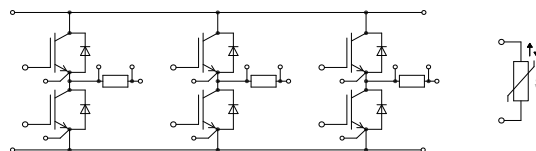
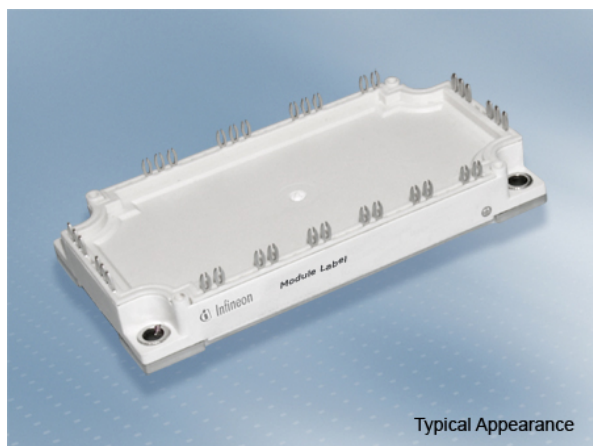


MIPAQ™base 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管 带有pressfit预涂导热材料
 MIPAQ™base module with Trench/Fieldstop IGBT4 and Emitter Controlled diode and PressFIT / pre-applied Thermal Interface Material



$V_{CES} = 1700V$
 $I_{C\ nom} = 150A / I_{CRM} = 300A$

典型应用

- 电机传动
- UPS系统

Typical Applications

- Motor drives
- UPS systems

电气特性

- 提高工作结温 $T_{vj\ op}$
- 低 V_{CEsat}
- V_{CEsat} 带正温度系数

Electrical Features

- Extended operating temperature $T_{vj\ op}$
- Low V_{CEsat}
- V_{CEsat} with positive temperature coefficient

机械特性

- 集成NTC温度传感器
- 绝缘的基板
- 焊接技术
- 标准封装
- 预涂导热介质

Mechanical Features

- Integrated NTC temperature sensor
- Isolated base plate
- Solder contact technology
- Standard housing
- Pre-applied Thermal Interface Material

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, 逆变器 / IGBT, Inverter

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}	1700	V
连续集电极直流电流 Continuous DC collector current	$T_H = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	150	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	300	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	$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$		1,95	2,30	V	
	$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$		2,35		V	
	$I_C = 150\text{ A}, V_{GE} = 15\text{ V}$		2,45		V	
栅极阈值电压 Gate threshold voltage	$I_C = 6,00\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	V_{GEth}	5,25	5,80	6,35	V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$	Q_G	1,70		μC	
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$	R_{Gint}	5,0		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}	13,5		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}	0,44		nF	
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$	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	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,20		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,22		μs	
	$R_{Gon} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,23		μs	
上升时间(电感负载) Rise time, inductive load	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,03		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,04		μs	
	$R_{Gon} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,04		μs	
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,40		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,55		μs	
	$R_{Goff} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,59		μs	
下降时间(电感负载) Fall time, inductive load	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	0,09		μs	
	$V_{GE} = \pm 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$	0,15		μs	
	$R_{Goff} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	0,17		μs	
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}, L_S = 30\text{ nH}$	$T_{vj} = 25^{\circ}\text{C}$	25,0		mJ	
	$V_{GE} = \pm 15\text{ V}, di/dt = 4500\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$	$T_{vj} = 125^{\circ}\text{C}$	36,0		mJ	
	$R_{Gon} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	39,5		mJ	
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 150\text{ A}, V_{CE} = 900\text{ V}, L_S = 30\text{ nH}$	$T_{vj} = 25^{\circ}\text{C}$	27,0		mJ	
	$V_{GE} = \pm 15\text{ V}, du/dt = 3100\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$	$T_{vj} = 125^{\circ}\text{C}$	44,0		mJ	
	$R_{Goff} = 0,24\ \Omega$	$T_{vj} = 150^{\circ}\text{C}$	49,5		mJ	
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 1000\text{ V}$ $V_{CE\max} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}	700	A	
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个 IGBT / per IGBT valid with IFX pre-applied thermal interface material	R_{thJH}		0,206	K/W	
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{op}}$	-40	150	$^{\circ}\text{C}$	

