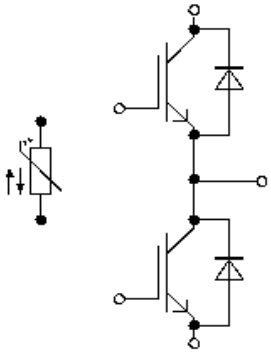
技术信息 / Technical Information

IGBT-模块
IGBT-Module

FF1400R17IP4P

PrimePACK™3 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管
PrimePACK™3 module with Trench/Fieldstop IGBT4 and Emitter Controlled diode





V_{CES} = 1700V
$I_{C\ nom}$ = 1400A / I_{CRM} = 2800A

典型应用
- 大功率变流器
- 电机传动
- 风力发电机

Typical Applications
- High power converters
- Motor drives
- Wind turbines

电气特性
- 高短路能力
- 高冲击电流能力
- 高电流密度
- $T_{vj\ op}$ = 150°C
- V_{CEsat} 带正温度系数

Electrical Features
- High short-circuit capability
- High surge current capability
- High current density
- $T_{vj\ op}$ = 150°C
- V_{CEsat} with positive temperature coefficient

机械特性
- 4 kV 交流 1分钟 绝缘
- 封装的 CTI > 400
- 高爬电距离和电气间隙
- 集成NTC温度传感器
- 符合RoHS
- 预涂导热介质

Mechanical Features
- 4 kV AC 1min insulation
- Package with CTI > 400
- High creepage and clearance distances
- Integrated NTC temperature sensor
- RoHS compliant
- Pre-applied Thermal Interface Material

Module Label Code

Barcode Code 128



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

prepared by: SM	date of publication: 2016-09-07	
approved by: RN	revision: V3.1	UL approved (E83335)

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°C	V_{CES}		1700	V
连续集电极直流电流 Continuous DC collector current	T_H = 65°C, $T_{vj\,max}$ = 175°C	$I_{C\,nom}$		1400	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}		2800	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 = 1400 A, V_{GE} = 15 V I_C = 1400 A, V_{GE} = 15 V I_C = 1400 A, V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$V_{CE\,sat}$		1,75 2,10 2,20	2,20 2,65 2,80	V V V
栅极阈值电压 Gate threshold voltage	I_C = 50,0 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,20	5,80	6,40	V
栅极电荷 Gate charge	V_{GE} = -15 V ... +15 V		Q_G		13,5		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,6		Ω
输入电容 Input capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		110		nF
反向传输电容 Reverse transfer capacitance	f = 1 MHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		3,60		nF
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE} = 1700 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			5,0	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			400	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	I_C = 1400 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Gon} = 0,47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,on}$		0,84 0,88 0,89		µs µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 1400 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Gon} = 0,47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_r		0,13 0,14 0,14		µs µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 1400 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Goff} = 0,68 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	$t_{d\,off}$		1,15 1,35 1,40		µs µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 1400 A, V_{CE} = 900 V V_{GE} = ±15 V R_{Goff} = 0,68 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	t_f		0,50 0,77 0,79		µs µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 1400 A, V_{CE} = 900 V, L_S = 30 nH V_{GE} = ±15 V, di/dt = 9500 A/µs (T_{vj} = 150°C) R_{Gon} = 0,47 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{on}		340 500 560		mJ mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 1400 A, V_{CE} = 900 V, L_S = 30 nH V_{GE} = ±15 V, du/dt = 2500 V/µs (T_{vj} = 150°C) R_{Goff} = 0,68 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{off}		440 625 650		mJ mJ mJ
短路数据 SC data	V_{GE} ≤ 15 V, V_{CC} = 1000 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	t_P ≤ 10 µs, T_{vj} = 150°C	I_{SC}		5600		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}			27,4	K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		150	°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°C	V_{RRM}	1700	V
连续正向直流电流 Continuous DC forward current		I_F	1400	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	2800	A
I2t-值 I²t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C	I²t	200	kA²s
最大损耗功率 Maximum power dissipation	T_{vj} = 125°C	P_{RQM}	1400	kW

