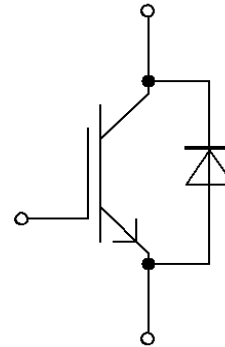


高绝缘等级模块
high insulated module



$V_{CES} = 6500V$
 $I_{C\ nom} = 250A / I_{CRM} = 500A$

典型应用

- 中压变流器
- 牵引变流器

电气特性

- 低 V_{CEsat}

机械特性

- 碳化硅铝 (AlSiC) 基板提供更高的温度循环能力
- 扩大存储温度范围至 $T_{stg} = -55^{\circ}C$
- 封装的 CTI > 600
- 加强绝缘封装, 10.2kV 交流 1分钟
- 高爬电距离和电气间隙

Typical Applications

- Medium Voltage Converters
- Traction Drives

Electrical Features

- Low V_{CEsat}

Mechanical Features

- AlSiC Base Plate for increased Thermal Cycling Capability
- Extended Storage Temperature down to $T_{stg} = -55^{\circ}C$
- Package with CTI > 600
- Package with enhanced Insulation of 10.2kV AC 1min
- 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

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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	$T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -50^{\circ}\text{C}$	V_{CES}	6500 6500 5900	V
连续集电极直流电流 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$	250	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ms}$	I_{CRM}	500	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	P_{tot}	4,80	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	$I_C = 250\text{A}, V_{GE} = 15\text{V}$ $I_C = 250\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	3,00 3,70	3,40 4,20	V V	
栅极阈值电压 Gate threshold voltage	$I_C = 35,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,4	6,0	6,6	V
栅极电荷 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}, V_{CE} = 3600\text{V}$		Q_G	10,0		μC	
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}	2,3		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}	69,0		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}	1,05		nF	
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 6500\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$		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	$I_C = 250\text{A}, V_{CE} = 3600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 3,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_{don}	0,70 0,80		μs μs	
上升时间(电感负载) Rise time, inductive load	$I_C = 250\text{A}, V_{CE} = 3600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 3,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,33 0,40		μs μs	
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 250\text{A}, V_{CE} = 3600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 20\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_{doff}	7,30 7,60		μs μs	
下降时间(电感负载) Fall time, inductive load	$I_C = 250\text{A}, V_{CE} = 3600\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 20\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,40 0,50		μs μs	
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 250\text{A}, V_{CE} = 3600\text{V}, L_S = 280\text{nH}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 3,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	1400 2200		mJ mJ	
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 250\text{A}, V_{CE} = 3600\text{V}, L_S = 280\text{nH}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 20\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	1200 1400		mJ mJ	
短路数据 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 4500\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 125^{\circ}\text{C}$		I_{SC}	1500		A	
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		26,1	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}		26,5	K/kW	
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-50	125	$^{\circ}\text{C}$	

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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	$T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -50^{\circ}\text{C}$	V_{RRM}	6500 6500 5900	V
连续正向直流电流 Continuous DC forward current		I_F	250	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	500	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^2t	52,0	kA ² s
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	P_{RQM}	1000	kW
最小开通时间 Minimum turn-on time		$t_{on \text{ min}}$	10,0	μs

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 250 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 250 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	3,00 2,95	3,50 3,50	V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 250 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 3600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	370 400		A A
恢复电荷 Recovered charge	$I_F = 250 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 3600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	290 540		μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 250 \text{ A}, -di_F/dt = 1000 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 3600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	470 1000		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}		56,0	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}	42,0		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj \text{ op}}$	-50	125	$^{\circ}\text{C}$

