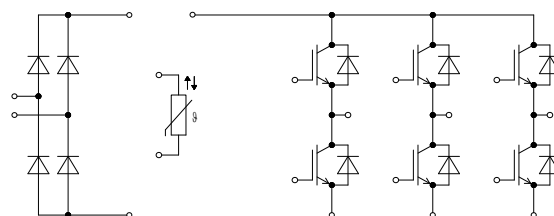
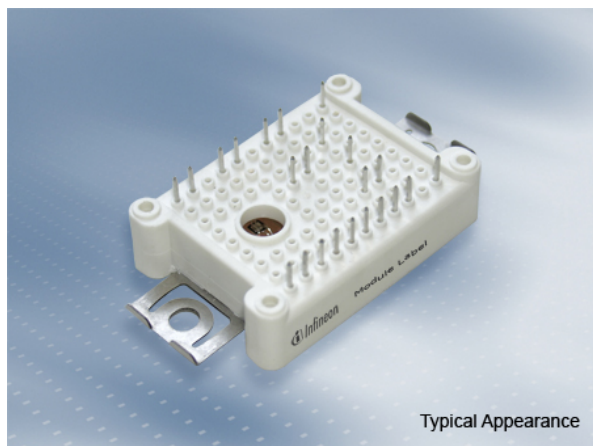


EasyPIM™ モジュール 高速トレンチ/フィールドストップ IGBT3 and エミッターコントロール3 diode内蔵 and NTCサーミスタ

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

暫定データ / Preliminary Data



$V_{CES} = 600V$
 $I_{C\ nom} = 30A / I_{CRM} = 60A$

一般応用

- スタティックインバーター
- 空冷
- モーター駆動

Typical Applications

- Auxiliary Inverters
- Air Conditioning
- Motor Drives

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

Electrical Features

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

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

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

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: 2013-11-04	
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 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	600	V
連続DCコレクタ電流 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	30 39	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}	60	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}	115	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	$I_C = 30\text{A}, V_{GE} = 15\text{V}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,55 1,70 1,80	2,00	V V V	
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 0,43\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	4,9	5,8	6,5	V
ゲート電荷量 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G	0,30			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	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		C_{ies}	1,65			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}	0,051			nF
コレクタ・エミッタ間遮断電流 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 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	$I_C = 30\text{A}, V_{CE} = 300\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,02 0,02 0,02			μs μs μs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 30\text{A}, V_{CE} = 300\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,016 0,021 0,022			μs μs μs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 30\text{A}, V_{CE} = 300\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,14 0,16 0,18			μs μs μs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 30\text{A}, V_{CE} = 300\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,045 0,06 0,065			μs μs μs
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 30\text{A}, V_{CE} = 300\text{V}, L_S = 45\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 2100\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	0,50 0,65 0,75			mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 30\text{A}, V_{CE} = 300\text{V}, L_S = 45\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 4200\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 15\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	0,60 0,75 0,80			mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 360\text{V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 8\mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_P \leq 6\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	210 150			A 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}	1,15	1,30		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}	1,10			K/W
動作温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	150		$^{\circ}\text{C}$

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暫定データ
Preliminary Data

Diode、インバータ / Diode, Inverter
最大定格 / Maximum Rated Values

ピーク繰返し逆電圧 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	600	V
連続DC電流 Continuous DC forward current		I_F	30	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	60	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	90,0 82,0	A^2s A^2s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 30\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 30\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 30\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,60 1,55 1,50	2,00	V V V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	44,0 48,0 49,0		A A A
逆回復電荷量 Recovered charge	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	1,30 2,30 2,70		μC μC μC
逆回復損失 Reverse recovery energy	$I_F = 30\text{ A}, -di_F/dt = 2100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	0,35 0,55 0,65		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}	1,60	1,75	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}	1,30		K/W
動作温度 Temperature under switching conditions			$T_{vj op}$	-40	150	$^{\circ}\text{C}$

Diode、整流器 / Diode, Rectifier
最大定格 / Maximum Rated Values

ピーク繰返し逆電圧 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	800	V
最大実効順電流/chip Maximum RMS forward current per chip	$T_C = 80^{\circ}\text{C}$	I_{FRMSM}	50	A
整流出力の最大実効電流 Maximum RMS current at rectifier output	$T_C = 80^{\circ}\text{C}$	I_{RMSM}	60	A
サージ順電流 Surge forward current	$t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I_{FSM}	450 360	A A
電流二乗時間積 I^2t - value	$t_p = 10\text{ ms}, T_{vj} = 25^{\circ}\text{C}$ $t_p = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	1000 640	A^2s A^2s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 30\text{ A}$		V_F	0,95		V
逆電流 Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 800\text{ V}$		I_R	0,10		mA
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}	0,95	1,05	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}	0,95		K/W
動作温度 Temperature under switching conditions			$T_{vj op}$			$^{\circ}\text{C}$

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暫定データ
Preliminary Data

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.

