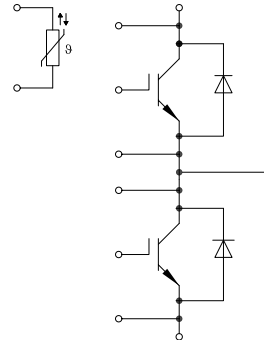


PrimePACK™3+ 模块 采用第五代沟槽栅/场终止IGBT5和第五代发射极控制二极管 带有温度检测NTC
PrimePACK™3+ module with Trench/Fieldstop IGBT5, Emitter Controlled 5 diode and NTC



$V_{CES} = 1700V$
 $I_{C\ nom} = 1800A / I_{CRM} = 3600A$

典型应用

- 大功率变流器
- 电机传动
- 牵引变流器
- 风力发电机

Typical Applications

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

电气特性

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

Electrical Features

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

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

prepared by: TA	date of publication: 2016-01-26	
approved by: WR	revision: V3.1	

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	$T_C = 85^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	1800	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ms}$	I_{CRM}	3600	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	P_{tot}	8,95	kW
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	$I_C = 1800\text{A}, V_{GE} = 15\text{V}$ $I_C = 1800\text{A}, V_{GE} = 15\text{V}$ $I_C = 1800\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,75 2,10 2,30	2,20 2,65 2,90	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 64,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,35	5,80 6,25	V
栅极电荷 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G	9,00		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	0,8		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}	105		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}	3,20		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}		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	$I_C = 1800\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 0,56\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{don}	0,31 0,33 0,34		μs μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 1800\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 0,56\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_r	0,17 0,18 0,19		μs μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 1800\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 0,68\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_{doff}	0,71 0,80 0,85		μs μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 1800\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 0,68\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	t_f	0,14 0,18 0,21		μs μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 1800\text{A}, V_{CE} = 900\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 9100\text{A}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $R_{Gon} = 0,56\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{on}	405 600 725		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 1800\text{A}, V_{CE} = 900\text{V}, L_S = 30\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 2500\text{V}/\mu\text{s} (T_{vj} = 175^{\circ}\text{C})$ $R_{Goff} = 0,68\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 175^{\circ}\text{C}$	E_{off}	485 680 780		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 1000\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 175^{\circ}\text{C}$		I_{SC}	7200		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		16,5	K/kW
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$		R_{thCH}	14,0		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	175	$^{\circ}\text{C}$

prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1

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	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	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 175^{\circ}\text{C}$	I^2t	730 650	kA ² s kA ² s
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	P_{RQM}	1800	kW

特征值 / Characteristic Values

				min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	V_F		1,75	2,10	V
	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$			1,70	2,05	V
	$I_F = 1800\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 175^{\circ}\text{C}$			1,70	2,05	V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1800\text{ A}, -di_F/dt = 9100\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	I_{RM}		1350		A
		$T_{vj} = 125^{\circ}\text{C}$			1600		A
		$T_{vj} = 175^{\circ}\text{C}$			1800		A
恢复电荷 Recovered charge	$I_F = 1800\text{ A}, -di_F/dt = 9100\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	Q_r		315		μC
		$T_{vj} = 125^{\circ}\text{C}$			620		μC
		$T_{vj} = 175^{\circ}\text{C}$			810		μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1800\text{ A}, -di_F/dt = 9100\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	E_{rec}		160		mJ
		$T_{vj} = 125^{\circ}\text{C}$			365		mJ
		$T_{vj} = 175^{\circ}\text{C}$			480		mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode	R_{thJC}			33,0		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}			17,0		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.

