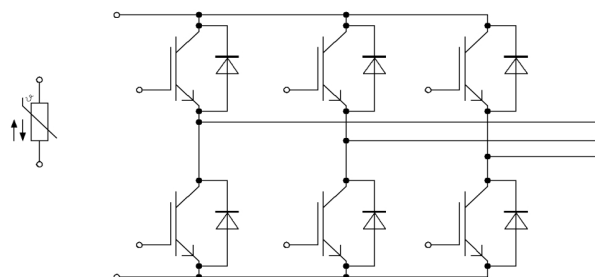
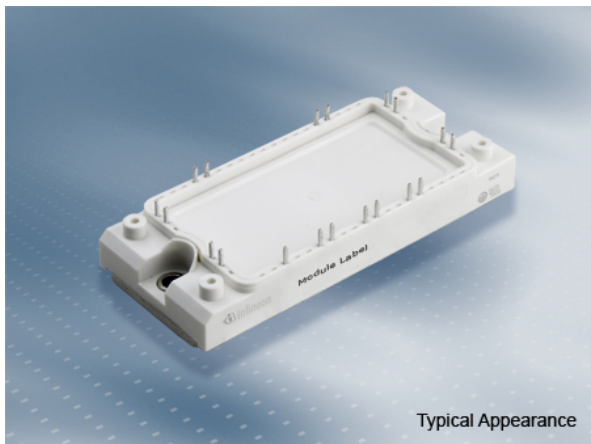


EconoPACK™2 モジュール トレンチ/フィールドストップ IGBT4 and エミッターコントロール4 diode内蔵 and NTCサーミスタ

EconoPACK™2 module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and NTC

**暫定データ / Preliminary Data**



$V_{CES} = 650V$   
 $I_{C\ nom} = 75A / I_{CRM} = 150A$

**一般応用**

- モーター駆動

**電気的特性**

- 650Vに増加したブロッキング電圧
- 高い短絡電流耐量、自己抑制型短絡電流
- トレンチ IGBT 4
- $T_{vj\ op} = 150^{\circ}C$

**機械的特性**

- 内蔵されたNTCサーミスタ
- 銅ベースプレート
- 半田接合技術
- 標準ハウジング

**Typical Applications**

- Motor Drives

**Electrical Features**

- Increased blocking voltage capability to 650V
- High Short Circuit Capability, Self Limiting Short Circuit Current
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$

**Mechanical Features**

- Integrated NTC temperature sensor
- Copper Base Plate
- Solder Contact Technology
- Standard Housing

**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: AS	date of publication: 2013-11-06	
approved by: RS	revision: 2.0	UL approved (E83335)



暫定データ  
Preliminary Data

IGBT- インバータ / IGBT, Inverter  
最大定格 / Maximum Rated Values

コレクタ・エミッタ間電圧 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	650	V
連続DCコレクタ電流 Continuous DC collector current	$T_C = 70^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	$I_{C\text{ nom}}$	75	A
繰り返しピークコレクタ電流 Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	150	A
トータル損失 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	$P_{tot}$	250	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	$I_C = 75\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 75\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 75\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,55 1,70 1,75	1,95	V V V	
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 1,20\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	5,0	5,8	6,5	V
ゲート電荷量 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		$Q_G$	0,75			$\mu\text{C}$
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,0			$\Omega$
入力容量 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	4,60			nF
帰還容量 Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,145			nF
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$			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	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,025 0,025 0,025			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,02 0,02 0,02			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,21 0,24 0,25			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,06 0,07 0,07			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 4000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	0,385 0,55 0,66			mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 75\text{ A}, V_{CE} = 300\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 4000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 5,1\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	3,35 3,90 4,20			mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$ $V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 25^{\circ}\text{C}$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	$I_{SC}$	360 290			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		$R_{thJC}$			0,60	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 $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,20			K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

