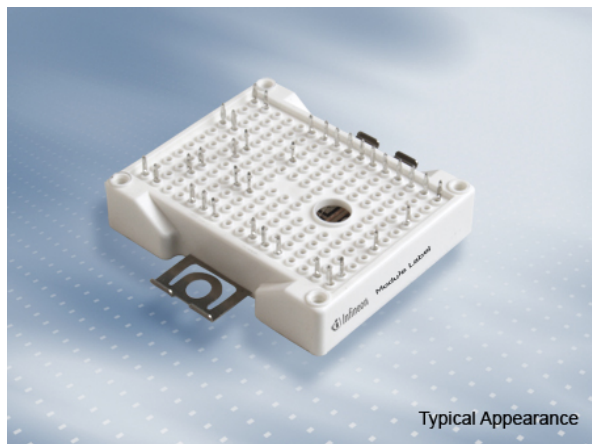


EasyPACK 模块 带有pressfit压接管脚和温度检测NTC
EasyPACK module and PressFIT / NTC



典型应用

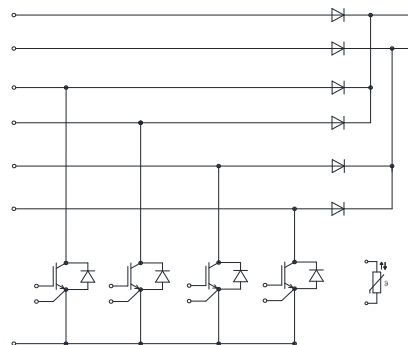
- 太阳能应用

电气特性

-
- 高速IGBT H3
- 低开关损耗
- thinQ!H 碳化硅肖特基二极管 1200V

机械特性

- 3 kV 交流 1分钟 绝缘
- 低热阻的三氧化二铝 (Al_2O_3) 衬底
- 集成NTC温度传感器
- 紧凑型设计
- PressFIT 压接技术



$V_{CES} = 1200V$

$I_{C\text{ nom}} = 160A / I_{CRM} = 320A$

Typical Applications

- Solar applications

Electrical Features

- CoolSiC (TM) Schottky diode gen 5
- High speed IGBT H3
- Low switching losses
- thinQ!H SiC Schottky diode 1200V

Mechanical Features

- 3 kV AC 1min insulation
- Al_2O_3 substrate with low thermal resistance
- Integrated NTC temperature sensor
- Compact design
- PressFIT contact technology

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

旁路二极管 / Bypass-Diode

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	$T_H = 60^{\circ}\text{C}$	I_{FRMSM}	50	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	$T_H = 60^{\circ}\text{C}$	I_{RMSM}	60	A
正向浪涌电流 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}	450 360	A A
I^2t -值 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	1000 650	A^2s A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 30\text{ A}$	V_F		0,95		V
反向电流 Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1200\text{ V}$	I_R		0,10		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,60		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

反极性保护二极管A / Inverse-polarity protection diode A

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
最大正向均方根电流(每芯片) Maximum RMS forward current per chip	$T_H = 100^{\circ}\text{C}$	I_{FRMSM}	30	A
最大整流器输出均方根电流 Maximum RMS current at rectifier output	$T_H = 100^{\circ}\text{C}$	I_{RMSM}	60	A
正向浪涌电流 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}	290 245	A A
I^2t -值 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	420 300	A^2s A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$T_{vj} = 150^{\circ}\text{C}, I_F = 20\text{ A}$	V_F		1,00		V
反向电流 Reverse current	$T_{vj} = 150^{\circ}\text{C}, V_R = 1200\text{ V}$	I_R		0,10		mA
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		2,35		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

IGBT, 斩波器 / IGBT-Chopper

最大额定值 / Maximum Rated Values

集电极 - 发射极电压 Collector-emitter voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
集电极电流 Implemented collector current		I_{CN}	40	A
连续集电极直流电流 Continuous DC collector current	$T_H = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{ nom}}$	20	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	80	A
栅极 - 发射极峰值电压 Gate-emitter peak voltage		V_{GES}	+/-20	V

特征值 / Characteristic Values

			min.	typ.	max.	
集电极 - 发射极饱和电压 Collector-emitter saturation voltage	$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,55 1,70 1,75	1,70	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 1,00\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	5,00	5,80	6,50 V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	0,32		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	0,0		Ω
输入电容 Input capacitance	$f = 1\text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}	2,35		nF
反向传输电容 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}	0,13		nF
集电极-发射极截止电流 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
栅极-发射极漏电流 Gate-emitter leakage current	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}, T_{vj} = 25^{\circ}\text{C}$		I_{GES}		100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{ on}}$	0,025 0,025 0,028		μs μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Gon} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,01 0,012 0,012		μs μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{d\text{ off}}$	0,25 0,32 0,35		μs μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{Goff} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,016 0,023 0,025		μs μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 1800\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	0,26 0,32 0,35		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 20\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}, du/dt = 3000\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 12\text{ }\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	0,80 1,20 1,40		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CE\text{ max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\text{ }\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		I_{SC}	130		A
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个 IGBT / per IGBT		R_{thJH}	1,10		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

