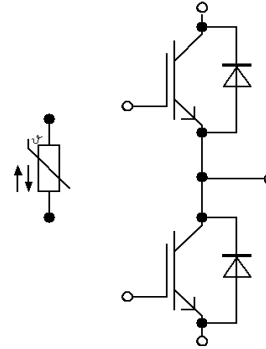
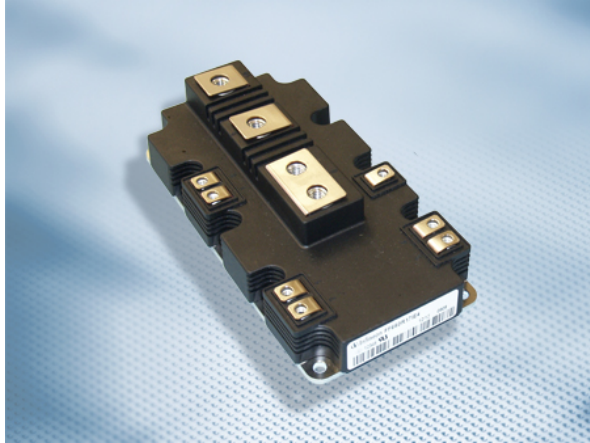


PrimePACK™2 模块 采用第四代沟槽栅/场终止IGBT4和发射极控制二极管
PrimePACK™2 module with Trench/Fieldstop IGBT4 and Emitter Controlled diode



$V_{CES} = 1200V$
 $I_{C\ nom} = 900A / I_{CRM} = 1800A$

典型应用

- 商业性农用车辆
- 牵引变流器

电气特性

- 高短路能力
- 高冲击电流能力
- 高电流密度
- 低开关损耗
- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} 带正温度系数

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
- 高机械坚固性
- 集成NTC温度传感器
- 符合RoHS
- 预涂导热介质

Typical Applications

- Commercial Agriculture Vehicles
- Traction drives

Electrical Features

- High short-circuit capability
- High surge current capability
- High current density
- Low switching losses
- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} with positive temperature coefficient

Mechanical Features

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

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: SM	date of publication: 2016-08-23	
approved by: RN	revision: V3.0	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	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	$T_H = 60^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	900	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ms}$	I_{CRM}	1800	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	$I_C = 900\text{A}, V_{GE} = 15\text{V}$ $I_C = 900\text{A}, V_{GE} = 15\text{V}$ $I_C = 900\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,75 2,05 2,10	2,10 2,45 2,50	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}	5,20	5,80	6,40	V
栅极电荷 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		Q_G	6,40			μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	1,2			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}	54,0			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}	3,00			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	$I_C = 900\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,5\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{don}	0,20 0,22 0,22			μs μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 900\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,5\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_r	0,11 0,12 0,13			μs μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 900\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,5\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_{doff}	0,66 0,75 0,79			μs μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 900\text{A}, V_{CE} = 600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,5\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	t_f	0,09 0,14 0,15			μs μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 900\text{A}, V_{CE} = 600\text{V}, L_S = 45\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 5700\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,3\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{on}	55,0 70,0 80,0			mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 900\text{A}, V_{CE} = 600\text{V}, L_S = 45\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 3200\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,5\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{off}	85,0 120 130			mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 900\text{V}$ $V_{CEmax} = V_{CES} - L_{sCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		I_{SC}	3600			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}			48,1	K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40		150	$^{\circ}\text{C}$

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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	900	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	1800	A
I_{2t} -值 I^2t - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	I^2t	91,0 88,0	kA ² s kA ² s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 900\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 900\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F	1,90 1,85 1,80	2,40 2,35 2,30	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 900\text{ A}, -di_F/dt = 5700\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}	500 660 710		A A A
恢复电荷 Recovered charge	$I_F = 900\text{ A}, -di_F/dt = 5700\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r	90,0 150 195		μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 900\text{ A}, -di_F/dt = 5700\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}	40,0 80,0 90,0		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}		87,2	K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	150	$^{\circ}\text{C}$

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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模块 / Module

