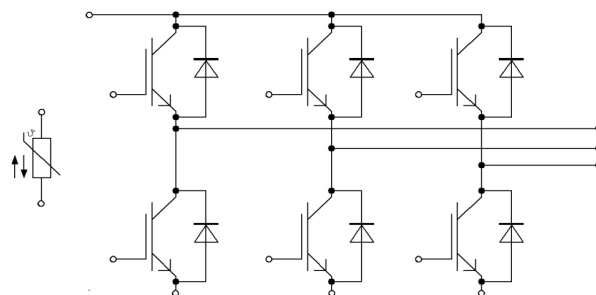
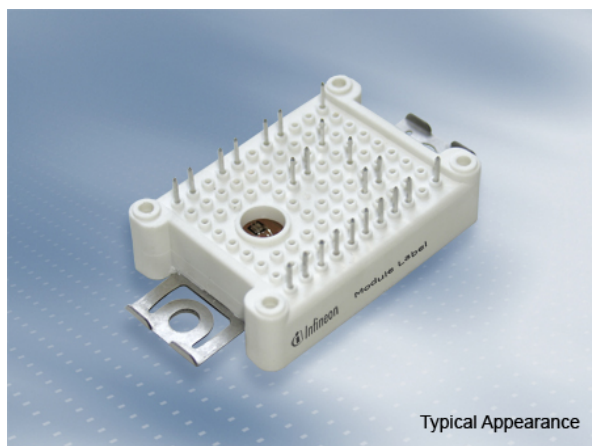


EasyPACK™ モジュール TRENCHSTOP™ IGBT7とエミッターコントロール 7 ダイオード内蔵 とNTCサーミスタ
 EasyPACK™ module with TRENCHSTOP™ IGBT7 and Emitter Controlled 7 diode and NTC

暫定データ / Preliminary Data



$V_{CES} = 1200V$
 $I_{C\ nom} = 25A / I_{CRM} = 50A$

アプリケーションの可能性

- UPSシステム
- サーボ駆動
- モーター駆動
- 空調
- 補助インバーター

Potential Applications

- UPS systems
- Servo drives
- Motor drives
- Air conditioning
- Auxiliary inverters

電気的特性

- トレンチ IGBT 7
- 低 V_{CEsat} 飽和電圧
- 最大175° c の過負荷動作

Electrical Features

- Trenchstop™ IGBT7
- Low V_{CEsat}
- Overload operation up to 175°C

機械的特性

- 2.5 kV AC 1分 絶縁耐圧
- コンパクトデザイン
- 低熱インピーダンスの Al_2O_3 DCB
- 半田接合技術
- 高いパワー密度

Mechanical Features

- 2.5 kV AC 1min insulation
- Compact design
- Al_2O_3 substrate with low thermal resistance
- Solder contact technology
- High power density

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

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	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	I_{CDC}	25	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}	50	A
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	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,60 1,74 1,82	t.b.d. V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 0,525\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,15 5,80 6,45	V
ゲート電荷量 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		Q_G	0,395	μC
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,0	Ω
入力容量 Input capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	4,77	nF
帰還容量 Reverse transfer capacitance	$f = 100\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}	0,017	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}		0,0056 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	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,035 0,036 0,043	μs μs μs
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,021 0,026 0,031	μs μs μs
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,19 0,26 0,38	μs μs μs
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,19 0,27 0,29	μs μs μs
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 35\text{ nH}$ $di/dt = 650\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	1,78 2,57 3,18	mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 25\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 35\text{ nH}$ $du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 6,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	1,68 2,67 3,20	mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 8\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$ $t_P \leq 7\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	I_{SC}	80 75	A A
ジャンクション・ヒートシンク間熱抵抗 Thermal resistance, junction to heatsink	IGBT部 (1素子当り) / per IGBT		R_{thJH}	1,44	K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	175 $^{\circ}\text{C}$

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	35	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	50	A
電流二乗時間積 I^2t - value	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 175^{\circ}\text{C}$	I^2t	150 140	A^2s A^2s

電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 35 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		1,72	t.b.d.	V
	$I_F = 35 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	V_F	1,59		V
	$I_F = 35 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		1,52		V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 35 \text{ A}, -di_F/dt = 750 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		22,5		A
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	I_{RM}	29,8		A
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		33,8		A
逆回復電荷量 Recovered charge	$I_F = 35 \text{ A}, -di_F/dt = 750 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		2,84		μC
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	Q_r	5,22		μC
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		6,84		μC
逆回復損失 Reverse recovery energy	$I_F = 35 \text{ A}, -di_F/dt = 750 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		1,08		mJ
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	E_{rec}	1,99		mJ
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		2,60		mJ
ジャンクション・ヒートシンク間熱抵抗 Thermal resistance, junction to heatsink	/Diode (1 素子当り) / per diode	R_{thJH}		1,81		K/W
動作温度 Temperature under switching conditions		$T_{vj op}$	-40		175	$^{\circ}\text{C}$

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	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
R100の偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
損失 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	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.

