



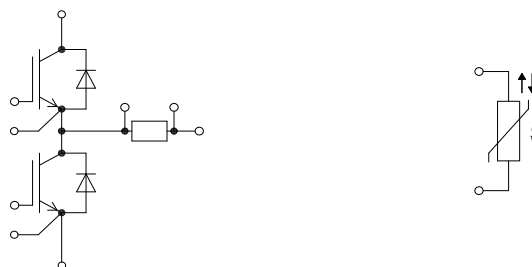
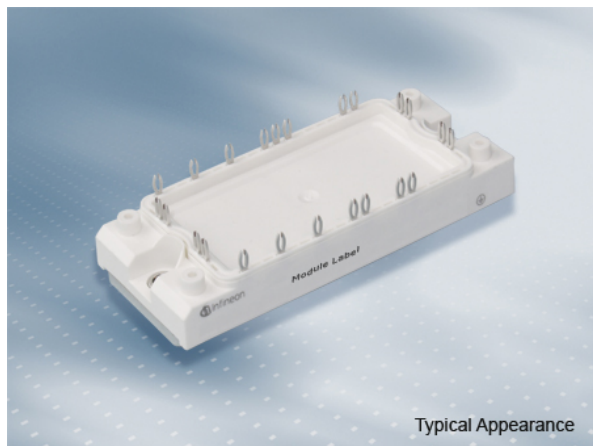
IGBT-モジュール
IGBT-Module

IFF300B17N2E4P_B11

MIPAQ™base 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 diode内蔵 and pressFIT / すでに塗布されたサーマルグリース

MIPAQ™base module with trench/fieldstop IGBT4 and Emitter Controlled Diode and PressFIT / pre applied Thermal Interface Material

暫定データ / Preliminary Data



$V_{CES} = 1700V$
 $I_{C\ nom} = 300A / I_{CRM} = 600A$

一般応用

- モーター駆動
- UPSシステム

Typical Applications

- Motor Drives
- UPS Systems

電気的特性

- 拡張された動作温度 $T_{vj\ op}$
- 低 V_{CESat} 飽和電圧
- 正温度特性を持った V_{CESat} 飽和電圧

Electrical Features

- Extended Operation Temperature $T_{vj\ op}$
- Low V_{CESat}
- V_{CESat} with positive Temperature Coefficient

機械的特性

- 内蔵されたNTCサーミスタ
- 絶縁されたベースプレート
- 半田接合技術
- 標準ハウジング
- すでに塗布されたサーマルグリース

Mechanical Features

- Integrated NTC temperature sensor
- Isolated Base Plate
- Solder Contact Technology
- Standard Housing
- Pre-applied Thermal Interface Material

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

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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}	1700	V
連続DCコレクタ電流 Continuous DC collector current	$T_C = 85^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	300 400	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}	600	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}	1500	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	$I_C = 300\text{A}, V_{GE} = 15\text{V}$ $I_C = 300\text{A}, V_{GE} = 15\text{V}$ $I_C = 300\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,95 2,35 2,45	2,30	V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 12,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,25	5,80	6,35 V
ゲート電荷量 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G	3,40		μC
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	2,5		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}	27,0		nF
帰還容量 Reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		C_{res}	0,88		nF
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	$V_{CE} = 1700\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$		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}		100	nA
ターンオン遅れ時間 (誘導負荷) Turn-on delay time, inductive load	$I_C = 300\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,26 0,28 0,28		μs μs μs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 300\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,05 0,06 0,06		μs μs μs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 300\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,45 0,60 0,65		μs μs μs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 300\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,11 0,16 0,18		μs μs μs
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 300\text{A}, V_{CE} = 900\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 4800\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	74,0 98,0 105		mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 300\text{A}, V_{CE} = 900\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 3100\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	54,0 86,5 98,0		mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 1000\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		I_{SC}	1400		A
ジャンクション・ケース間熱抵抗 Thermal resistance, junction to case	IGBT部 (1素子当り) / per IGBT		R_{thJC}		0,10	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 valid with IFX pre-applied thermal interface material		R_{thCH}		0,075	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}	1700	V
連続DC電流 Continuous DC forward current		I_F	200	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	400	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	6600 6450	A^2s A^2s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 200\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,80 1,90 1,95	2,20	V V V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	340 350 360		A A A
逆回復電荷量 Recovered charge	$I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	51,5 86,0 95,5		μC μC μC
逆回復損失 Reverse recovery energy	$I_F = 200\text{ A}, -di_F/dt = 4500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	28,0 50,5 57,5		mJ mJ mJ
ジャンクション・ケース間熱抵抗 Thermal resistance, junction to case	/Diode (1 素子当り) / per diode		R_{thJC}		0,235	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 valid with IFX pre-applied thermal interface material		R_{thCH}		0,14	K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