prepared by: AS	date of publication: 2013-11-06
approved by: RS	revision: 2.0



暫定データ  
Preliminary Data

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

ピーク繰返し逆電圧 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	650	V
連続DC電流 Continuous DC forward current		$I_F$	75	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	$I_{FRM}$	150	A
電流二乗時間積 $I^2t$ - value	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	660 610	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 75 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$	1,55 1,50 1,45	1,95	V V V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 75 \text{ A}, -di_F/dt = 4000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$	100 115 125		A A A
逆回復電荷量 Recovered charge	$I_F = 75 \text{ A}, -di_F/dt = 4000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$	3,00 6,00 7,50		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
逆回復損失 Reverse recovery energy	$I_F = 75 \text{ A}, -di_F/dt = 4000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$	0,95 1,50 1,85		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		$R_{thJC}$		0,95	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 $\lambda_{Paste} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1 \text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,31		K/W
動作温度 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 Rated resistance	$T_C = 25^{\circ}\text{C}$		$R_{25}$	5,00		$\text{k}\Omega$
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.

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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 <sub>ISOL</sub>	2,5		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 <sub>2</sub> O <sub>3</sub>		
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.
ケース・ヒートシンク間熱抵抗 Thermal resistance, case to heatsink	/モジュール / per module $\lambda_{\text{Paste}} = 1 \text{ W/(m}\cdot\text{K)} / \lambda_{\text{grease}} = 1 \text{ W/(m}\cdot\text{K)}$	R <sub>thCH</sub>	0,02		K/W
内部インダクタンス Stray inductance module		L <sub>sCE</sub>	19		nH
パワーターミナル・チップ間抵抗 Module lead resistance, terminals - chip	T <sub>C</sub> = 25°C, /スイッチ / per switch	R <sub>CC+EE'</sub>	2,50		mΩ
保存温度 Storage temperature		T <sub>stg</sub>	-40	125	°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

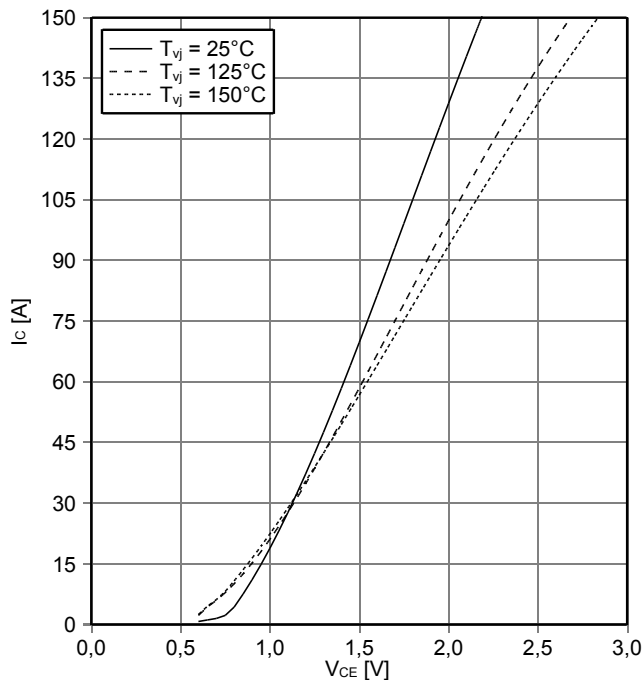
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暫定データ  
Preliminary Data

