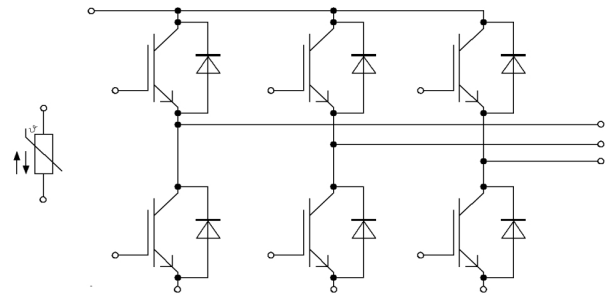
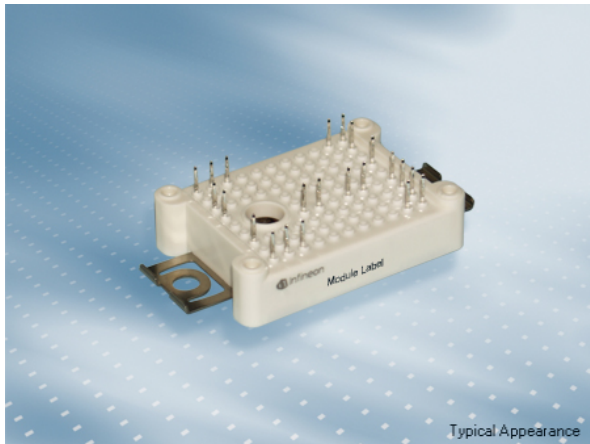


EasyPACK™ モジュール TRENCHSTOP™ IGBT7とエミッターコントロール7ダイオード内蔵 とPressFIT / NTCサーミスタ

EasyPACK™ module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and PressFIT / NTC

暫定データ / Preliminary Data



$V_{CES} = 1200V$
 $I_{C\ nom} = 50A / I_{CRM} = 100A$

アプリケーションの可能性

- UPSシステム
- サーボ駆動
- モーター駆動
- 空調
- 補助インバーター

Potential Applications

- UPS systems
- Servo drives
- Motor drives
- Air conditioning
- Auxiliary inverters

電気的特性

- トレンチ IGBT 7
- 低 V_{CEsat} 飽和電圧
- 最大175° c の過負荷動作

Electrical Features

- Trenchstop™ IGBT7
- Low V_{CEsat}
- Overload operation up to 175°C

機械的特性

- 2.5 kV AC 1分 絶縁耐圧
- PressFIT 接合 技術
- コンパクトデザイン
- 低熱インピーダンスの Al_2O_3 DCB
- 高いパワー密度

Mechanical Features

- 2.5 kV AC 1min insulation
- PressFIT contact technology
- Compact design
- Al_2O_3 substrate with low thermal resistance
- High power density

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 |

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 | $T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ | I_{CDC} | 50 | 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} | 100 | A |
| 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 | $I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | $V_{CE\text{ sat}}$ | 1,50 1,64 1,72 | t.b.d. V V V |
| ゲート・エミッタ間しきい値電圧 Gate threshold voltage | $I_C = 1,28\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$ | | V_{GEth} | 5,15 5,80 6,45 | V |
| ゲート電荷量 Gate charge | $V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$ | | Q_G | 0,92 | μC |
| 内蔵ゲート抵抗 Internal gate resistor | $T_{vj} = 25^{\circ}\text{C}$ | | R_{Gint} | 0,0 | Ω |
| 入力容量 Input capacitance | $f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{ies} | 11,1 | nF |
| 帰還容量 Reverse transfer capacitance | $f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ | | C_{res} | 0,039 | 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} | | 0,0079 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} | | 100 nA |
| ターンオン遅れ時間 (誘導負荷) Turn-on delay time, inductive load | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | t_{don} | 0,045 0,047 0,048 | μs μs μs |
| ターンオン上昇時間 (誘導負荷) Rise time, inductive load | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | t_r | 0,041 0,044 0,048 | μs μs μs |
| ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | t_{doff} | 0,27 0,33 0,35 | μs μs μs |
| ターンオフ下降時間 (誘導負荷) Fall time, inductive load | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | t_f | 0,11 0,20 0,26 | μs μs μs |
| ターンオンスイッチング損失 Turn-on energy loss per pulse | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 35\text{ nH}$ $di/dt = 850\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | E_{on} | 4,44 6,05 7,11 | mJ mJ mJ |
| ターンオフスイッチング損失 Turn-off energy loss per pulse | $I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 35\text{ nH}$ $du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 4,3\ \Omega$ | $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$ | E_{off} | 3,35 5,20 6,45 | mJ mJ mJ |
| 短絡電流 SC data | $V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$ | $t_P \leq 8\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ $t_P \leq 7\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$ | I_{SC} | 190 180 | A A |
| ジャンクション・ヒートシンク間熱抵抗 Thermal resistance, junction to heatsink | IGBT部 (1素子当り) / per IGBT | | R_{thJH} | 1,05 | K/W |
| 動作温度 Temperature under switching conditions | | | $T_{vj\text{ op}}$ | -40 | 175 $^{\circ}\text{C}$ |

