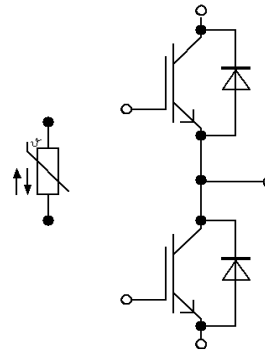
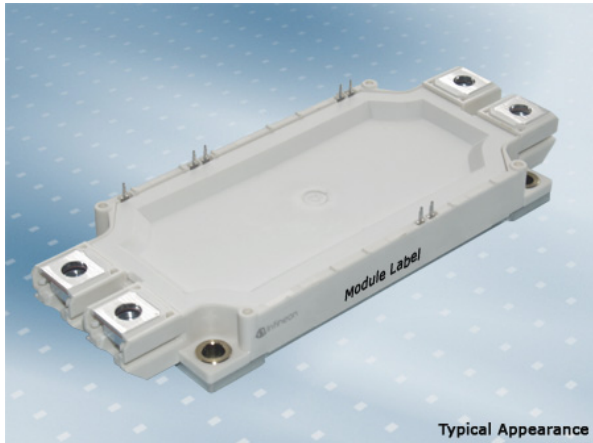


EconoDUAL™3 モジュール トレンチ/フィールドストップ IGBT4 and エミッターコントロール diode内蔵 and PressFIT / NTCサーミスタ

EconoDUAL™3 module with trench/fieldstop IGBT4 and Emitter Controlled Diode and PressFIT / NTC

暫定データ / Preliminary Data



$V_{CES} = 1700V$
 $I_{C\ nom} = 225A / I_{CRM} = 450A$

一般応用

- モーター駆動
- サーボ駆動
- UPSシステム
- 風力タービン

Typical Applications

- Motor Drives
- Servo Drives
- UPS Systems
- Wind Turbines

電気的特性

- 低 V_{CEsat} 飽和電圧
- $T_{vj\ op} = 150^{\circ}C$

Electrical Features

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

機械的特性

- 標準ハウジング

Mechanical Features

- 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



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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	$T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	225 340	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}	450	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	$I_C = 225\text{A}, V_{GE} = 15\text{V}$ $I_C = 225\text{A}, V_{GE} = 15\text{V}$ $I_C = 225\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	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	$I_C = 9,00\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		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	2,35			μC
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	2,8			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}	18,5			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}	0,60			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}			3,0	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	$I_C = 225\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 3,3\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,22 0,25 0,26			μs μs μs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 225\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 3,3\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,08 0,085 0,09			μs μs μs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 225\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 6,2\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,69 0,84 0,88			μs μs μs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 225\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 6,2\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,28 0,54 0,62			μs μs μs
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 225\text{A}, V_{CE} = 900\text{V}, L_S = 35\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 3100\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 3,3\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	51,0 67,5 72,0			mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 225\text{A}, V_{CE} = 900\text{V}, L_S = 35\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 3000\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 6,2\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	45,5 73,5 83,5			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}	1100			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}			0,099	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}			0,029	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	225	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	450	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	8300	A^2s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 225\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 225\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 225\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	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	$I_F = 225\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	320 375 385		A A A
逆回復電荷量 Recovered charge	$I_F = 225\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	57,0 97,0 110		μC μC μC
逆回復損失 Reverse recovery energy	$I_F = 225\text{ A}, -di_F/dt = 3100\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	32,5 60,5 69,0		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}		0,16	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}	0,047		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 _{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 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		14,5 13,0		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		12,5 10,0		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}	0,009		K/W
内部インダクタンス Stray inductance module		L _{sCE}	20		nH
パワーターミナル・チップ間抵抗 Module lead resistance, terminals - chip	T _C = 25°C, /スイッチ / per switch	R _{CC+EE'}	1,10		mΩ
保存温度 Storage temperature		T _{stg}	-40	150	°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
主端子ネジ締め付けトルク Terminal connection torque	取り付けネジ M6 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 M6 - Mounting according to valid application note	M	3,0	-	6,0 Nm
質量 Weight		G	345		g

