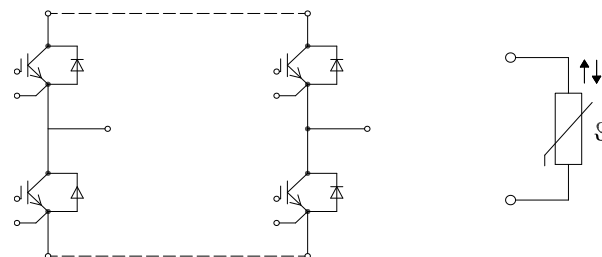
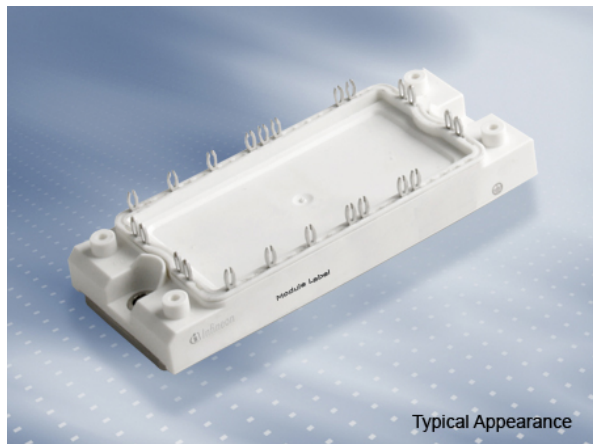


EconoPACK™2 モジュール 高周波スイッチング向け高速IGBT and SiCダイオード内蔵 and PressFIT / NTCサーミスタ

EconoPACK™2 module with the fast IGBT2 for high-frequency switching and PressFIT / NTC

**暫定データ / Preliminary Data**



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

**一般応用**

- 誘導加熱 and 溶接
- UPSシステム

**Typical Applications**

- Inductive Heating and Welding
- UPS Systems

**電気的特性**

- 高い短絡電流耐量、自己抑制型短絡電流
- 低スイッチング損失

**Electrical Features**

- High Short Circuit Capability, Self Limiting Short Circuit Current
- Low Switching Losses

**機械的特性**

- 絶縁されたベースプレート
- 銅ベースプレート
- PressFIT 接合 技術
- RoHS対応
- 標準ハウジング

**Mechanical Features**

- Isolated Base Plate
- Copper Base Plate
- PressFIT Contact Technology
- RoHS compliant
- Standard Housing

**Module Label Code**

Barcode Code 128



**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

DMX - Code



prepared by: NK	date of publication: 2013-11-11	
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	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	1200	V
連続DCコレクタ電流 Continuous DC collector current	$T_C = 70^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ $I_C$	50 70	A A
繰り返しピークコレクタ電流 Repetitive peak collector current	$t_P = 1\text{ms}$	$I_{CRM}$	100	A
トータル損失 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$P_{\text{tot}}$	355	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	$I_C = 50\text{A}, V_{GE} = 15\text{V}$ $I_C = 50\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	3,20 3,85	3,75	V V	
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 2,00\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	4,5	5,5	6,5	V
ゲート電荷量 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		$Q_G$	0,60		$\mu\text{C}$	
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	5,0		$\Omega$	
入力容量 Input capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{\text{ies}}$	3,40		nF	
帰還容量 Reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{\text{res}}$	0,21		nF	
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	$V_{CE} = 1200\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$		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	$I_C = 50\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{G\text{on}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	0,12 0,13		$\mu\text{s}$ $\mu\text{s}$	
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 50\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{G\text{on}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_r$	0,05 0,06		$\mu\text{s}$ $\mu\text{s}$	
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 50\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{G\text{off}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	0,31 0,36		$\mu\text{s}$ $\mu\text{s}$	
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 50\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{G\text{off}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_f$	0,02 0,03		$\mu\text{s}$ $\mu\text{s}$	
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 50\text{A}, V_{CE} = 600\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 1400\text{A}/\mu\text{s}$ $R_{G\text{on}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{\text{on}}$	3,30 6,00		mJ mJ	
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 50\text{A}, V_{CE} = 600\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 7000\text{V}/\mu\text{s}$ $R_{G\text{off}} = 13\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{\text{off}}$	1,70 2,50		mJ mJ	
短絡電流 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 900\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\mu\text{s}, T_{vj} = 125^{\circ}\text{C}$	$I_{SC}$	300		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		$R_{thJC}$		0,35	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 $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,12		K/W	
動作温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	125	$^{\circ}\text{C}$	