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模块 / Module

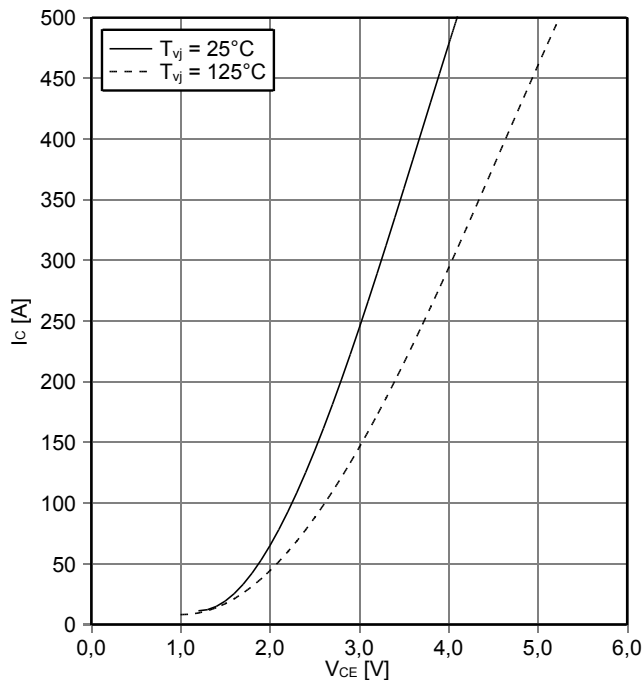
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	10,2		kV
局部放电熄灭电压 Partial discharge extinction voltage	RMS, f = 50 Hz, Q _{PD} typ 10 pC (acc. to IEC 1287)	V _{ISOL}	5,1		kV
DC 稳定性 DC stability	T _{vj} = 25°C, 100 fit	V _{CE D}	3800		V
模块基板材料 Material of module baseplate			AISiC		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		AlN		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		56,0 56,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		26,0 26,0		mm
相对电痕指数 Comperative tracking index		CTI	> 600		
			min.	typ.	max.
杂散电感, 模块 Stray inductance module		L _{sCE}		25	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'}		0,36 0,36	mΩ
储存温度 Storage temperature		T _{stg}	-55		125 °C
模块安装的安装扭矩 Mounting torque for modul mounting	螺丝 M6 根据相应的应用手册进行安装 Screw M6 - Mounting according to valid application note	M	4,25	-	5,75 Nm
端子联接扭矩 Terminal connection torque	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	8,0	-	10 Nm
重量 Weight		G		500	g

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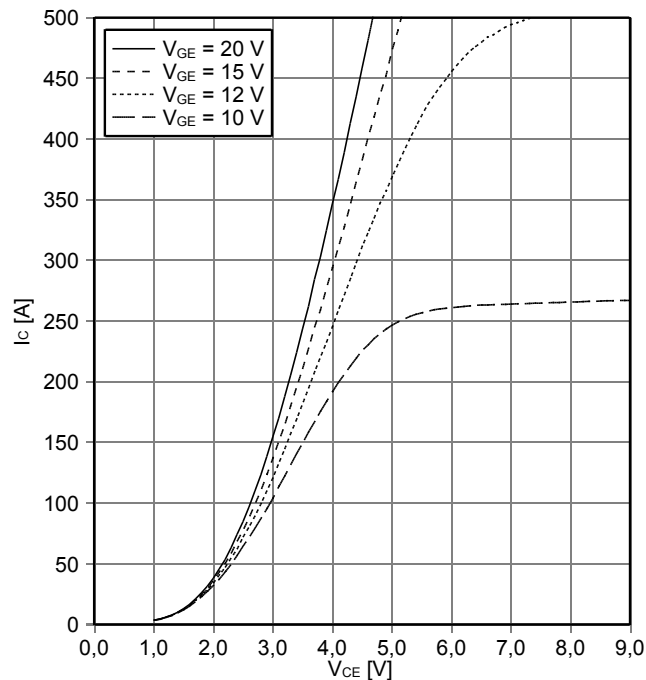
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



