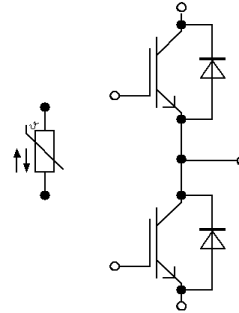


PrimePACK™2 模块 采用第五代沟槽栅/场终止IGBT5和第五代发射极控制二极管 带有温度检测NTC  
 PrimePACK™2 module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC



$V_{CES} = 1200V$   
 $I_{C\ nom} = 1200A / I_{CRM} = 2400A$

### 潜在应用

- UPS系统
- 大功率变流器
- 电机传动

### Potential Applications

- UPS systems
- High power converters
- Motor drives

### 电气特性

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

### Electrical Features

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

### 机械特性

- 封装的 CTI > 400
- 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
- High power density
- High power and thermal cycling capability
- High creepage and clearance distances

## 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	$T_C = 80^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{CDC}$	1200	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	$I_{CRM}$	2400	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	$I_C = 1200\text{ A}$ $V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1,70 2,00 2,15	2,15 2,45 2,60	V V V	
栅极阈值电压 Gate threshold voltage	$I_C = 33,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	5,25	5,80	6,35	V
栅极电荷 Gate charge	$V_{GE} = -15 / 15\text{ V}, V_{CE} = 600\text{ V}$		$Q_G$	5,75			$\mu\text{C}$
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	0,75			$\Omega$
输入电容 Input capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{ies}$	65,5			nF
反向传输电容 Reverse transfer capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		$C_{res}$	2,60			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	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_{don}$	0,20 0,23 0,25			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
上升时间(电感负载) Rise time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_r$	0,16 0,17 0,18			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_{doff}$	0,48 0,52 0,55			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
下降时间(电感负载) Fall time, inductive load	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$t_f$	0,08 0,11 0,13			$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 45\text{ nH}$ $di/dt = 6000\text{ A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$E_{on}$	80,0 120 160			mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 1200\text{ A}, V_{CE} = 600\text{ V}, L_{\sigma} = 45\text{ nH}$ $du/dt = 2800\text{ V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 0,82\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$E_{off}$	130 160 180			mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 175^{\circ}\text{C}$	$I_{SC}$	4000			A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		$R_{thJC}$			28,7	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$			22,1	K/kW
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		$I_F$	1200	A
正向重复峰值电流 Repetitive peak forward current	$t_p = 1 \text{ ms}$	$I_{FRM}$	2400	A
I <sup>2</sup> t-值 I <sup>2</sup> t - value	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 125^{\circ}\text{C}$	I <sup>2</sup> t	370	kA <sup>2</sup> s
	$V_R = 0 \text{ V}, t_p = 10 \text{ ms}, T_{vj} = 175^{\circ}\text{C}$		335	kA <sup>2</sup> s

## 特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1200 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$V_F$		1,90	2,35	V
	$I_F = 1200 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 125^{\circ}\text{C}$			1,75	2,20	V
	$I_F = 1200 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 175^{\circ}\text{C}$			1,70	2,15	V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1200 \text{ A}, -di_F/dt = 6600 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$I_{RM}$		630		A
		$T_{vj} = 125^{\circ}\text{C}$			860		A
		$T_{vj} = 175^{\circ}\text{C}$			985		A
恢复电荷 Recovered charge	$I_F = 1200 \text{ A}, -di_F/dt = 6600 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$Q_r$		91,0		$\mu\text{C}$
		$T_{vj} = 125^{\circ}\text{C}$			205		$\mu\text{C}$
		$T_{vj} = 175^{\circ}\text{C}$			280		$\mu\text{C}$
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1200 \text{ A}, -di_F/dt = 6600 \text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$E_{rec}$		37,0		mJ
		$T_{vj} = 125^{\circ}\text{C}$			83,0		mJ
		$T_{vj} = 175^{\circ}\text{C}$			120		mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	$R_{thJC}$			46,3	K/kW	
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{\text{Paste}} = 1 \text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1 \text{ W}/(\text{m}\cdot\text{K})$	$R_{thCH}$			29,0	K/kW	
在开关状态下温度 Temperature under switching conditions		$T_{vj op}$	-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 $\Omega$
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.

