

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	$T_C = 70^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	2400 3200	A A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	4800	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150$	P_{tot}	10,0	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	$I_C = 2400\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 2400\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,70 2,00	2,15 2,50	V V
栅极阈值电压 Gate threshold voltage	$I_C = 96,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	5,0	5,8	6,5 V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	23,0		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	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}	170		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}	8,00		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	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 1,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	0,60 0,66		μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 1,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,22 0,23		μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	0,82 0,96		μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,15 0,18		μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 1,2\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	490		mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 2400\text{ A}, V_{CE} = 600\text{ V}, L_S = 30\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,3\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	380		mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 900\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$		I_{SC}	9600		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		12,5	K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	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	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	2400	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1\text{ ms}$	I_{FRM}	4800	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	680	kA ² s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 2400\text{ A}, V_{GE} = 0\text{ V}$ $I_F = 2400\text{ A}, V_{GE} = 0\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	2,20 2,00	2,80 2,60	V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 2400\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	775 1200		A A
恢复电荷 Recovered charge	$I_F = 2400\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	115 270		μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 2400\text{ A}, -di_F/dt = 11000\text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 600\text{ V}$ $V_{GE} = -15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	36,0 70,0		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}		21,0	K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40	125	$^{\circ}\text{C}$

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, $f = 50\text{ Hz}, t = 1\text{ min}$	V_{ISOL}	2,5	kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al_2O_3	
爬电距离 Creepage distance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		32,0	mm
电气间隙 Clearance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		20,0	mm
相对电痕指数 Comperative tracking index		CTI	> 400	
外壳 - 散热器热阻 Thermal resistance, case to heatsink	每个模块 / per module $\lambda_{\text{paste}} = 1\text{ W}/(\text{m}\cdot\text{K}) / \lambda_{\text{grease}} = 1\text{ W}/(\text{m}\cdot\text{K})$	R_{thCH}	6,00	K/kW
杂散电感, 模块 Stray inductance module		L_{sCE}	12	nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	$T_c = 25^{\circ}\text{C}$, 每个开关 / per switch	R_{CC+EE}	0,19	m Ω
储存温度 Storage temperature		T_{stg}	-40	125 $^{\circ}\text{C}$
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 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	1,7 8,0	- 2,3 10 Nm
重量 Weight		G	1500	g

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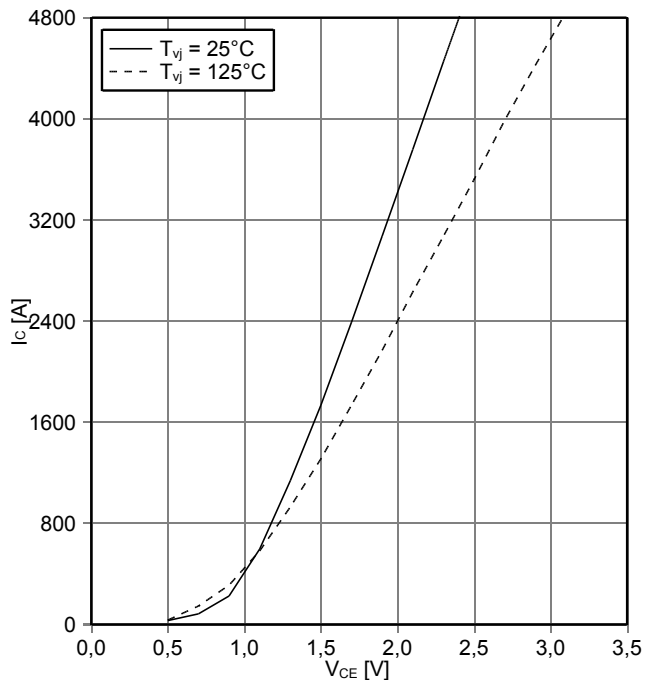
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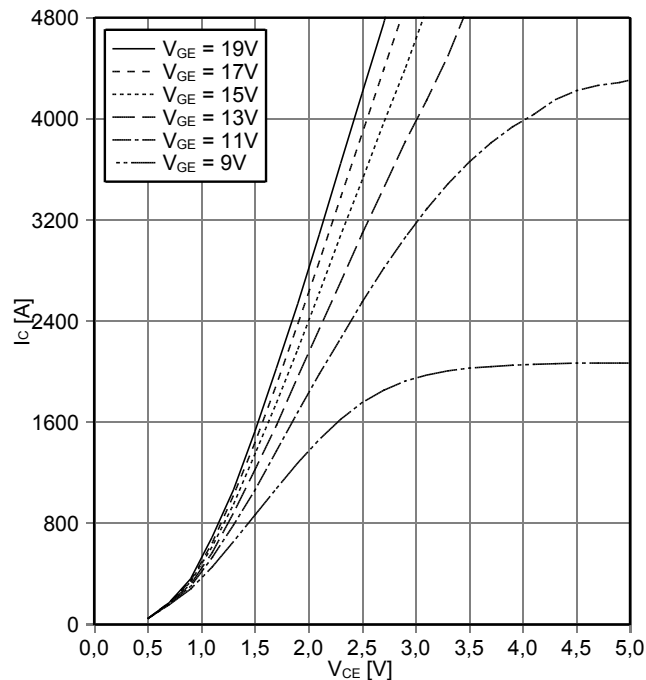
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