prepared by: NK	date of publication: 2013-11-11
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	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	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	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	$I^2t$	1250	A <sup>2</sup> s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_F$	2,00 1,70	2,55	V V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$I_{RM}$	28,0 41,0		A A
逆回復電荷量 Recovered charge	$I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$Q_r$	3,00 8,50		$\mu\text{C}$ $\mu\text{C}$
逆回復損失 Reverse recovery energy	$I_F = 50\text{ A}, -di_F/dt = 1400\text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$E_{rec}$	1,10 3,10		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		$R_{thJC}$		0,70	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 $\lambda_{\text{Paste}} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,24		K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	125	$^{\circ}\text{C}$

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		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.

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



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>	30		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>	2,20		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

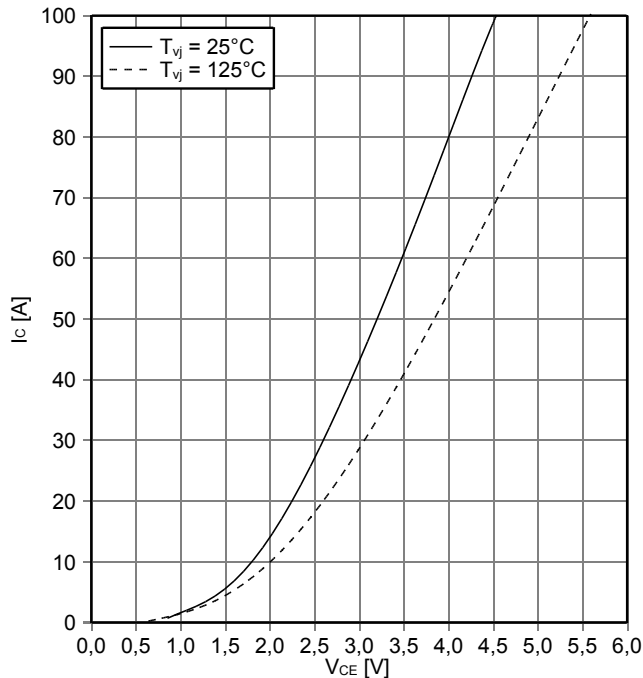
prepared by: NK	date of publication: 2013-11-11
approved by: RS	revision: 2.0



暫定データ  
Preliminary Data

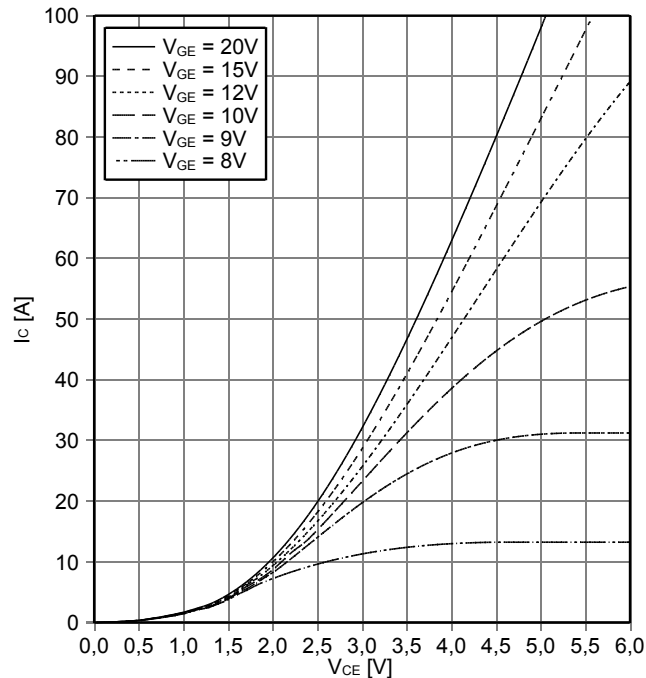
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



