

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	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -25^{\circ}\text{C}$	V_{CES}	3300 3300	V
连续集电极直流电流 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\text{max}} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	400 750	A A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	800	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	$I_C = 400\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 400\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	3,00 3,70	3,65 4,45	V V
栅极阈值电压 Gate threshold voltage	$I_C = 40,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	4,20	5,10	6,00 V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}, V_{CE} = 1800\text{ V}$		Q_G	7,50		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	1,3		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}	48,0		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}	2,70		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$V_{CE} = 3300\text{ V}, V_{GE} = 0\text{ V}, T_{vj} = 25^{\circ}\text{C}$		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	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 13\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	1,00 1,00		μs μs
上升时间(电感负载) Rise time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 13\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,40 0,40		μs μs
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 13\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	3,70 3,90		μs μs
下降时间(电感负载) Fall time, inductive load	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 13\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,25 0,35		μs μs
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}, L_S = 60\text{ nH}$ $V_{GE} = \pm 15\text{ V}, di/dt = 3000\text{ A}/\mu\text{s}$ $R_{G\text{on}} = 6,2\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	900 1200		mJ mJ
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 400\text{ A}, V_{CE} = 1800\text{ V}, L_S = 60\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 13\ \Omega, C_{GE} = 100\text{ nF}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	440 600		mJ mJ
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 2500\text{ V}$ $V_{CE\text{max}} = V_{CES} - L_{SCE} \cdot di/dt$ $t_P \leq 10\ \mu\text{s}, T_{vj} = 125^{\circ}\text{C}$		I_{SC}	1800		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		25,5	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}	24,0		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40	125	$^{\circ}\text{C}$

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	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = -25^{\circ}\text{C}$	V_{RRM}	3300 3300	V
连续正向直流电流 Continuous DC forward current		I_F	400	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	800	A
I^2t -值 I^2t - value	$V_R = 0 \text{ V}$, $t_P = 10 \text{ ms}$, $T_{vj} = 125^{\circ}\text{C}$	I^2t	72,0	kA^2s
最大损耗功率 Maximum power dissipation	$T_{vj} = 125^{\circ}\text{C}$	P_{RQM}	600	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	$I_F = 400 \text{ A}$, $V_{GE} = 0 \text{ V}$ $I_F = 400 \text{ A}$, $V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	2,60 2,55	t.b.d.	V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 400 \text{ A}$, $-di_F/dt = 3000 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	600 670		A A
恢复电荷 Recovered charge	$I_F = 400 \text{ A}$, $-di_F/dt = 3000 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	270 480		μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 400 \text{ A}$, $-di_F/dt = 3000 \text{ A}/\mu\text{s}$ ($T_{vj}=125^{\circ}\text{C}$) $V_R = 1800 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	250 500		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}		51,0	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}	48,0		K/kW
在开关状态下温度 Temperature under switching conditions			$T_{vj \text{ op}}$	-40	125	$^{\circ}\text{C}$

