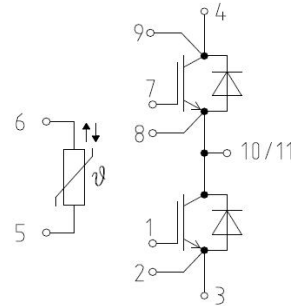


M series package: 1200V 300A IGBT module

Datasheet



等效电路图

Equivalent Circuit Schematic

**Features:**

- 1200V 300A,  $V_{CE(sat)} = 1.5\text{ V}@25^\circ\text{C}$
- MPT Gate Technology
- Low Losses
- High RBSOA capability
- Low reverse-recovery losses

**产品特性:**

- 1200V 300A,  $V_{CE(sat)} = 1.5\text{ V}@25^\circ\text{C}$
- 微沟槽栅/场终止技术
- 低损耗
- 高 RBSOA 能力
- 低反向恢复损耗

**Typical Applications:**

- Motor Drives
- Solar Applications
- UPS Systems
- Energy Storage

**典型应用:**

- 电机驱动
- 光伏应用
- UPS 系统
- 储能

**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	$T_{vj}=25^{\circ}\text{C}$	$V_{CES}$	1200	V
Continuous DC Collector Current 集电极连续直流电流		$I_{C\text{ nom}}$	300	A
	$T_c=100^{\circ}\text{C}, T_{vj\text{ max}}\leq 175^{\circ}\text{C}$	$I_C$	358	A
Repetitive Peak Collector Current 集电极可重复峰值电流	$t_p=1\text{ms}$	$I_{CRM}$	600	A
Gate-emitter Peak Voltage 门极-发射极峰值电压		$V_{GES}$	$\pm 20$	V

**Characteristic Values / 性能参数**

		min.	typ.	max.		
Collector-emitter Saturation Voltage <sup>1)</sup> 集电极-发射极饱和压降	$I_C=300\text{A}, V_{GE}=15\text{V}$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$V_{CE\text{ sat}}$	1.40 1.50 1.76 1.84	1.70	V	
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=6\text{mA}, T_{vj}=25^{\circ}\text{C}$	$V_{GE\text{ th}}$	5.0	6.0	7.0	V
Gate Charge 门极电荷	$V_{GE}=15\text{V}/-8\text{V}, V_{CE}=600\text{V}$	$Q_G$	-	3.0	-	$\mu\text{C}$
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$	$R_{G\text{ int}}$	-	0.65	-	$\Omega$
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}, f=100\text{KHz}$	$C_{ies}$	-	70.6	-	nF
Reverse Transfer Capacitance 反向传输电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}, f=100\text{KHz}$	$C_{res}$	-	0.26	-	nF
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	$I_{CES}$	-	-	1	mA
Gate-emitter Leakage Current 门极-发射极漏电流	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_{vj}=25^{\circ}\text{C}$	$I_{GES}$	-	-	500	nA
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Gon}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$t_{don}$	-	193 195 203 205	-	ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Gon}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$t_r$	-	41 51 53 66	-	ns
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$t_{doff}$	-	361 408 418 440	-	ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$t_f$	-	125 190 219 220	-	ns
Turn-on energy Loss Per Pulse 开通损耗	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=1\Omega, L_{\sigma}=35\text{nH}$ $di/dt=3600(T_{vj}=175^{\circ}\text{C})$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	$E_{on}$	-	11.8 17.3 19.1 22.1	-	mJ

Turn-off Energy Loss Per Pulse 关断损耗	$I_C=300A, V_{CC}=600V$ $V_{GE}=15V/-8V$ $R_{Gon}=1\Omega, L_G=35nH$ $dv/dt=7100(T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$E_{off}$	-	20.3 28.8 31.4 36.3	-	mJ
SC Data 短路耐量	$V_{CC}=600V$ $V_{GE}=15V/-8V$	$T_p \leq 10\mu s, T_{vj}=150^\circ C$ $T_p \leq 8\mu s, T_{vj}=175^\circ C$	$I_{sc}$	-	1600 1500	-	A
Thermal Resistance, Junction to Case 结-外壳热阻	Per IGBT/单个 IGBT		$R_{thJC}$	-	0.104	-	K/W
Thermal Resistance, Case to Heatsink 外壳-散热器热阻	Per IGBT/单个 IGBT $\lambda_{grease} = 1W(m \cdot K)$		$R_{thJH}$	-	0.023	-	K/W
Temperature under Switching Conditions 工作温度			$T_{vj op}$	-40	-	175	$^\circ C$