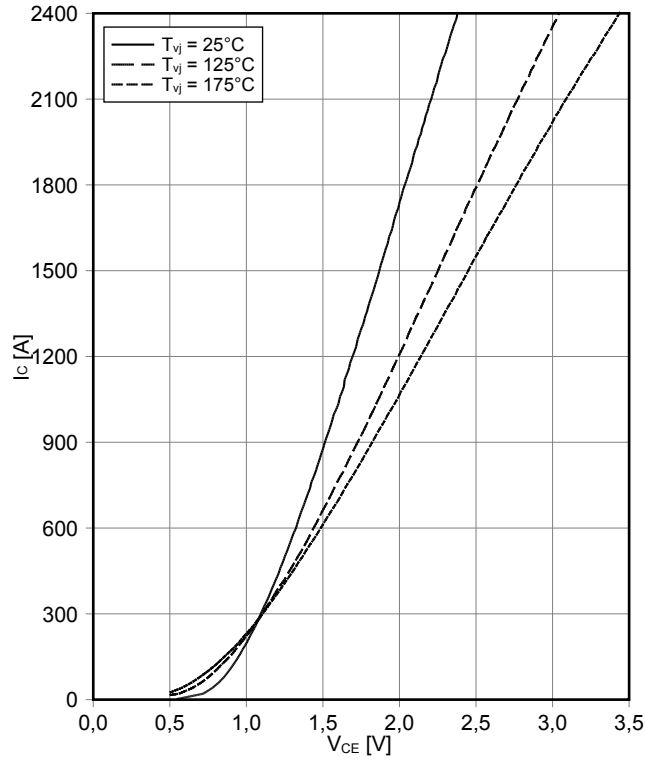
## 模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISOL</sub>	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 <sub>2</sub> O <sub>3</sub>		
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 <sub>sCE</sub>		18	nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	T <sub>c</sub> = 25°C, 每个开关 / per switch	R <sub>CC'+EE'</sub> R <sub>AA'+CC'</sub>		0,30 0,22	mΩ
储存温度 Storage temperature		T <sub>stg</sub>	-40		150 °C
最高基板工作温度 Maximum baseplate operation temperature		T <sub>BPmax</sub>			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	- -	2,1 10 Nm
重量 Weight		G		825	g

输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

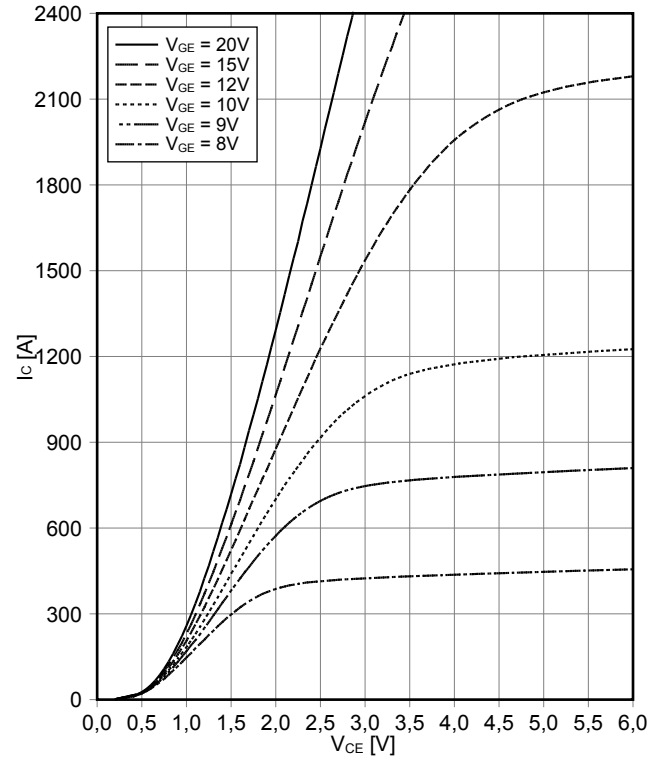
$I_C = f(V_{CE})$   
 $V_{GE} = 15\text{ V}$