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approved by: WR	revision: V3.1



模块 / Module

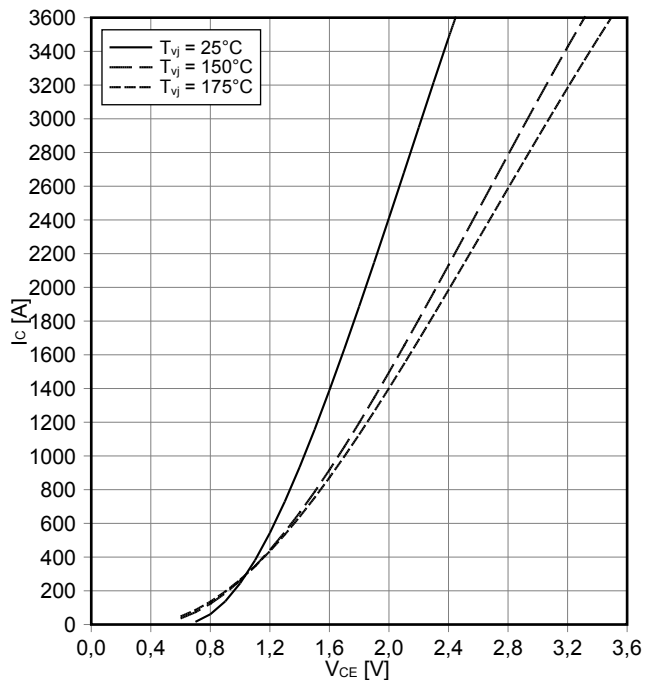
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	4,0		kV
模块基板材料 Material of module baseplate			Cu		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		33,0 33,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		19,0 19,0		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'}		0,10	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	- -	2,1 15 Nm
重量 Weight		G		1400	g

prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1



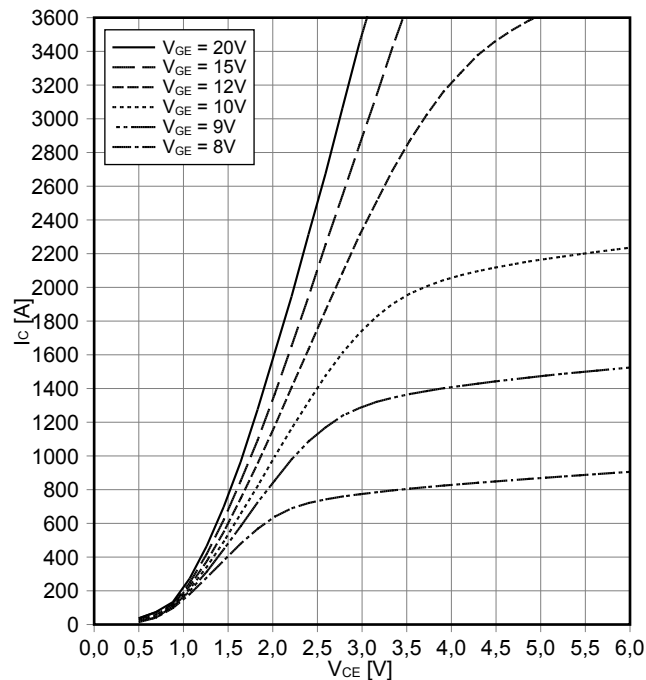
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



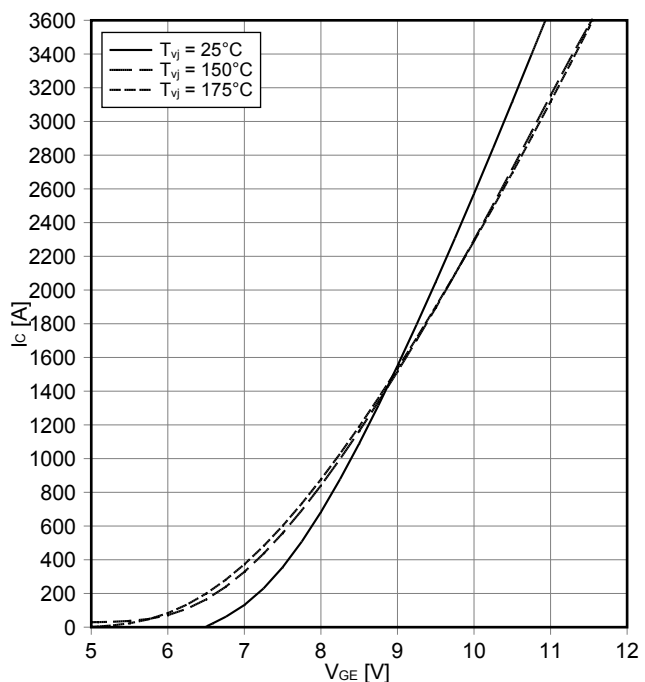
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



