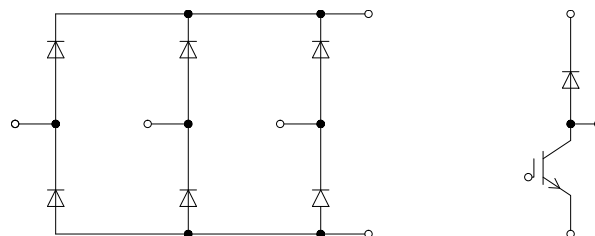
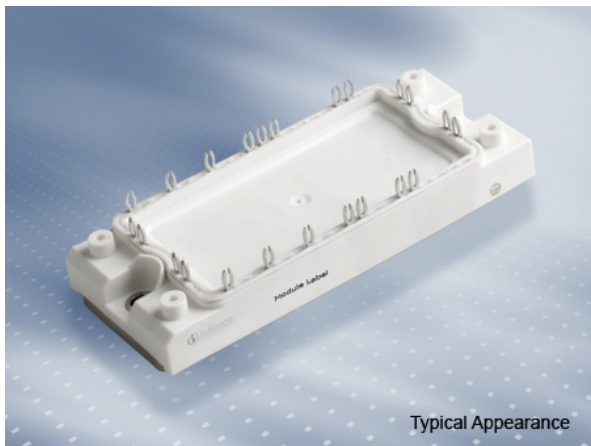


EconoPACK™2 モジュール トレンチ/フィールドストップ IGBT4 and エミッターコントロール4 diode内蔵 and PressFIT

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



$V_{CES} = 1600V$
 $I_{C\ nom} = 180A / I_{CRM} = 360A$

一般応用

- スタティックインバーター
- 空冷
- モーター駆動
- サーボ駆動

Typical Applications

- Auxiliary Inverters
- Air Conditioning
- Motor Drives
- Servo Drives

電気的特性

- $T_{vj\ op} = 150^{\circ}C$

Electrical Features

- $T_{vj\ op} = 150^{\circ}C$

機械的特性

- 低熱インピーダンスの Al_2O_3 DCB
- 高いパワー密度
- 絶縁されたベースプレート
- コンパクトデザイン
- PressFIT 接合 技術
- RoHS対応
- 標準ハウジング

Mechanical Features

- Al_2O_3 Substrate with Low Thermal Resistance
- High Power Density
- Isolated Base Plate
- Compact design
- PressFIT Contact Technology
- RoHS compliant
- 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: CM	date of publication: 2014-06-10	
approved by: RS	revision: 3.0	UL approved (E83335)



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}	1600	V
最大実効順電流/chip Maximum RMS forward current per chip	$T_c = 80^{\circ}\text{C}$	I_{FRMSM}	150	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}	180	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}	1600 1400	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	13000 9500	A^2s A^2s

電気的特性 / Characteristic Values

		min. typ. max.			
順電圧 Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 150\text{ A}$	V_F		1,20	V
しきい値電圧 Threshold voltage	$T_{vj} = 150^{\circ}\text{C}$	V_{TO}		0,83	V
傾き抵抗 Slope resistance	$T_{vj} = 150^{\circ}\text{C}$	r_T		2,30	$\text{m}\Omega$
逆電流 Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1600\text{ V}$	I_R		1,00	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}			0,35 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}		0,165	K/W
動作温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150 $^{\circ}\text{C}$

prepared by: CM	date of publication: 2014-06-10
approved by: RS	revision: 3.0



IGBT-ブレーキチョッパー / IGBT, Brake-Chopper
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	$T_C = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	100 140	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}	200	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}	515	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	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,75 2,05 2,10	2,20	V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 3,55\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		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	0,80		μC
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	7,5		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}	6,30		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}	0,27		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	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,16 0,17 0,17		μs μs μs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,03 0,04 0,04		μs μs μs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,33 0,43 0,45		μs μs μs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,08 0,145 0,17		μs μs μs
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 3000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	5,50 8,50 9,50		mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	5,50 8,50 9,50		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}	360		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}		0,29	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}	0,135		K/W
動作温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	150	$^{\circ}\text{C}$