二极管, 逆变器 / Diode, Inverter 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}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	150	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	300	A
I^2t -值 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	3800 3700	A^2s A^2s

特征值 / Characteristic Values

		min.	typ.	max.	
正向电压 Forward voltage	$I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 150 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,80 1,90 1,95	2,20 V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 150 \text{ A}, -di_F/dt = 4500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	275 280 285	A A A
恢复电荷 Recovered charge	$I_F = 150 \text{ A}, -di_F/dt = 4500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	45,0 60,5 68,0	μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 150 \text{ A}, -di_F/dt = 4500 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	23,0 36,0 40,5	mJ mJ mJ
结 - 散热器热阻 Thermal resistance, junction to heatsink	每个二极管 / per diode valid with IFX pre-applied thermal interface material		R_{thJH}		0,404 K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj op}$	-40	150 $^{\circ}\text{C}$

电流取样电阻 / Shunt

		min.	typ.	max.	
额定电阻值 Rated resistance	$T_c = 20^{\circ}\text{C}$	R_{20}	1,50		m Ω
温度系数 (tcr) Temperature coefficient (tcr)	$20^{\circ}\text{C} - 60^{\circ}\text{C}$		< 30		ppm/K
电流取样电阻工作温度 Operation temperature shunt-resistor		T_{tjop}		200	$^{\circ}\text{C}$
结 - 散热器热阻 Thermal resistance, junction to heatsink		R_{thJH}		9,7	K/W

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	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-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.

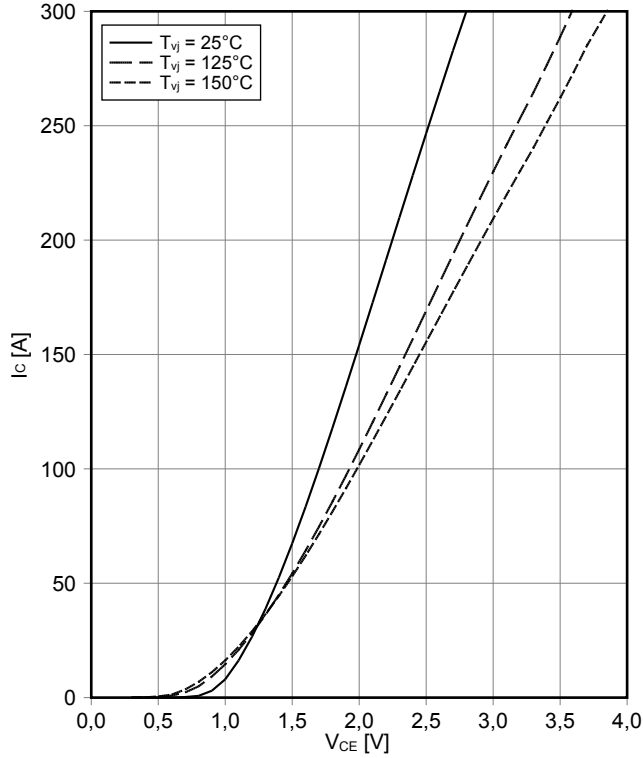
模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	3,4		kV
模块基板材料 Material of module baseplate			Cu		
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		10,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		7,5		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
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	T _H = 25°C, 每个开关 / per switch	R _{CC+EE'}		2,50	mΩ
储存温度 Storage temperature		T _{stg}	-40		125 °C
最高基板工作温度 Maximum baseplate operation temperature		T _{BPmax}			125 °C
模块安装的安装扭矩 Mounting torque for modul mounting	螺丝 M5 根据相应的应用手册进行安装 Screw M5 - Mounting according to valid application note	M	3,00		6,00 Nm
重量 Weight		G		300	g