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 | 50 | A |
| ピーク繰返し順電流 Repetitive peak forward current | $t_P = 1\text{ ms}$ | I_{FRM} | 100 | A |
| 電流二乗時間積 I^2t - value | $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$ | I^2t | 300 250 | A^2s A^2s |

電気的特性 / Characteristic Values

| | | | min. | typ. | max. | |
|--|---|--------------------------------|-----------|------|--------|--------------------|
| 順電圧 Forward voltage | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 25^{\circ}\text{C}$ | | 1,72 | t.b.d. | V |
| | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 125^{\circ}\text{C}$ | V_F | 1,59 | | V |
| | $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ | $T_{vj} = 175^{\circ}\text{C}$ | | 1,52 | | V |
| ピーク逆回復電流 Peak reverse recovery current | $I_F = 50\text{ A}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ | $T_{vj} = 25^{\circ}\text{C}$ | | 29,4 | | A |
| | $V_R = 600\text{ V}$ | $T_{vj} = 125^{\circ}\text{C}$ | I_{RM} | 38,6 | | A |
| | $V_{GE} = -15\text{ V}$ | $T_{vj} = 175^{\circ}\text{C}$ | | 41,8 | | A |
| 逆回復電荷量 Recovered charge | $I_F = 50\text{ A}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ | $T_{vj} = 25^{\circ}\text{C}$ | | 3,38 | | μC |
| | $V_R = 600\text{ V}$ | $T_{vj} = 125^{\circ}\text{C}$ | Q_r | 6,53 | | μC |
| | $V_{GE} = -15\text{ V}$ | $T_{vj} = 175^{\circ}\text{C}$ | | 8,84 | | μC |
| 逆回復損失 Reverse recovery energy | $I_F = 50\text{ A}, -di_F/dt = 850\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ | $T_{vj} = 25^{\circ}\text{C}$ | | 1,36 | | mJ |
| | $V_R = 600\text{ V}$ | $T_{vj} = 125^{\circ}\text{C}$ | E_{rec} | 2,59 | | mJ |
| | $V_{GE} = -15\text{ V}$ | $T_{vj} = 175^{\circ}\text{C}$ | | 3,47 | | mJ |
| ジャンクション・ヒートシンク間熱抵抗 Thermal resistance, junction to heatsink | /Diode (1 素子当り) / per diode | R_{thJH} | | 1,60 | | K/W |
| 動作温度 Temperature under switching conditions | | $T_{vj\text{ op}}$ | -40 | | 175 | $^{\circ}\text{C}$ |

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 | $T_{NTC} = 25^{\circ}\text{C}$ | R_{25} | | 5,00 | | k Ω |
| R100の偏差 Deviation of R100 | $T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493\ \Omega$ | $\Delta R/R$ | -5 | | 5 | % |
| 損失 Power dissipation | $T_{NTC} = 25^{\circ}\text{C}$ | 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.

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 | | 11,5 6,3 | | 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 | | 10,0 5,0 | | mm |
| 相対トラッキング指数 Comperative tracking index | | CTI | > 200 | | |
| 相対温度指数 (電気) RTI Elec. | 住宅 housing | RTI | 140 | | °C |
| | | | min. | typ. | max. |
| 内部インダクタンス Stray inductance module | | L _{sCE} | | 30 | nH |
| 保存温度 Storage temperature | | T _{stg} | -40 | | 125 °C |
| Anpresskraft für mech. Bef. pro Feder mounting force per clamp | | F | 40 | - | 80 N |
| 質量 Weight | | G | | 24 | g |

Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.

The current under continuous operation is limited to 25 A rms per connector pin.