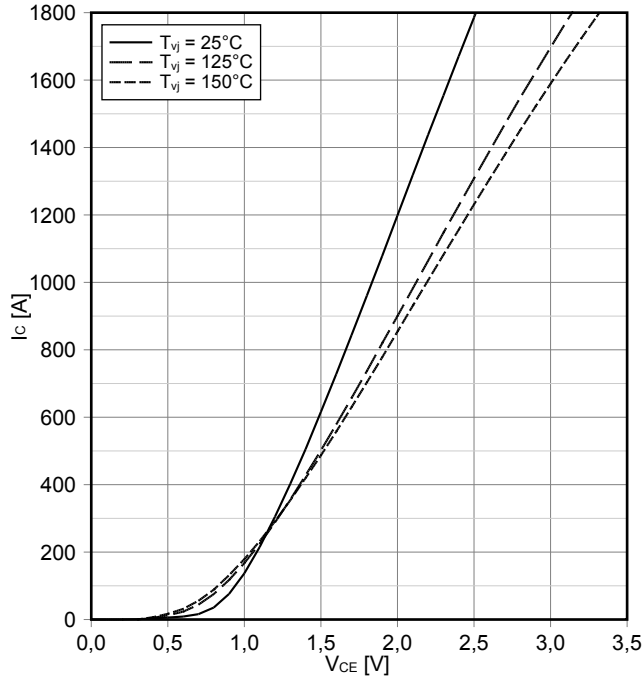
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	4,0		kV
模块基板材料 Material of module baseplate			Cu		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		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}		18	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'}		0,30	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

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

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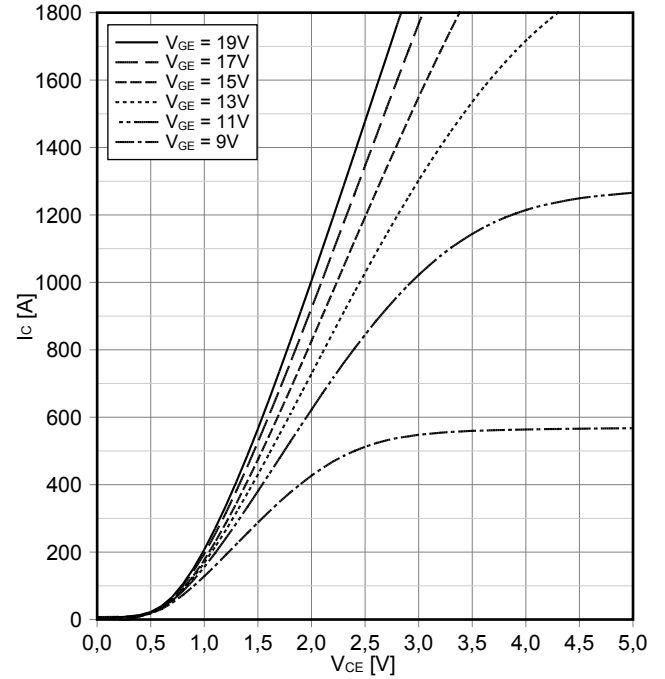
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



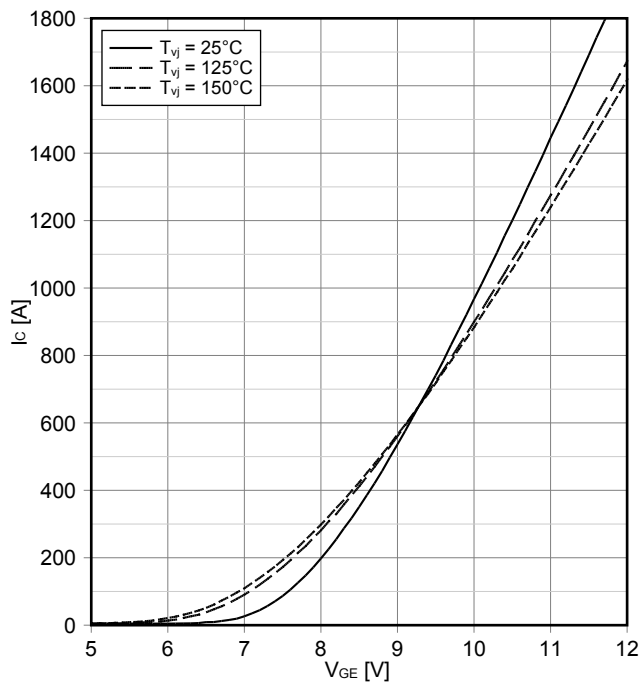
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 150^\circ\text{C}$



