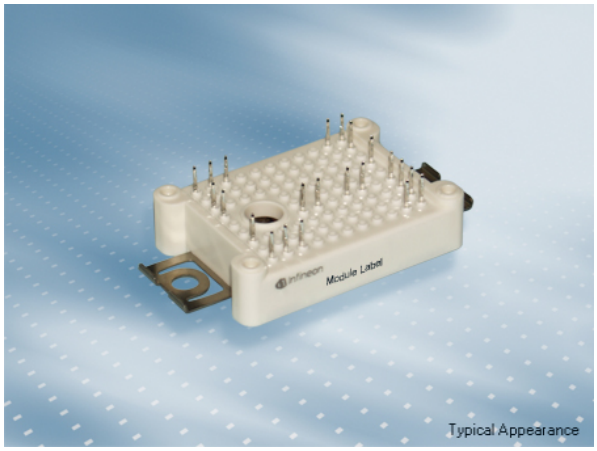
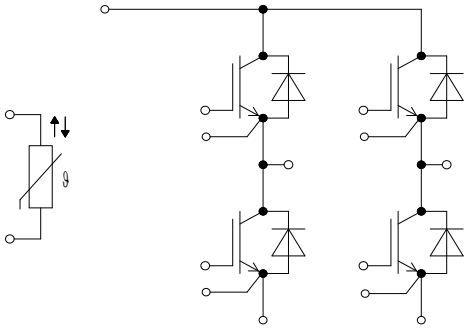
テクニカルインフォメーション / Technical Information

IGBT-モジュール
IGBT-modules

F4-50R07W1H3_B11A

EasyPACK モジュール and PressFIT / NTCサーミスタ
EasyPACK module and PressFIT / NTC





V_{CES} = 650V
$I_{C\ nom}$ = 25A / I_{CRM} = 50A

一般応用
- 車載用アプリケーション
- 高周波スイッチングアプリケーション
- ja
- スタティックインバーター
- ハイブリッド自動車
- 誘導加熱　and　溶接

Typical Applications
- Automotive Applications
- High Frequency Switching Application
- DC/DC converter
- Auxiliary Inverters
- Hybrid Electrical Vehicles (H)EV
- Inductive Heating and Welding

電気的特性
- 650Vに増加したブロッキング電圧
- 高速IGBT H3
- 低インダクタンスデザイン
- 低スイッチング損失
- 低 V_{CEsat} 飽和電圧

Electrical Features
- Increased blocking voltage capability to 650V
- High Speed IGBT H3
- Low inductive design
- Low Switching Losses
- Low V_{CEsat}

機械的特性
- 2.5 kV AC 1分　絶縁耐圧
- 長い縁面/空間距離
- PressFIT 接合 技術
- RoHS対応
- 固定用クランプによる強固なマウンティング

Mechanical Features
- 2.5 kV AC 1min Insulation
- High Creepage and Clearance Distances
- PressFIT Contact Technology
- RoHS compliant
- Rugged mounting due to integrated mounting clamps

