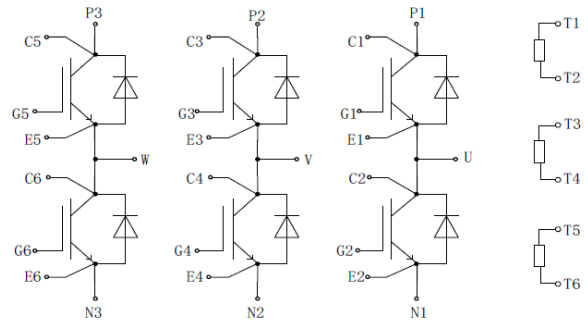
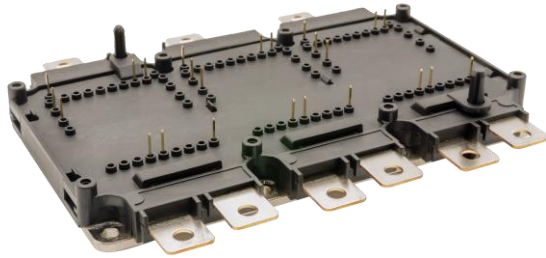


A6 package: 750V 820A IGBT module



等效电路图
Equivalent Circuit Schematic

Features:

- 750V 820A, $V_{CE(sat)} = 1.5V @ 25^{\circ}C$
- Direct cooled PinFin Base Plate
- Trench/FS Technology
- Low switching losses

产品特性:

- 750V 820A, $V_{CE(sat)} = 1.5V @ 25^{\circ}C$
- PinFin 直接液冷散热底板
- 沟槽栅/场终止技术
- 低开关损耗

Typical Applications:

- Electric Vehicles
- Motor Drives

典型应用:

- 电动汽车
- 电机驱动

IGBT, Inverter / IGBT, 逆变部分
Maximum Rated Values / 最大标称参数

Collector-emitter Voltage 集电极-发射极电压	$T_{vj}=25^{\circ}\text{C}$	V_{CES}	750	V
Continuous DC collector current 集电极连续直流电流		$I_{C\text{ nom}}$	820	A
Continuous DC collector current 集电极连续直流电流	$T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	I_C	480 ¹⁾	A
Repetitive Peak collector current 集电极可重复峰值电流	$t_p=1\text{ms}$	I_{CRM}	1640	A
Gate-emitter peak voltage 门极-发射极峰值电压		V_{GES}	± 20	V

Characteristic Values / 性能参数

		min.	typ.	max.			
Collector-emitter saturation Voltage 集电极-发射极饱和压降	$I_C=450\text{A}, V_{GE}=15\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1.25	1.6	V		
	$I_C=820\text{A}, V_{GE}=15\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$		1.3	1.35			
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=9.6\text{mA}, T_{vj}=25^{\circ}\text{C}$	$V_{GE\text{ th}}$	5.0	5.75	6.8	V	
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$	$R_{G\text{ int}}$	0.57			Ω	
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}$	C_{ies}	45			nF	
Reverse Transfer Capacitance 反向传输电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}$	C_{res}	0.9			nF	
Gate Charge 门极电荷	$V_{GE}=-8\text{V}\sim+15\text{V}$	Q_G	TBD			μC	
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	$V_{CE}=750\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	I_{CES}			1	mA	
Gate-emitter Leakage Current 门极-发射极漏电流	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_{vj}=25^{\circ}\text{C}$	I_{GES}			400	nA	
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=450\text{A}, V_{CE}=400\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=2.4\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_{don}	106		ns	
				108			
				107			
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=450\text{A}, V_{CE}=400\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=2.4\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_r	58		ns	
				68			
				69			
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=450\text{A}, V_{CE}=400\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=5.1\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_{doff}	570		ns	
				635			
				650			
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=450\text{A}, V_{CE}=400\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=5.1\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_f	227		ns	
				327			
				355			
Turn-on energy loss per pulse 开通损耗	$I_C=450\text{A}, V_{CE}=400\text{V}$ $V_{GE}=-8\text{V}/15\text{V}, R_{Gon}=2.4\Omega$ $di/dt(T_{vj}=25^{\circ}\text{C})=6150\text{A}/\mu\text{s}$ $di/dt(T_{vj}=150^{\circ}\text{C})=5250\text{A}/\mu\text{s}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	E_{on}	5.53	9.16	9.74	mJ

