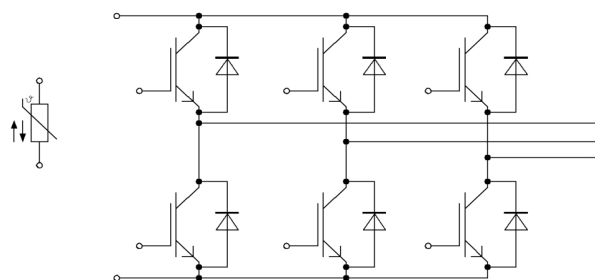
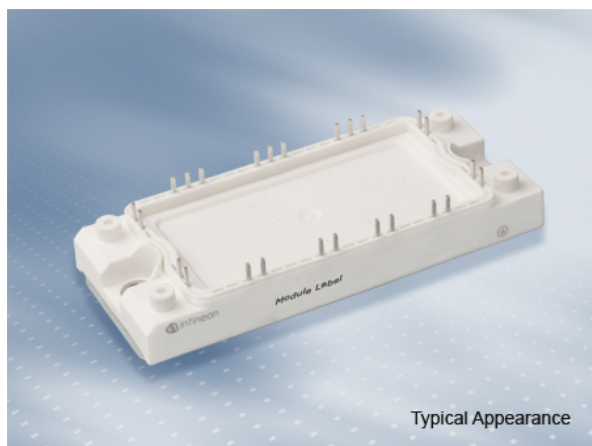


EconoPACK™2 模块 采用第四代沟槽栅/场终止IGBT4和第四代发射极控制二极管 带有温度检测NTC
 EconoPACK™2 module with Trench/Fieldstop IGBT4 and Emitter Controlled 4 diode and NTC

初步数据 / Preliminary Data



$V_{CES} = 1200V$
 $I_{C\ nom} = 100A / I_{CRM} = 200A$

潜在应用

- 伺服驱动器
- 电机传动
- 辅助逆变器

Potential Applications

- Servo drives
- Motor drives
- Auxiliary inverters

电气特性

- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} 带正温度系数
- 低 V_{CESat}
- 沟槽栅IGBT4

Electrical Features

- $T_{vj\ op} = 150^{\circ}C$
- V_{CESat} with positive temperature coefficient
- LOW V_{CESat}
- Trench IGBT 4

机械特性

- 低热阻的三氧化二铝 Al_2O_3 衬底
- 铜基板
- 集成NTC温度传感器
- 高功率循环和温度循环能力

Mechanical Features

- Al_2O_3 substrate with low thermal resistance
- Copper base plate
- Integrated NTC temperature sensor
- High power and thermal cycling capability