シャント抵抗 / Shunt

			min.	typ.	max.	
定格抵抗値 Rated resistance	$T_c = 20^{\circ}\text{C}$		R_{20}	1,00		m Ω
温度係数 Temperature coefficient (tcr)	$20^{\circ}\text{C} - 60^{\circ}\text{C}$			< 30		ppm/K
シャント抵抗の動作温度 Operation temperature shunt-resistor			$T_{tvj\text{ op}}$		200	$^{\circ}\text{C}$
ジャンクション・ケース間熱抵抗 Thermal resistance; junction to case			R_{thJC}		6,0	K/W

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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}		3,4		kV
ベースプレート材質 Material of module baseplate				Cu		
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			10,0		mm
空間距離 Clearance	連絡方法 - ヒートシンク / terminal to heatsink 連絡方法 - 連絡方法 / terminal to terminal			7,5		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}		35		nH
パワーターミナル・チップ間抵抗 Module lead resistance, terminals - chip	$T_C = 25^\circ\text{C}, / \text{スイッチ} / \text{per switch}$	$R_{\text{CC}+\text{EE}'}$		1,80		m Ω
保存温度 Storage temperature		T_{stg}	-40		125	$^\circ\text{C}$
最大ベース・プレート動作温度 Maximum baseplate operation temperature		T_{BPmax}			125	$^\circ\text{C}$
取り付けネジ締め付けトルク Mounting torque for modul mounting	取り付けネジ M5 適切なアプリケーションノートによるマウンティング Screw M5 - Mounting according to valid application note	M	3,00		6,00	Nm
質量 Weight		G		180		g

Lagerung und Transport von Modulen mit TIM => siehe AN
Storage and shipment of modules with TIM => see AN

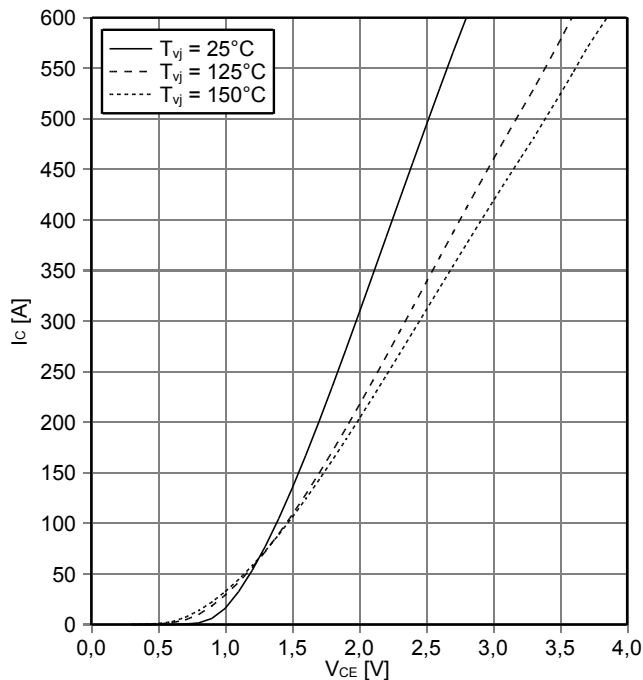
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暫定データ
Preliminary Data