prepared by: CM	date of publication: 2014-06-10
approved by: RS	revision: 3.0



Diode、ブレーキチョッパー / Diode, Brake-Chopper
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	510	A ² 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	$I_F = 50\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}		54,0 60,0 63,0		A A A
逆回復電荷量 Recovered charge	$I_F = 50\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r		5,50 8,80 10,0		μC μC μC
逆回復損失 Reverse recovery energy	$I_F = 50\text{ A}, -di_F/dt = 2500\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}		1,70 3,00 3,70		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}		0,375		K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

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approved by: RS	revision: 3.0



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
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 ₂ O 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.
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 _{thCH}		0,02	K/W
内部インダクタンス Stray inductance module		L _{sCE}		50	nH
最大ジャンクション温度 Maximum junction temperature	インバータ、ブレーキチョッパー / inverter, brake-chopper 整流器 / rectifier	T _{vj max}			175 °C 150 °C
動作温度 Temperature under switching conditions	インバータ、ブレーキチョッパー / inverter, brake-chopper 整流器 / rectifier	T _{vj op}	-40 -40		150 °C 150 °C
保存温度 Storage temperature		T _{stg}	-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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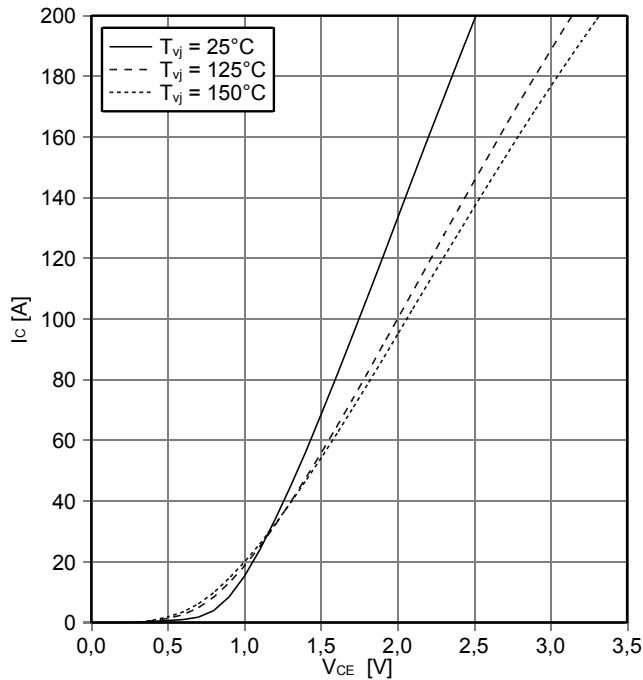


IGBT-モジュール
IGBT-Module

DDB6U180N16RR_B11

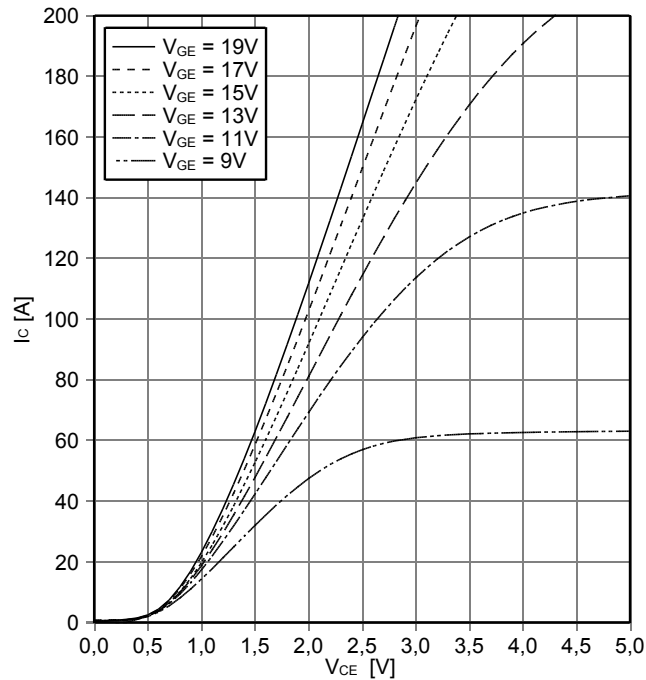
出力特性 IGBT-ブレーキチョッパー (Typical)
output characteristic IGBT, Brake-Chopper (typical)