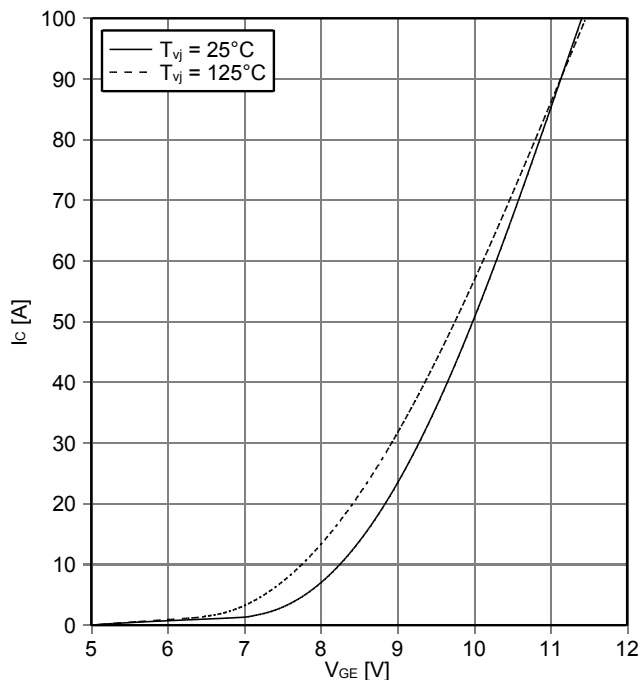
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

$I_c = f(V_{CE})$   
 $T_{vj} = 125^\circ\text{C}$



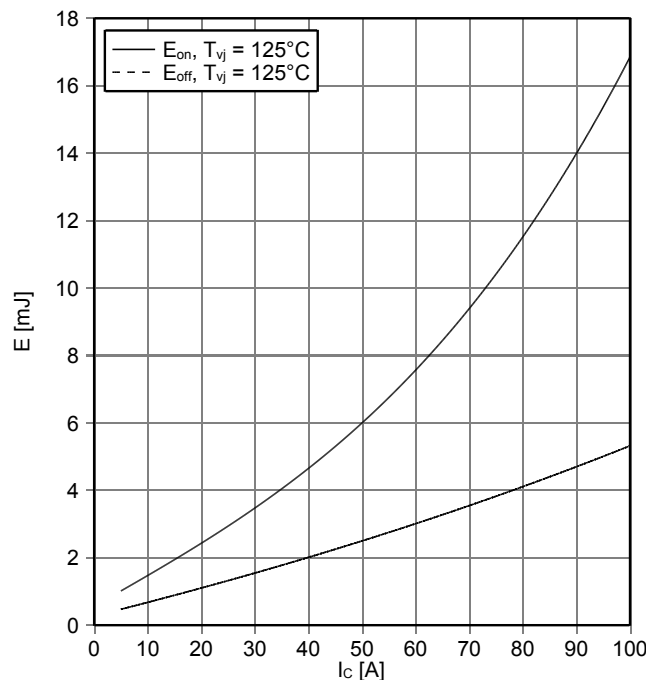
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_c), E_{off} = f(I_c)$   
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 13\ \Omega, R_{Goff} = 13\ \Omega, V_{CE} = 600\text{ V}$