## 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	$T_{vj}=25^\circ C$	$V_{RRM}$	1200	V
Continuous DC Forward Current 可连续正向直流电流		$I_{Fnom}$	300	A
Repetitive Peak Forward Current 可重复正向峰值电流	$t_p=1ms$	$I_{FRM}$	600	A

### Characteristic Values / 性能参数

			min.	typ.	max.		
Forward Voltage <sup>1)</sup> 正向通态压降	$I_F=300A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$V_F$	1.5 1.95 1.92 1.82	2.40	-	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=300A, V_{CC}=600V$ $V_{GE}=-8V$ $-di_f/dt=3600A/\mu s(T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$I_{RM}$	-	248 276 284 292	-	A
Recovery Charge 反向恢复电荷	$I_F=300A, V_{CC}=600V$ $V_{GE}=-8V$ $-di_f/dt=3600A/\mu s(T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$Q_R$	-	16.5 28.5 32.6 37.6	-	$\mu C$
Reverse Recovery Energy 反向恢复损耗	$I_F=300A, V_{CC}=600V$ $V_{GE}=-8V$ $-di_f/dt=3600A/\mu s(T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$ $T_{vj}=175^\circ C$	$E_{rec}$	-	9.0 16.7 19.0 25.4	-	mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per FRD/单个 FRD		$R_{thJC}$	-	0.160	-	K/W
Thermal Resistance, Case to Heatsink 外壳-散热器热阻	Per FRD/单个 FRD $\lambda_{grease} = 1W(m \cdot K)$		$R_{thCH}$	-	0.026	-	K/W
Temperature under switching conditions 工作温度			$T_{vj op}$	-40	-	175	$^\circ C$

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

			min.	typ.	max.	
Rated Resistance 标称电阻	$T_{NTC}=25^{\circ}C$	$R_{25}$	-	5	-	K $\Omega$
Deviation of R100 R100 偏移值	$T_{NTC}=100^{\circ}C, R_{100}=465\Omega$	$\Delta R/R$	-7.3	-	7.3	%
Power Dissipation 功率耗散	$T_{NTC}=25^{\circ}C$	$P_{25}$	-	-	10	mW
B-Value B 值	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$	-	3380	-	K
	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$	-	3470	-	K
	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$	$B_{25/100}$	-	3520	-	K

**Module / 模块**

Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	$V_{ISOL}$		2.5		KV
Material of Module Baseplate 模块底板材料				Cu		
Internal Isolation 内部绝缘				Al <sub>2</sub> O <sub>3</sub>		
Creepage Distance 爬电距离	Terminal to heatsink			15.0		mm
	Terminal to terminal			13.0		
Clearance 电气间隙	Terminal to heatsink			12.5		mm
	Terminal to terminal			10.0		
Comparative Tracking Index 相对漏电起痕指数		CTI		200 <sup>2)</sup>		