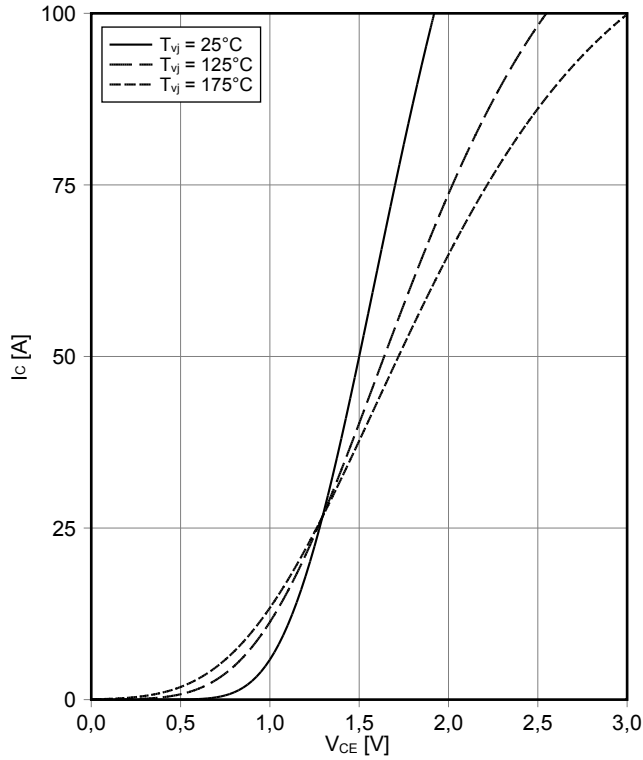
T_{vj op} > 150°C ist im Überlastbetrieb zulässig. Detaillierte Angaben sind AN 2018-14 zu entnehmen.

T_{vj op} > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

暫定データ Preliminary Data

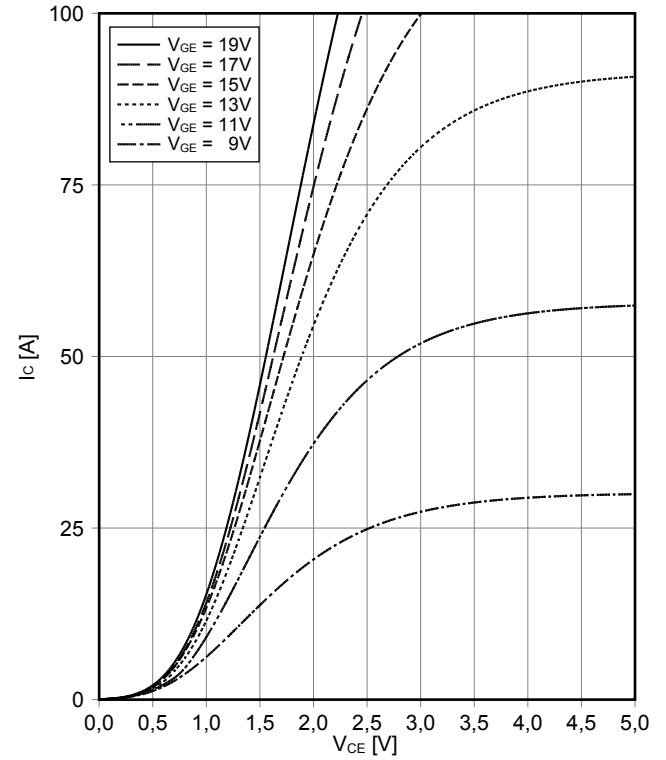
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



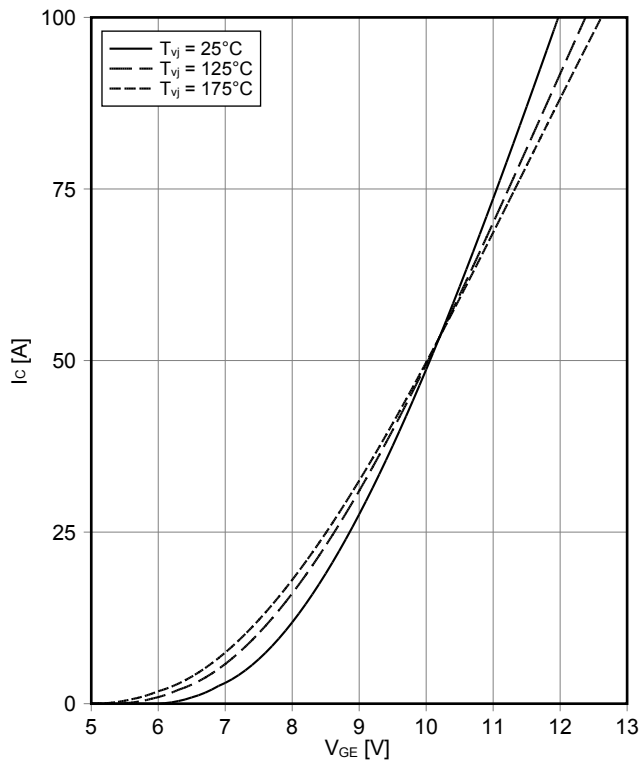
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 175^\circ\text{C}$