输出特性 IGBT, 逆变器 (典型)

output characteristic IGBT, Inverter (typical)

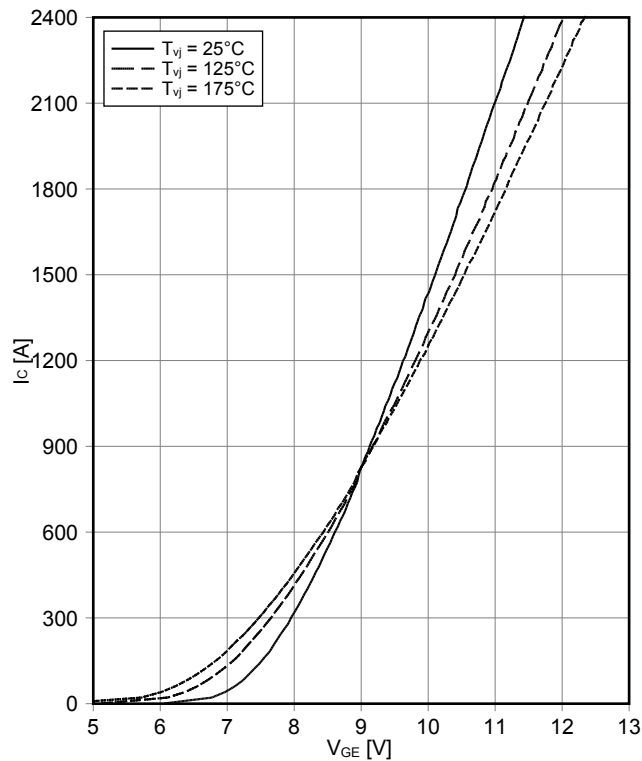
$I_C = f(V_{CE})$   
 $T_{vj} = 175^\circ\text{C}$



传输特性 IGBT, 逆变器 (典型)

transfer characteristic IGBT, Inverter (typical)

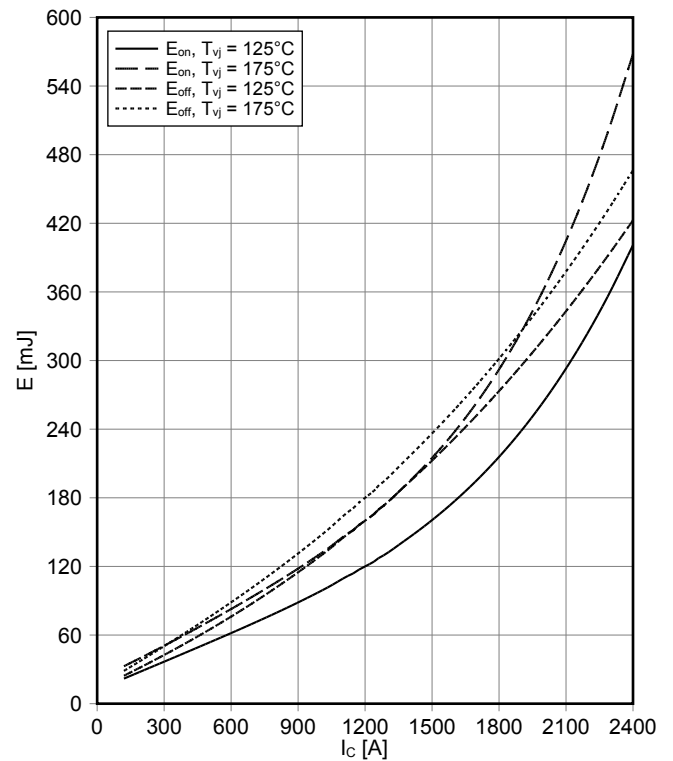
$I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$



开关损耗 IGBT, 逆变器 (典型)