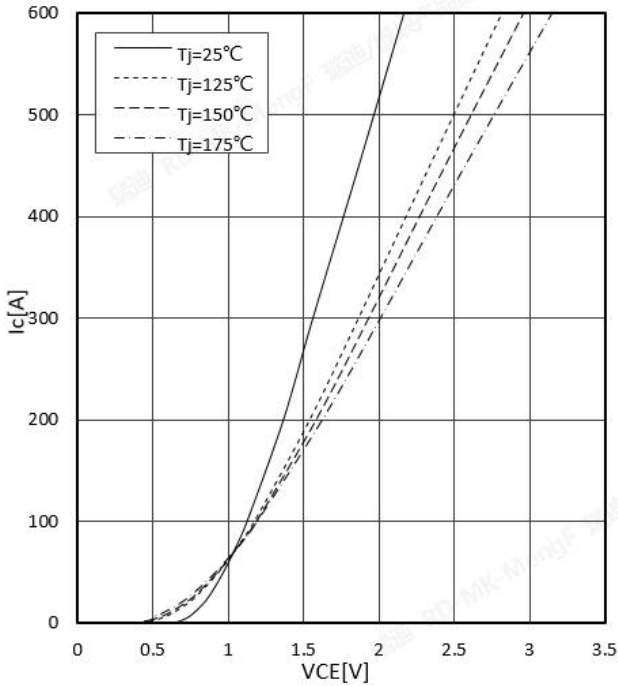
			min.	typ.	max.	
Stray Inductance Module 模块杂散电感		$L_{sCE}$	-	17	-	nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片	$T_C=25^{\circ}C, \text{ Per Switch}$	$R_{CC+EE}$	-	0.8	-	m $\Omega$
Storage Temperature 贮存温度		$T_{stg}$	-40	-	125	$^{\circ}C$
Mounting Torque for Module Mounting 模块安装力矩	Screw M5 / M5 螺丝	M	3.0	-	6.0	Nm
Power Terminal Installation Torque 功率端子安装扭矩	Screw M6 / M6 螺丝	M	3.0	-	6.0	Nm
Weight 重量		G	-	345	-	g

- 1) Terminal impedance is not included.  
不包含端子阻抗。
- 2) CTI is about 200.  
CTI 约等于 200。

Circuit Diagram / 曲线图

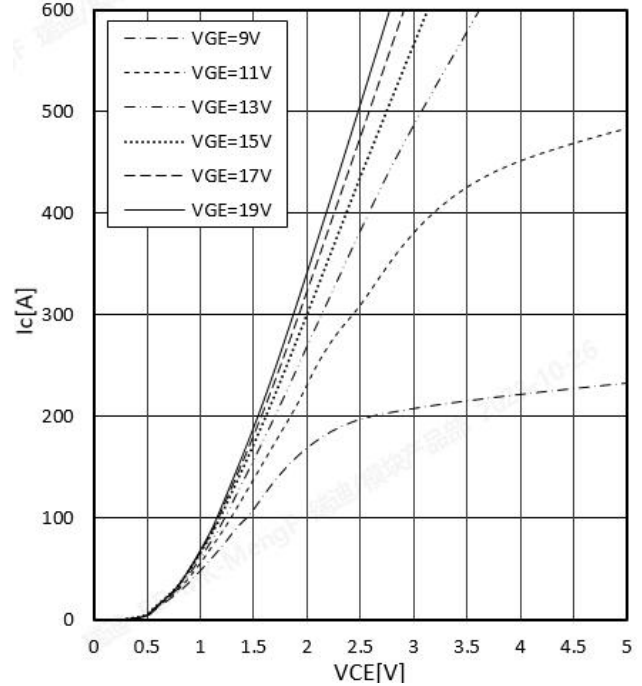
Output characteristic IGBT, Inverter (typical),  
输出特性 IGBT, 逆变器 (典型值)

$I_c=f(V_{CE}), V_{GE}=15V$



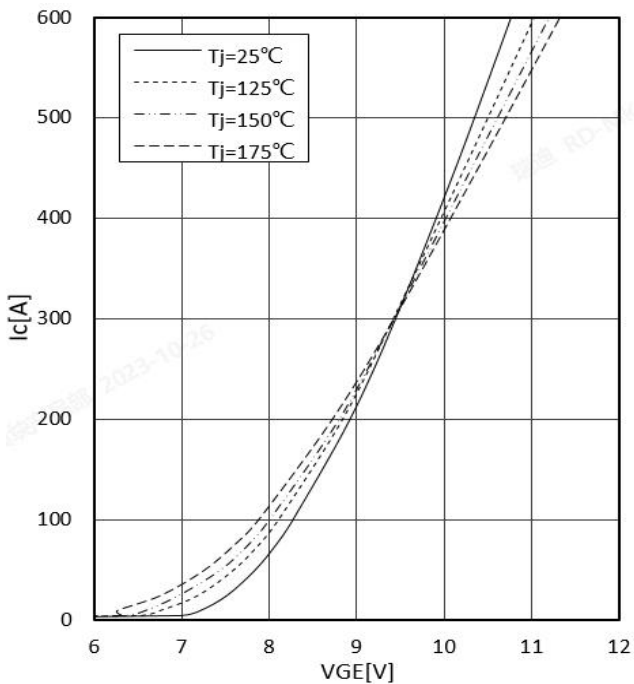
Output characteristic IGBT, Inverter (typical)  
输出特性 IGBT, 逆变器 (典型值)

