

62mm C-Series 模块 采用第四代沟槽栅/场终止IGBT4和第三代发射极控制二极管  
62mm C-Series module with Trench/Fieldstop IGBT4 and Emitter Controlled 3 diode

**初步数据 / Preliminary Data**



$V_{CES} = 1700V$   
 $I_{C\ nom} = 500A / I_{CRM} = 1000A$

**典型应用**

- 大功率变流器
- 电机传动
- UPS系统
- 风力发电机

**Typical Applications**

- High power converters
- Motor drives
- UPS systems
- Wind turbines

**电气特性**

- 提高工作结温  $T_{vj\ op}$
- 低  $V_{CEsat}$
- 无与伦比的坚固性
- $V_{CEsat}$  带正温度系数

**Electrical Features**

- Extended operating temperature  $T_{vj\ op}$
- Low  $V_{CEsat}$
- Unbeatable robustness
- $V_{CEsat}$  with positive temperature coefficient

**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
- 绝缘的基板
- 标准封装

**Mechanical Features**

- 4 kV AC 1min insulation
- Package with CTI > 400
- High creepage and clearance distances
- Isolated base plate
- Standard housing

**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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初步数据  
Preliminary Data

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	$T_C = 100^{\circ}\text{C}, T_{vj\max} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	500	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ms}$	$I_{CRM}$	1000	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	$I_C = 500\text{A}, V_{GE} = 15\text{V}$ $I_C = 500\text{A}, V_{GE} = 15\text{V}$ $I_C = 500\text{A}, V_{GE} = 15\text{V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,95 2,35 2,45	2,30	V V V
栅极阈值电压 Gate threshold voltage	$I_C = 20,0\text{mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{GEth}$	5,20 5,80	6,40	V
栅极电荷 Gate charge	$V_{GE} = -15\text{V} \dots +15\text{V}$		$Q_G$	5,75		$\mu\text{C}$
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{Gint}$	1,3		$\Omega$
输入电容 Input capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{ies}$	45,0		nF
反向传输电容 Reverse transfer capacitance	$f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{V}, V_{GE} = 0\text{V}$		$C_{res}$	1,45		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 1700\text{V}, V_{GE} = 0\text{V}, T_{vj} = 25^{\circ}\text{C}$		$I_{CES}$		1,0	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	$I_C = 500\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{don}$	0,22 0,25 0,26		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
上升时间(电感负载) Rise time, inductive load	$I_C = 500\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_r$	0,04 0,05 0,05		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 500\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_{doff}$	0,53 0,67 0,71		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
下降时间(电感负载) Fall time, inductive load	$I_C = 500\text{A}, V_{CE} = 900\text{V}$ $V_{GE} = \pm 15\text{V}$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$t_f$	0,10 0,16 0,18		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 500\text{A}, V_{CE} = 900\text{V}, L_S = 35\text{nH}$ $V_{GE} = \pm 15\text{V}, di/dt = 10000\text{A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Gon} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{on}$	91,5 130 140		mJ mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 500\text{A}, V_{CE} = 900\text{V}, L_S = 35\text{nH}$ $V_{GE} = \pm 15\text{V}, du/dt = 3000\text{V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $R_{Goff} = 1,0\Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{off}$	94,0 155 170		mJ mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{V}, V_{CC} = 1000\text{V}$ $V_{CE\text{max}} = V_{CES} - L_{sCE} \cdot di/dt$ $t_P \leq 10\mu\text{s}, T_{vj} = 150^{\circ}\text{C}$		$I_{SC}$	2000		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		$R_{thJC}$		0,0485	K/W
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个 IGBT / per IGBT $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{W}/(\text{m}\cdot\text{K})$		$R_{thCH}$		0,0241	K/W
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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初步数据  
Preliminary Data

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		$I_F$	500	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	$I_{FRM}$	1000	A
$I^2t$ -值 $I^2t$ - value	$V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 125^{\circ}\text{C}$ $V_R = 0\text{ V}, t_P = 10\text{ ms}, T_{vj} = 150^{\circ}\text{C}$	$I^2t$	33000 31500	$\text{A}^2\text{s}$ $\text{A}^2\text{s}$