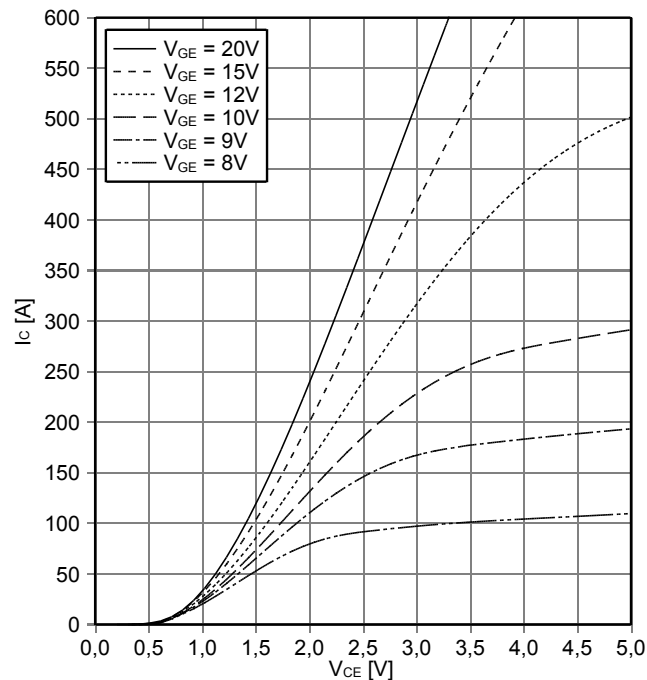
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



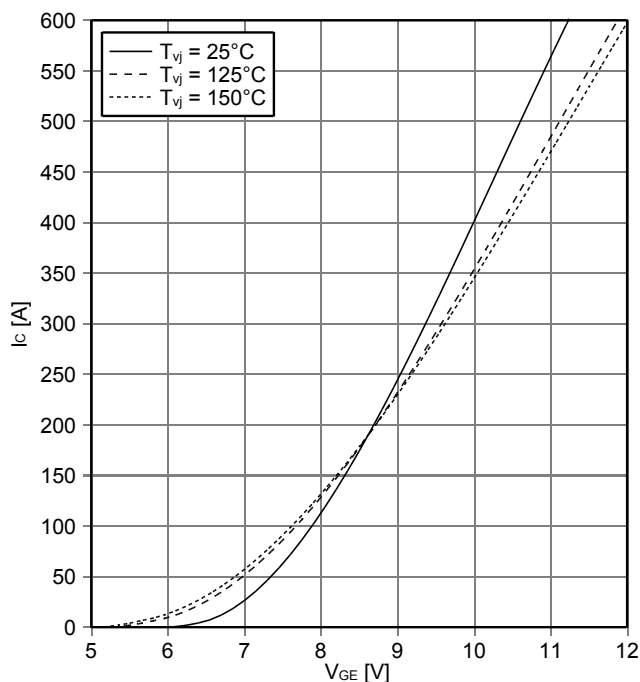
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



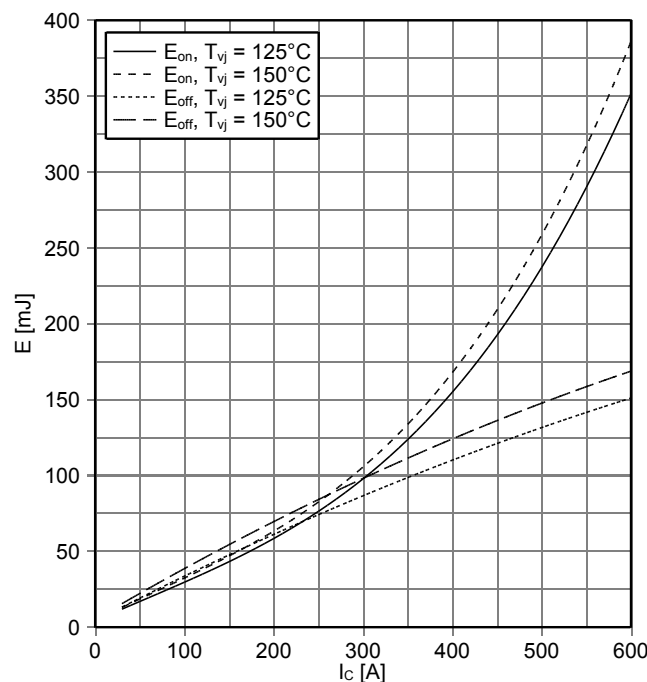
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_c)$, $E_{off} = f(I_c)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1\ \Omega$, $R_{Goff} = 1\ \Omega$, $V_{CE} = 900\text{ V}$