$I_c=f(V_{CE}), T_{vj}=175^{\circ}C$



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

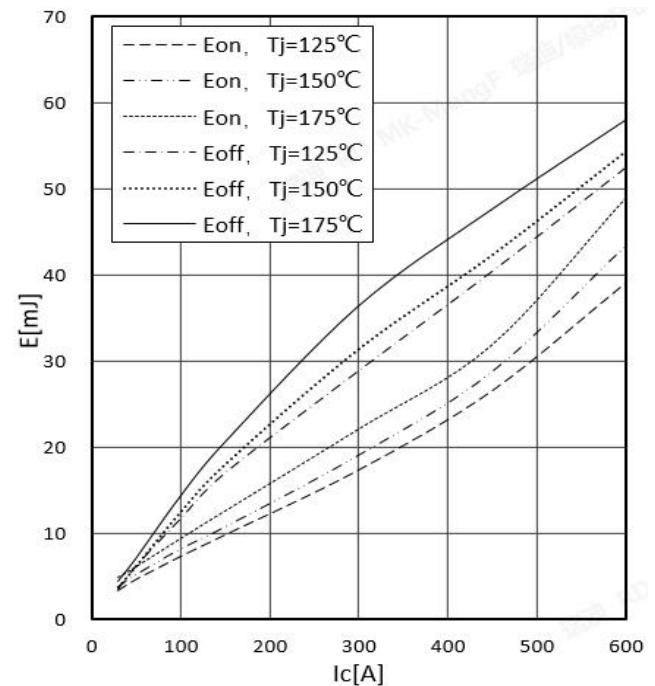
$I_c=f(V_{GE}), V_{CE}=20V$



Switching losses IGBT, Inverter (Typical)  
开关损耗 IGBT, 逆变器 (典型值)

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

$V_{GE}=+15V/-8V, R_{Gon}=1\Omega, R_{Goff}=1\Omega, V_{CC}=600V$

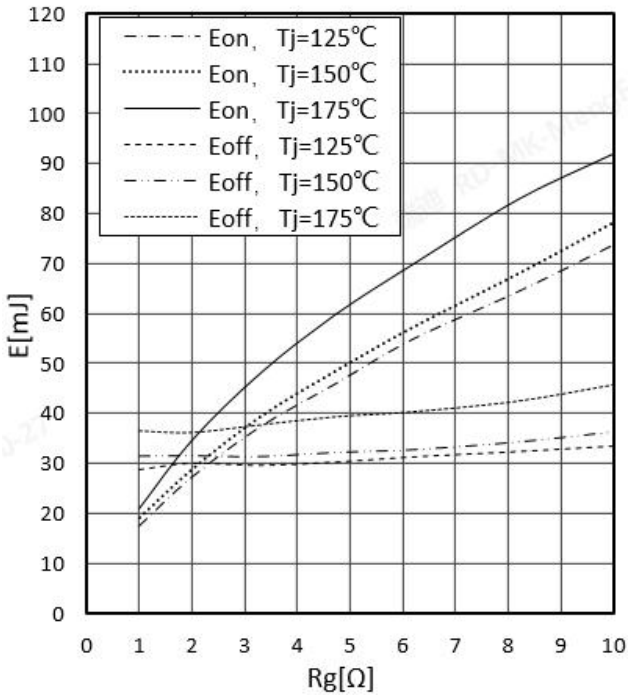


**Switching losses IGBT, Inverter (Typical)**

开关损耗 IGBT, 逆变器 (典型值)