¹⁾通过特性/设计而不是测试来验证

Turn-off energy loss per pulse 关断损耗	$I_C=450A, V_{CE}=400V, T_{vj}=25^\circ C$ $V_{GE}=-8V/15V, R_{Goff}=5.1\Omega, T_{vj}=150^\circ C$ $dv/dt(T_{vj}=25^\circ C)=3950V/\mu s, T_{vj}=175^\circ C$ $dv/dt(T_{vj}=150^\circ C)=3400V/\mu s$	E_{off}		34 42.1 43.6		mJ
SC Data 短路耐量	$V_{CC}=400V, V_{GE}=15V/-8V, T_{vj}=25^\circ C$	t_{psc}		6		μs
Thermal Resistance, Junction to Cooling fluid 结-散热器热阻	Per IGBT, $\Delta V/\Delta t=10dm^3/min$ Cooling fluid=50% water	R_{thJF}			0.14 ²⁾	K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^\circ C$

Diode, Inverter / 二极管, 逆变部分

Maximum Rated Values / 最大标称参数

Repetitive peak reverse voltage 可重复反向峰值电压	$T_{vj}=25^\circ C$	V_{RRM}	750	V
Continuous DC Forward Current 可连续正向直流电流		I_F	450 ¹⁾	A
Repetitive Peak Forward Current 可重复正向峰值电流	$t_p=1ms$	I_{FRM}	1640	A

Characteristic Values / 性能参数

		min.	typ.	max.		
Forward Voltage 正向通态压降	$I_F=450A, V_{GE}=0V$ $T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	V_F	1.5	2.0	V	
	$I_F=820A, V_{GE}=0V$ $T_{vj}=25^\circ C$ $T_{vj}=175^\circ C$		1.55	1.5		
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=450A, V_R=400V$ $-di_F/dt=4500A/\mu s(T_{vj}=150^\circ C)$ $V_{GE}=-8V$ $T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	I_{RM}	246	303	322	A
Recovery Charge 反向恢复电荷	$I_F=450A, V_R=400V$ $-di_F/dt=4500A/\mu s(T_{vj}=150^\circ C)$ $V_{GE}=-8V$ $T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	Q_r	13.1	26.6	31.3	μC
Reverse Recovery Energy 反向恢复损耗	$I_F=450A, V_R=400V$ $-di_F/dt=4500A/\mu s(T_{vj}=150^\circ C)$ $V_{GE}=-8V$ $T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	E_{rec}	4.71	9.15	10.8	mJ
Thermal Resistance, Junction to Cooling fluid 结-散热器热阻	Per FRD, $\Delta V/\Delta t=10dm^3/min$ Cooling fluid=50% water	R_{thJF}			0.20 ²⁾	K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^\circ C$

¹⁾通过特性/设计而不是测试来验证

²⁾仿真值非测试值

NTC-Thermistor/ NTC-热敏电阻
Characteristic Values / 性能参数

		min.	typ.	max.	
Rated Resistance 标称电阻	$T_C=25^{\circ}\text{C}$	R_{25}	5.00		$\text{K}\Omega$
Deviation of R100 R100 偏移值	$T_C=100^{\circ}\text{C}$, $R_{100}=465\Omega$	$\Delta R/R$	-5	5	%
Power Dissipation 功率耗散	$T_C=25^{\circ}\text{C}$	P_{25}		10	mW
B-Value B 值	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	$B_{25/50}$	3395		K
B-Value B 值	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	$B_{25/80}$	3468		K
B-Value B 值	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$	$B_{25/100}$	3523		K