Diode-斩波器 / Diode-Chopper

最大额定值 / Maximum Rated Values

反向重复峰值电压 Repetitive peak reverse voltage	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	15	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	30	A
I_{2t} -值 I_{2t} - value	$V_R = 0\text{ V}$, $t_P = 10\text{ ms}$, $T_{vj} = 125^{\circ}\text{C}$	I_{2t}	40,0	A^2s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 15\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25^{\circ}\text{C}$ $I_F = 15\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $I_F = 15\text{ A}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 150^{\circ}\text{C}$	V_F		1,45 1,75 1,85	1,75	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 15\text{ A}$, $-di_F/dt = 1800\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}		5,00 5,00 5,00		A A A
恢复电荷 Recovered charge	$I_F = 15\text{ A}$, $-di_F/dt = 1800\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r		0,15 0,25 0,25		μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 15\text{ A}$, $-di_F/dt = 1800\text{ A}/\mu\text{s}$ ($T_{vj}=150^{\circ}\text{C}$) $T_{vj} = 25^{\circ}\text{C}$ $V_R = 600\text{ V}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}		0,03 0,03 0,03		mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode	R_{thJH}		1,57		K/W
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

			min.	typ.	max.	
额定电阻值 Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		k Ω
R100 偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}$, $R_{100} = 493\text{ }\Omega$	$\Delta R/R$	-5		5	%
耗散功率 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$	$B_{25/100}$		3433		K

根据应用手册标定

Specification according to the valid application note.

模块 / Module

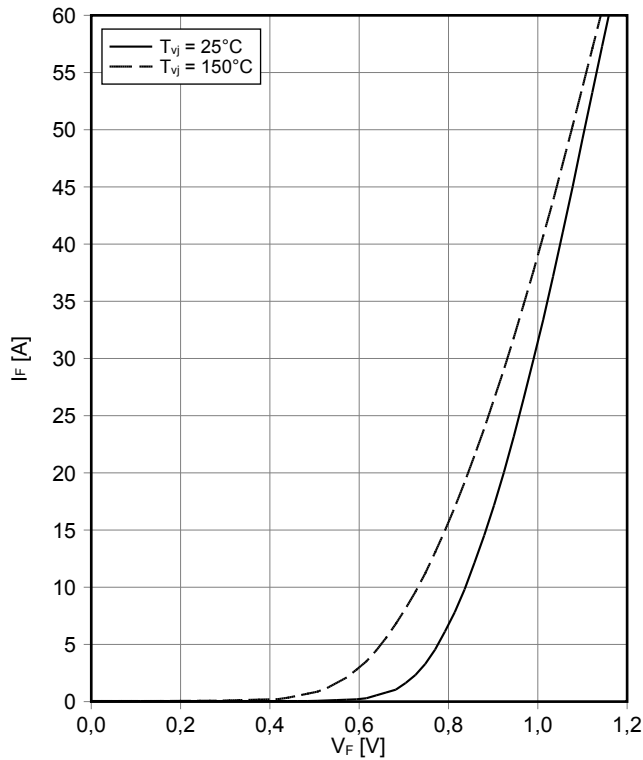
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	3,0	kV		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃			
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		11,5 6,3	mm		
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		10,0 5,0	mm		
相对电痕指数 Comperative tracking index		CTI	> 200			
		min. typ. max.				
杂散电感,模块 Stray inductance module		L _{sCE}		20		nH
储存温度 Storage temperature		T _{stg}	-40		125	°C
Anpresskraft für mech. Bef. pro Feder mounting force per clamp		F	40	-	80	N
重量 Weight		G		36		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.

