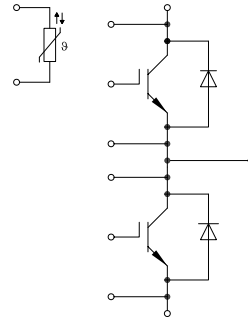


PrimePACK™3+ 模块 采用第五代沟槽栅/场终止IGBT5和第五代发射极控制二极管 带有温度检测NTC
 PrimePACK™3+ module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC



$V_{CES} = 1200V$
 $I_{C\ nom} = 1800A / I_{CRM} = 3600A$

典型应用

- 大功率变流器
- 电机传动
- 太阳能应用
- UPS系统

Typical Applications

- High power converters
- Motor drives
- Solar applications
- UPS systems

电气特性

- 提高工作结温 $T_{vj\ op}$
- 高短路能力
- 无与伦比的坚固性
- $T_{vj\ op} = 175^{\circ}C$
- 沟槽栅IGBT5

Electrical Features

- Extended operating temperature $T_{vj\ op}$
- High short-circuit capability
- Unbeatable robustness
- $T_{vj\ op} = 175^{\circ}C$
- Trench IGBT 5

机械特性

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

Mechanical Features

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

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}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 95^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	1800	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	3600	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	$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$		1,70	2,15	V	
	$T_{vj} = 25^{\circ}\text{C}$					
	$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$		2,00	2,45	V	
	$T_{vj} = 125^{\circ}\text{C}$					
栅极阈值电压 Gate threshold voltage	$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$		2,15	2,60	V	
	$T_{vj} = 175^{\circ}\text{C}$					
	$I_C = 49,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	V_{GEth}	5,25	5,80	6,35	V
	$T_{vj} = 175^{\circ}\text{C}$					
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}, V_{CE} = 600\text{ V}$	Q_G	8,65		μC	
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$	R_{Gint}	0,5		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}	98,5		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}	3,90		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}		5,0	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}		400	nA	
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$		0,24		μs	
	$V_{GE} = \pm 15\text{ V}$		0,29		μs	
	$R_{Gon} = 0,82\ \Omega$		0,31		μs	
	$T_{vj} = 25^{\circ}\text{C}$					
上升时间(电感负载) Rise time, inductive load	$T_{vj} = 125^{\circ}\text{C}$					
	$T_{vj} = 175^{\circ}\text{C}$					
	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$		0,19		μs	
	$V_{GE} = \pm 15\text{ V}$		0,20		μs	
关断延迟时间(电感负载) Turn-off delay time, inductive load	$R_{Gon} = 0,82\ \Omega$		0,20		μs	
	$T_{vj} = 25^{\circ}\text{C}$					
	$T_{vj} = 125^{\circ}\text{C}$					
	$T_{vj} = 175^{\circ}\text{C}$					
下降时间(电感负载) Fall time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$		0,57		μs	
	$V_{GE} = \pm 15\text{ V}$		0,63		μs	
	$R_{Goff} = 0,82\ \Omega$		0,66		μs	
	$T_{vj} = 25^{\circ}\text{C}$					
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$T_{vj} = 125^{\circ}\text{C}$					
	$T_{vj} = 175^{\circ}\text{C}$					
	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$		130		mJ	
	$V_{GE} = \pm 15\text{ V}, di/dt = 8150\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$		195		mJ	
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$R_{Gon} = 0,82\ \Omega$		235		mJ	
	$T_{vj} = 25^{\circ}\text{C}$					
	$T_{vj} = 125^{\circ}\text{C}$					
	$T_{vj} = 175^{\circ}\text{C}$					
短路数据 SC data	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$		210		mJ	
	$V_{GE} = \pm 15\text{ V}, du/dt = 2350\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$		260		mJ	
	$R_{Goff} = 0,82\ \Omega$		290		mJ	
	$T_{vj} = 25^{\circ}\text{C}$					
结 - 外壳热阻 Thermal resistance, junction to case	$T_{vj} = 125^{\circ}\text{C}$					
	$T_{vj} = 175^{\circ}\text{C}$					
	$V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$		6800		A	
	$V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	I_{SC}			
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT	R_{thJC}		17,3	K/kW	
	每个 IGBT / per IGBT	R_{thCH}		11,4	K/kW	
	$\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K})$ / $\lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$					
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{op}}$	-40	175	$^{\circ}\text{C}$	