初步数据 Preliminary Data

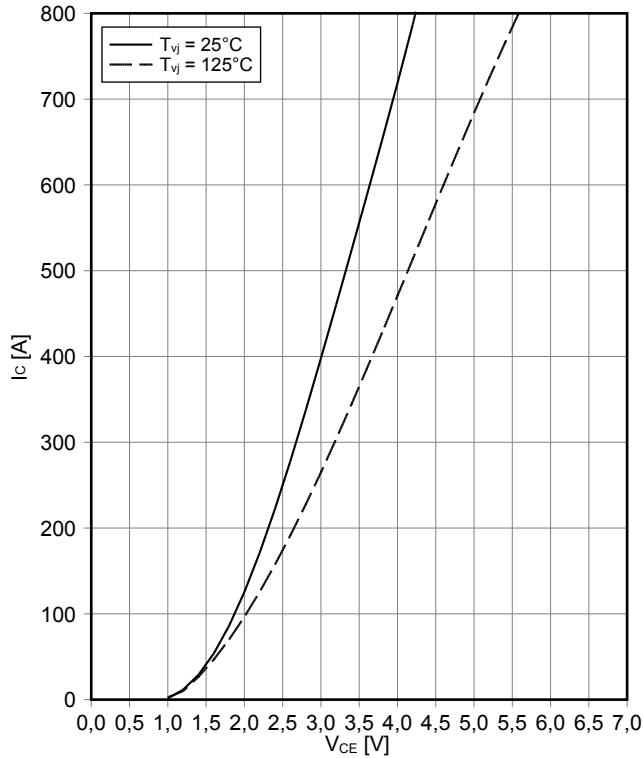
模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 10 s	V _{ISOL}	10,4		kV
局部放电停止电压 Partial discharge extinction voltage	RMS, f = 50 Hz, Q _{PD} typ 10 pC	V _{ISOL}	5,1		kV
DC 稳定性 DC stability	T _{vj} = 25°C, 100 fit	V _{CE D}	2150		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)		AIN		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		64,0 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		40,0 26,0		mm
相对电痕指数 Comperative tracking index		CTI	> 600		
			min.	typ.	max.
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}		16,0	K/kW
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'}		0,37	mΩ
储存温度 Storage temperature		T _{stg}	-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	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

初步数据 Preliminary Data

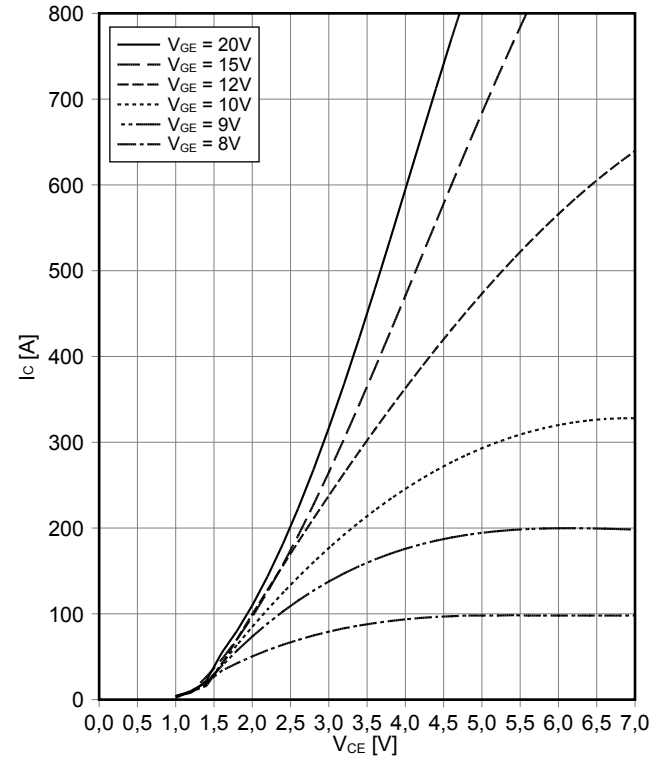
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



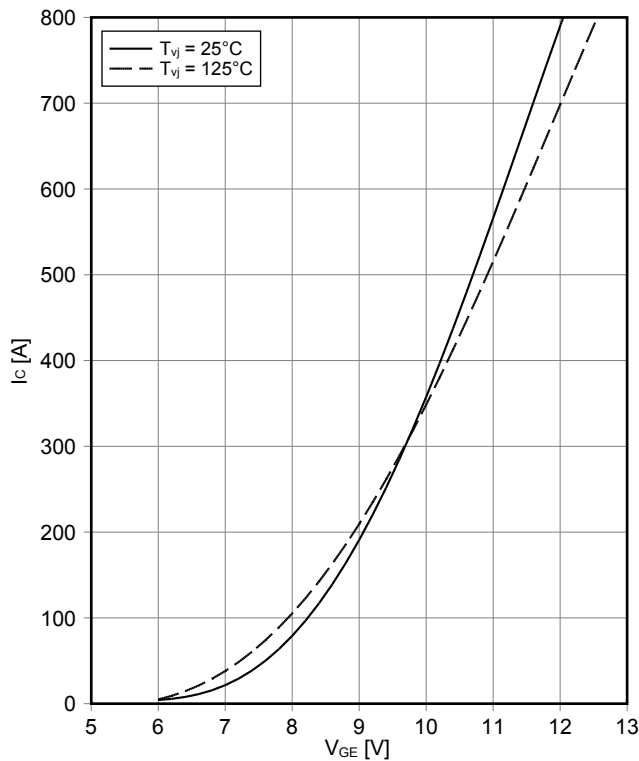
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