Module / 模块

Isolation Test Voltage 绝缘测试电压	RMS, $f=50\text{Hz}$, $t=1\text{min}$	V_{ISOL}	2.5		KV
Material of Module Baseplate 模块底板材料			Cu		
Internal Isolation 内部绝缘			ZTA		
Creepage Distance 爬电距离	Terminal to heatsink Terminal to terminal		9.0 9.0		mm
Clearance 电气间隙	Terminal to heatsink Terminal to terminal		4.5 4.5		mm
Comparative Tracking Index 相对漏电起痕指数		CTI	200 ¹⁾		

		min.	typ.	max.	
Stray Inductance Module 模块杂散电感		L_{SCE}	8.0 ²⁾		nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片	$T_C=25^{\circ}\text{C}$, Per Switch	$R_{\text{CC+EE}}$	0.75 ²⁾		m Ω
Storage Temperature 贮存温度		T_{stg}	-40	125	$^{\circ}\text{C}$
Mounting Torque for Module Mounting 模块安装力矩	Screw M4 / M4 螺丝	M	2.0	3.0	Nm
Weight 重量		G	715		g

¹⁾CTI 约为 200

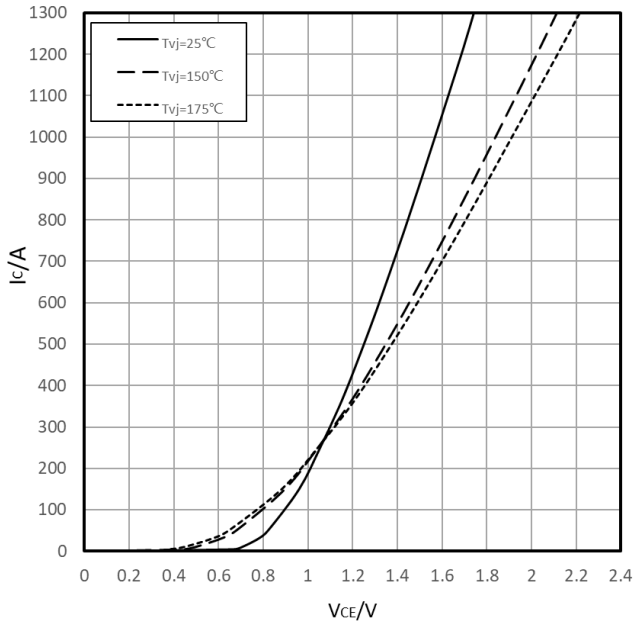
²⁾通过设计/仿真而非测试值

Circuit Diagram / 曲线图

Output characteristic , Inverter IGBT (typical)

输出特性, 逆变IGBT (典型)

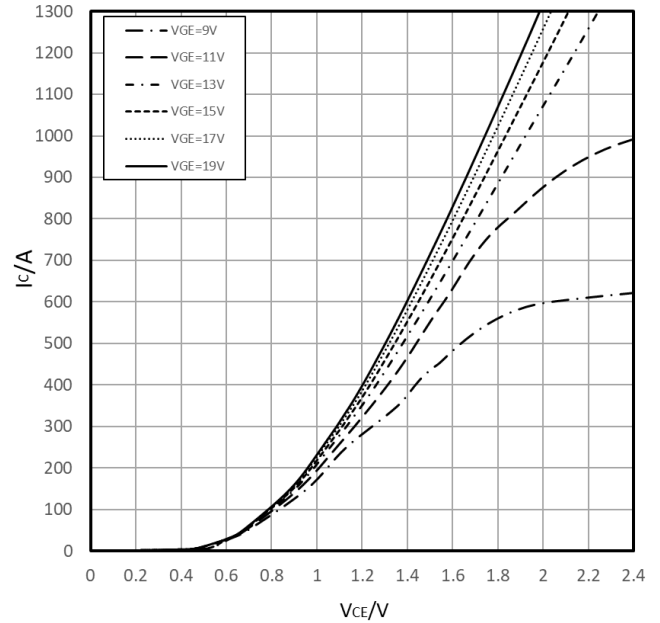
$I_c=f(V_{CE})$, $V_{GE}=15V$ (Inclusive R_{CC+EE})