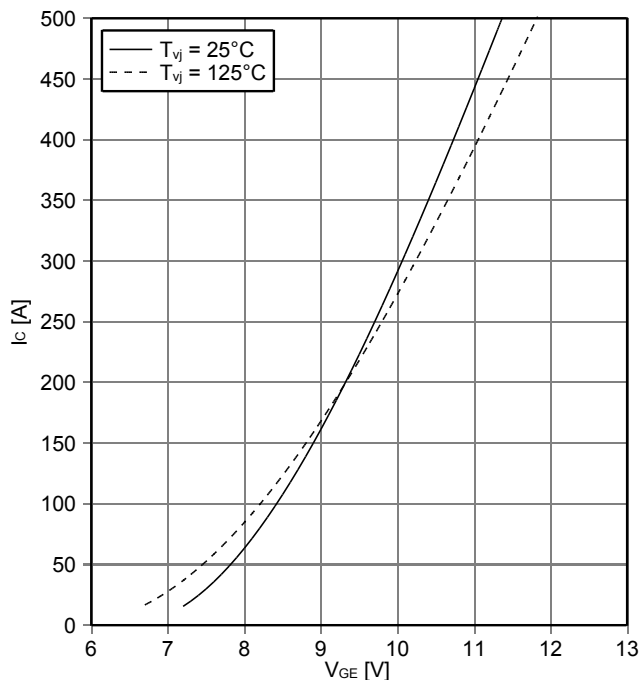
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$
 $T_{vj} = 125^\circ\text{C}$



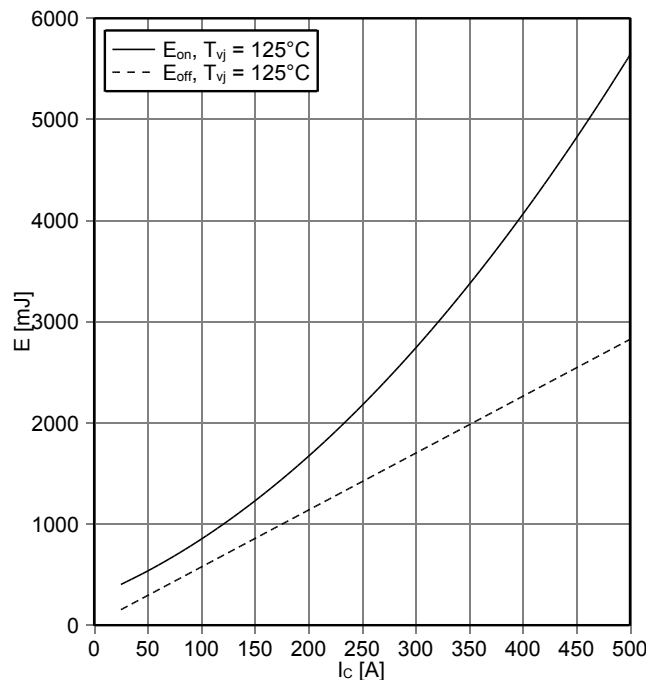
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 3\ \Omega, R_{Goff} = 20.4\ \Omega, V_{CE} = 3600\text{ V}$

