

IHM-A Modul mit Low Loss IGBT2 and Emitter Controlled Diode
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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	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_{CES}	1200 1200	V
连续集电极直流电流 Continuous DC collector current	$T_C = 80^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$ $T_C = 25^{\circ}\text{C}, T_{vj\max} = 150^{\circ}\text{C}$	$I_{C\text{nom}}$ I_C	1800 2850	A A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	3600	A
总功率损耗 Total power dissipation	$T_C = 25^{\circ}\text{C}, T_{vj\max} = 150$	P_{tot}	11,5	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	$I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$ $I_C = 1800\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$V_{CE\text{sat}}$	2,10 2,40	2,60 2,90	V V	
栅极阈值电压 Gate threshold voltage	$I_C = 72,0\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		$V_{G\text{Eth}}$	4,5	5,5	6,5	V
栅极电荷 Gate charge	$V_{GE} = -15\text{ V} \dots +15\text{ V}$		Q_G	19,5		μC	
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		$R_{G\text{int}}$	0,9		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}	135		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}	9,00		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	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{on}}$	0,59 0,61		μs μs	
上升时间(电感负载) Rise time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_r	0,19 0,20		μs μs	
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	$t_{d\text{off}}$	1,10 1,20		μs μs	
下降时间(电感负载) Fall time, inductive load	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	t_f	0,16 0,17		μs μs	
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_S = 70\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{on}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{on}	230		mJ mJ	
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 1800\text{ A}, V_{CE} = 600\text{ V}, L_S = 70\text{ nH}$ $V_{GE} = \pm 15\text{ V}$ $R_{G\text{off}} = 0,51\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{off}	295		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}	14000		A	
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}		11,0	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}	6,00		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	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_{RRM}	1200 1200	V
连续正向直流电流 Continuous DC forward current		I_F	1800	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	3600	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	590	kA ² s

特征值 / Characteristic Values

			min.	typ.	max.	
正向电压 Forward voltage	$I_F = 1800 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 1800 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	V_F	1,80 1,70	2,30 2,20	V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 1800 \text{ A}, -di_F/dt = 9900 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	I_{RM}	990 1300		A A
恢复电荷 Recovered charge	$I_F = 1800 \text{ A}, -di_F/dt = 9900 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	Q_r	170 380		μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 1800 \text{ A}, -di_F/dt = 9900 \text{ A}/\mu\text{s} (T_{vj}=125^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$	E_{rec}	70,0 130		mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}		24,0	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}	13,0		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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模块 / Module

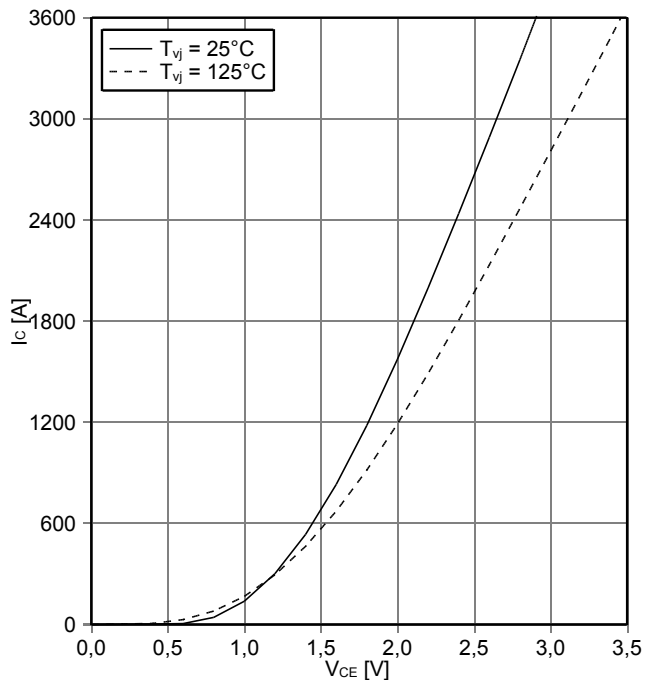
绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min	V _{ISOL}	2,5		kV
内部绝缘 Internal isolation	基本绝缘 (class 1, IEC 61140) basic insulation (class 1, IEC 61140)		Al ₂ O ₃		
爬电距离 Creepage distance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		32,0		mm
电气间隙 Clearance	端子- 散热片 / terminal to heatsink 端子- 端子 / terminal to terminal		20,0		mm
相对电痕指数 Comperative tracking index		CTI	> 400		
			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}		4,00	K/kW
杂散电感, 模块 Stray inductance module		L _{sCE}		10	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'}		0,12	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 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		2250	g

