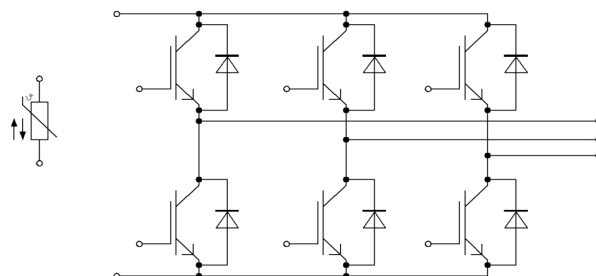
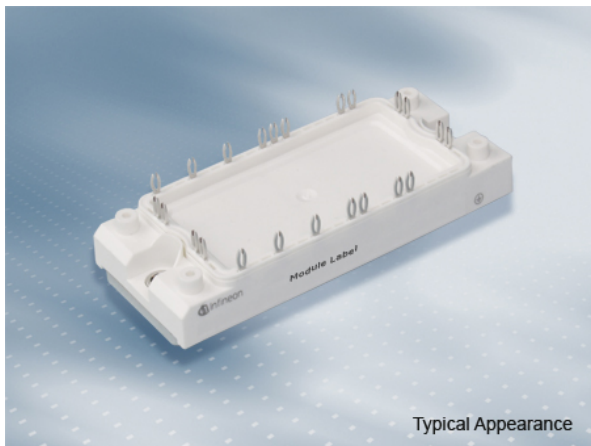


EconoPACK™2 モジュール トレンチ/フィールドストップ IGBT4 and エミッターコントロール4 diode内蔵 and PressFIT / NTCサーミスタ

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



$V_{CES} = 1200V$

$I_{C\ nom} = 50A / I_{CRM} = 100A$

### 一般応用

- スタティックインバーター
- モーター駆動
- サーボ駆動

### 電気的特性

- 低  $V_{CEsat}$  飽和電圧
- トレンチ IGBT 4
- $T_{vj\ op} = 150^{\circ}C$
- 正温度特性を持った  $V_{CEsat}$  飽和電圧

### 機械的特性

- 低熱インピーダンスの  $Al_2O_3$  DCB
- 高いパワー/サーマルサイクル耐量
- 内蔵されたNTCサーミスタ
- 銅ベースプレート
- PressFIT 接合 技術
- 標準ハウジング

### Typical Applications

- Auxiliary Inverters
- Motor Drives
- Servo Drives

### Electrical Features

- Low  $V_{CEsat}$
- Trench IGBT 4
- $T_{vj\ op} = 150^{\circ}C$
- $V_{CEsat}$  with positive Temperature Coefficient

### Mechanical Features

- $Al_2O_3$  Substrate with Low Thermal Resistance
- High Power and Thermal Cycling Capability
- Integrated NTC temperature sensor
- Copper Base Plate
- PressFIT 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

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revision: 3.0

UL approved (E83335)



**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	$T_C = 95^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	$I_{C\text{ nom}}$	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
トータル損失 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	$P_{tot}$	280	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	$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 50\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 50\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,85 2,15 2,25	2,15	V V V	
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 1,60\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	5,2	5,8	6,4	V
ゲート電荷量 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		$Q_G$	0,38			$\mu\text{C}$
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	4,0			$\Omega$
入力容量 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	2,80			nF
帰還容量 Reverse transfer capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,10			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	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,13 0,15 0,15			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,02 0,03 0,035			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,30 0,38 0,40			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,045 0,08 0,09			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 1300\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	4,50 6,40 7,40			mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 50\text{ A}, V_{CE} = 600\text{ V}, L_S = 25\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3800\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 15\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	2,50 4,10 4,50			mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	180			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		$R_{thJC}$		0,54		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		$^{\circ}\text{C}$

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**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	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$	$I^2t$	560	$\text{A}^2\text{s}$