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 500\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 500\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 500\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$V_F$	1,95 2,10 2,15	2,60	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 500\text{ A}, -di_F/dt = 10000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$I_{RM}$	770 815 825		A A A
恢复电荷 Recovered charge	$I_F = 500\text{ A}, -di_F/dt = 10000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$Q_r$	120 195 215		$\mu\text{C}$ $\mu\text{C}$ $\mu\text{C}$
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 500\text{ A}, -di_F/dt = 10000\text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 900\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	$E_{rec}$	69,0 120 135		mJ mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		$R_{thJC}$		0,104	K/W
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个二极管 / per diode $\lambda_{Paste} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{grease} = 1\text{ W}/(\text{m}\cdot\text{K})$		$R_{thCH}$	0,0354		K/W
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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模块 / Module

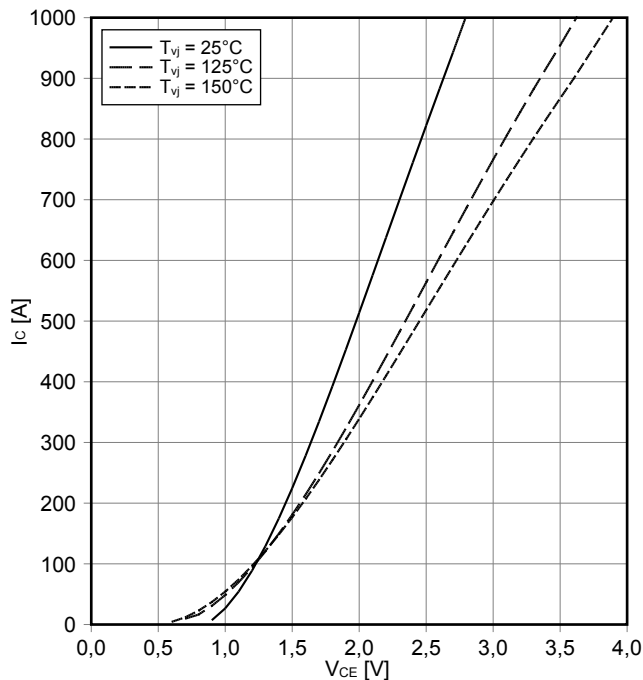
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V <sub>ISOL</sub>	4,0		kV
模块基板材料 Material of module baseplate			Cu		
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al <sub>2</sub> O <sub>3</sub>		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		29,0 23,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		23,0 11,0		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>		20	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>		0,46	mΩ
储存温度 Storage temperature		T <sub>stg</sub>	-40		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	3,00		6,00 Nm
端子联接扭矩 Terminal connection torque	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	2,5	-	5,0 Nm
重量 Weight		G		340	g

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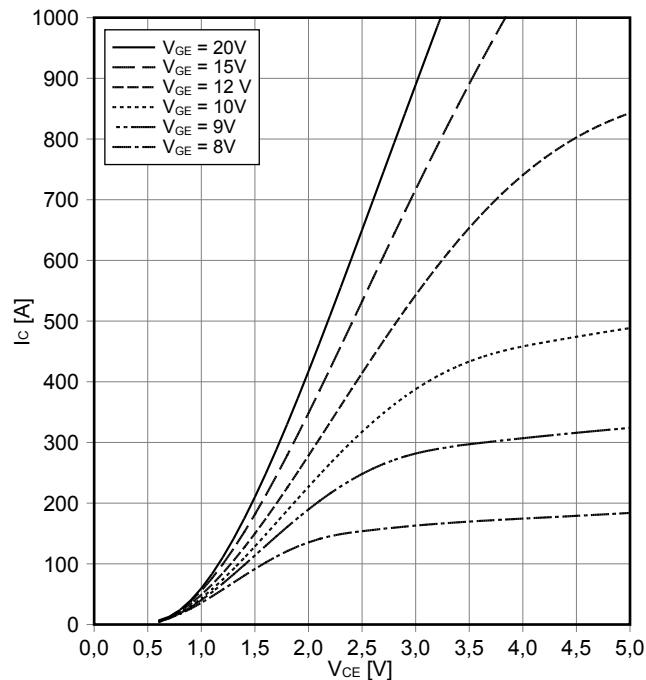
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