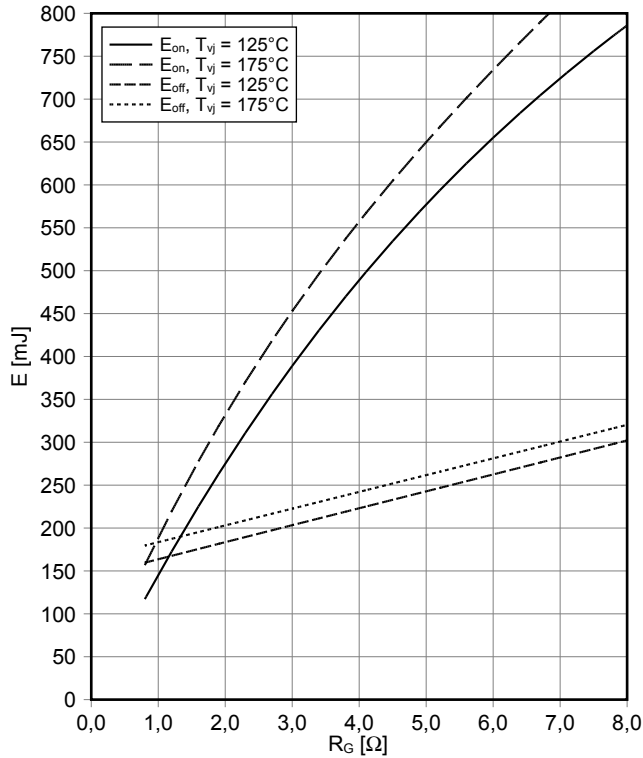
switching losses IGBT, Inverter (typical)

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



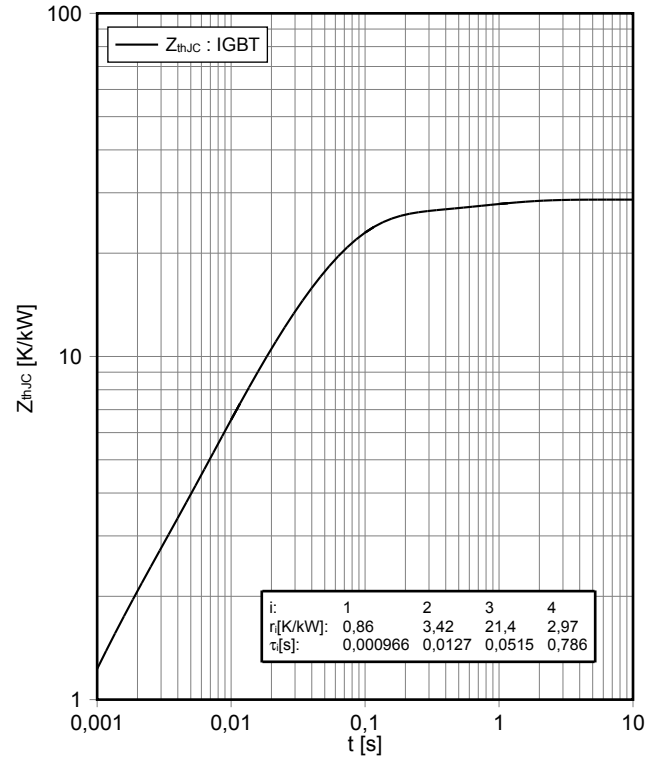
开关损耗 IGBT, 逆变器 (典型)  
**switching losses IGBT, Inverter (typical)**

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15 \text{ V}, I_C = 1200 \text{ A}, V_{CE} = 600 \text{ V}$