**電気的特性 / Characteristic Values**

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 50\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$	1,70 1,65 1,65	2,15	V V V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 50\text{ A}, -di_F/dt = 1300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$	70,0 75,0 77,0		A A A
逆回復電荷量 Recovered charge	$I_F = 50\text{ A}, -di_F/dt = 1300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$	5,10 9,30 10,0		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
逆回復損失 Reverse recovery energy	$I_F = 50\text{ A}, -di_F/dt = 1300\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$	1,70 3,20 3,60		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		$R_{thJC}$		0,81	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 $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,30		K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-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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モジュール / Module

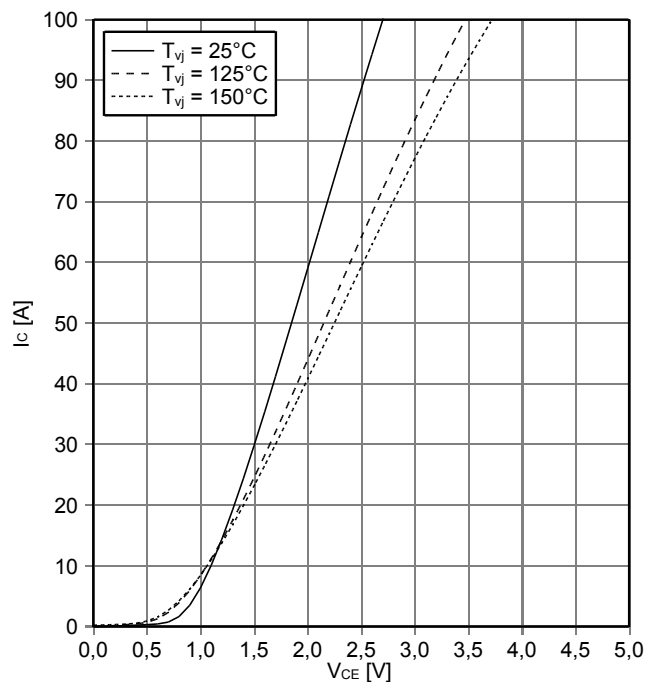
絶縁耐圧 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISOL</sub>	2,5		kV
ベースプレート材質 Material of module baseplate			Cu		
内部絶縁 Internal isolation	基礎絶縁 (クラス1, IEC 61140) basic insulation (class 1, IEC 61140)		Al <sub>2</sub> O <sub>3</sub>		
沿面距離 Creepage distance	連絡方法 - ヒートシンク / terminal to heatsink 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>		1,80	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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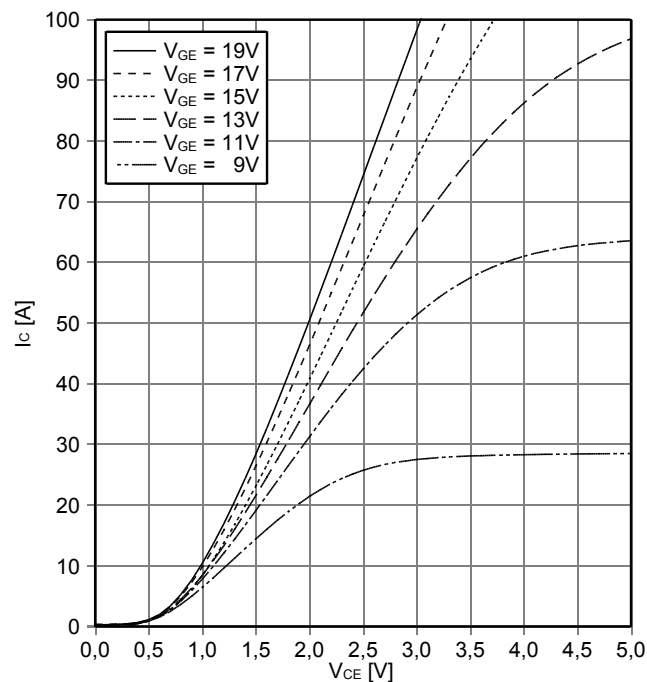
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