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

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	$T_C = 95^{\circ}\text{C}, T_{vj\text{max}} = 175^{\circ}\text{C}$	$I_{C\text{nom}}$	100	A
集电极重复峰值电流 Repetitive peak collector current	$t_P = 1\text{ ms}$	I_{CRM}	200	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	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25^{\circ}\text{C}$	$V_{CE\text{sat}}$	1,75	2,10	V	
	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 125^{\circ}\text{C}$		2,05		V	
	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 150^{\circ}\text{C}$		2,10		V	
栅极阈值电压 Gate threshold voltage	$I_C = 3,80\text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$		V_{GEth}	5,05	5,80	6,45	V
栅极电荷 Gate charge	$V_{GE} = -15 / 15\text{ V}$		Q_G		0,80		μC
内部栅极电阻 Internal gate resistor	$T_{vj} = 25^{\circ}\text{C}$		R_{Gint}		7,5		Ω
输入电容 Input capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{ies}		6,30		nF
反向传输电容 Reverse transfer capacitance	$f = 1000\text{ kHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		C_{res}		0,27		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}			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}			100	nA
开通延迟时间(电感负载) Turn-on delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	t_{don}	0,13		μs	
		$T_{vj} = 125^{\circ}\text{C}$		0,15		μs	
		$T_{vj} = 150^{\circ}\text{C}$		0,15		μs	
上升时间(电感负载) Rise time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	t_r	0,02		μs	
		$T_{vj} = 125^{\circ}\text{C}$		0,03		μs	
		$T_{vj} = 150^{\circ}\text{C}$		0,035		μs	
关断延迟时间(电感负载) Turn-off delay time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	t_{doff}	0,30		μs	
		$T_{vj} = 125^{\circ}\text{C}$		0,38		μs	
		$T_{vj} = 150^{\circ}\text{C}$		0,40		μs	
下降时间(电感负载) Fall time, inductive load	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}$ $V_{GE} = -15 / 15\text{ V}$ $R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	t_f	0,045		μs	
		$T_{vj} = 125^{\circ}\text{C}$		0,08		μs	
		$T_{vj} = 150^{\circ}\text{C}$		0,09		μs	
开通损耗能量(每脉冲) Turn-on energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 25\text{ nH}$ $di/dt = 2600\text{ A}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Gon} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	E_{on}	7,20		mJ	
		$T_{vj} = 125^{\circ}\text{C}$		9,50		mJ	
		$T_{vj} = 150^{\circ}\text{C}$		10,5		mJ	
关断损耗能量(每脉冲) Turn-off energy loss per pulse	$I_C = 100\text{ A}, V_{CE} = 600\text{ V}, L\sigma = 25\text{ nH}$ $du/dt = 3600\text{ V}/\mu\text{s} (T_{vj} = 150^{\circ}\text{C})$ $V_{GE} = -15 / 15\text{ V}, R_{Goff} = 1,6\ \Omega$	$T_{vj} = 25^{\circ}\text{C}$	E_{off}	5,40		mJ	
		$T_{vj} = 125^{\circ}\text{C}$		8,20		mJ	
		$T_{vj} = 150^{\circ}\text{C}$		9,00		mJ	
短路数据 SC data	$V_{GE} \leq 15\text{ V}, V_{CC} = 800\text{ V}$ $V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$t_P \leq 10\ \mu\text{s}, T_{vj} = 150^{\circ}\text{C}$	I_{SC}		360		A
结 - 外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			0,302	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}		0,135		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{op}}$	-40		150	$^{\circ}\text{C}$

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	$T_{vj} = 25^{\circ}\text{C}$	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	100	A
正向重复峰值电流 Repetitive peak forward current	$t_P = 1 \text{ ms}$	I_{FRM}	200	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	1550 1500	A^2s A^2s

特征值 / Characteristic Values

			min.	typ.	max.		
正向电压 Forward voltage	$I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}$ $I_F = 100 \text{ A}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	V_F		1,70 1,65 1,65	2,15	V V V
反向恢复峰值电流 Peak reverse recovery current	$I_F = 100 \text{ A}, -di_F/dt = 2600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	I_{RM}		140 145 150		A A A
恢复电荷 Recovered charge	$I_F = 100 \text{ A}, -di_F/dt = 2600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	Q_r		9,60 17,0 19,0		μC μC μC
反向恢复损耗 (每脉冲) Reverse recovery energy	$I_F = 100 \text{ A}, -di_F/dt = 2600 \text{ A}/\mu\text{s} (T_{vj}=150^{\circ}\text{C})$ $V_R = 600 \text{ V}$ $V_{GE} = -15 \text{ V}$	$T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$	E_{rec}		4,10 7,00 8,00		mJ mJ mJ
结 - 外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			0,454	K/W
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}		0,144		K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

			min.	typ.	max.	
额定电阻值 Rated resistance	$T_{NTC} = 25^{\circ}\text{C}$	R_{25}		5,00		$\text{k}\Omega$
R100 偏差 Deviation of R100	$T_{NTC} = 100^{\circ}\text{C}, R_{100} = 493 \Omega$	$\Delta R/R$	-5		5	%
耗散功率 Power dissipation	$T_{NTC} = 25^{\circ}\text{C}$	P_{25}			20,0	mW
B-值 B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/50}$		3375		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/80}$		3411		K
B-值 B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	$B_{25/100}$		3433		K

根据应用手册标定

Specification according to the valid application note.