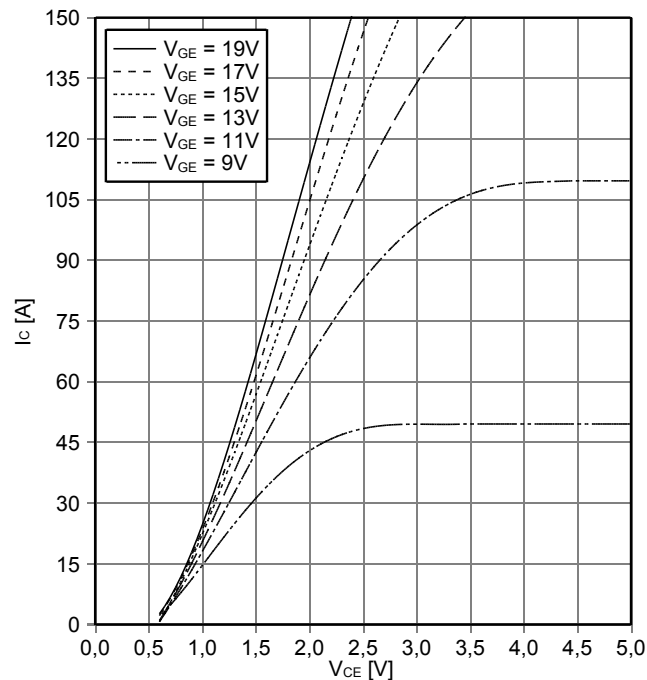
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



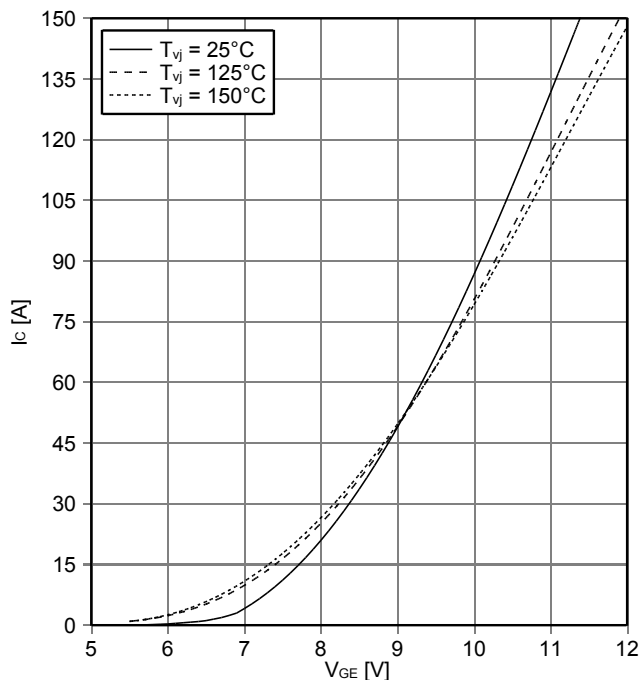
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



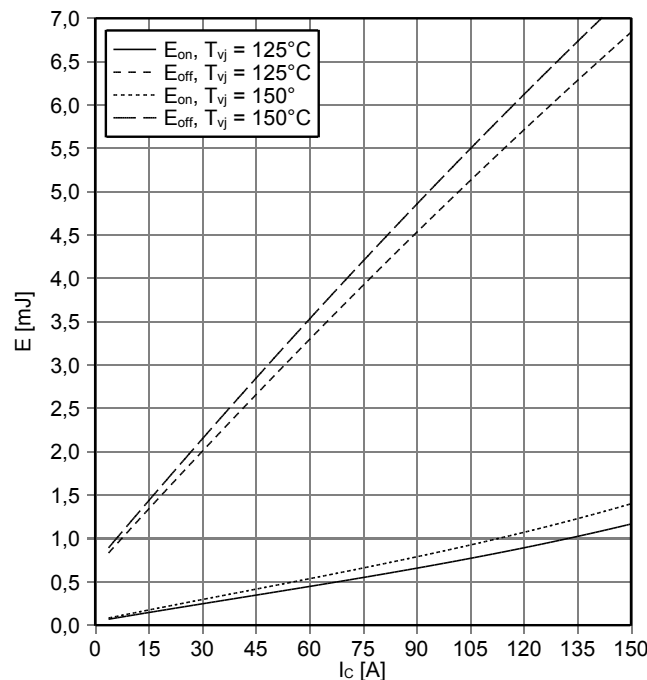
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 5.1\ \Omega$ ,  $R_{Goff} = 5.1\ \Omega$ ,  $V_{CE} = 300\text{ V}$



