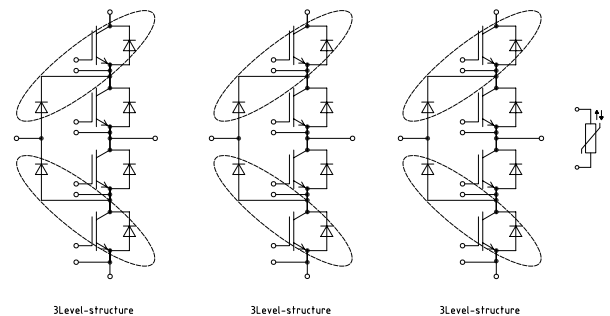
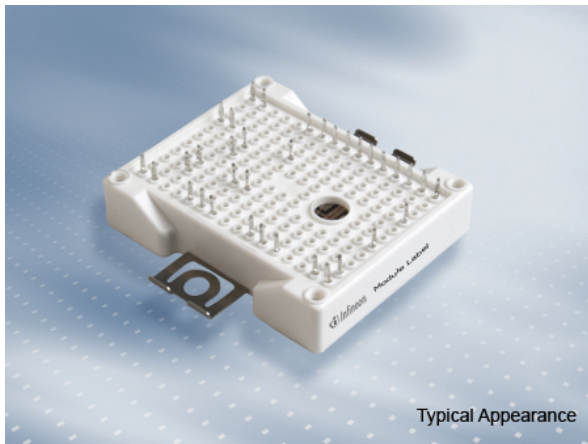


EasyPACK™ モジュール TRENCHSTOP™ 5 H5 と CoolSiC™ ショットキーダイオード内蔵 と PressFIT / NTCサーミスタ

EasyPACK™ module with TRENCHSTOP™ 5 H5 and CoolSiC™ Schottky diode and PressFIT / NTC



$V_{CES} = 650V$

$I_{C\ nom} = 40A / I_{CRM} = 80A$

### アプリケーションの可能性

- 3レベル アプリケーション
- UPSシステム
- ソーラーアプリケーション
- モーター駆動

### 電気的特性

- 650Vに増加したブロッキング電圧
- CoolSiC™ ショットキーダイオード gen5
- 低スイッチング損失

### 機械的特性

- PressFIT 接合 技術
- コンパクトデザイン
- 低熱インピーダンスの  $Al_2O_3$  DCB
- 固定用クランプによる強固なマウンティング

### Potential Applications

- 3-level-applications
- UPS systems
- Solar applications
- Motor drives

### Electrical Features

- Increased blocking voltage capability up to 650V
- CoolSiC™ Schottky diode gen 5
- Low switching losses

### Mechanical Features

- PressFIT contact technology
- Compact design
- $Al_2O_3$  substrate with low thermal resistance
- Rugged mounting due to integrated mounting clamps

## 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	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	650	V
コレクタ電流 Implemented collector current		$I_{CN}$	40	A
連続DCコレクタ電流 Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{CDC}$	20	A
繰り返しピークコレクタ電流 Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	80	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	$I_C = 20\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,40 1,46 1,50	1,81 V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 0,35\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{Geth}$	3,25	4,00 4,75
ゲート電荷量 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 300\text{ V}$		$Q_G$	0,165	$\mu\text{C}$
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,0	$\Omega$
入力容量 Input capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	2,00	nF
帰還容量 Reverse transfer capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,008	nF
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$		0,018
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
ターンオン遅れ時間 (誘導負荷) Turn-on delay time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,019 0,02 0,02	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,008 0,008 0,008	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,09 0,11 0,11	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,014 0,022 0,024	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_{\sigma} = 35\text{ nH}$ $di/dt = 1000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	0,32 0,44 0,47	mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_{\sigma} = 35\text{ nH}$ $du/dt = 5600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 7,5\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	0,10 0,15 0,16	mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$ $V_{CE\max} = V_{CES} - L_{sCE} \cdot di/dt$ $t_P \leq 0\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	180	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		$R_{thJH}$	2,12	K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150

## 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	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	650	V
順電流 Implemented forward current		$I_{FN}$	25	A
連続DC電流 Continuous DC forward current		$I_F$	20	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	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	50,0 40,0	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

### 電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 20 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$V_F$	1,65	2,15	V
	$I_F = 20 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		1,55		V
	$I_F = 20 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		1,50		V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 20 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$I_{RM}$	12,0		A
		$T_{vj} = 125^{\circ}\text{C}$		19,0		A
		$T_{vj} = 150^{\circ}\text{C}$		21,0		A
逆回復電荷量 Recovered charge	$I_F = 20 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$Q_r$	1,25		$\mu\text{C}$
		$T_{vj} = 125^{\circ}\text{C}$		1,76		$\mu\text{C}$
		$T_{vj} = 150^{\circ}\text{C}$		1,99		$\mu\text{C}$
逆回復損失 Reverse recovery energy	$I_F = 20 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 300 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$E_{rec}$	0,28		mJ
		$T_{vj} = 125^{\circ}\text{C}$		0,38		mJ
		$T_{vj} = 150^{\circ}\text{C}$		0,42		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		$R_{thJH}$	2,78		K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

## IGBT、スリー・レベル / IGBT,3-Level

### 最大定格 / Maximum Rated Values

コレクタ・エミッタ間電圧 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{CES}$	650	V
コレクタ電流 Implemented collector current		$I_{CN}$	40	A
連続DCコレクタ電流 Continuous DC collector current	$T_H = 65^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{CDC}$	20	A
繰り返しピークコレクタ電流 Repetitive peak collector current	$t_p = 1\text{ ms}$	$I_{CRM}$	80	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	$I_C = 20\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,40 1,46 1,50	1,81 V V V
ゲート・エミッタ間しきい値電圧 Gate threshold voltage	$I_C = 0,35\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{Geth}$	3,25 4,00 4,75	V
ゲート電荷量 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 300\text{ V}$		$Q_G$	0,165	$\mu\text{C}$
内蔵ゲート抵抗 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,0	$\Omega$
入力容量 Input capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	2,00	nF
帰還容量 Reverse transfer capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	0,008	nF
コレクタ・エミッタ間遮断電流 Collector-emitter cut-off current	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$		0,018 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	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,012 0,014 0,014	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオン上昇時間 (誘導負荷) Rise time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,004 0,004 0,004	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ遅れ時間 (誘導負荷) Turn-off delay time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,09 0,11 0,11	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオフ下降時間 (誘導負荷) Fall time, inductive load	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,014 0,022 0,024	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
ターンオンスイッチング損失 Turn-on energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_{\sigma} = 35\text{ nH}$ $di/dt = 4000\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	0,13 0,16 0,17	mJ mJ mJ
ターンオフスイッチング損失 Turn-off energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 300\text{ V}, L_{\sigma} = 35\text{ nH}$ $du/dt = 5500\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 3,9\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	0,10 0,15 0,16	mJ mJ mJ
短絡電流 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 360\text{ V}$ $V_{CE\max} = V_{CES} - L_{sCE} \cdot di/dt$ $t_p \leq 0\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	180	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		$R_{thJH}$	2,12	K/W
動作温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150 $^{\circ}\text{C}$

## ダイオード、スリー・レーベル / Diode, 3-Level

### 最大定格 / Maximum Rated Values

ピーク繰返し逆電圧 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	$V_{RRM}$	650	V
連続DC電流 Continuous DC forward current		$I_F$	20	A
ピーク繰返し順電流 Repetitive peak forward current	$t_P = 1\text{ ms}$	$I_{FRM}$	40	A
電流二乗時間積 $I^2t$ - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	65,0 60,0	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

### 電気的特性 / Characteristic Values

			min.	typ.	max.	
順電圧 Forward voltage	$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		1,45	1,85	V
	$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	$V_F$	1,60		V
	$I_F = 20\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		1,65		V
ピーク逆回復電流 Peak reverse recovery current	$I_F = 20\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		26,0		A
	$V_R = 300\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	$I_{RM}$	23,0		A
	$V_{GE} = 15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		22,0		A
逆回復電荷量 Recovered charge	$I_F = 20\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		0,29		$\mu\text{C}$
	$V_R = 300\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	$Q_r$	0,29		$\mu\text{C}$
	$V_{GE} = 15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		0,29		$\mu\text{C}$
逆回復損失 Reverse recovery energy	$I_F = 20\text{ A}, -di_F/dt = 4000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		0,08		mJ
	$V_R = 300\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	$E_{rec}$	0,08		mJ
	$V_{GE} = 15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		0,08		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	$R_{thJH}$		2,60		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	$T_{NTC} = 25^{\circ}\text{C}$	$R_{25}$		5,00		k $\Omega$
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.