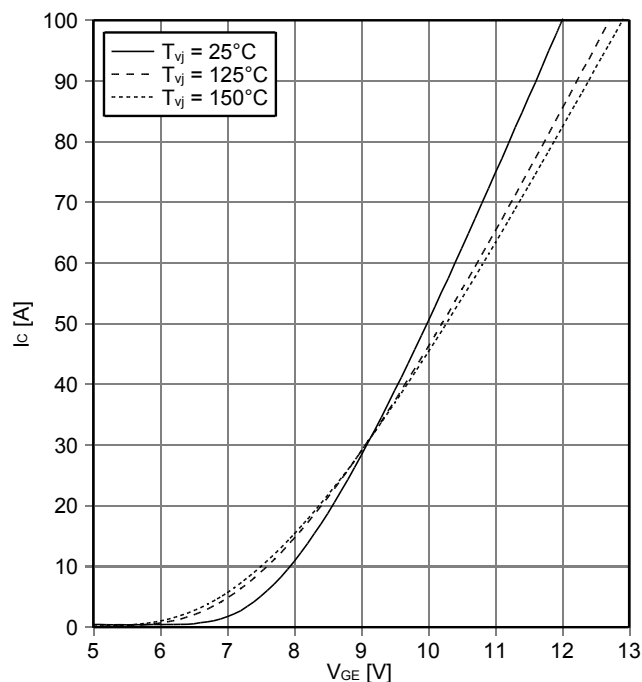
出力特性 IGBT- インバータ (Typical)  
output characteristic IGBT, Inverter (typical)

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



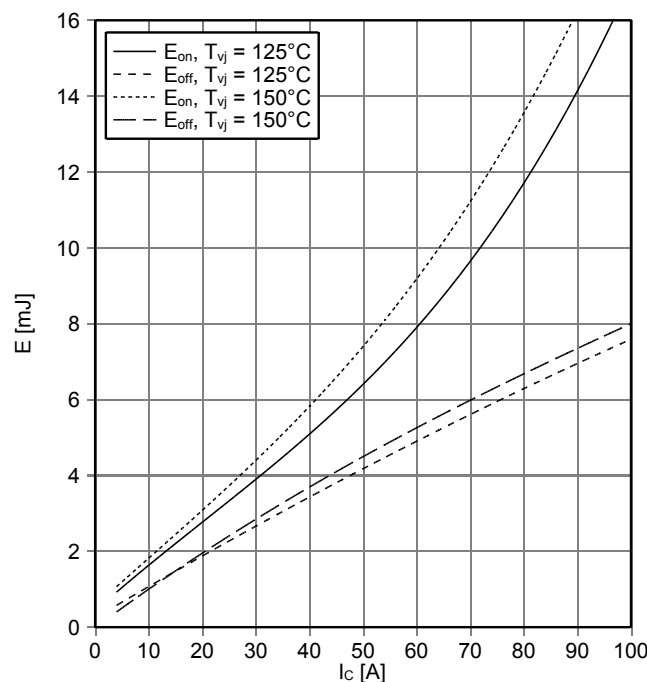
伝達特性 IGBT- インバータ (Typical)  
transfer characteristic IGBT, Inverter (typical)