正向偏压特性 旁路二极管 (典型)

forward characteristic of Bypass-Diode (typical)

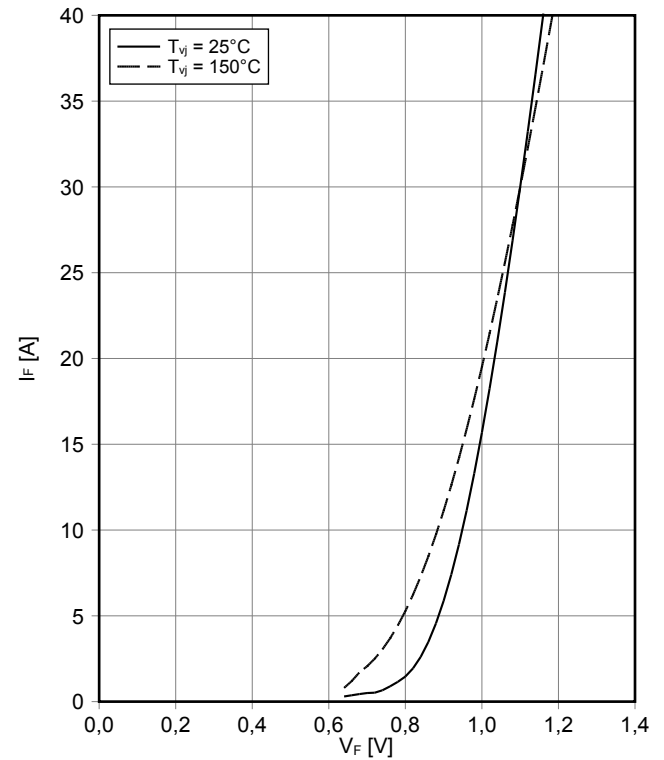
$I_F = f(V_F)$



正向偏压特性 反极性保护二极管A (典型)

forward characteristic of Inverse-polarity protection diode A (typical)

$I_F = f(V_F)$

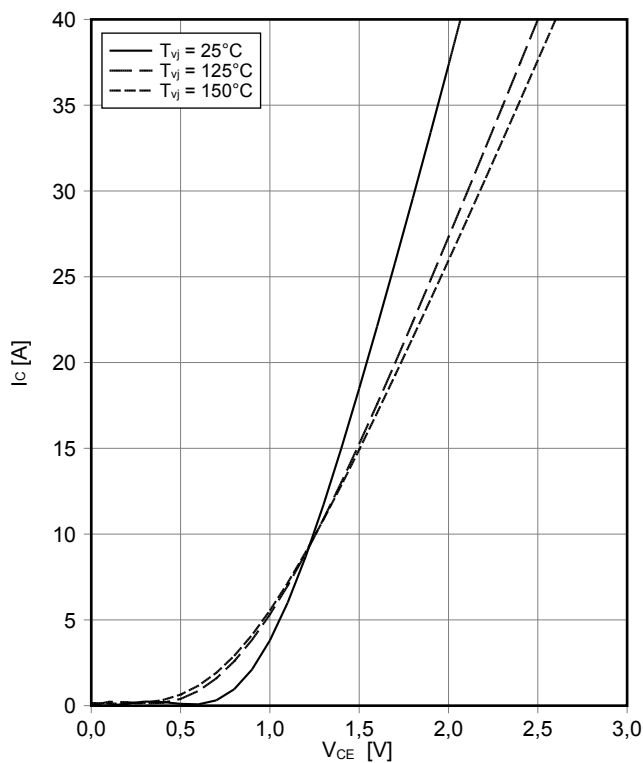


输出特性 IGBT, 斩波器 (典型)

output characteristic IGBT-Chopper (typical)

$I_C = f(V_{CE})$

$V_{GE} = 15 \text{ V}$

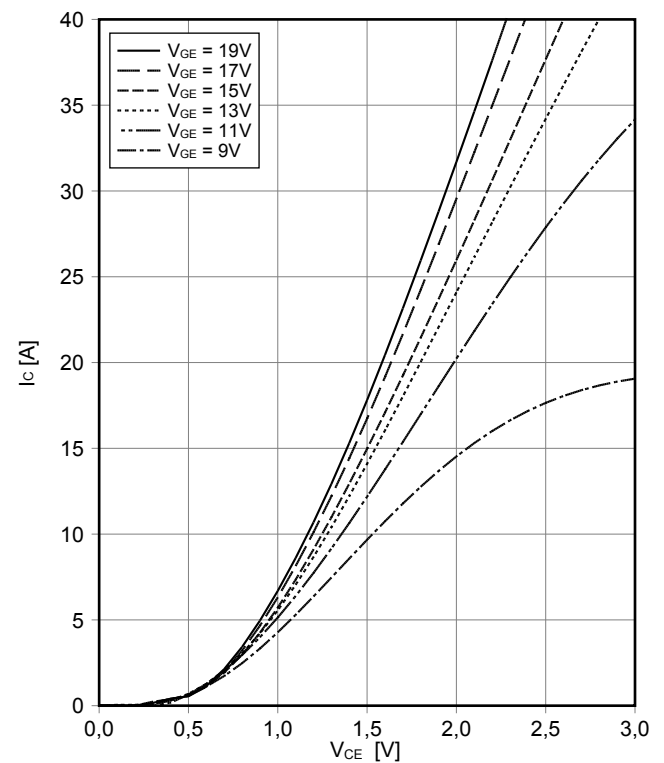


输出特性 IGBT, 斩波器 (典型)

output characteristic IGBT-Chopper (typical)