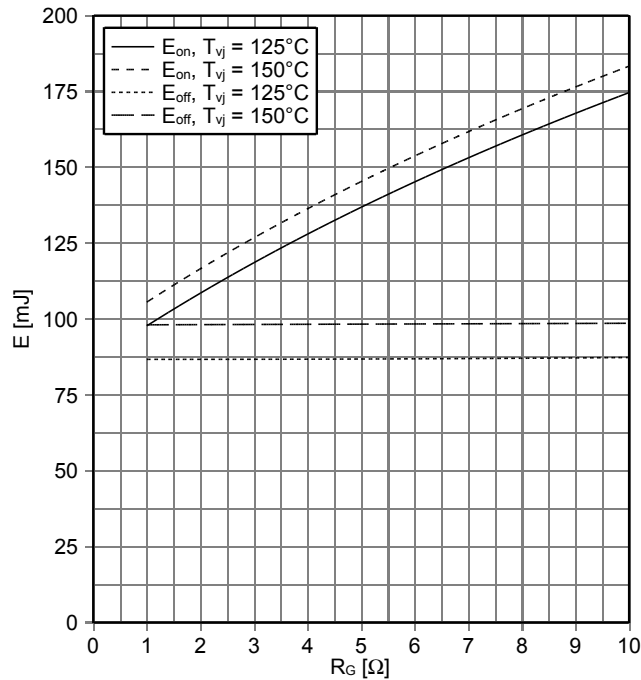
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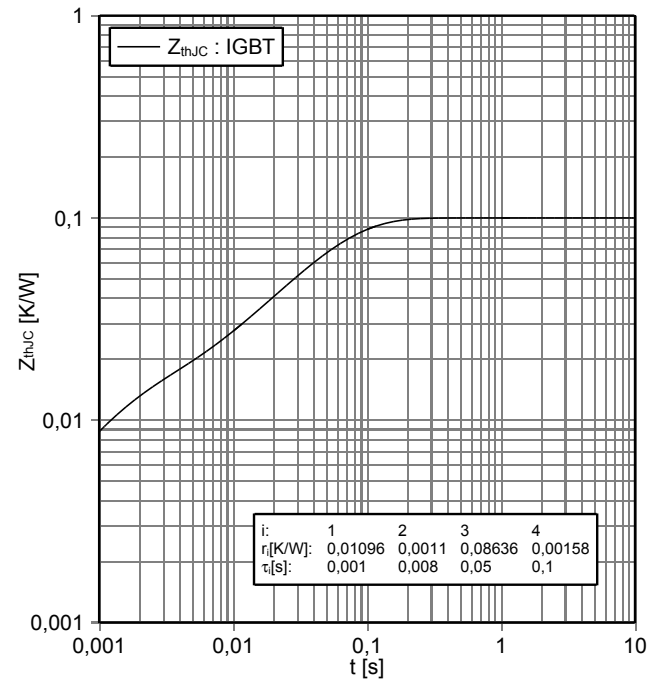
スイッチング損失 IGBT- インバータ (Typical)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 300\text{ A}, V_{CE} = 900\text{ V}$