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



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

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

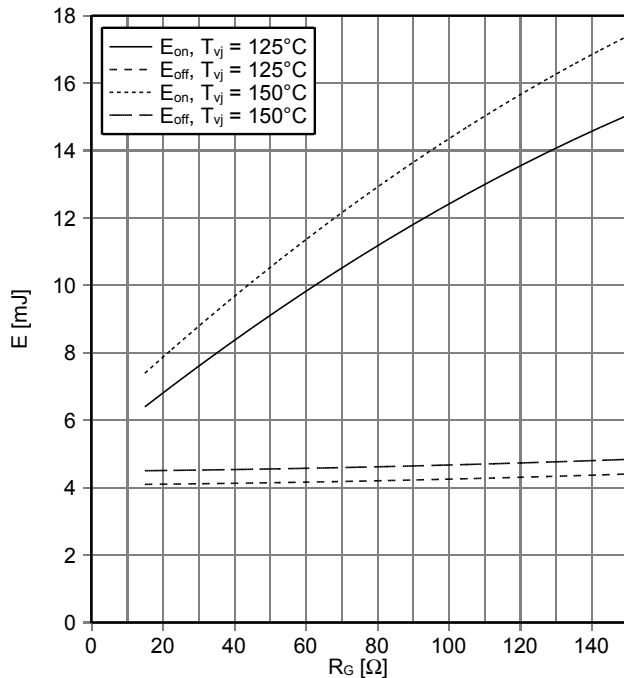


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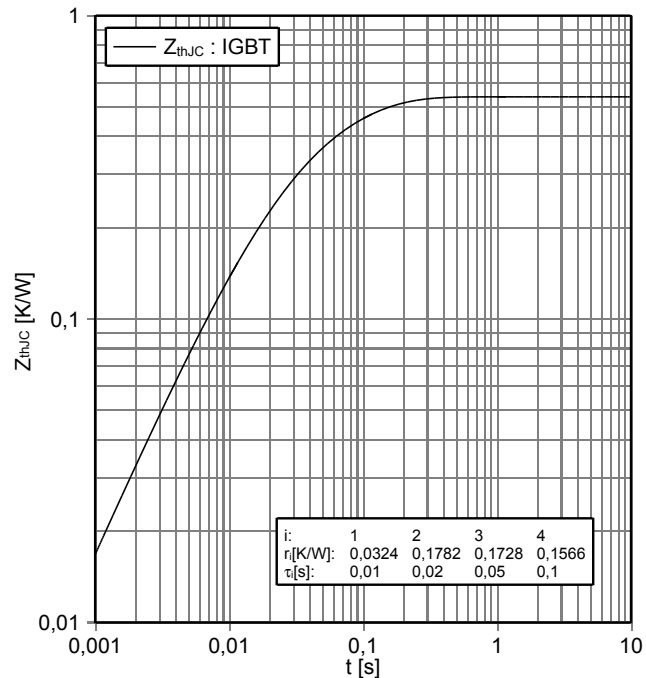
スイッチング損失 IGBT- インバータ (Typical)  
switching losses IGBT, Inverter (typical)

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



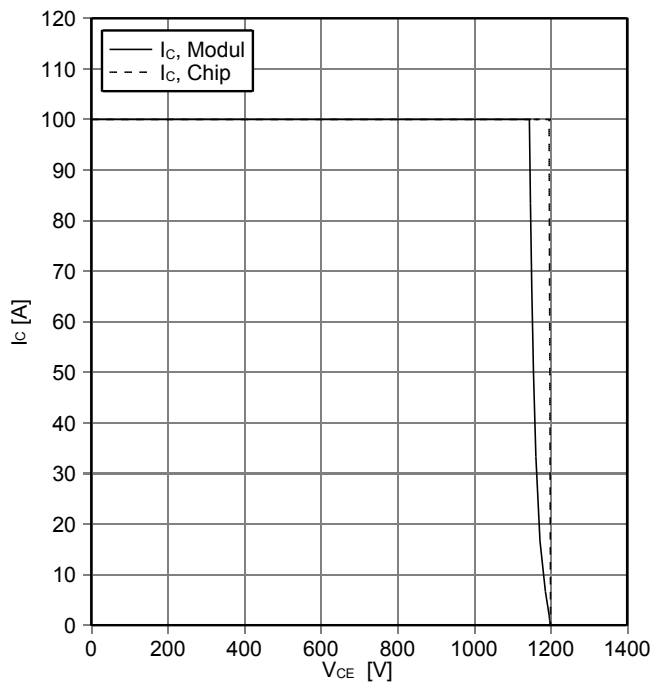
過渡熱インピーダンス IGBT- インバータ  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