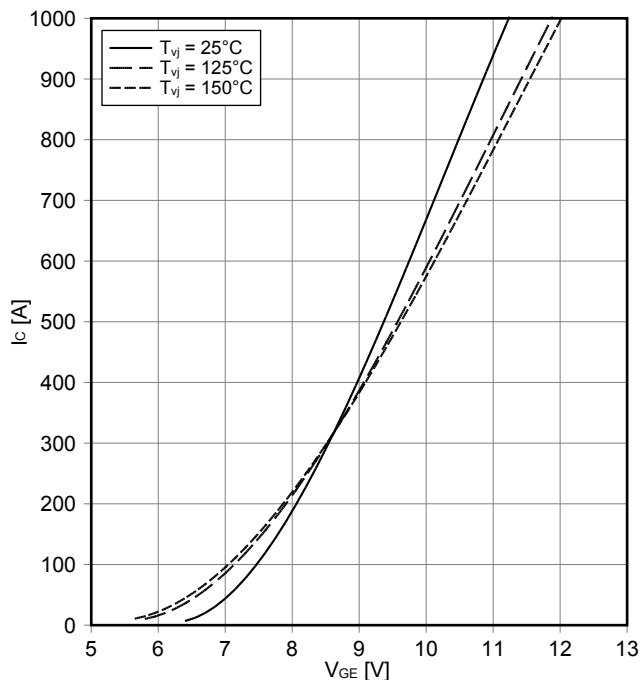
输出特性 IGBT, 逆变器 (典型)  
output characteristic IGBT, Inverter (typical)

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



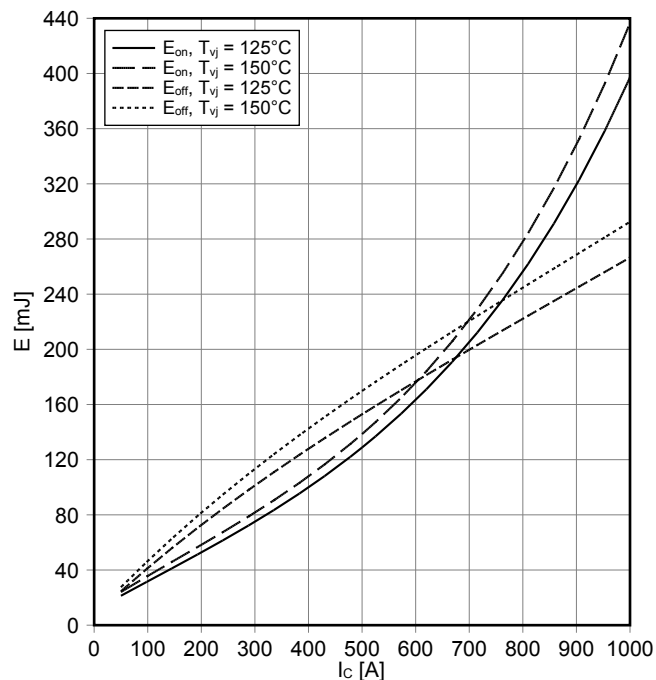
传输特性 IGBT, 逆变器 (典型)  
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C)$ ,  $E_{off} = f(I_C)$   
 $V_{GE} = \pm 15\text{ V}$ ,  $R_{Gon} = 1\ \Omega$ ,  $R_{Goff} = 1\ \Omega$ ,  $V_{CE} = 900\text{ V}$