Lagerung und Transport von Modulen mit TIM => siehe AN2012-07
Storage and shipment of modules with TIM => see AN2012-07

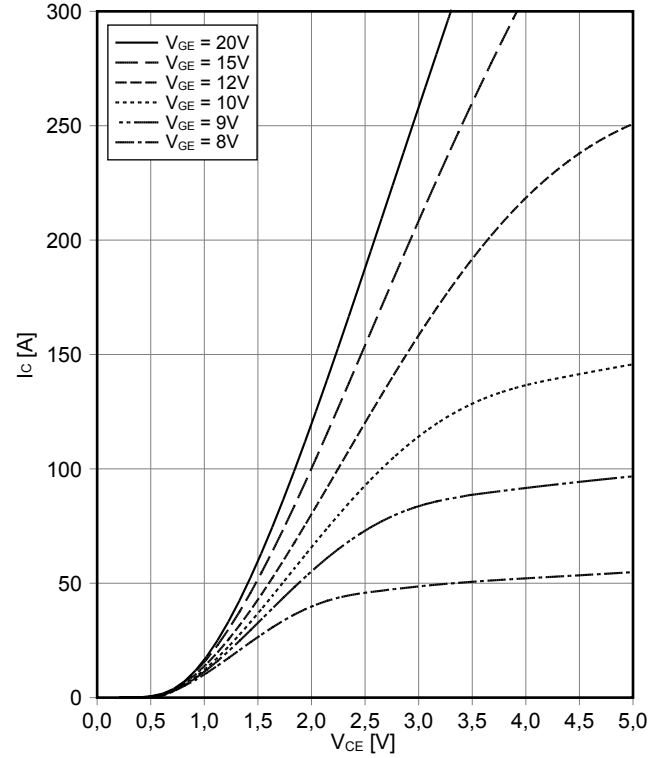
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



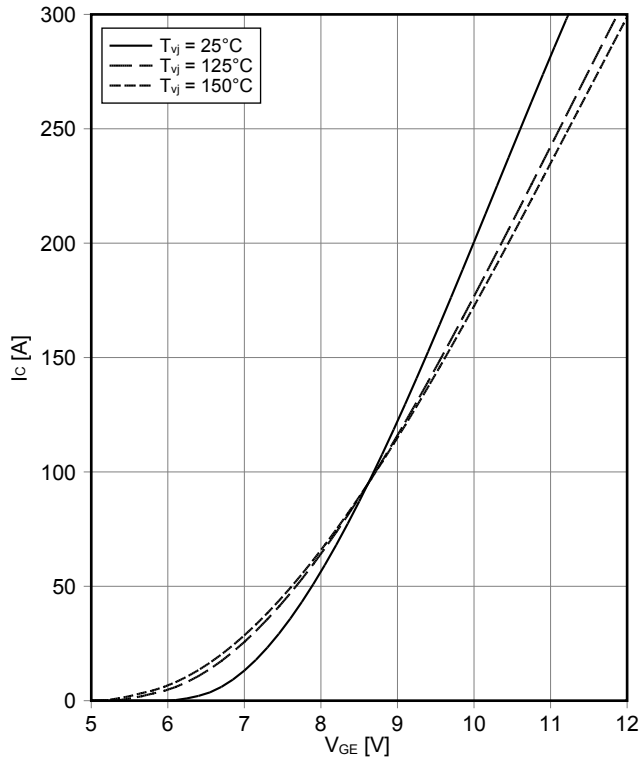
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