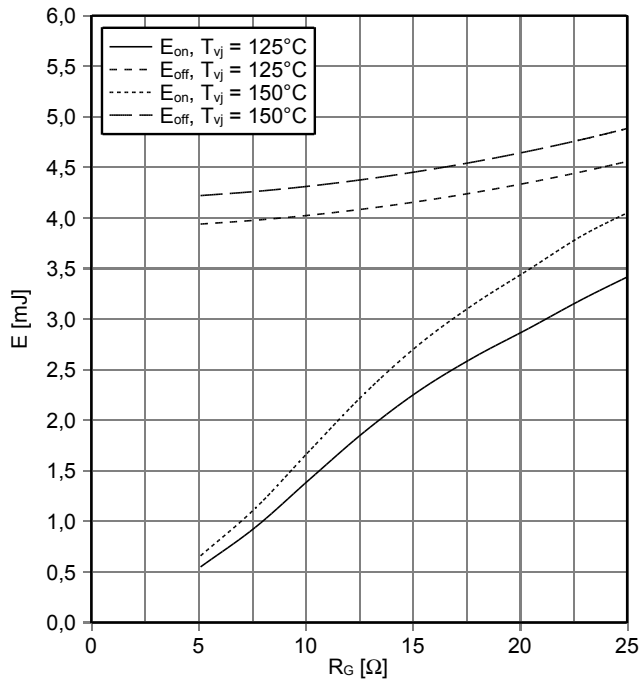
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暫定データ  
Preliminary Data

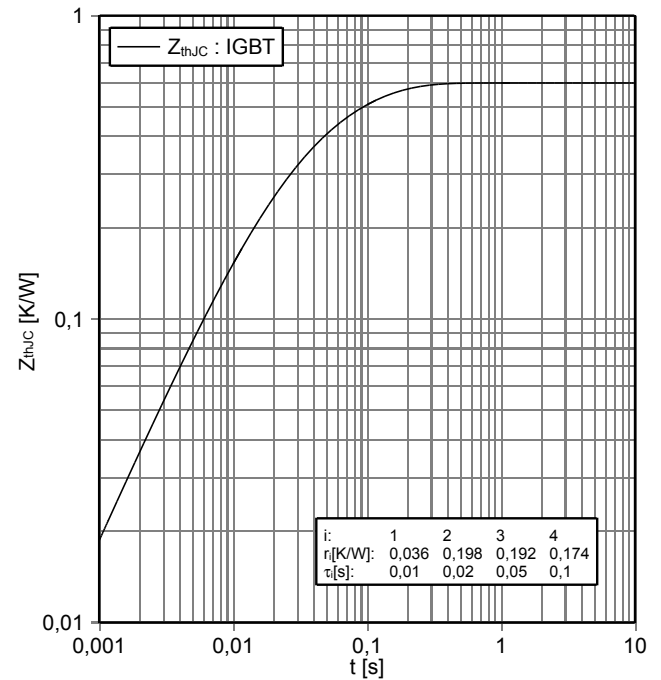
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 75\text{ A}, V_{CE} = 300\text{ V}$