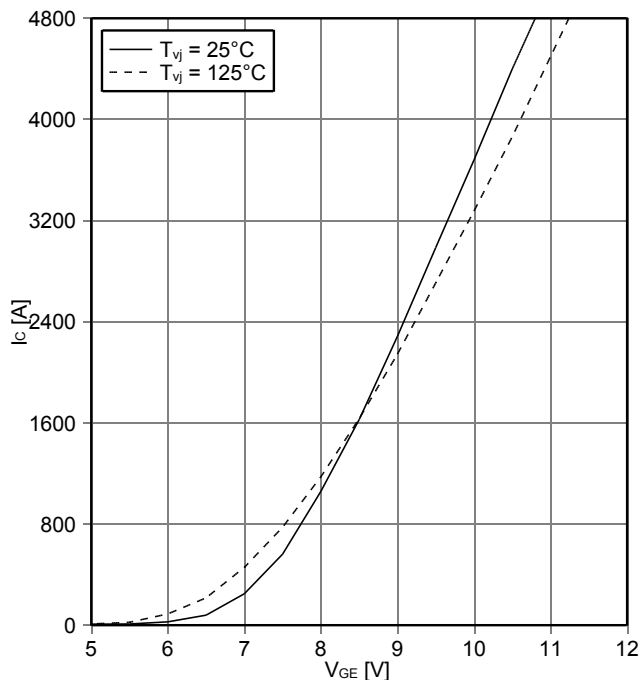
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



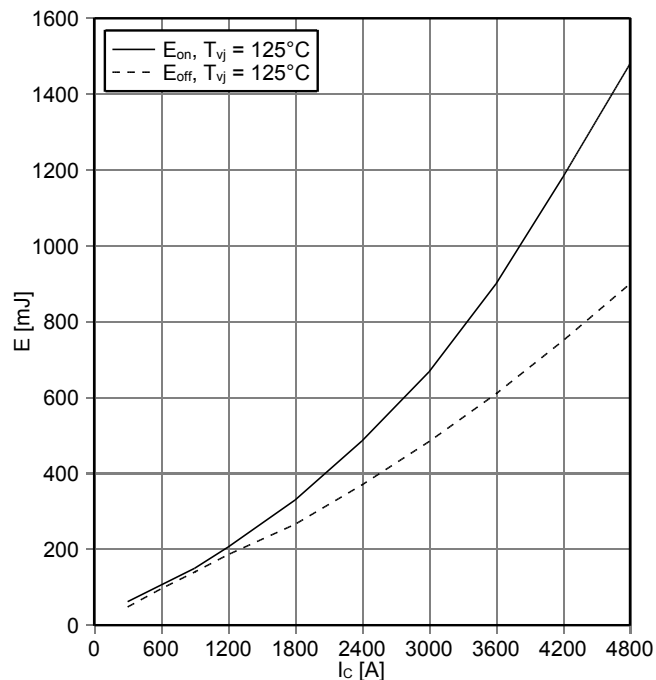
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 1.2\ \Omega, R_{Goff} = 0.3\ \Omega, V_{CE} = 600\text{ V}$