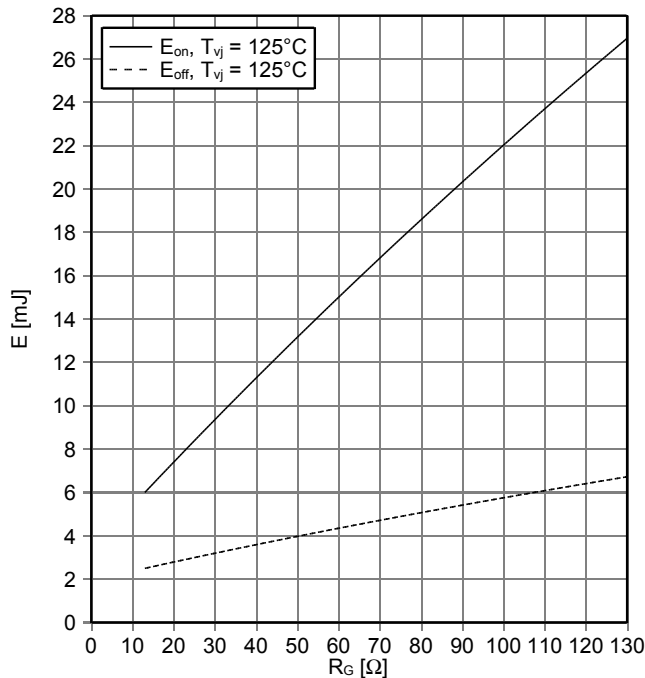
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approved by: RS	revision: 2.0



暫定データ  
Preliminary Data

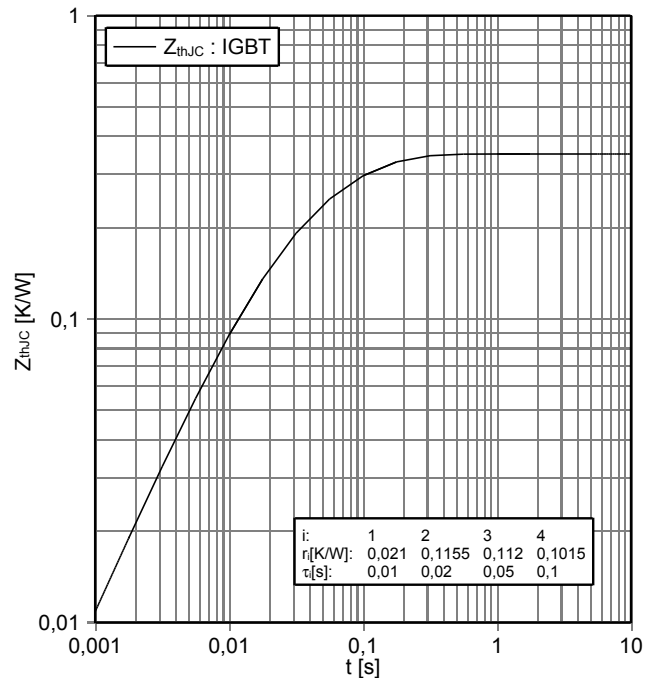
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

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



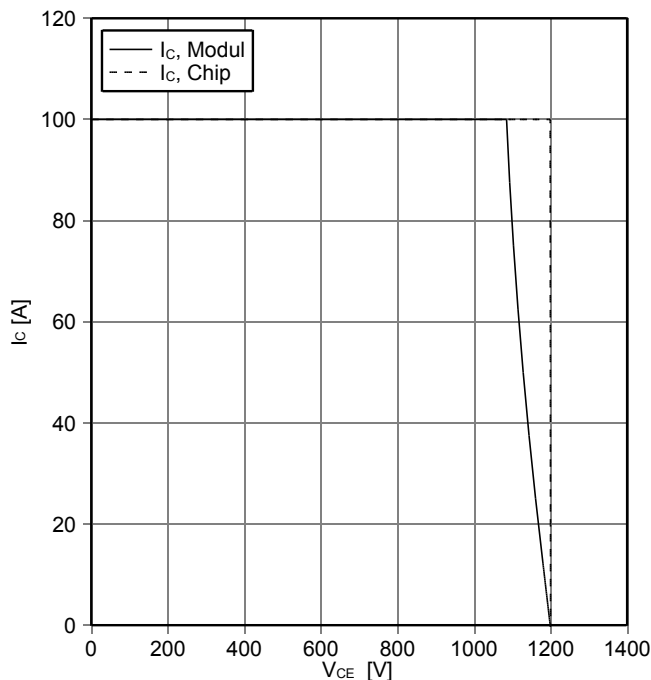
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