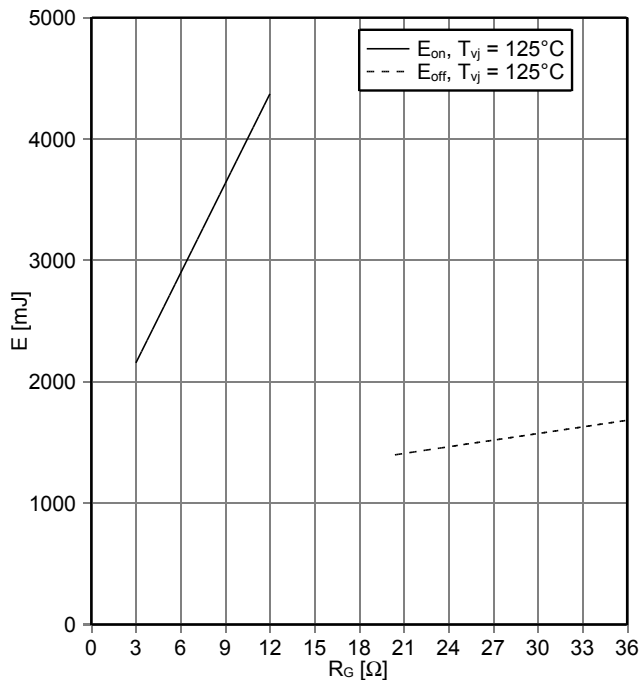


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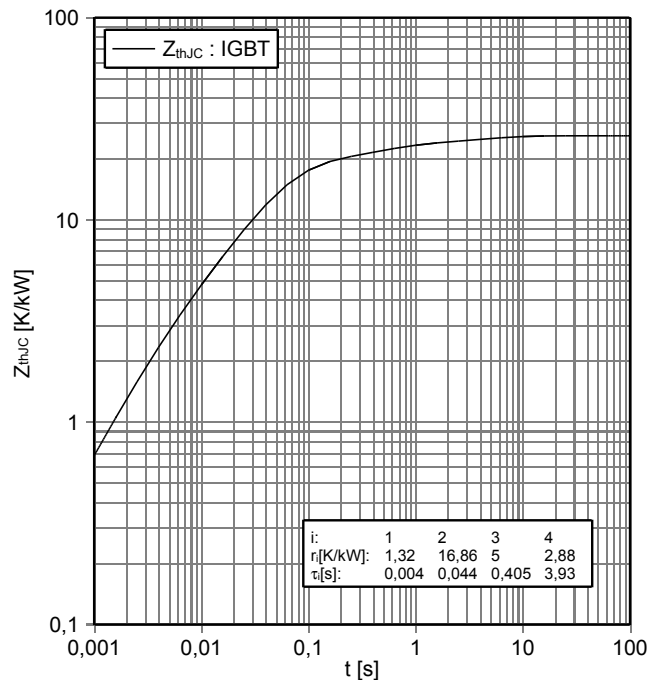
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15 V, I_C = 250 A, V_{CE} = 3600 V$



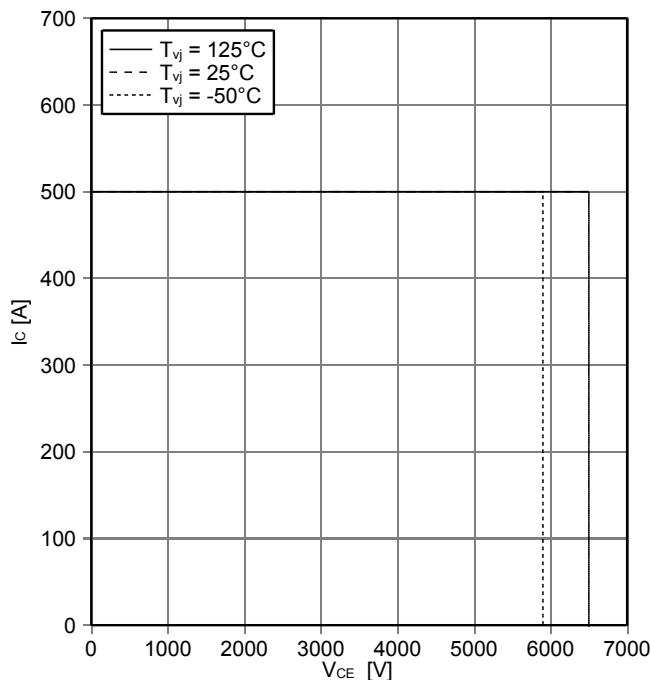
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