Output characteristic , Inverter IGBT (typical)

输出特性, 逆变IGBT (典型)

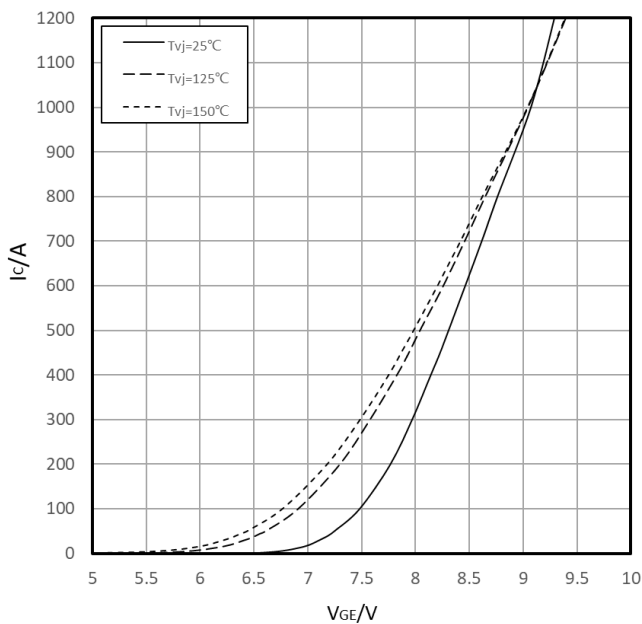
$I_c=f(V_{CE})$, $T_{vj}=150^{\circ}C$



Transfer characteristic , Inverter IGBT (typical)

传输特性, 逆变IGBT (典型)

$I_c=f(V_{GE})$, $V_{CE}=20V$

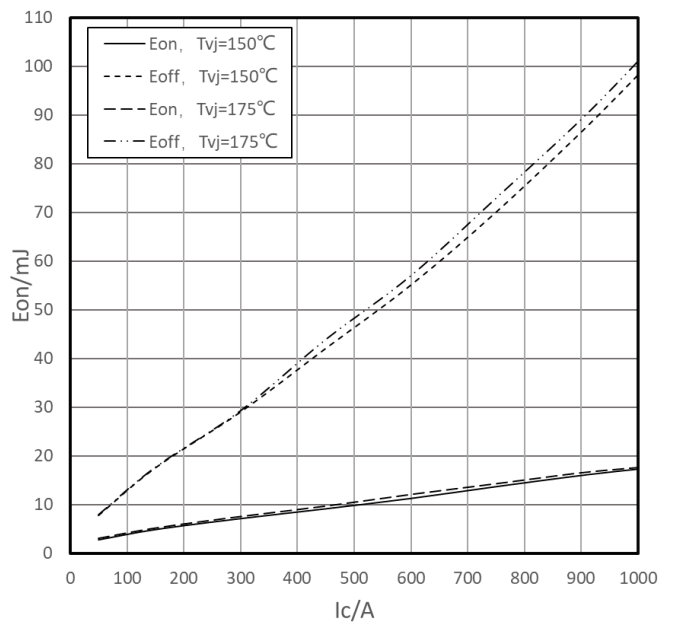


Switching losses , Inverter IGBT (typical)

开关损耗, 逆变IGBT (典型)