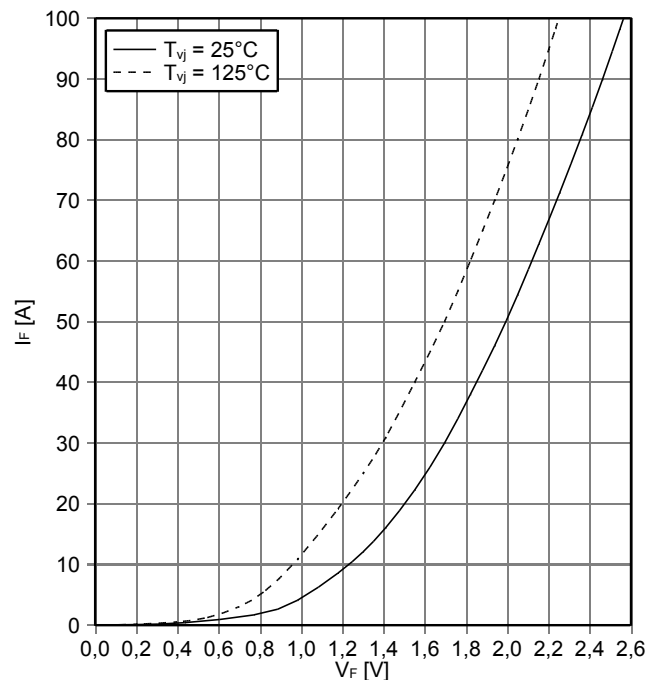
逆バイアス安全動作領域 IGBT- インバータ ( RBSOA )  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 13\ \Omega$ ,  $T_{vj} = 125^\circ\text{C}$



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

$I_F = f(V_F)$



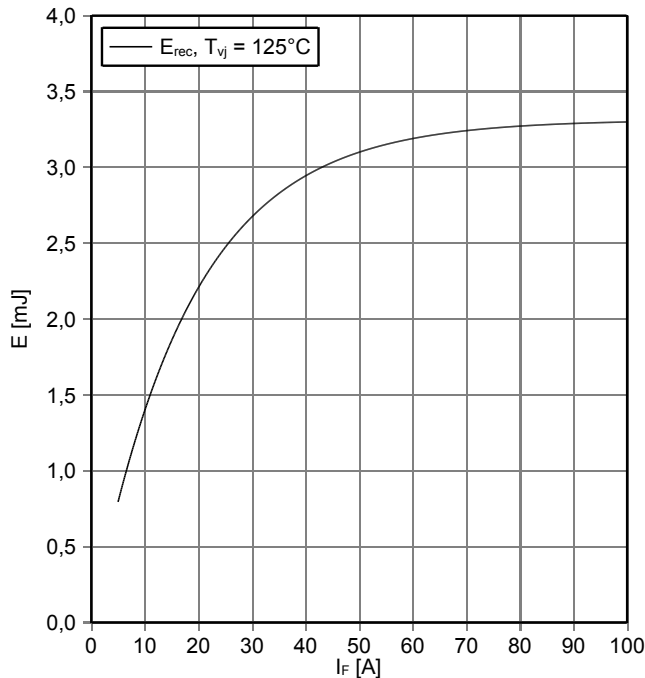
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approved by: RS	revision: 2.0



暫定データ  
Preliminary Data

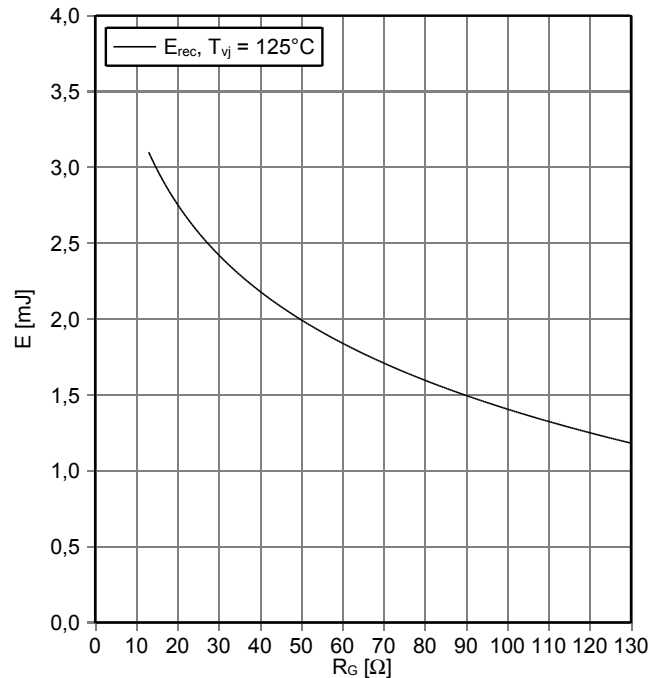
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 13 \Omega, V_{CE} = 600 V$