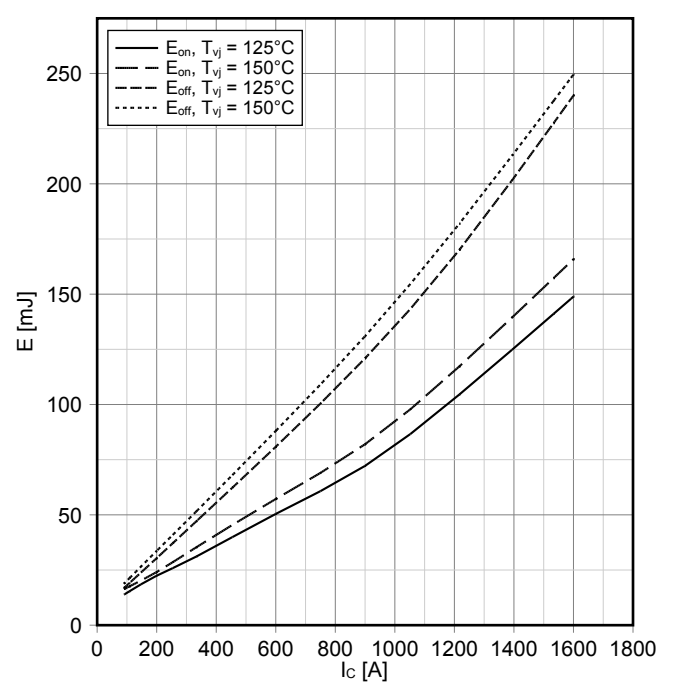
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.3\ \Omega$, $R_{Goff} = 1.5\ \Omega$, $V_{CE} = 600\text{ V}$