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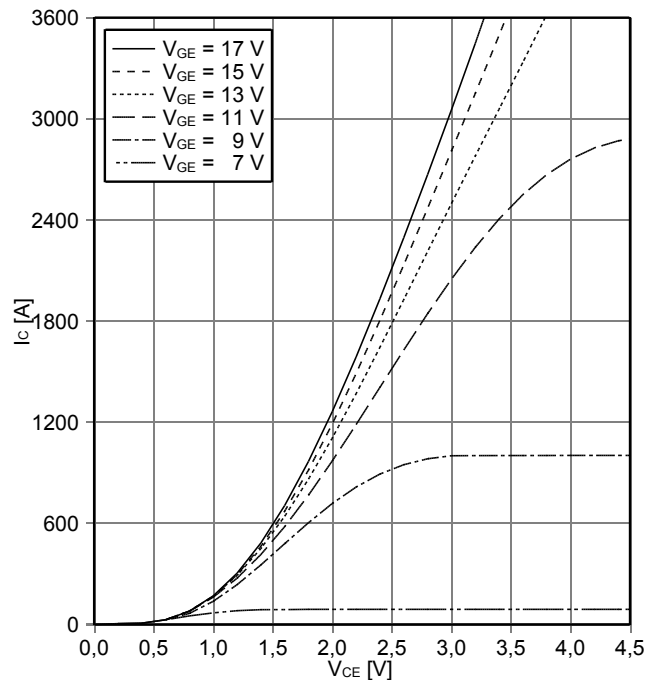
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



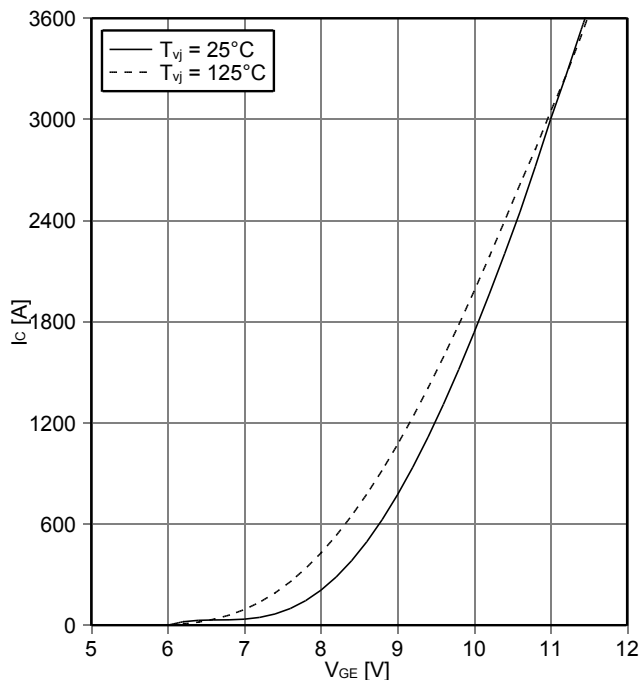
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