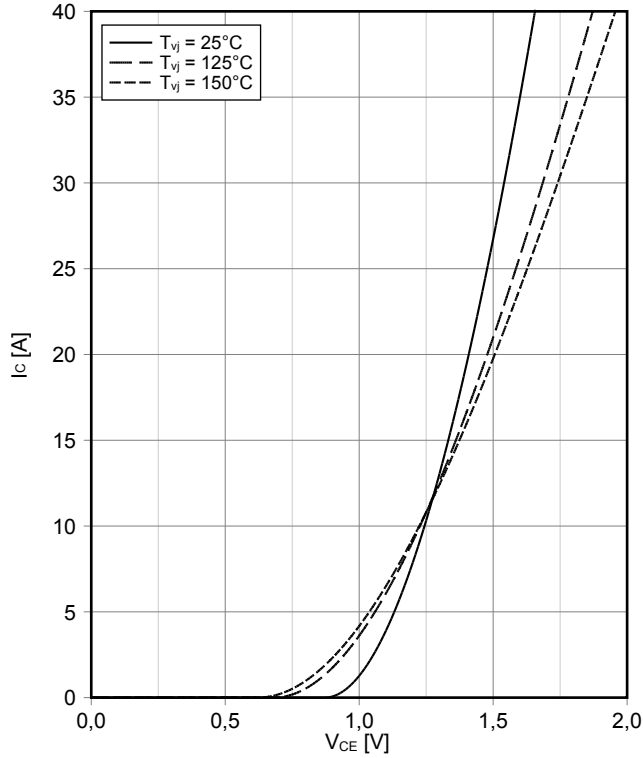
## モジュール / Module

絶縁耐圧 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISOL</sub>	2,5		kV
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		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 <sub>sCE</sub>		45	nH
保存温度 Storage temperature		T <sub>stg</sub>	-40		125 °C
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80 N
質量 Weight		G		39	g

Der Strom im Dauerbetrieb ist auf 25A effektiv pro Anschlusspin begrenzt.  
The current under continuous operation is limited to 25A rms per connector pin

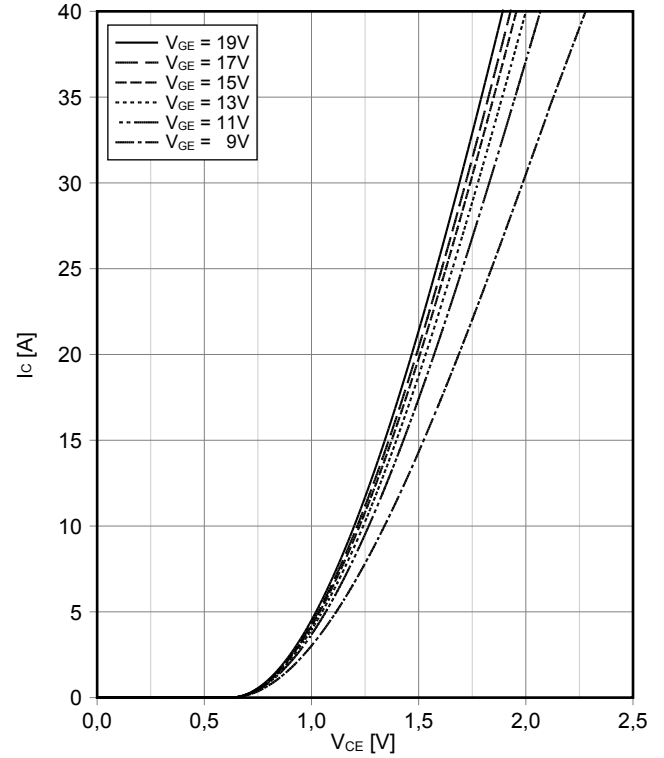
出力特性 IGBT- インバータ (Typical)  
**output characteristic IGBT, Inverter (typical)**

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



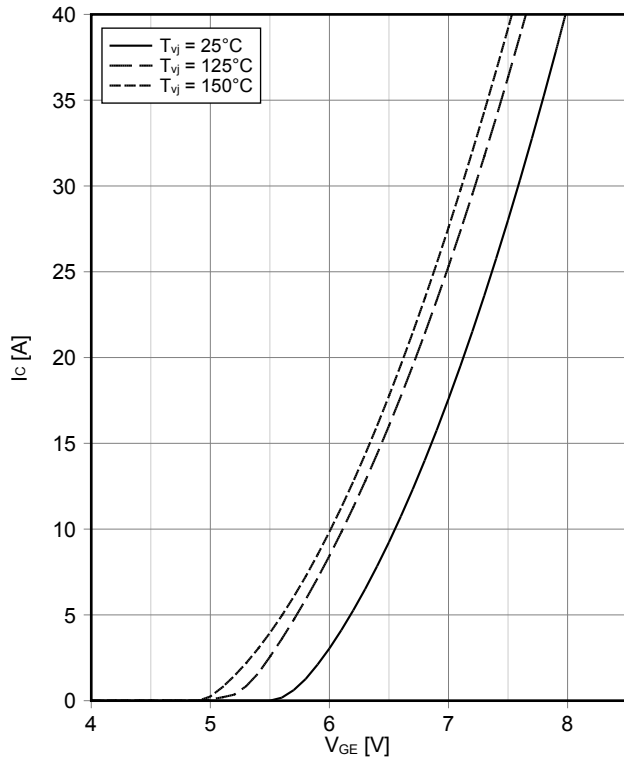
出力特性 IGBT- インバータ (Typical)  
**output characteristic IGBT, Inverter (typical)**

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



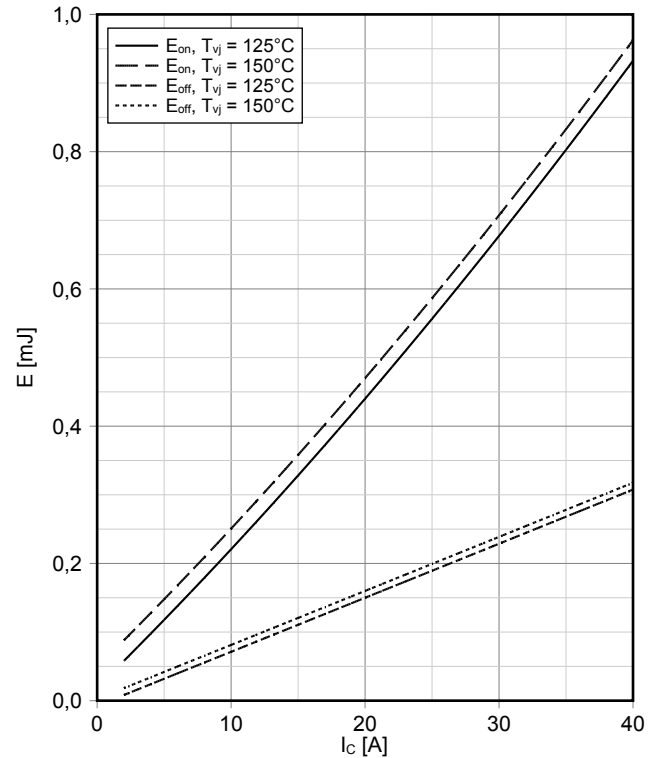
伝達特性 IGBT- インバータ (Typical)  
**transfer characteristic IGBT, Inverter (typical)**

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



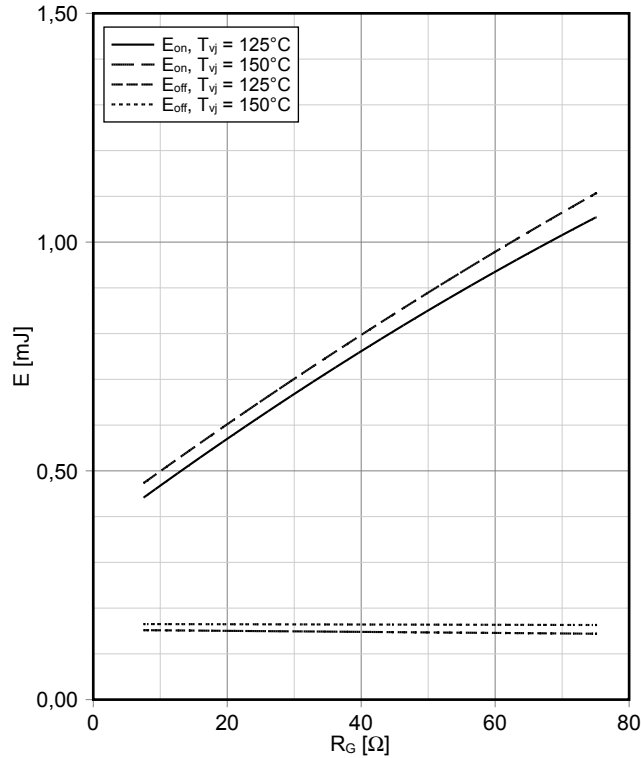
スイッチング損失 IGBT- インバータ (Typical)  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 7,5\ \Omega$ ,  $R_{Goff} = 7,5\ \Omega$ ,  $V_{CE} = 300\text{ V}$