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}	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)		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		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		
相対温度指数 (電気) RTI Elec.	住宅 housing	RTI	140		°C
			min.	typ.	max.
内部インダクタンス Stray inductance module		L _{sCE}		30	nH
保存温度 Storage temperature		T _{stg}	-40		125 °C
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80 N
質量 Weight		G		24	g

Der Strom im Dauerbetrieb ist auf 30 A effektiv pro Anschlusspin begrenzt.

The current under continuous operation is limited to 30 A rms per connector pin.

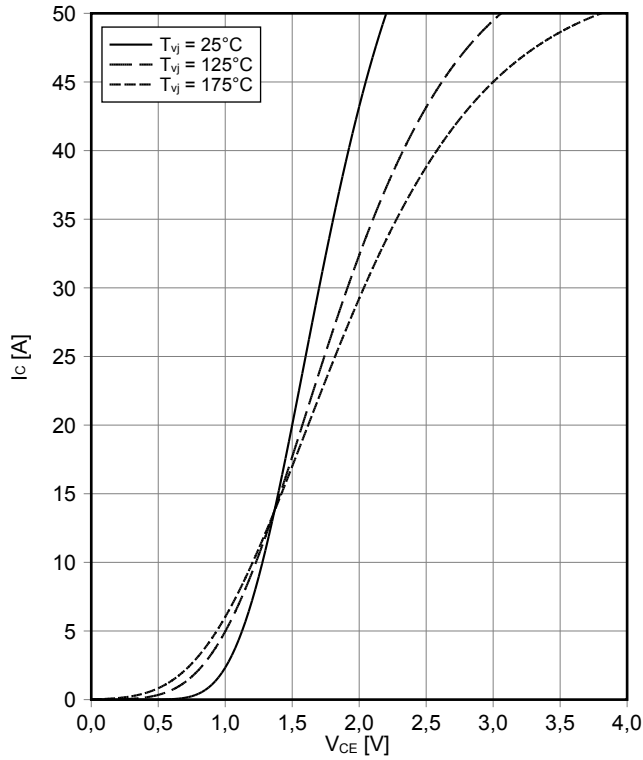
T_{vj op} > 150°C ist im Überlastbetrieb zulässig. Detaillierte Angaben sind AN 2018-14 zu entnehmen.

T_{vj op} > 150°C is allowed for operation at overload conditions. For detailed specifications, please refer to AN 2018-14.

暫定データ Preliminary Data

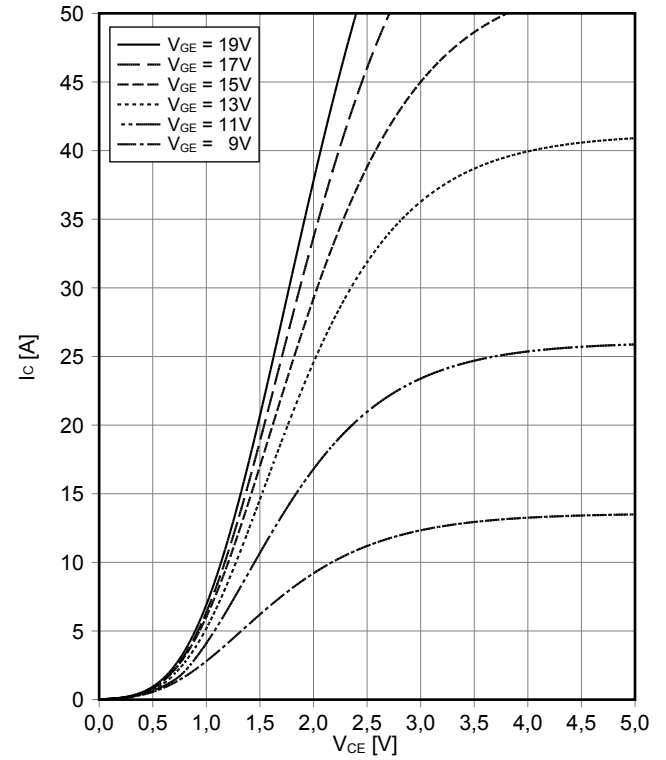
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

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



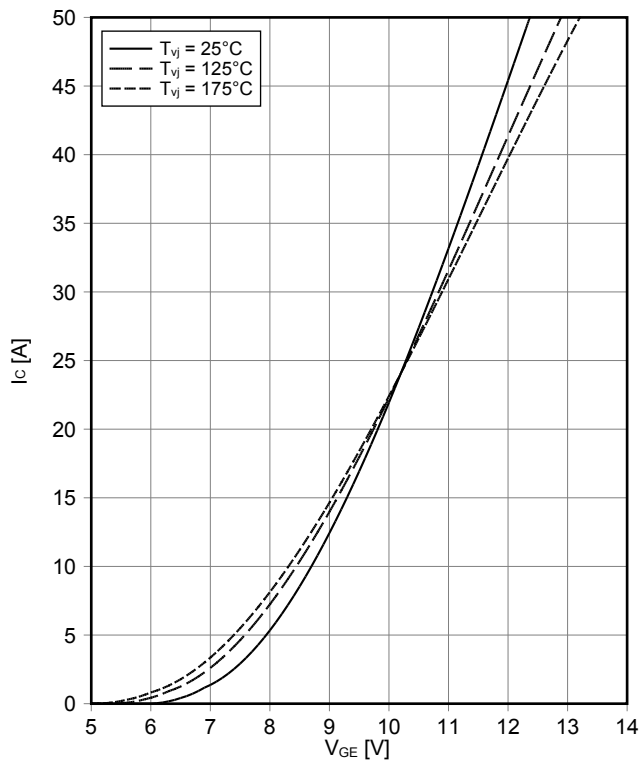
出力特性 IGBT- インバータ (Typical)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 175^\circ\text{C}$