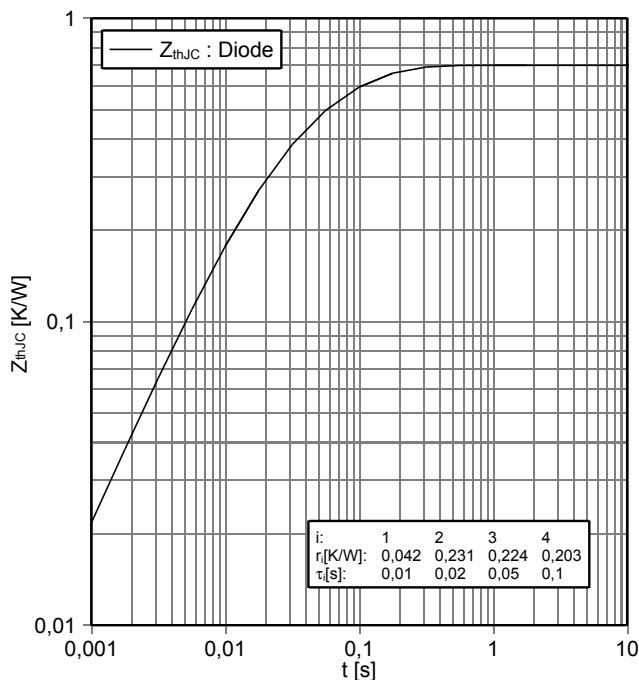
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 50 A, V_{CE} = 600 V$