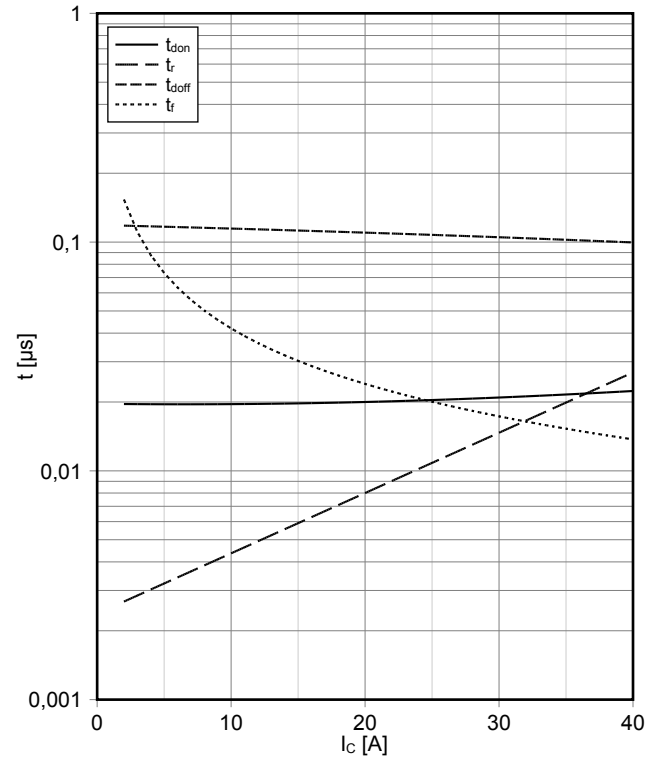
スイッチング損失 IGBT-インバータ (Typical)  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 20\text{ A}$ ,  $V_{CE} = 300\text{ V}$



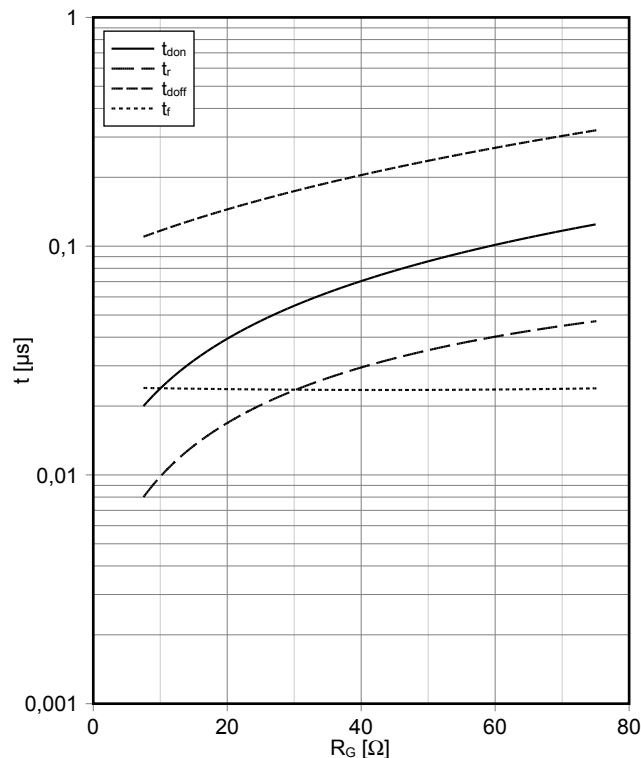
??? IGBT-インバータ (Typical)  
**switching times IGBT, Inverter (typical)**

$t_{don} = f(I_C)$ ,  $t_r = f(I_C)$ ,  $t_{doff} = f(I_C)$ ,  $t_f = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 7.5\ \Omega$ ,  $R_{Goff} = 7.5\ \Omega$ ,  $V_{CE} = 300\text{ V}$ ,  $T_{vj} = 150^\circ\text{C}$



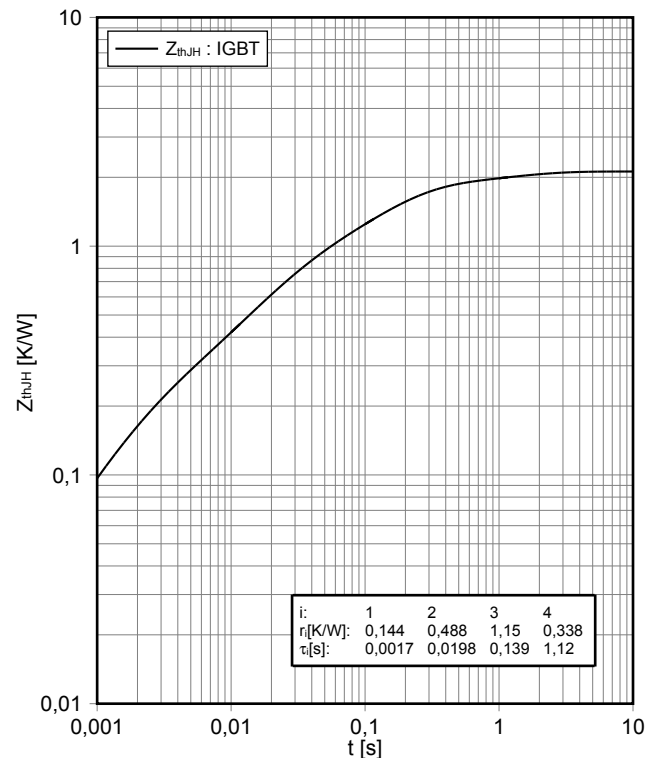
??? IGBT-インバータ (Typical)  
**switching times IGBT, Inverter (typical)**

$t_{don} = f(R_G)$ ,  $t_r = f(R_G)$ ,  $t_{doff} = f(R_G)$ ,  $t_f = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 20\text{ A}$ ,  $V_{CE} = 300\text{ V}$ ,  $T_{vj} = 150^\circ\text{C}$



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

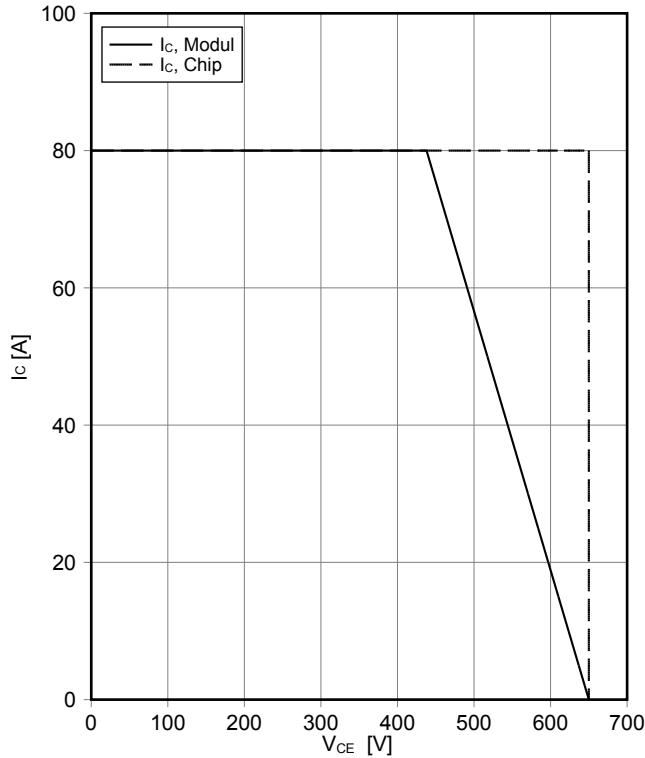
$Z_{thJH} = f(t)$





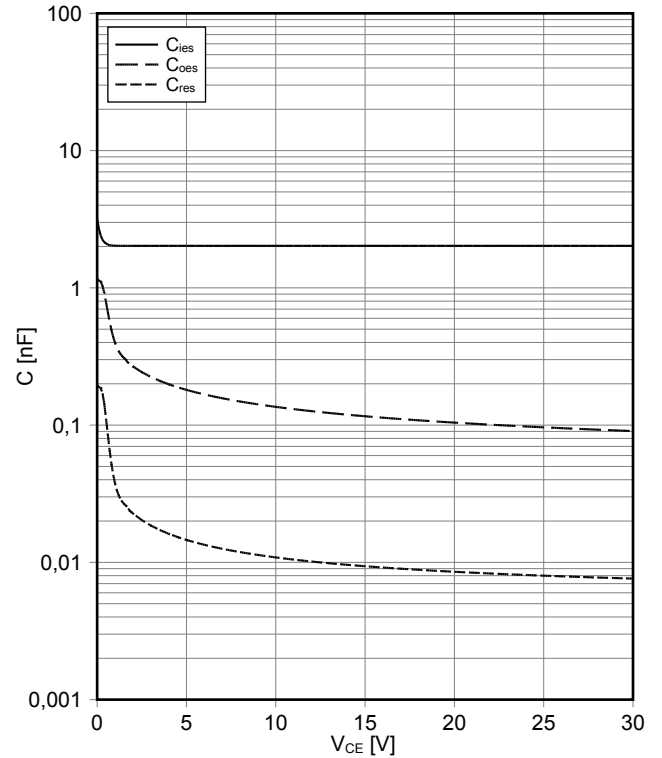
逆バイアス安全動作領域 IGBT- インバータ ( RBSOA ))  
**reverse bias safe operating area IGBT, Inverter (RBSOA)**

