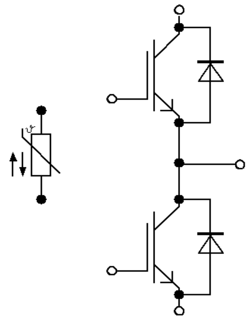
FF1500R17IP5R

PrimePACK™3 模块 采用第五代沟槽栅/场终止IGBT5和第五代发射极控制二极管 带有温度检测NTC
PrimePACK™3 module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC



V_{CES} = 1700V
$I_{C\ nom}$ = 1500A / I_{CRM} = 3000A

潜在应用
- 大功率变流器
- 牵引变流器
- 电机传动
- 风力发电机

Potential Applications
- High power converters
- Traction drives
- Motor drives
- Wind turbines

电气特性
- $T_{vj\ op}$ = 175°C
- 低 V_{CEsat}
- 低开关损耗
- 提高工作结温 $T_{vj\ op}$
- 高电流密度

Electrical Features
- $T_{vj\ op}$ = 175°C
- Low V_{CEsat}
- Low switching losses
- Extended operating temperature $T_{vj\ op}$
- High current density

机械特性
- 封装的 CTI > 400
- 标准封装
- 高功率密度
- 高功率循环和温度循环能力
- 高爬电距离和电气间隙

Mechanical Features
- Package with CTI > 400
- Standard housing
- High power density
- High power and thermal cycling capability
- High creepage and clearance distances

Module Label Code

Barcode Code 128

0000012345600000000000000

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

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_C = 90°C, $T_{vj\,max}$ = 175°C	I_{CDC}	1500	A
集电极重复峰值电流 Repetitive peak collector current	t_P = 1 ms	I_{CRM}	3000	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 = 1500 A V_{GE} = 15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	$V_{CE\,sat}$		1,75 2,10 2,30	2,20 2,65 2,90	V V V
栅极阈值电压 Gate threshold voltage	I_C = 54,0 mA, V_{CE} = V_{GE}, T_{vj} = 25°C		V_{GEth}	5,35	5,80	6,25	V
栅极电荷 Gate charge	V_{GE} = -15 / 15 V, V_{CE} = 900 V		Q_G		7,50		µC
内部栅极电阻 Internal gate resistor	T_{vj} = 25°C		R_{Gint}		1,0		Ω
输入电容 Input capacitance	f = 1000 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{ies}		88,0		nF
反向传输电容 Reverse transfer capacitance	f = 1000 kHz, T_{vj} = 25°C, V_{CE} = 25 V, V_{GE} = 0 V		C_{res}		2,70		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} = 125°C	I_{CES}			10	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 = 1500 A, V_{CE} = 900 V V_{GE} = -15 / 15 V R_{Gon} = 0,51 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	$t_{d\,on}$		0,30 0,31 0,32		µs µs µs
上升时间(电感负载) Rise time, inductive load	I_C = 1500 A, V_{CE} = 900 V V_{GE} = -15 / 15 V R_{Gon} = 0,51 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	t_r		0,15 0,16 0,16		µs µs µs
关断延迟时间(电感负载) Turn-off delay time, inductive load	I_C = 1500 A, V_{CE} = 900 V V_{GE} = -15 / 15 V R_{Goff} = 0,82 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	$t_{d\,off}$		0,66 0,74 0,80		µs µs µs
下降时间(电感负载) Fall time, inductive load	I_C = 1500 A, V_{CE} = 900 V V_{GE} = -15 / 15 V R_{Goff} = 0,82 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	t_f		0,11 0,16 0,17		µs µs µs
开通损耗能量 (每脉冲) Turn-on energy loss per pulse	I_C = 1500 A, V_{CE} = 900 V, L_σ = 30 nH di/dt = 8550 A/µs (T_{vj} = 175°C) V_{GE} = -15 / 15 V, R_{Gon} = 0,51 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	E_{on}		335 500 595		mJ mJ mJ
关断损耗能量 (每脉冲) Turn-off energy loss per pulse	I_C = 1500 A, V_{CE} = 900 V, L_σ = 30 nH du/dt = 2750 V/µs (T_{vj} = 175°C) V_{GE} = -15 / 15 V, R_{Goff} = 0,82 Ω	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	E_{off}		330 465 545		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq$ 15 V, V_{CC} = 1000 V V_{CEmax} = V_{CES} -L_{sCE} ·di/dt	$t_P \leq$ 10 µs, T_{vj} = 175°C	I_{SC}		6000		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			19,0	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		15,5		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\,op}$	-40		175	°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	1500	A
正向重复峰值电流 Repetitive peak forward current	t_P = 1 ms	I_{FRM}	3000	A
I2t-值 I^2t - value	V_R = 0 V, t_P = 10 ms, T_{vj} = 125°C V_R = 0 V, t_P = 10 ms, T_{vj} = 175°C	I^2t	580 485	kA²s kA²s
最大损耗功率 Maximum power dissipation	T_{vj} = 175°C	P_{RQM}	1500	kW