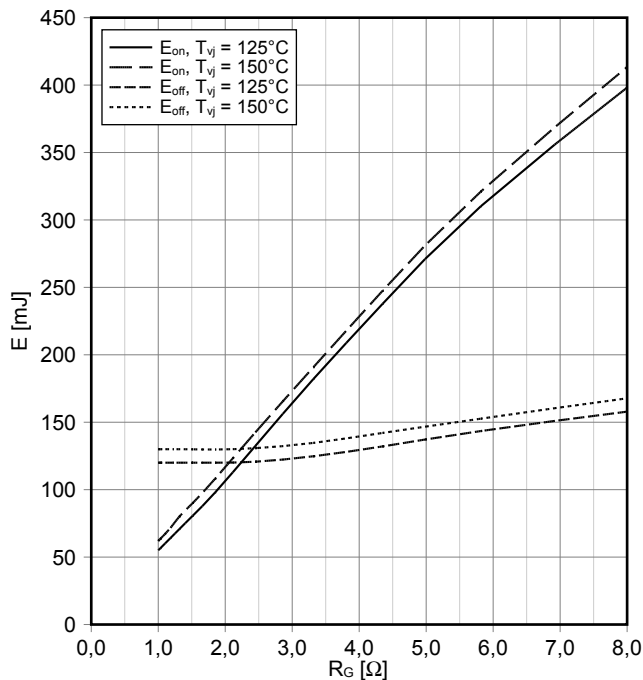


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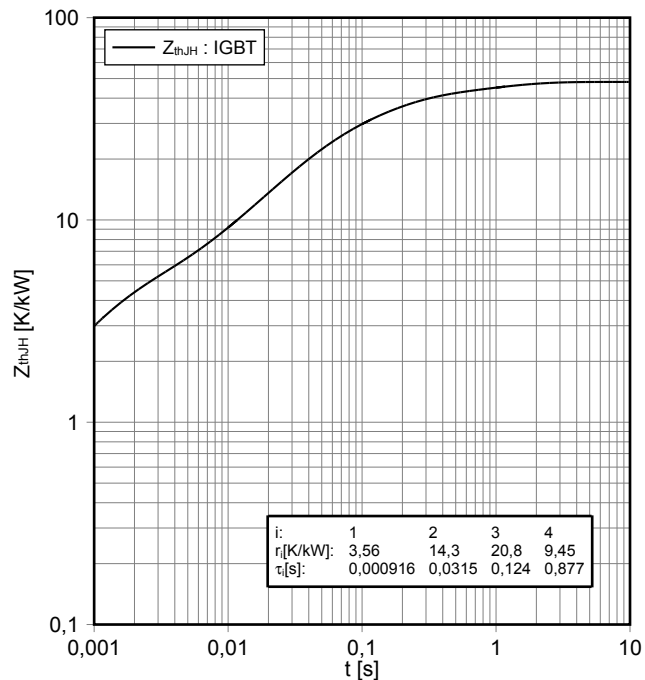
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 900\text{ A}, V_{CE} = 600\text{ V}$



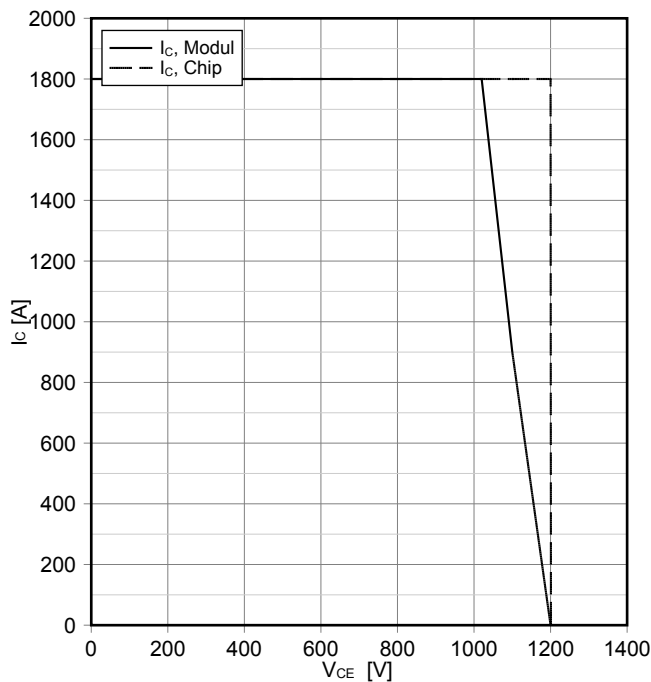
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJH} = f(t)$



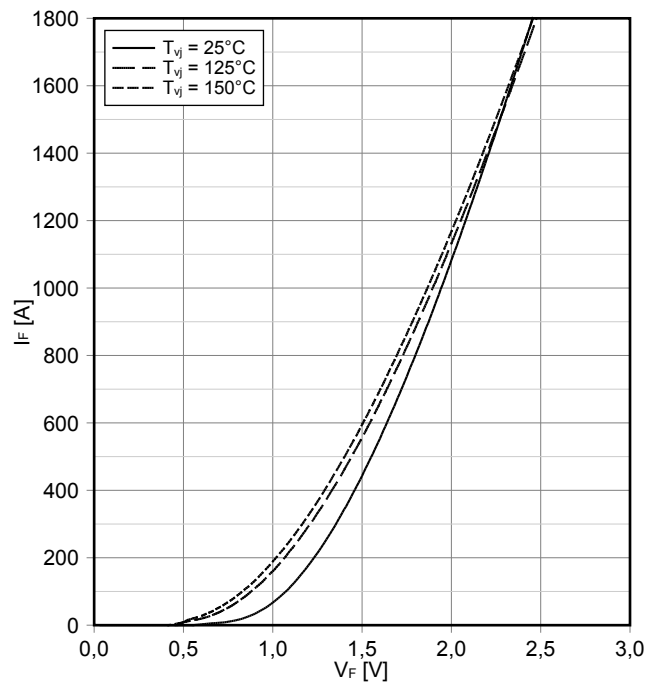
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.5\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$