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 7.5\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



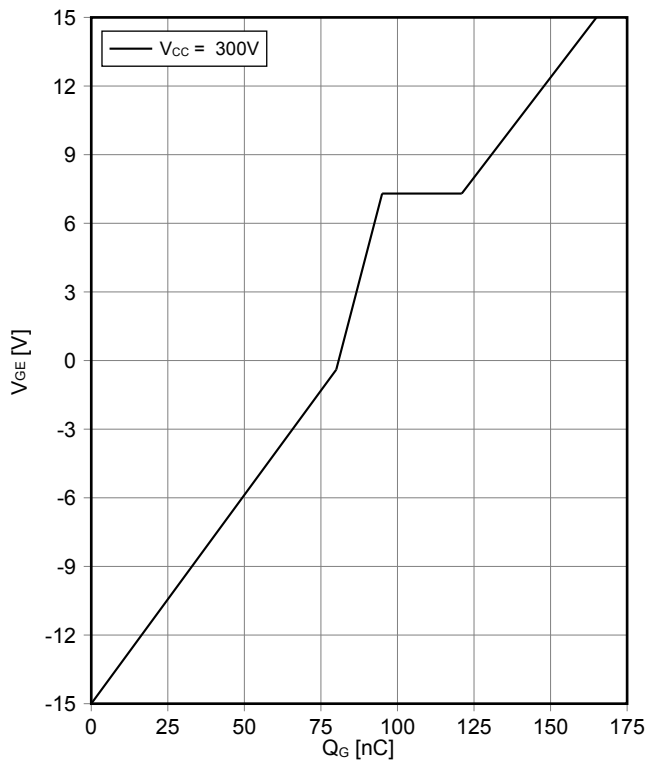
容量特性 IGBT- インバータ (Typical)  
**capacity characteristic IGBT, Inverter (typical)**

$C = f(V_{CE})$   
 $V_{GE} = 0\text{ V}$ ,  $T_{vj} = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$



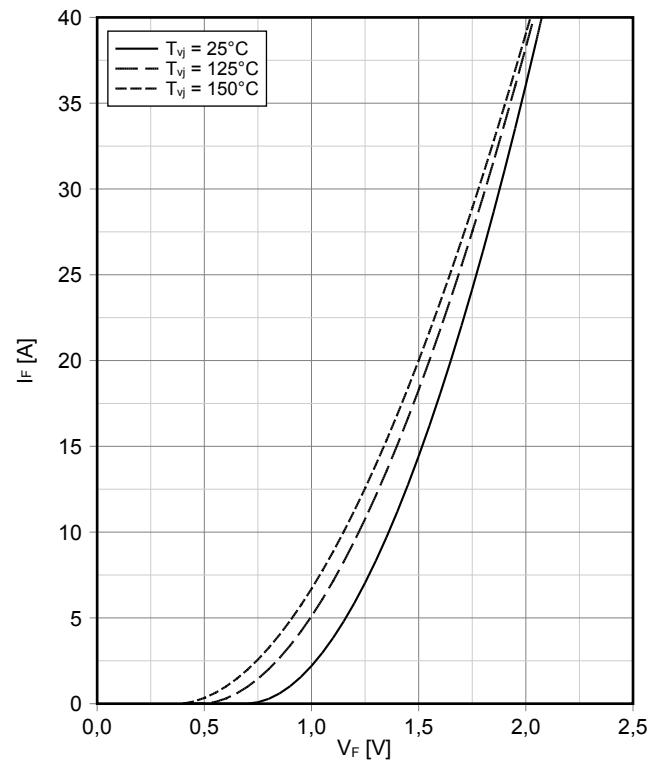
ゲート充電特性 IGBT- インバータ ( 典型 )  
**gate charge characteristic IGBT, Inverter (typical)**

$V_{GE} = f(Q_G)$   
 $I_C = 20\text{ A}$ ,  $T_{vj} = 25^\circ\text{C}$



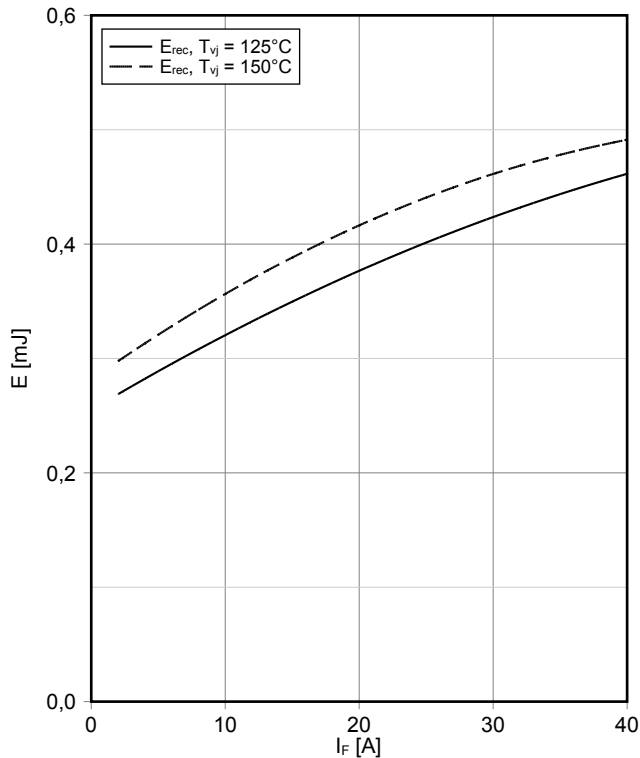
順電圧特性 Diode、インバータ ( typical )  
**forward characteristic of Diode, Inverter (typical)**

$I_F = f(V_F)$



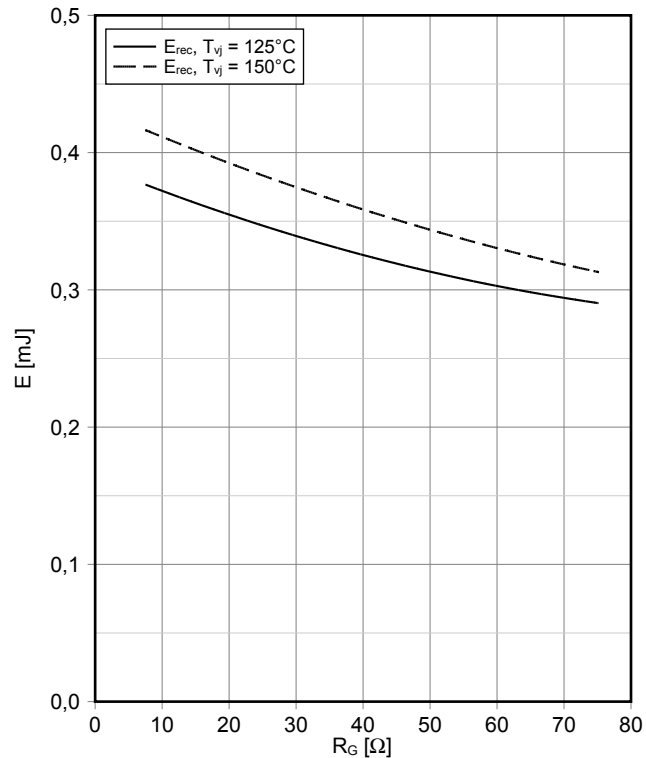
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 7,5 \Omega, V_{CE} = 300 V$