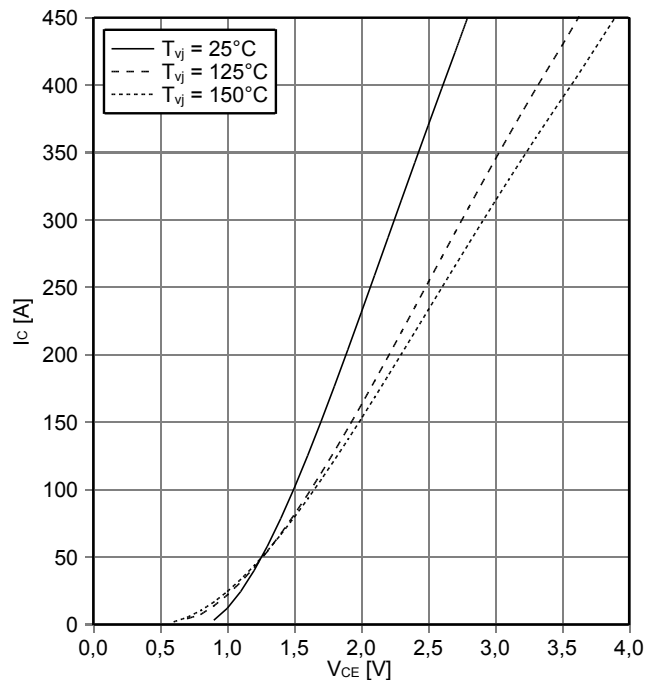
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暫定データ
Preliminary Data

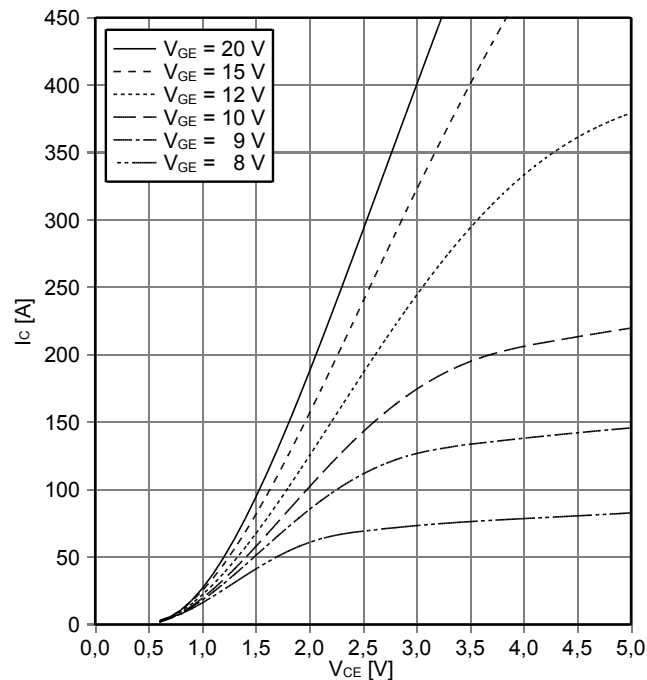
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