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}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	1800	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	3600	A
I ² t-值 I ² t - value	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I ² t	760	kA ² s
	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj} = 175^{\circ}\text{C}$		720	kA ² s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1800 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$		1,90	2,35	V
	$I_F = 1800 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		1,75	2,20	V
	$I_F = 1800 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		1,70	2,15	V
			V_F			
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1800 \text{ A}, -di_F/dt = 8700 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		810		A
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		1150		A
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		1300		A
恢复电荷 Recovered charge	$I_F = 1800 \text{ A}, -di_F/dt = 8700 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		175		μC
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		330		μC
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		435		μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1800 \text{ A}, -di_F/dt = 8700 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj} = 25^{\circ}\text{C}$		79,0		mJ
	$V_R = 600 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		145		mJ
	$V_{GE} = -15 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$		190		mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	R_{thJC}			28,3	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$	R_{thCH}		13,2		K/kW
在开关状态下温度 Temperature under switching conditions		$T_{vj\text{ op}}$	-40		175	$^{\circ}\text{C}$

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

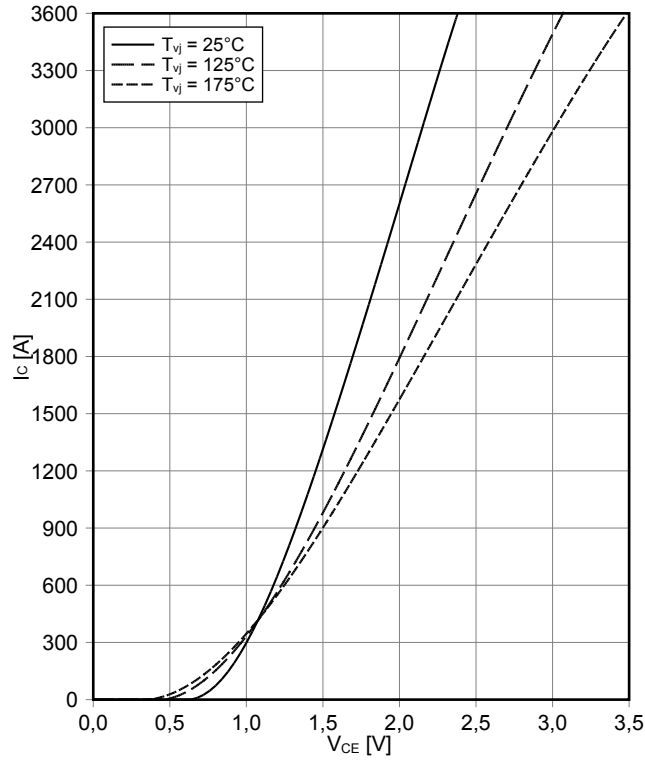
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	4,0		kV
模块基板材料 Material of module baseplate			Cu		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		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'}	0,10 0,09		mΩ
储存温度 Storage temperature		T _{stg}	-40	150	°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
端子联接扭矩 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	- 10	2,1 Nm Nm
重量 Weight		G	1400		g

Höchstzulässige Bodenplattenbetriebstemperatur TBPmax = 150°C
Maximum baseplate operation temperature TBPmax = 150°C