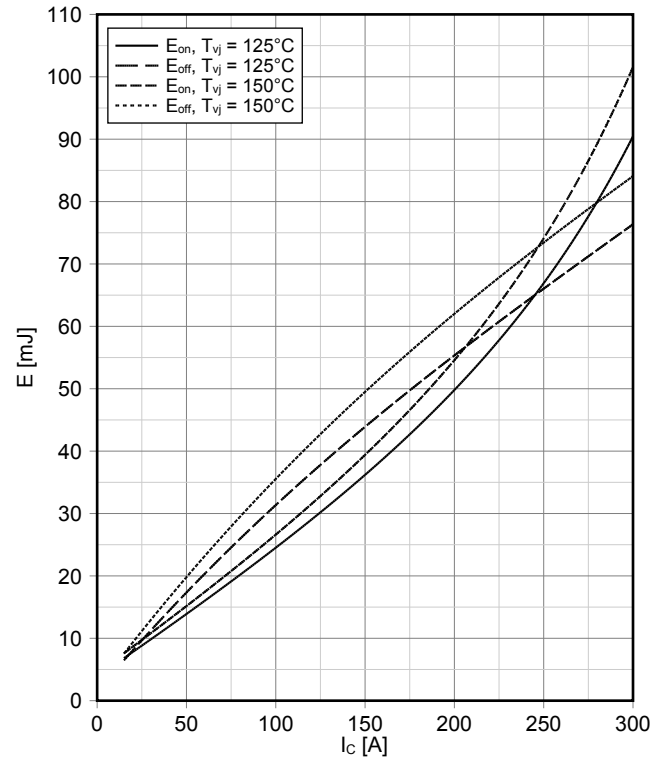
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



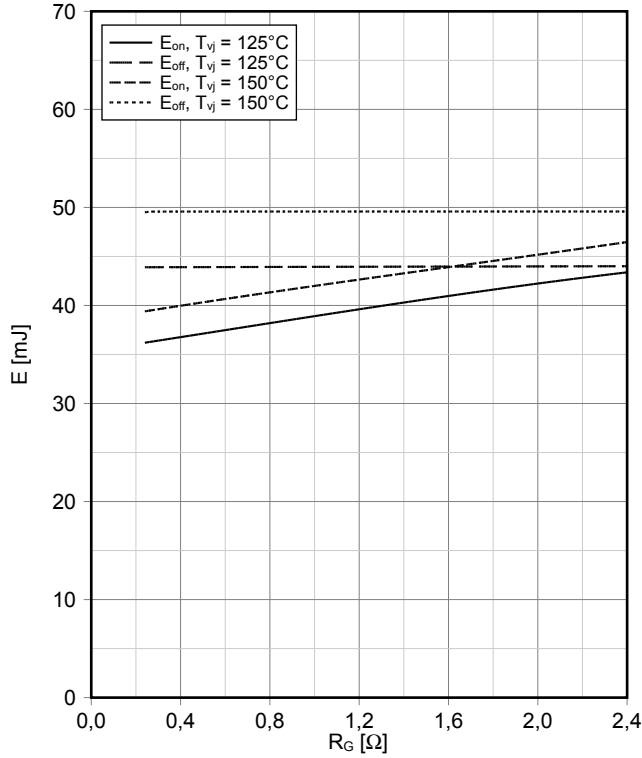
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.24\ \Omega$, $R_{Goff} = 0.24\ \Omega$, $V_{CE} = 900\text{ V}$