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	I_F = 1500 A, V_{GE} = 0 V I_F = 1500 A, V_{GE} = 0 V I_F = 1500 A, V_{GE} = 0 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	V_F		1,75 1,70 1,70	2,10 2,05 2,05	V V V
反向恢复峰值电流 Peak reverse recovery current	I_F = 1500 A, - di_F/dt = 8550 A/µs (T_{vj}=175°C) V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	I_{RM}		1250 1450 1550		A A A
恢复电荷 Recovered charge	I_F = 1500 A, - di_F/dt = 8550 A/µs (T_{vj}=175°C) V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	Q_r		325 550 700		µC µC µC
反向恢复损耗(每脉冲) Reverse recovery energy	I_F = 1500 A, - di_F/dt = 8550 A/µs (T_{vj}=175°C) V_R = 900 V V_{GE} = -15 V	T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	E_{rec}		185 325 425		mJ mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			35,0	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)		R_{thCH}		18,5		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		175	°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

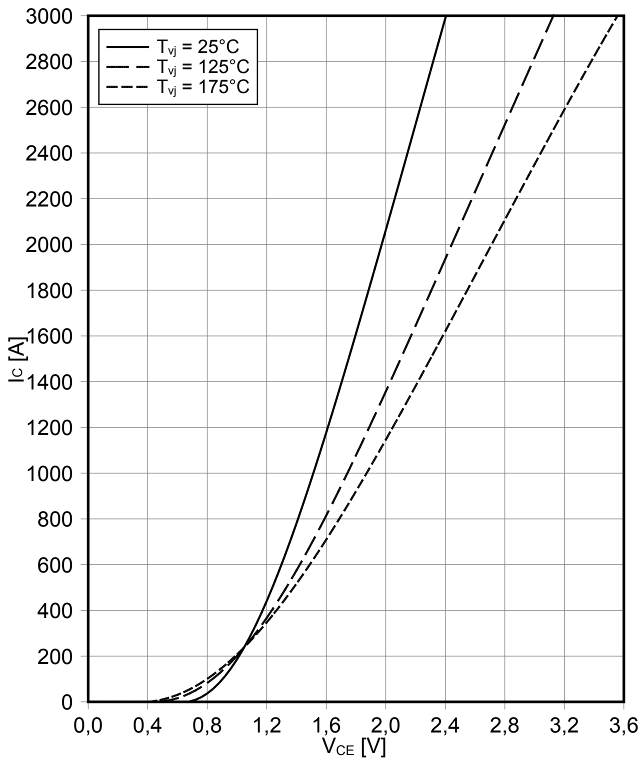
根据应用手册标定
Specification according to the valid application note.

模块 / Module

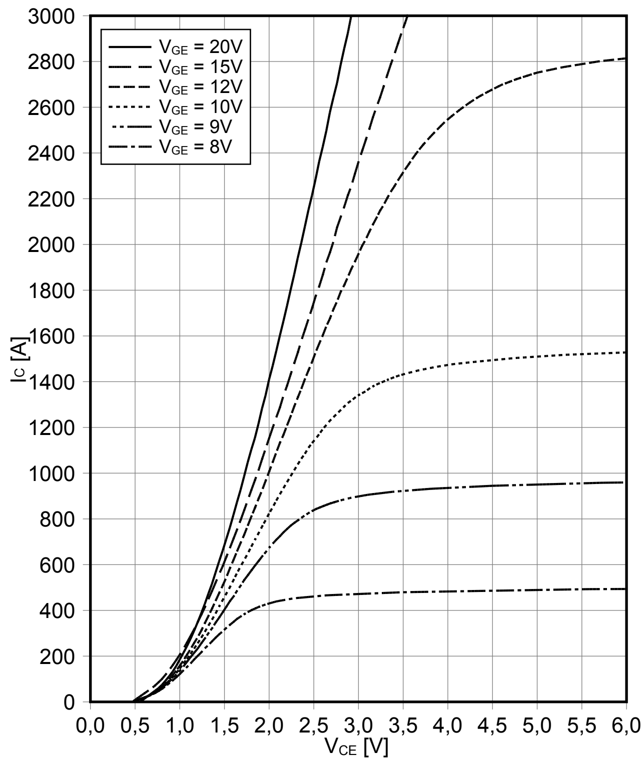
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V_{ISOL}		4,0		kV
模块基板材料 Material of module baseplate				Cu		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			33,0 33,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal			19,0 19,0		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_C = 25°C, 每个开关 / per switch	$R_{CC'+EE'}$ $R_{AA'+CC'}$		0,20 0,18		mΩ
储存温度 Storage temperature		T_{stg}	-40		150	°C
最高基板工作温度 Maximum baseplate operation temperature		T_{BPmax}			150	°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