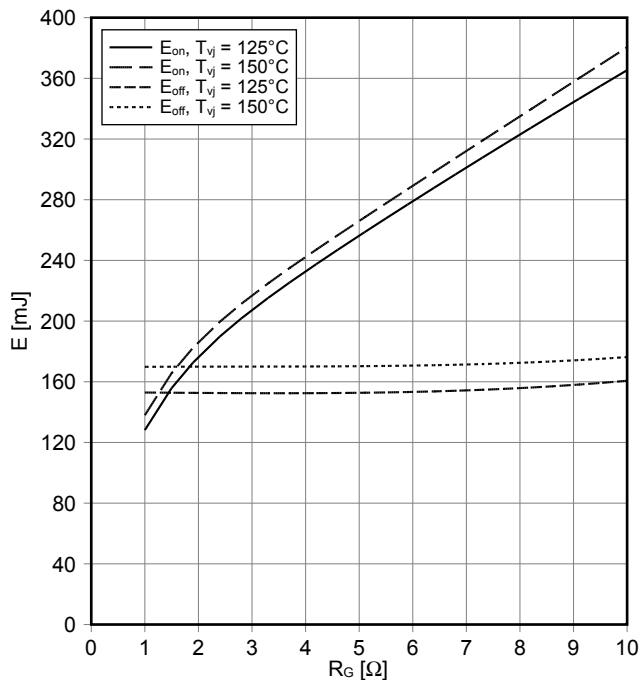


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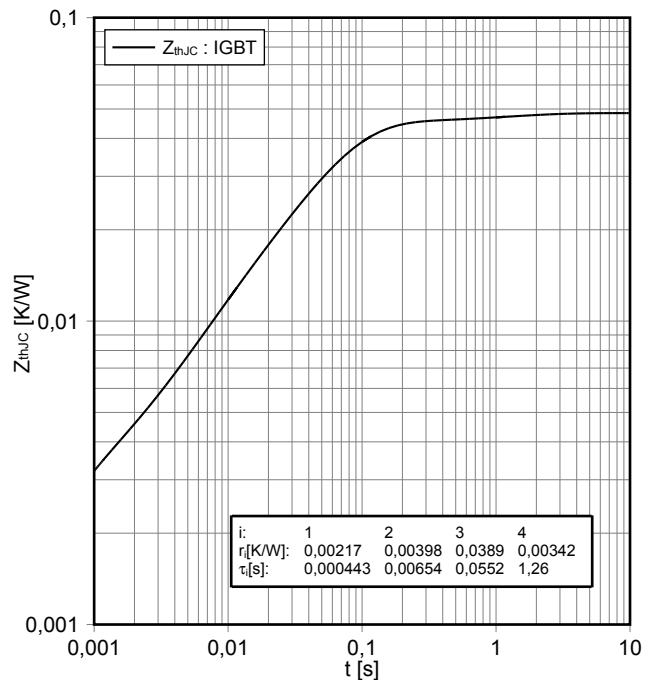
开关损耗 IGBT, 逆变器 (典型)  
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$   
 $V_{GE} = \pm 15\text{ V}, I_C = 500\text{ A}, V_{CE} = 900\text{ V}$



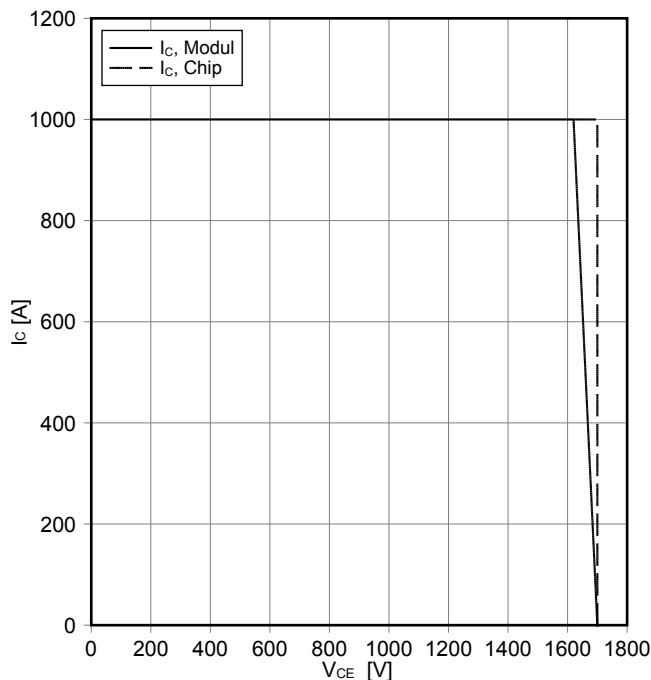
瞬态热阻抗 IGBT, 逆变器  
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