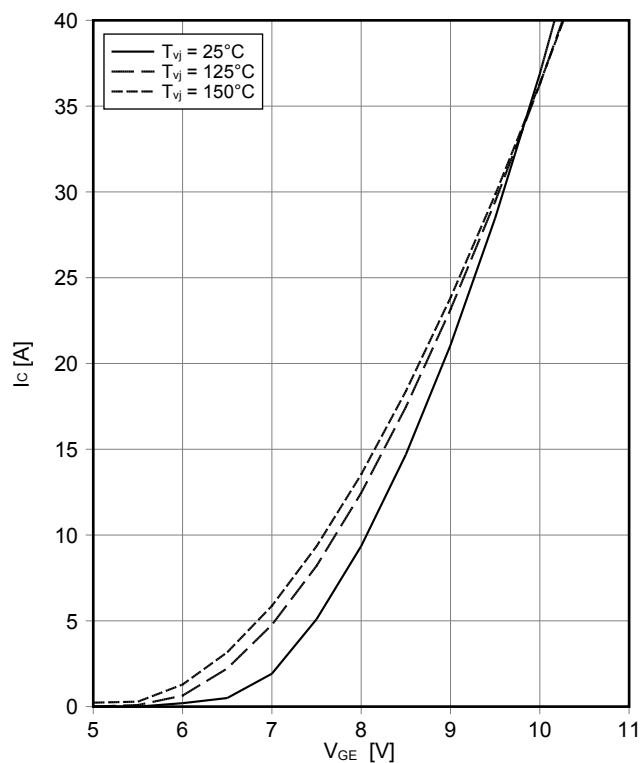
$I_C = f(V_{CE})$

$T_{vj} = 150^\circ\text{C}$



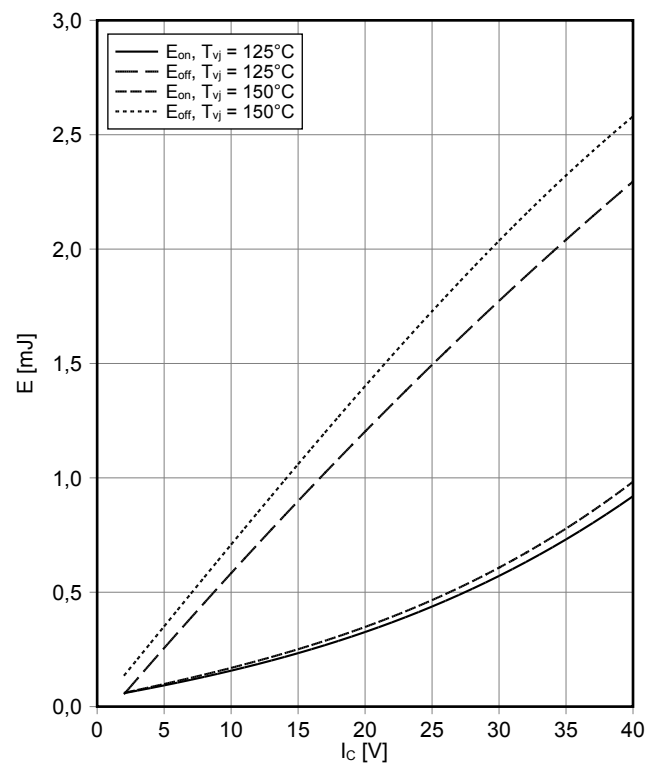
传输特性 IGBT, 斩波器 (典型) transfer characteristic IGBT-Chopper (typical)