Die thermisch abzuführende Leistung an den Lastanschlüssen muss im Systemaufbau berücksichtigt werden.
The thermal power transferred via the power terminals needs to be considered in the system design.

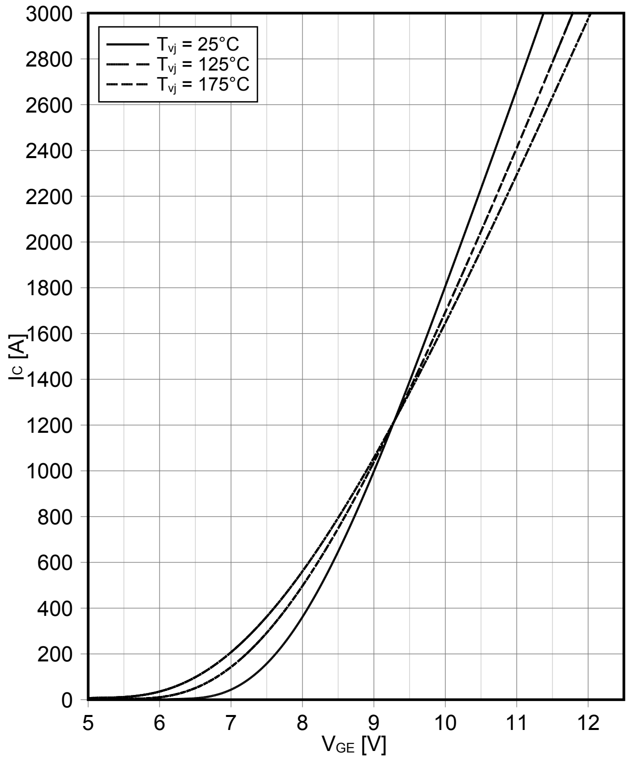
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$V_{GE} = 15$ V



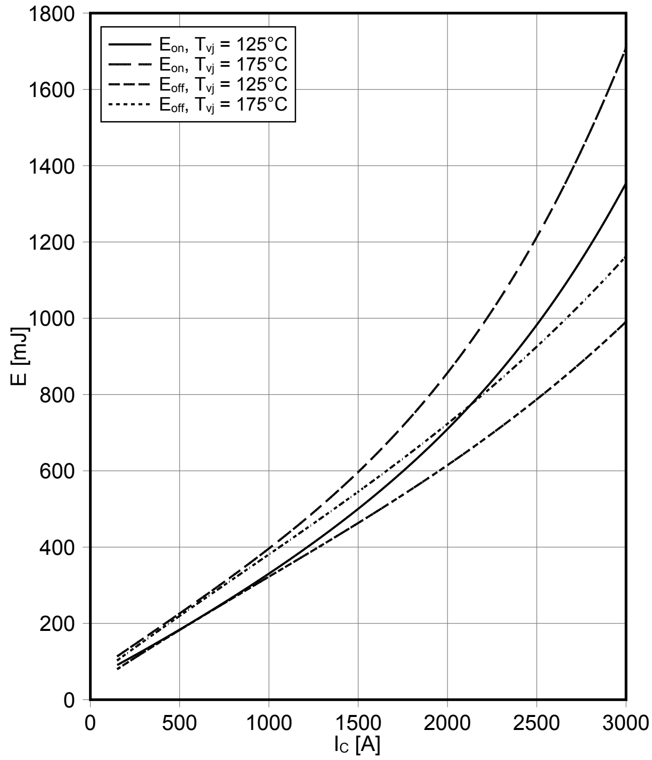
输出特性 IGBT, 逆变器 （典型)
output characteristic IGBT,Inverter (typical)
$I_C = f(V_{CE})$
$T_{vj} = 175$°C