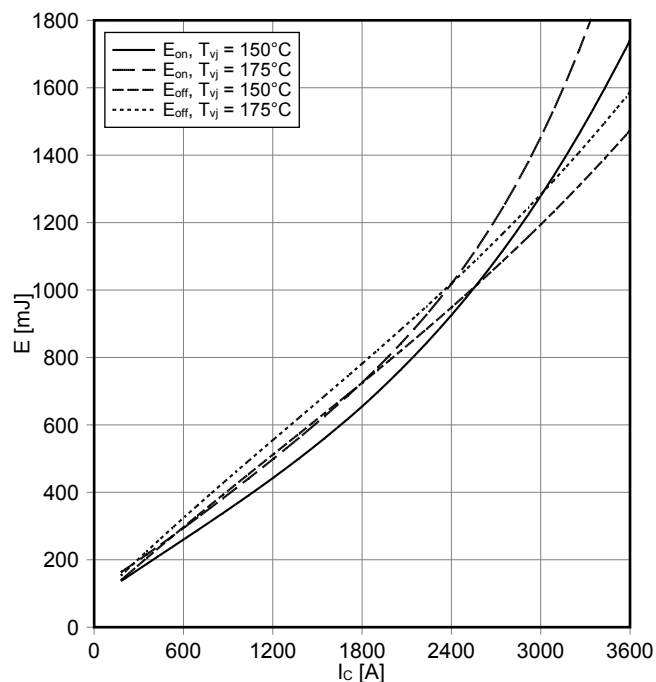
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 0.56\ \Omega$, $R_{Goff} = 0.68\ \Omega$, $V_{CE} = 900\text{ V}$