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	I_F = 1400 A, V_{GE} = 0 V, T_{vj} = 25°C I_F = 1400 A, V_{GE} = 0 V, T_{vj} = 125°C I_F = 1400 A, V_{GE} = 0 V, T_{vj} = 150°C	V_F		1,75 1,80 1,80	2,45 2,50 2,50	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 1400 A, - di_F/dt = 10000 A/µs (T_{vj}=150°C), V_R = 900 V, V_{GE} = -15 V, T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	I_{RM}		1500 1650 1700		A A A
恢复电荷 Recovered charge	I_F = 1400 A, - di_F/dt = 10000 A/µs (T_{vj}=150°C), V_R = 900 V, V_{GE} = -15 V, T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	Q_r		345 585 650		µC µC µC
反向恢复损耗（每脉冲） Reverse recovery energy	I_F = 1400 A, - di_F/dt = 10000 A/µs (T_{vj}=150°C), V_R = 900 V, V_{GE} = -15 V, T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 150°C	E_{rec}		195 345 385		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}			50,5	K/kW
在开关状态下温度 Temperature under switching conditions		$T_{vj\,op}$	-40		150	°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°C	R_{25}		5,00		kΩ
R100 偏差 Deviation of R100	T_{NTC} = 100°C, R_{100} = 493 Ω	ΔR/R	-5		5	%
耗散功率 Power dissipation	T_{NTC} = 25°C	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298{,}15\ K))]$	$B_{25/100}$		3433		K

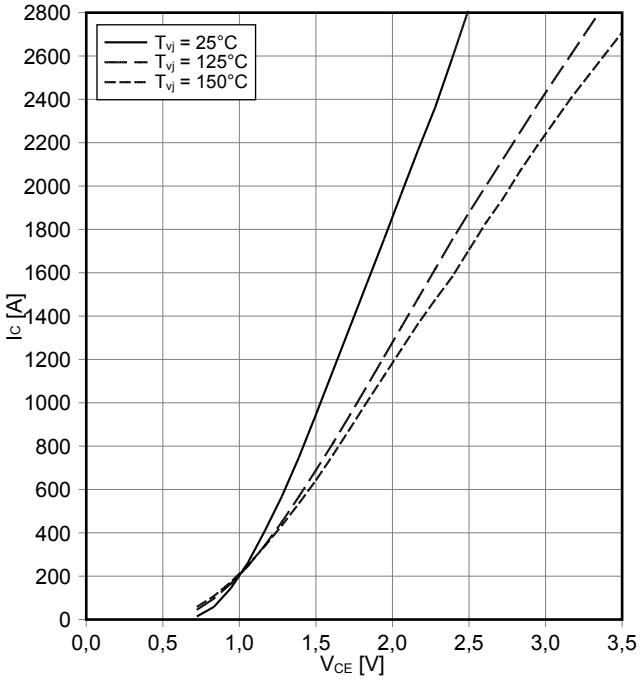
根据应用手册标定
Specification according to the valid application note.