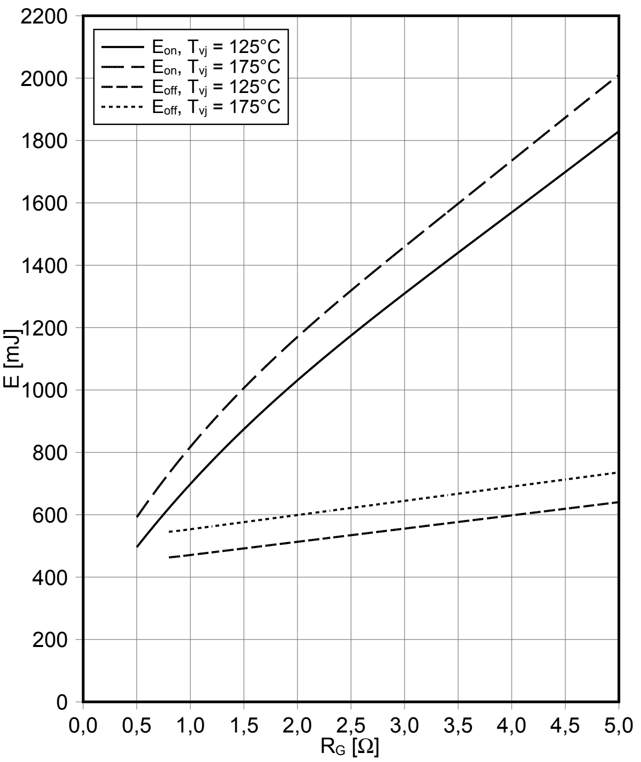
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT,Inverter (typical)
$I_C = f(V_{GE})$
$V_{CE} = 20$ V



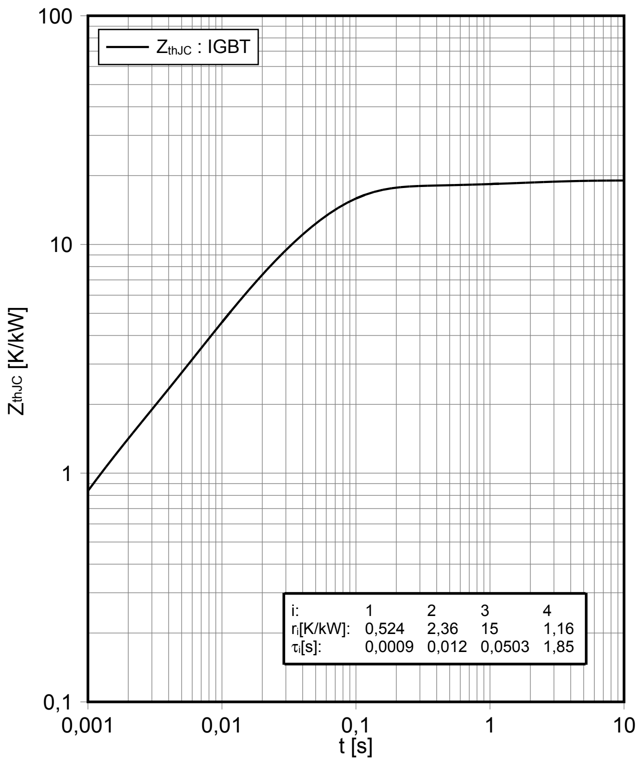
开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
$V_{GE} = \pm 15$ V, $R_{Gon} = 0.51$ Ω, $R_{Goff} = 0.82$ Ω, $V_{CE} = 900$ V