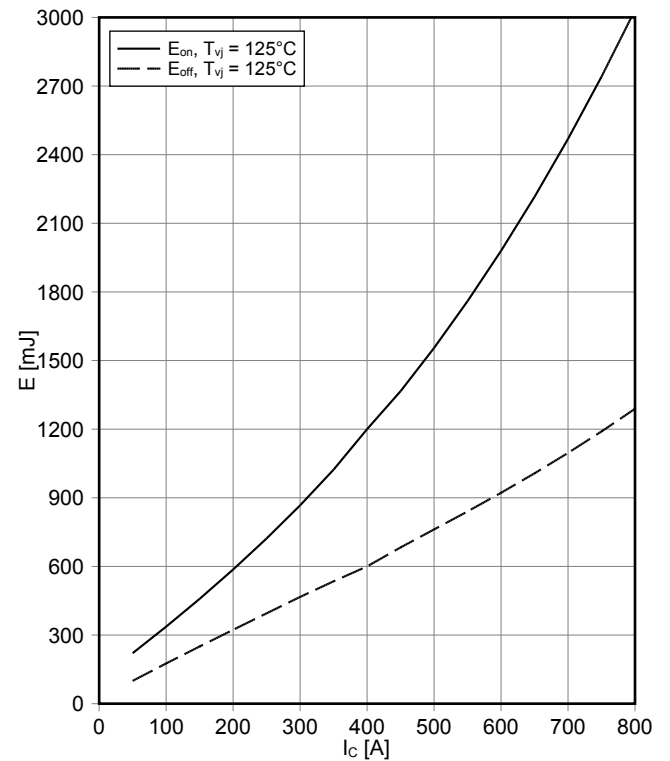
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

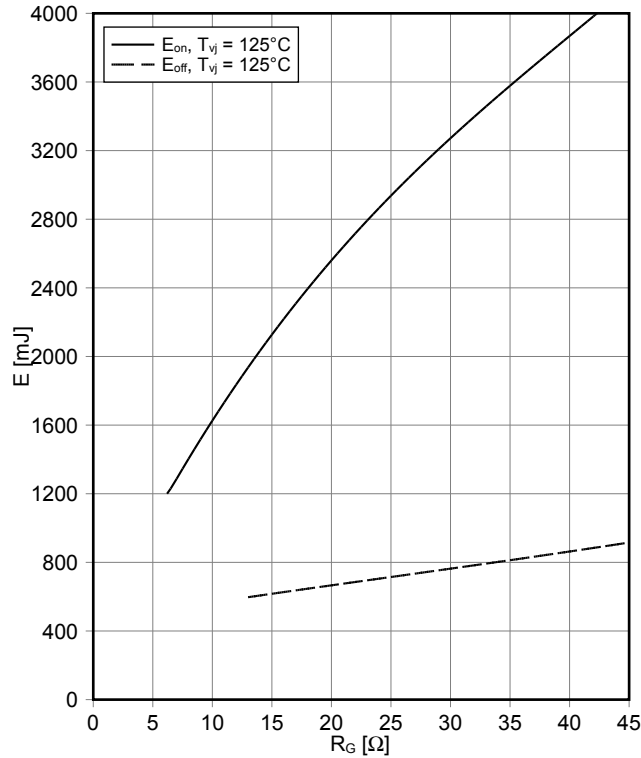
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.2\ \Omega$, $R_{Goff} = 13\ \Omega$, $V_{CE} = 1800\text{ V}$, $C_{GE} = 100\text{ nF}$