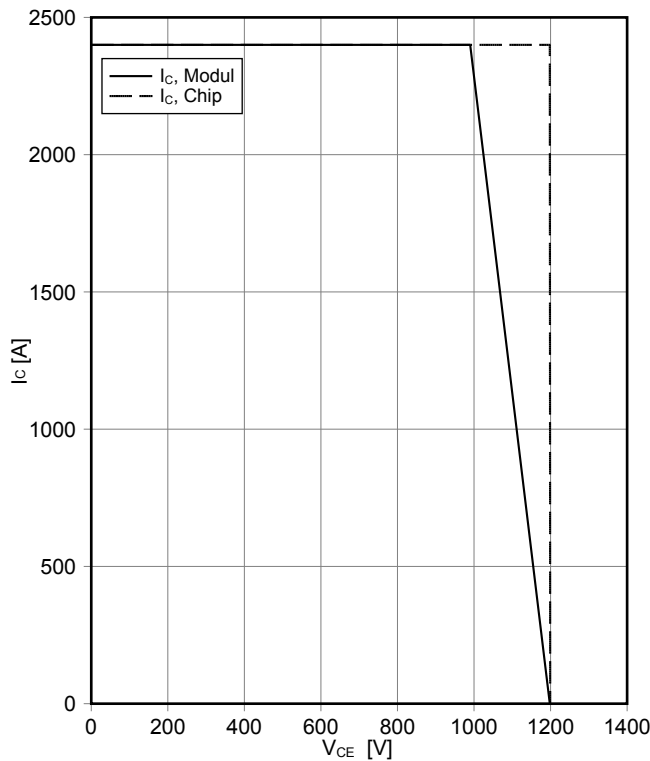
瞬态热阻抗 IGBT, 逆变器  
**transient thermal impedance IGBT, Inverter**

$Z_{thJC} = f(t)$



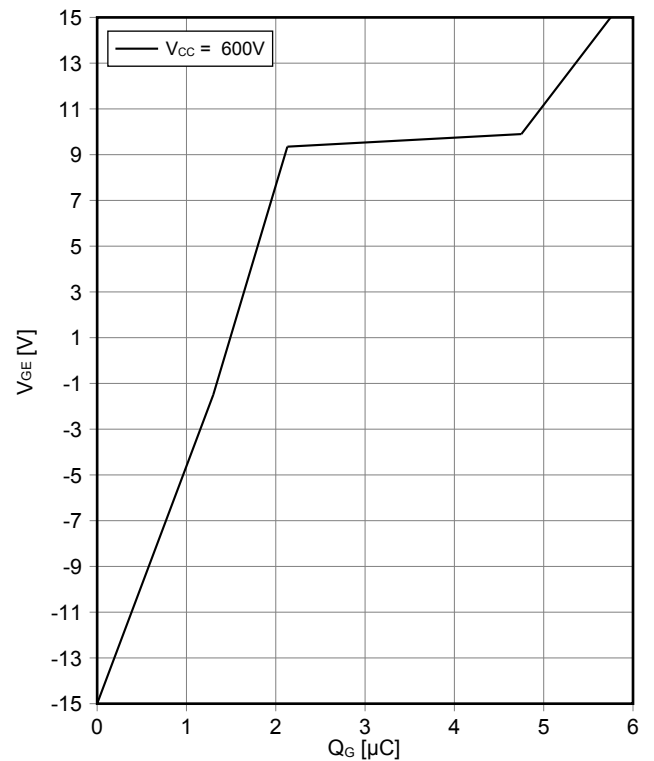
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
**reverse bias safe operating area IGBT, Inverter (RBSOA)**