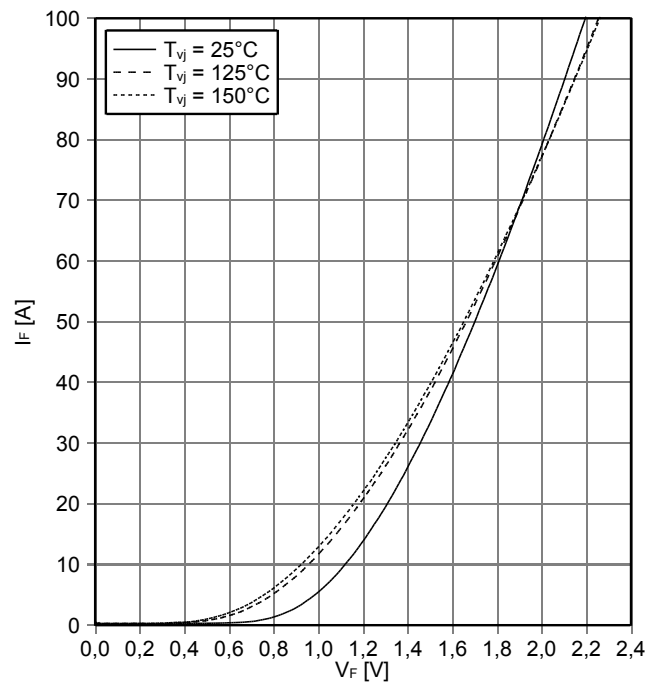
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