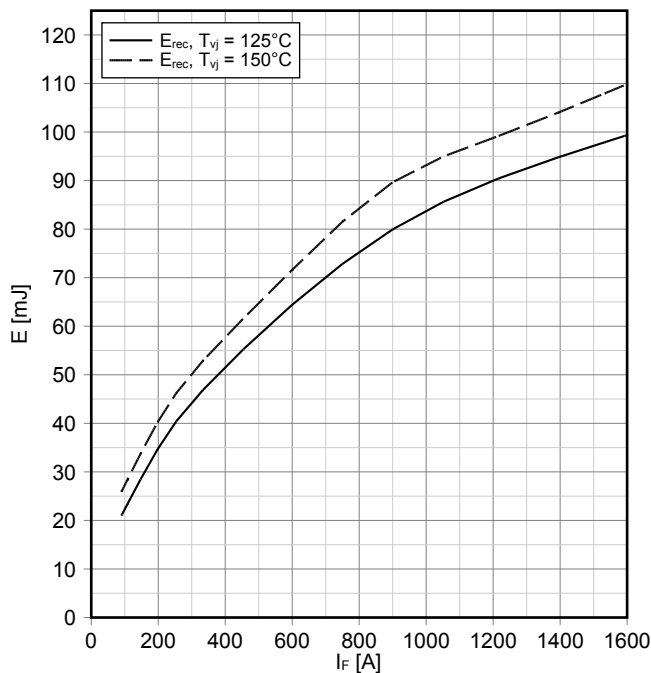


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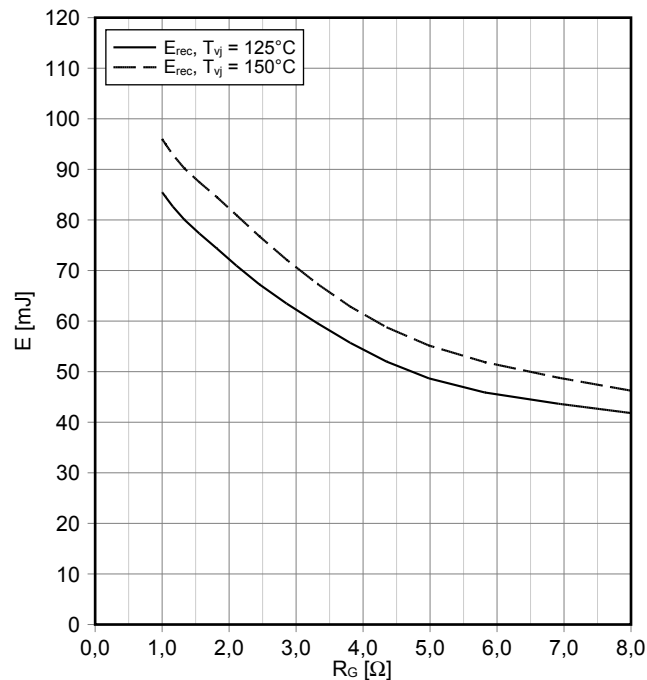
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.3 \Omega, V_{CE} = 600 V$



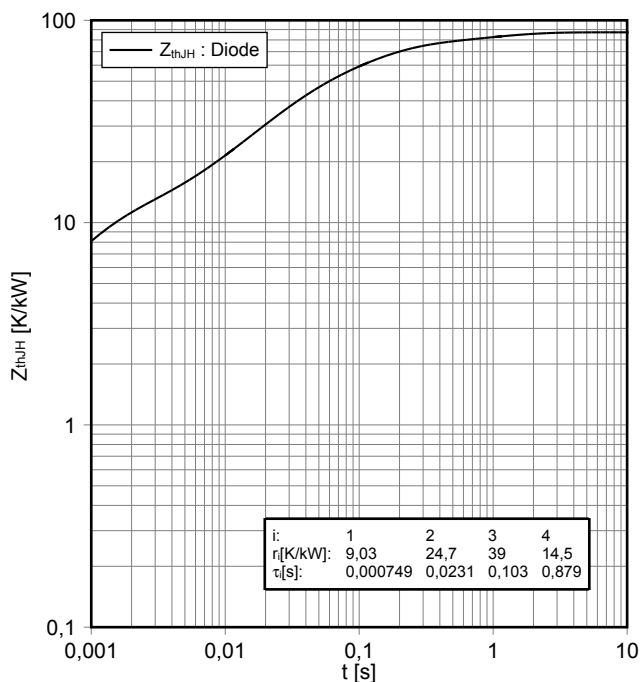
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 900 A, V_{CE} = 600 V$