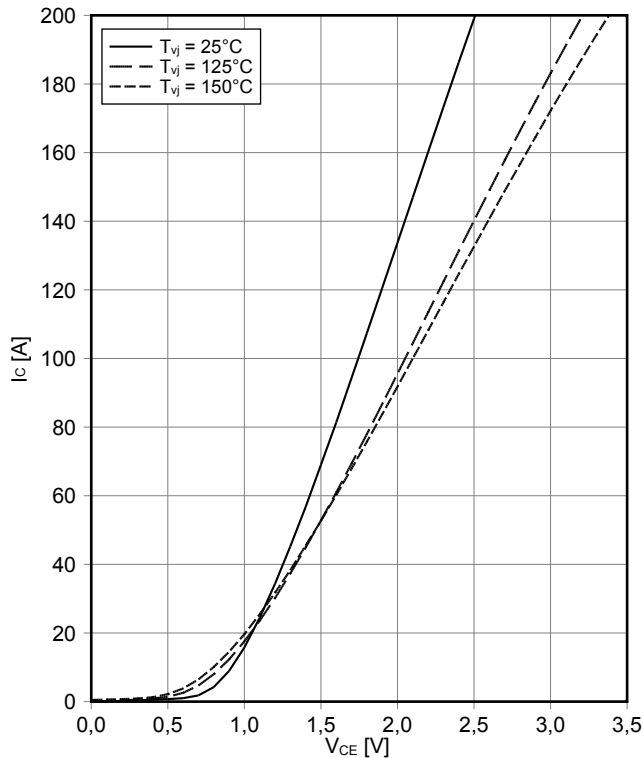
初步数据 Preliminary Data

模块 / Module

绝缘测试电压 Isolation test voltage	RMS, f = 50 Hz, t = 1 min.	V _{ISOL}	2,5		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 ₂ O ₃		
爬电距离 Creepage distance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		10,0		mm
电气间隙 Clearance	端子至散热器 / terminal to heatsink 端子至端子 / terminal to terminal		7,5		mm
相对电痕指数 Comperative tracking index		CTI	> 200		
			min.	typ.	max.
杂散电感, 模块 Stray inductance module		L _{sCE}		19	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'}		1,80	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 M5 根据相应的应用手册进行安装 Screw M5 - Mounting according to valid application note	M	3,00		6,00 Nm
重量 Weight		G		180	g

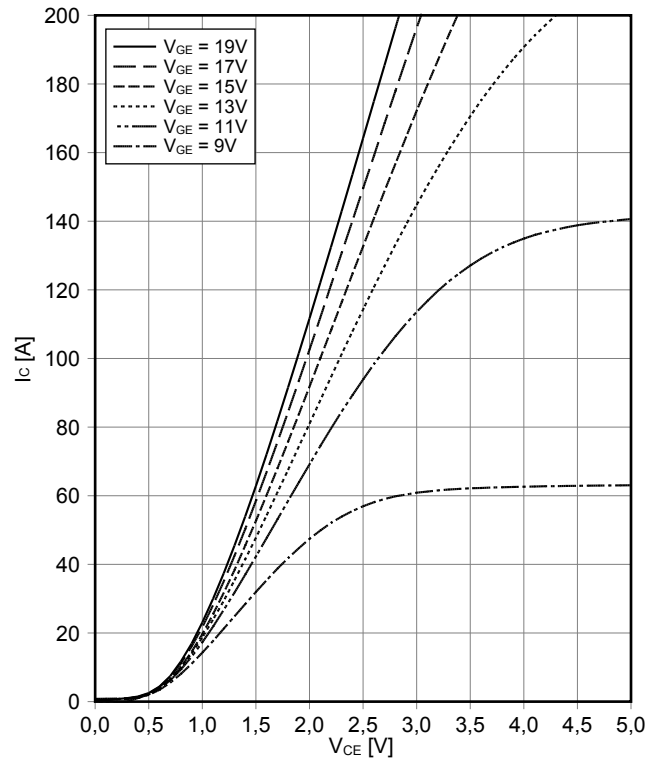
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



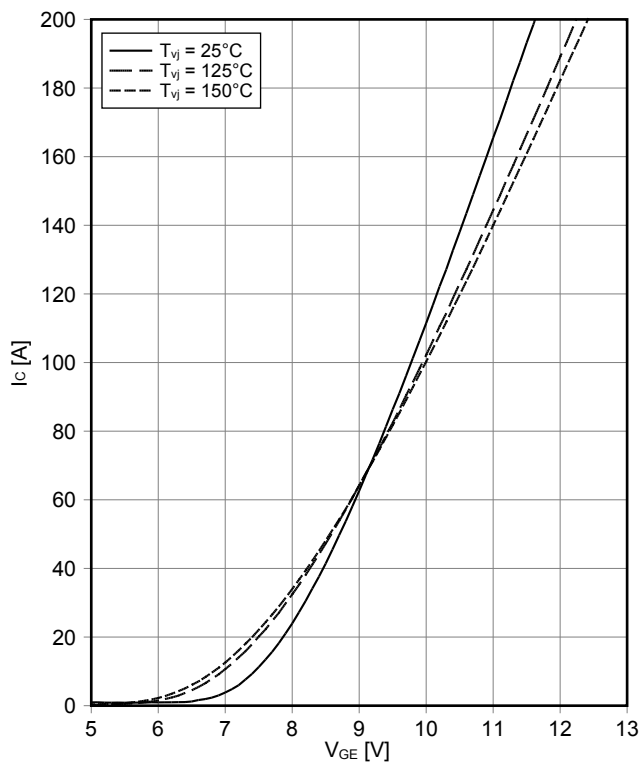
输出特性 IGBT, 逆变器 (典型)
output characteristic IGBT, Inverter (typical)