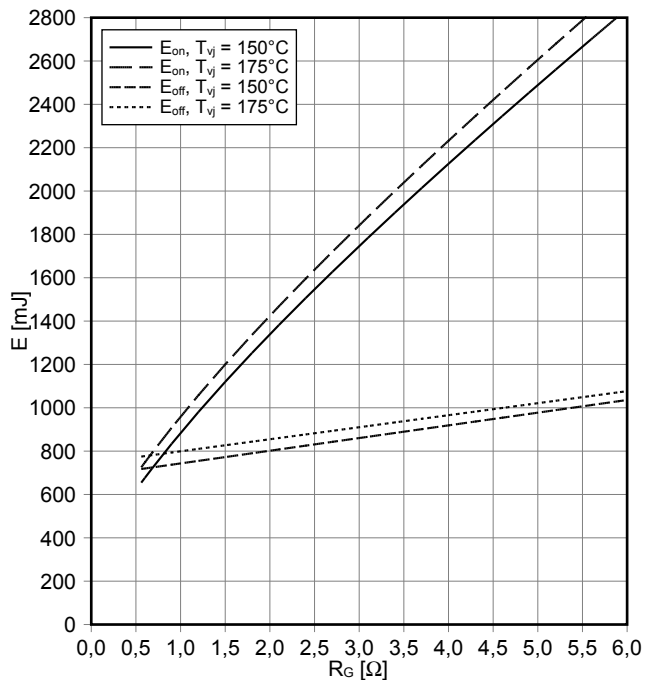


prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1



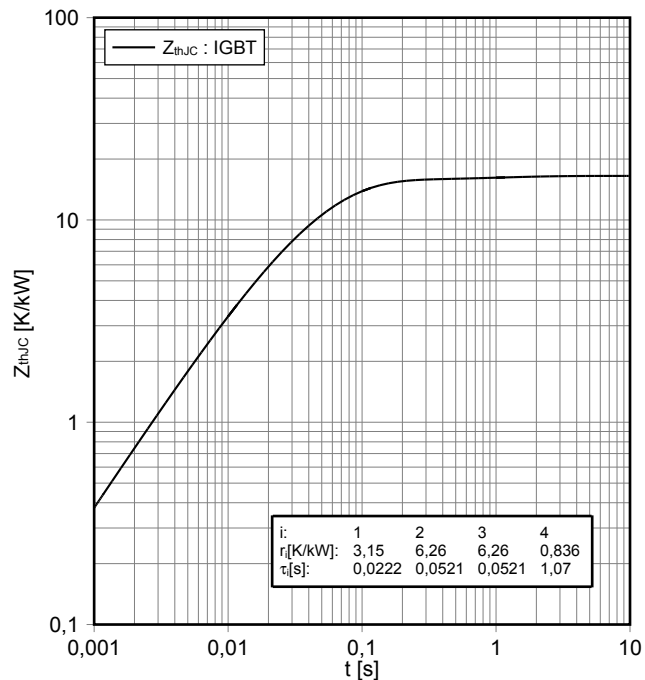
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 1800\text{ A}, V_{CE} = 900\text{ V}$



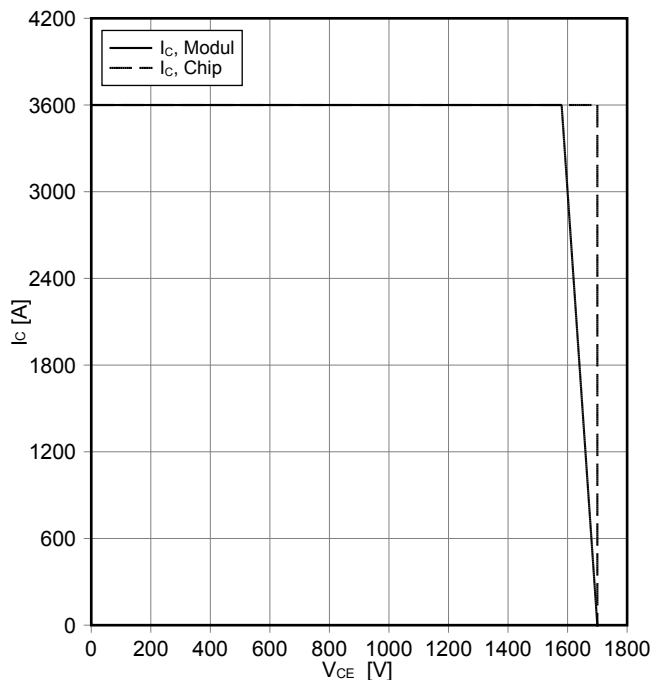
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



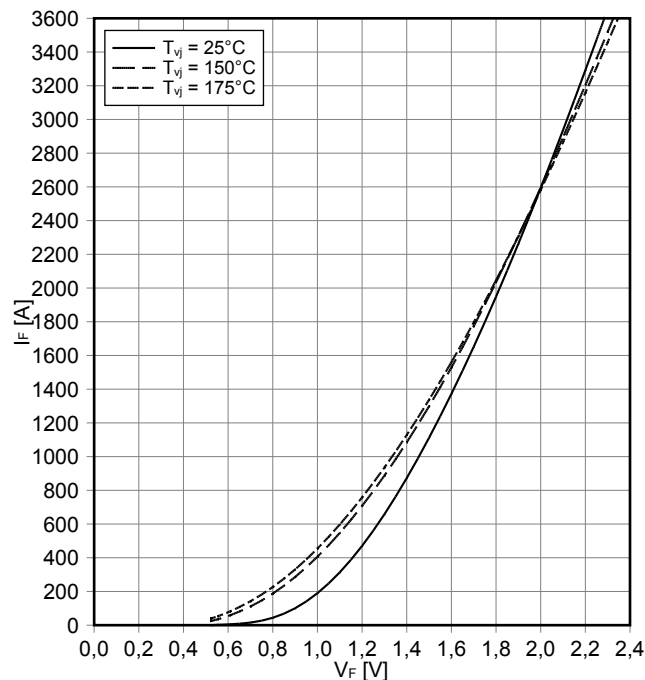
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 0.68\ \Omega, T_{vj} = 175^\circ\text{C}$



正向偏压特性 二极管, 逆变器 (典型)
forward characteristic of Diode, Inverter (typical)