$E_{on}=f(I_c)$, $E_{off}=f(I_c)$

$V_{GE}=+15V/-8V$, $R_{gon}=2.4\Omega$, $R_{goff}=5.1\Omega$, $V_{CE}=400V$

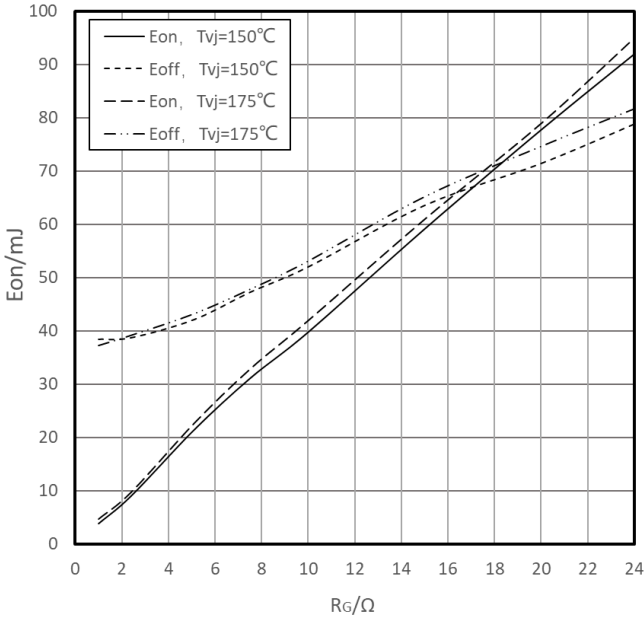


Switching losses , Inverter IGBT (typical)

开关损耗, 逆变IGBT (典型)

$E_{on}=f(R_g), E_{off}=f(R_g)$

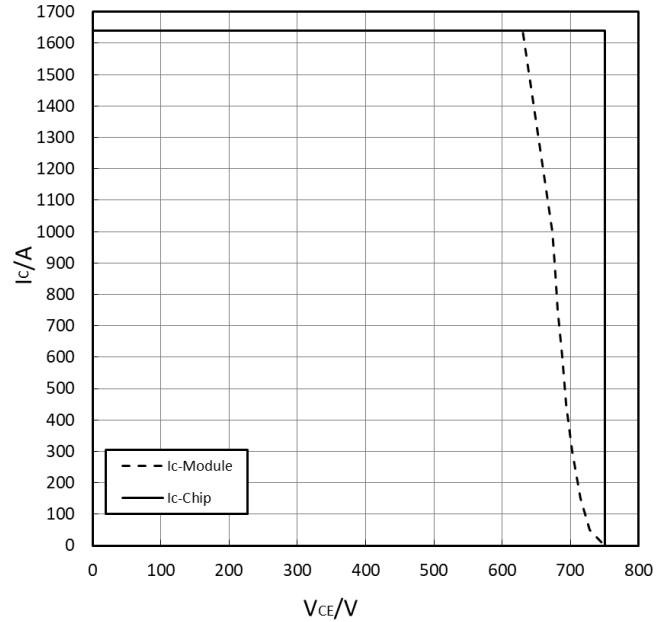
$V_{GE}=+15V/-8V, I_c=450A, V_{CE}=400V$



Reverse bias safe operating area , Inverter IGBT (RBSOA)

反偏安全工作区, 逆变IGBT (RBSOA)