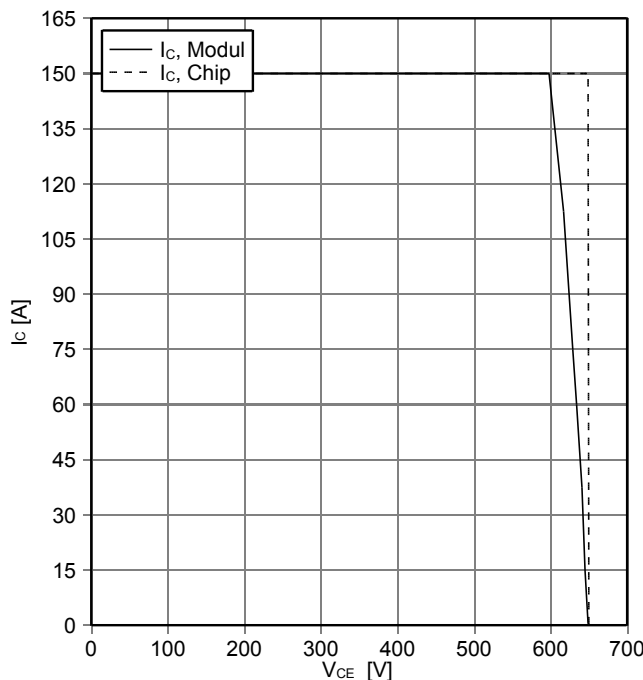
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



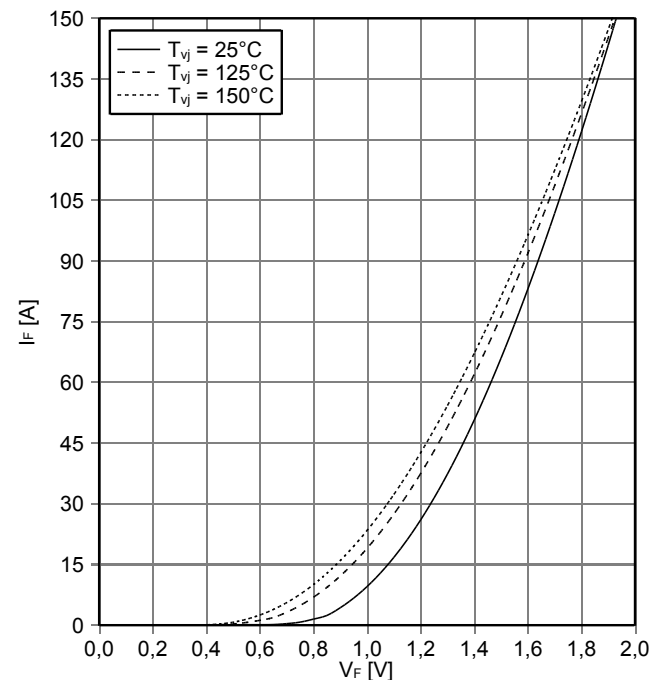
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 5.1\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



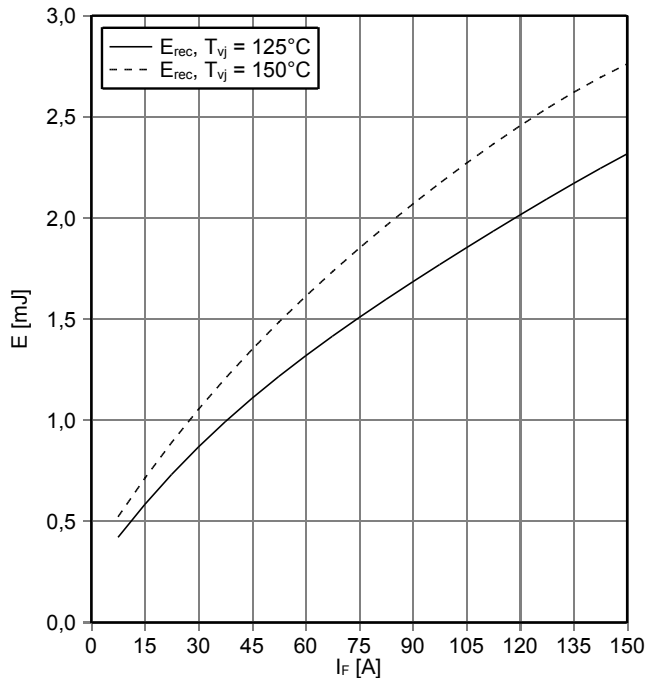
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暫定データ  
Preliminary Data