模块 / Module

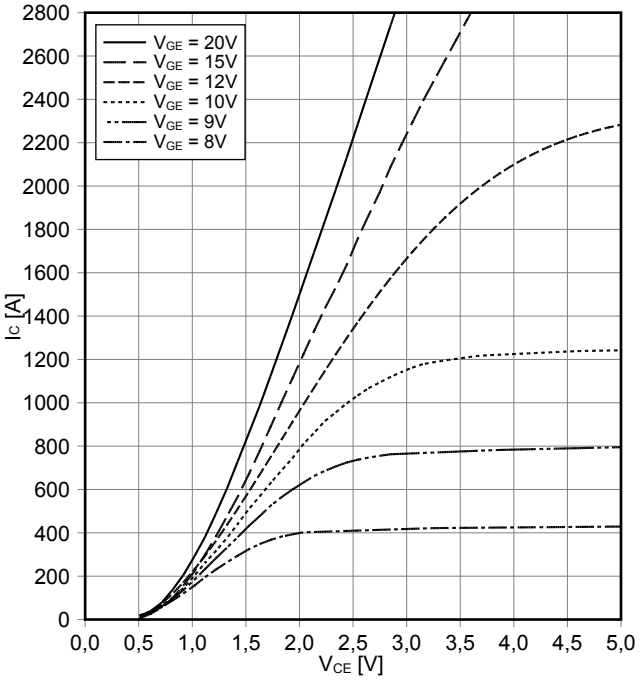
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		4,0		kV
模块基板材料 Material of module baseplate				Cu		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)			Al_2O_3		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			33,0 33,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			19,0 19,0		mm
相对电痕指数 Comperative tracking index		CTI		> 400		
			min.	typ.	max.	
杂散电感,模块 Stray inductance module		L_{sCE}		10		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	$R_{CC'+EE'}$		0,20		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
模块安装的安装扭距 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
端子联接扭距 Terminal connection torque	螺丝 M4 根据相应的应用手册进行安装 Screw M4 - Mounting according to valid application note 螺丝 M8 根据相应的应用手册进行安装 Screw M8 - Mounting according to valid application note	M	1,8 8,0	- -	2,1 10	Nm Nm
重量 Weight		G		1200		g

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

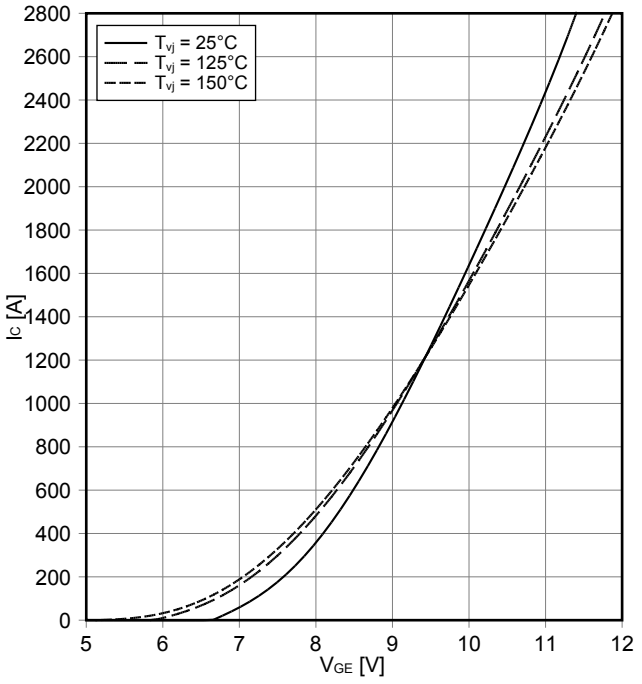
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
V_{GE} = 15 V



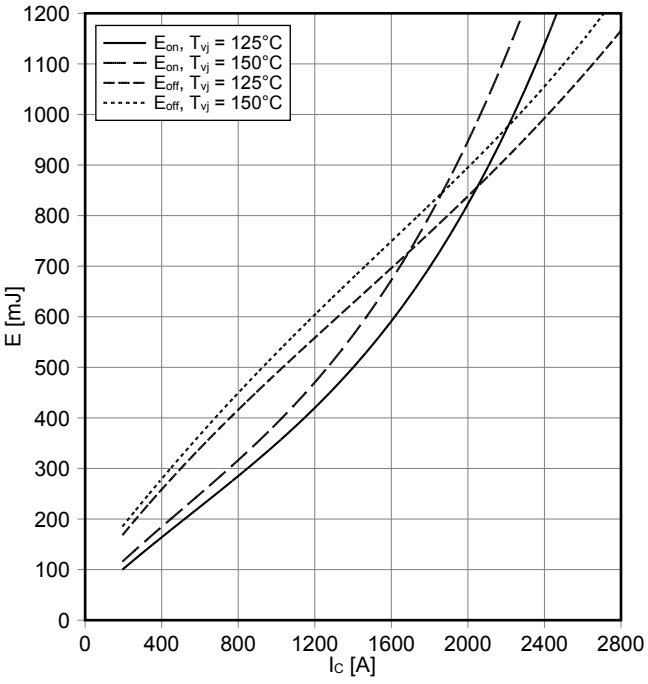
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
T_{vj} = 150°C