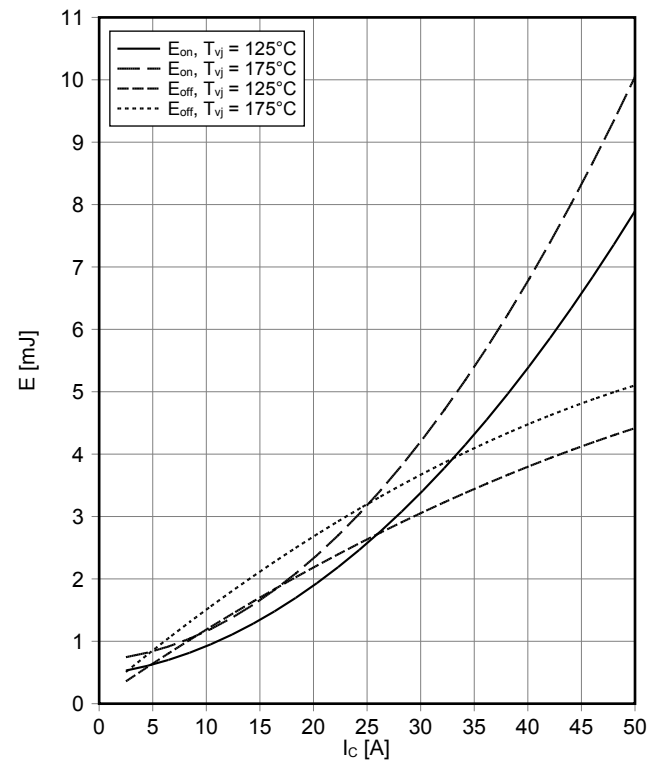
伝達特性 IGBT- インバータ (Typical)
transfer characteristic IGBT, Inverter (typical)

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



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

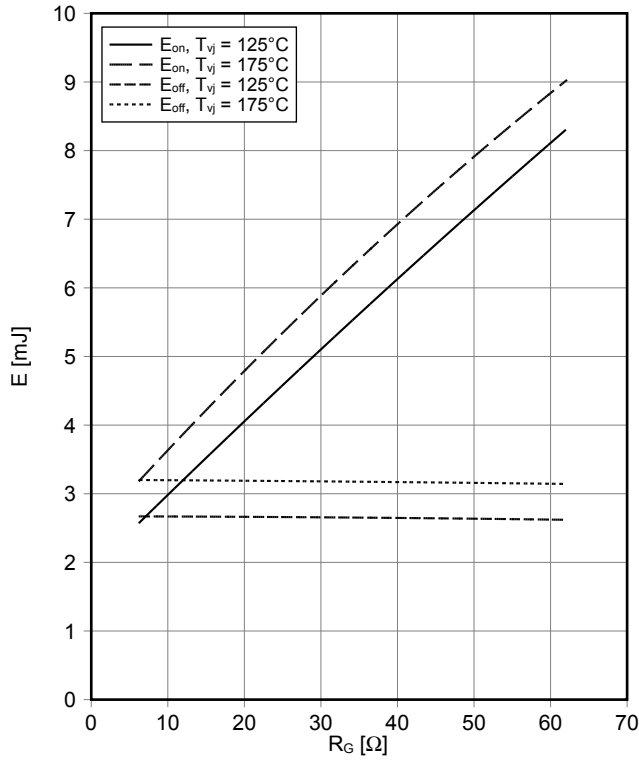
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $R_{Goff} = 6.2\ \Omega$, $V_{CE} = 600\text{ V}$



暫定データ Preliminary Data

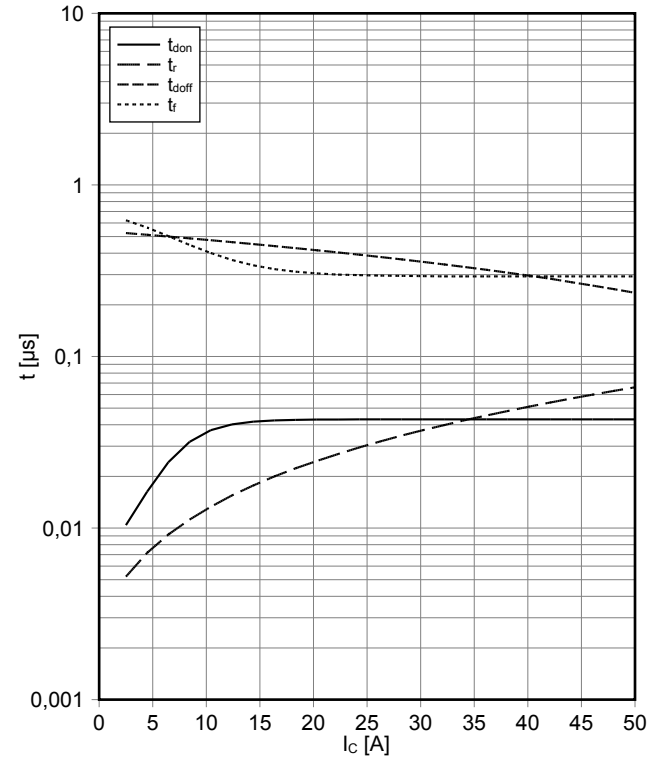
スイッチング損失 IGBT-インバータ (Typical) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 25\text{ A}, V_{CE} = 600\text{ V}$