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



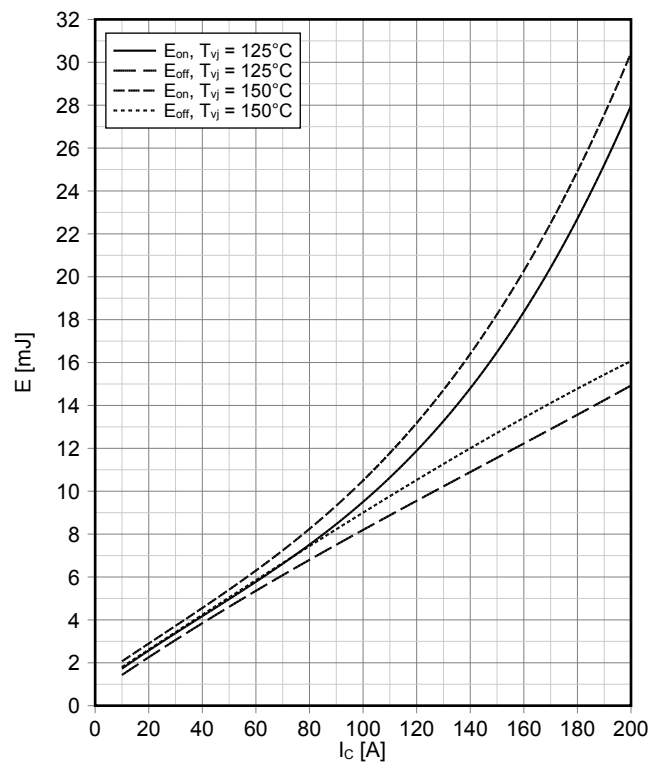
传输特性 IGBT, 逆变器 (典型)
transfer characteristic IGBT, Inverter (typical)

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



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

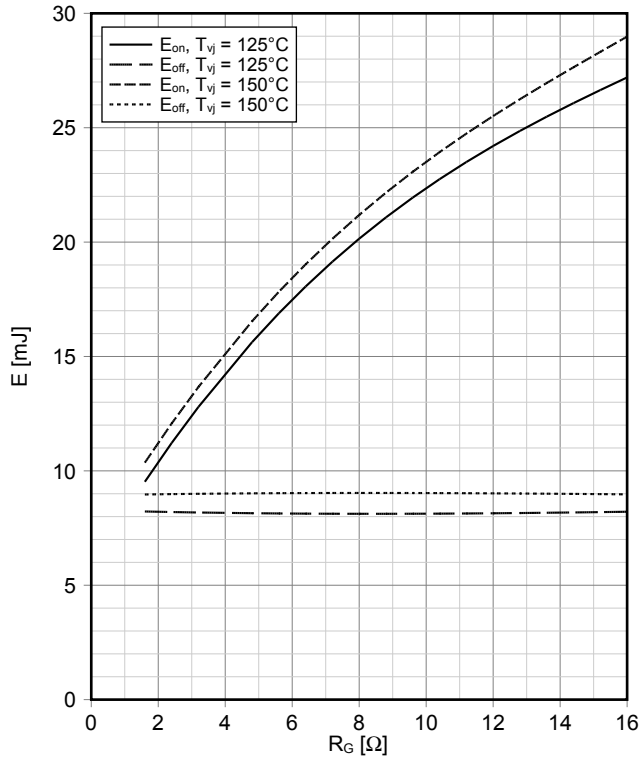
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$
 $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 1.6\ \Omega$, $R_{Goff} = 1.6\ \Omega$, $V_{CE} = 600\text{ V}$