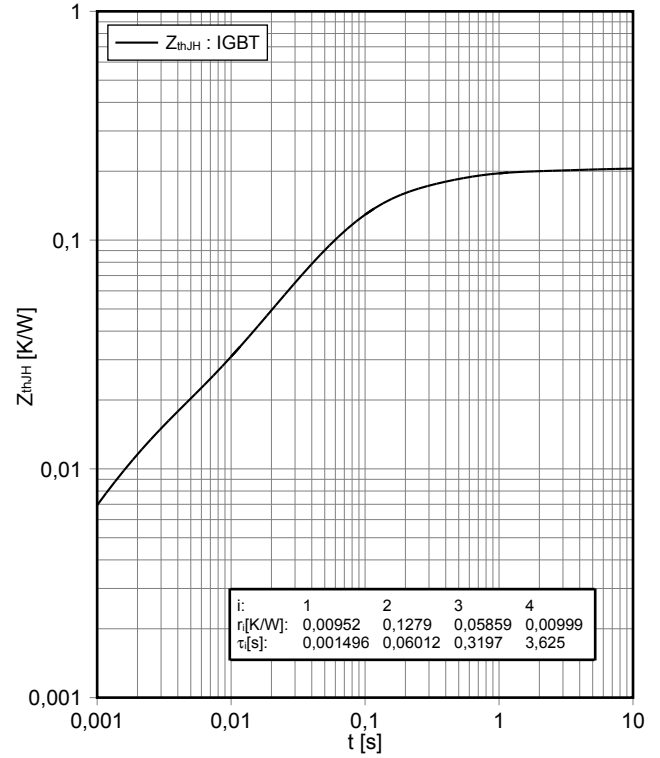


开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 150\text{ A}, V_{CE} = 900\text{ V}$

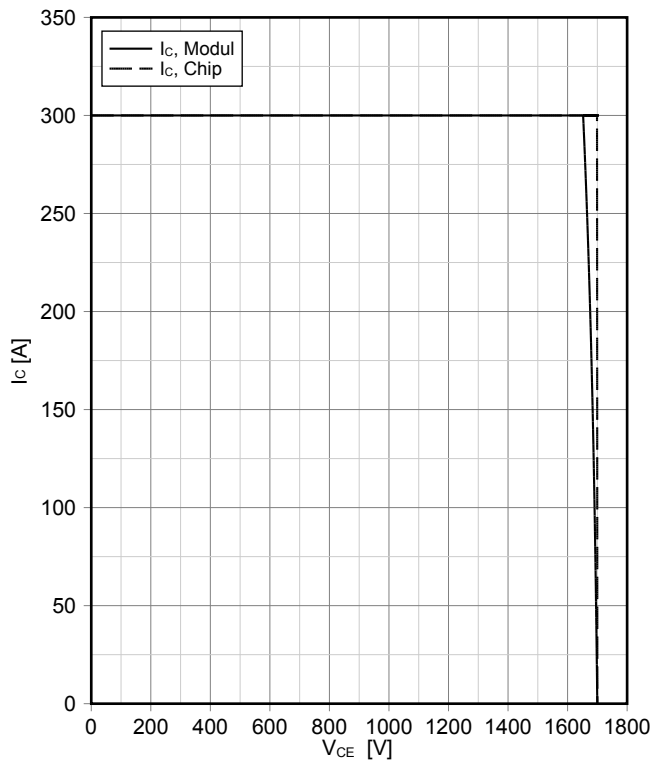


瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJH} = f(t)$

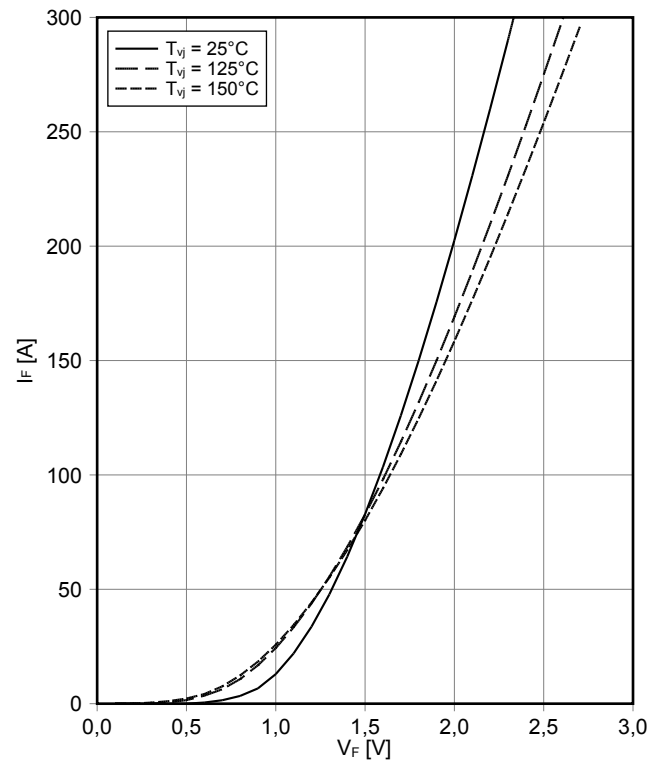


反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 0.24\ \Omega, T_{vj} = 150^\circ\text{C}$