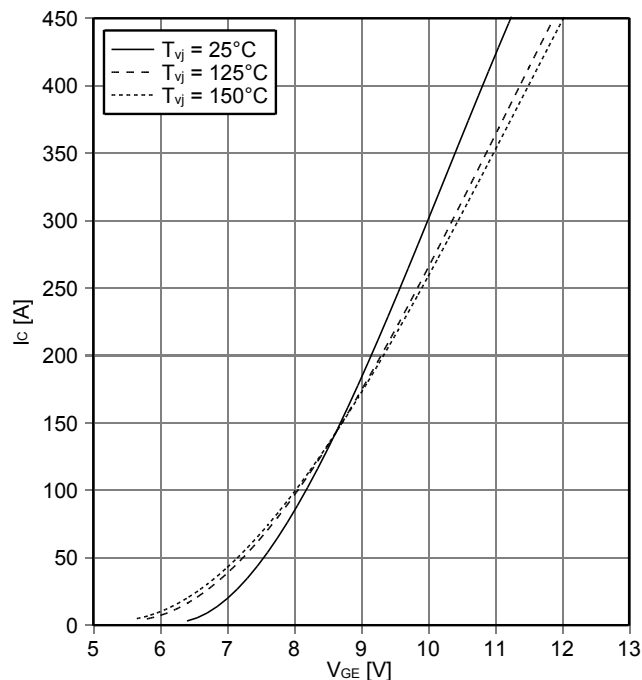
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



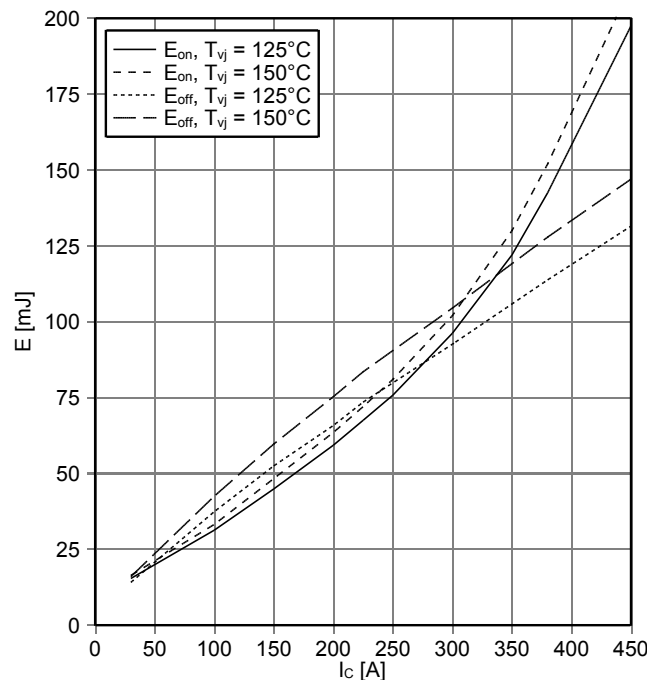
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 3.3\ \Omega$, $R_{Goff} = 6.2\ \Omega$, $V_{CE} = 900\text{ V}$



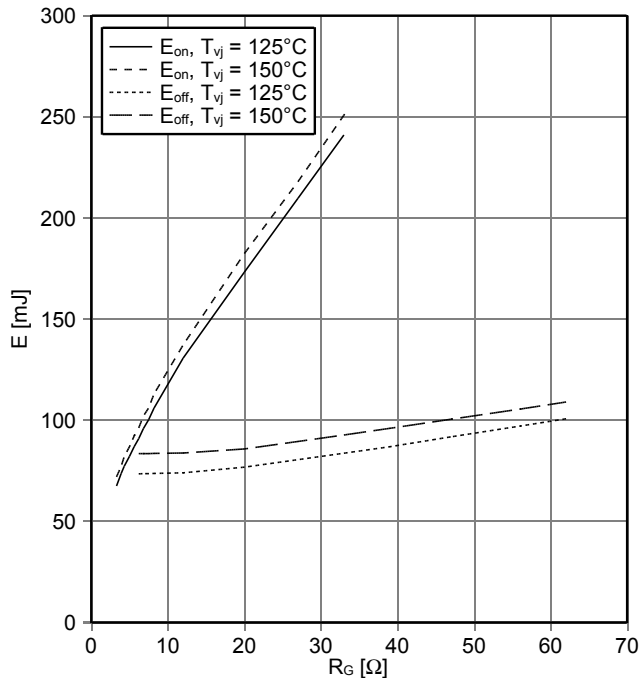
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暫定データ
Preliminary Data