初步数据 Preliminary Data

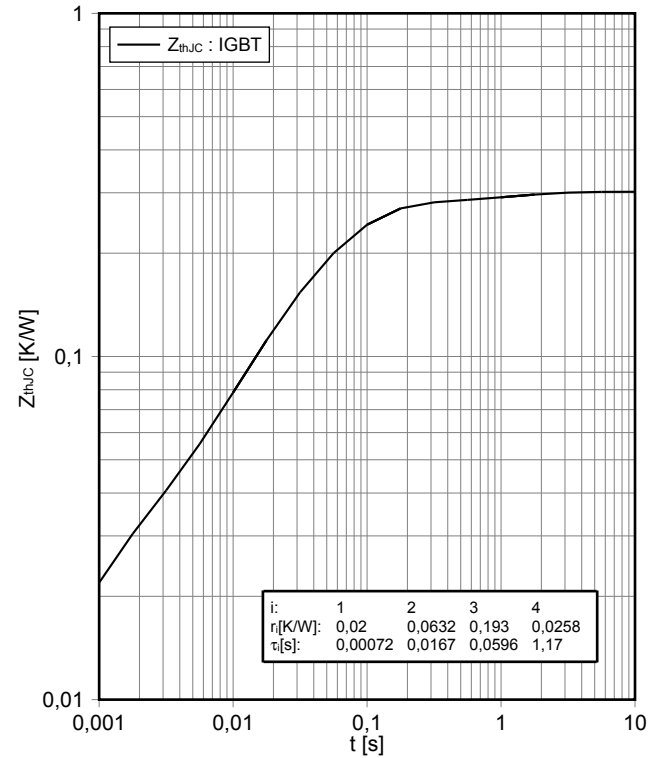
开关损耗 IGBT, 逆变器 (典型) switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G), E_{off} = f(R_G)$
 $V_{GE} = \pm 15\text{ V}, I_C = 100\text{ A}, V_{CE} = 600\text{ V}$



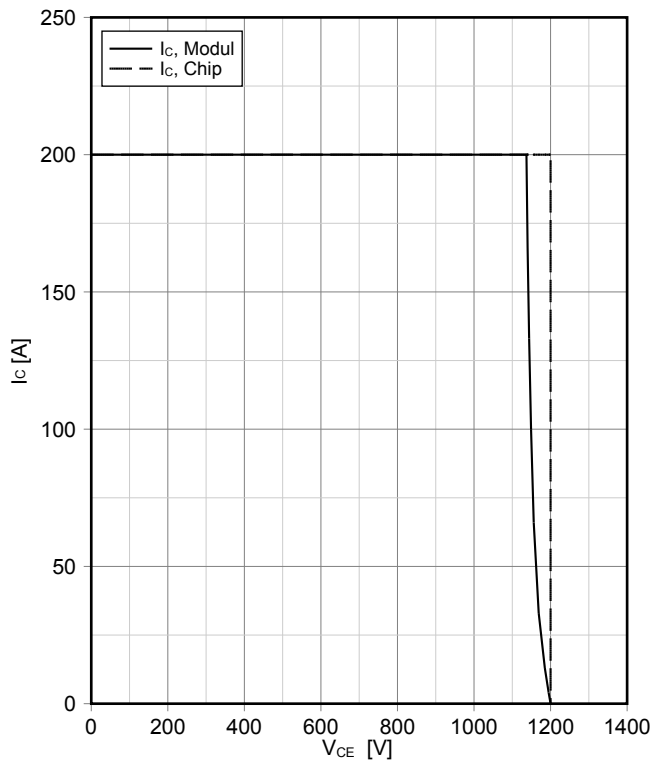
瞬态热阻抗 IGBT, 逆变器 transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