Module Label Code

Barcode Code 128

Sample
00000123456000000000000

DMX - 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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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°C	V_{CES}	650	V
コレクタ電流 Implemented collector current		I_{CN}	50	A
連続DCコレクタ電流 Continuous DC collector current	T_C = 130°C, $T_{vj\,max}$ = 175°C T_C = 25°C, $T_{vj\,max}$ = 175°C	$I_{C\,nom}$ I_C	25 55	A A
繰り返しピークコレクタ電流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	100	A
トータル損失 Total power dissipation	T_C = 25°C, $T_{vj\,max}$ = 175°C	P_{tot}	200	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 = 25 A, V_{GE} = 15 V I_C = 25 A, V_{GE} = 15 V I_C = 25 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,50 1,55 1,60	1,85	V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	I_C = 0,80 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	4,9	5,8	6,5	V
ゲート電荷量 Gate charge	V_{GE} = -15 V ... +15 V		Q_G		0,50		µC
内蔵ゲート抵抗 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		0,0		Ω
入力容量 Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		3,25		nF
帰還容量 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		0,09		nF
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	V_{CE} = 650 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			0,05	mA
ゲート・エミッタ間漏れ電流 Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°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 = 25 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,02 0,02 0,02		µs µs µs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	I_C = 25 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Gon} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,01 0,011 0,012		µs µs µs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	I_C = 25 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		0,15 0,18 0,19		µs µs µs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	I_C = 25 A, V_{CE} = 300 V V_{GE} = ±15 V R_{Goff} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,007 0,011 0,013		µs µs µs
ターンオンスイッチング損失 Turn-on energy loss per pulse	I_C = 25 A, V_{CE} = 300 V, L_S = 25 nH V_{GE} = ±15 V, di/dt = 2300 A/µs (T_{vj} = 150°C) R_{Gon} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		0,21 0,32 0,35		mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	I_C = 25 A, V_{CE} = 300 V, L_S = 25 nH V_{GE} = ±15 V, du/dt = 4800 V/µs (T_{vj} = 150°C) R_{Goff} = 6,8 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		0,22 0,35 0,38		mJ mJ mJ
短絡電流 SC data	V_{GE} ≤ 15 V, V_{CC} = 360 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 4 µs, T_{vj} = 150°C	I_{SC}		280		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	0,75	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 λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,75		K/W
動作温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°C

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°C	V_{RRM}		650		V
連続DC電流 Continuous DC forward current		I_F		25		A
ピーク繰返し順電流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}		50		A
電流二乗時間積 I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I²t		50,0		A²s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	I_F = 25 A, V_{GE} = 0 V, T_{vj} = 25°C I_F = 25 A, V_{GE} = 0 V, T_{vj} = 125°C I_F = 25 A, V_{GE} = 0 V, T_{vj} = 150°C	V_F		1,65 1,60 1,55	2,15	V V V
ピーク逆回復電流 Peak reverse recovery current	I_F = 25 A, - di_F/dt = 2300 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 300 V, T_{vj} = 125°C V_{GE} = -15 V, T_{vj} = 150°C	I_{RM}		35,0 40,0 41,0		A A A
逆回復電荷量 Recovered charge	I_F = 25 A, - di_F/dt = 2300 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 300 V, T_{vj} = 125°C V_{GE} = -15 V, T_{vj} = 150°C	Q_r		0,96 1,60 1,75		µC µC µC
逆回復損失 Reverse recovery energy	I_F = 25 A, - di_F/dt = 2300 A/µs (T_{vj}=150°C), T_{vj} = 25°C V_R = 300 V, T_{vj} = 125°C V_{GE} = -15 V, T_{vj} = 150°C	E_{rec}		0,21 0,35 0,39		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}		1,25	1,45	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 λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		0,95		K/W
動作温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°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°C	R_{25}		5,00		kΩ
R100の偏差 Deviation of R100	T_C = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
損失 Power dissipation	T_C = 25°C	P_{25}			20,0	mW
B-定数 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/50}$		3375		K
B-定数 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/80}$		3411		K
B-定数 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/100}$		3433		K

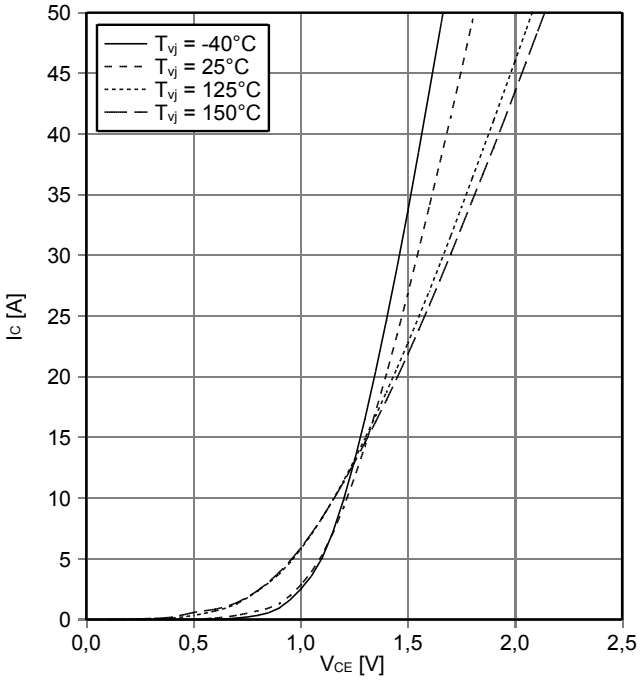
適切なアプリケーションノートによる仕様
Specification according to the valid application note.