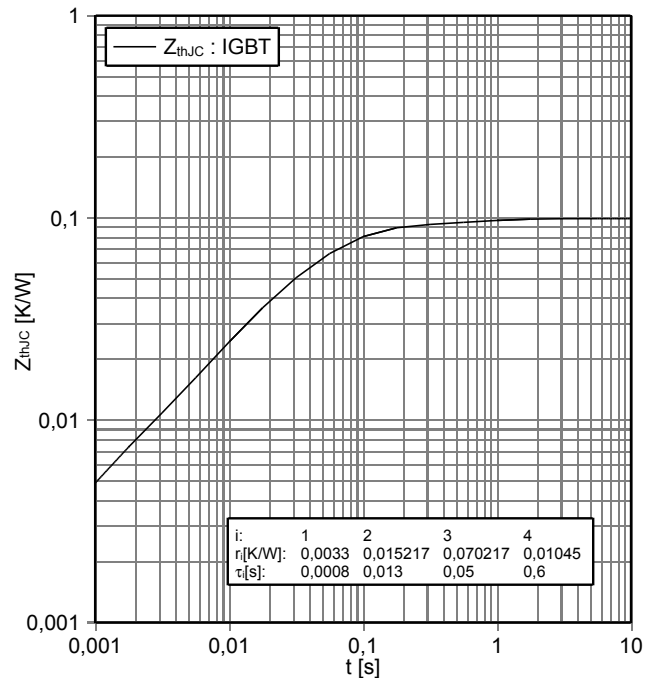
スイッチング損失 IGBT- インバータ (Typical)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 225\text{ A}$, $V_{CE} = 900\text{ V}$



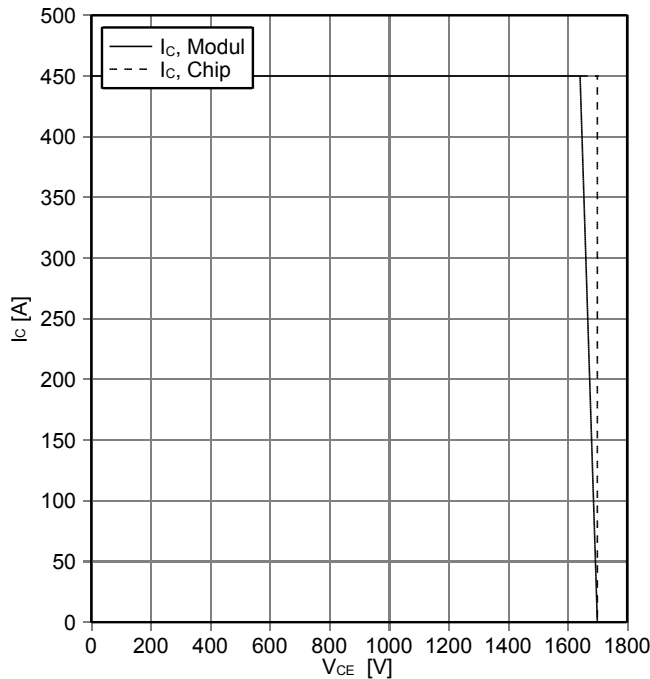
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