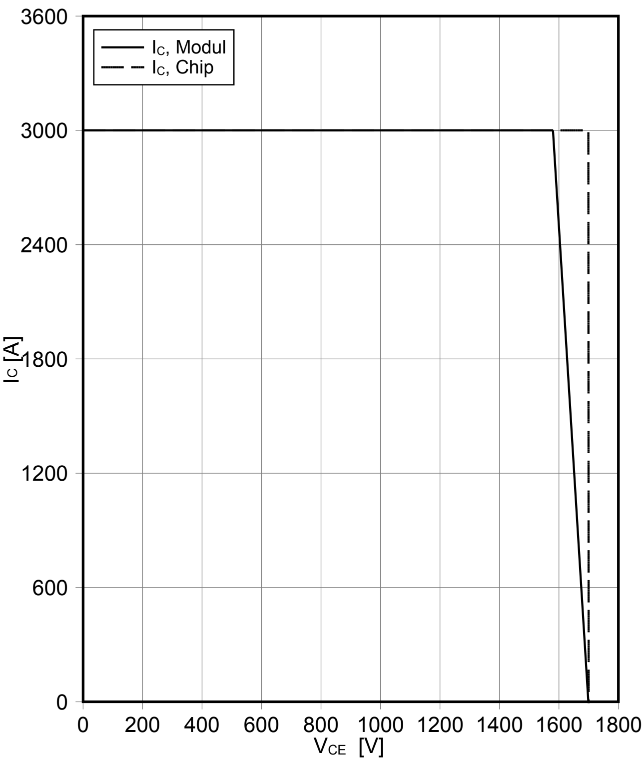
开关损耗 IGBT, 逆变器 （典型)
switching losses IGBT,Inverter (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$V_{GE} = \pm 15$ V, $I_C = 1500$ A, $V_{CE} = 900$ V



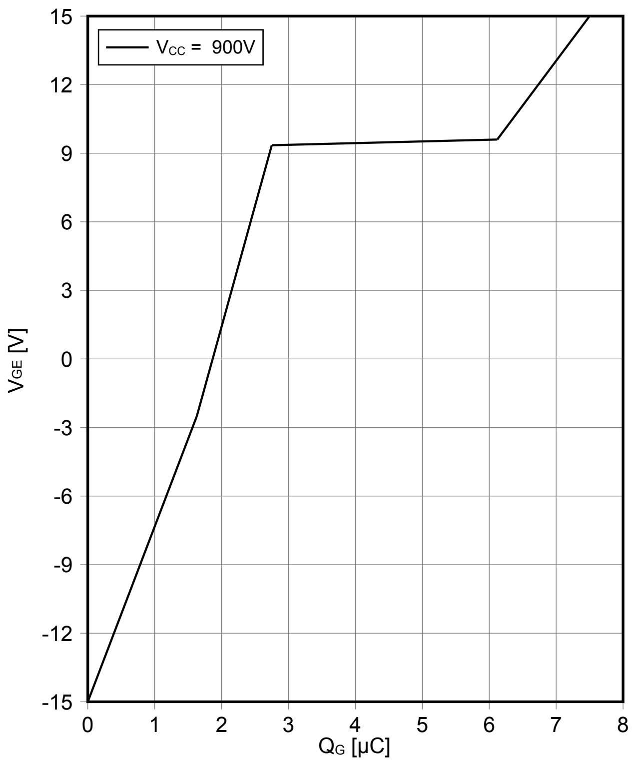
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT,Inverter
$Z_{thJC} = f(t)$



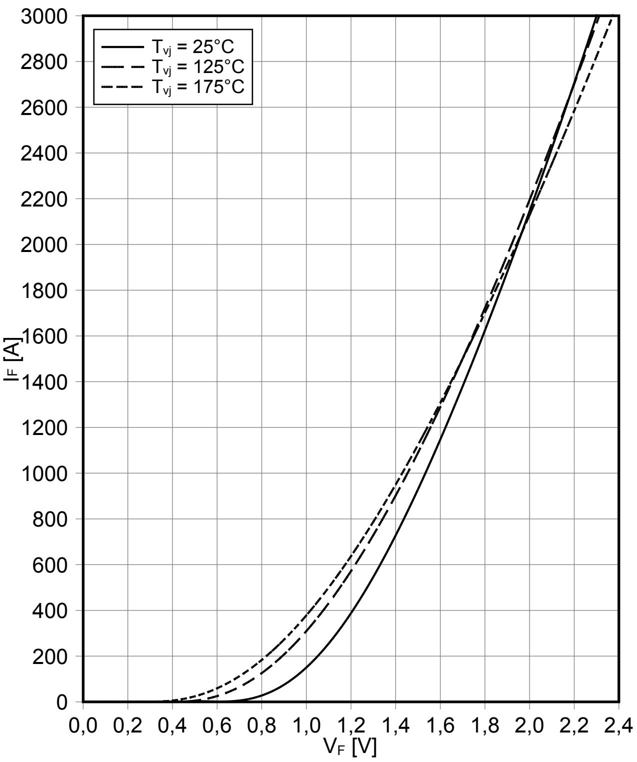
反偏安全工作区 IGBT, 逆变器 （RBSOA）
reverse bias safe operating area IGBT,Inverter (RBSOA)
$I_C = f(V_{CE})$
$V_{GE} = \pm 15$ V, $R_{Goff} = 0.82$ Ω, $T_{vj} = 175°C$