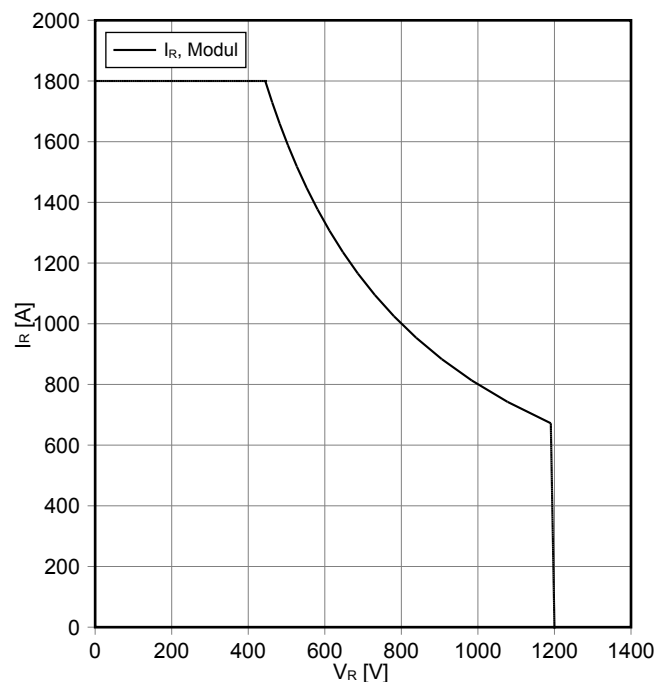
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter

$Z_{thJH} = f(t)$



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

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

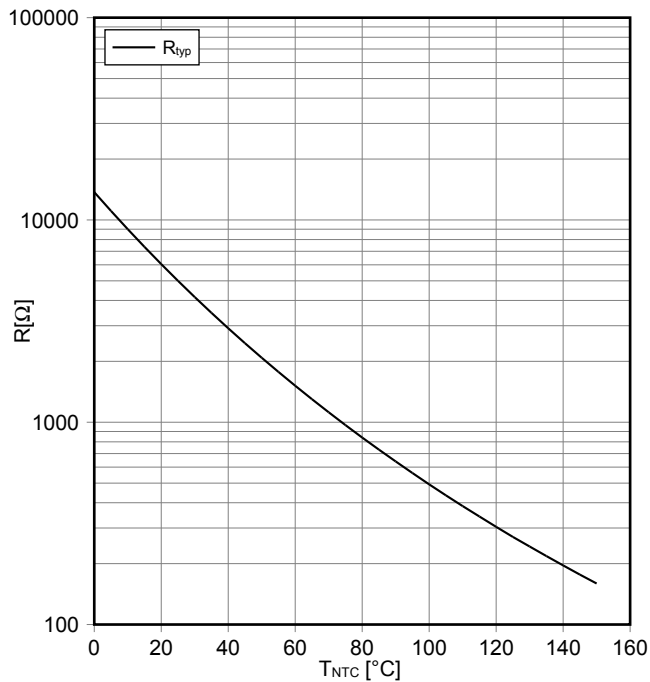


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负温度系数热敏电阻 温度特性

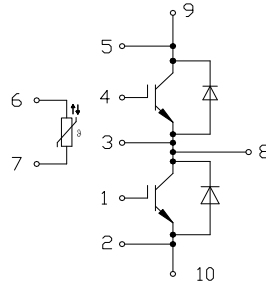
NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$