输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

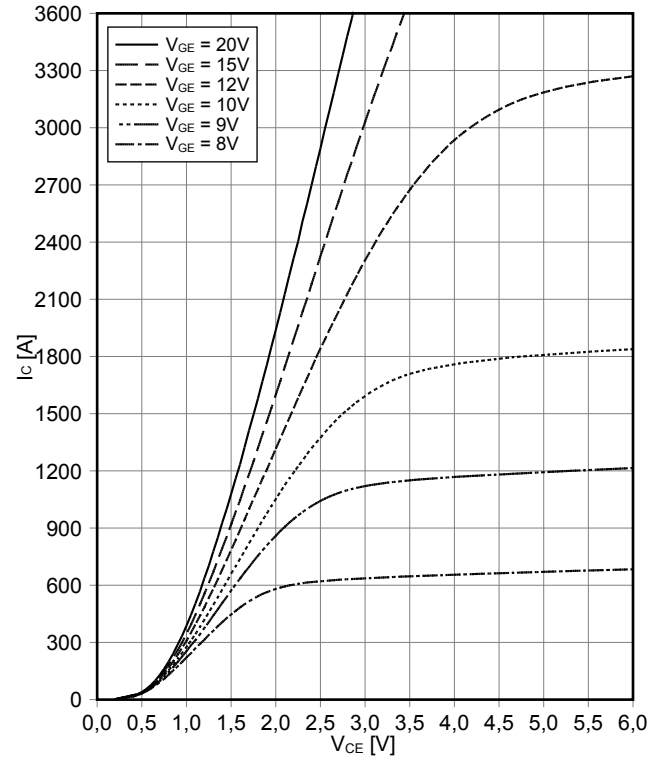
$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

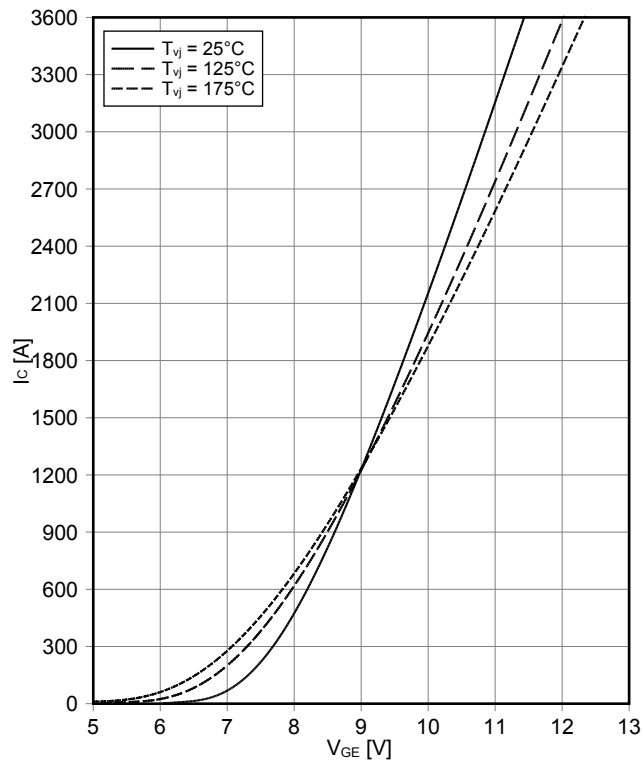
$I_C = f(V_{CE})$
 $T_{vj} = 175^\circ\text{C}$



传输特性 IGBT, 逆变器 (典型)

transfer characteristic IGBT, Inverter (typical)

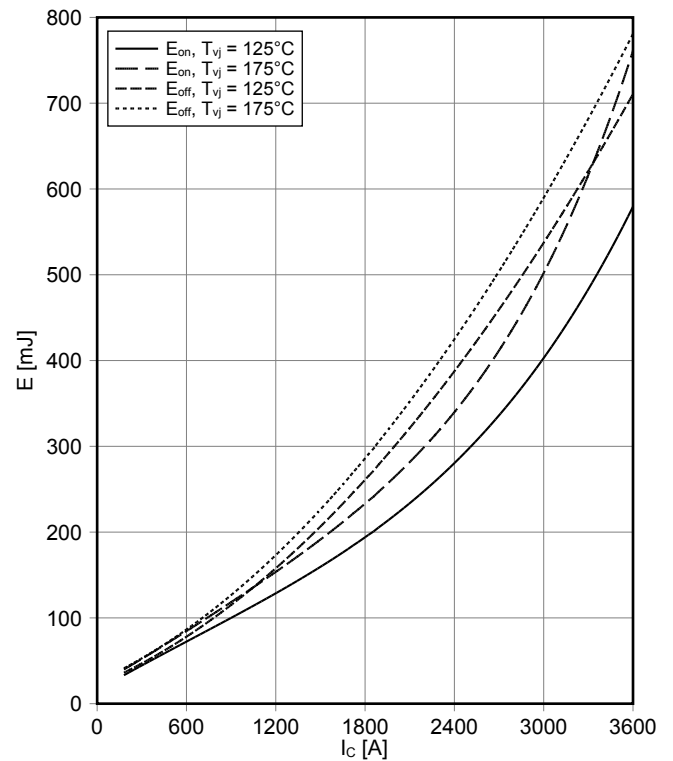
$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