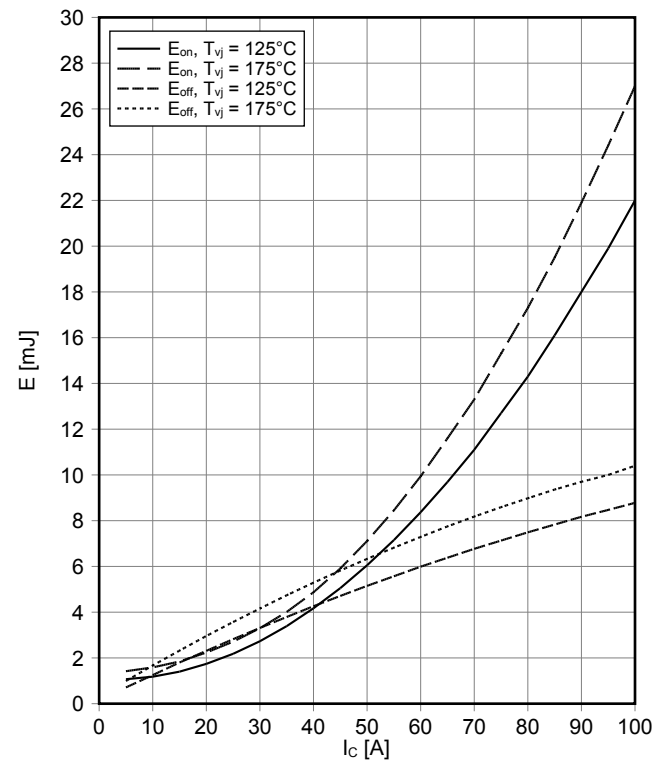
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

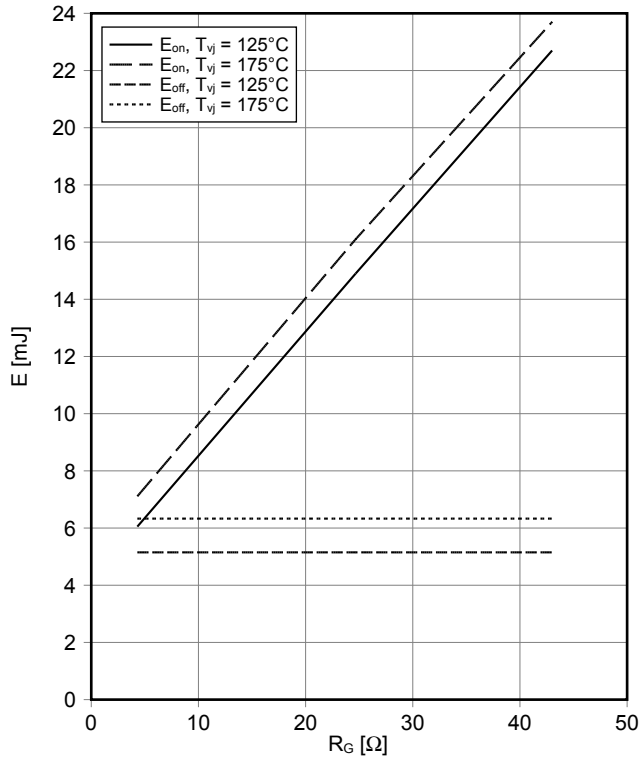
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$, $R_{Goff} = 4.3\ \Omega$, $V_{CE} = 600\text{ V}$



暫定データ Preliminary Data

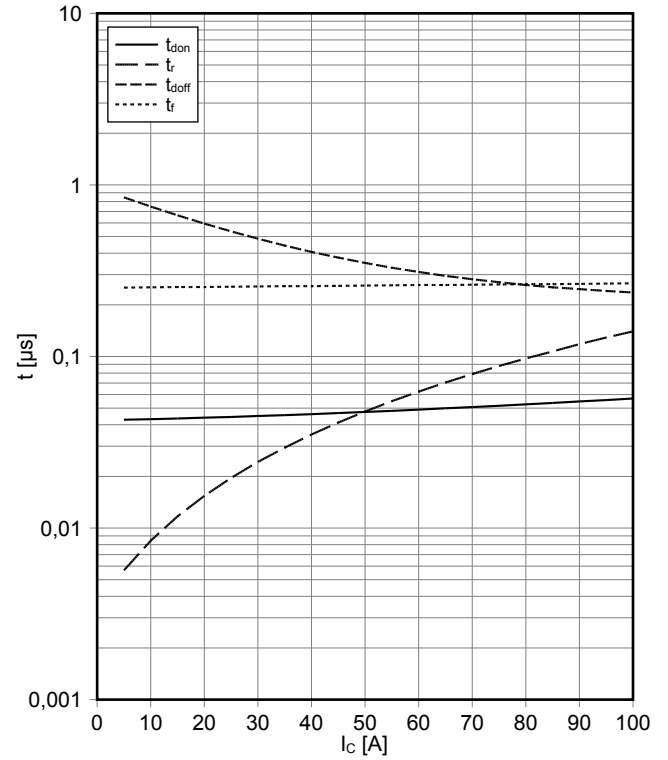
スイッチング損失 IGBT-インバータ (Typical) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$