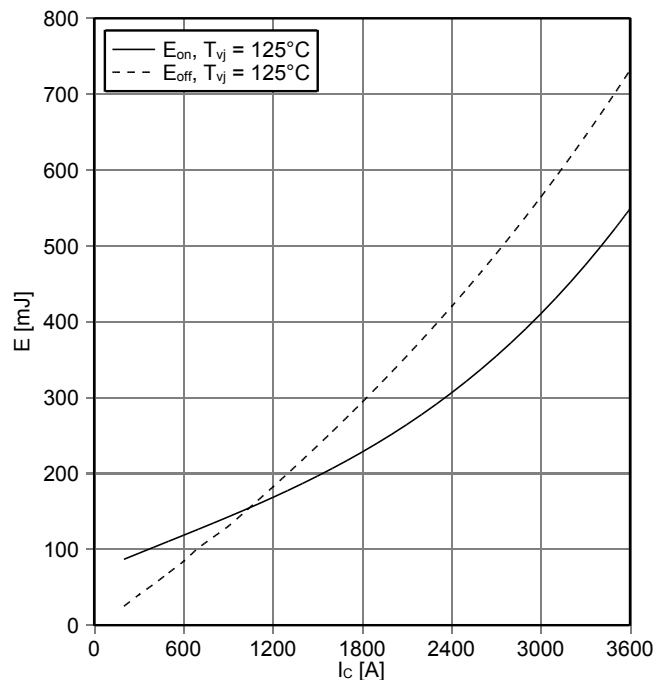
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

$E_{on} = f(I_C), E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}, R_{Gon} = 0.51\ \Omega, R_{Goff} = 0.51\ \Omega, V_{CE} = 600\text{ V}$

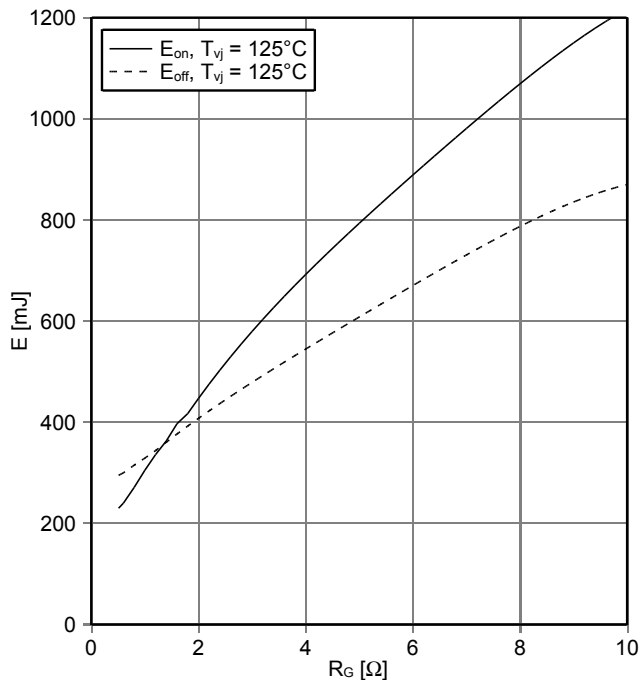


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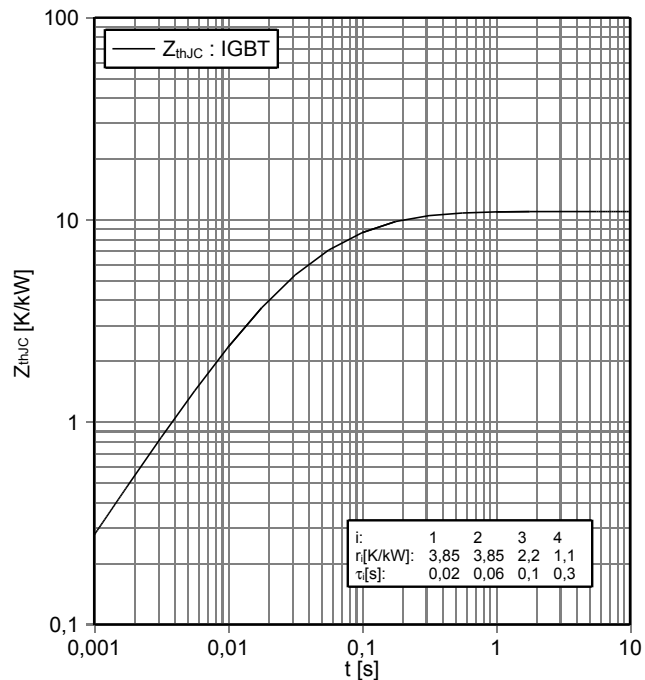
开关损耗 IGBT, 逆变器 (典型)
switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}$, $I_C = 1800\text{ A}$, $V_{CE} = 600\text{ V}$