开关损耗 IGBT, 逆变器 (典型)

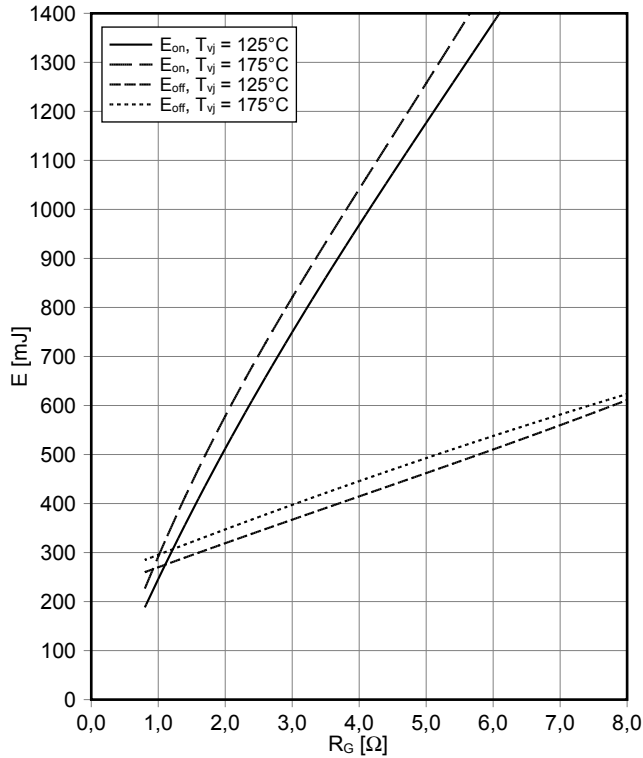
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.82\ \Omega$, $R_{Goff} = 0.82\ \Omega$, $V_{CE} = 600\text{ V}$

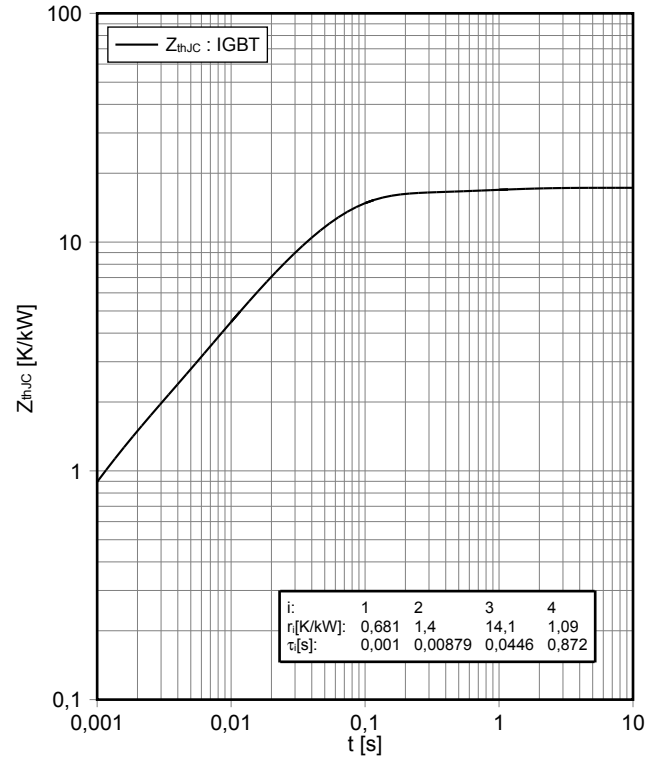


开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15 V, I_C = 1800 A, V_{CE} = 600 V$