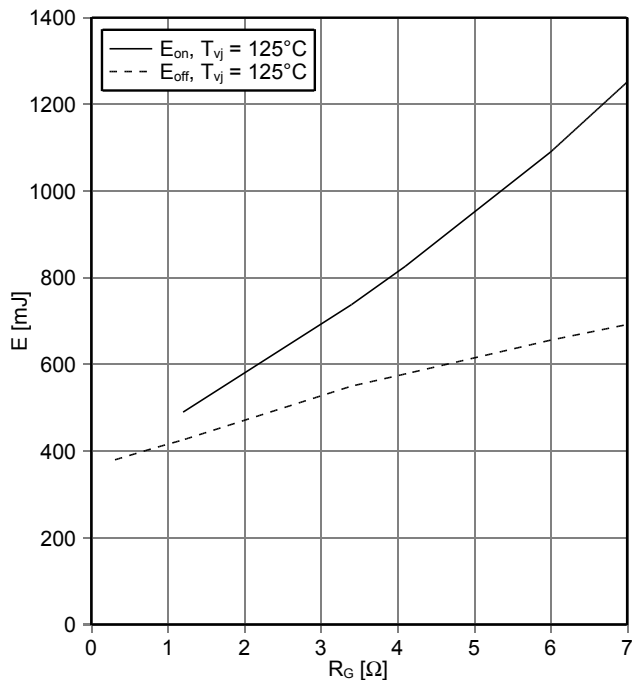


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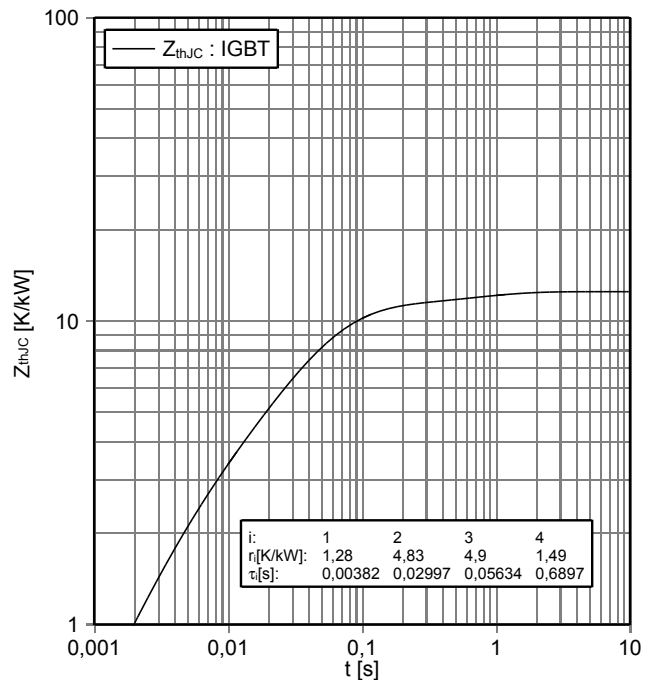
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 2400\text{ A}, V_{CE} = 600\text{ V}$