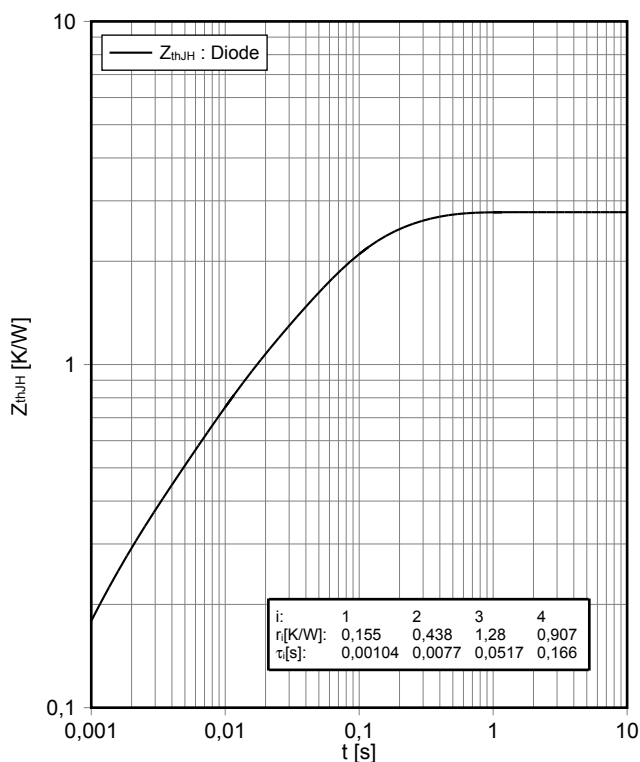
スイッチング損失 Diode、インバータ (Typical)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 20 A, V_{CE} = 300 V$



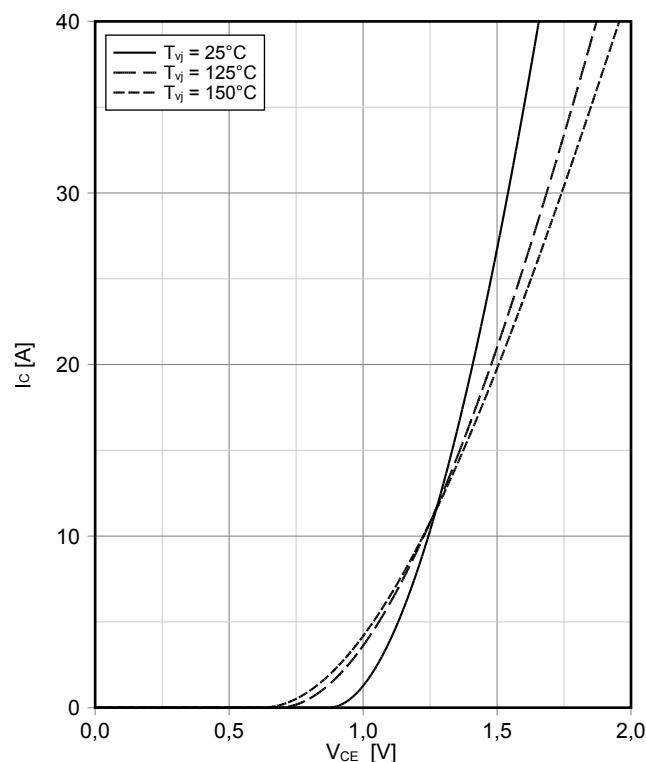
過渡熱インピーダンス Diode、インバータ  
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



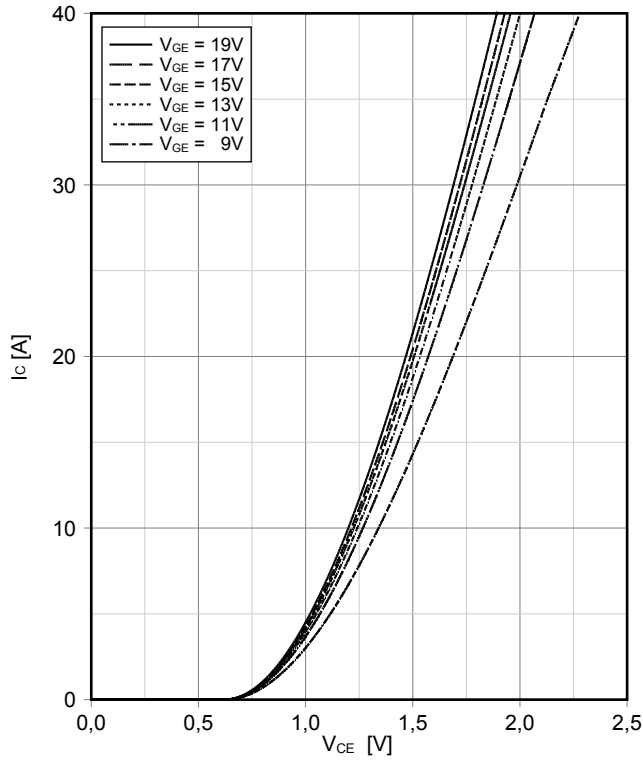
出力特性 IGBT、スリー・レベル (Typical)  
output characteristic IGBT, 3-Level (typical)

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



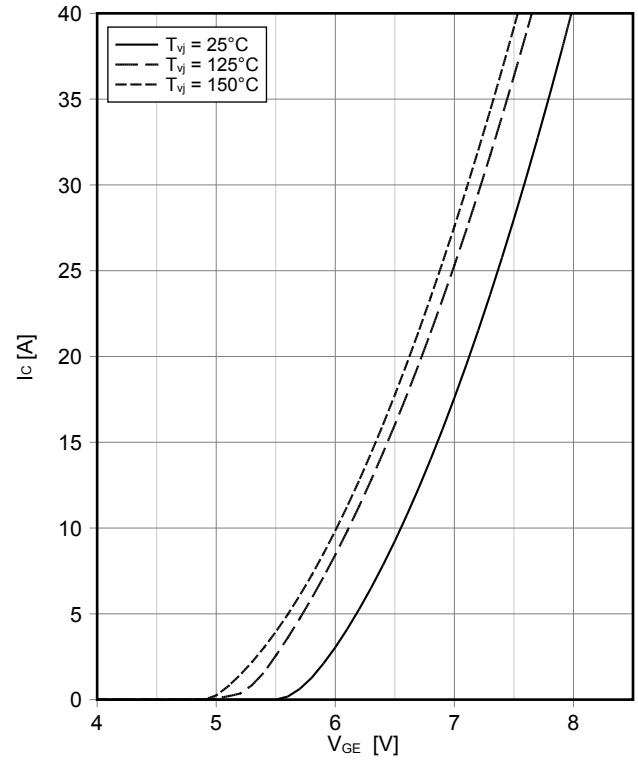
出力特性 IGBT、スリー・レーベル (Typical)  
**output characteristic IGBT,3-Level (typical)**

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



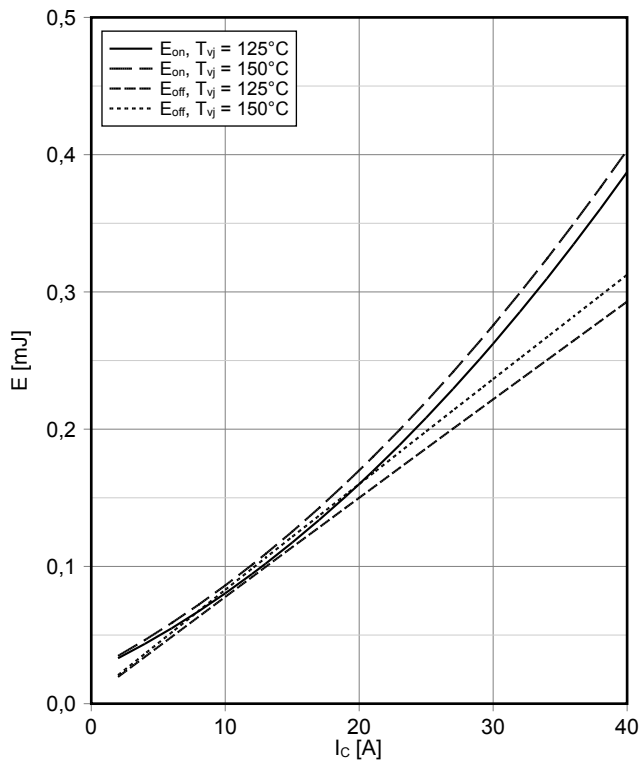
伝達特性 IGBT、スリー・レーベル (Typical)  
**transfer characteristic IGBT,3-Level (typical)**