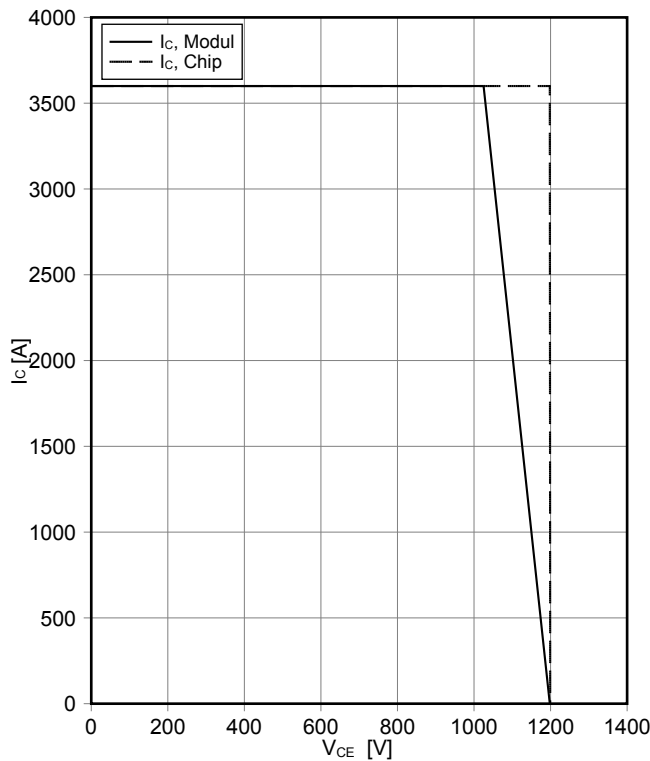


瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



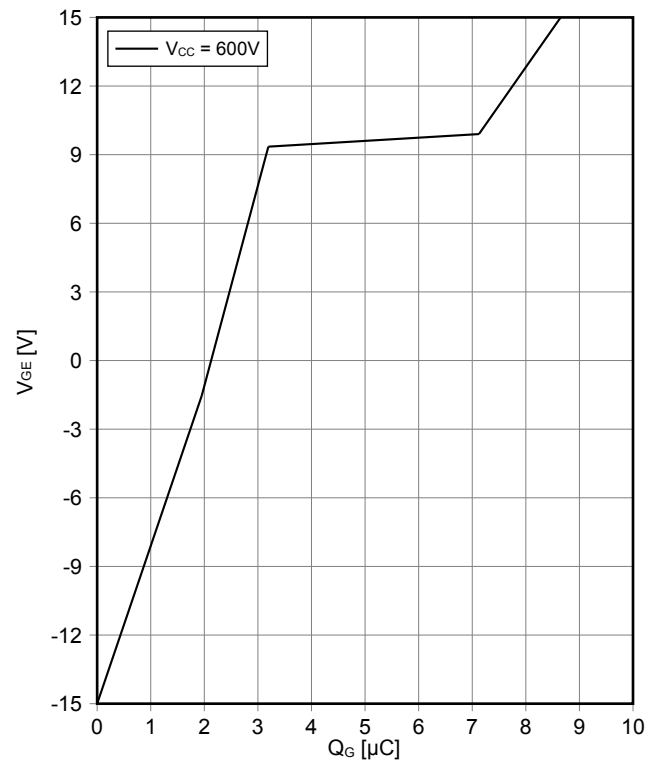
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15 V, R_{Goff} = 0.82 \Omega, T_{vj} = 175^\circ C$