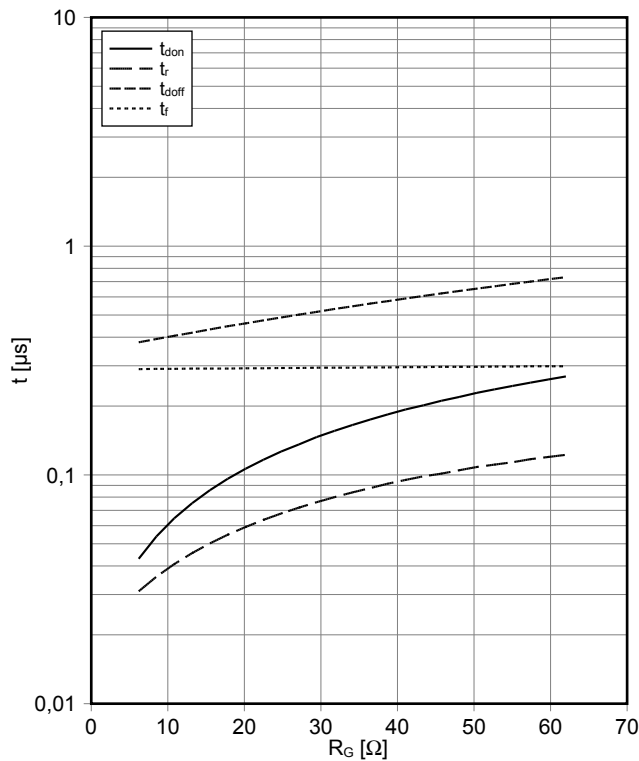
??? IGBT-インバータ (Typical) switching times IGBT, Inverter (typical)

$t_{don} = f(I_C), t_r = f(I_C), t_{doff} = f(I_C), t_f = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 6.2\ \Omega, R_{Goff} = 6.2\ \Omega, V_{CE} = 600\text{ V}, T_{vj} = 175^\circ\text{C}$



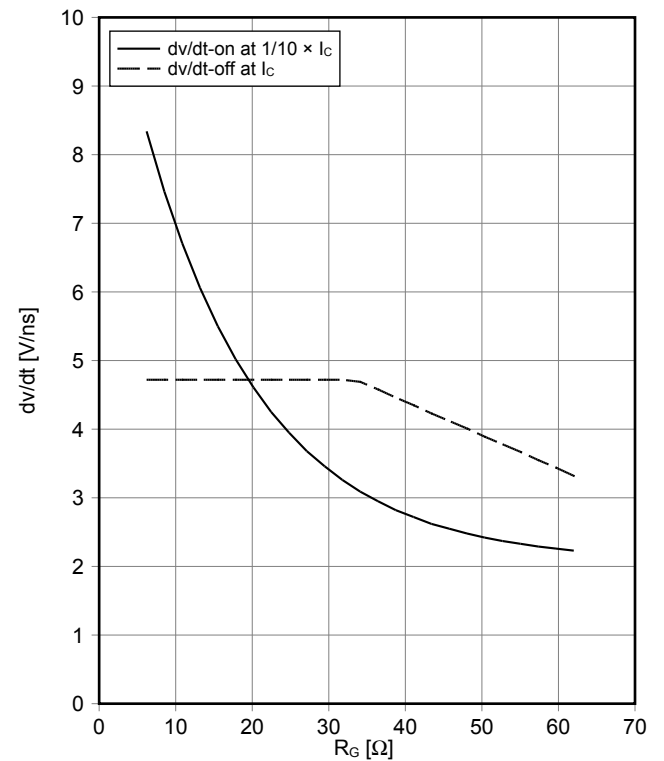
??? IGBT-インバータ (Typical) switching times IGBT, Inverter (typical)

$t_{don} = f(R_G), t_r = f(R_G), t_{doff} = f(R_G), t_f = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 25\text{ A}, V_{CE} = 600\text{ V}, T_{vj} = 175^\circ\text{C}$