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



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

$I_F = f(V_F)$

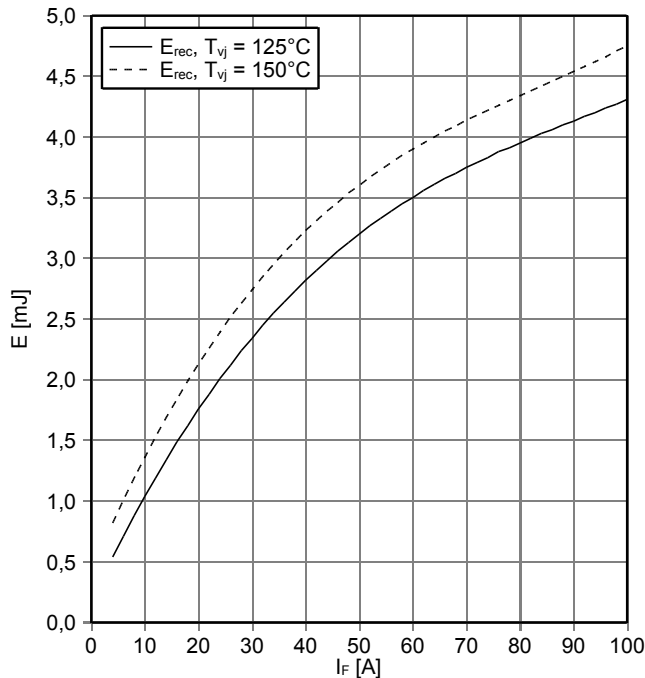


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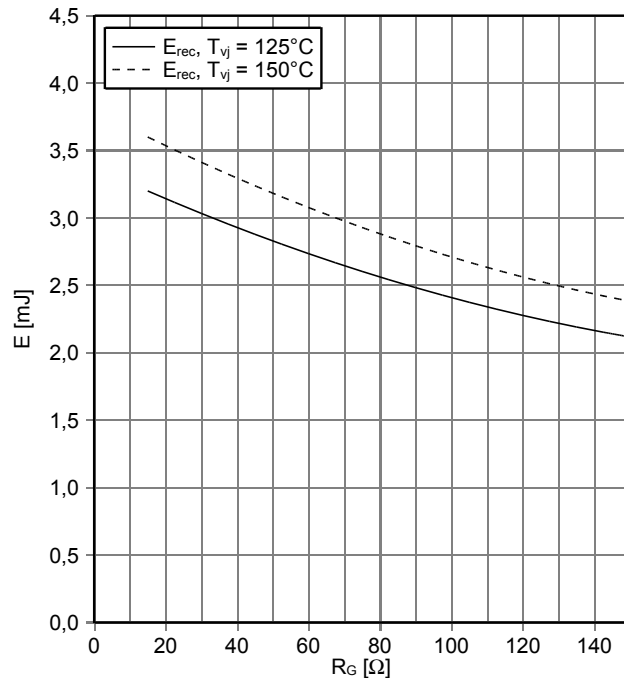
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 15 \Omega, V_{CE} = 600 V$



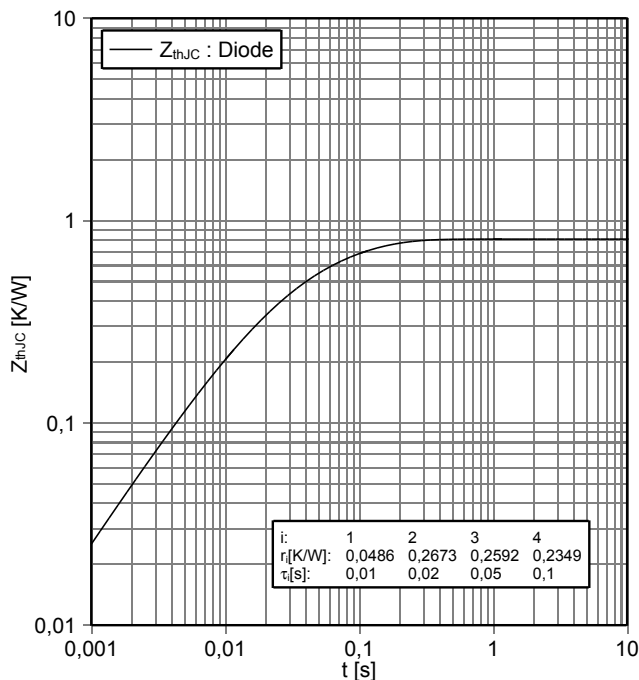
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

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



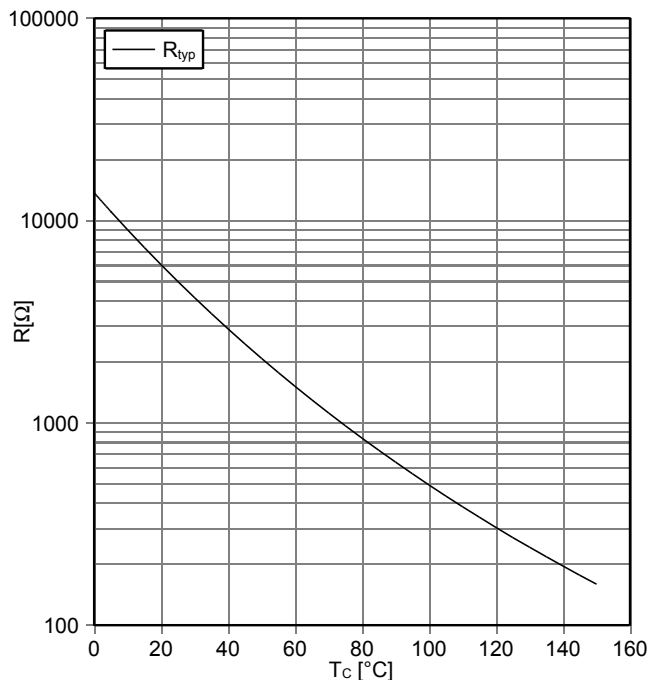
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