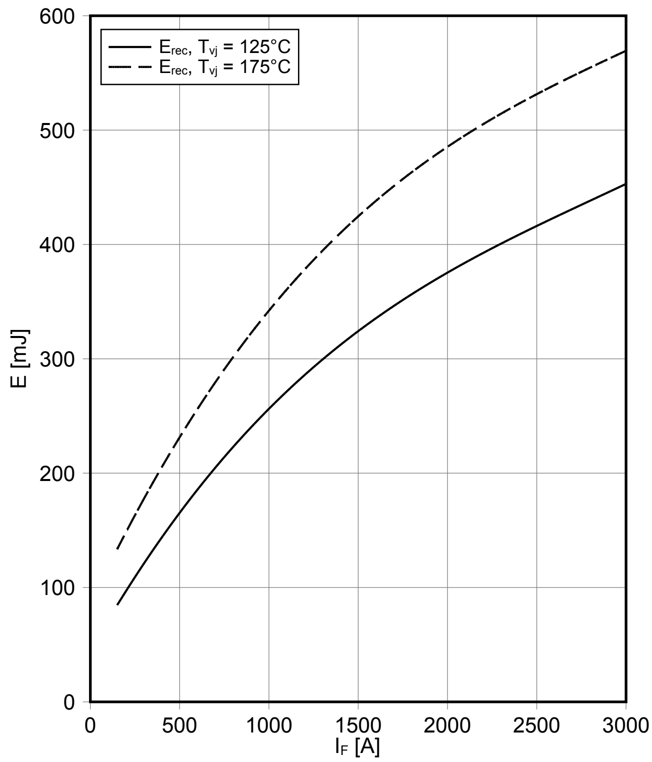
栅极电荷特性 IGBT, 逆变器 （典型)
gate charge characteristic IGBT,Inverter (typical)
$V_{GE} = f(Q_G)$
$I_C = 1500$ A, $T_{vj} = 25°C$



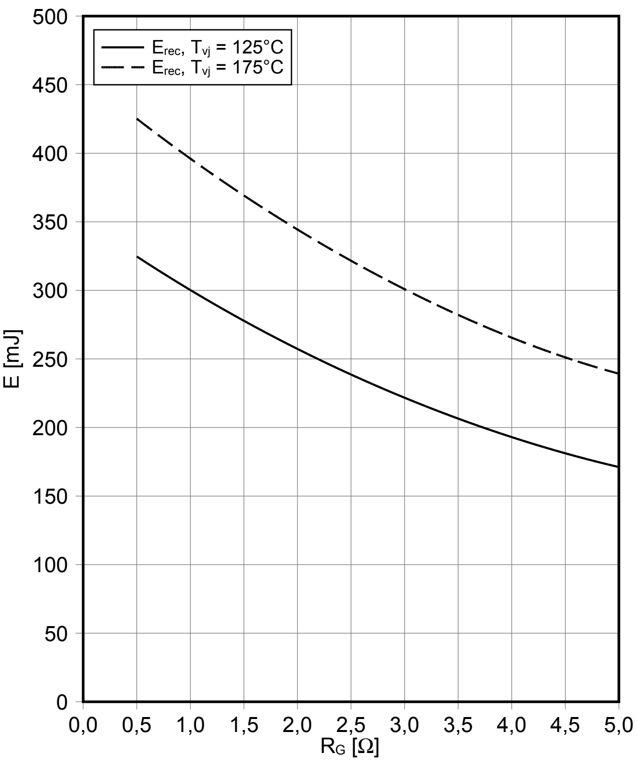
正向偏压特性 二极管,逆变器 （典型)
forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