モジュール / Module

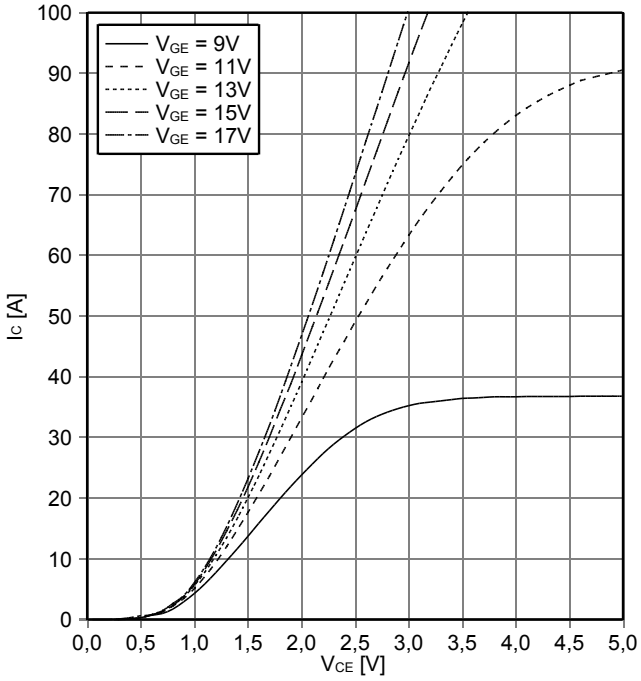
絶縁耐圧 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		2,5		kV
内部絶縁 Internal isolation	基礎絶縁 (クラス1, IEC 61140) basic insulation (class 1, IEC 61140)			impr.Al_2O_3		
沿面距離 Creepage distance	連絡方法 - ヒートシンク / terminal to heatsink 連絡方法 - 連絡方法 / terminal to terminal			11,5 6,3		mm
空間距離 Clearance	連絡方法 - ヒートシンク / terminal to heatsink 連絡方法 - 連絡方法 / terminal to terminal			10,0 5,0		mm
相対トラッキング指数 Comperative tracking index		CTI		> 200		
			min.	typ.	max.	
内部インダクタンス Stray inductance module		L_{sCE}		15		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	$R_{CC'+EE'}$		5,50		mΩ
保存温度 Storage temperature		T_{stg}	-40		125	°C
Anpresskraft für mech. Bef. pro Feder mountig force per clamp		F	20	-	50	N
質量 Weight		G		24		g

Der Strom im Dauerbetrieb ist auf 25 A effektiv pro Anschlusspin begrenzt.
The current under continuous operation is limited to 25 A rms per connector pin.
VGE muss im Kurzschluss auf 15V begrenzt werden (z.B. Klemmschaltung).
VGE has to be limited to 15V during shortcircuit (e.g. clamping).

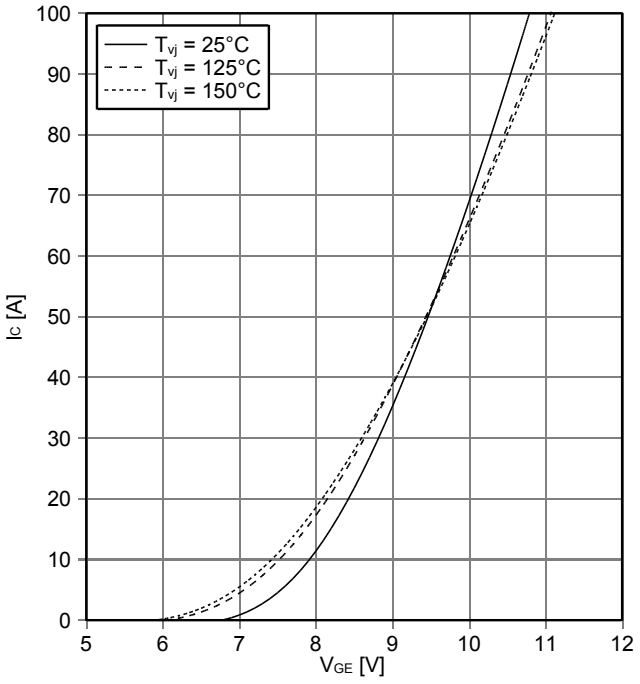
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