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



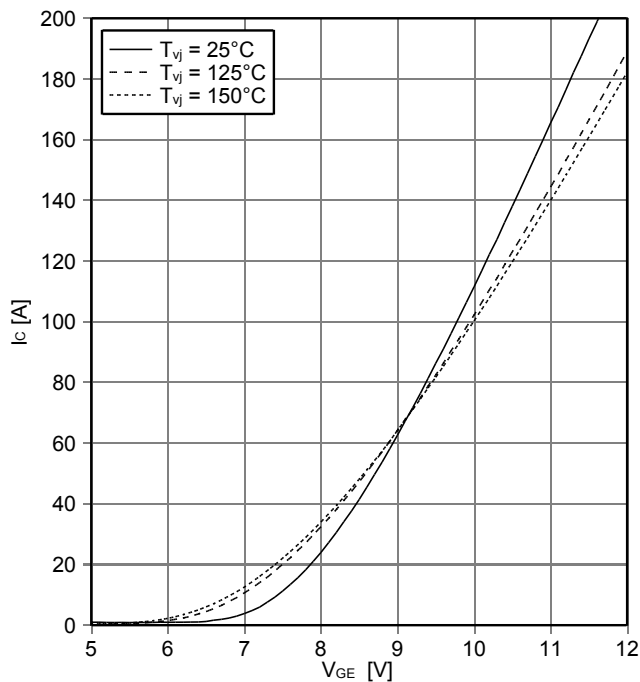
出力特性 IGBT-ブレーキチョッパー (Typical)
output characteristic IGBT, Brake-Chopper (typical)

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



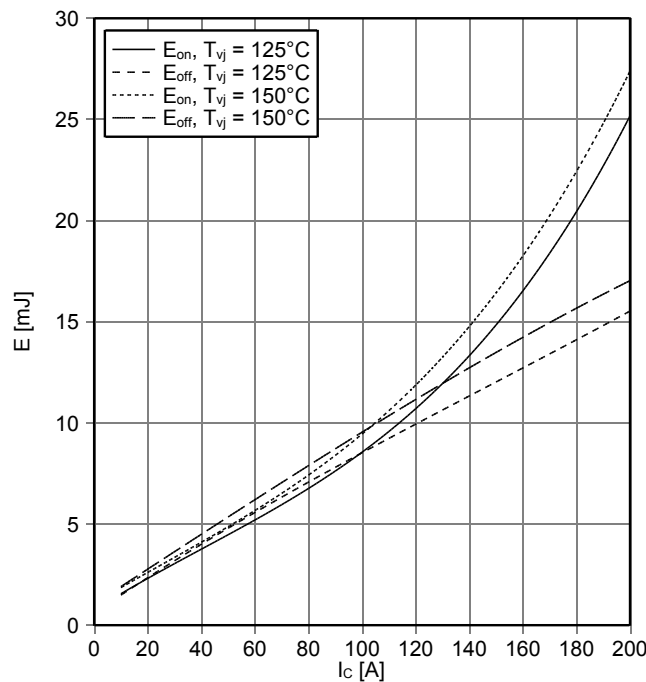
伝達特性 IGBT-ブレーキチョッパー (Typical)
transfer characteristic IGBT, Brake-Chopper (typical)

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



スイッチング損失 IGBT-ブレーキチョッパー (Typical)
switching losses IGBT, Brake-Chopper (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.6\ \Omega$, $R_{Goff} = 1.6\ \Omega$, $V_{CE} = 600\text{ V}$