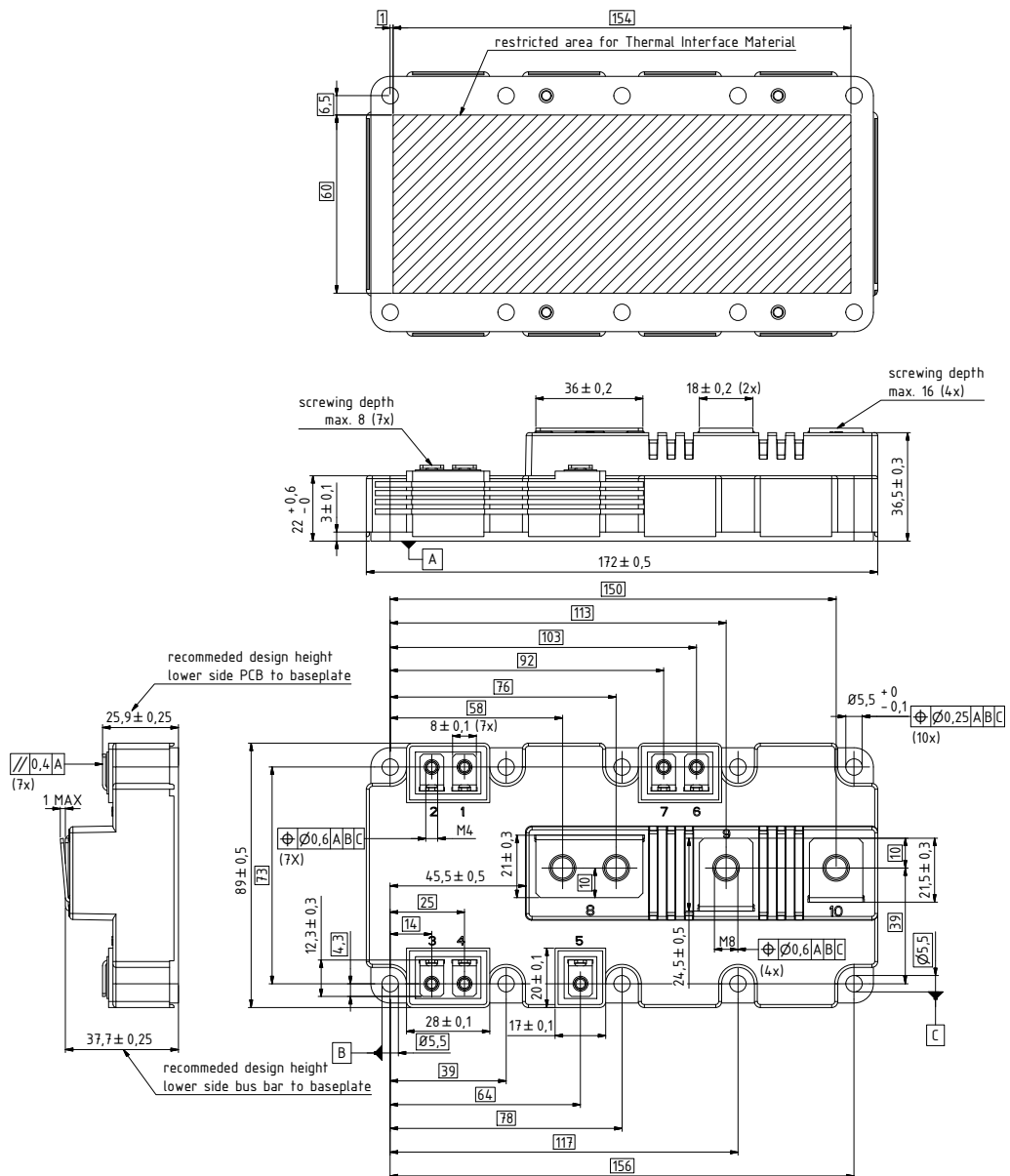


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接线图 / Circuit diagram



封装尺寸 / Package outlines



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