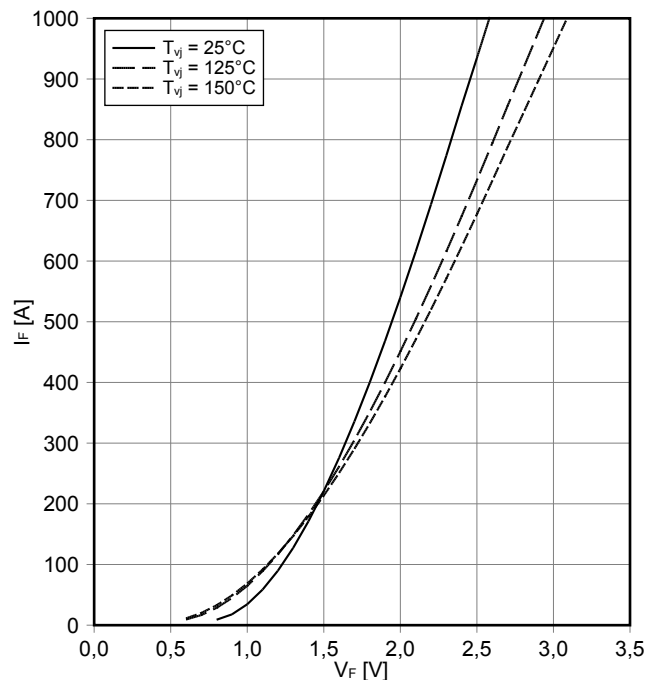
反偏安全工作区 IGBT, 逆变器 (RBSOA)  
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$   
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1\ \Omega, T_{vj} = 150^\circ\text{C}$