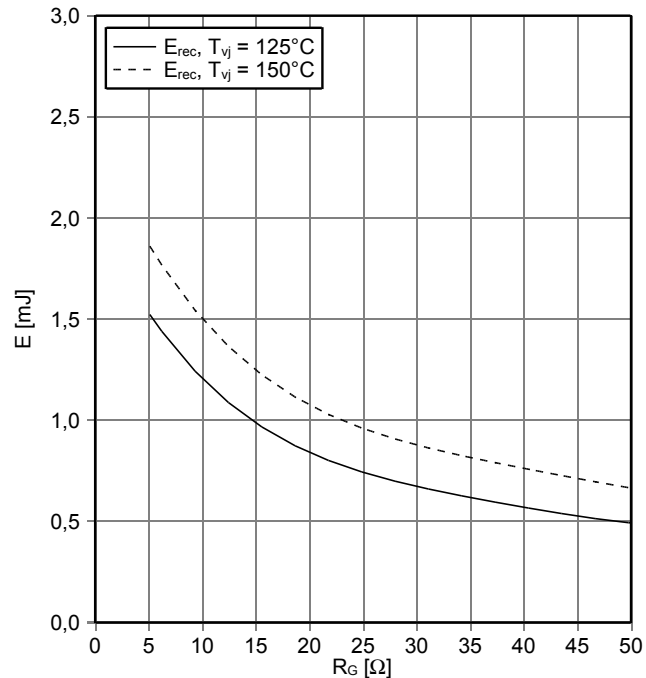
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 5.1 \Omega, V_{CE} = 300 V$



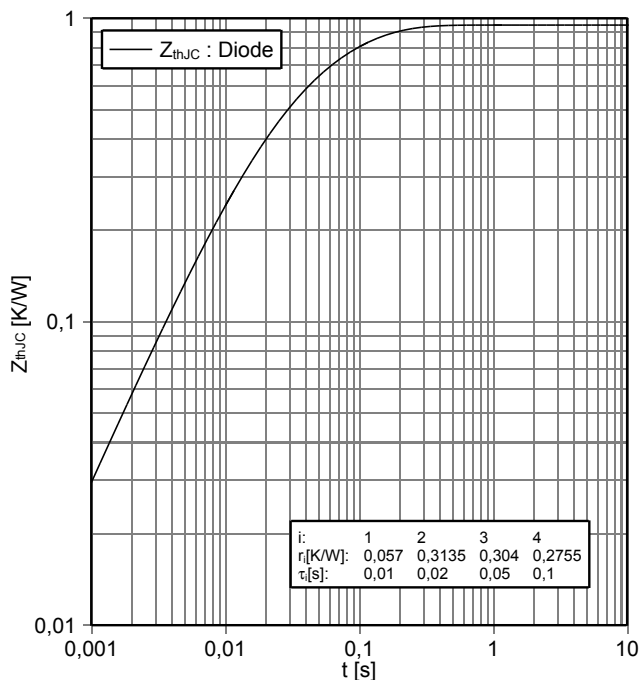
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 75 A, V_{CE} = 300 V$