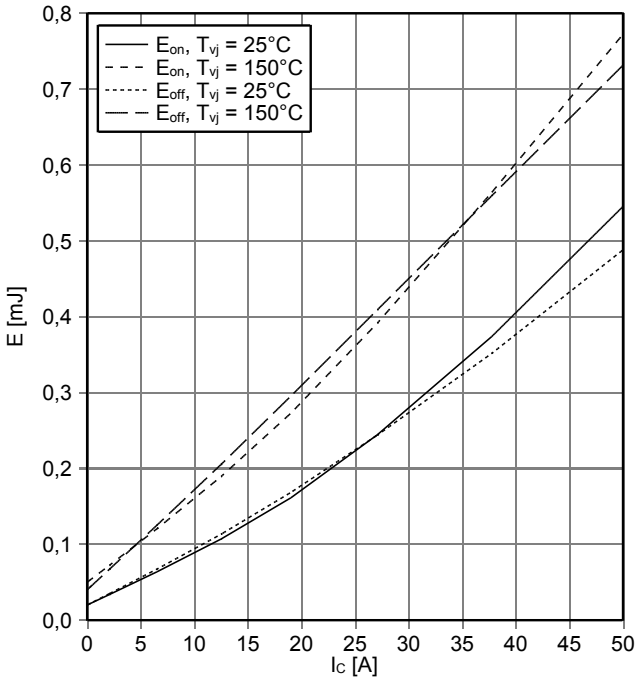
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 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} = ±15 V, R_{Gon} = 6.8 Ω, R_{Goff} = 6.8 Ω, V_{CE} = 300 V