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



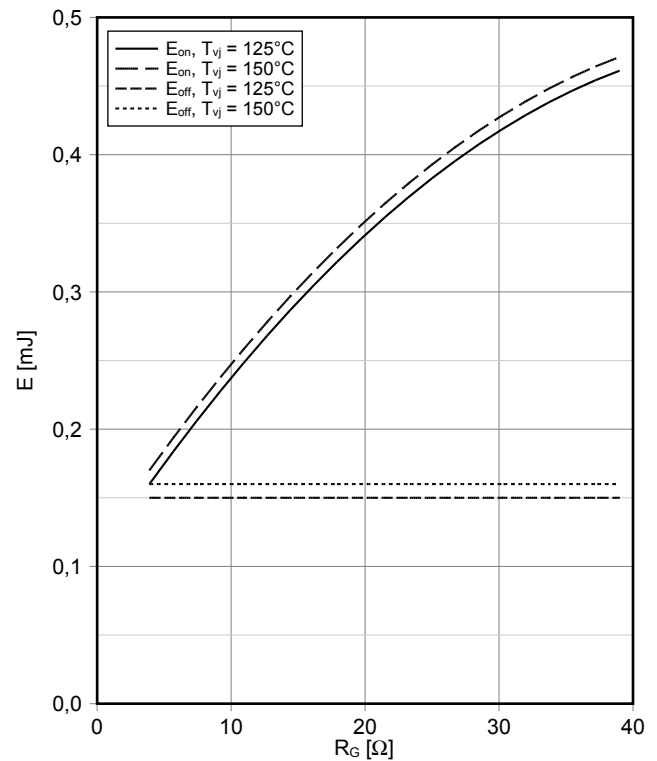
スイッチング損失 IGBT、スリー・レーベル (Typical)  
**switching losses IGBT,3-Level (typical)**

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 3,9\ \Omega$ ,  $R_{Goff} = 3,9\ \Omega$ ,  $V_{CE} = 300\text{ V}$



スイッチング損失 IGBT、スリー・レーベル (Typical)  
**switching losses IGBT,3-Level (typical)**

$E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 20\text{ A}$ ,  $V_{CE} = 300\text{ V}$

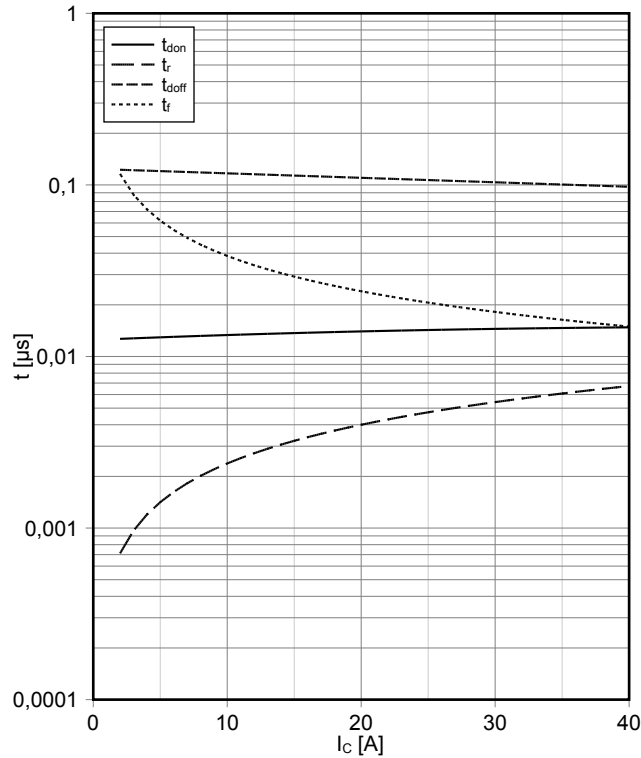


??? IGBT、スリー・レーベル (Typical)

**switching times IGBT,3-Level (typical)**

$t_{don} = f(I_c)$ ,  $t_r = f(I_c)$ ,  $t_{doff} = f(I_c)$ ,  $t_f = f(I_c)$

$V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 3.9\ \Omega$ ,  $R_{Goff} = 3.9\ \Omega$ ,  $V_{CE} = 300\text{ V}$ ,  $T_{vj} = 150^\circ\text{C}$

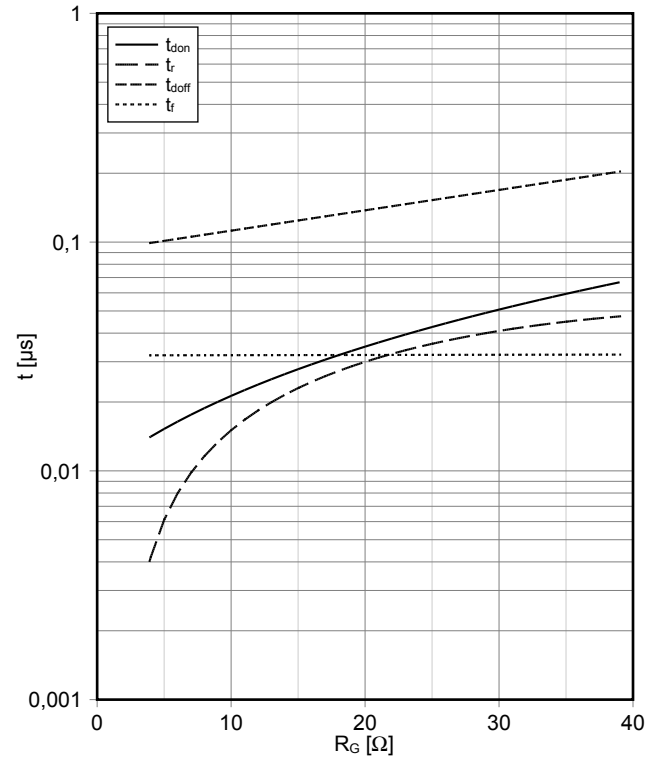


??? IGBT、スリー・レーベル (Typical)

**switching times IGBT,3-Level (typical)**

$t_{don} = f(R_G)$ ,  $t_r = f(R_G)$ ,  $t_{doff} = f(R_G)$ ,  $t_f = f(R_G)$

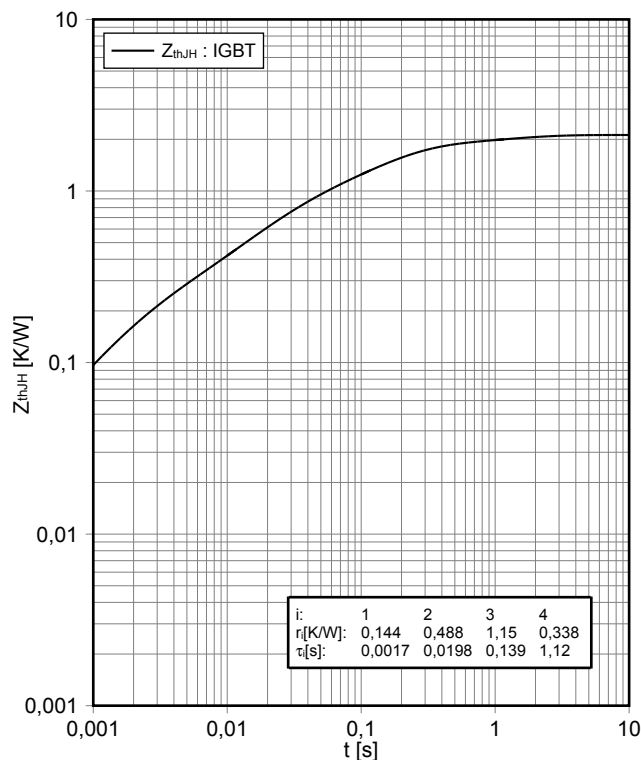
$V_{GE} = \pm 15\text{ V}$ ,  $I_c = 20\text{ A}$ ,  $V_{CE} = 300\text{ V}$ ,  $T_{vj} = 150^\circ\text{C}$



過渡熱インピーダンス IGBT、スリー・レーベル

**transient thermal impedance IGBT,3-Level**

$Z_{thJH} = f(t)$

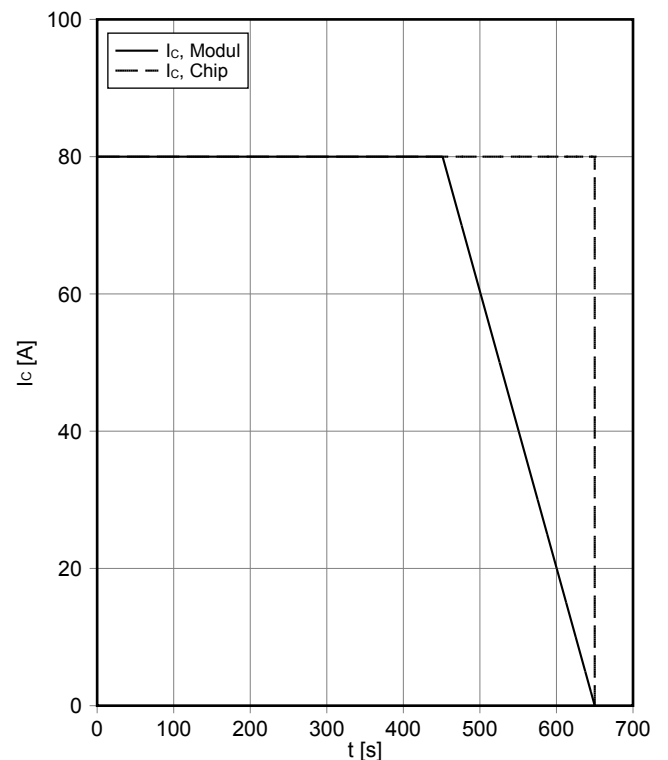


逆バイアス安全動作領域 IGBT、スリー・レーベル (RBSOA)