初步数据 Preliminary Data

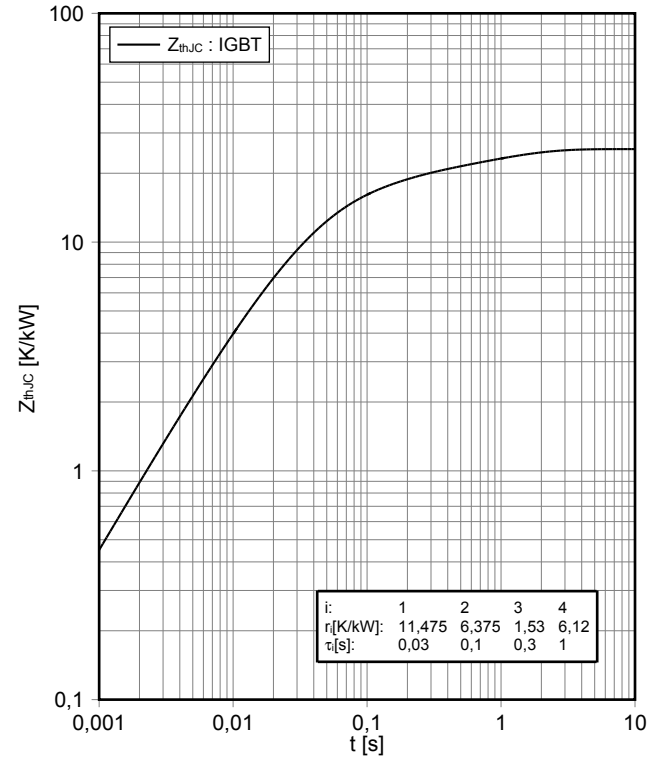
开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 400\text{ A}, V_{CE} = 1800\text{ V}, C_{GE} = 100\text{ nF}$



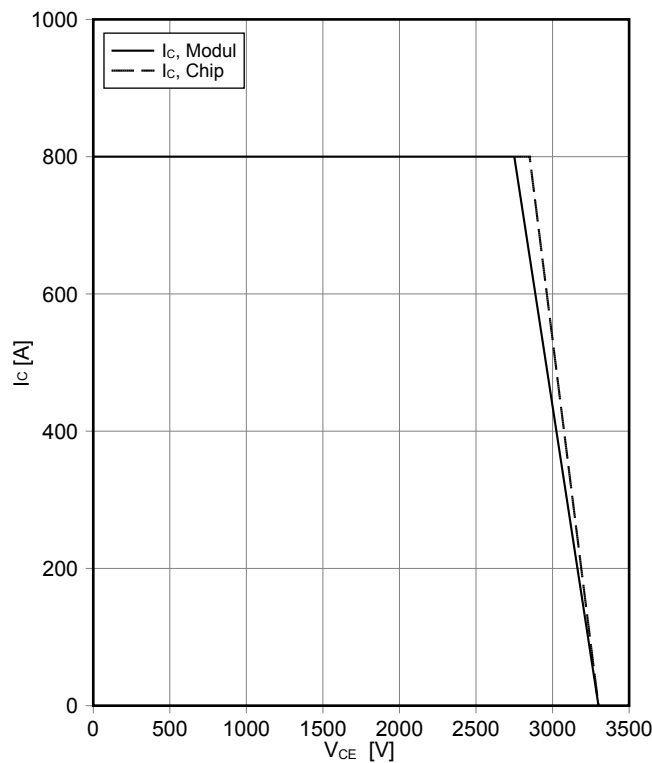
瞬态热阻抗 IGBT, 逆变器 transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