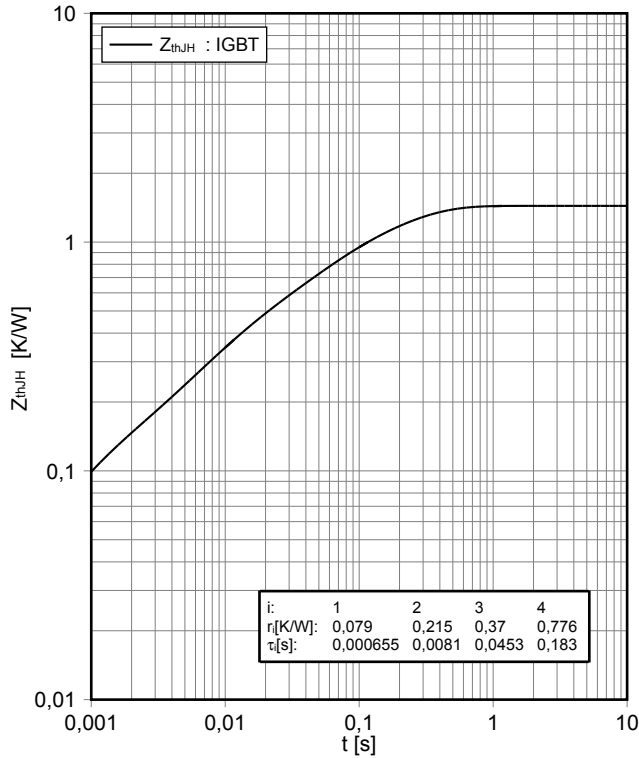
dv/dt IGBT-インバータ (Typical) dv/dt IGBT, Inverter (typical)

$dv/dt = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 25\text{ A}, V_{CE} = 600\text{ V}, T_{vj} = 25^\circ\text{C}$

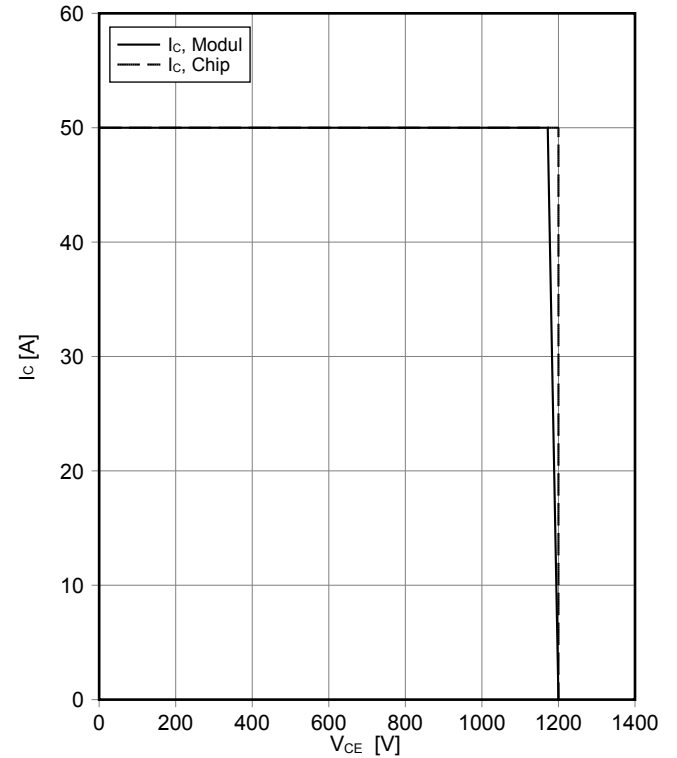


暫定データ Preliminary Data

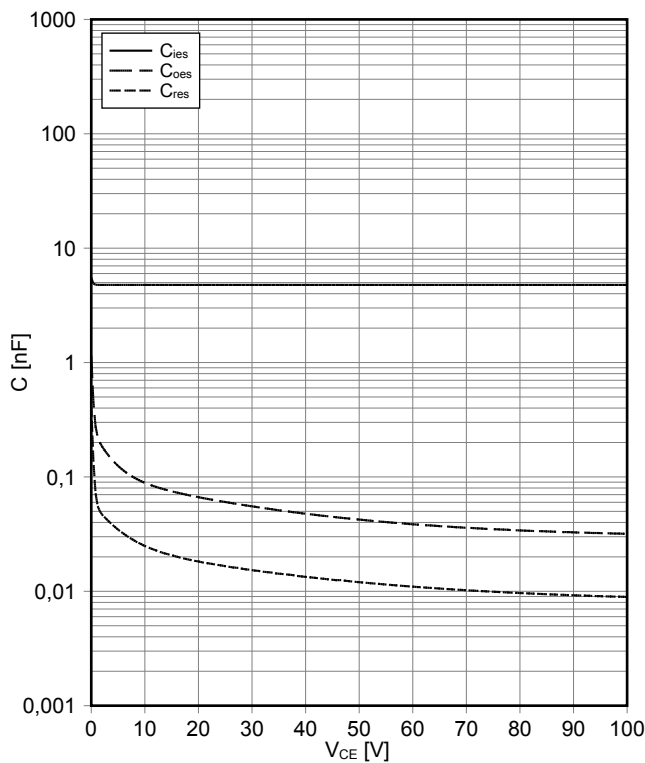
過渡熱インピーダンス IGBT- インバータ
transient thermal impedance IGBT, Inverter
 $Z_{thJH} = f(t)$