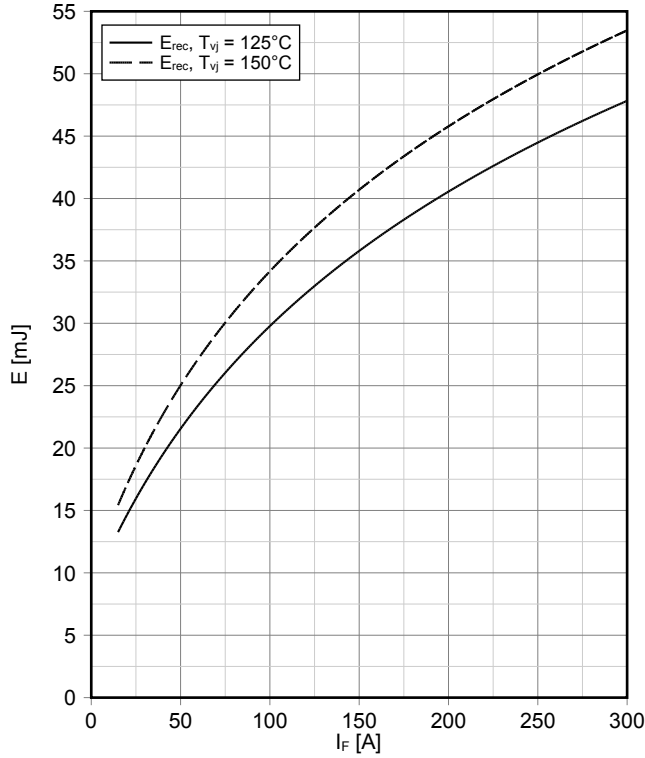


正向偏压特性 二极管, 逆变器 (典型)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



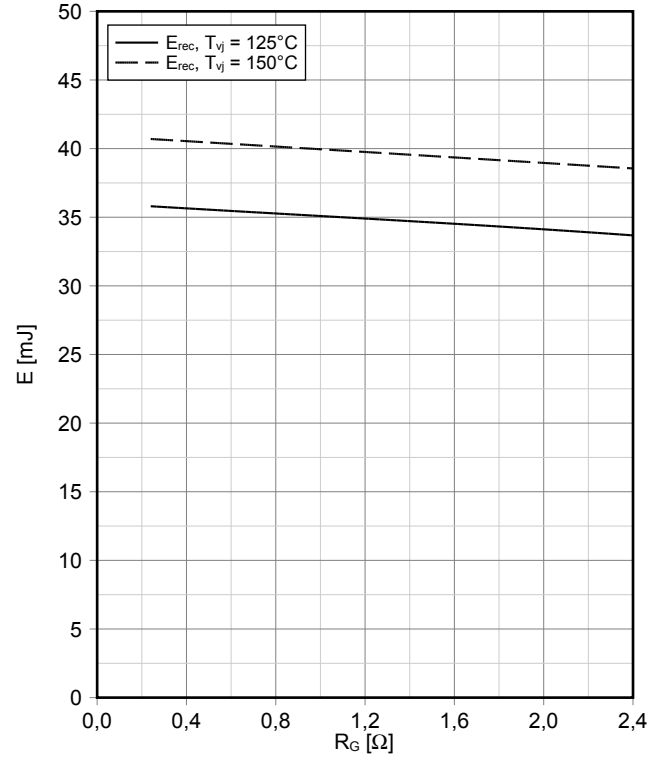
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 0.24 \Omega, V_{CE} = 900 V$