$I_c=f(V_{CE}), V_{GE}=+15V/-8V, R_{goff}=5.1\Omega, T_{vj}=175^\circ C$

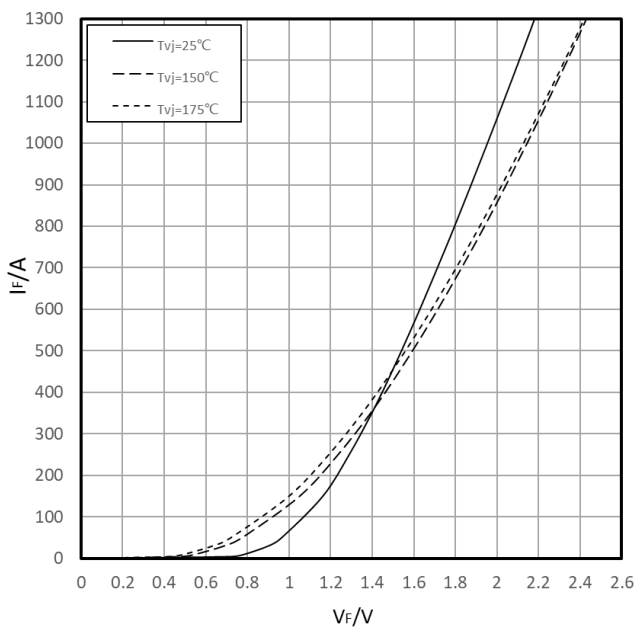


Forward characteristic , Inverter FRD (typical)

正向偏压特性, 逆变FRD (典型)

$I_F=f(V_F)$

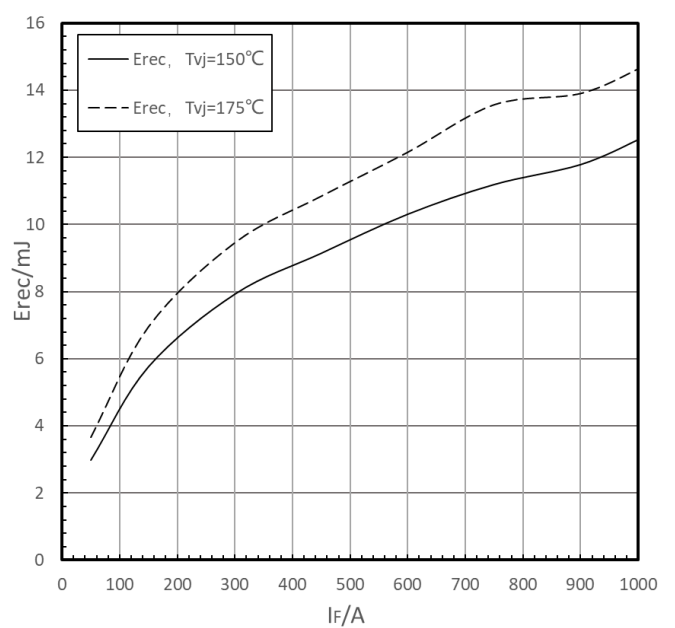
(Inclusive $R_{CC+EE'}$)



Switching losses , Inverter IGBT (typical)

开关损耗, 逆变FRD (典型)

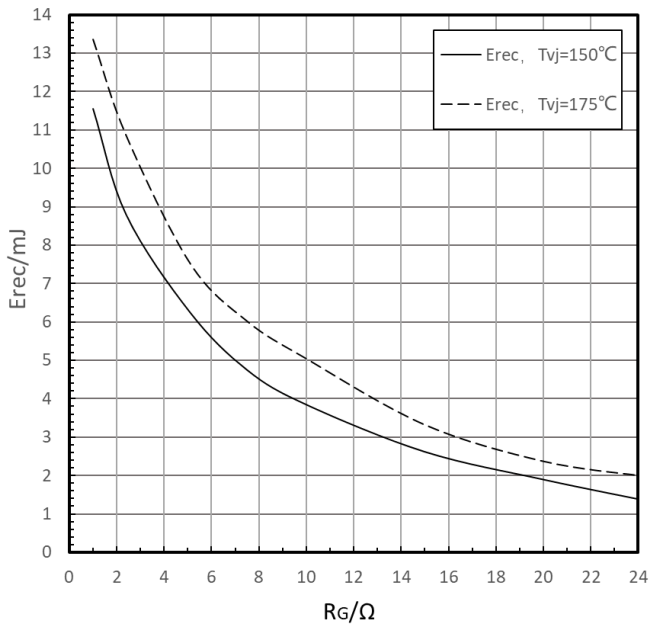
$E_{rec}=f(I_F), R_{gon}=2.4\Omega, V_{CE}=400V$