传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$
V_{CE} = 20 V

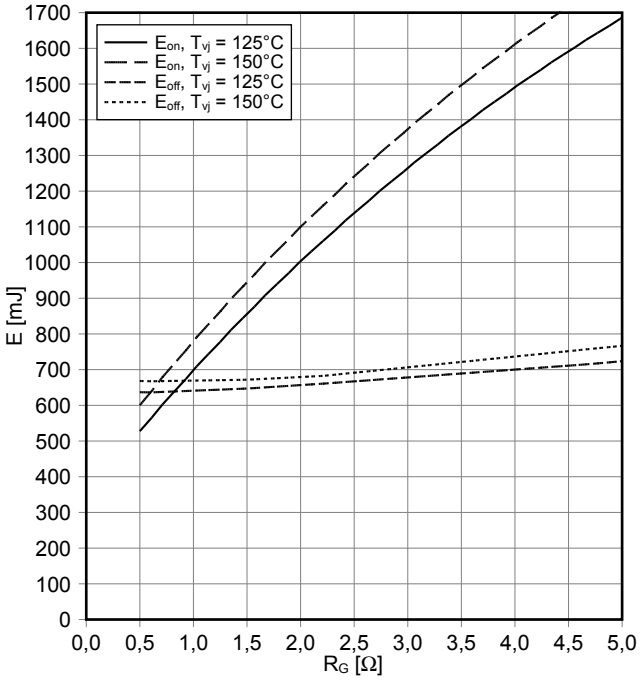


开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
V_{GE} = ±15 V, R_{Gon} = 0.47 Ω, R_{Goff} = 0.68 Ω, V_{CE} = 900 V