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

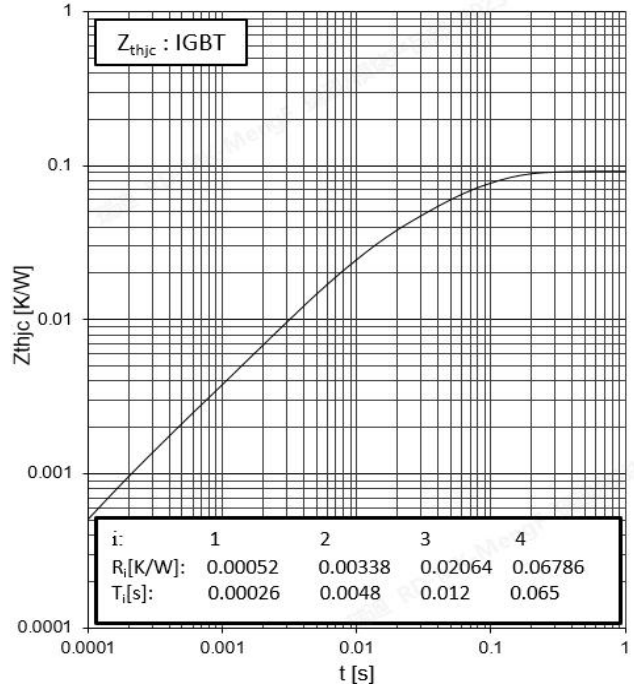
$V_{GE}=+15V/-8V, I_C=300A, V_{CC}=600V$



**Transient thermal impedance IGBT, Inverter**

瞬态热阻 IGBT, 逆变器

$Z_{thjc}=f(t)$

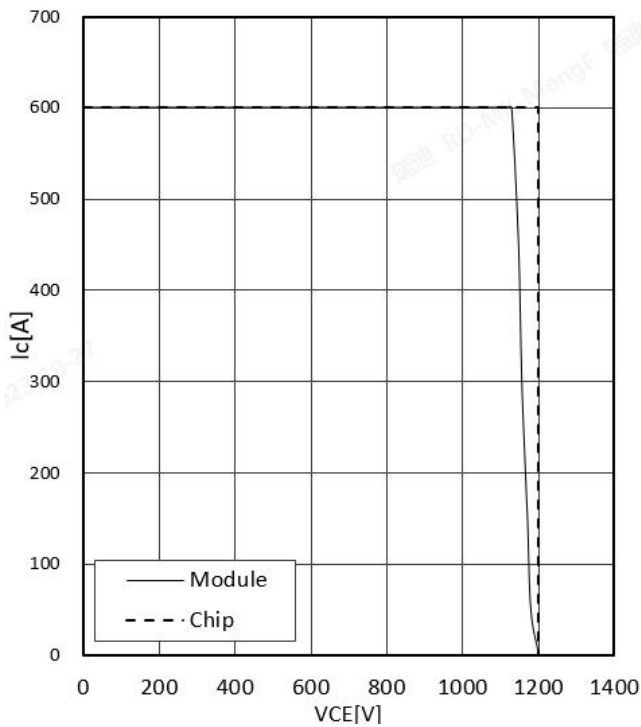


**Reverse bias safe operating area IGBT, Inverter (RBSOA)**

反向安全工作区 IGBT, 逆变器 (RBSOA)