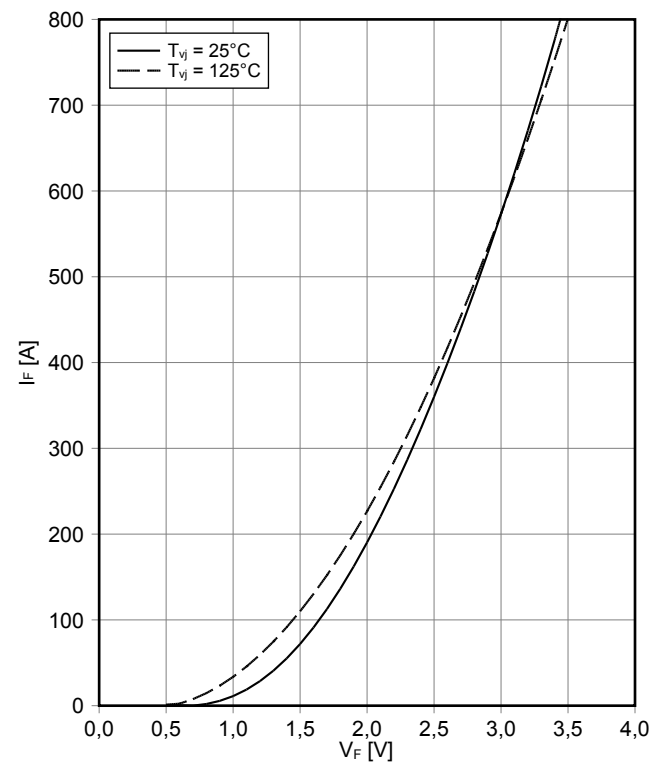
反偏安全工作区 IGBT, 逆变器 (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 13\ \Omega, T_{vj} = 125^\circ\text{C}, C_{GE} = 100\text{ nF}$



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

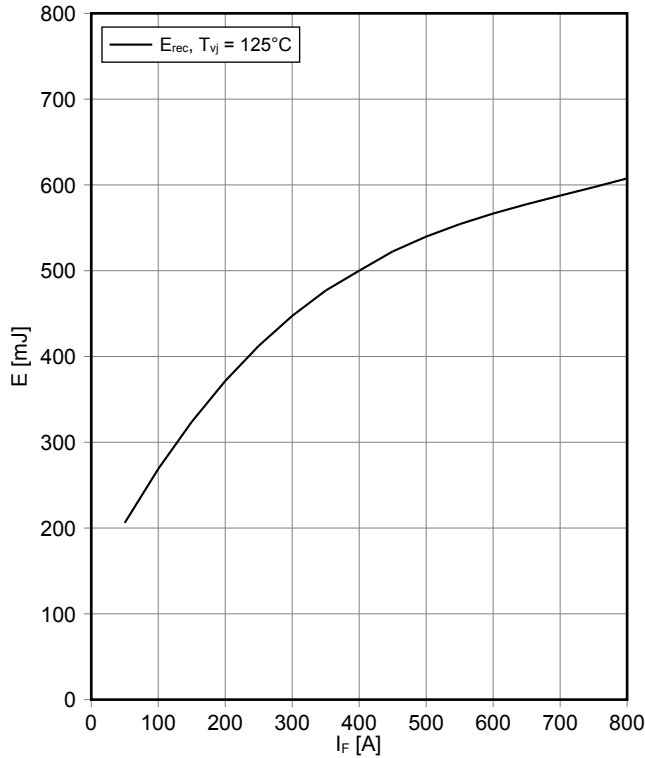
$I_F = f(V_F)$



初步数据 Preliminary Data

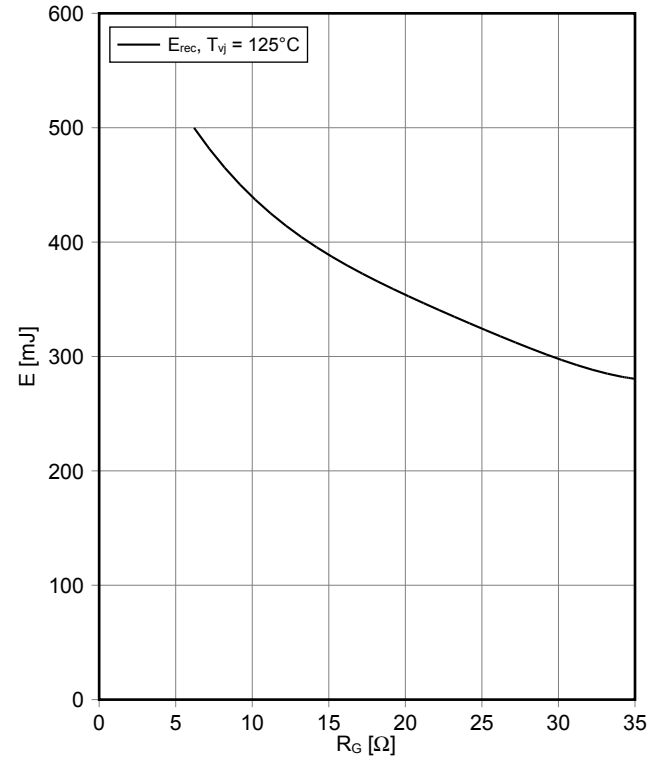
开关损耗 二极管,逆变器 (典型) switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 6.2 \Omega, V_{CE} = 1800 V$