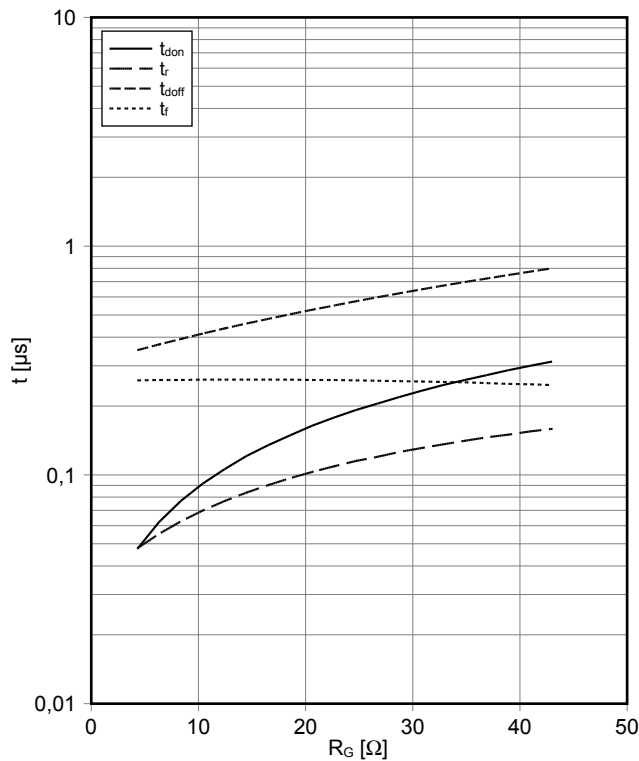
??? IGBT-インバータ (Typical) switching times IGBT, Inverter (typical)

$t_{don} = f(I_C)$, $t_r = f(I_C)$, $t_{doff} = f(I_C)$, $t_f = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 4.3\ \Omega$, $R_{Goff} = 4.3\ \Omega$, $V_{CE} = 600\text{ V}$, $T_{vj} = 175^\circ\text{C}$



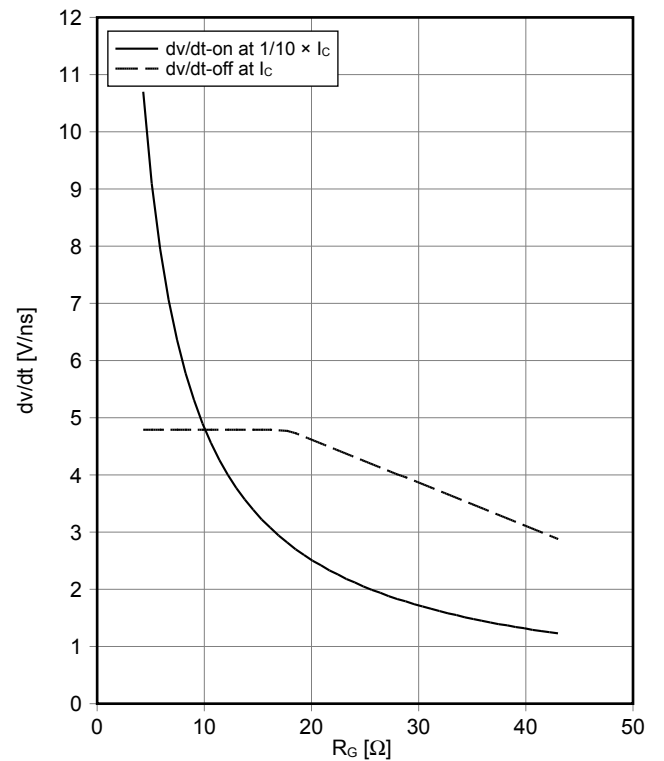
??? IGBT-インバータ (Typical) switching times IGBT, Inverter (typical)

$t_{don} = f(R_G)$, $t_r = f(R_G)$, $t_{doff} = f(R_G)$, $t_f = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 175^\circ\text{C}$