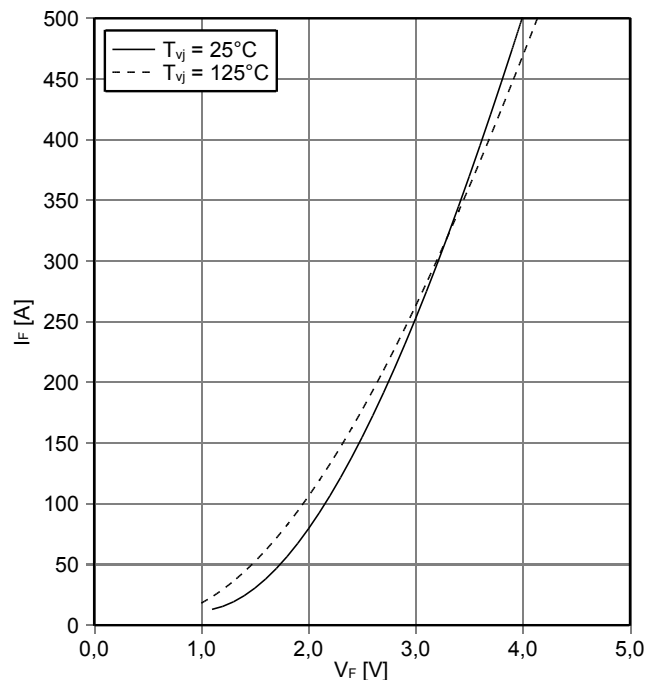
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15 V, R_{Goff} = 20.4 \Omega$



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

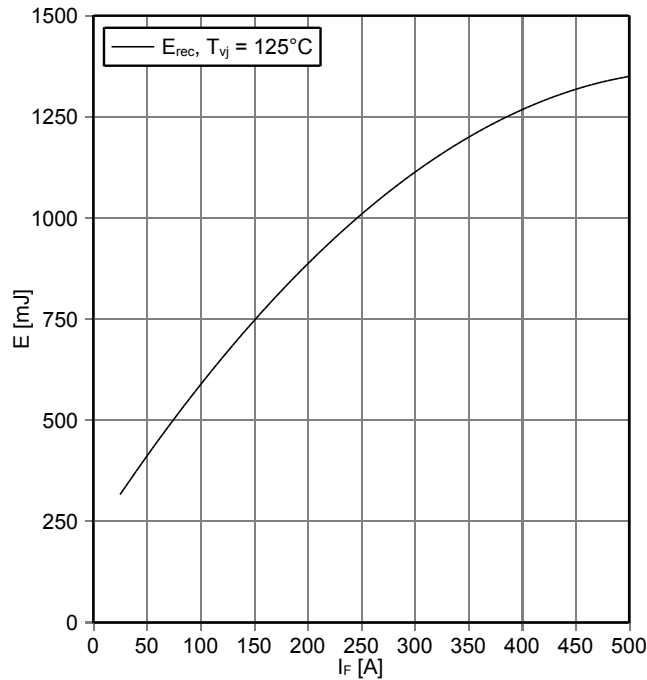
$I_F = f(V_F)$



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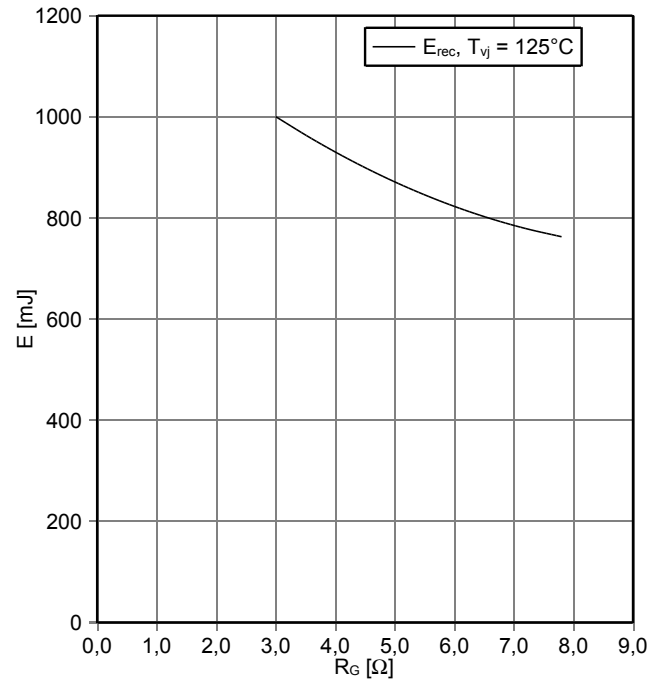
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 3 \Omega, V_{CE} = 3600 V$