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



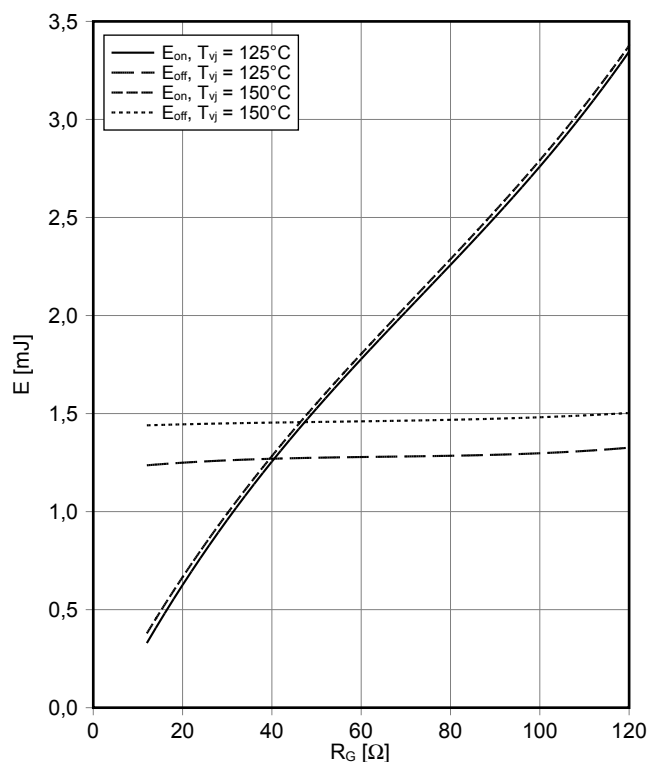
开关损耗 IGBT, 斩波器 (典型) switching losses IGBT-Chopper (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Gon} = 12 \Omega$, $R_{Goff} = 12 \Omega$, $V_{CE} = 600 \text{ V}$



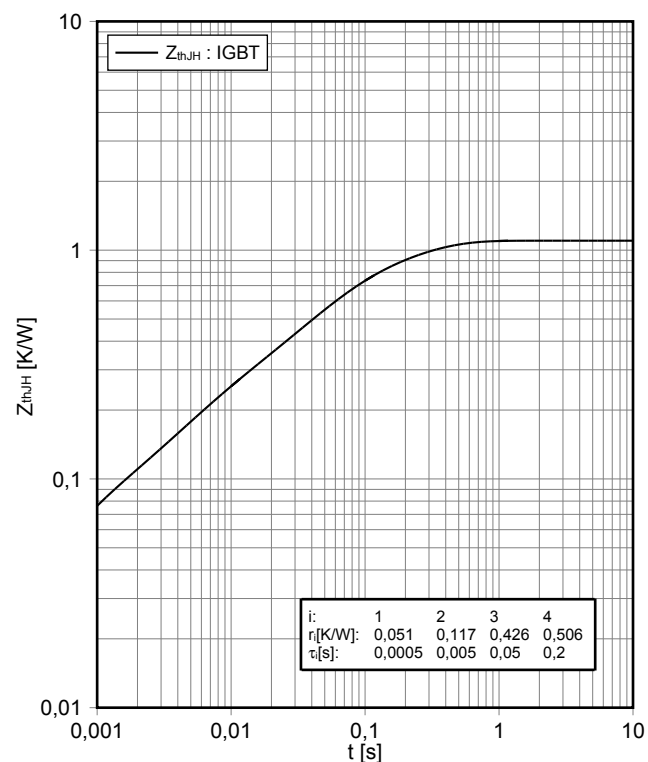
开关损耗 IGBT, 斩波器 (典型) switching losses IGBT-Chopper (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15 \text{ V}$, $I_C = 20 \text{ A}$, $V_{CE} = 600 \text{ V}$