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

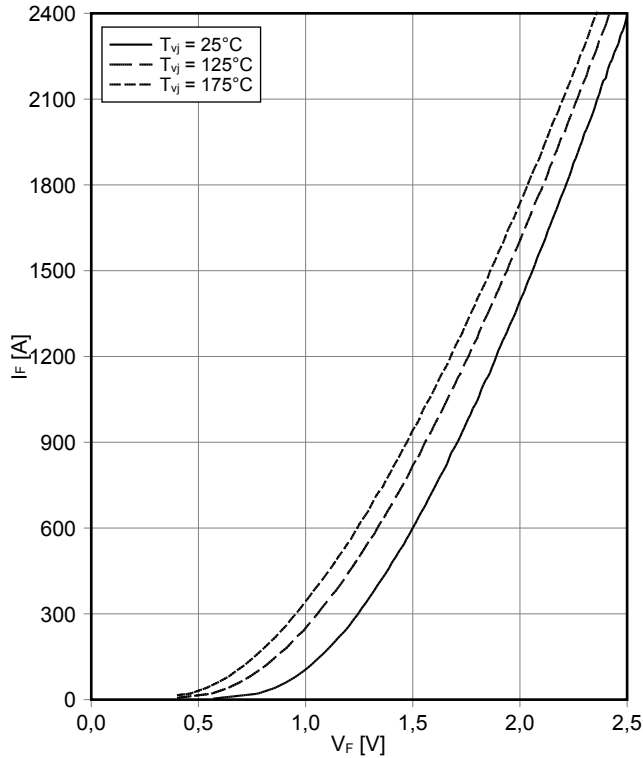


栅极电荷特性 IGBT, 逆变器 (典型)  
**gate charge characteristic IGBT, Inverter (typical)**

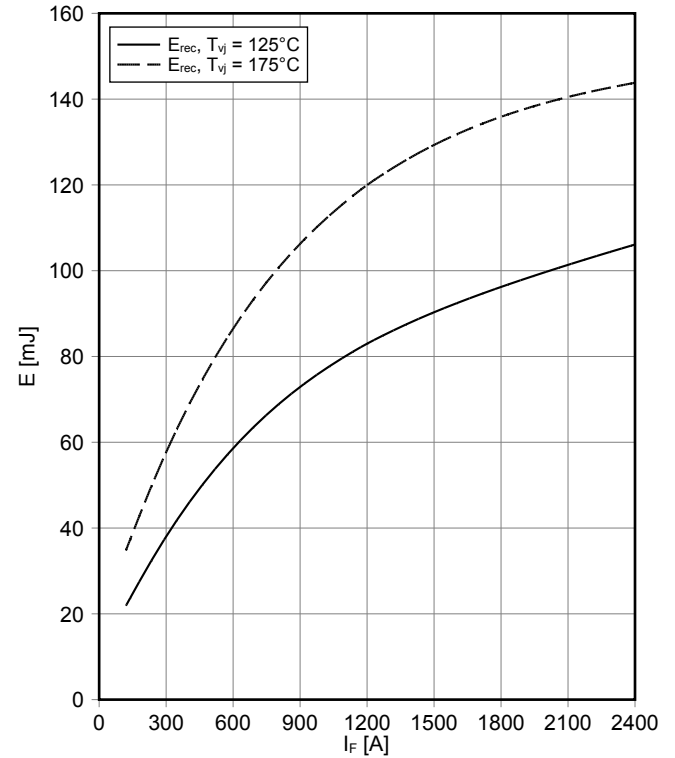
$V_{GE} = f(Q_G)$   
 $I_C = 1200 \text{ A}, T_{vj} = 25^\circ\text{C}$



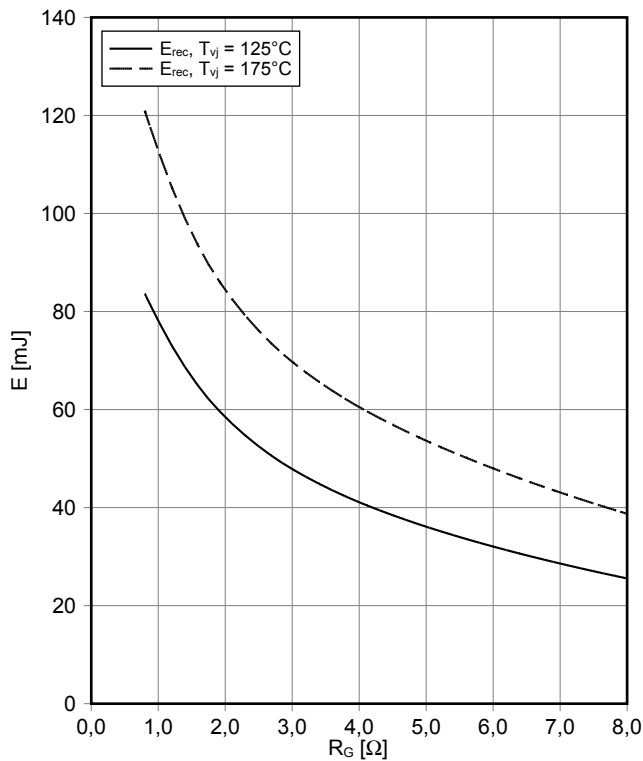
正向偏压特性 二极管,逆变器 (典型)  
**forward characteristic of Diode, Inverter (typical)**  
 $I_F = f(V_F)$