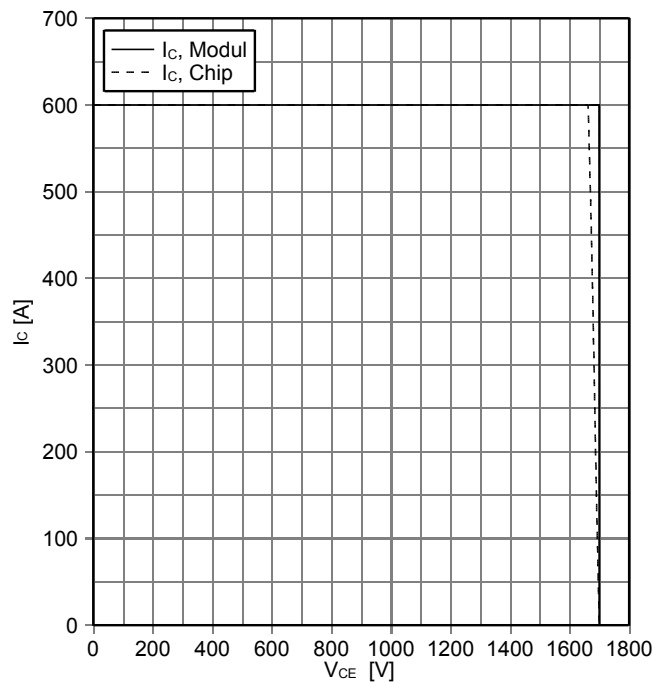
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



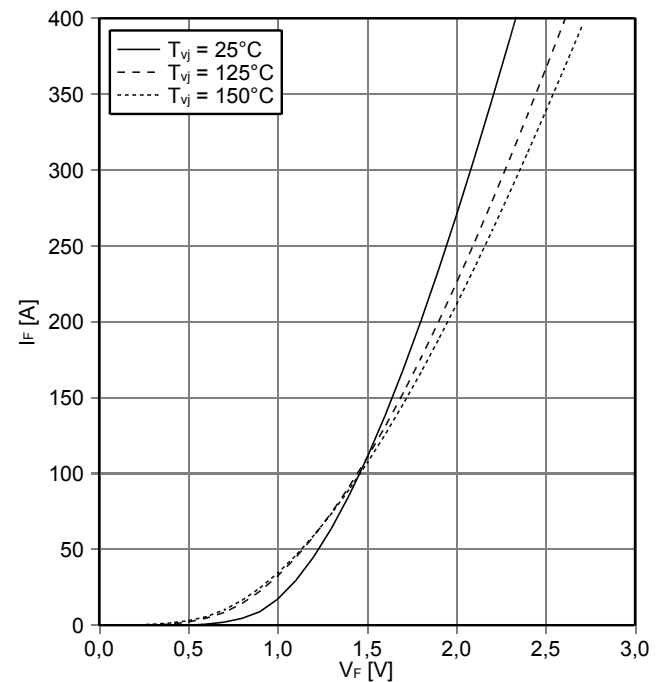
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