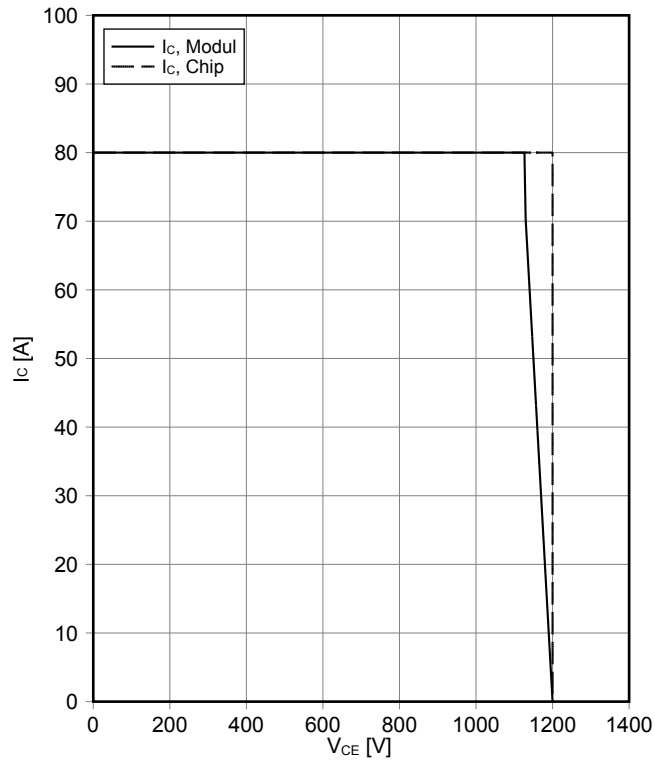


瞬态热阻抗 IGBT, 斩波器 transient thermal impedance IGBT-Chopper

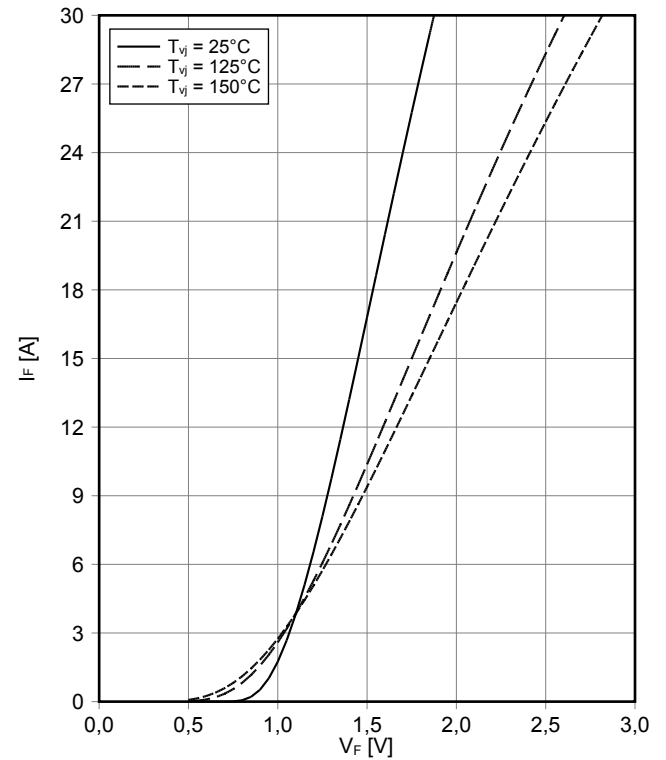
$Z_{thJH} = f(t)$



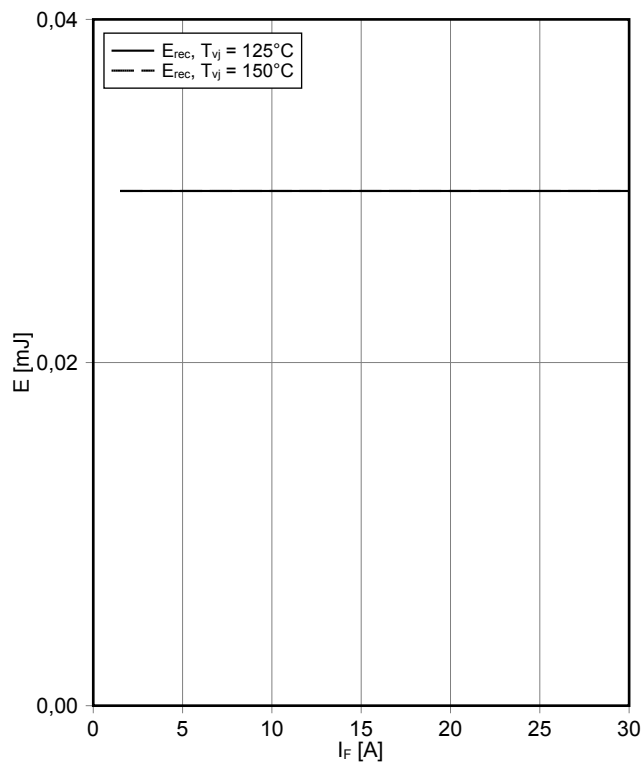
反偏安全工作区 IGBT, 斩波器 (RBSOA)
reverse bias safe operating area IGBT-Chopper (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = \pm 15 \text{ V}$, $R_{Goff} = 12 \Omega$, $T_{vj} = 150^\circ\text{C}$