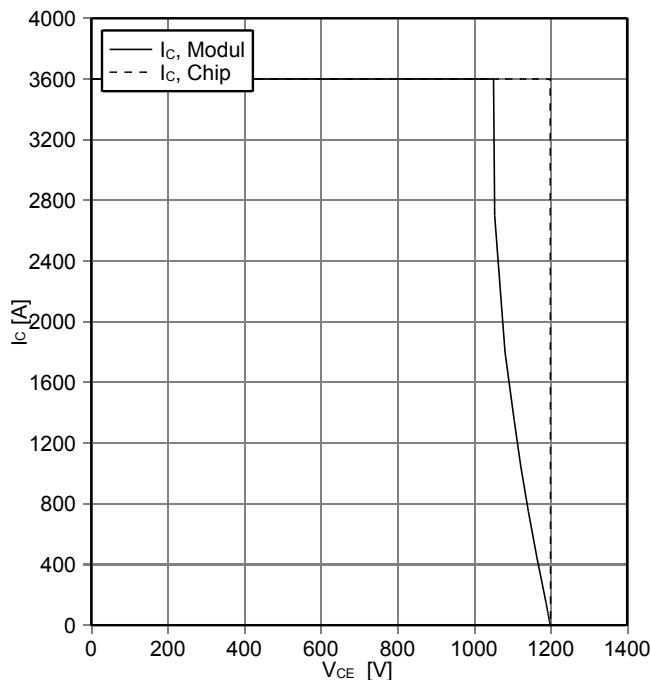
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



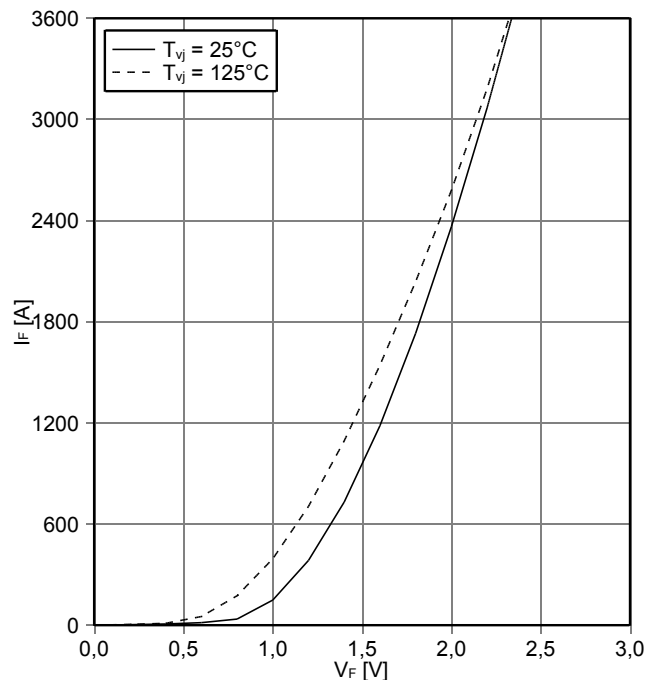
反偏安全工作区 IGBT, 逆变器 (RBSOA)
reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 0.51\ \Omega$, $T_{vj} = 125^\circ\text{C}$