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_2O_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		
			min.	typ.	max.	
内部インダクタンス Stray inductance module		L_{sCE}		30		nH
パワーターミナル・チップ間抵抗 Module lead resistance, terminals - chip	$T_C = 25^\circ\text{C}, /\text{スイッチ} / \text{per switch}$	R_{CC+EE} R_{AA+CC}		8,00 4,00		m Ω
保存温度 Storage temperature		T_{stg}	-40		125	$^\circ\text{C}$
Anpresskraft für mech. Bef. pro Feder mountig force per clamp		F	20	-	50	N
質量 Weight		G		24		g

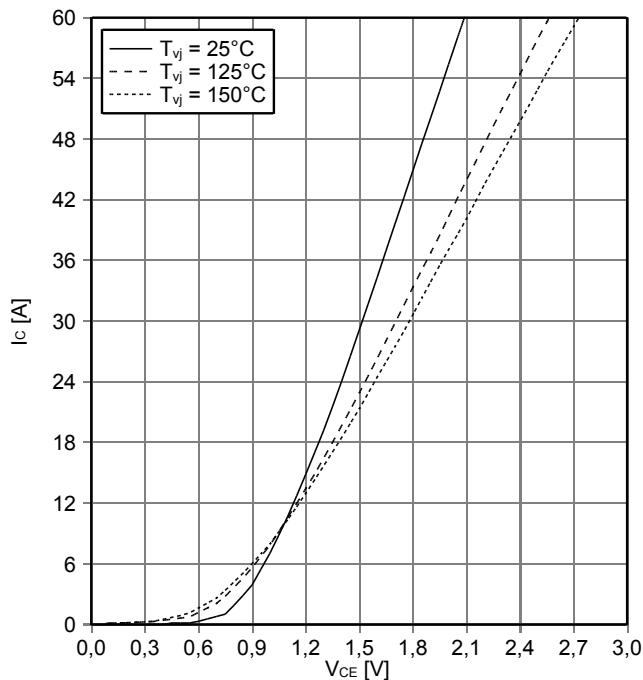
Der Strom im Dauerbetrieb ist auf 30A effektiv pro Anschlusspin begrenzt.
The current under continuous operation is limited to 30A rms per connector pin.

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暫定データ
Preliminary Data

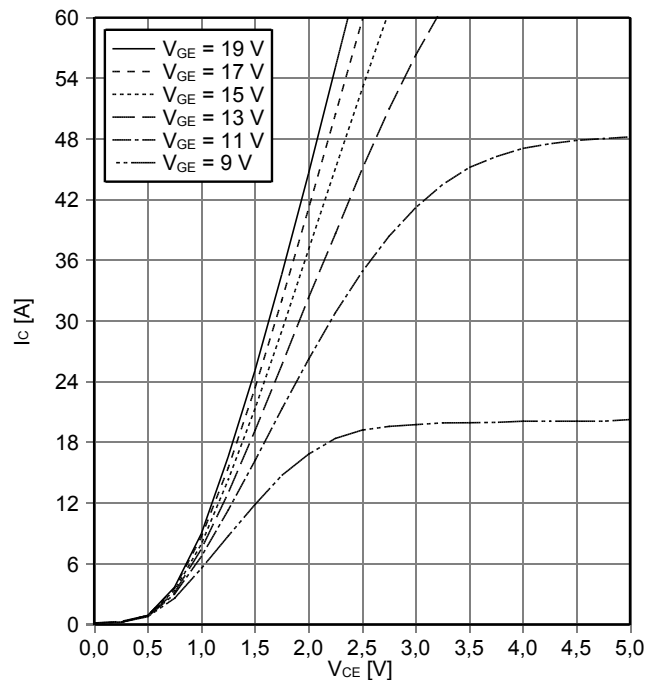
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