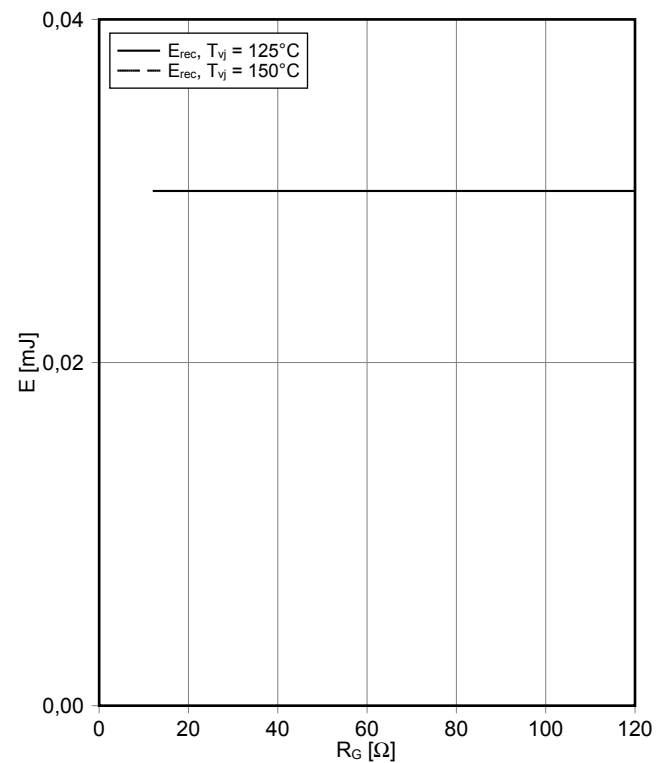
正向偏压特性 Diode-斩波器 (典型)
forward characteristic of Diode-Chopper (typical)
 $I_F = f(V_F)$



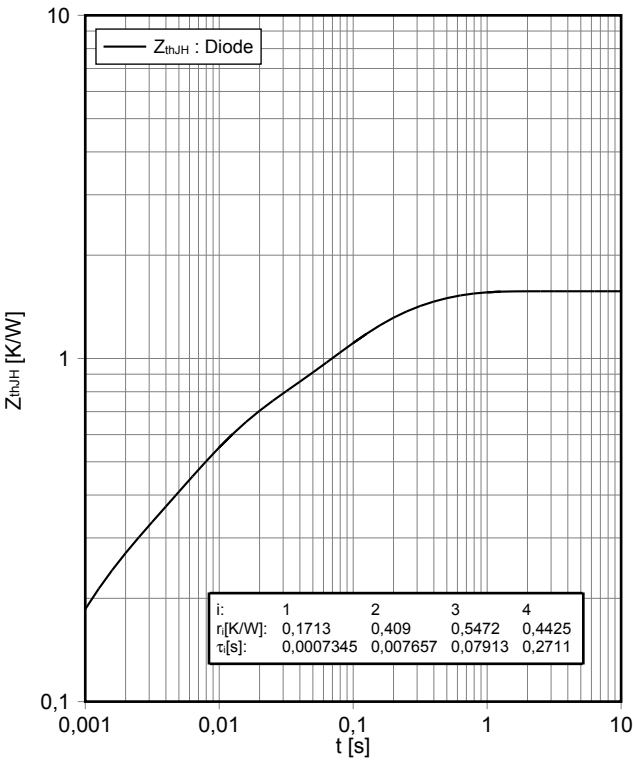
开关损耗 Diode-斩波器 (典型)
switching losses Diode-Chopper (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 12 \Omega$, $V_{CE} = 600 \text{ V}$



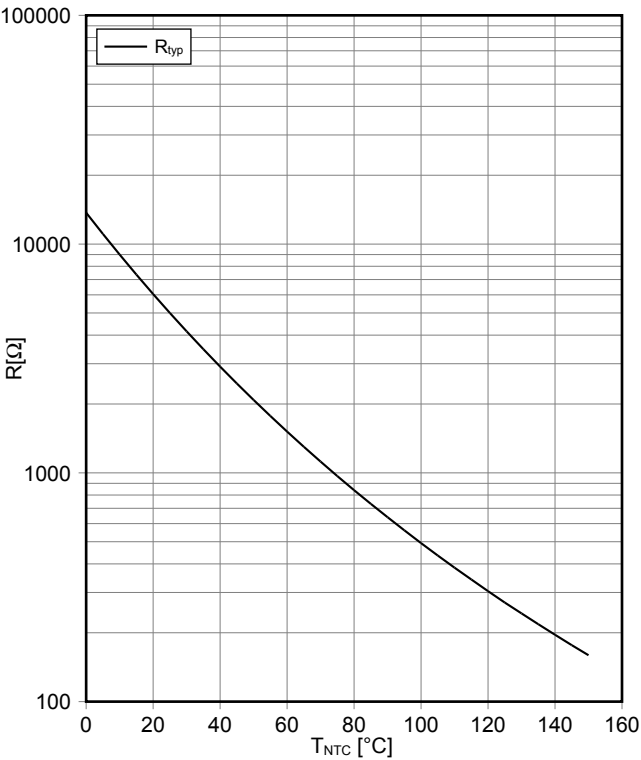
开关损耗 Diode-斩波器 (典型)
switching losses Diode-Chopper (typical)
 $E_{rec} = f(R_G)$
 $I_F = 15 \text{ A}$, $V_{CE} = 600 \text{ V}$