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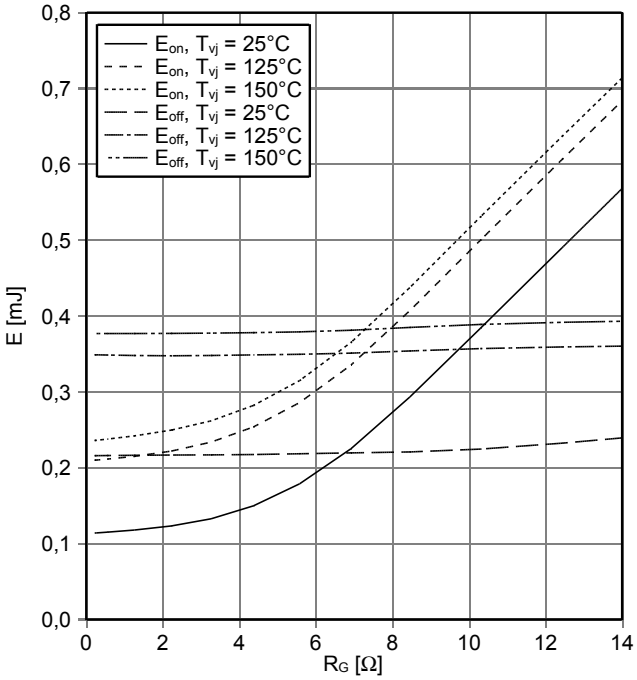
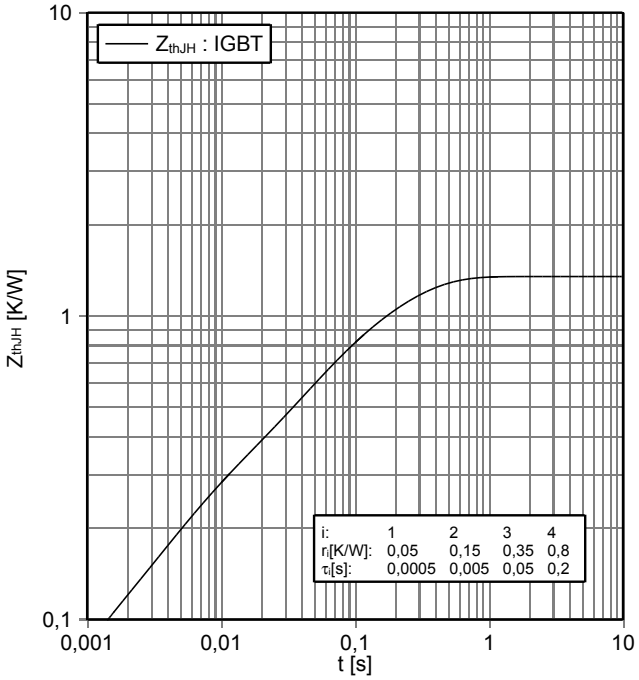
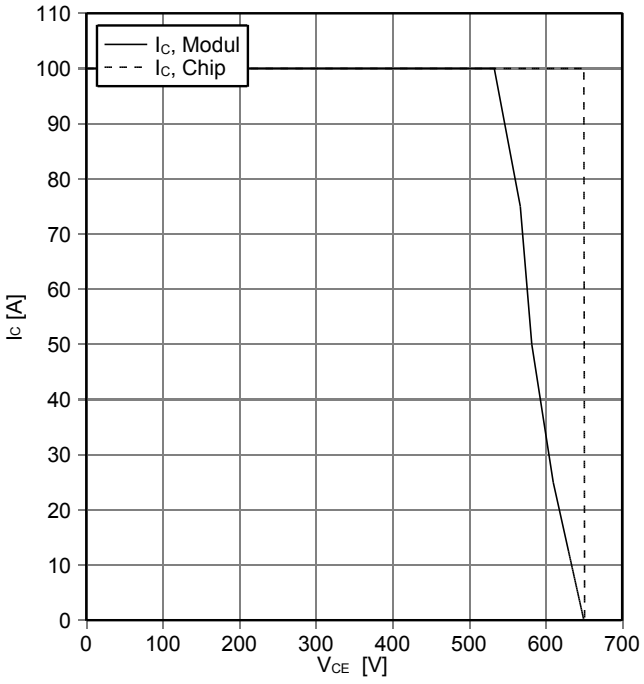
スイッチング損失 IGBT- インバータ (Typical)
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, I_C = 25 A, V_{CE} = 300 V



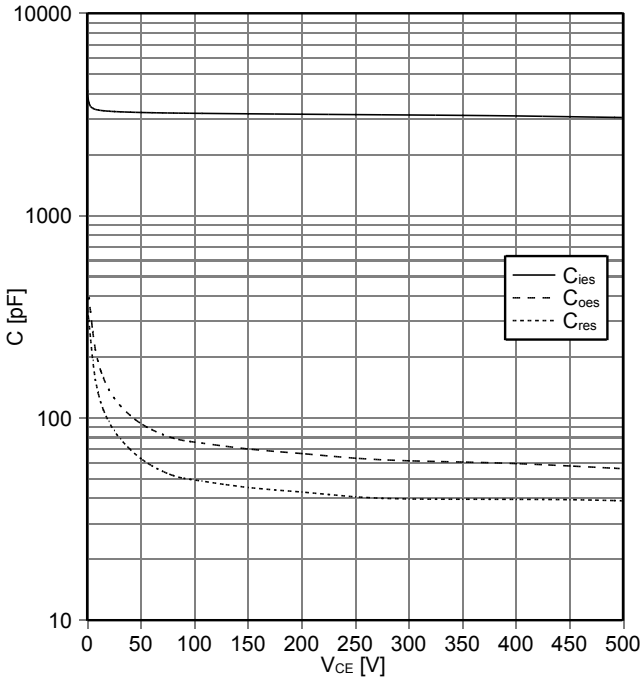
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT,Inverter
$Z_{thJH} = f(t)$



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} = ±15 V, R_{Goff} = 6.8 Ω, T_{vj} = 150°C



容量特性 IGBT- インバータ (Typical)
capacity charcteristic IGBT,Inverter (typical)
$C = f(V_{CE})$
V_{GE} = 0 V, T_{vj} = 25°C, f = 1MHz