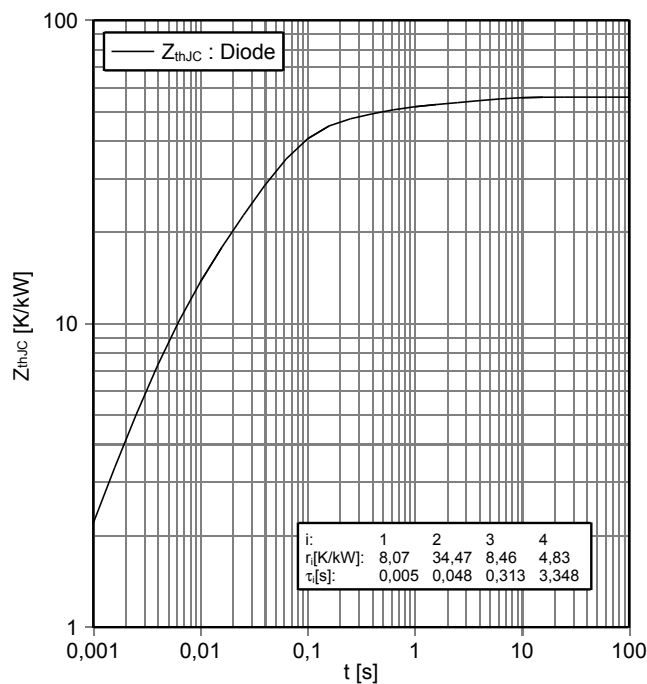
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 250 A, V_{CE} = 3600 V$



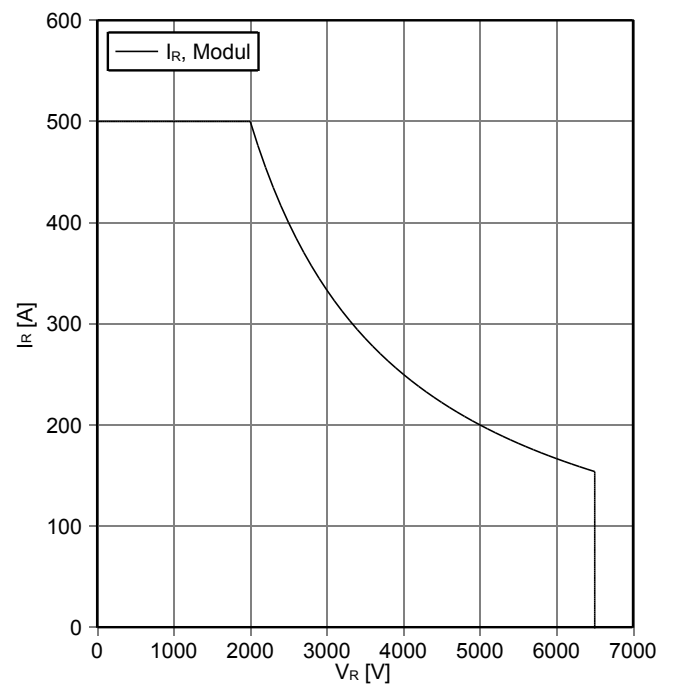
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