**reverse bias safe operating area IGBT,3-Level (RBSOA)**

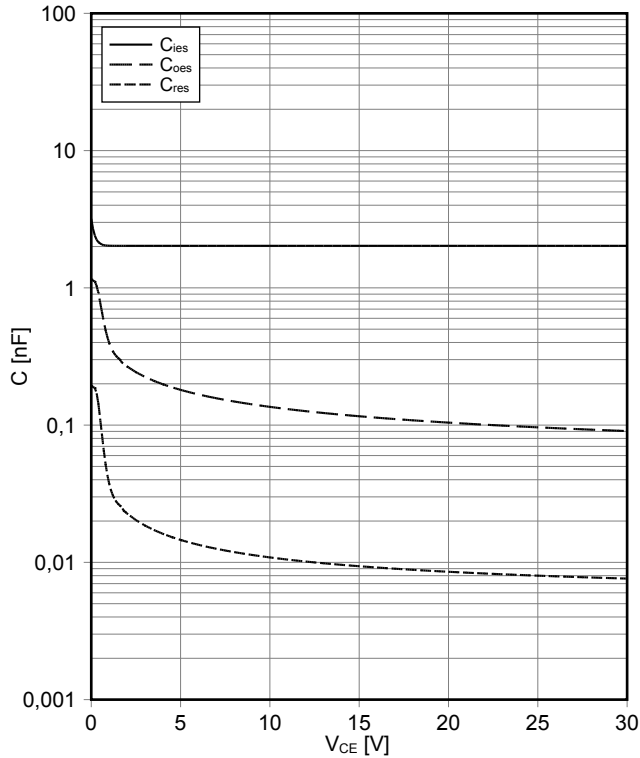
$I_c = f(V_{CE})$

$V_{GE} = \pm 15\text{ V}$ ,  $R_{Goff} = 3.9\ \Omega$ ,  $T_{vj} = 150^\circ\text{C}$



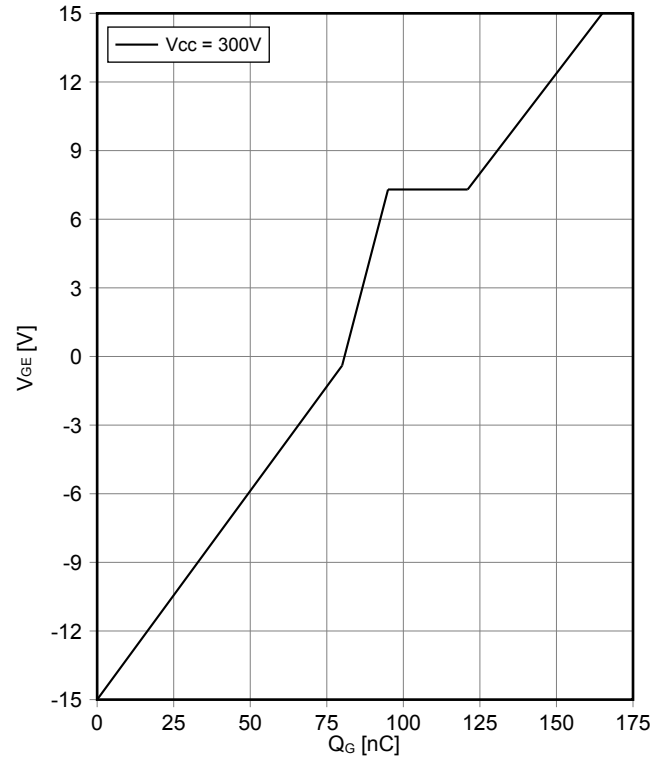
容量特性 IGBT、スリー・レベル (Typical)  
**capacity characteristic IGBT, 3-Level (typical)**

$C = f(V_{CE})$   
 $V_{GE} = 0\text{ V}, T_{vj} = 25^\circ\text{C}, f = 1\text{ MHz}$



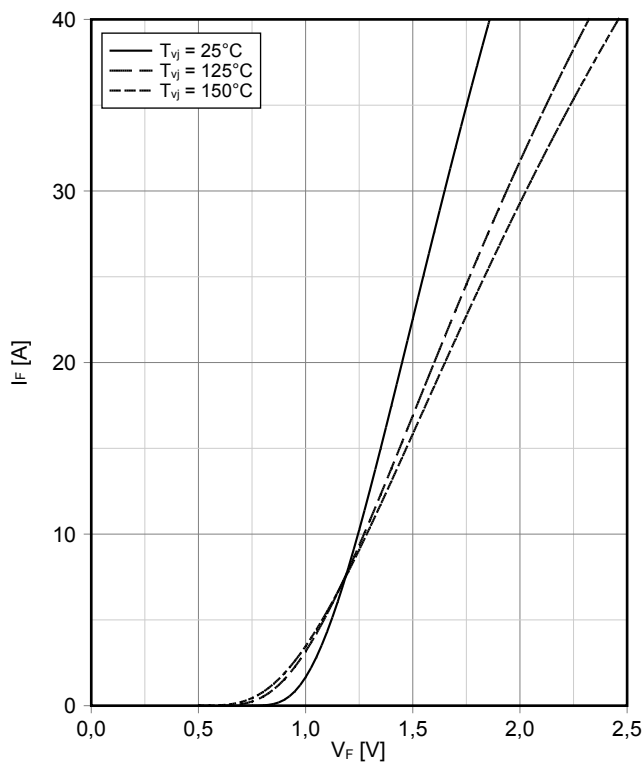
ゲート充電特性 IGBT、スリー・レベル (典型)  
**gate charge characteristic IGBT, 3-Level (typical)**

$V_{GE} = f(Q_G)$   
 $I_c = 20\text{ A}, T_{vj} = 25^\circ\text{C}$



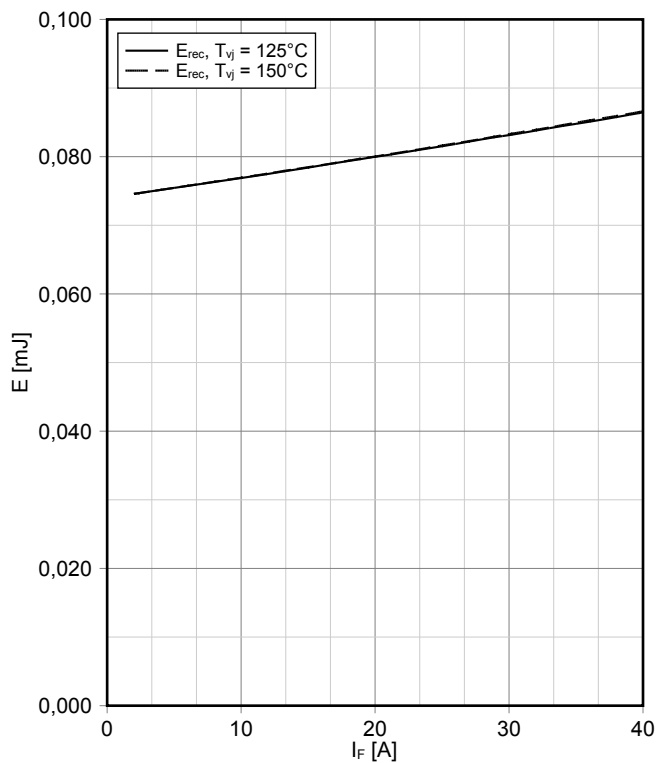
順電圧特性 ダイオード、スリー・レベル ( typical)  
**forward characteristic of Diode, 3-Level (typical)**