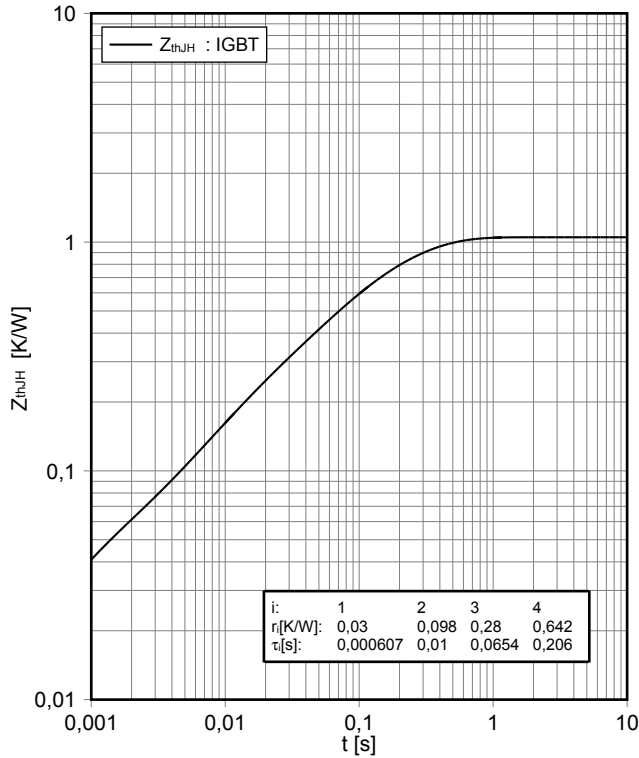
dv/dt IGBT-インバータ (Typical) dv/dt IGBT, Inverter (typical)

$dv/dt = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$, $V_{CE} = 600\text{ V}$, $T_{vj} = 25^\circ\text{C}$

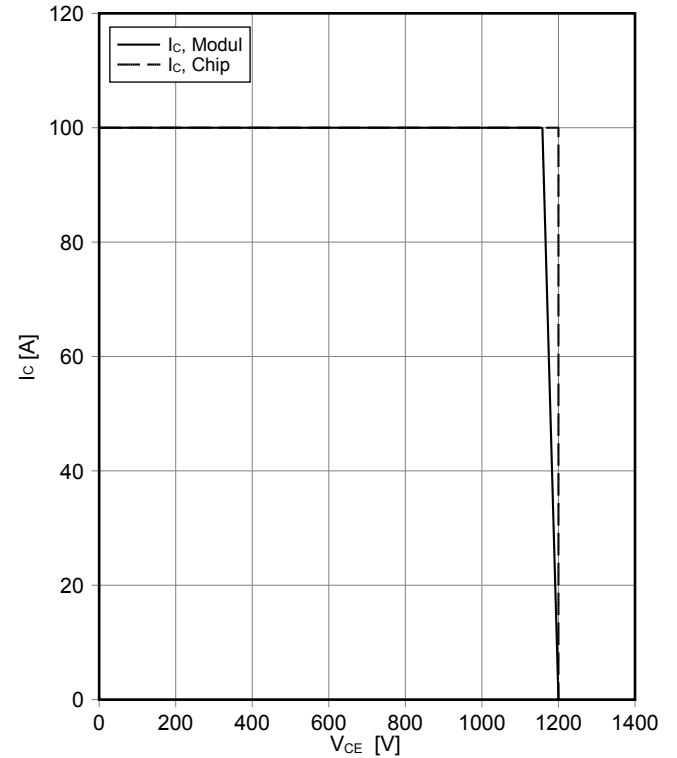


暫定データ Preliminary Data

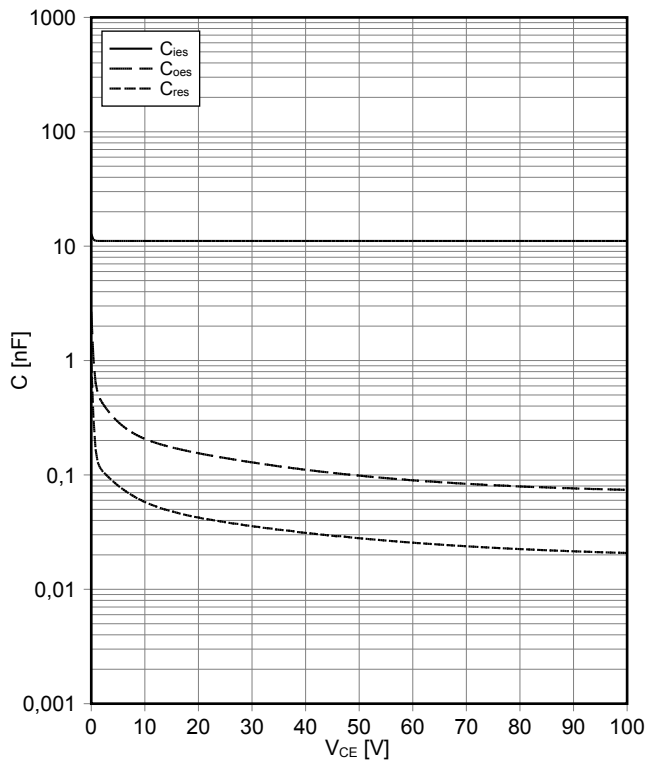
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter
 $Z_{thJH} = f(t)$