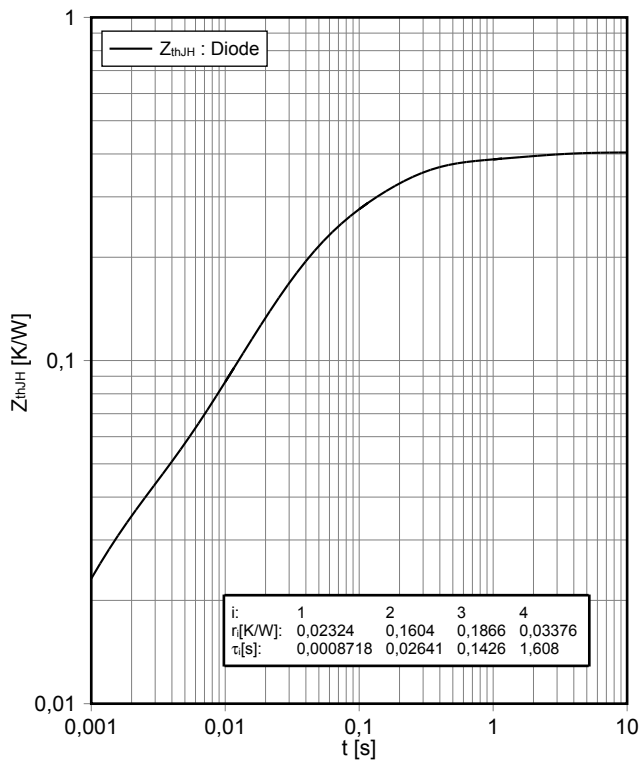
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 150 A, V_{CE} = 900 V$



瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$

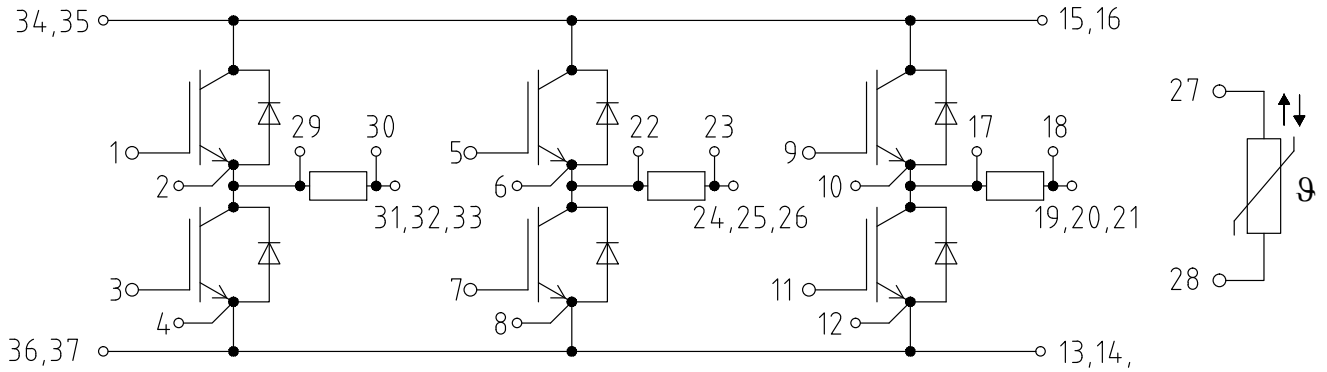


负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)