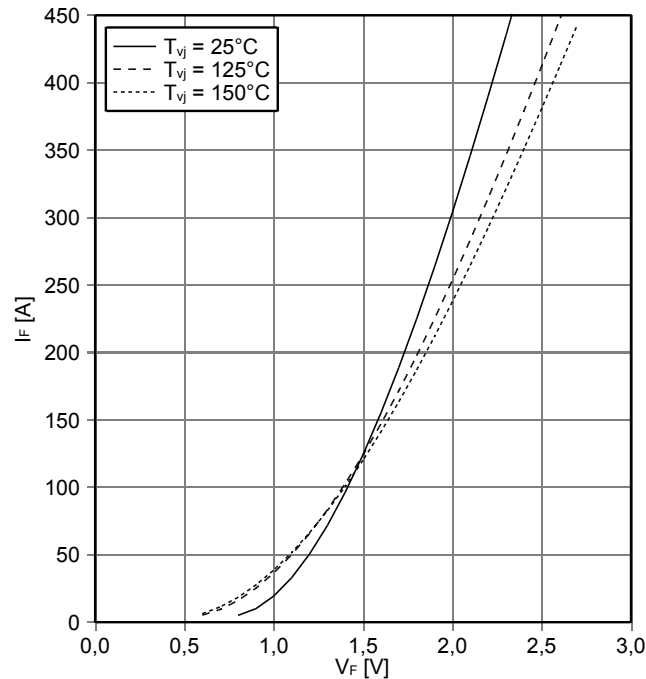
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.2\ \Omega$, $T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



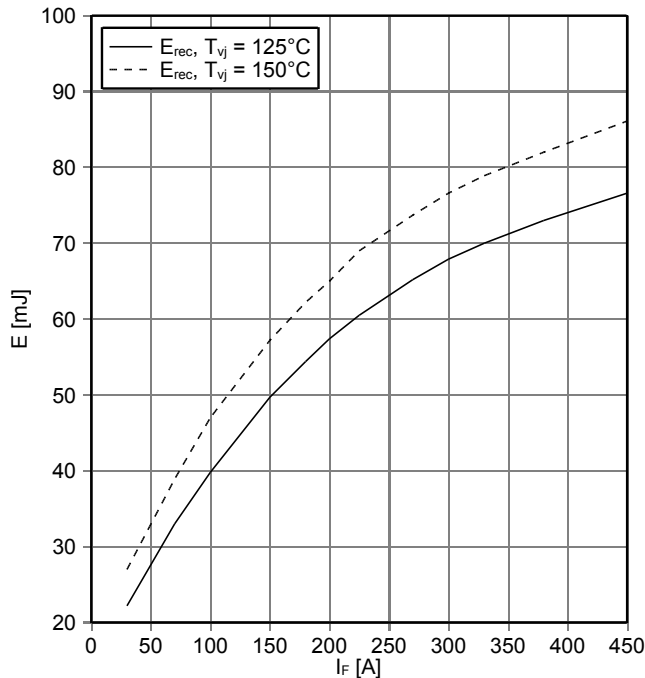
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暫定データ
Preliminary Data

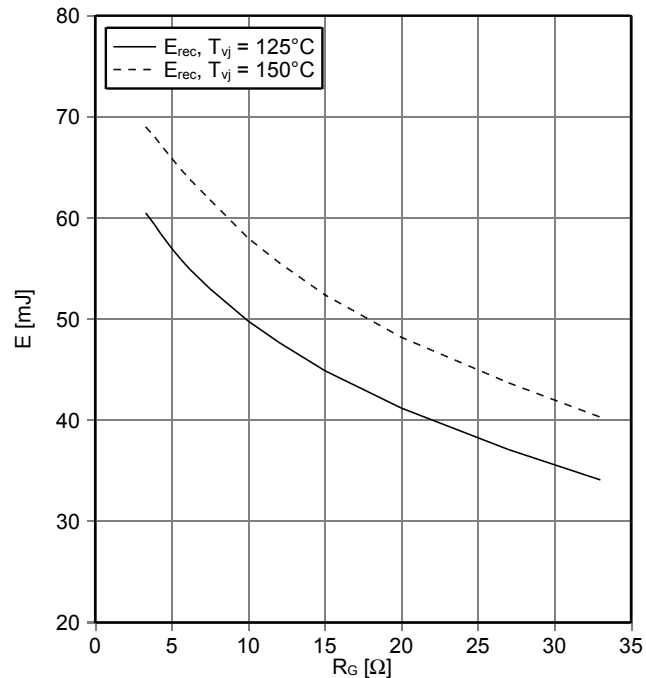
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 3.3 \Omega, V_{CE} = 900 V$