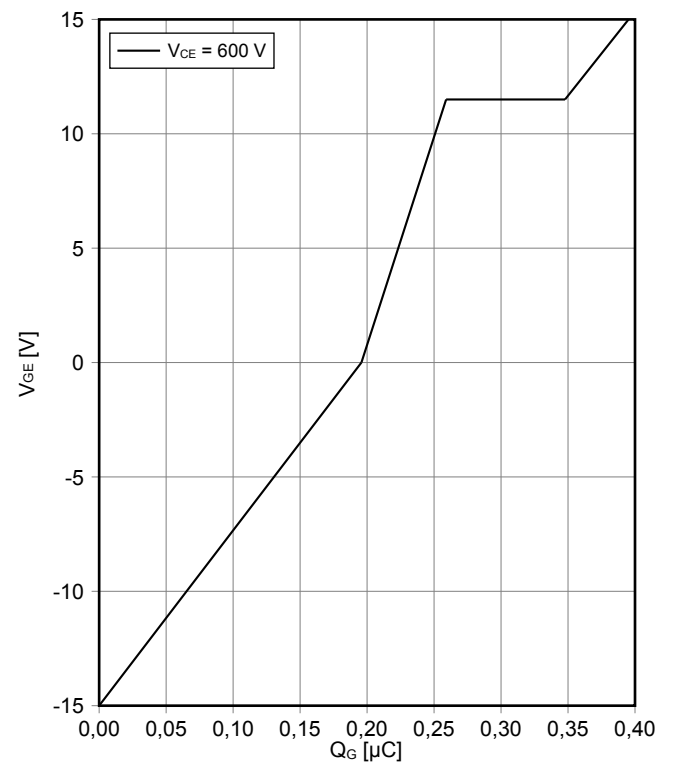
逆バイアス安全動作領域 IGBT- インバータ (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 6.2 \Omega$, $T_{vj} = 175^\circ\text{C}$



容量特性 IGBT- インバータ (Typical)
capacity characteristic IGBT, Inverter (typical)
 $C = f(V_{CE})$
 $V_{GE} = 0 \text{ V}$, $T_{vj} = 25^\circ\text{C}$, $f = 100\text{kHz}$

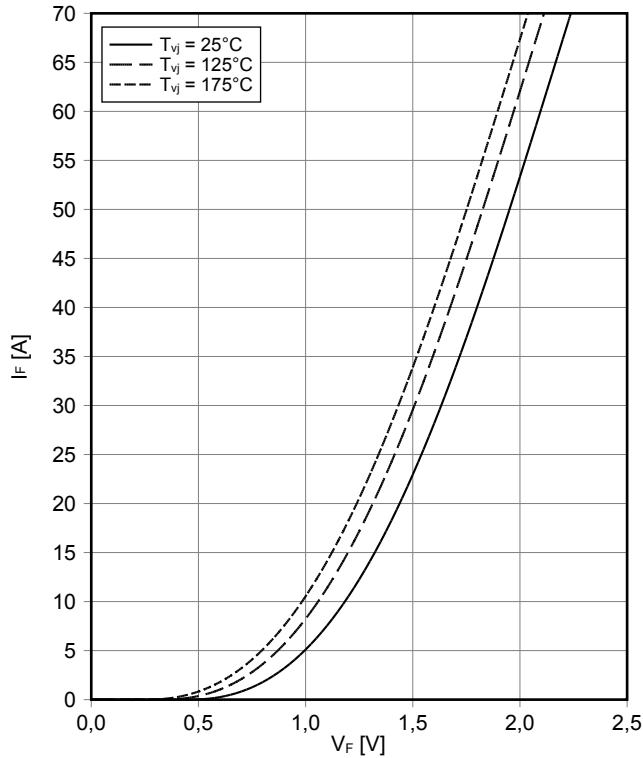


ゲート充電特性 IGBT- インバータ (典型)
gate charge characteristic IGBT, Inverter (typical)
 $V_{GE} = f(Q_G)$
 $I_C = 25 \text{ A}$, $T_{vj} = 25^\circ\text{C}$