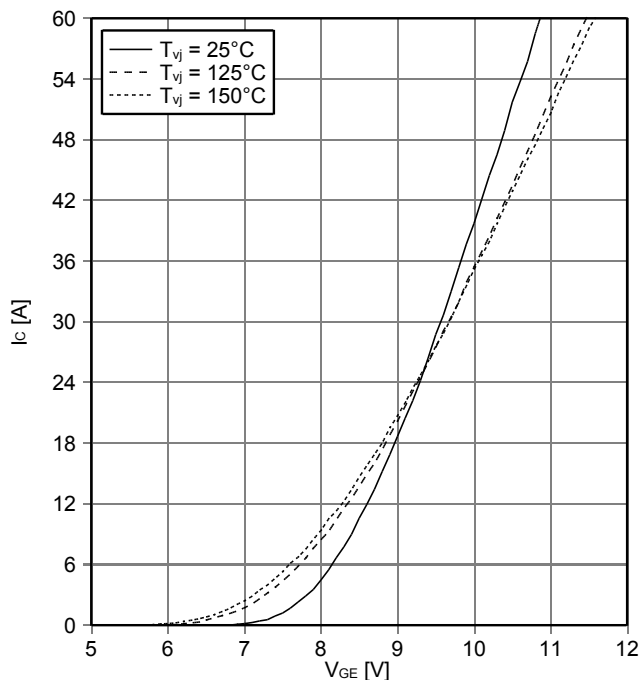
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



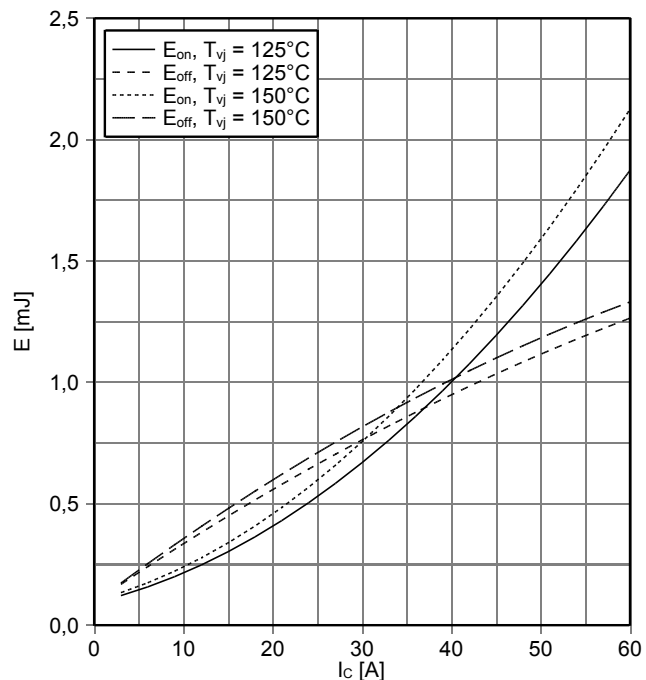
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

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



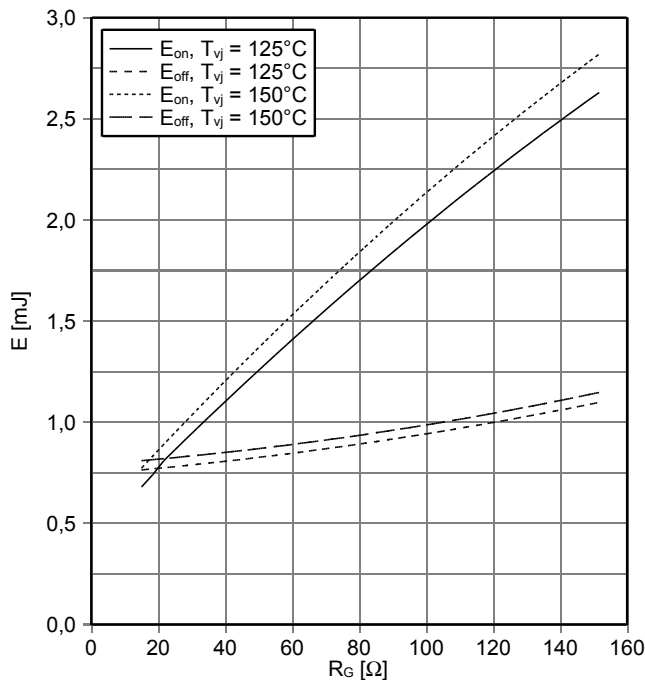
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暫定データ
Preliminary Data