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

$I_F = f(V_F)$



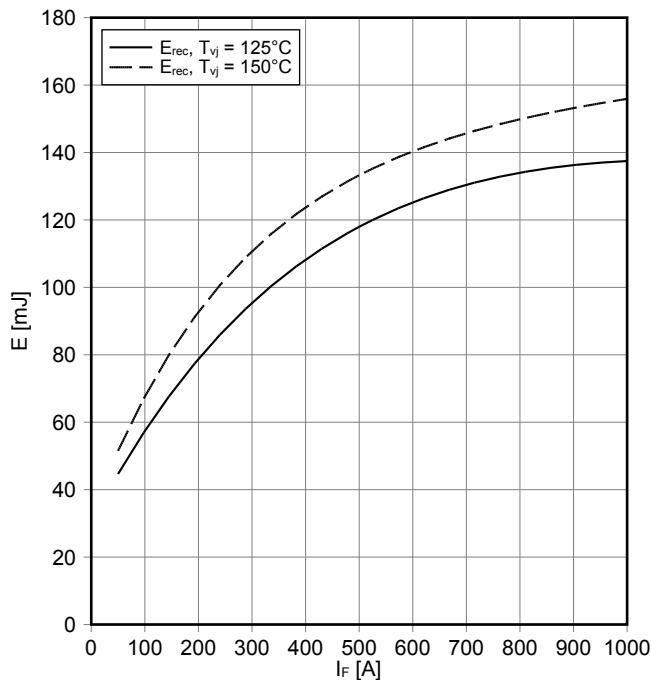
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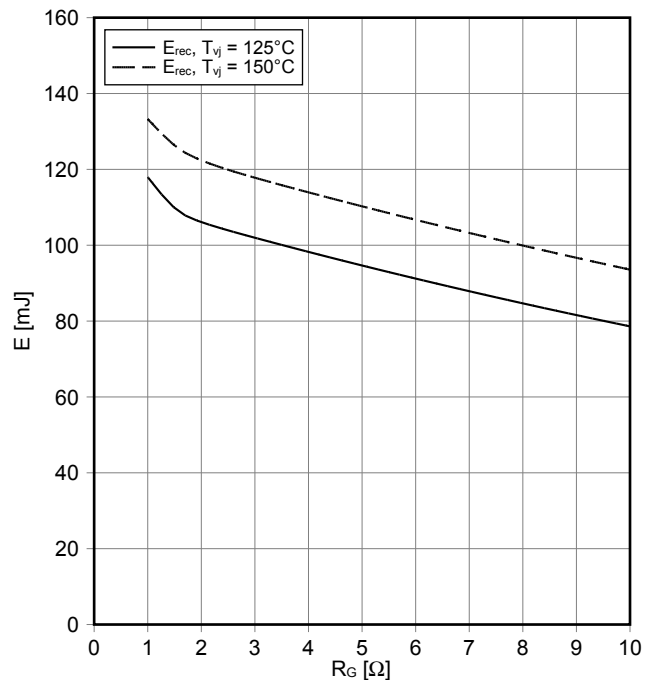
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$   
 $R_{Gon} = 1 \Omega, V_{CE} = 900 V$



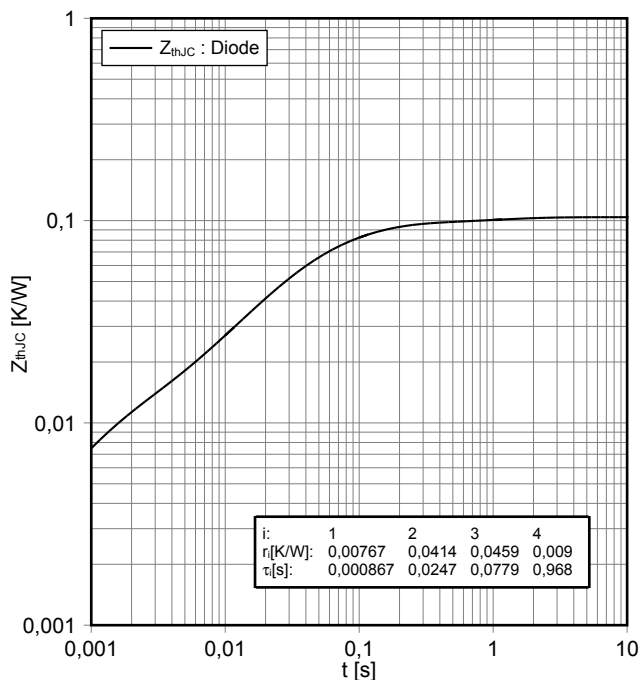
开关损耗 二极管, 逆变器 (典型)  
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 500 A, V_{CE} = 900 V$



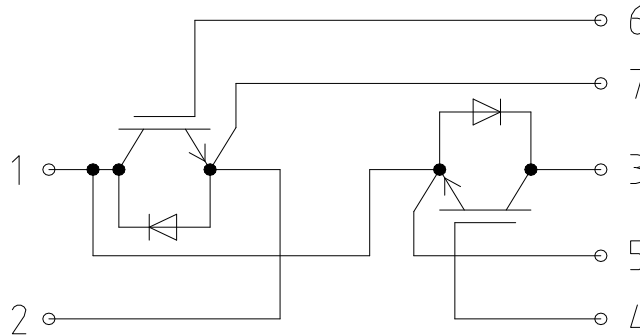
瞬态热阻抗 二极管, 逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