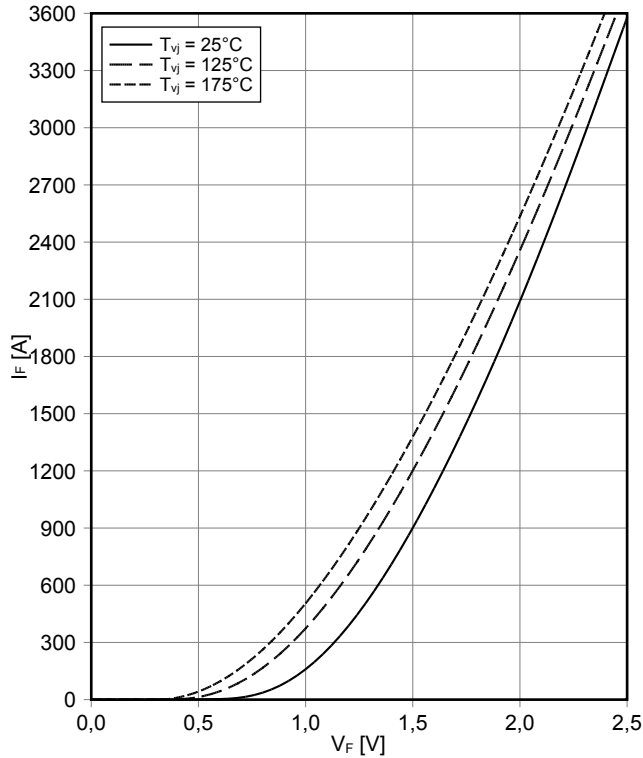


栅极电荷特性 IGBT, 逆变器 (典型)
gate charge characteristic IGBT, Inverter (typical)

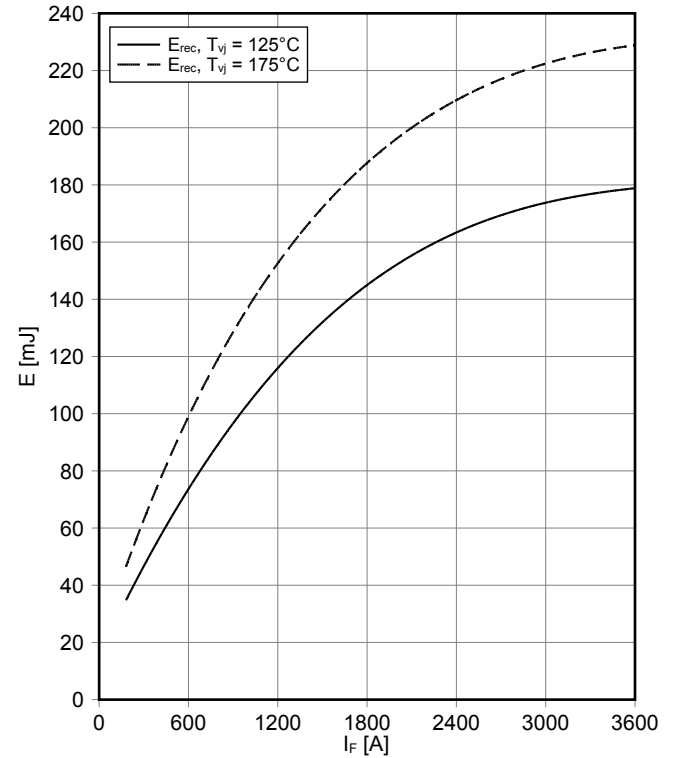
$V_{GE} = f(Q_G)$
 $I_C = 1800 A, T_{vj} = 25^\circ C$



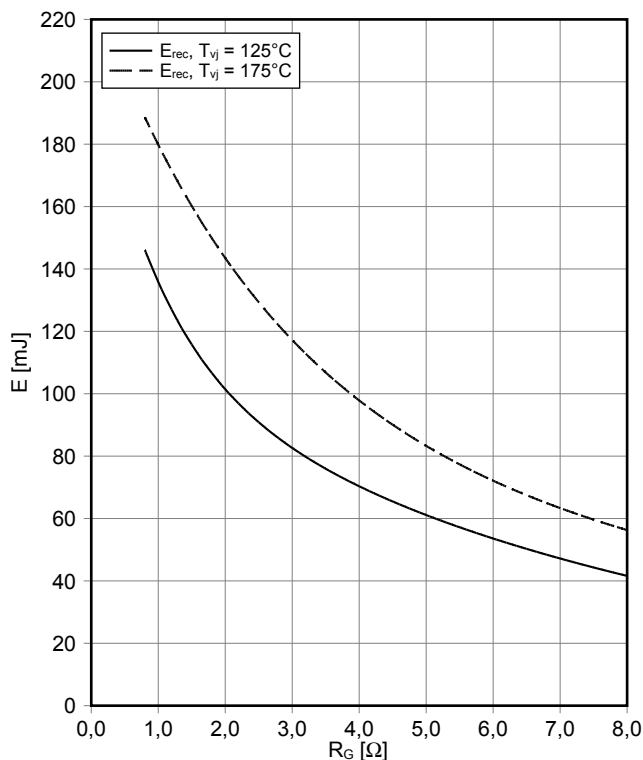
正向偏压特性 二极管, 逆变器 (典型)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