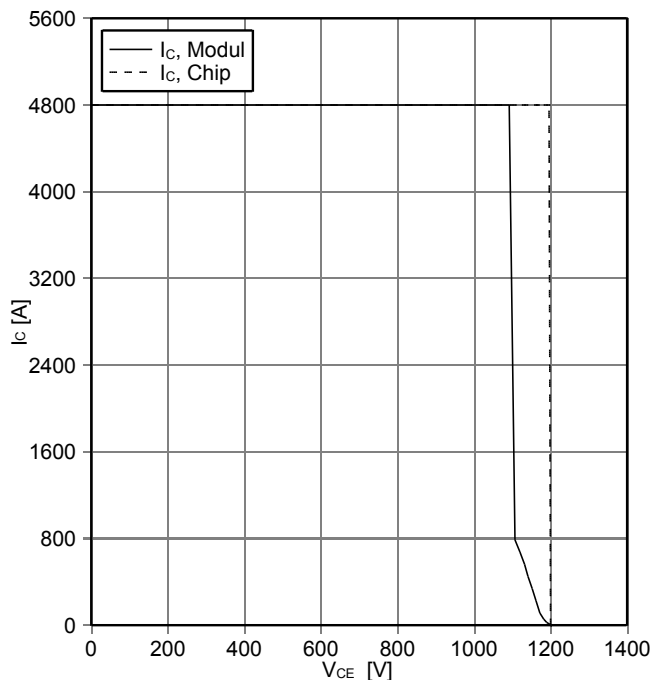
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



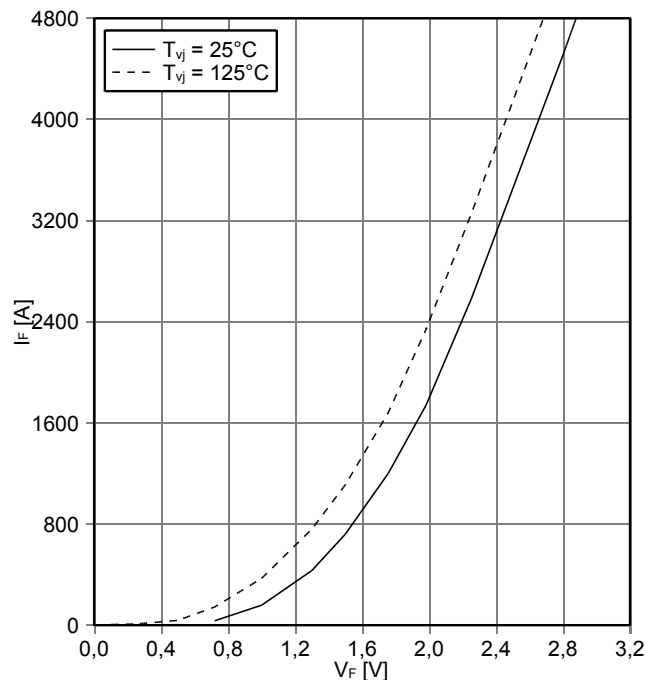
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 0.3\ \Omega, T_{vj} = 125^\circ\text{C}$