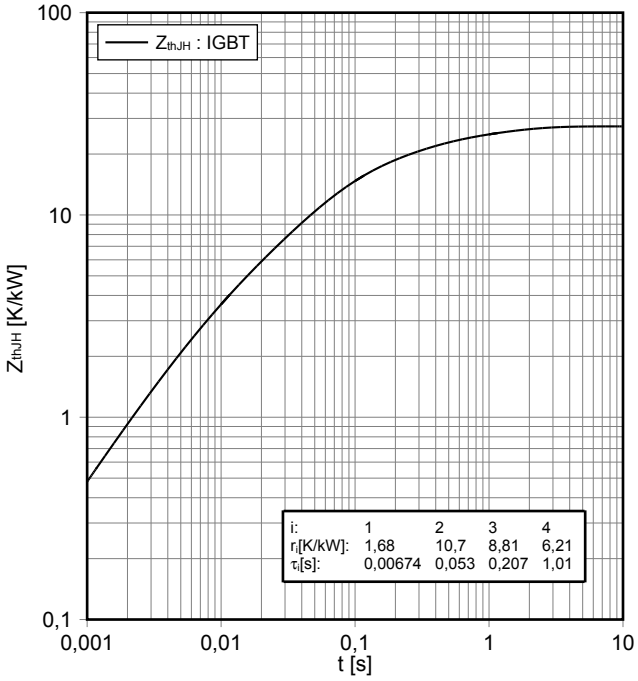


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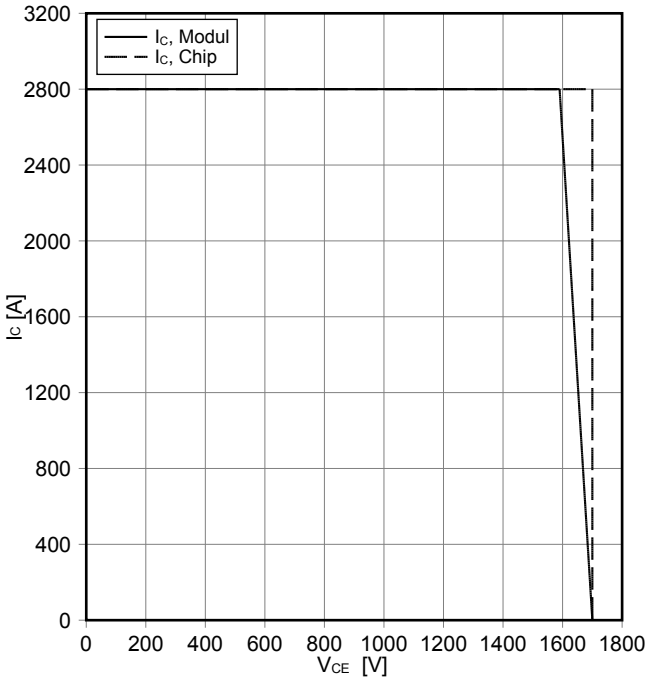
开关损耗 IGBT, 逆变器 （典型）
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
V_{GE} = ±15 V, I_C = 1400 A, V_{CE} = 900 V



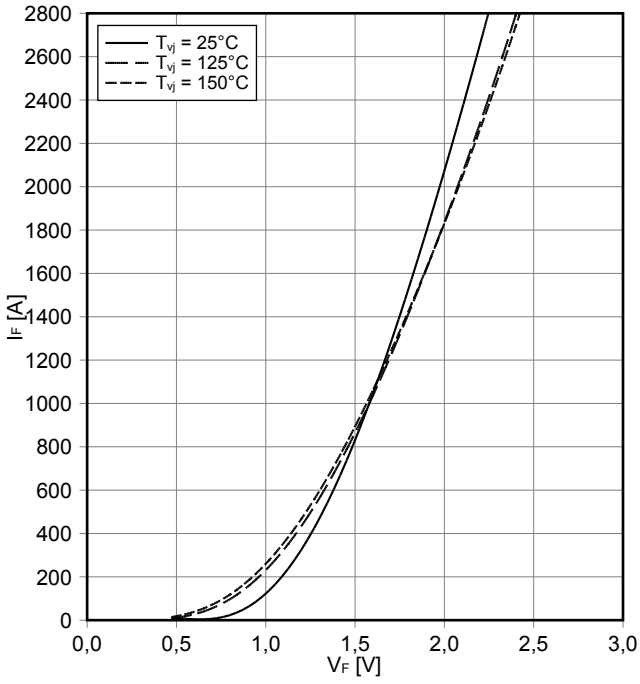
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT,Inverter
$Z_{thJH} = f(t)$



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} = ±15 V, R_{Goff} = 0.68 Ω, T_{vj} = 150°C