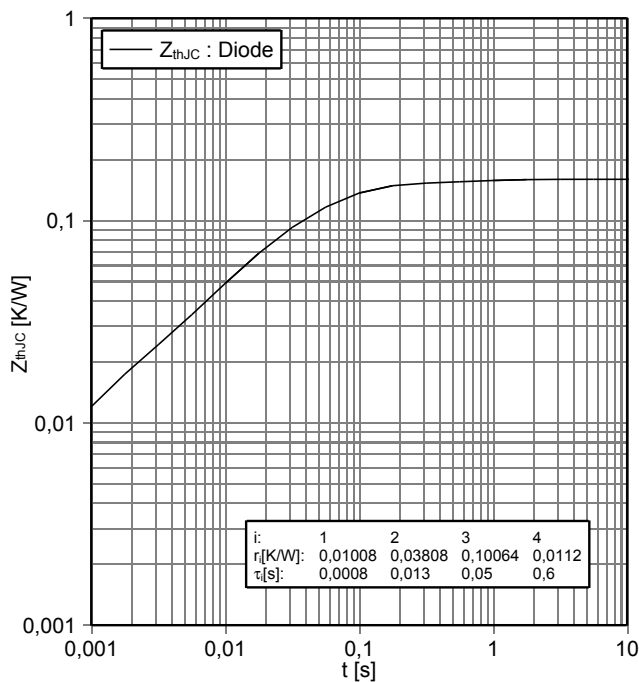
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 225 A, V_{CE} = 900 V$



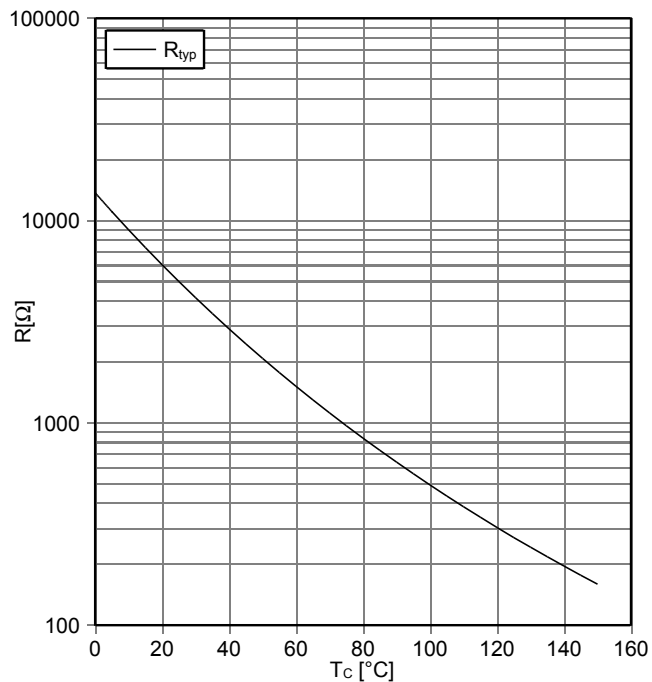
過渡熱インピーダンス Diode、インバータ
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