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

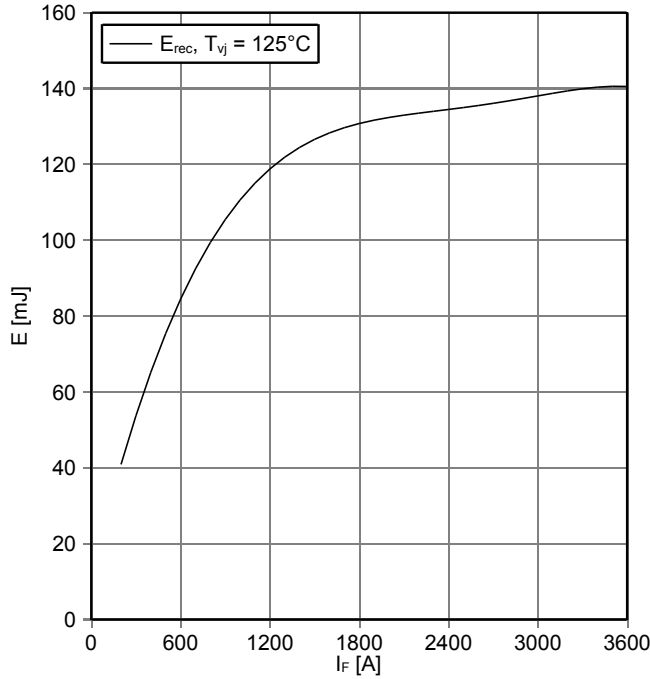
$I_F = f(V_F)$



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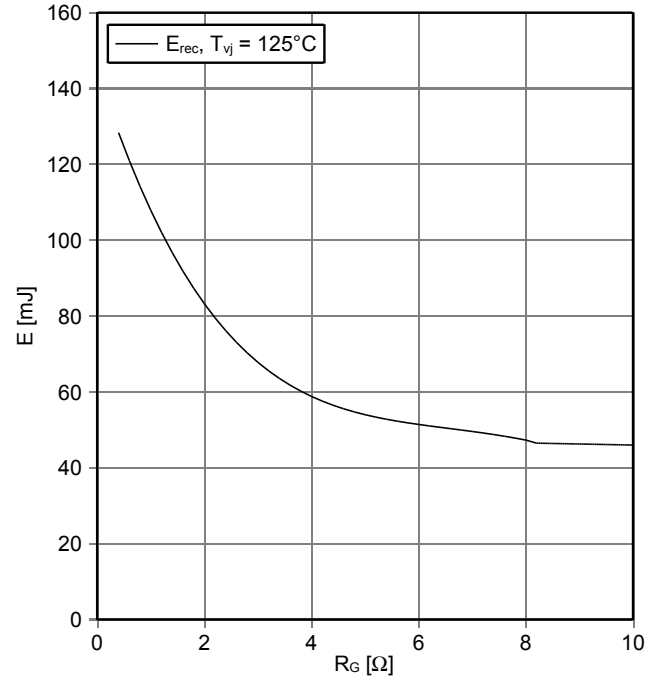
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 0.51 \Omega, V_{CE} = 600 V$



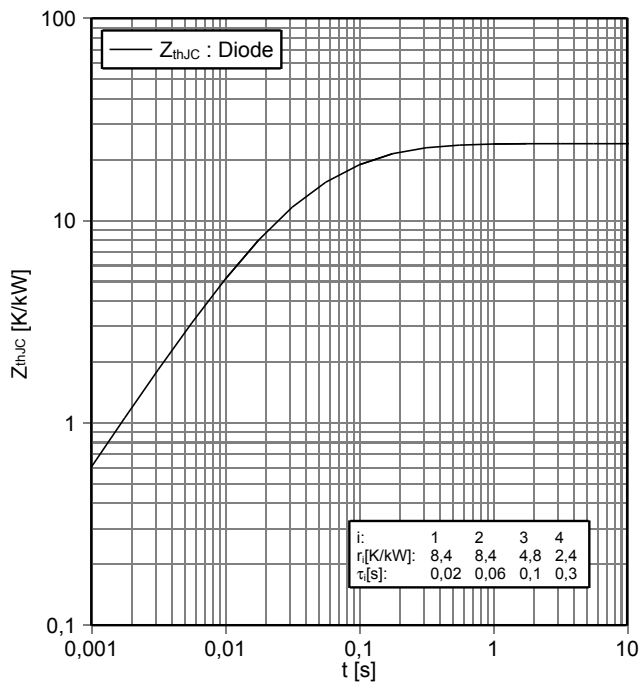
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 1800 A, V_{CE} = 600 V$



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
f[K/kW]:	8,4	8,4	4,8	2,4
τ[s]:	0,02	0,06	0,1	0,3

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