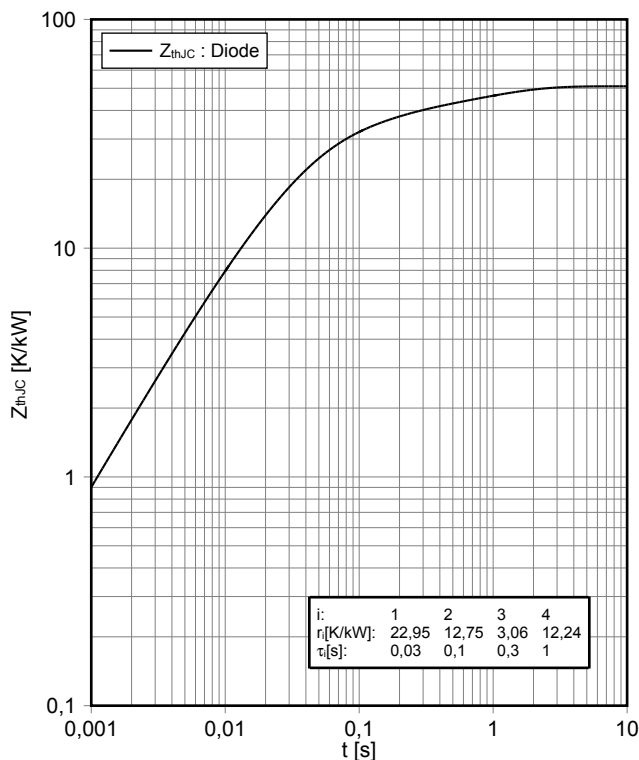
开关损耗 二极管,逆变器 (典型) switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 400 A, V_{CE} = 1800 V$



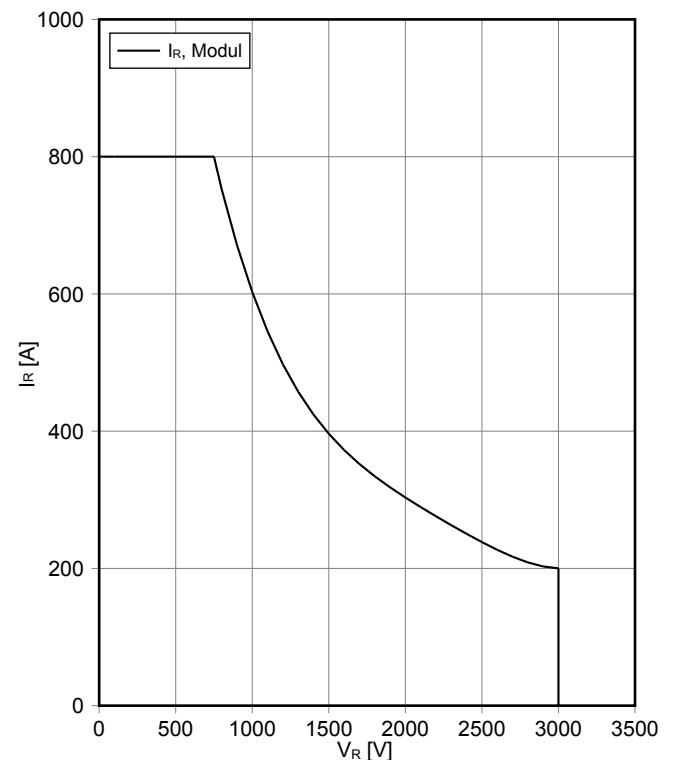
瞬态热阻抗 二极管,逆变器 transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