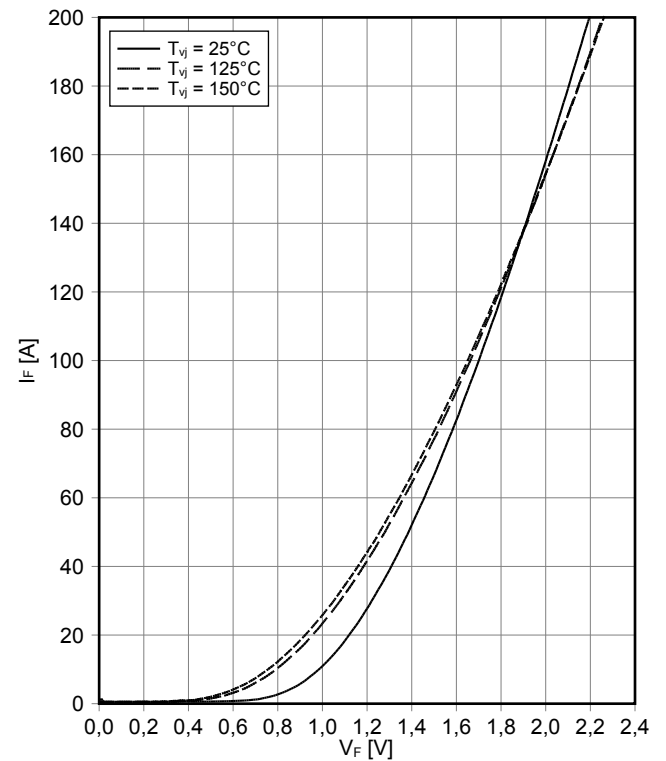
反偏安全工作区 IGBT, 逆变器 (RBSOA) reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$
 $V_{GE} = \pm 15\text{ V}, R_{Goff} = 1.6\ \Omega, T_{vj} = 150^\circ\text{C}$



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

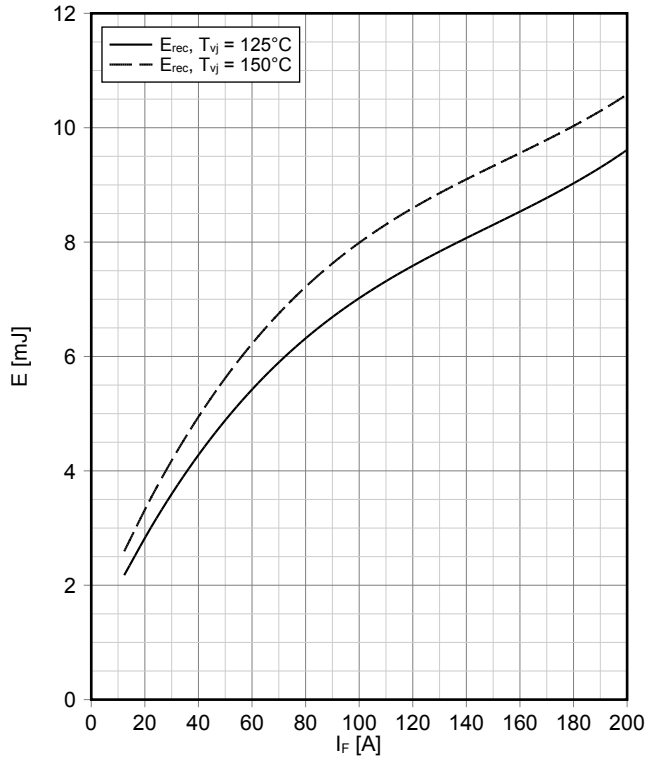
$I_F = f(V_F)$



初步数据 Preliminary Data

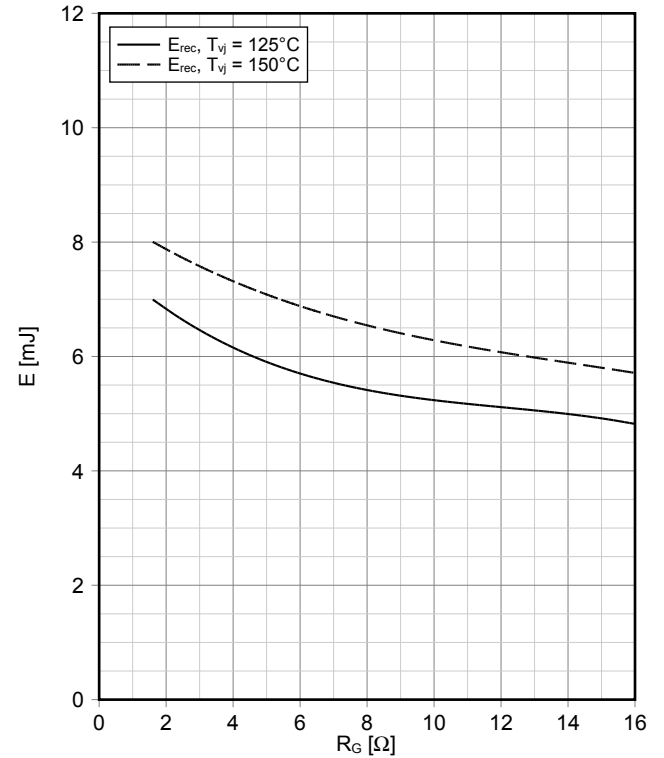
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$
 $R_{Gon} = 1.6 \Omega, V_{CE} = 600 V$