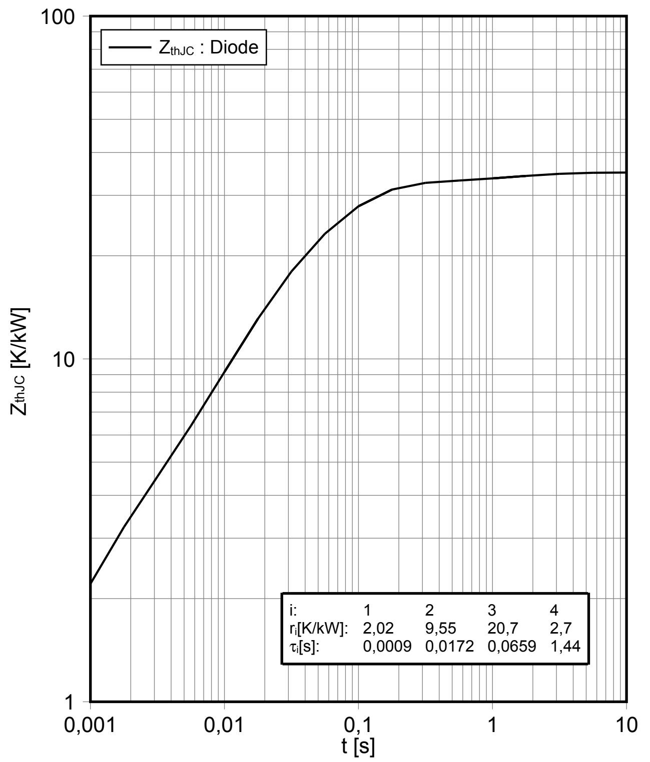
开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
R_{Gon} = 0.51 Ω, V_{CE} = 900 V



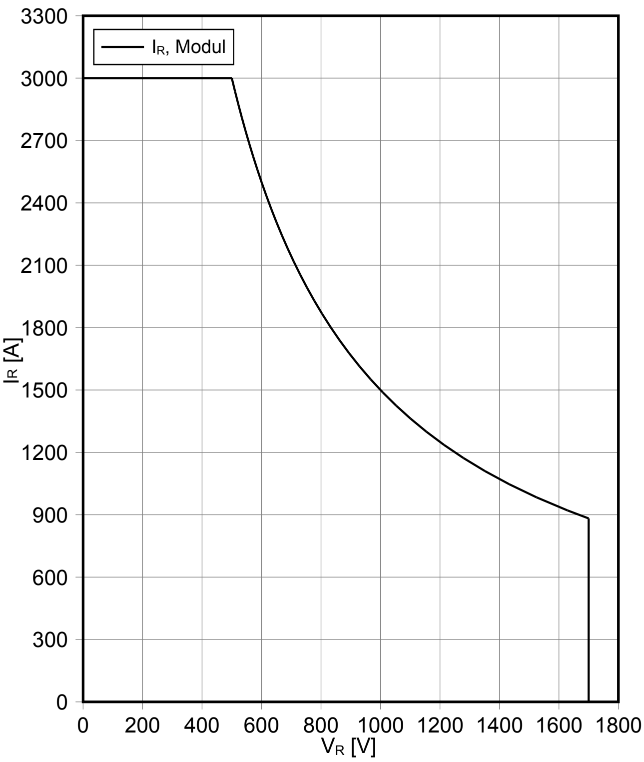
开关损耗 二极管,逆变器 （典型)
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
I_F = 1500 A, V_{CE} = 900 V



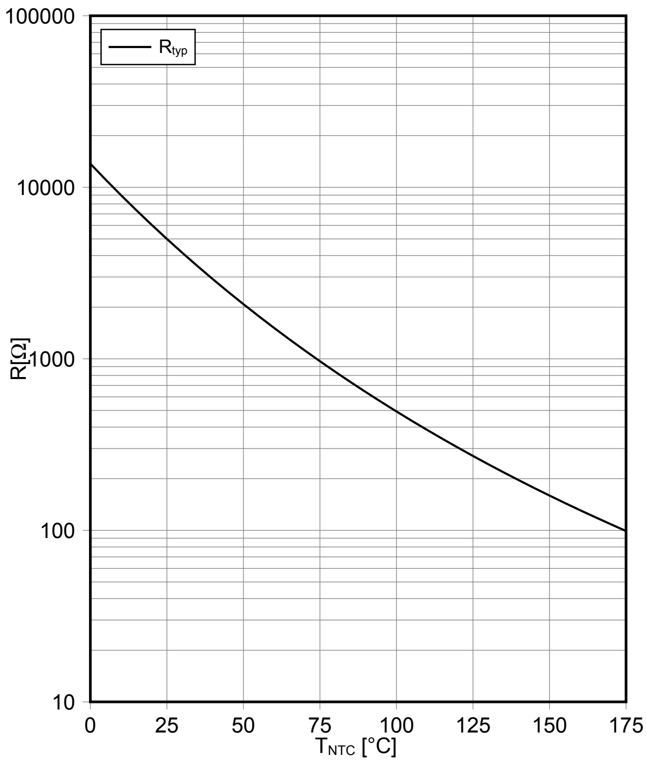
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter
$Z_{thJC} = f(t)$