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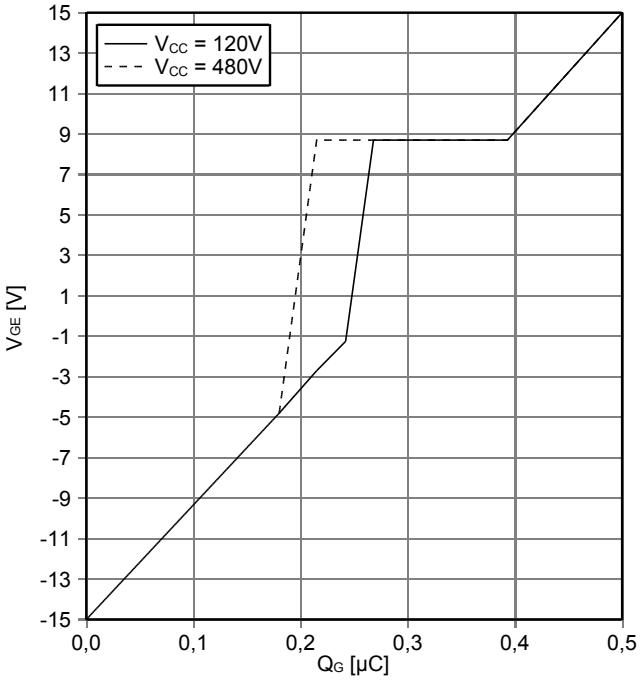
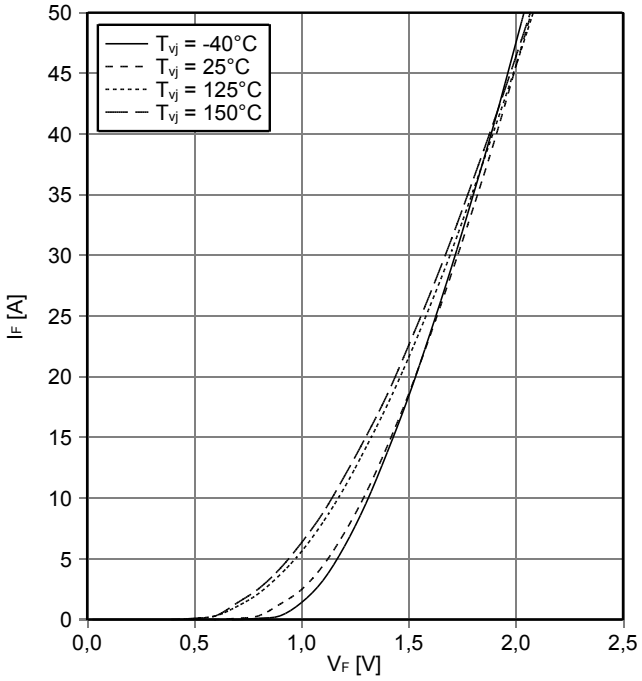
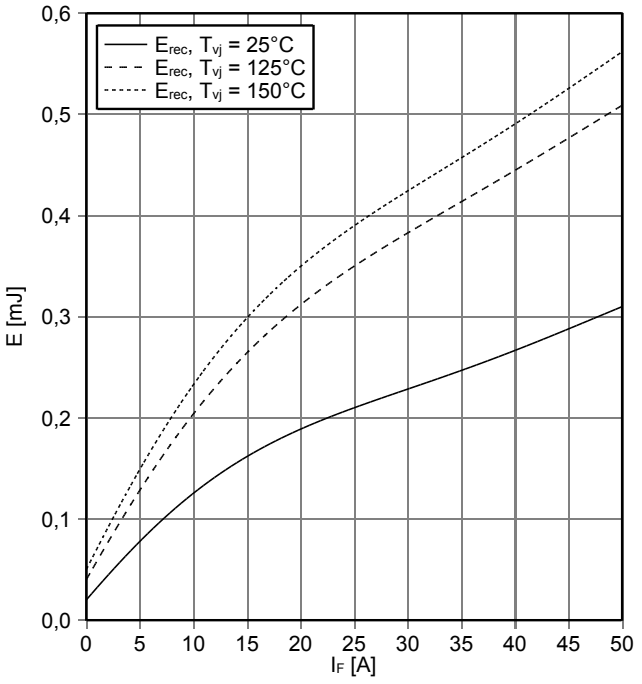
ゲート充電特性 IGBT- インバータ (典型)
gate charge characteristic IGBT,Inverter (typical)
$V_{GE} = f(Q_G)$
I_C = 25 A, T_{vj} = 25°C