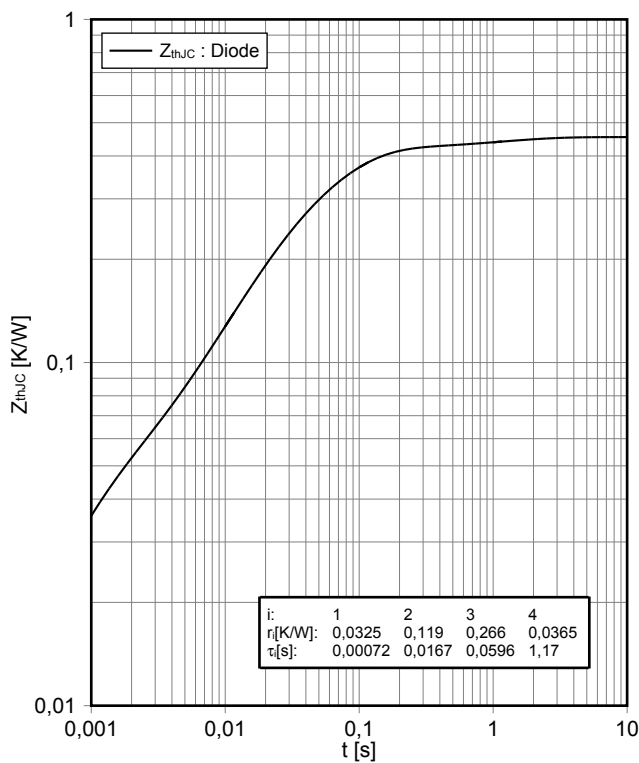
开关损耗 二极管,逆变器 (典型)
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$
 $I_F = 100 A, V_{CE} = 600 V$



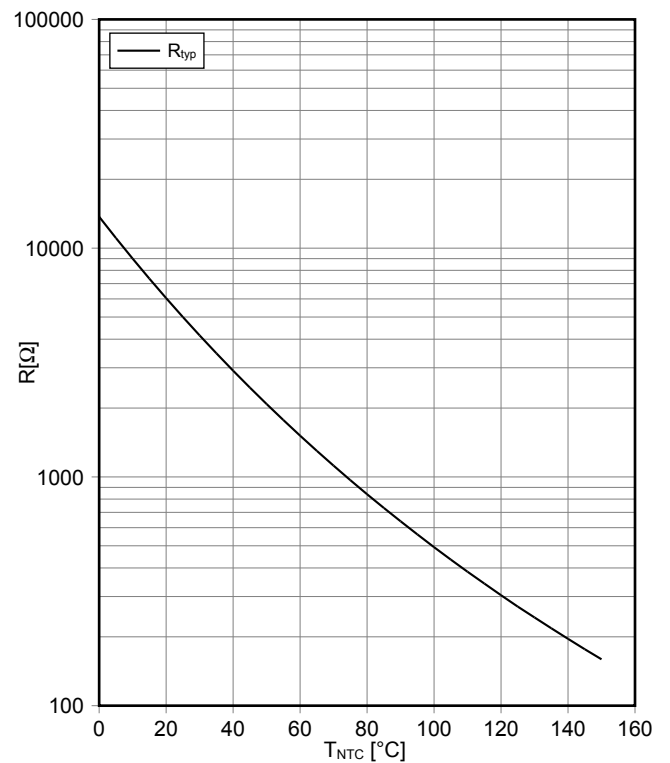
瞬态热阻抗 二极管,逆变器
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$

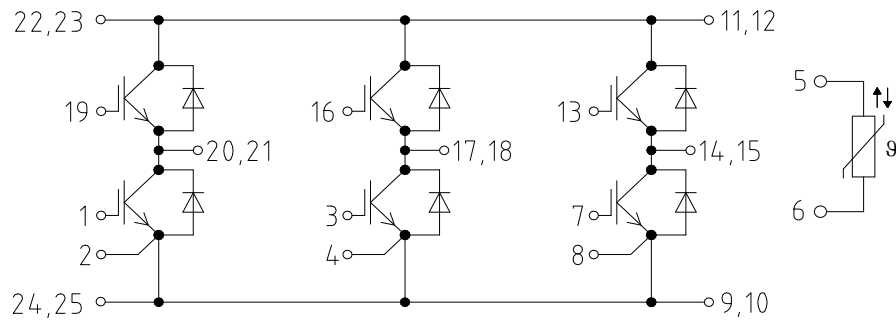


负温度系数热敏电阻 温度特性
NTC-Thermistor-temperature characteristic (typical)