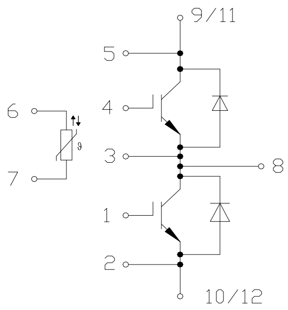
安全工作区 二极管,逆变器 (SOA)
safe operation area Diode, Inverter (SOA)
$I_R = f(V_R)$
$T_{vj} = 175°C$



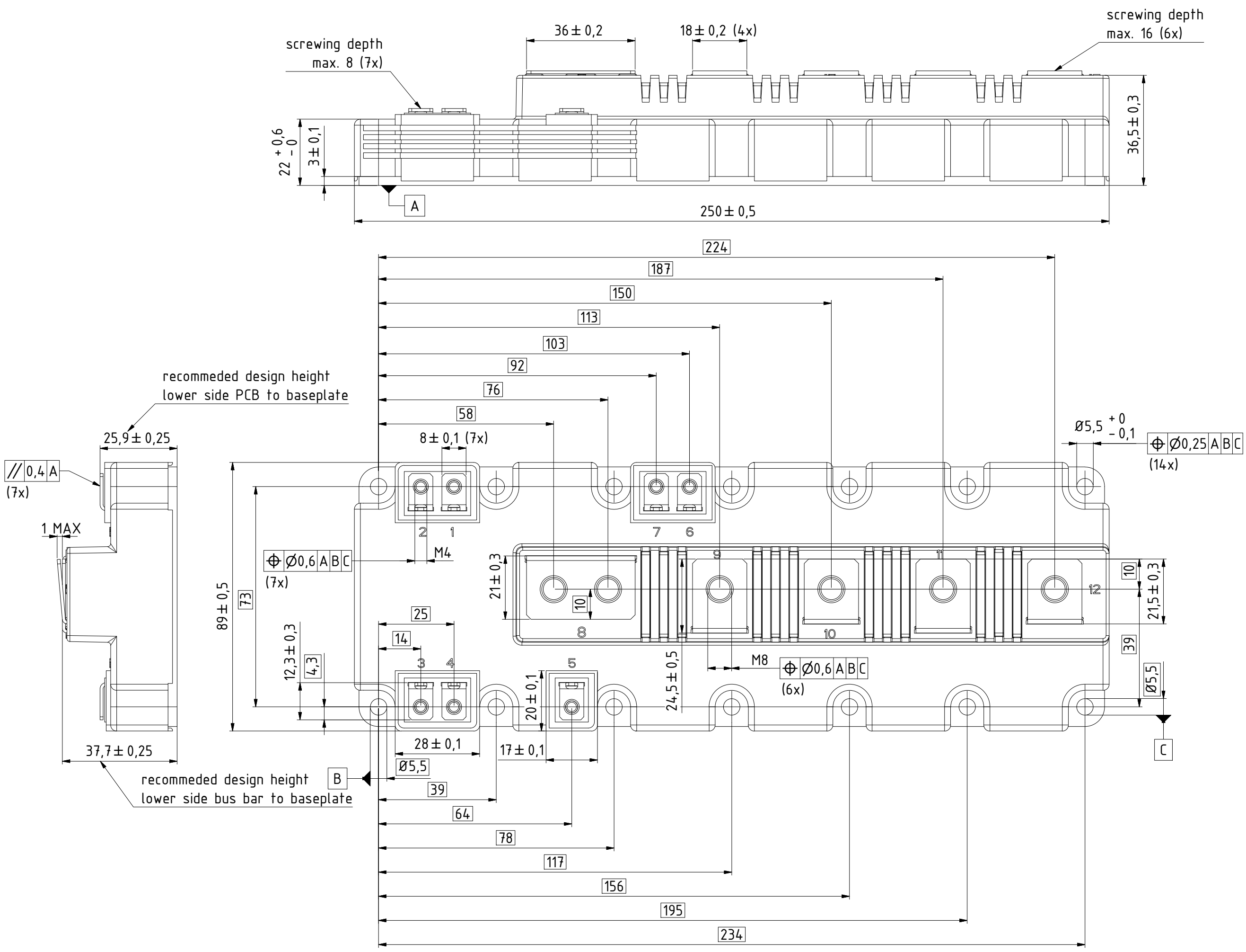
负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)
R = f (T)



接线图 / Circuit diagram



封装尺寸 / Package outlines



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