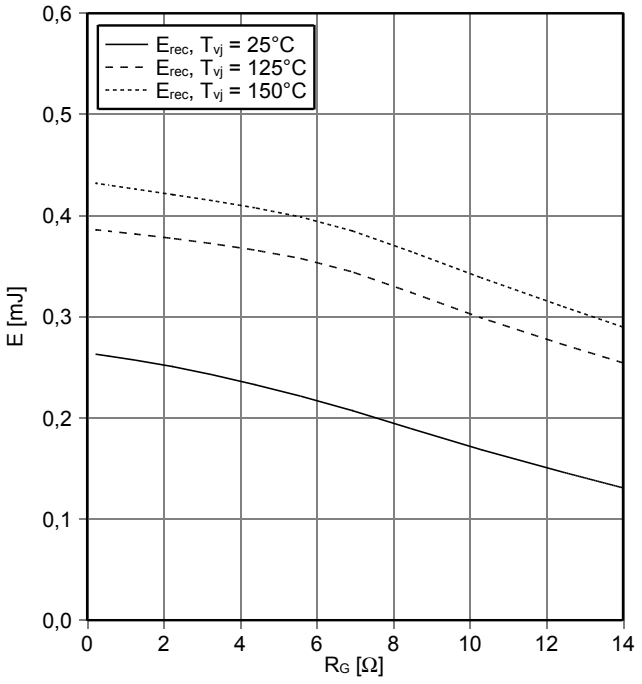
順電圧特性 Diode、インバータ (typical)
forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



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} = 6.8 Ω, 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 = 25 A, V_{CE} = 300 V



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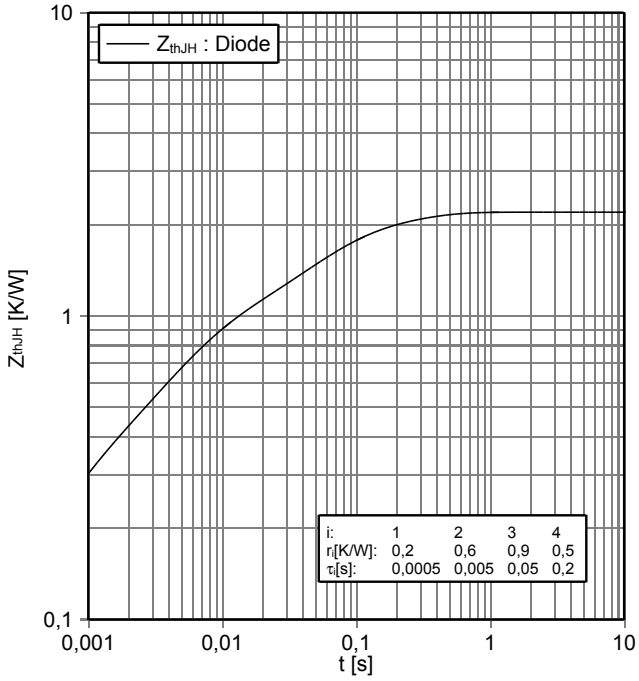
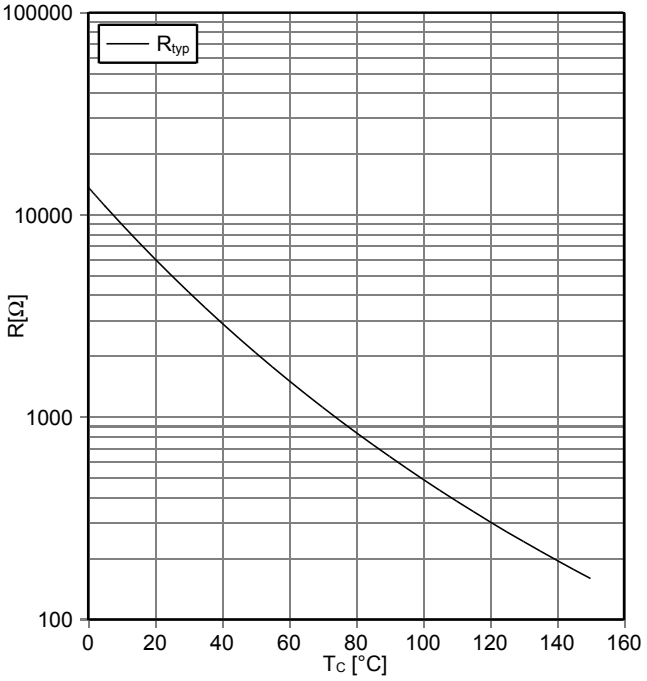
過渡熱インピーダンス Diode、インバータ
transient thermal impedance Diode, Inverter
$Z_{thJH} = f(t)$