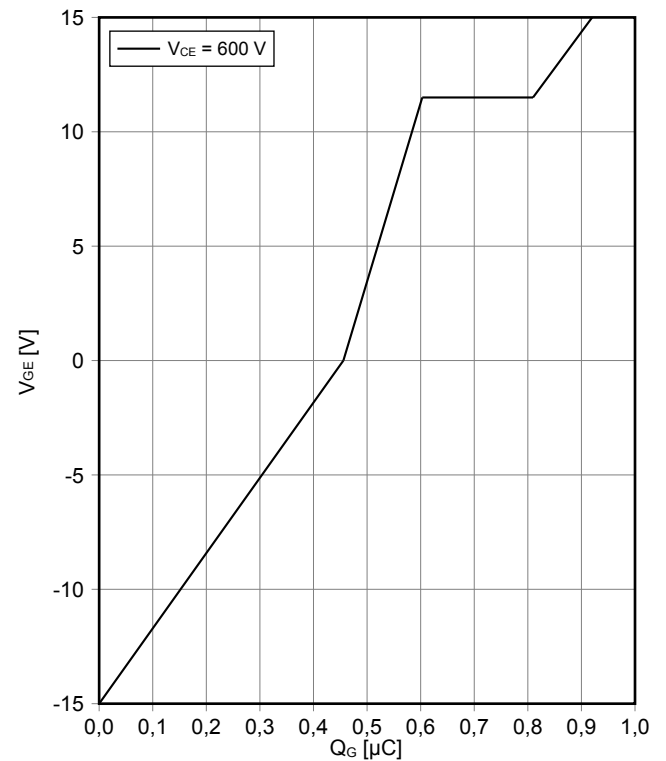
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}, R_{Goff} = 4.3 \Omega, T_{vj} = 175^\circ\text{C}$



容量特性 IGBT- インバータ (Typical)
capacity characteristic IGBT, Inverter (typical)
 $C = f(V_{CE})$
 $V_{GE} = 0 \text{ V}, T_{vj} = 25^\circ\text{C}, f = 100\text{kHz}$

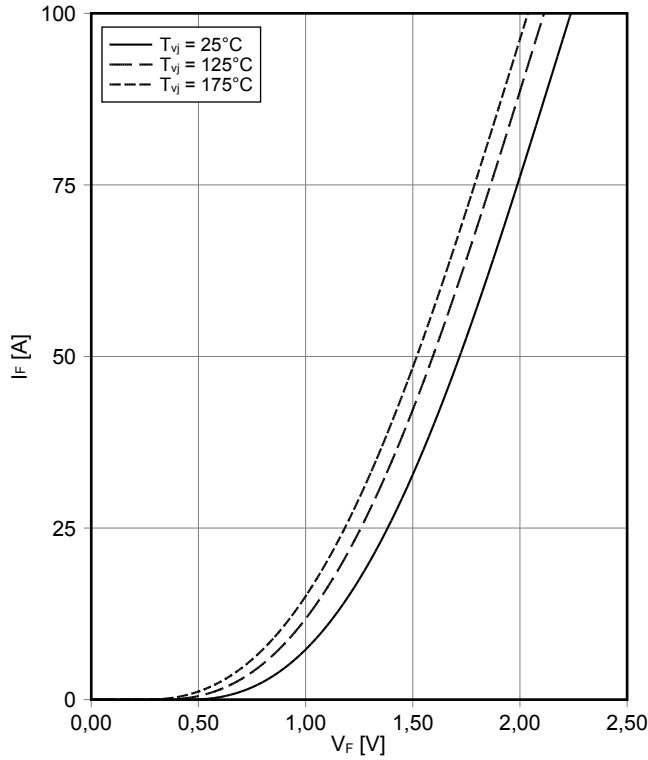


ゲート充電特性 IGBT- インバータ (典型)
gate charge characteristic IGBT, Inverter (typical)
 $V_{GE} = f(Q_G)$
 $I_C = 50 \text{ A}, T_{vj} = 25^\circ\text{C}$