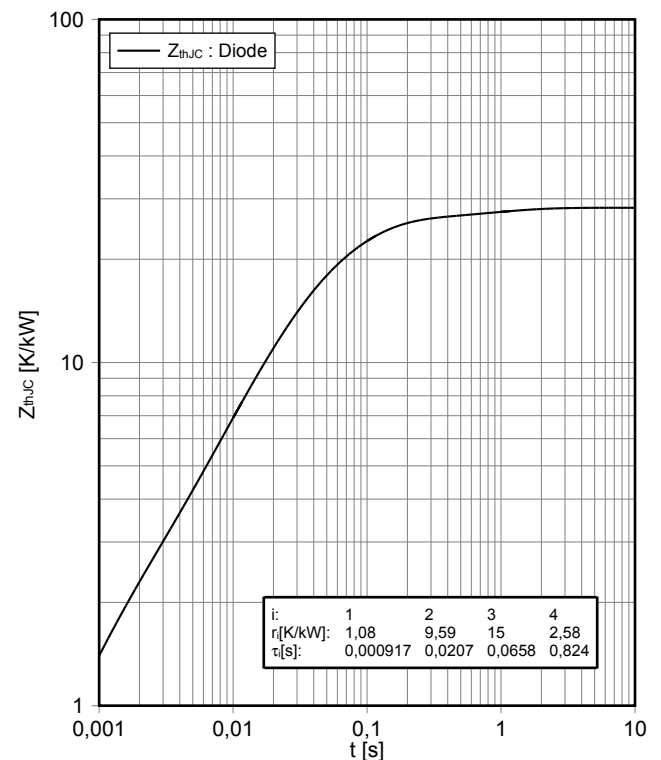
开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 0.82 \Omega, V_{CE} = 600 \text{ V}$



开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 1800 \text{ A}, V_{CE} = 600 \text{ V}$



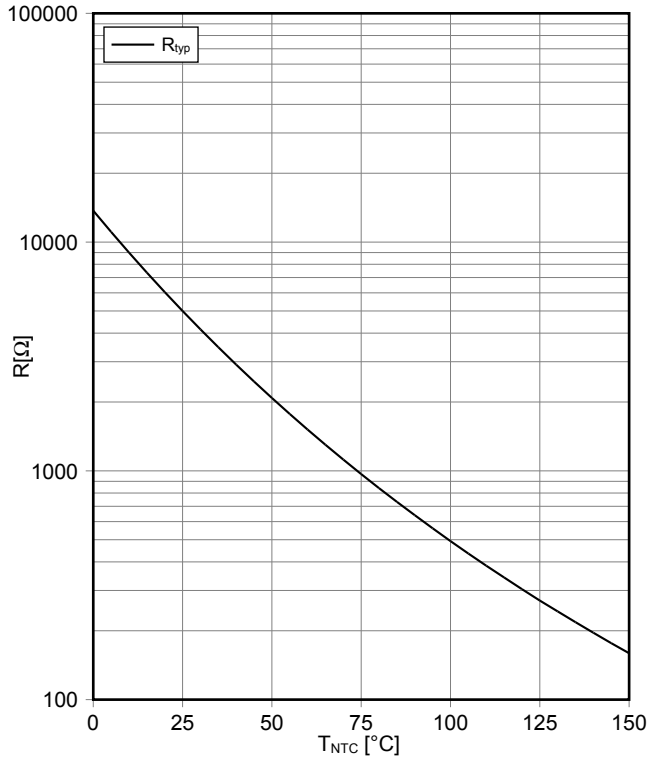
瞬态热阻抗 二极管, 逆变器
transient thermal impedance Diode, Inverter
 $Z_{thJC} = f(t)$