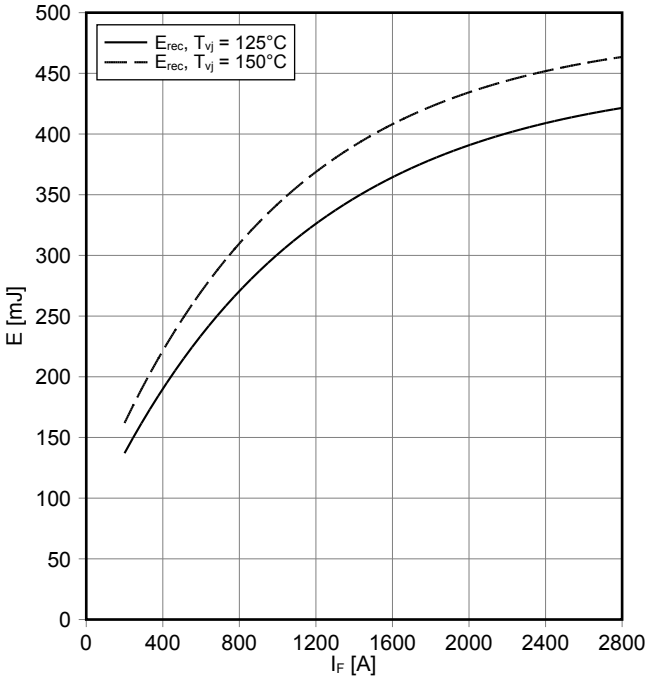


正向偏压特性 二极管,逆变器 （典型）
forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$

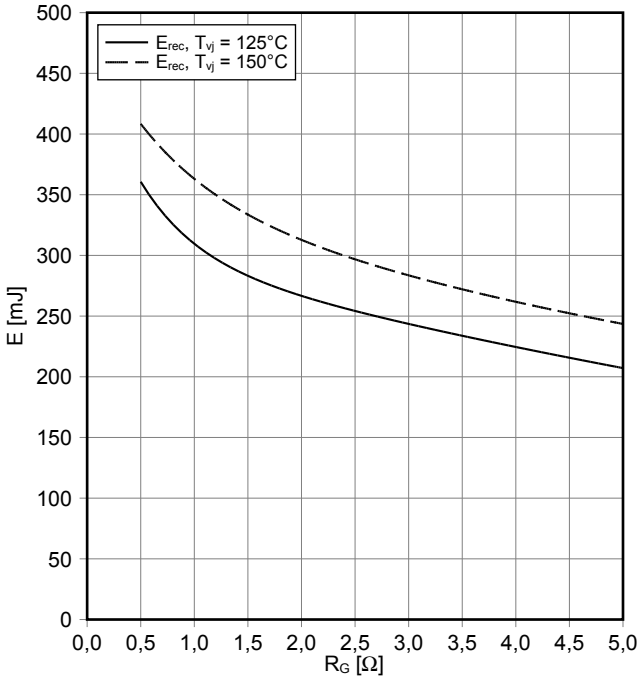


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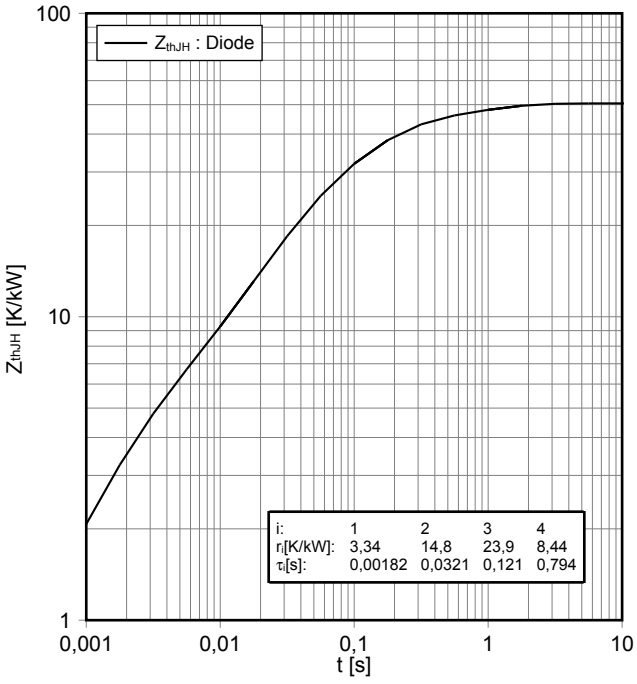
开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 0.47\ \Omega$, $V_{CE} = 900$ V