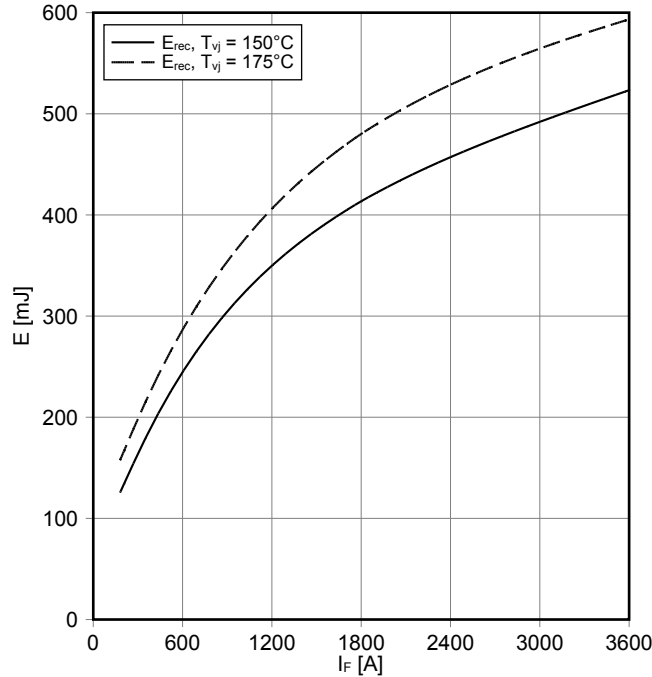
$I_F = f(V_F)$



prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1

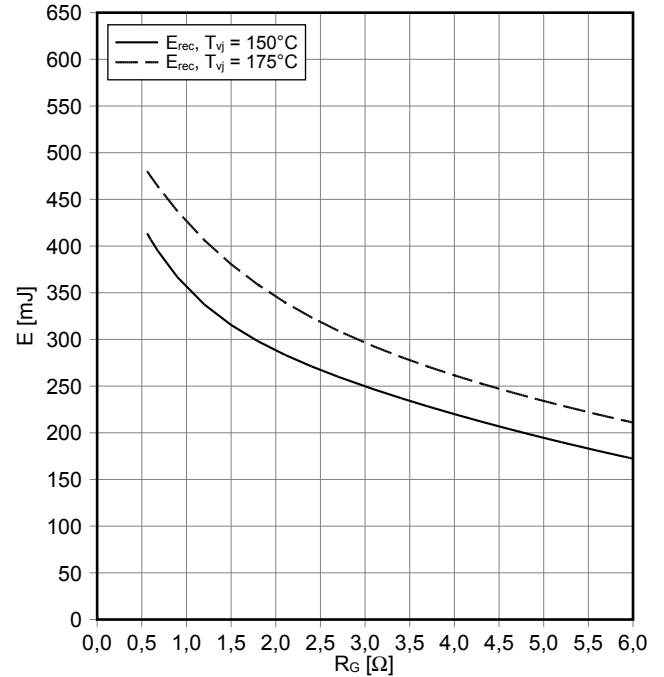
开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 0.56 \Omega, V_{CE} = 900 V$



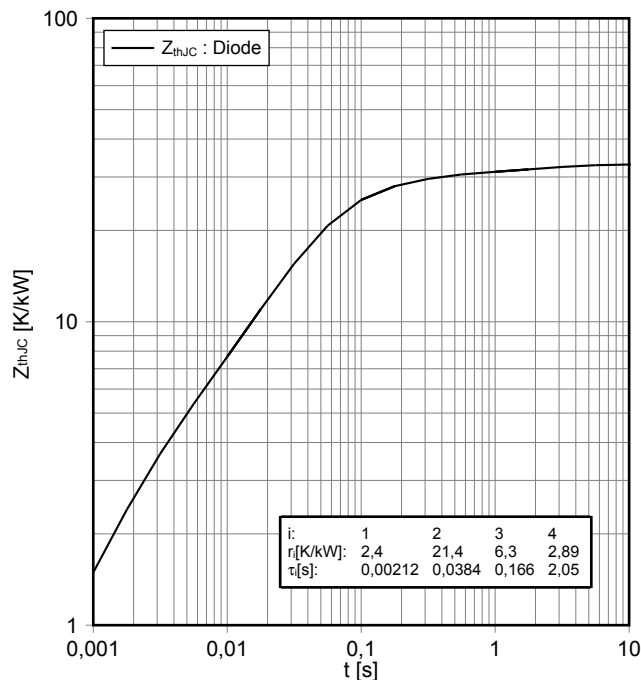
开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 1800 A, V_{CE} = 900 V$