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

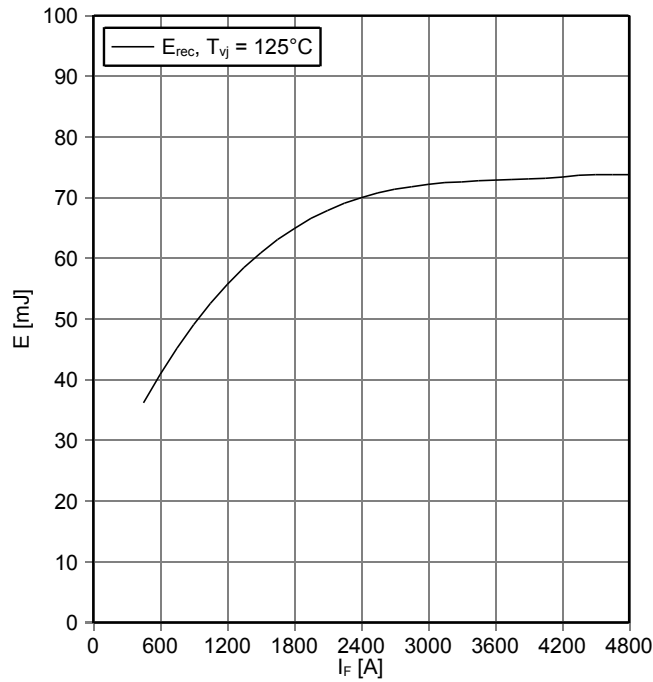
$I_F = f(V_F)$



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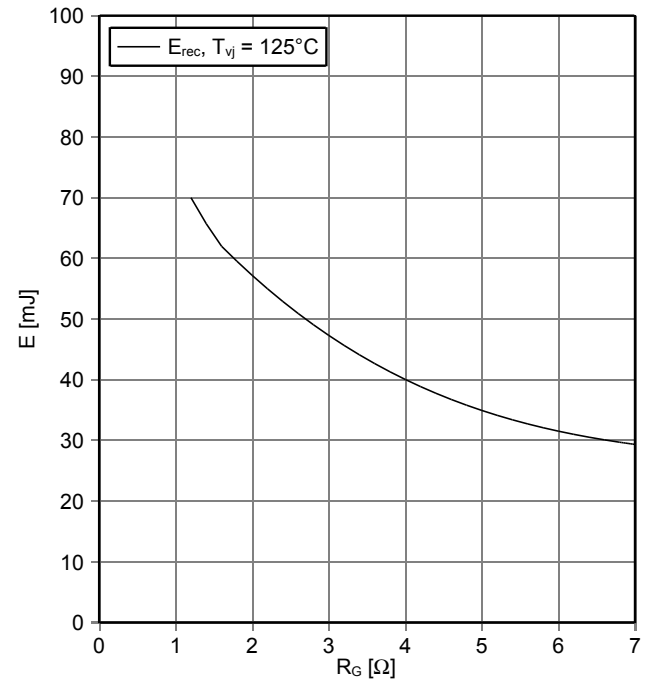
开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.2 \Omega, V_{CE} = 600 V$



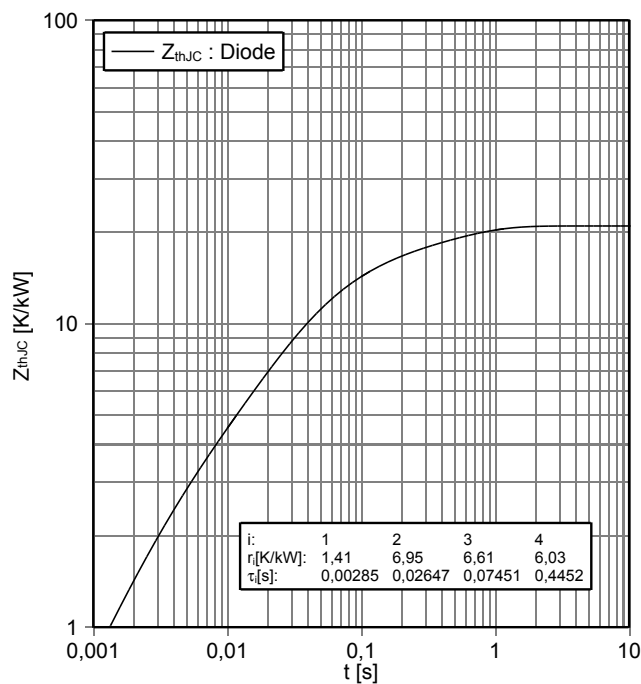
开关损耗 二极管, 逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 2400 A, V_{CE} = 600 V$