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

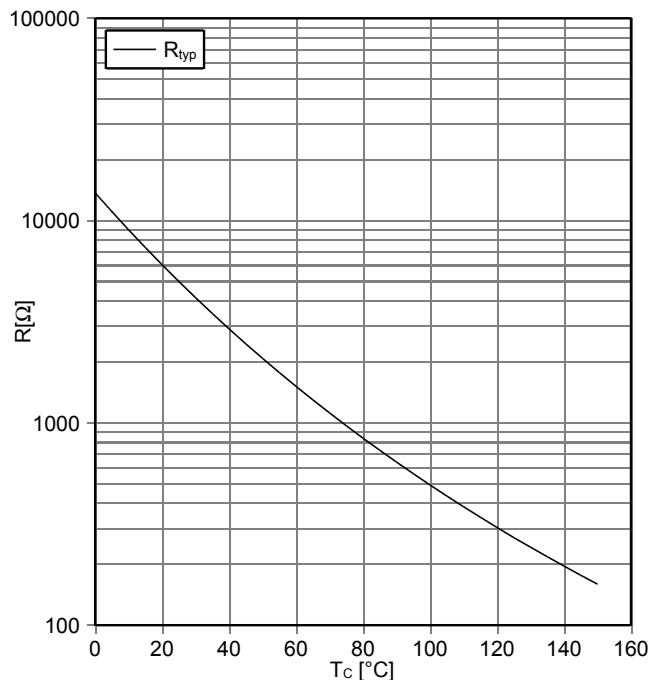
$Z_{thJC} = f(t)$



i:	1	2	3	4
$r_i$ [K/W]:	0,042	0,231	0,224	0,203
$\tau_i$ [s]:	0,01	0,02	0,05	0,1

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

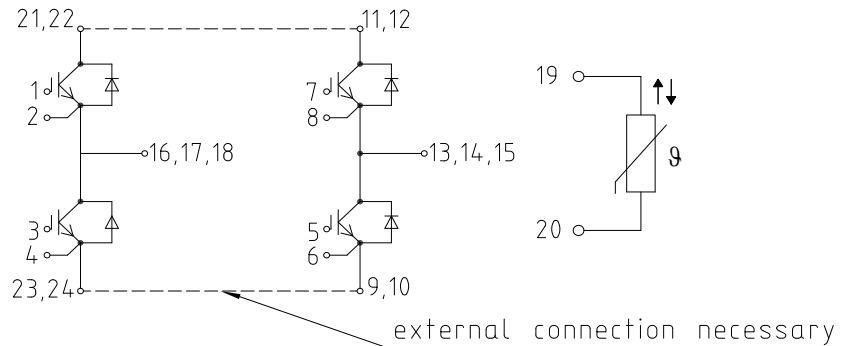
$R = f(T)$



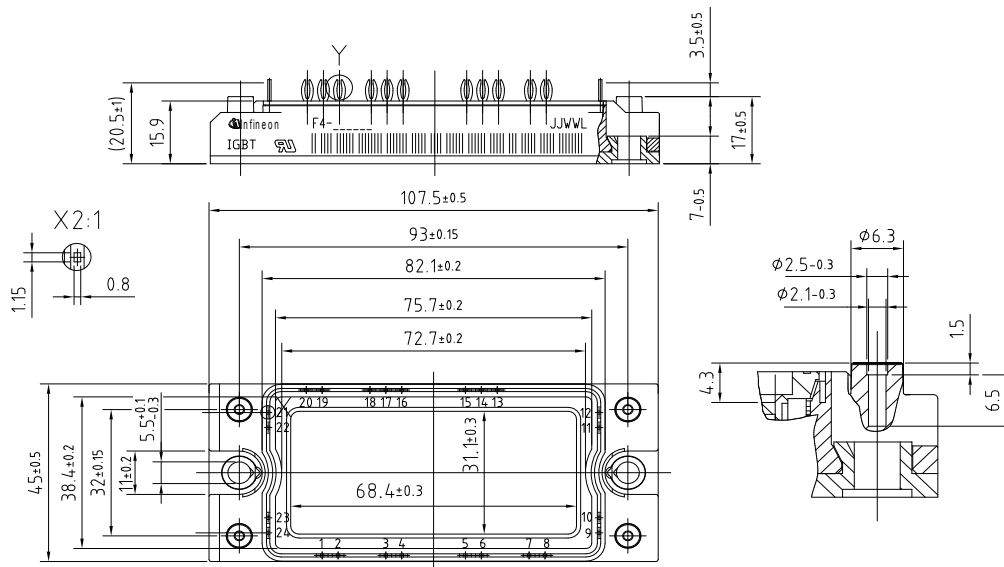
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approved by: RS	revision: 2.0

暫定データ  
Preliminary Data

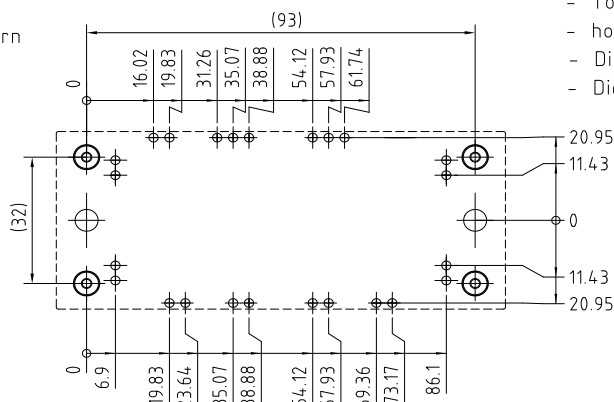
回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



PCB hole pattern



- Tolerance of PCB hole pattern  $\pm 0.1$
- hole specifications see AN 2007-09
- Diameters of plated holes  $\phi 2.1\text{mm} - 2.29\text{mm}$
- Diameter of drill  $\phi 2.35\text{mm}$

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