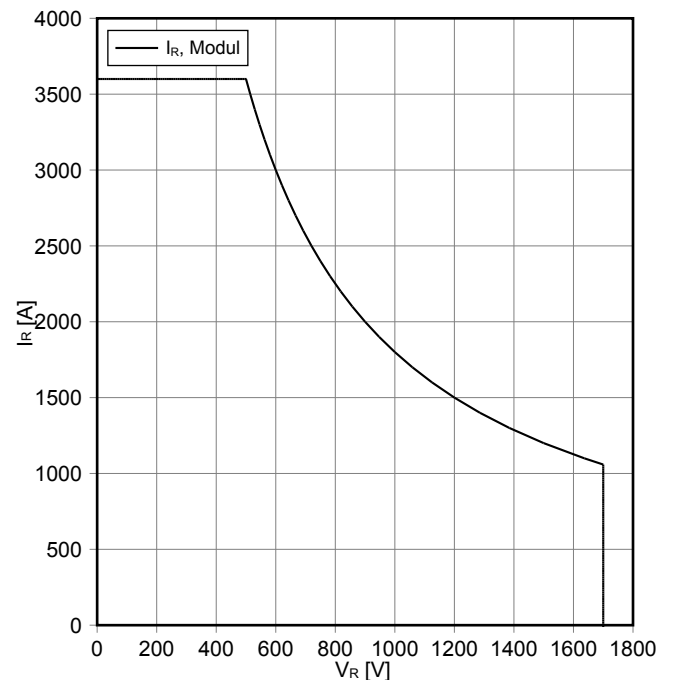
瞬态热阻抗 二极管, 逆变器
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



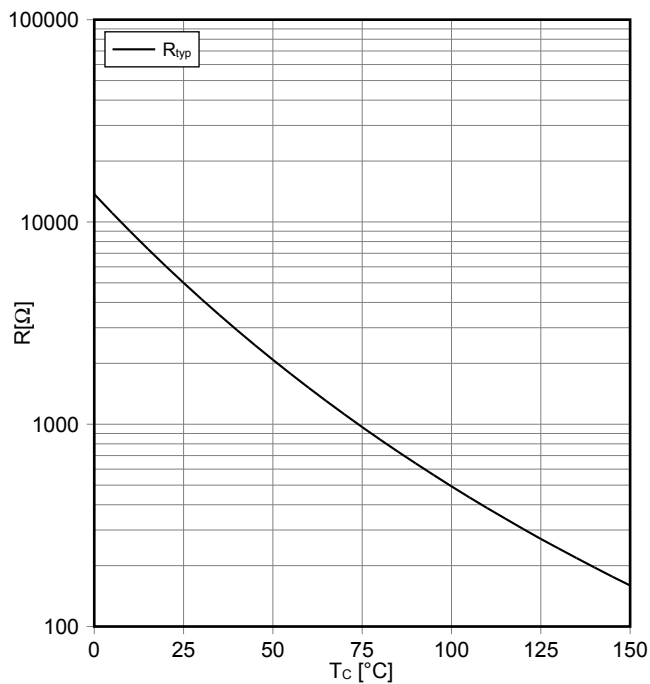
安全工作区 二极管, 逆变器 (SOA)
safe operation area Diode, Inverter (SOA)

$I_R = f(V_R)$
 $T_{vj} = 150^\circ C$



prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1

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



prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1



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 81726 München, Germany
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prepared by: TA	date of publication: 2016-01-26
approved by: WR	revision: V3.1