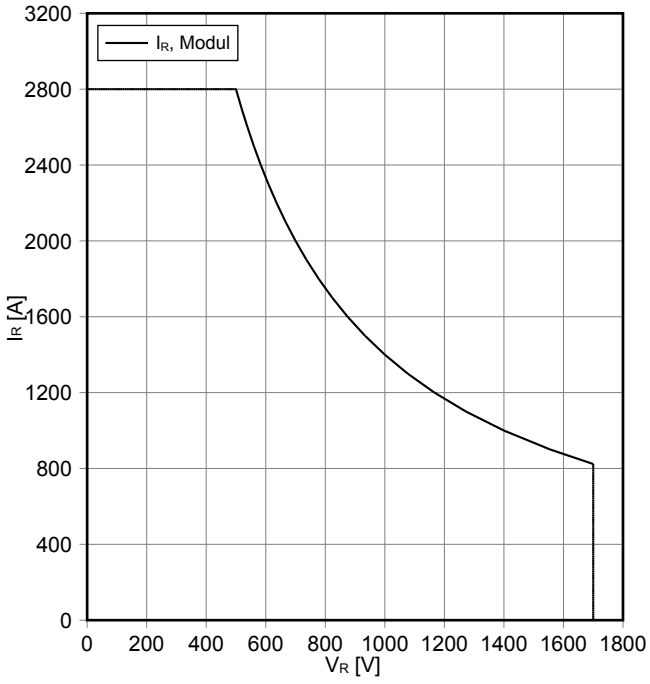
开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 1400$ A, $V_{CE} = 900$ V



瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter
$Z_{thJH} = f(t)$

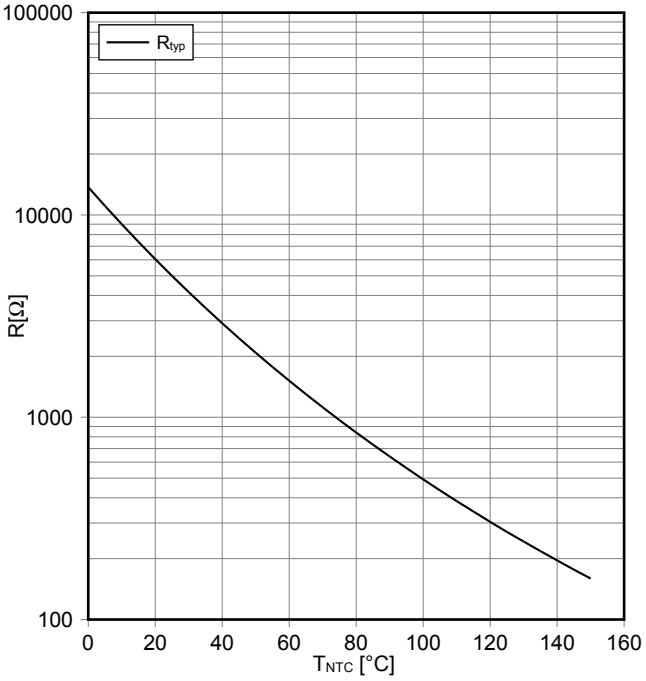


安全工作区 二极管,逆变器 (SOA)
safe operation area Diode, Inverter (SOA)
$I_R = f(V_R)$
$T_{vj} = 150$°C



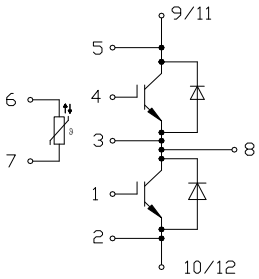
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负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
R = f (T)