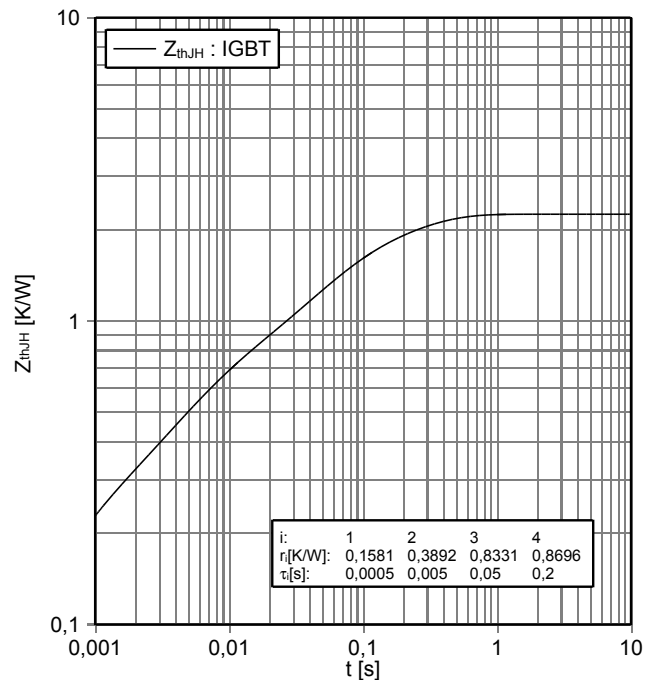
スイッチング損失 IGBT- インバータ (Typical)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 30\text{ A}$, $V_{CE} = 300\text{ V}$



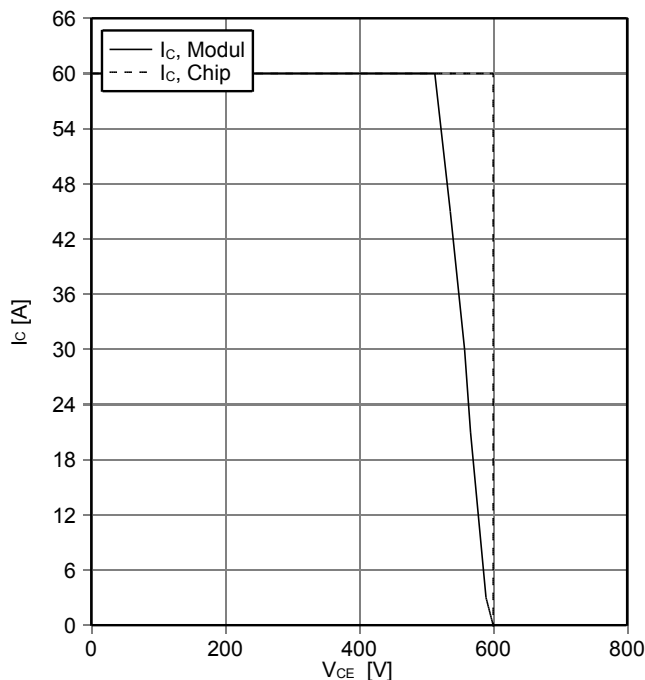
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



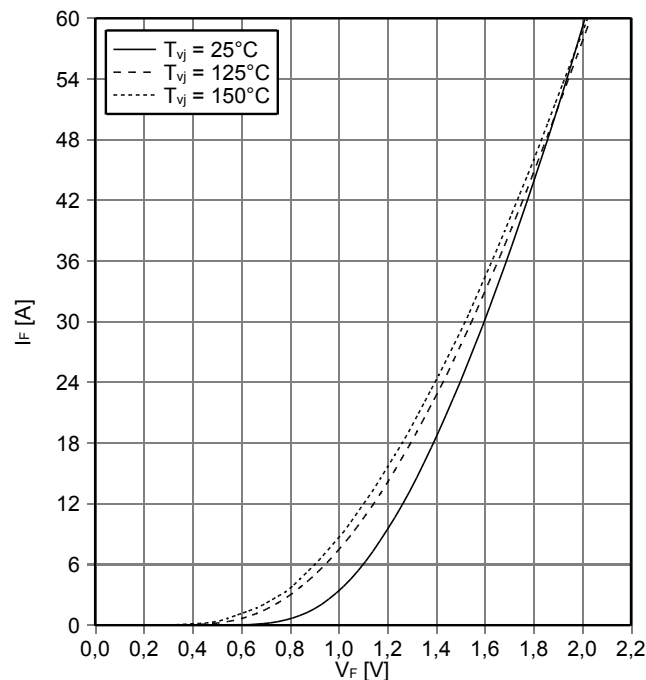
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