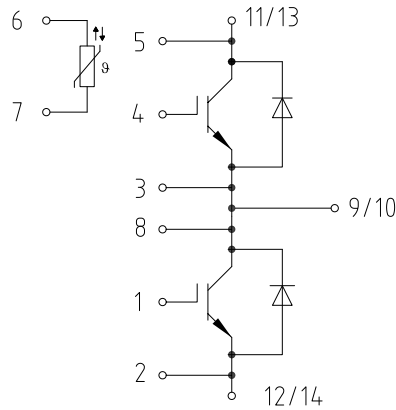
负温度系数热敏电阻 温度特性

NTC-Thermistor-temperature characteristic (typical)

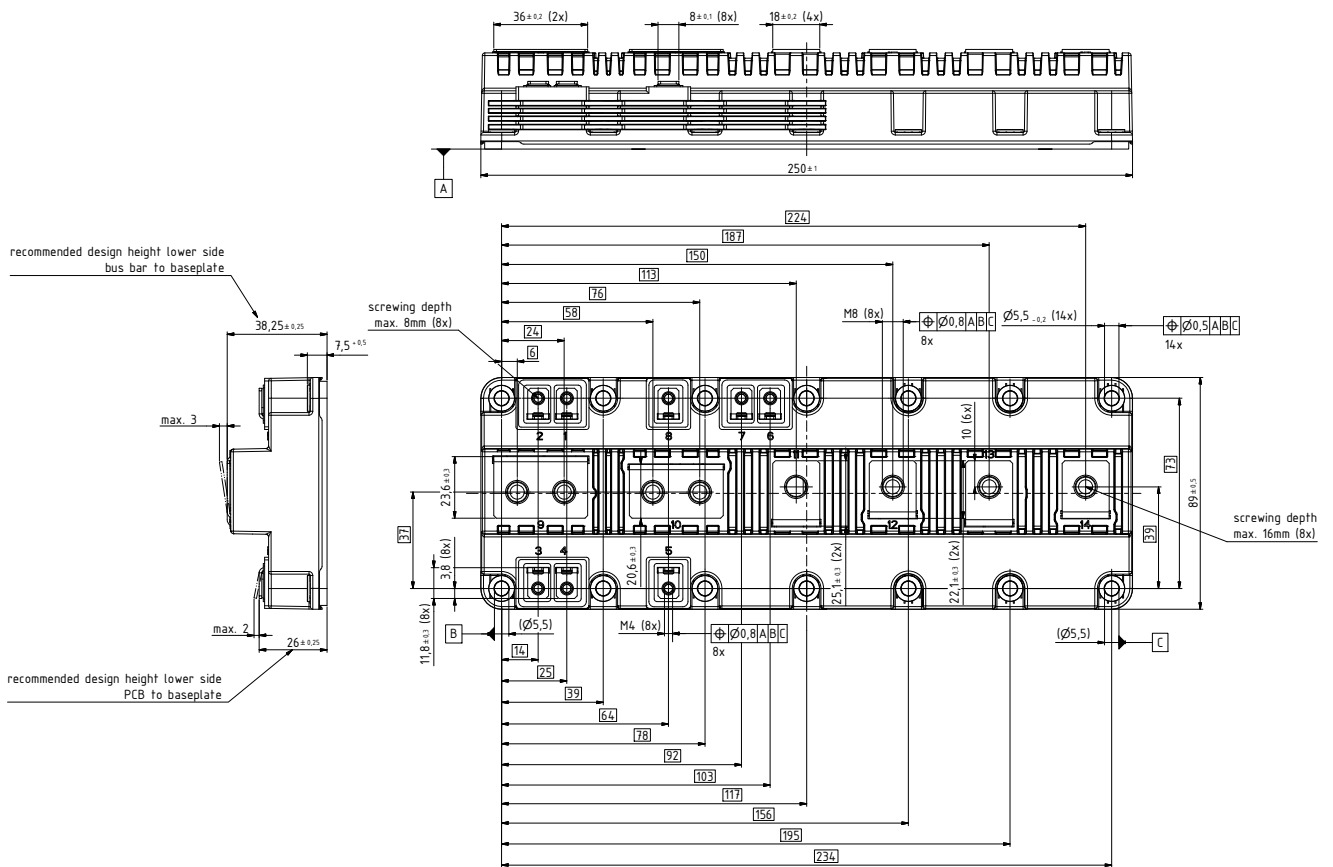
$R = f(T)$



接线图 / Circuit diagram



封装尺寸 / Package outlines



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