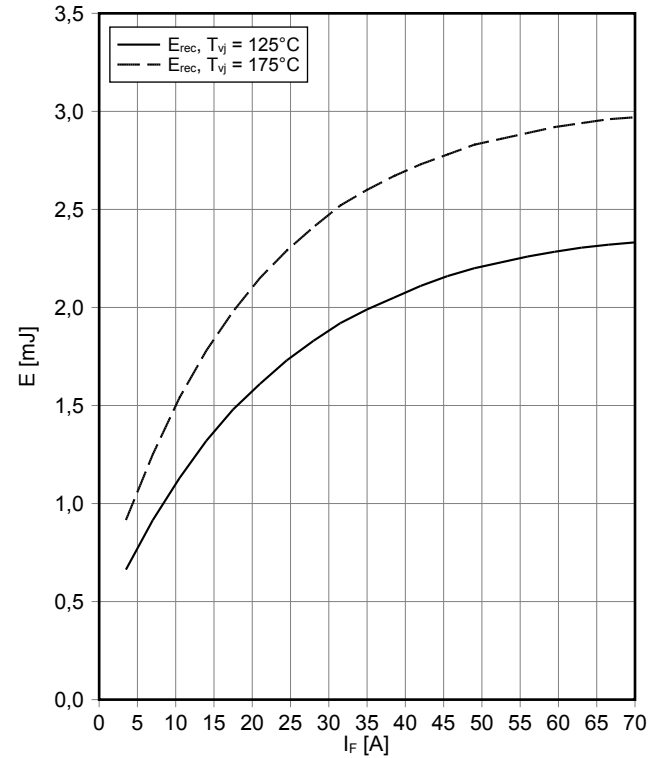


暫定データ Preliminary Data

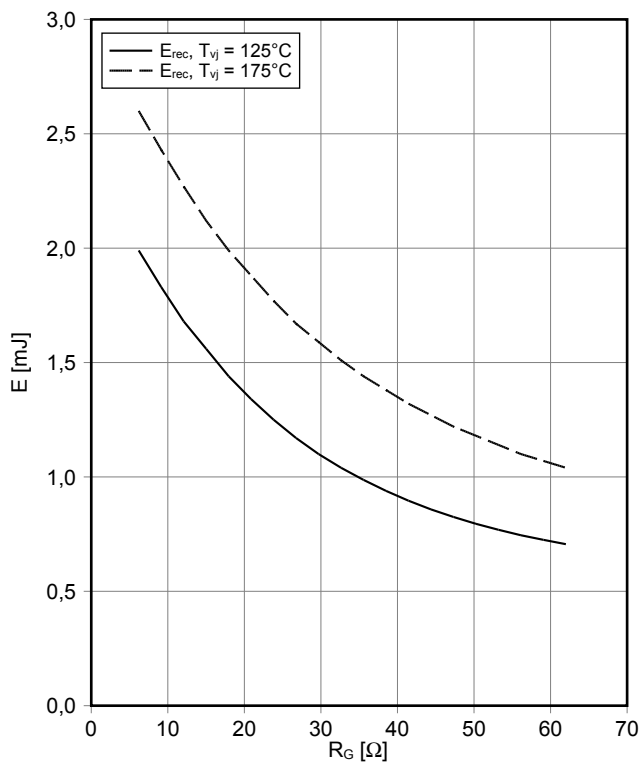
順電圧特性 Diode、インバータ (typical)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



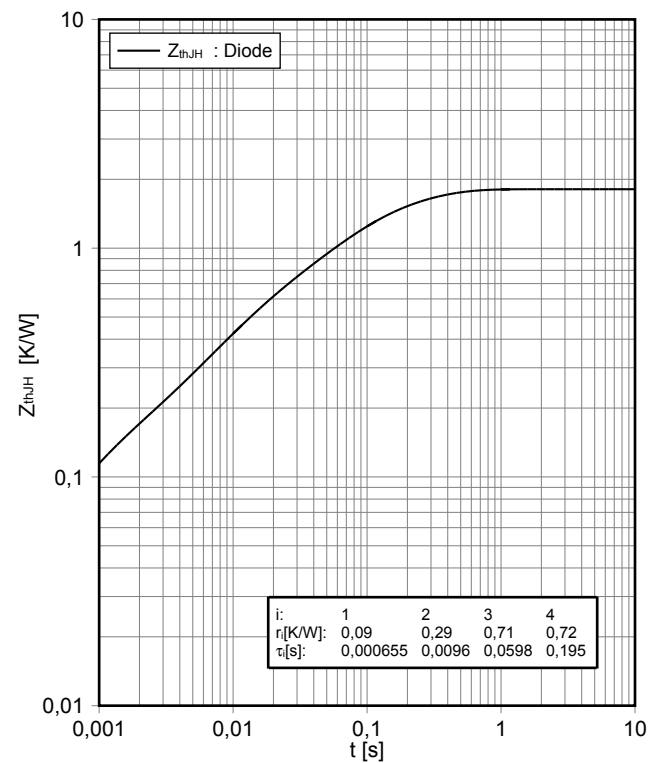
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 6.2 \Omega, V_{CE} = 600 \text{ V}$



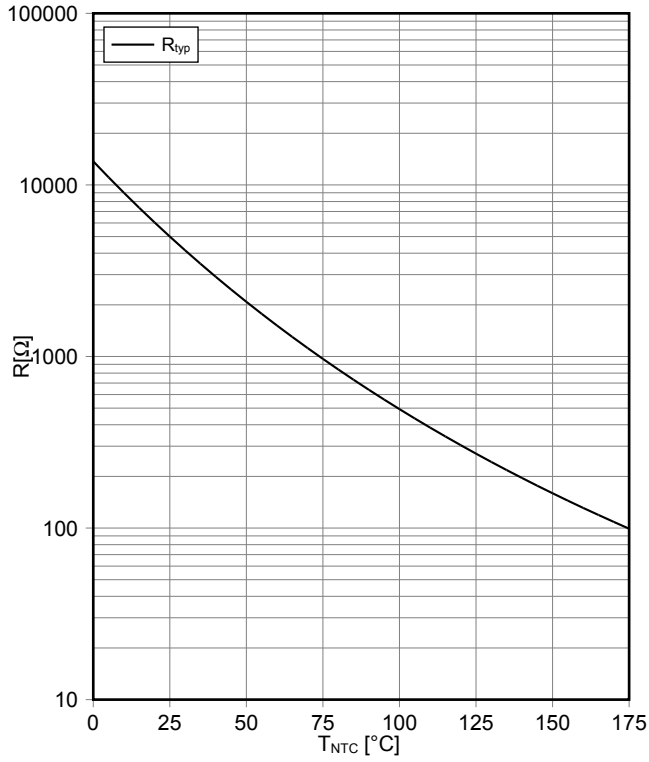
スイッチング損失 Diode、インバータ (Typical)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 35 \text{ A}, V_{CE} = 600 \text{ V}$