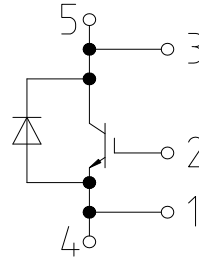
安全工作区 二极管,逆变器 (SOA)
safe operation area Diode, Inverter (SOA)

$I_R = f(V_R)$
 $T_{vj} = 125^\circ C$

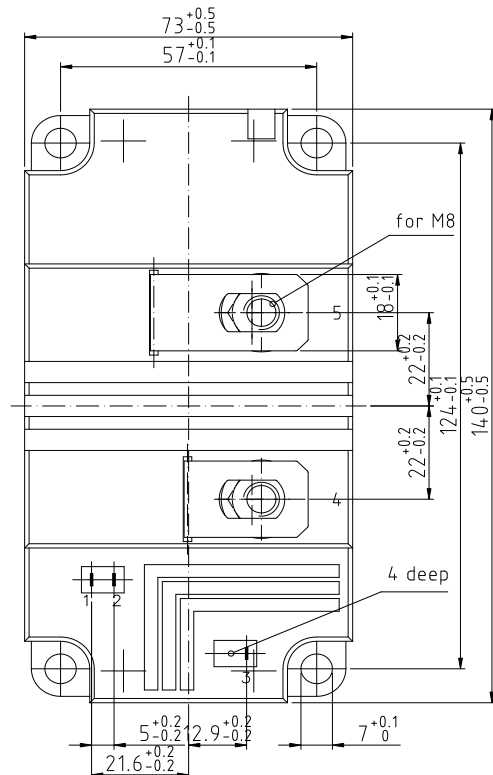
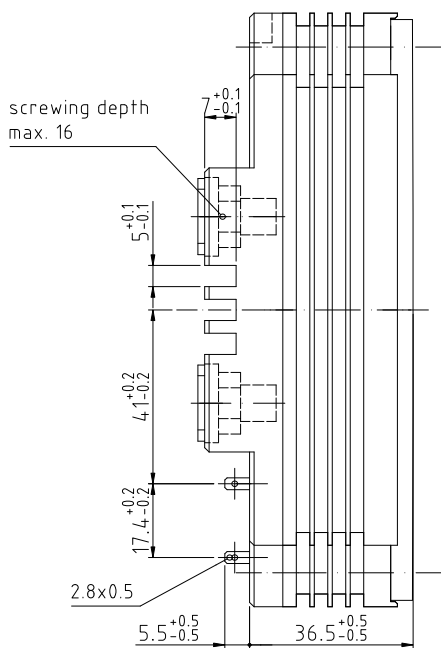
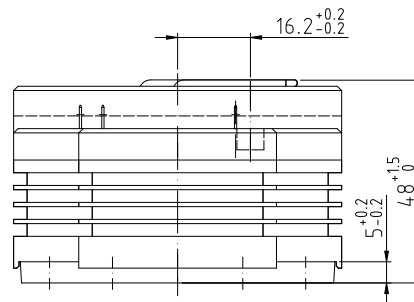


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接线图 / circuit_diagram_headline



封装尺寸 / package outlines



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使用条件和条款

使用条件和条款

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请注意，对这类应用我们强烈建议

- 执行联合的风险和质量评估
 - 得到质量协议的结论
 - 建立联合的测试和出厂产品检查，我们可以根据测试的实际情况供货
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Terms & Conditions of usage

The data contained in this product data sheet is exclusively intended for technically trained staff. You and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics. The information in the valid application- and assembly notes of the module must be considered.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.infineon.com). For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify. Please note, that for any such applications we urgently recommend

- to perform joint Risk and Quality Assessments;
- the conclusion of Quality Agreements;
- to establish joint measures of an ongoing product survey, and that we may make delivery depended on the realization of any such measures.

If and to the extent necessary, please forward equivalent notices to your customers.

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