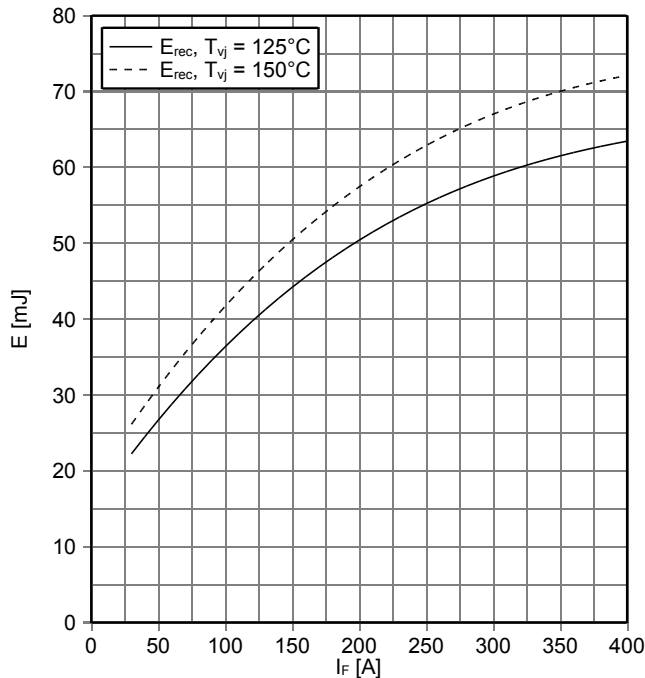
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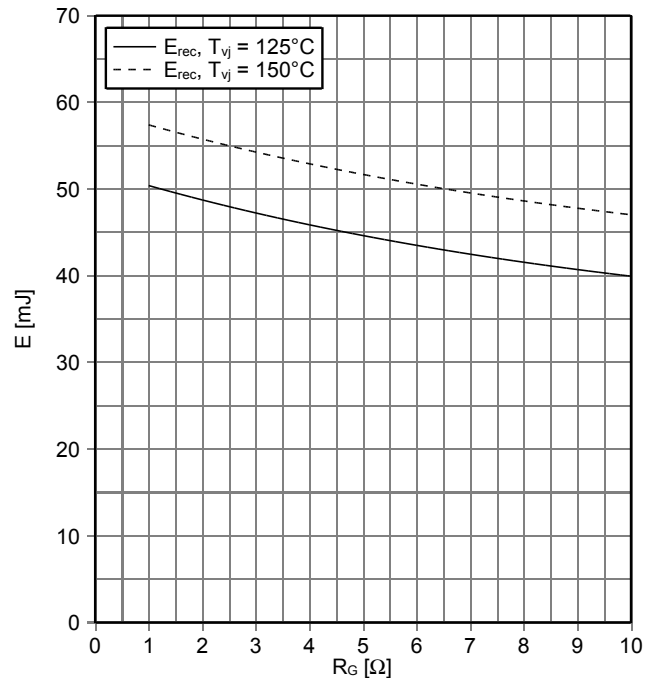
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1 \Omega, V_{CE} = 900 V$



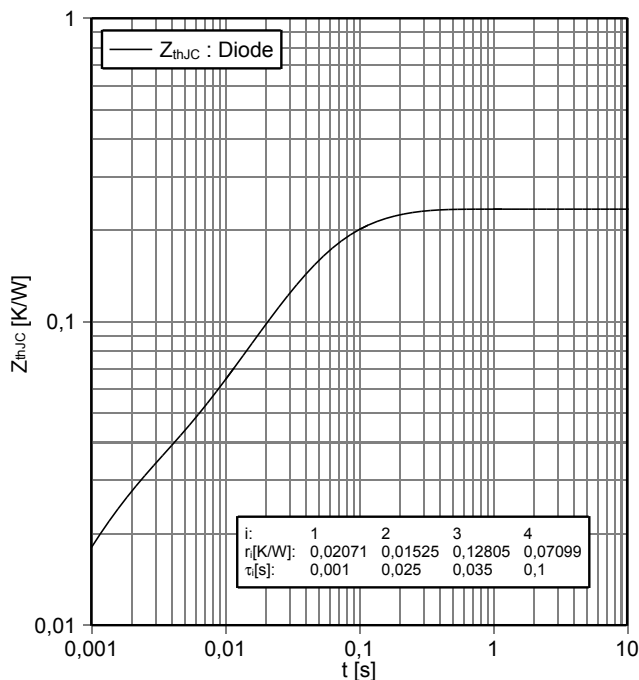
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 200 A, V_{CE} = 900 V$