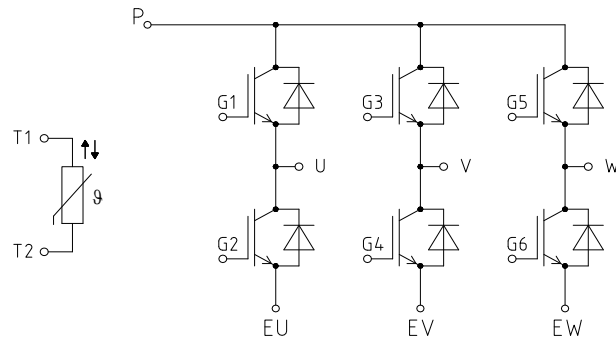
過渡熱インピーダンス Diode、インバータ
transient thermal impedance Diode, Inverter
 $Z_{thJH} = f(t)$



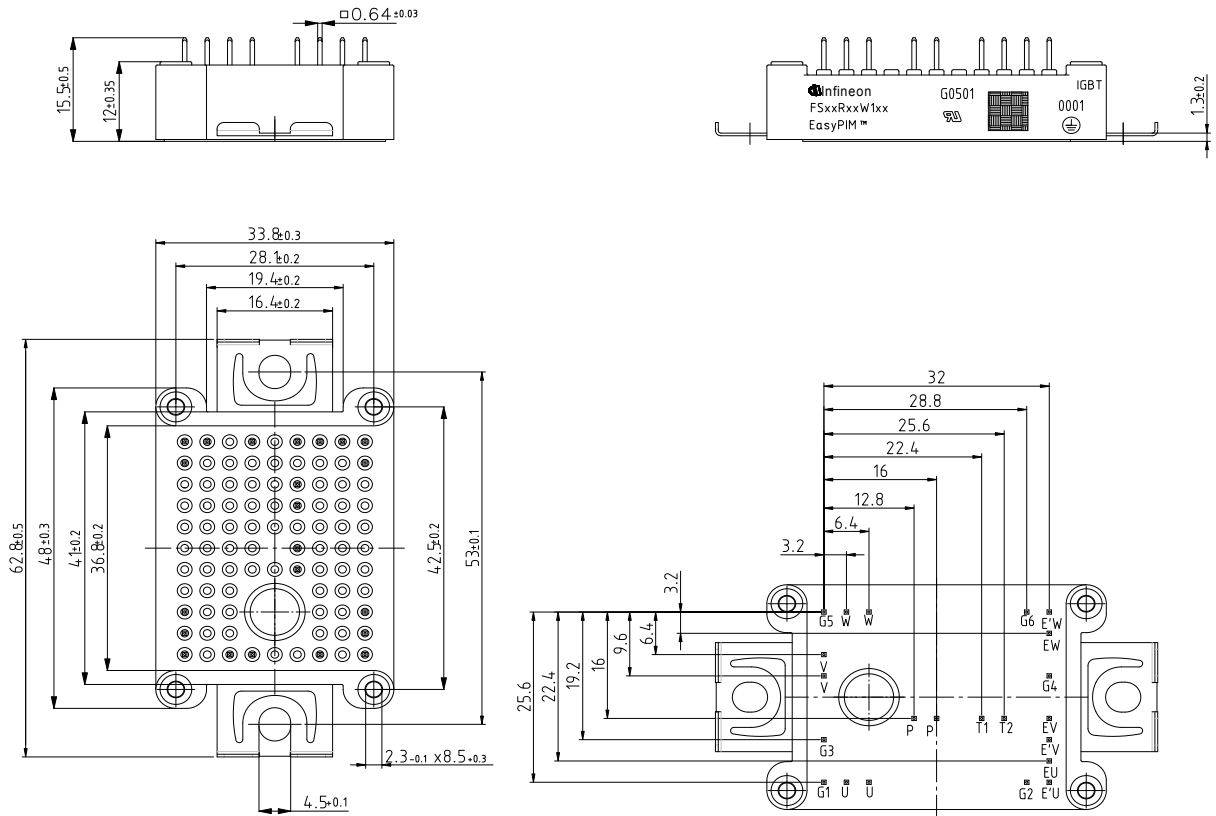
NTC-サーミスタ サーミスタの温度特性
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T_{NTC})$



回路図 / Circuit diagram



パッケージ概要 / Package outlines



Pinpositions with tolerance $\phi \pm 0.4$