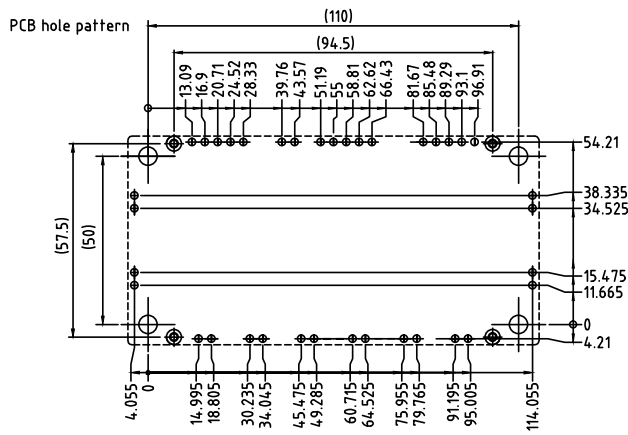
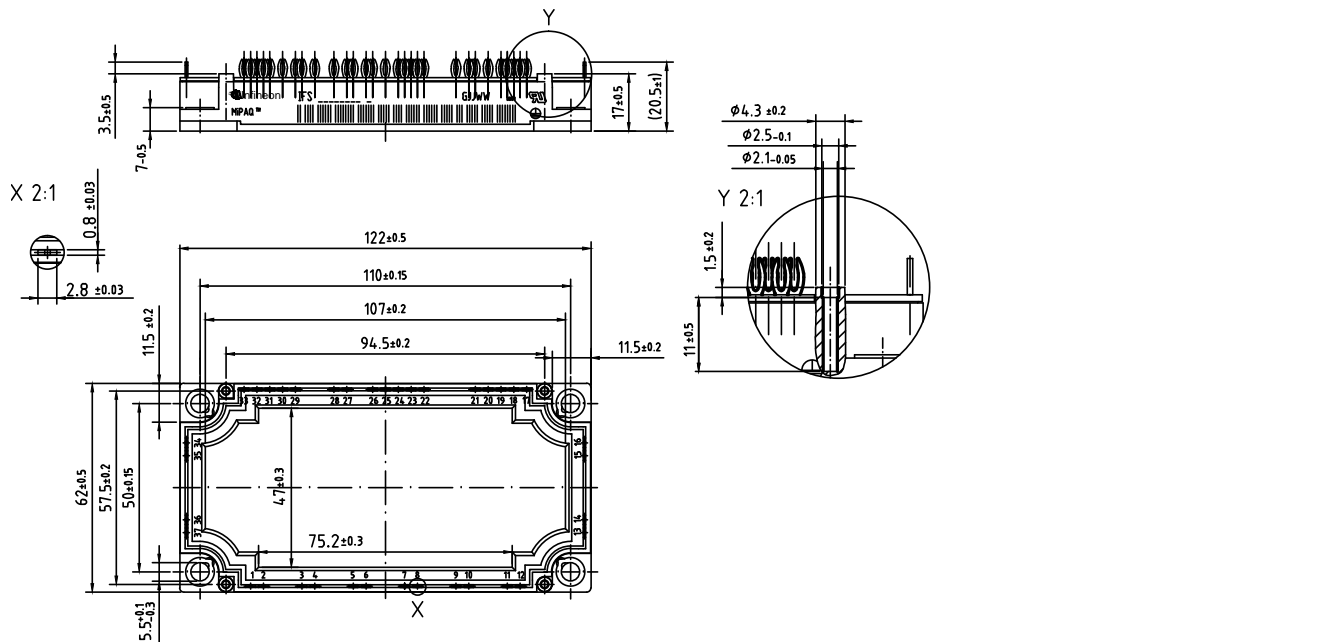
$R = f(T)$



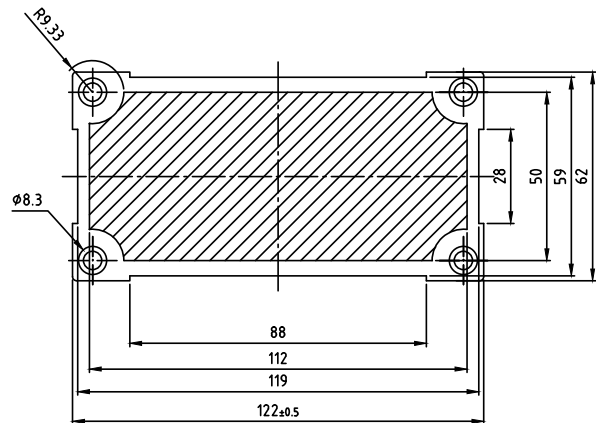
接线图 / Circuit diagram



封装尺寸 / Package outlines



- Tolerance of PCB hole pattern $\pm \phi 0.1$
- hole specifications see AN 2007-09
- Diameters of plated holes ϕ 2.14mm - 2.29mm
- Diameter of drill ϕ 2.35mm



restricted area for Thermal Interface Material

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Edition 2017-01-13

Published by
Infineon Technologies AG
81726 München, Germany

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