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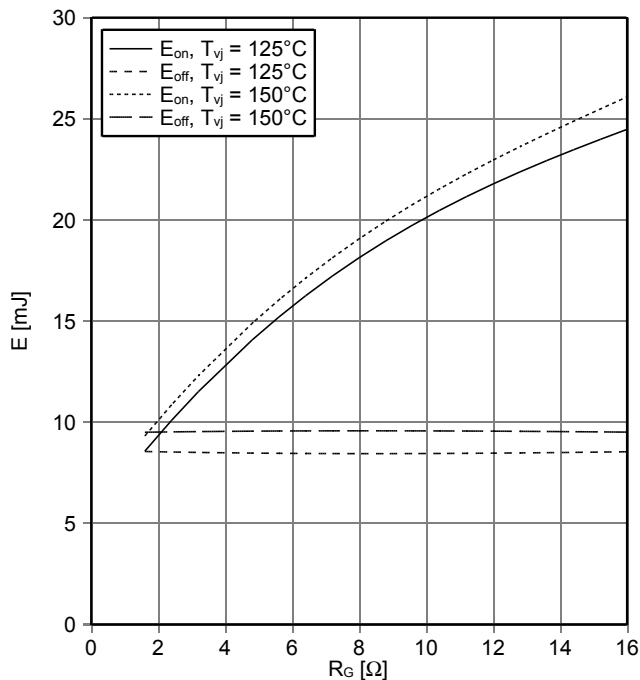
IGBT-モジュール
IGBT-Module

DDB6U180N16RR_B11

スイッチング損失 IGBT-ブレーキチョッパー (Typical)
switching losses IGBT, Brake-Chopper (typical)