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

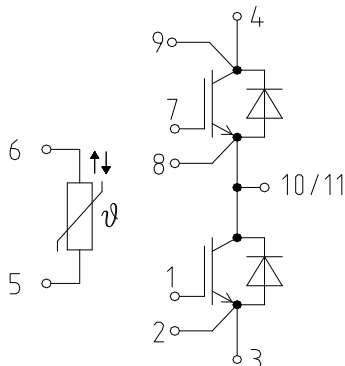
$R = f(T)$



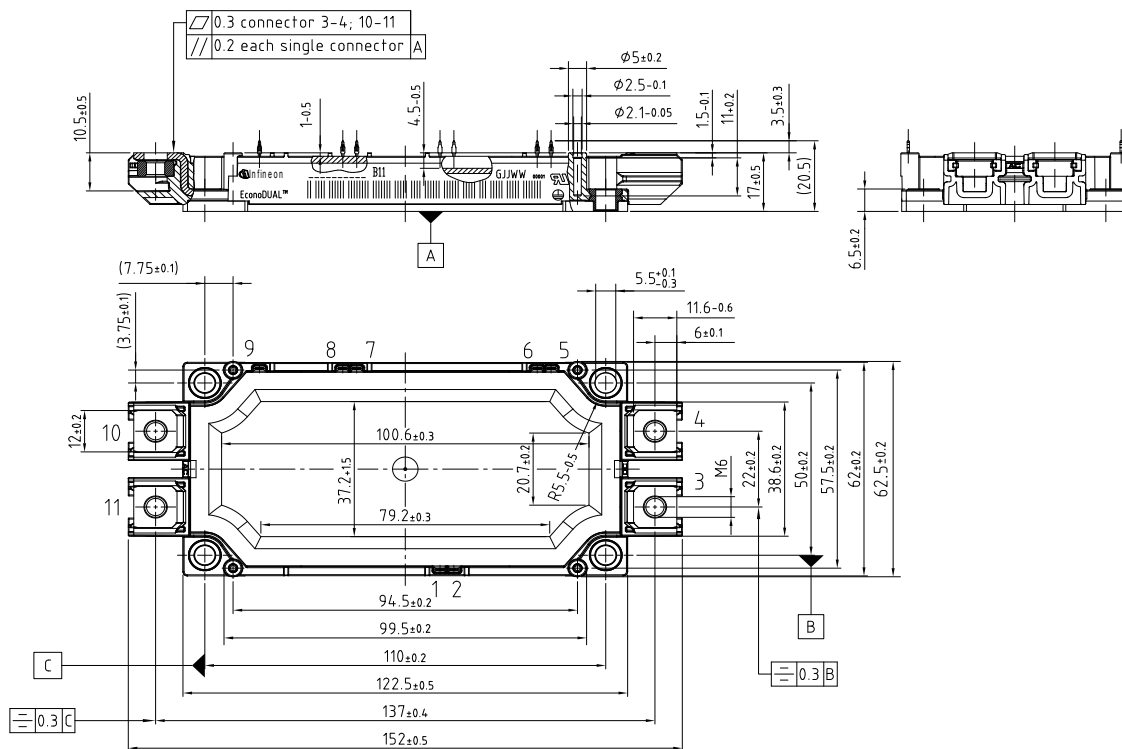
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暫定データ
Preliminary Data

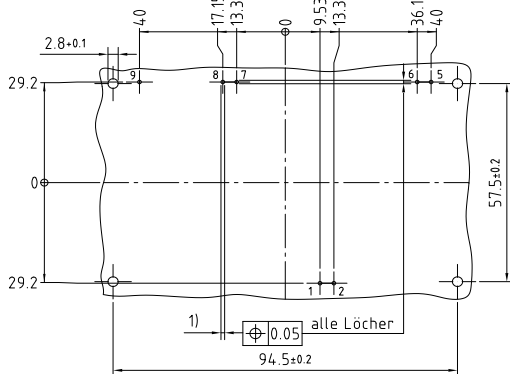
回路図 / circuit_diagram_headline



パッケージ概要 / package outlines



Leiterplatten-Lochbild / PCB drillhole pattern



- 1) $\phi 1.00_{-0.06}^{+0.09}$ Durchmesser des metallierten Loches
- $\phi 1.00_{-0.06}^{+0.09}$ Diameter of finished plated-through hole
- $\phi 1.15$ Bohrungsdurchmesser des Loches
- $\phi 1.15$ Diameter of drilled hole

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