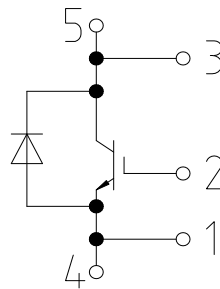


安全工作区 二极管,逆变器 (SOA) safe operation area Diode, Inverter (SOA)

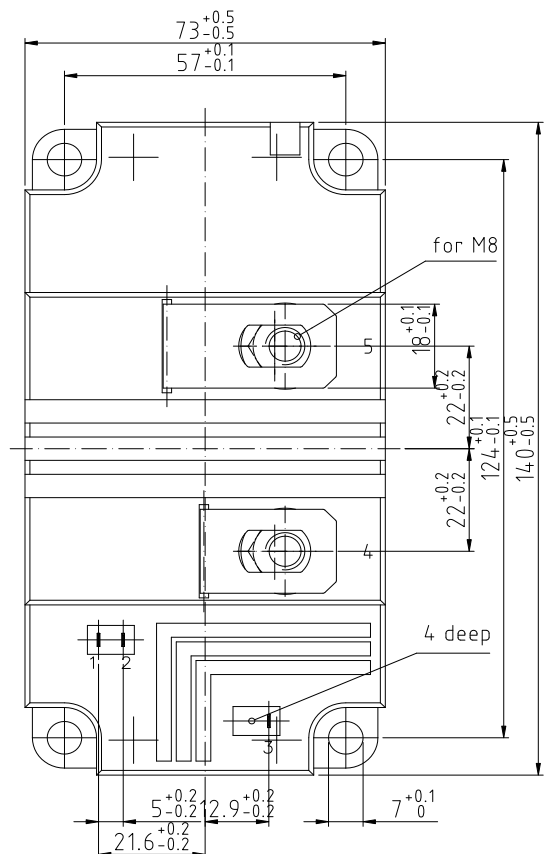
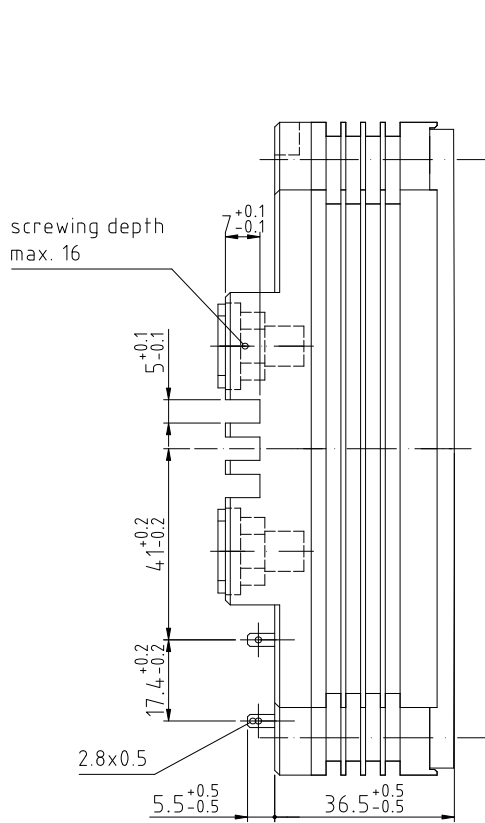
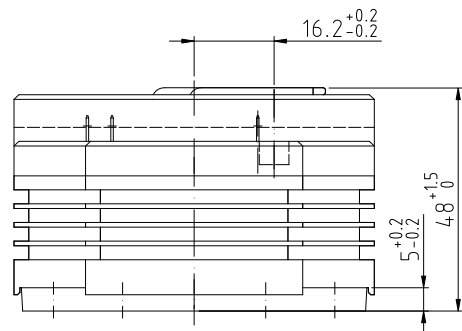
$I_R = f(V_R)$
 $T_{vj} = 125^\circ C$



接线图 / Circuit diagram



封装尺寸 / Package outlines



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