$I_C=f(V_{CE})$

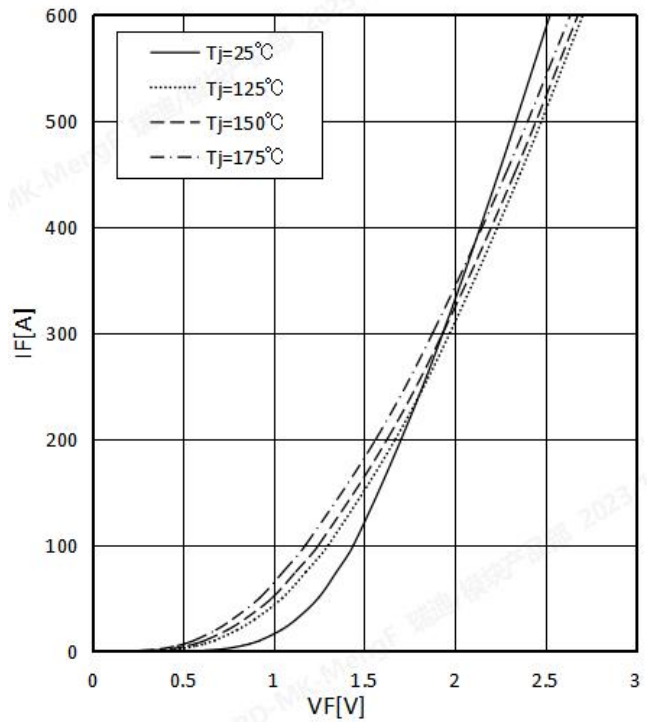
$V_{GE}=+15V/-8V, R_{Goff}=1\Omega, T_{vj}=175^\circ C$



**Forward characteristic of Diode, Inverter (typical)**

正向偏压特性 二极管, 逆变器 (典型值)

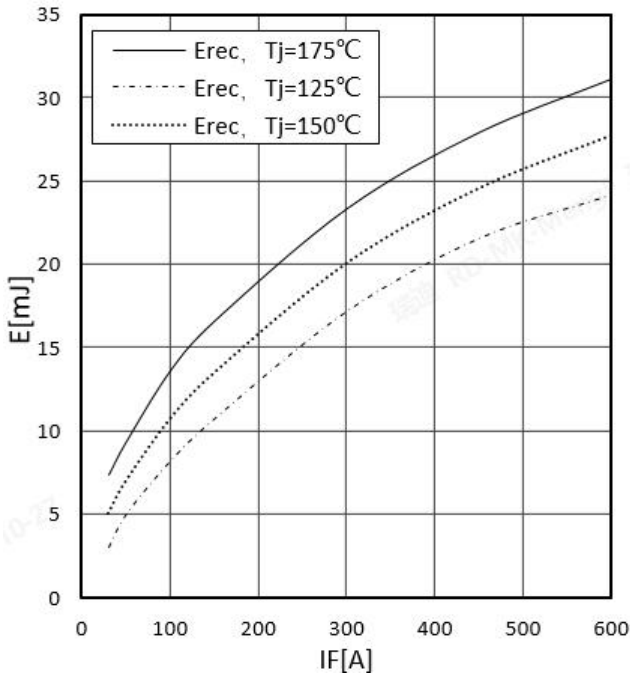
$I_F=f(V_F)$



Switching losses Diode, Inverter (typical)

开关损耗 二极管, 逆变器 (典型值)

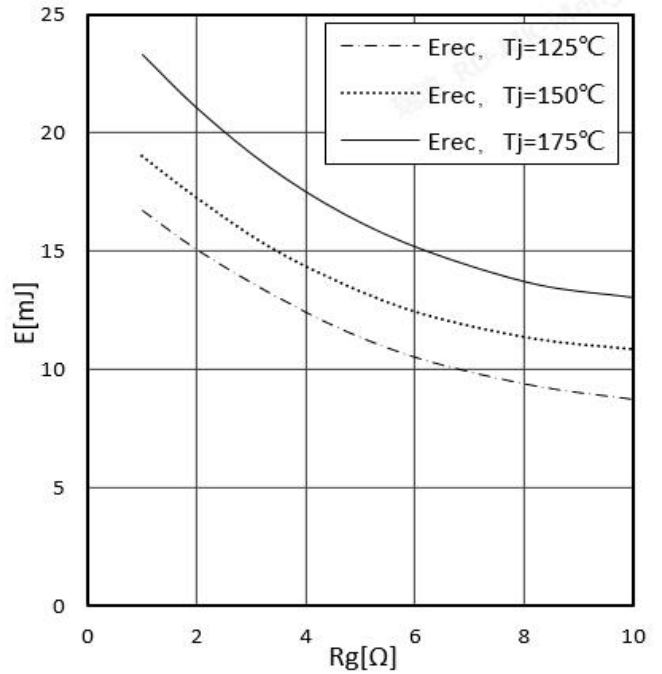
$E_{rec}=f(I_F)$ ,  
 $R_{gon}=1\ \Omega, V_{CE}=600V$