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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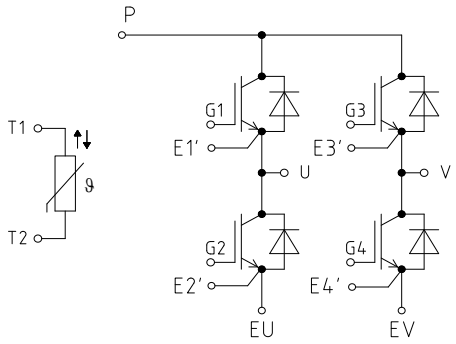
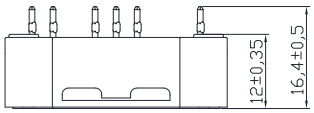
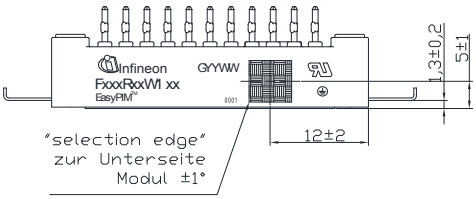
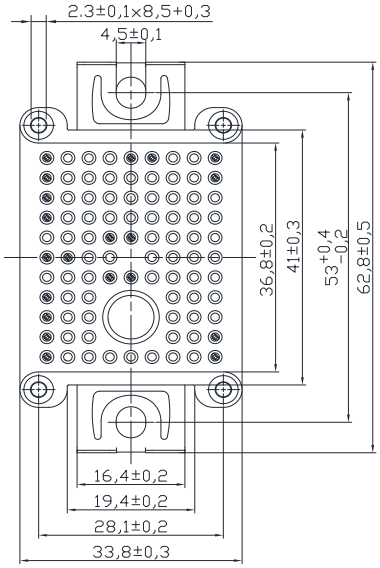
回路図 / circuit_diagram_headline

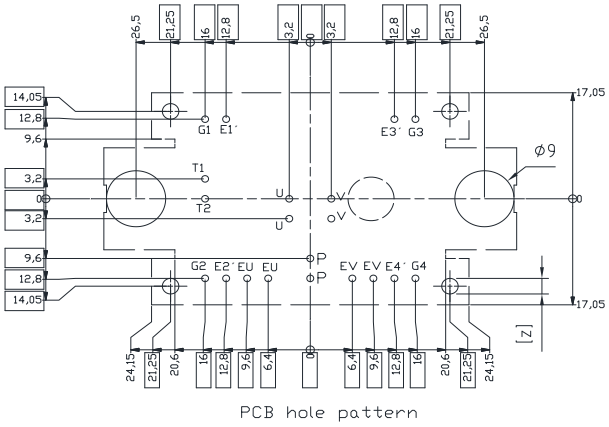


パッケージ概要 / package outlines









PCB hole pattern

-Pin-Grid 3,2mm
-Tolerance of PCB hole pattern ⌖ 0,1 24x
-Hole specifiaction for contacts see application note EASY PressFIT
-Diameters of drill Ø1,15mm
and copper thickness in hole 25-50 µm
-[z] recommanded diameter of PCB positioning guiding holes Ø2,8mm

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