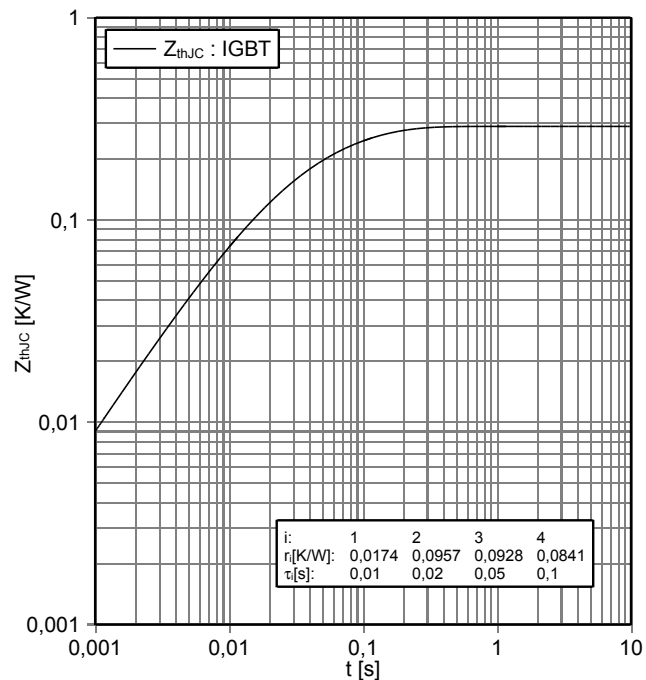
$E_{on} = f(R_G), E_{off} = f(R_G)$

$V_{GE} = \pm 15\text{ V}, I_C = 100\text{ A}, V_{CE} = 600\text{ V}$



過渡熱インピーダンス IGBT-ブレーキチョッパー
transient thermal impedance IGBT, Brake-Chopper

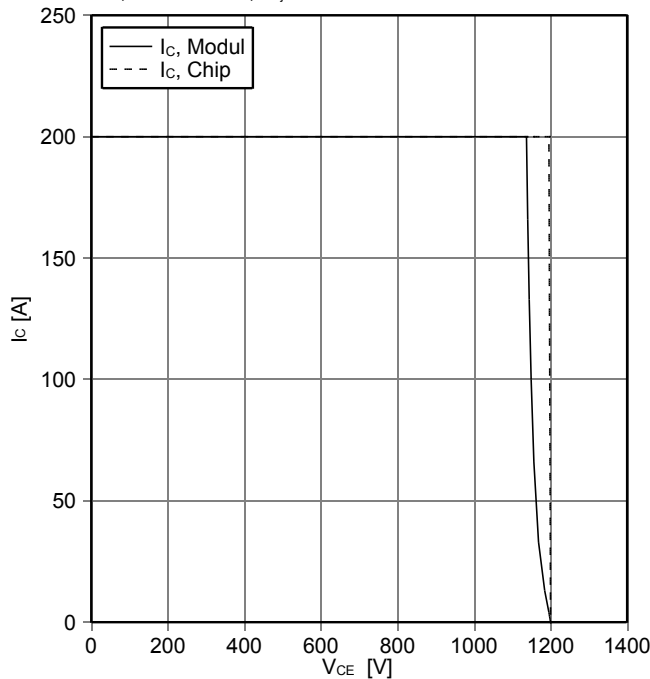
$Z_{thJC} = f(t)$



逆バイアス安全動作領域 IGBT-ブレーキチョッパー (RBSOA)
reverse bias safe operating area IGBT, Brake-Chopper (RBSOA)

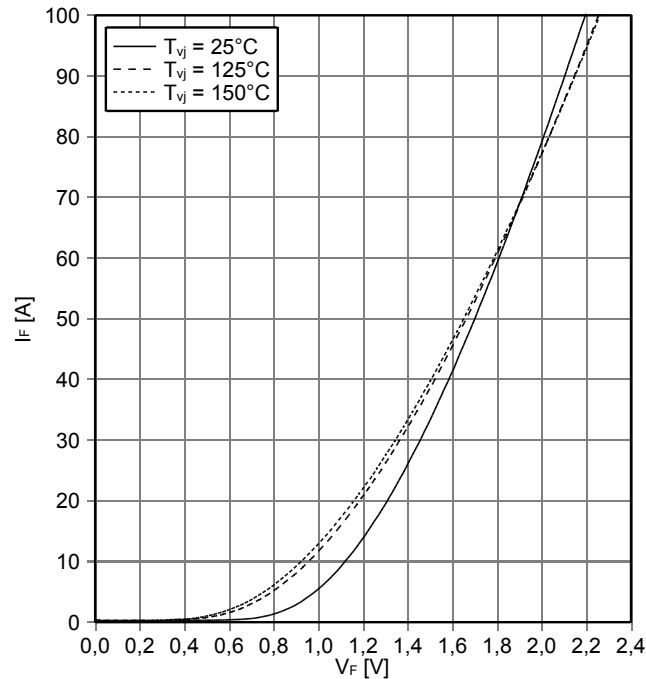
$I_C = f(V_{CE})$

$V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.6\ \Omega, T_{vj} = 150^\circ\text{C}$



順電圧特性 Diode、ブレーキチョッパー (typical)
forward characteristic of Diode, Brake-Chopper (typical)

$I_F = f(V_F)$



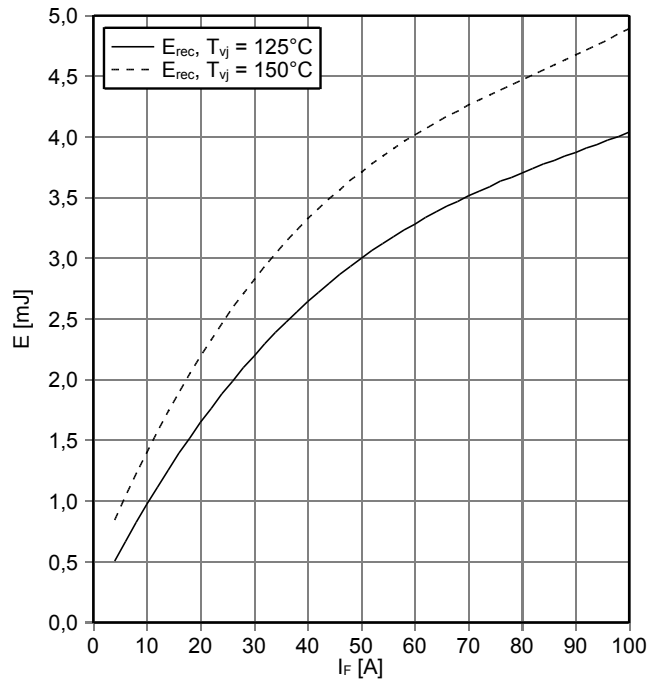
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approved by: RS	revision: 3.0