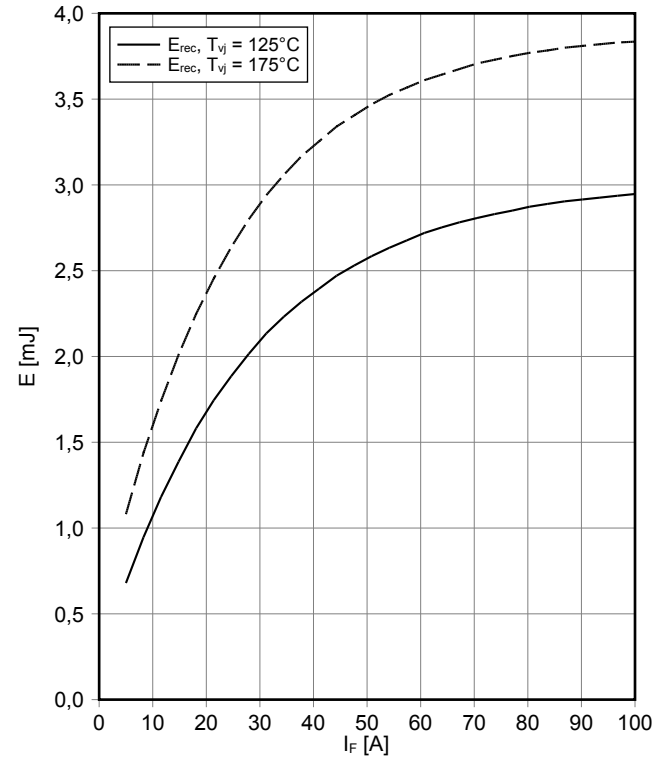


暫定データ Preliminary Data

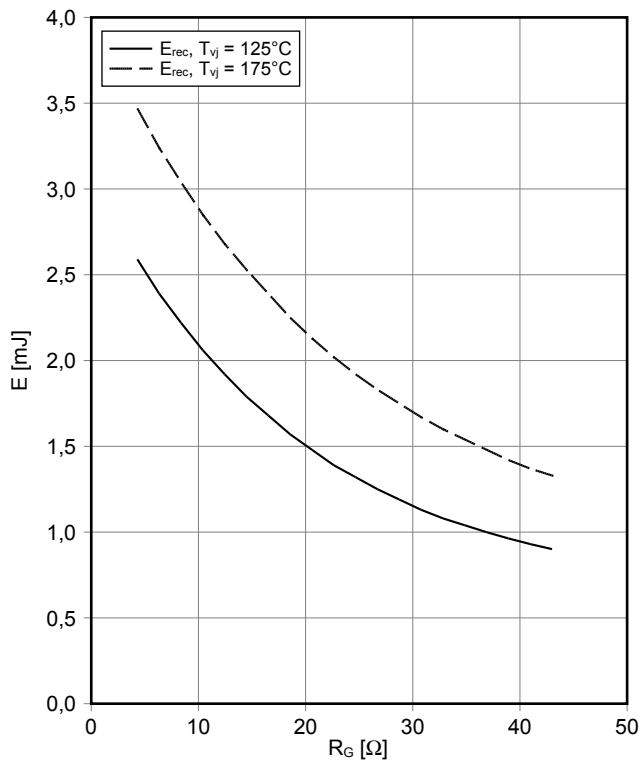
順電圧特性 Diode、インバータ (typical)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



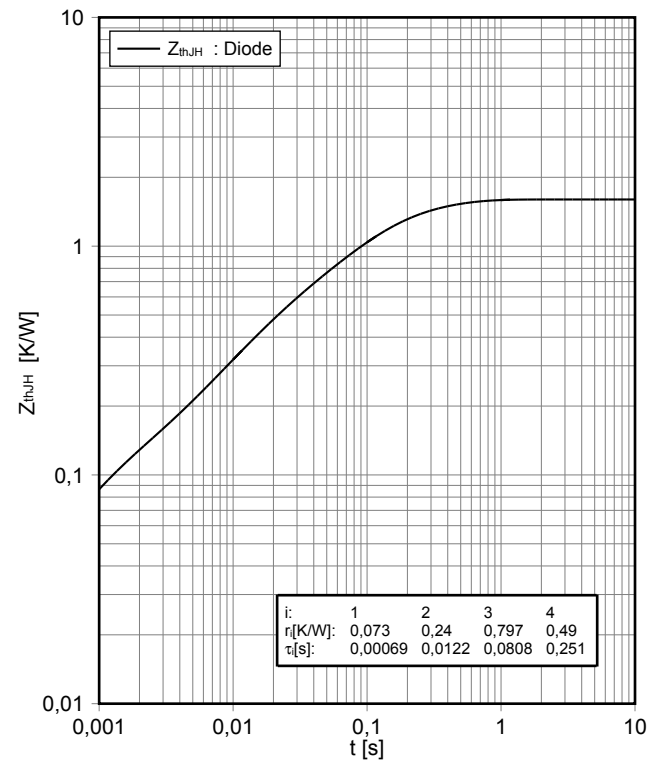
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 4.3 \Omega, V_{CE} = 600 \text{ V}$



スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 50 \text{ A}, V_{CE} = 600 \text{ V}$



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)
 $R = f(T_{NTC})$