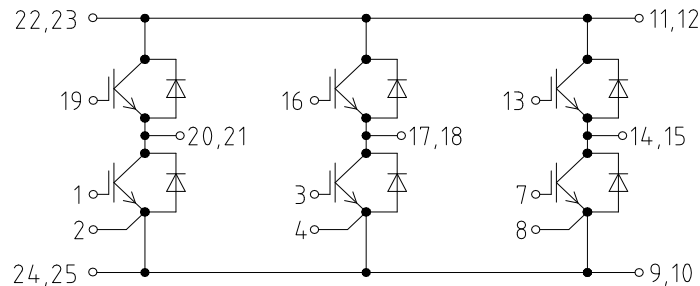
NTC-サーミスタ サーミスタの温度特性  
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

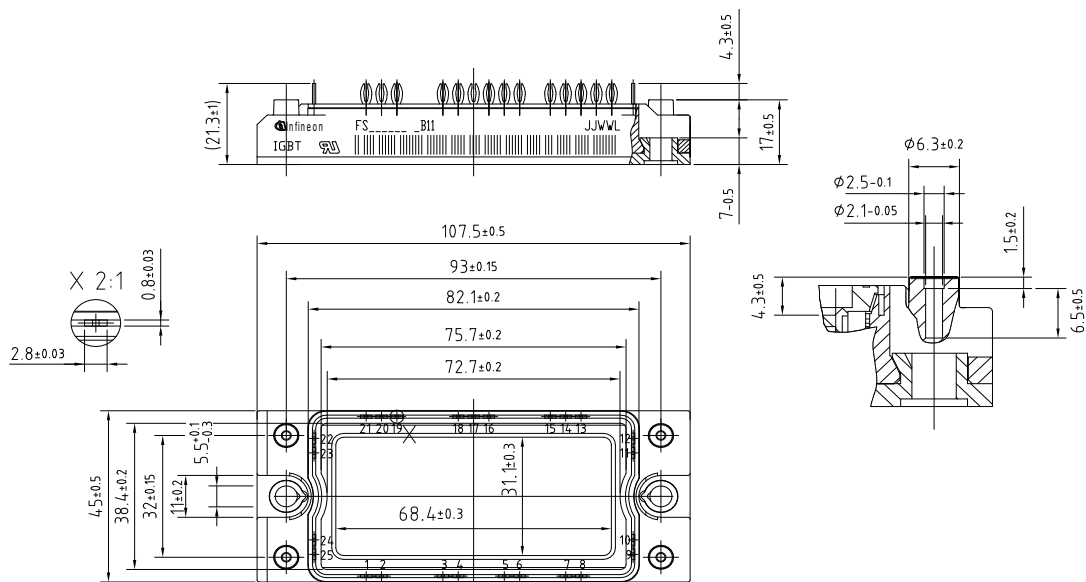


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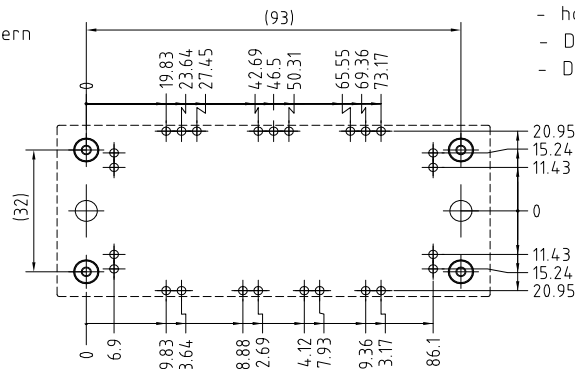
回路図 / circuit\_diagram\_headline



パッケージ概要 / package outlines



PCB hole pattern



- Tolerance of PCB hole pattern  $\oplus \phi 0.1$
- hole specifications see AN 2007-09
- Diameters of plated holes  $\phi$  2.14mm - 2.29mm
- Diameter of drill  $\phi$  2.35mm

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