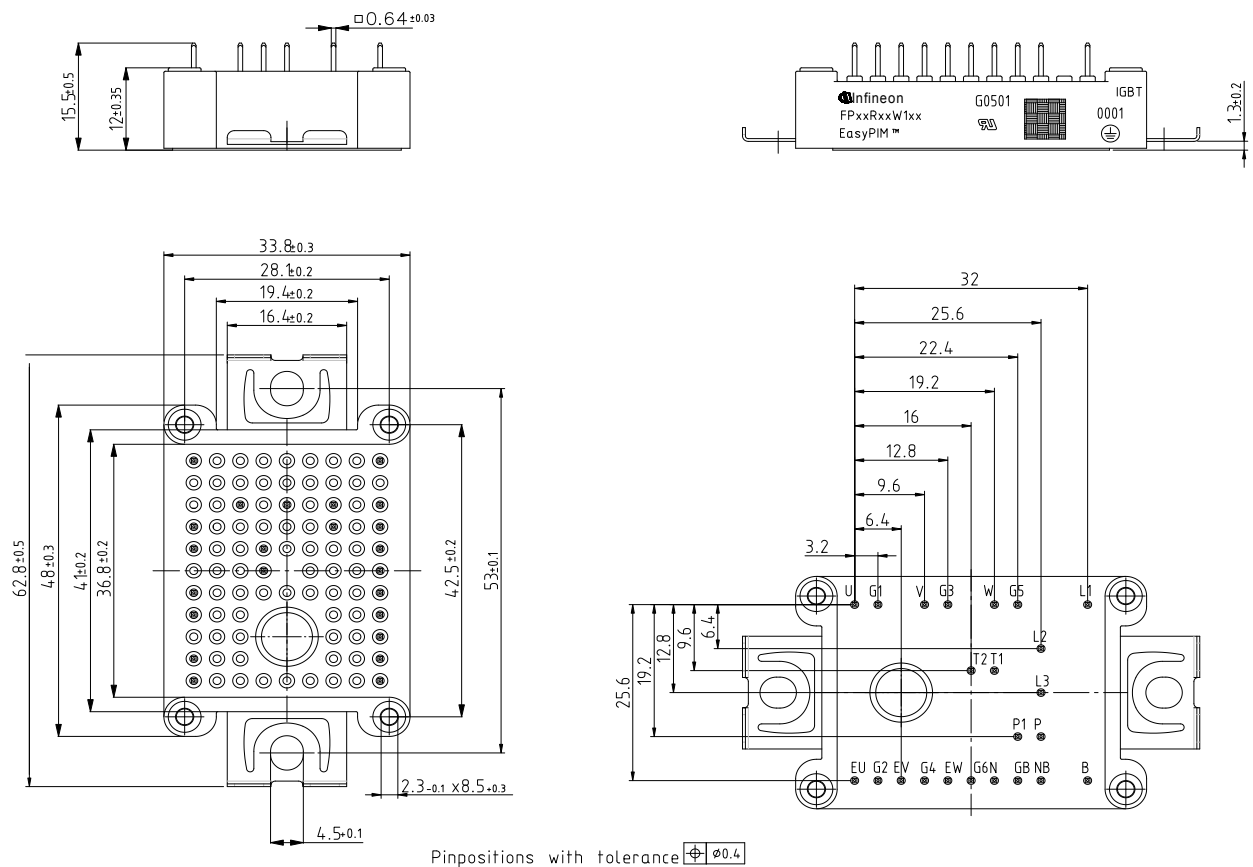
date of publication: 2013-10-03  
revision: 2.1

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  
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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.

If and to the extent necessary, please forward equivalent notices to your customers.

Changes of this product data sheet are reserved.

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