$I_F = f(V_F)$



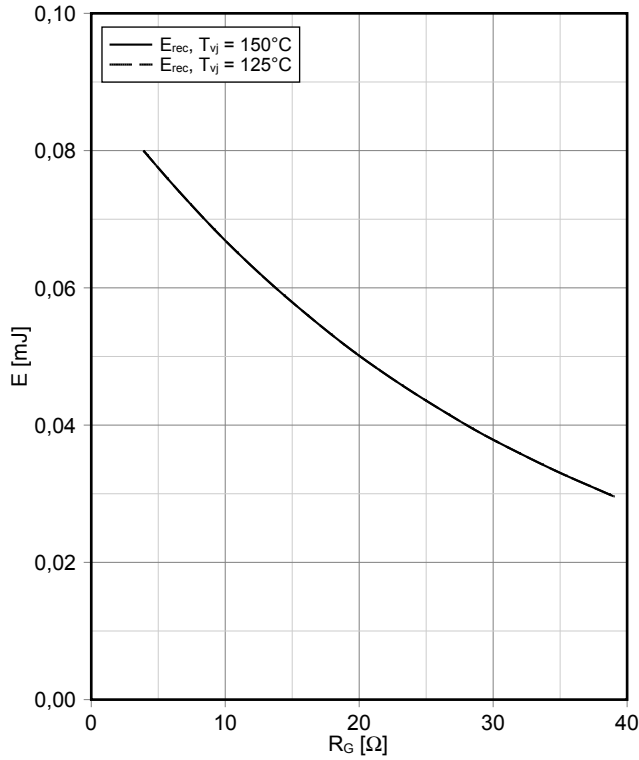
スイッチング損失 ダイオード、スリー・レベル (Typical)  
**switching losses Diode, 3-Level (typical)**

$E_{rec} = f(I_F)$   
 $R_{Gon} = 3,9\ \Omega, V_{CE} = 300\text{ V}$



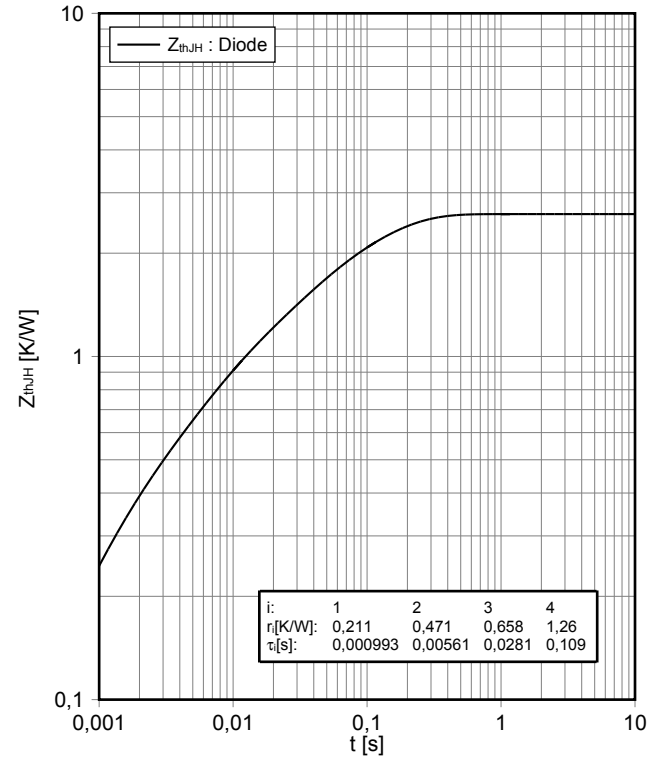
スイッチング損失 ダイオード、スリー・レーベル (Typical)  
**switching losses Diode, 3-Level (typical)**

$E_{rec} = f(R_G)$   
 $I_F = 20\text{ A}, V_{CE} = 300\text{ V}$

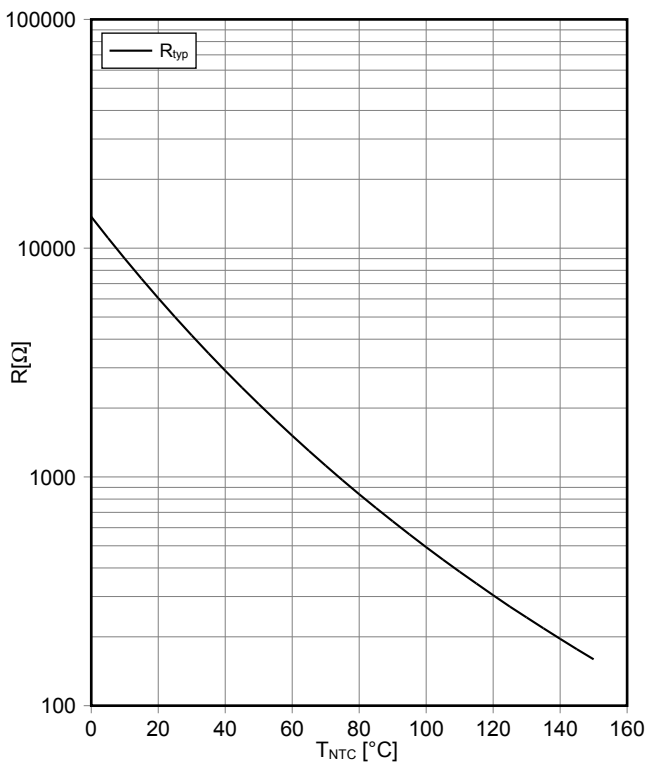


過渡熱インピーダンス ダイオード、スリー・レーベル  
**transient thermal impedance Diode, 3-Level**

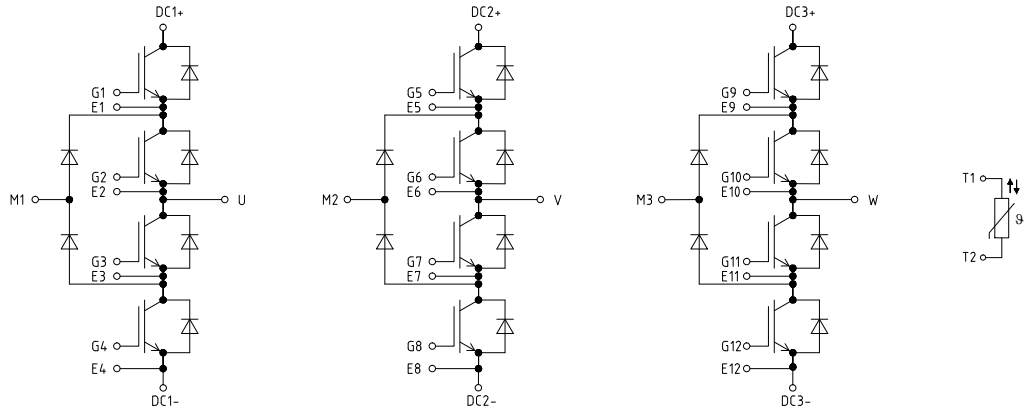
$Z_{thJH} = f(t)$



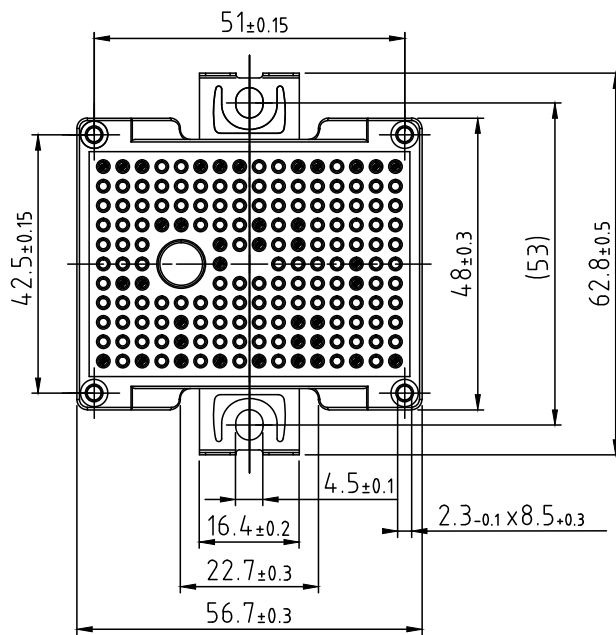
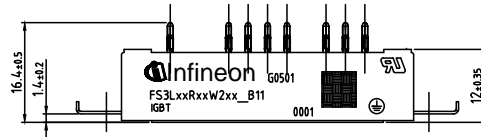
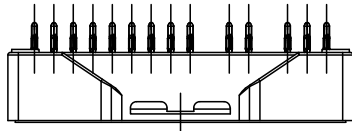
NTC-サーミスタ サーミスタの温度特性  
**NTC-Thermistor-temperature characteristic (typical)**  
 $R = f(T)$



## 回路図 / Circuit diagram



## パッケージ概要 / Package outlines



- Pin-Grid 3.2mm
- Tolerance of PCB hole pattern  $\varnothing 0.1$
- Hole specification for contacts see AN 2009-01:  
 Diameters of drill  $\varnothing 1.15$ mm  
 and copper thickness in hole 25-50 $\mu$ m