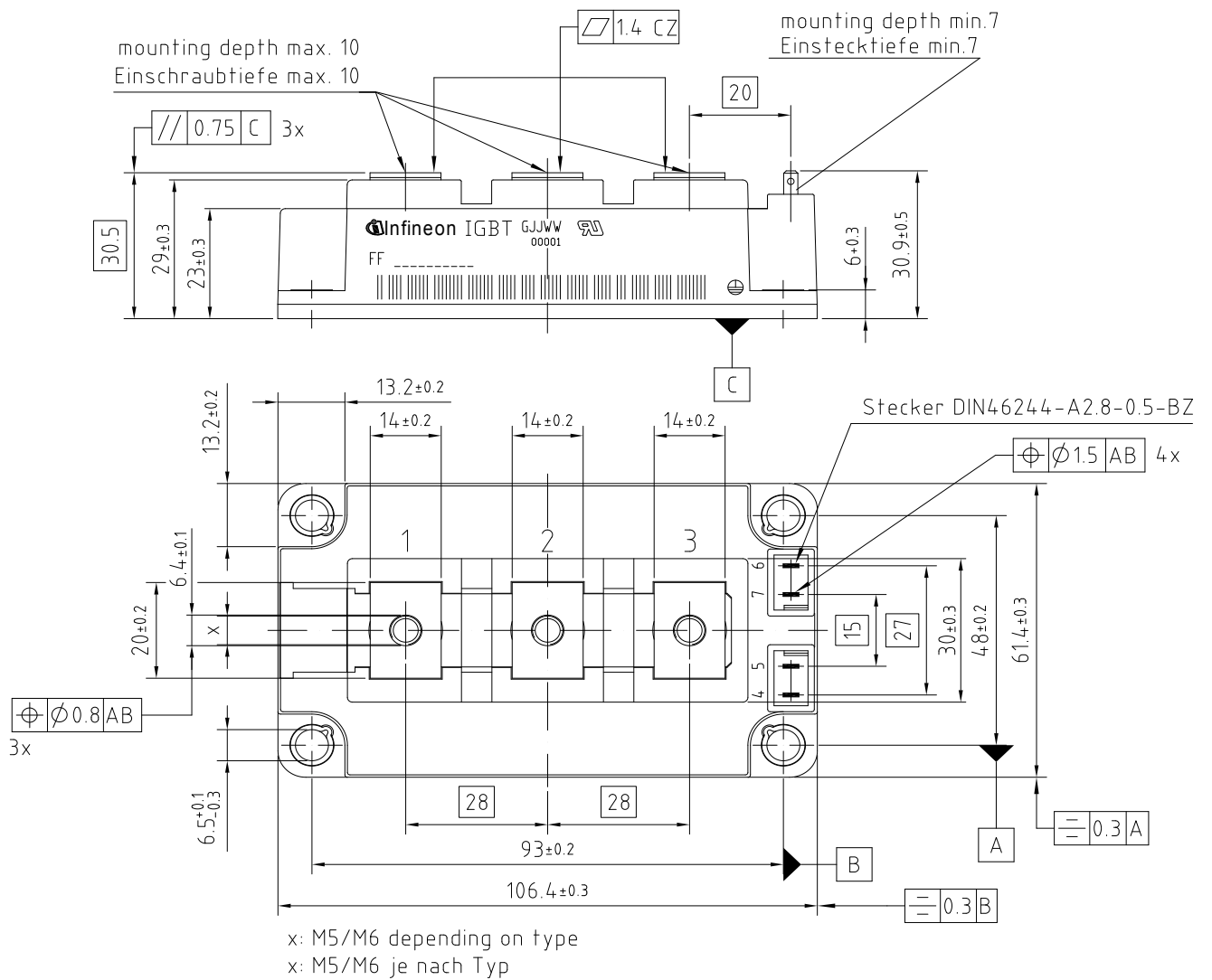


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接线图 / Circuit diagram



封装尺寸 / Package outlines



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**初步数据**  
**Preliminary Data**

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