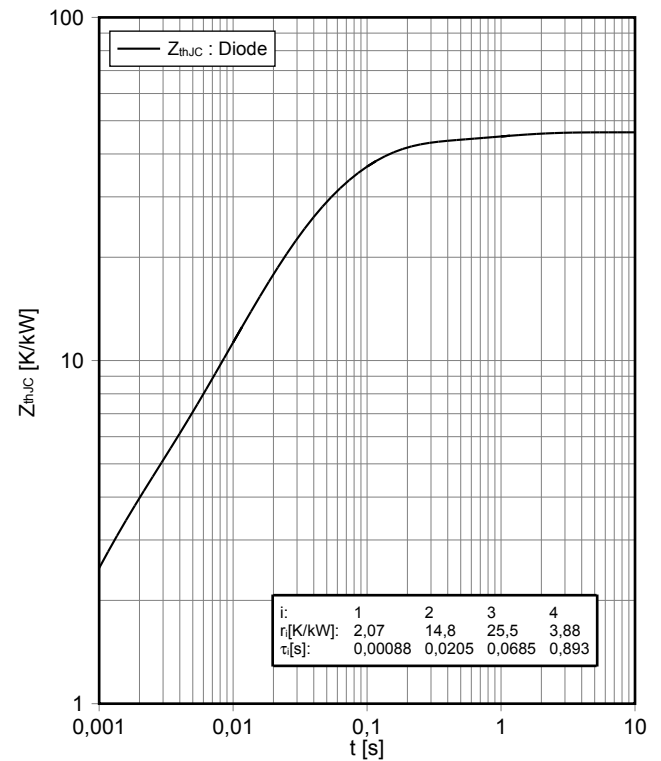
开关损耗 二极管,逆变器 (典型)  
**switching losses Diode, Inverter (typical)**  
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 0.82 \Omega, V_{CE} = 600 \text{ V}$



开关损耗 二极管,逆变器 (典型)  
**switching losses Diode, Inverter (typical)**  
 $E_{rec} = f(R_G)$   
 $I_F = 1200 \text{ A}, V_{CE} = 600 \text{ V}$



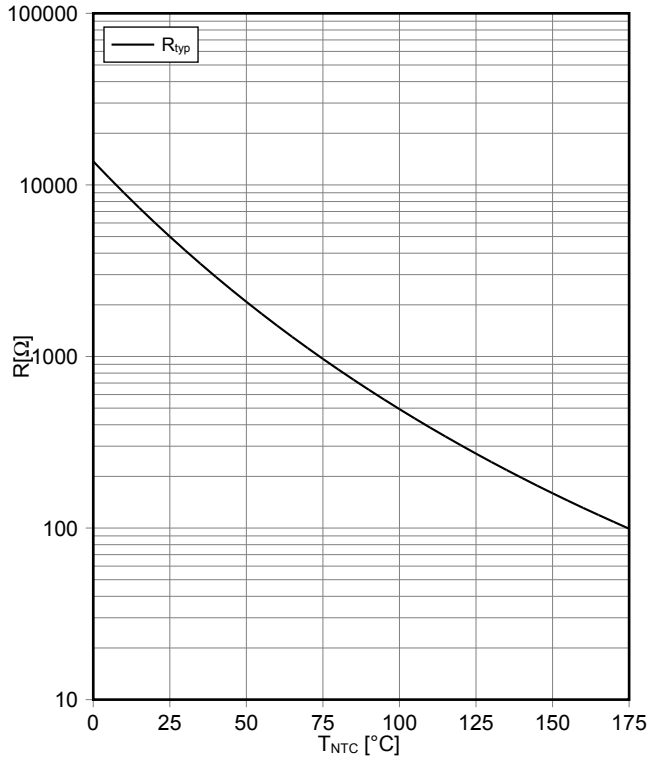
瞬态热阻抗 二极管,逆变器  
**transient thermal impedance Diode, Inverter**  
 $Z_{thJC} = f(t)$



负温度系数热敏电阻 温度特性

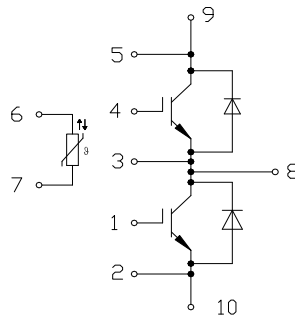
**NTC-Thermistor-temperature characteristic (typical)**