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



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

$I_F = f(V_F)$



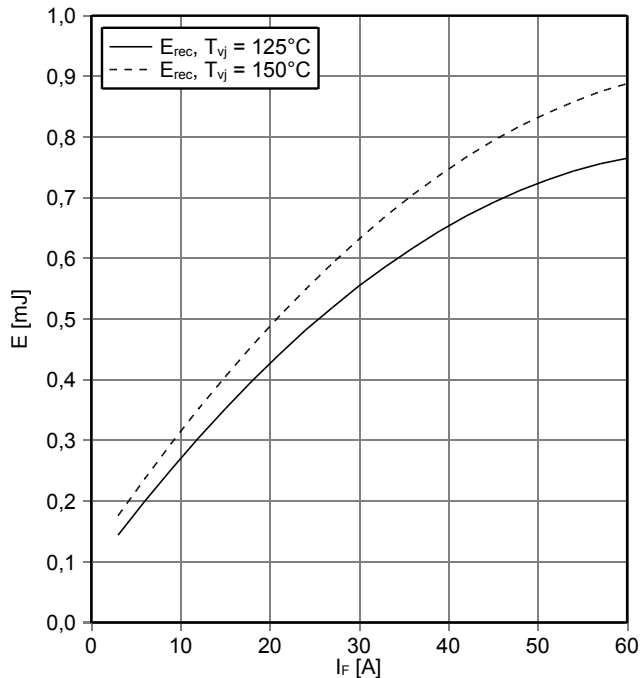
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暫定データ
Preliminary Data

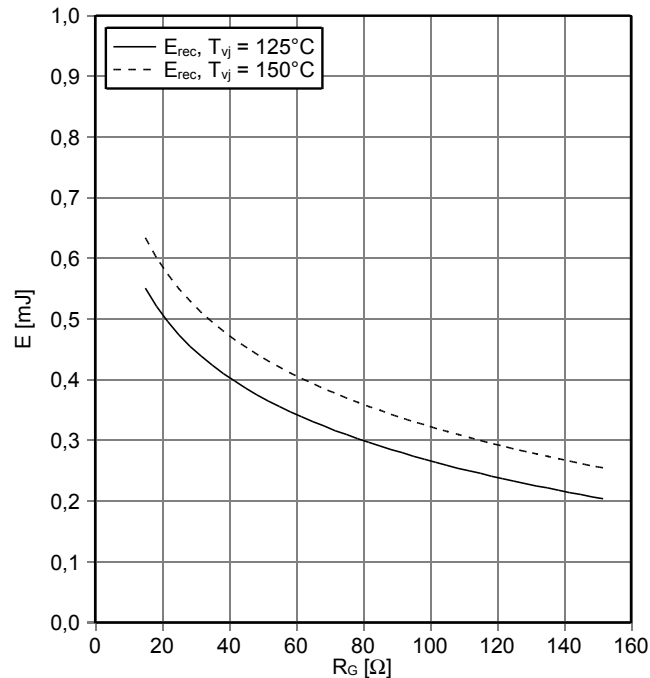
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 15 \Omega, V_{CE} = 300 V$



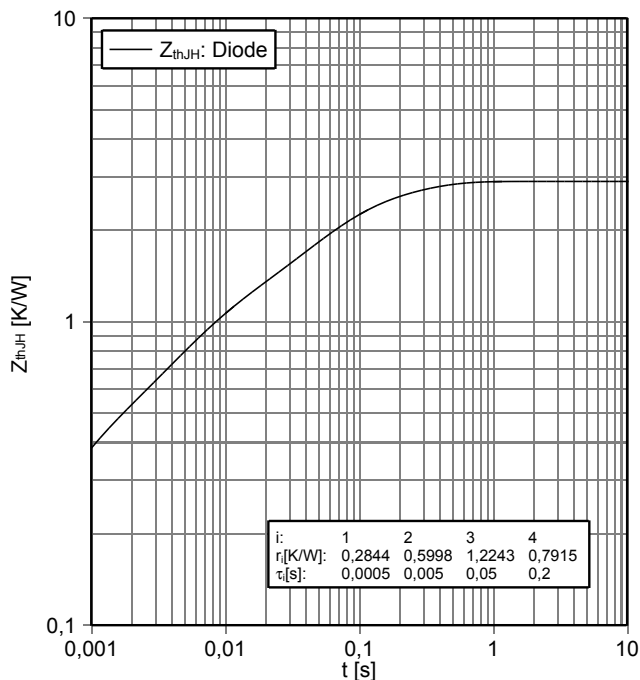
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 30 A, V_{CE} = 300 V$