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

$Z_{thJC} = f(t)$



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

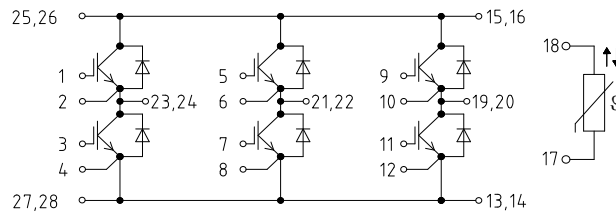
$R = f(T)$



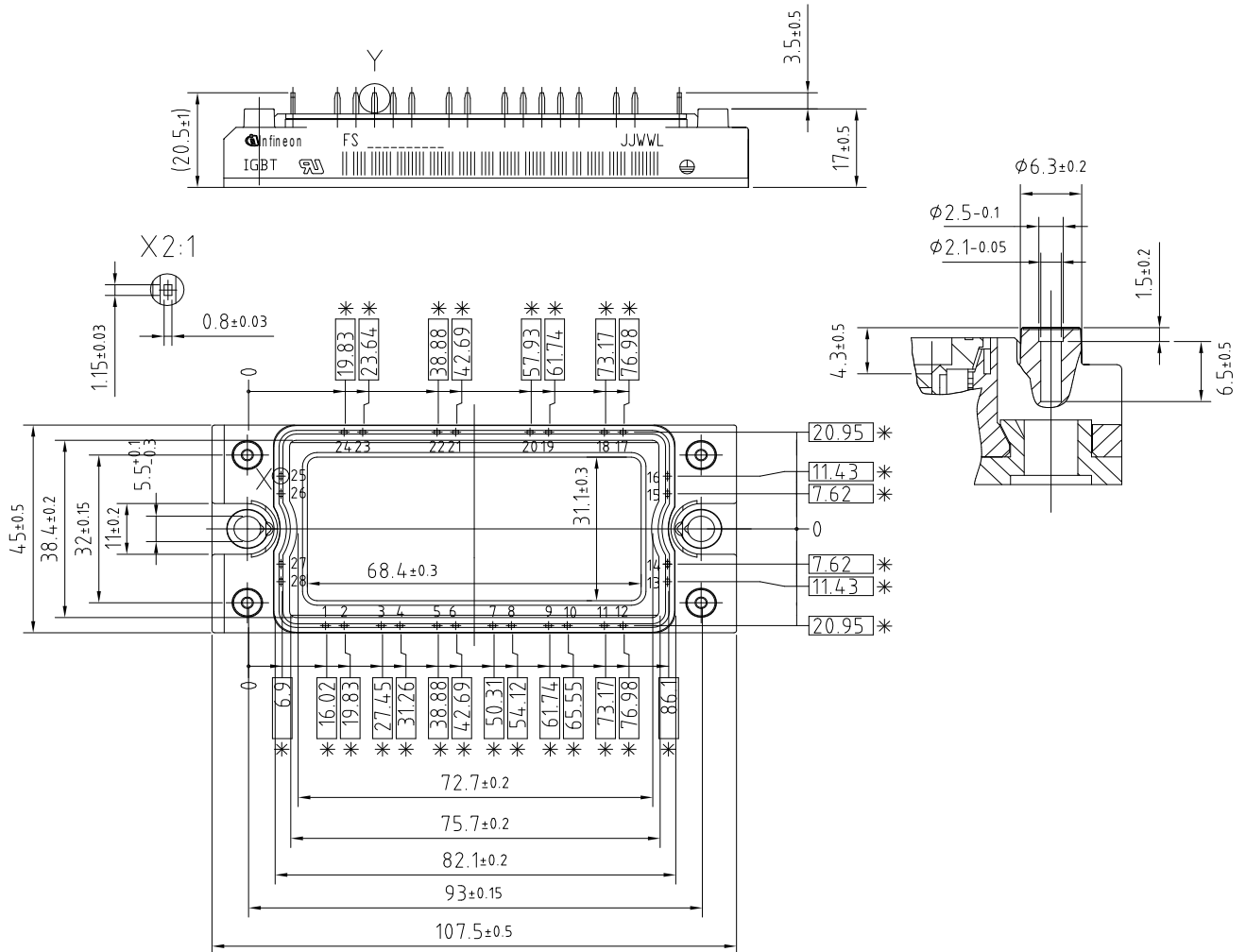
prepared by: AS	date of publication: 2013-11-06
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暫定データ  
Preliminary Data

回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



\* = alle Maße mit einer Toleranz von  $\pm 0.4$   
 \* = all dimensions with tolerance of  $\pm 0.4$

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