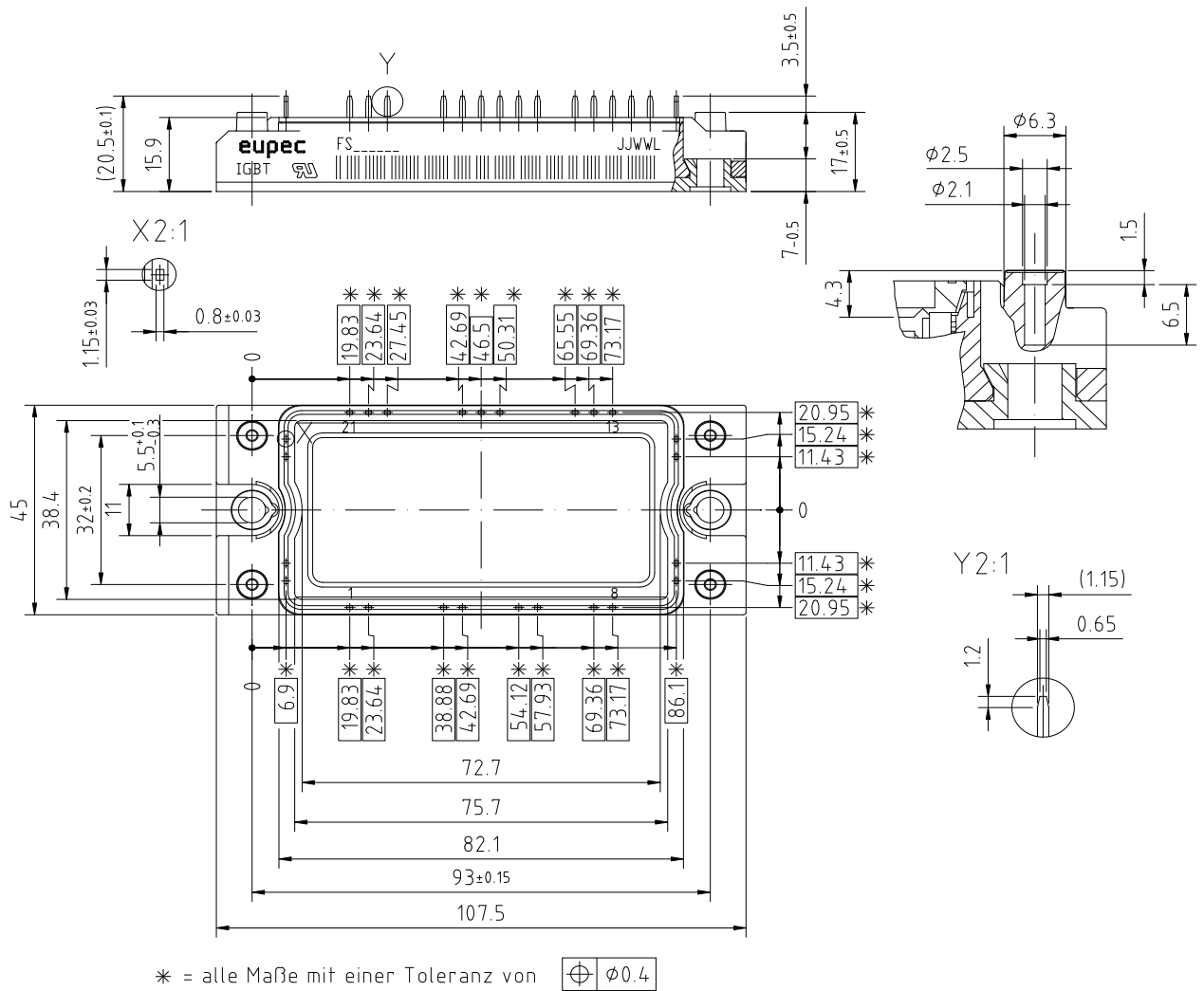
$R = f(T)$



接线图 / Circuit diagram



封装尺寸 / Package outlines



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