Switching losses , Inverter FRD (typical)

开关损耗, 逆变FRD (典型)

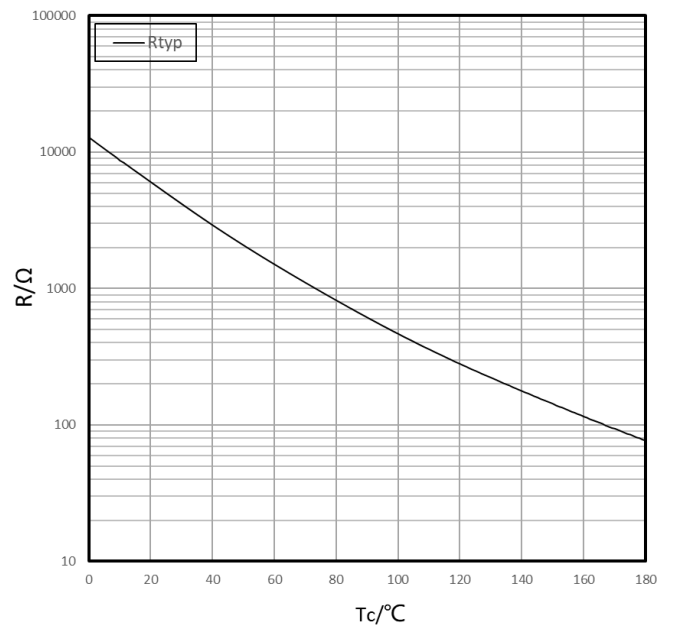
$E_{rec}=f(R_G)$, $I_F=450A$, $V_{CE}=400V$



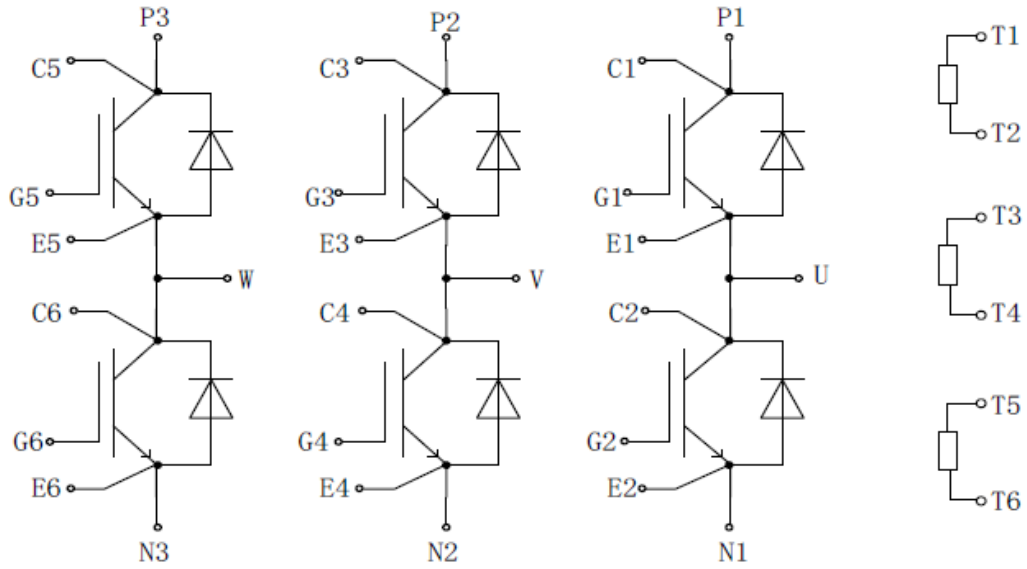
NTC-Thermistor-temperature characteristic

负温度系数热敏电阻 温度特性

$R=f(T)$



Internal Circuit / 内部电路



Package Dimension / 封装尺寸

Dimensions in Millimeters / 毫米为单位