IGBT-モジュール IGBT-Module **DDB6U180N16RR_B11**

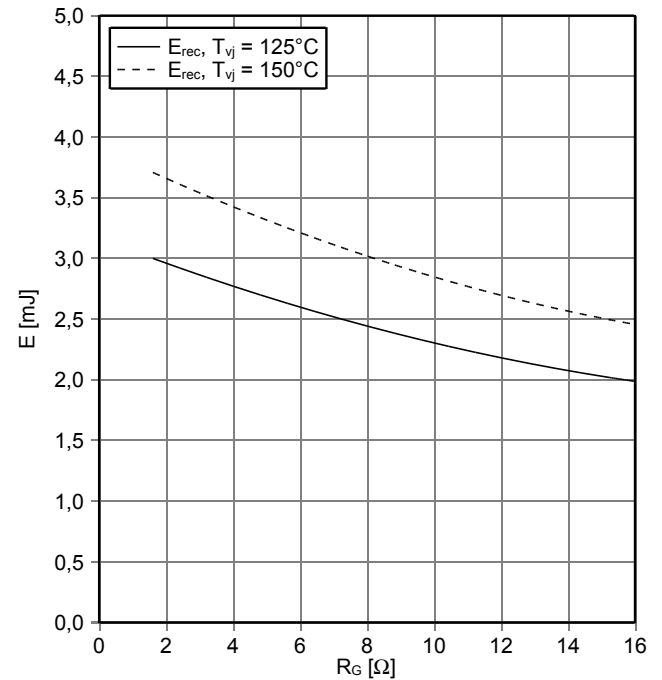
スイッチング損失 Diode、ブレーキチョッパー (Typical)
switching losses Diode, Brake-Chopper (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.6 \Omega, V_{CE} = 600 V$



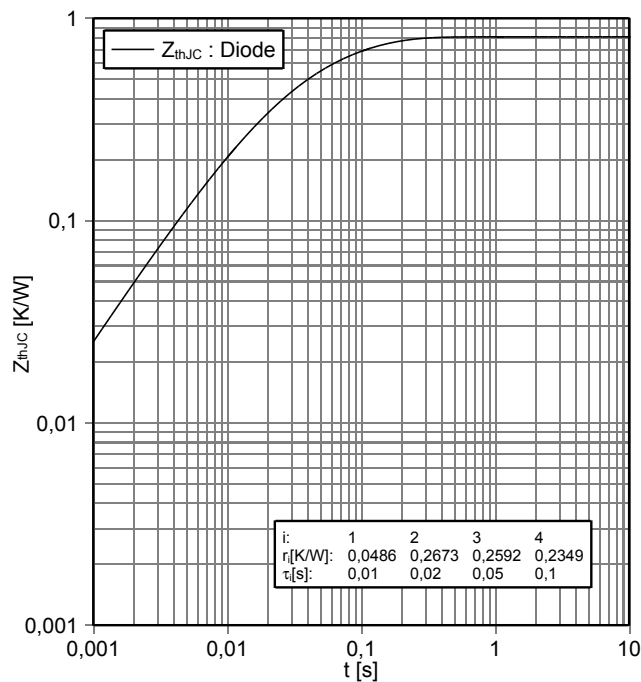
スイッチング損失 Diode、ブレーキチョッパー (Typical)
switching losses Diode, Brake-Chopper (typical)