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

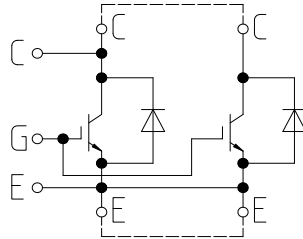
$Z_{thJC} = f(t)$



i:	1	2	3	4
r [K/kW]:	1,41	6,95	6,61	6,03
τ [s]:	0,00285	0,02647	0,07451	0,4452

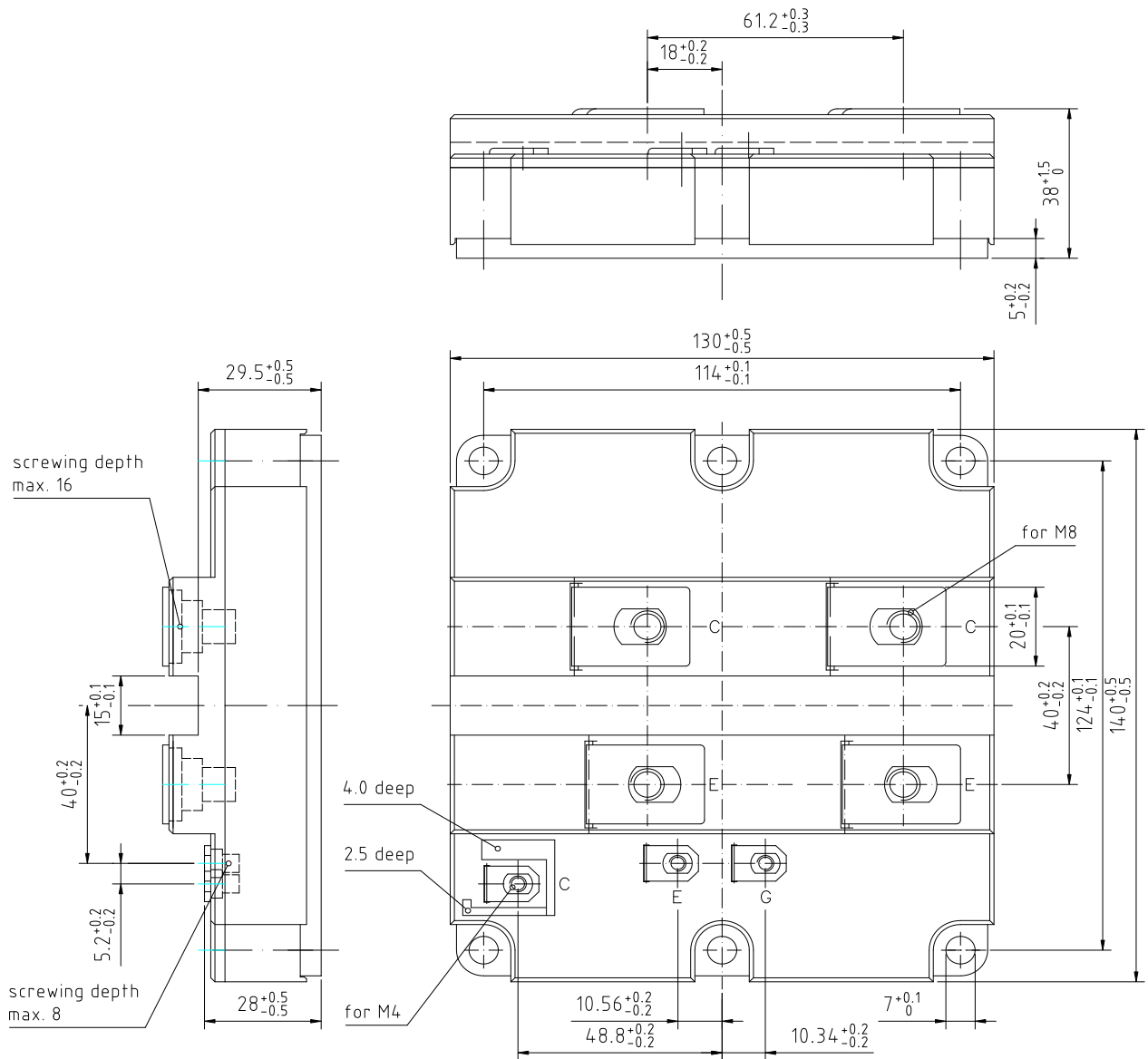
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接线图 / circuit_diagram_headline



external connection
to be done

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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- the conclusion of Quality Agreements;
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