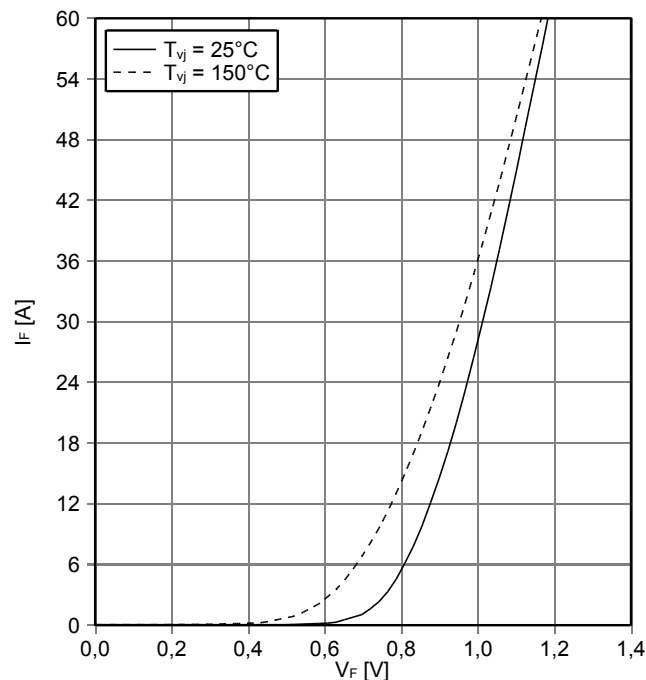
過渡熱インピーダンス Diode、インバータ
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



順方向特性 Diode、整流器 (典型)
forward characteristic of Diode, Rectifier (typical)

$I_F = f(V_F)$

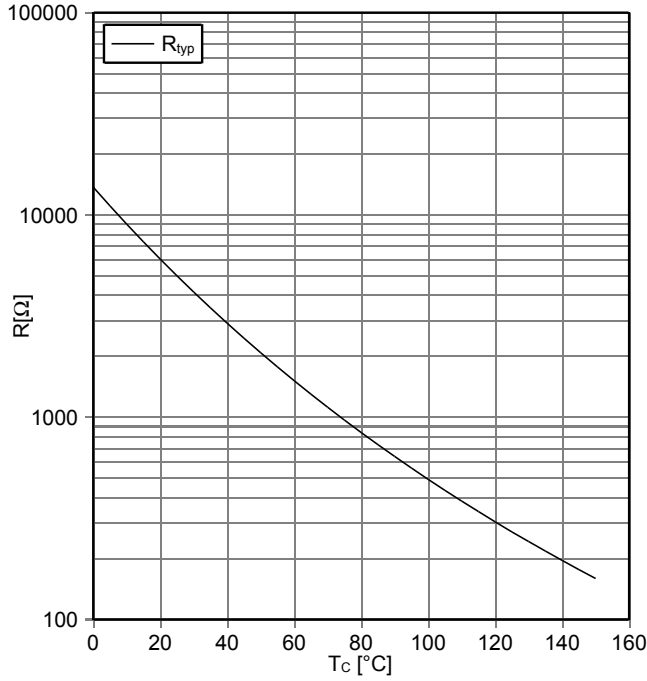


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暫定データ
Preliminary Data

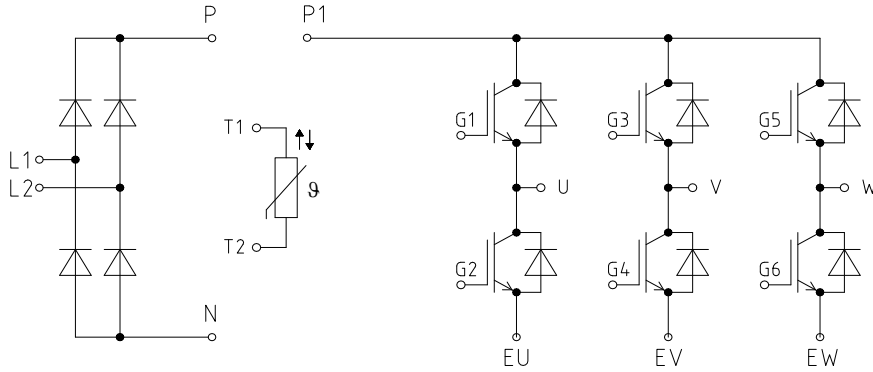
NTC-サーミスタ サーミスタの温度特性
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T)$