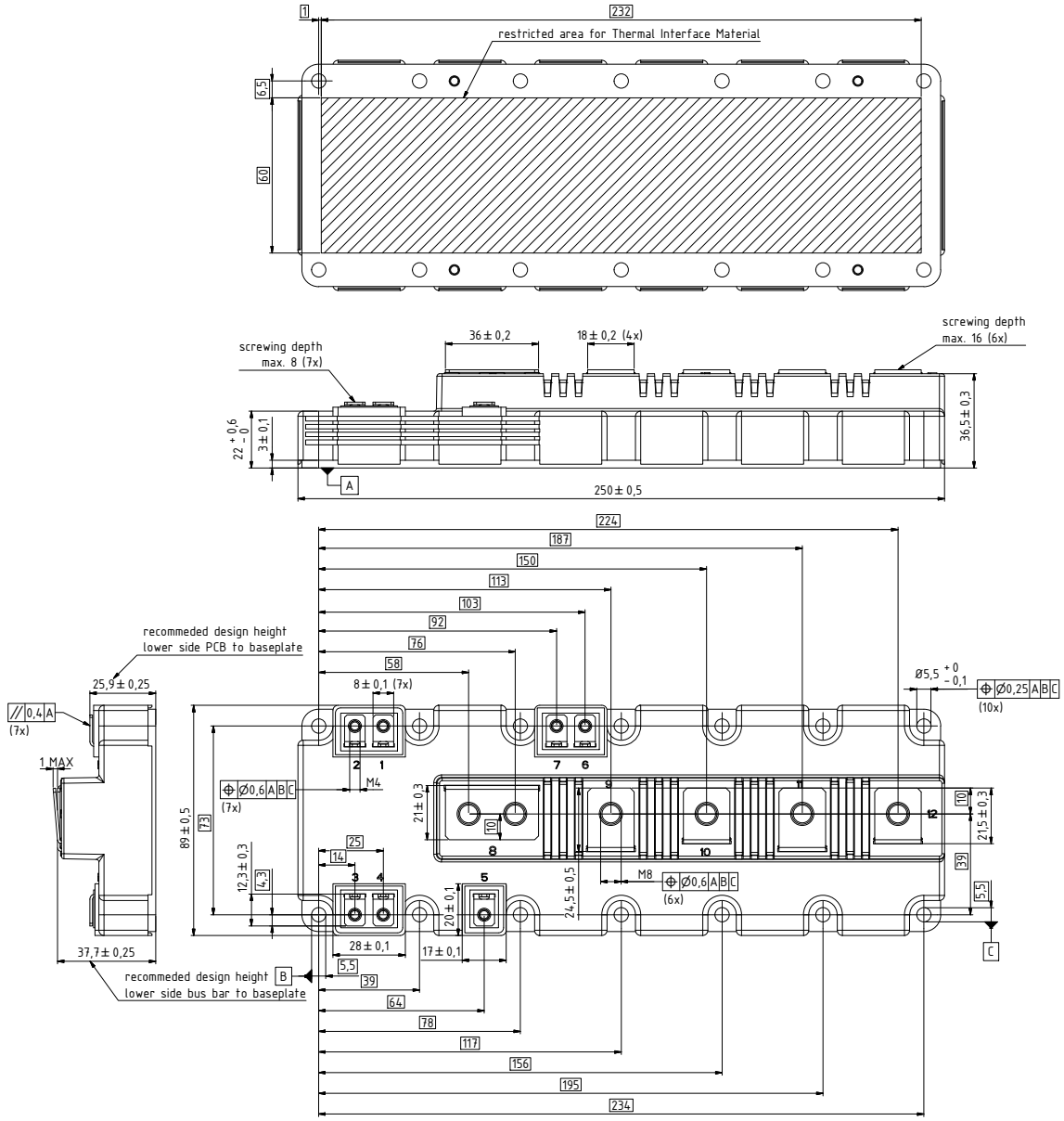


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接线图 / Circuit diagram



封装尺寸 / Package outlines



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Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies’ products may not be used in any applications where a failure of the product or any consequences of the use thereof can
reasonably be expected to result in personal injury.