$R = f(T)$

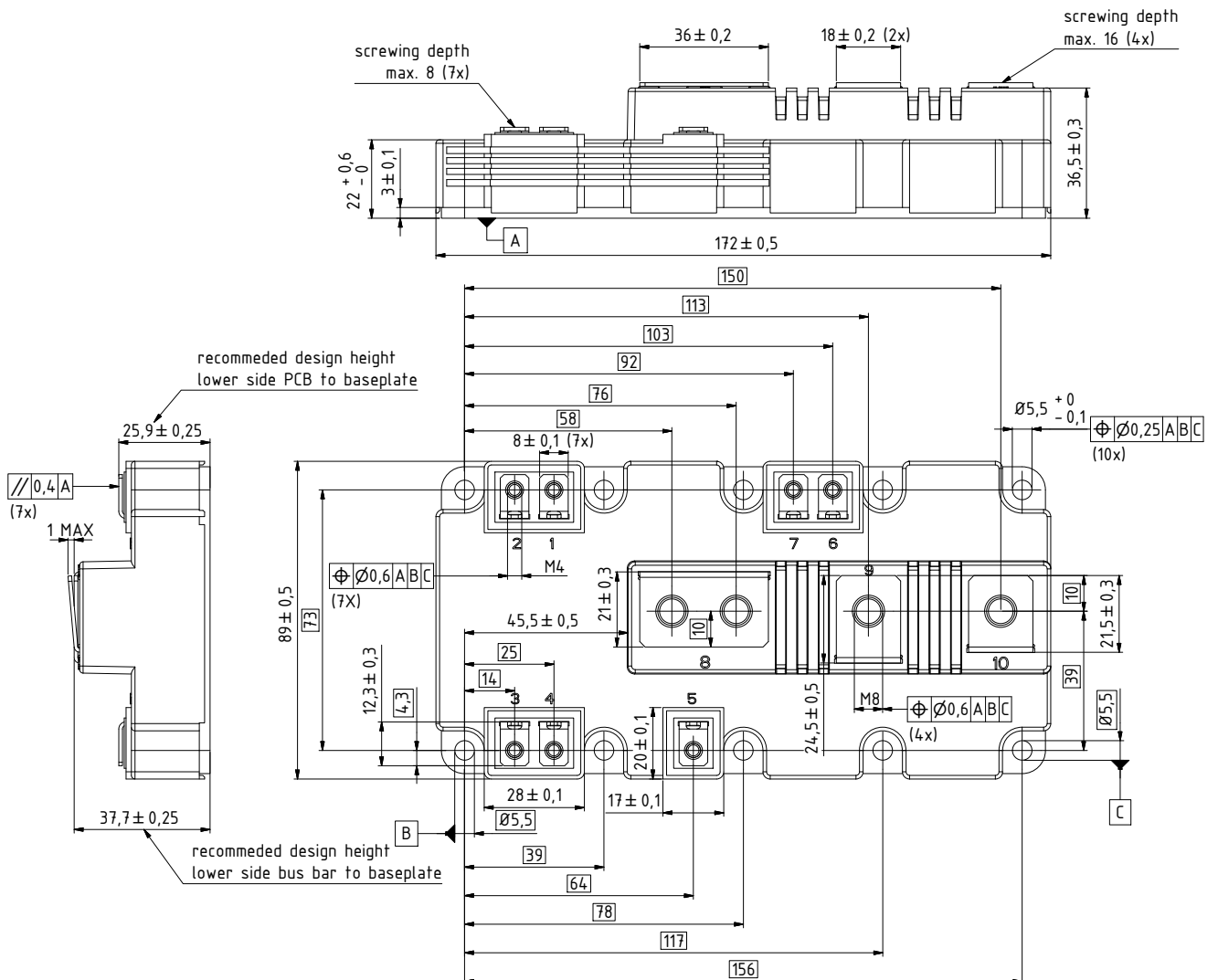




## 接线图 / Circuit diagram



## 封装尺寸 / Package outlines



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