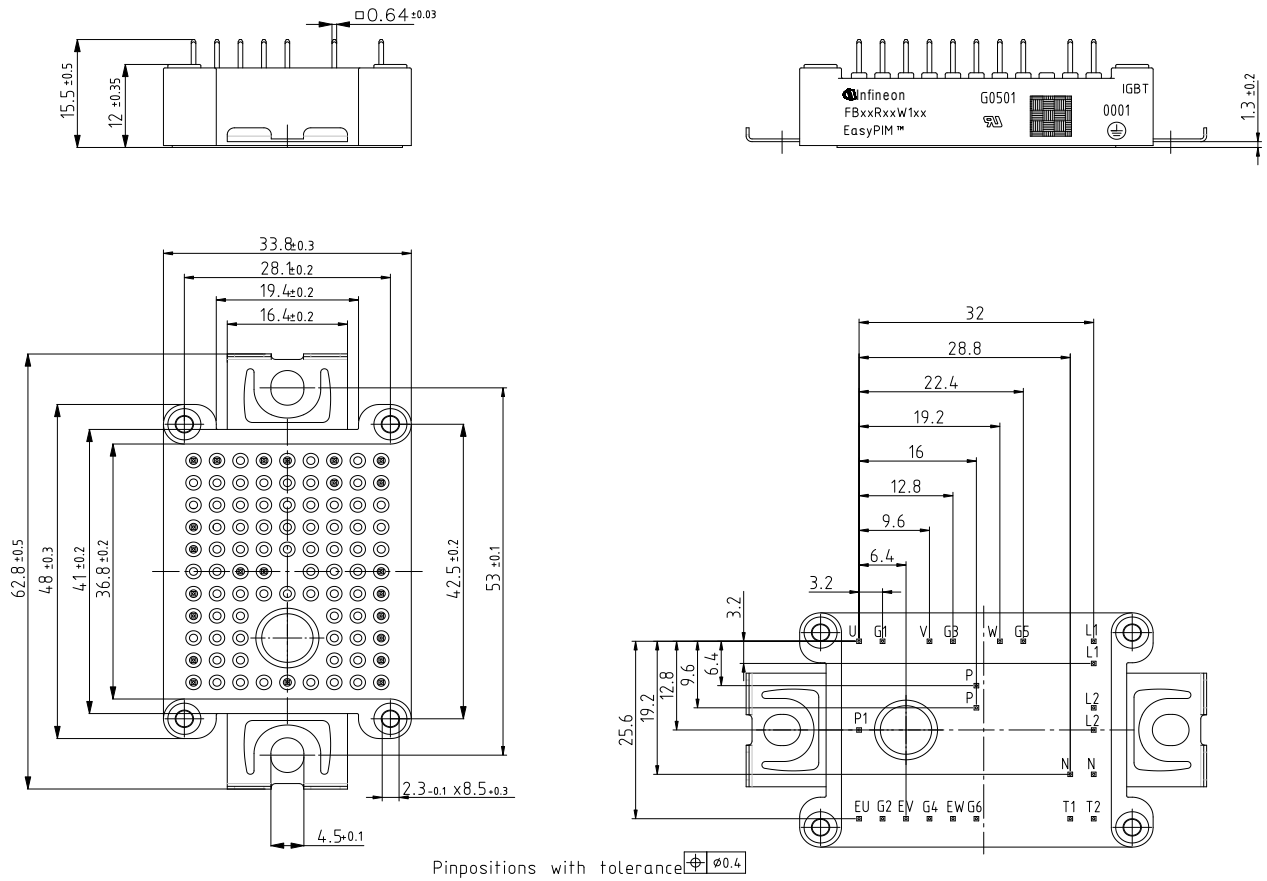
prepared by: DK	date of publication: 2013-11-04
approved by: MB	revision: 2.1

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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