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

$Z_{thJC} = f(t)$



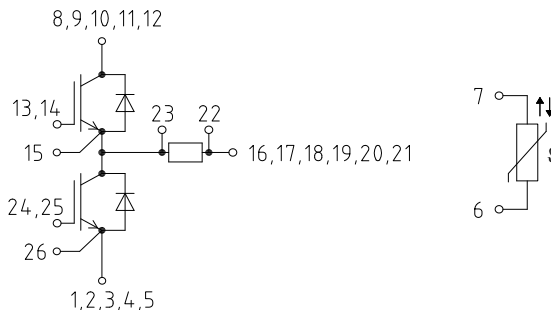
NTC-サーミスタ サーミスタの温度特性
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

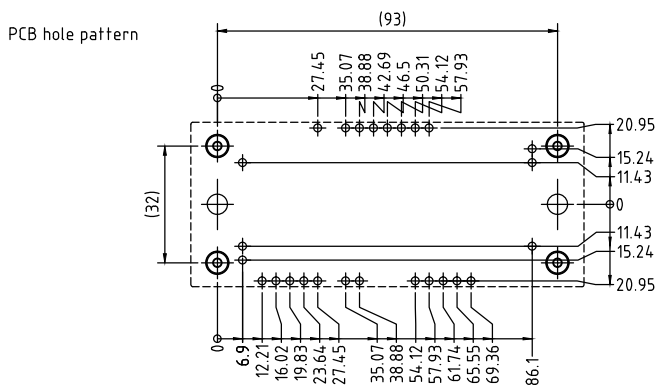
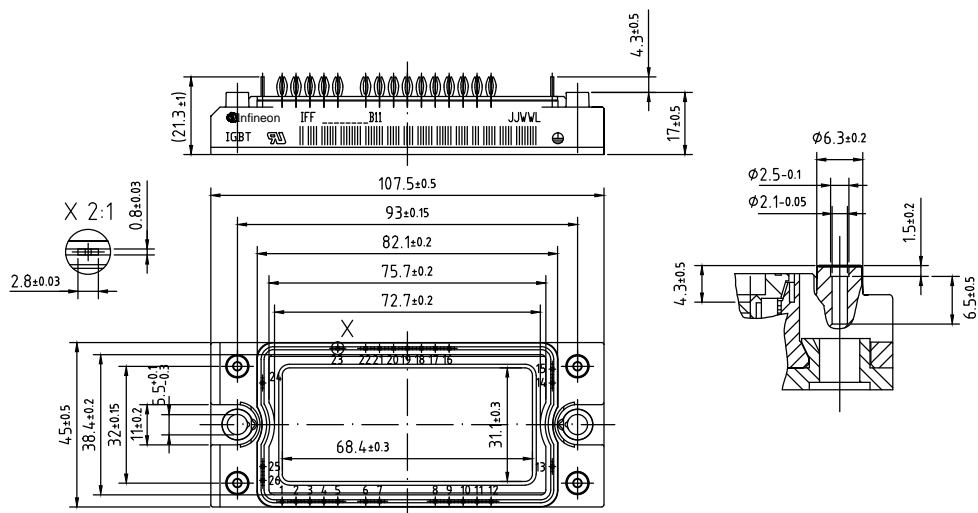


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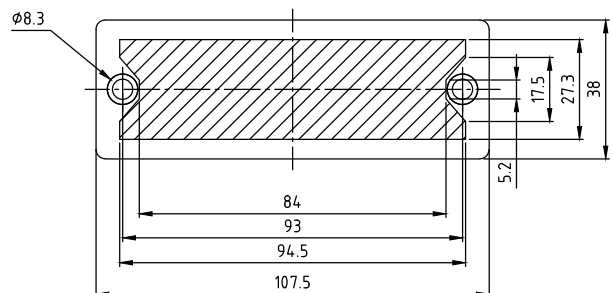
回路図 / circuit_diagram_headline



パッケージ概要 / package outlines



- Tolerance of PCB hole pattern $\pm \varnothing 0.1$
- hole specifications see AN 2007-09
- Diameters of plated holes $\varnothing 2.14\text{mm} - 2.29\text{mm}$
- Diameter of drill $\varnothing 2.35\text{mm}$



restricted area for Thermal Interface Material

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