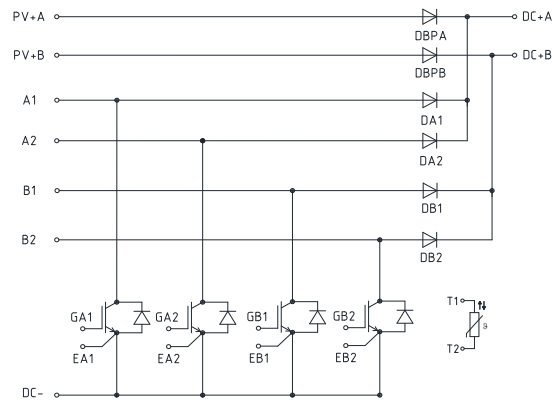
瞬态热阻抗 Diode-斩波器
transient thermal impedance Diode-Chopper
 $Z_{thJH} = f(t)$



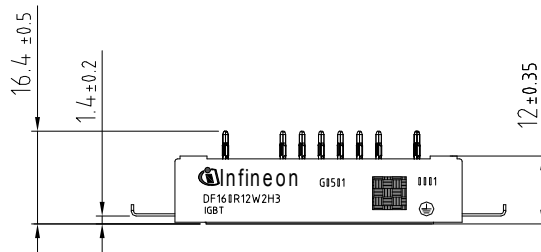
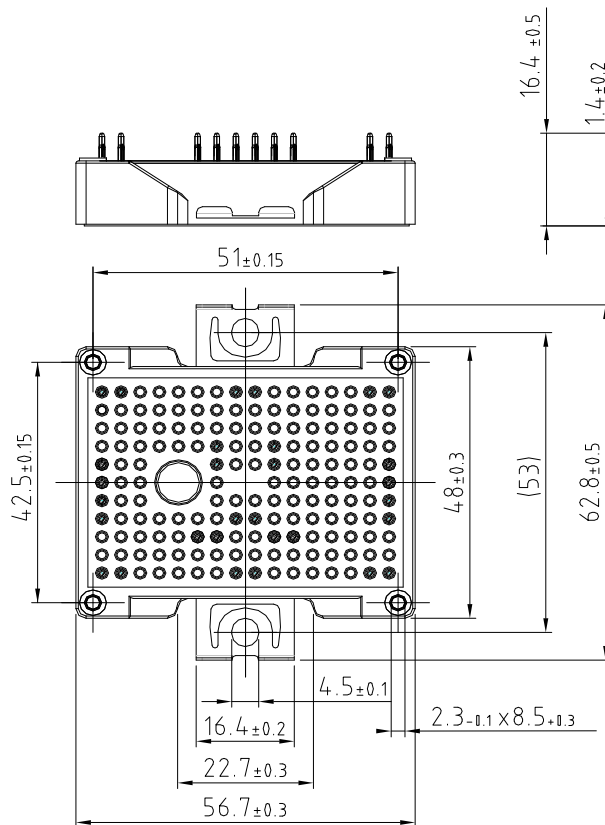
负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
 $R = f(T)$



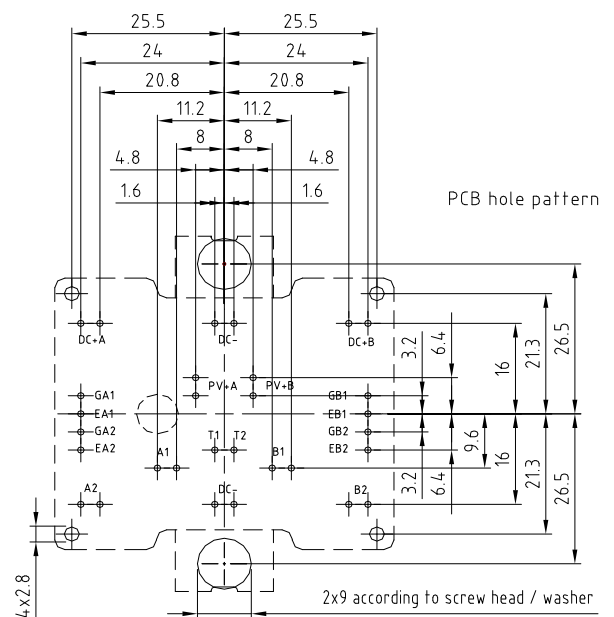
接线图 / Circuit diagram



封装尺寸 / 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 $\varnothing 1.15\text{mm}$
and copper thickness in hole 25-50 μm



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