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



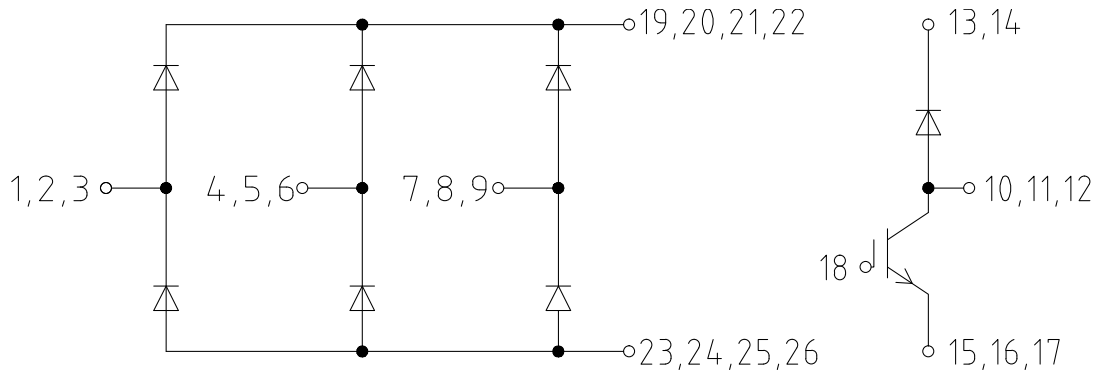
過渡熱インピーダンス Diode、ブレーキチョッパー
transient thermal impedance Diode, Brake-Chopper

$Z_{thJC} = f(t)$

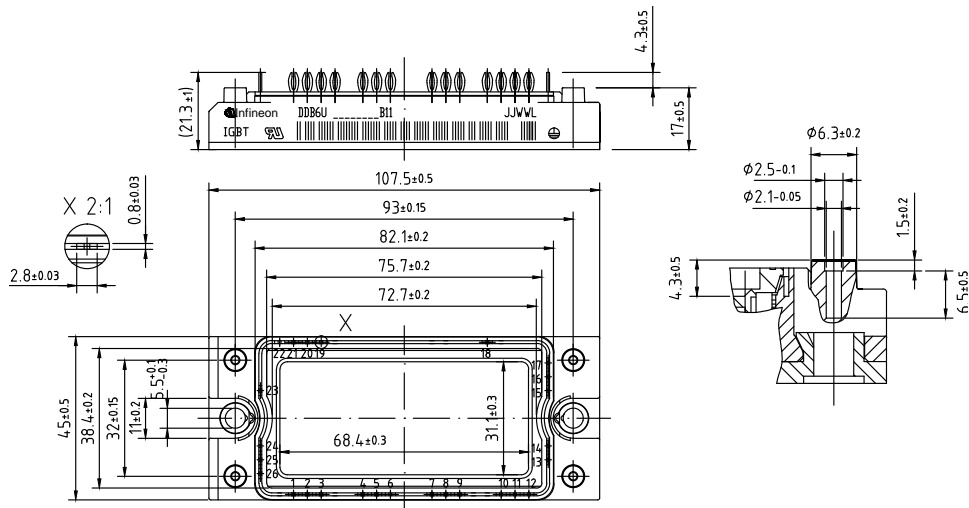


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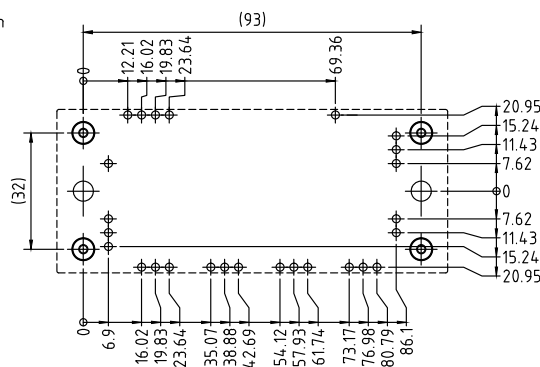
回路図 / circuit_diagram_headline



パッケージ概要 / package outlines



PCB hole pattern



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

prepared by: CM	date of publication: 2014-06-10
approved by: RS	revision: 3.0