Switching losses Diode, Inverter (typical)

开关损耗 二极管, 逆变器 (典型值)

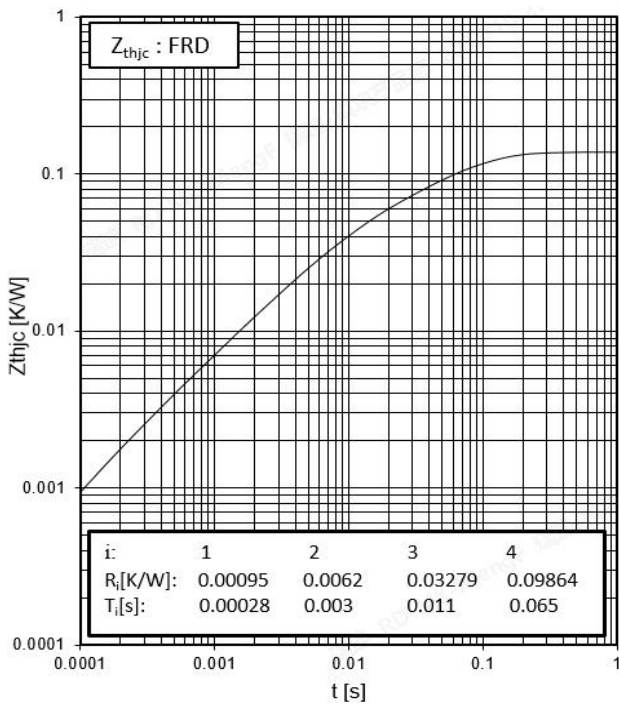
$E_{rec}=f(R_g)$ ,  
 $I_F=300A, V_{CE}=600V$



Transient thermal impedance Diode, Inverter

瞬态热阻抗 二极管, 逆变器

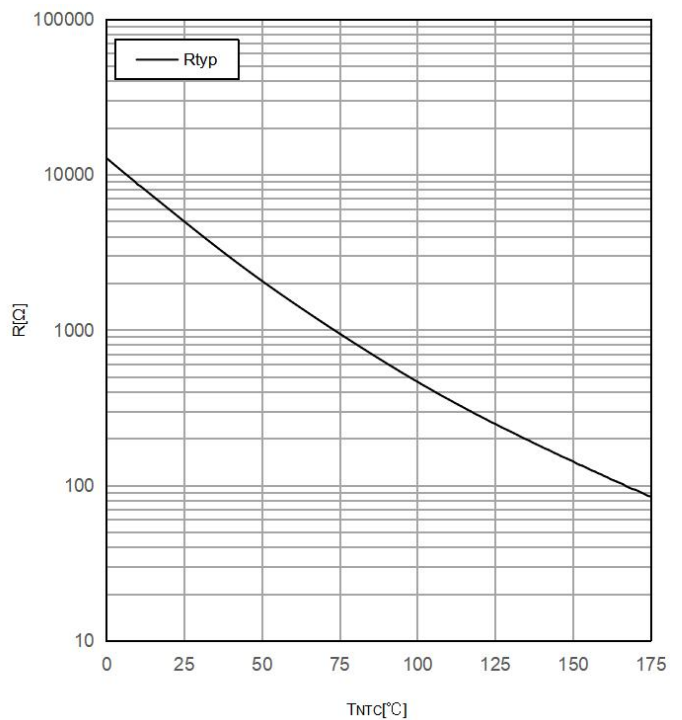
$Z_{thjc}=f(t)$



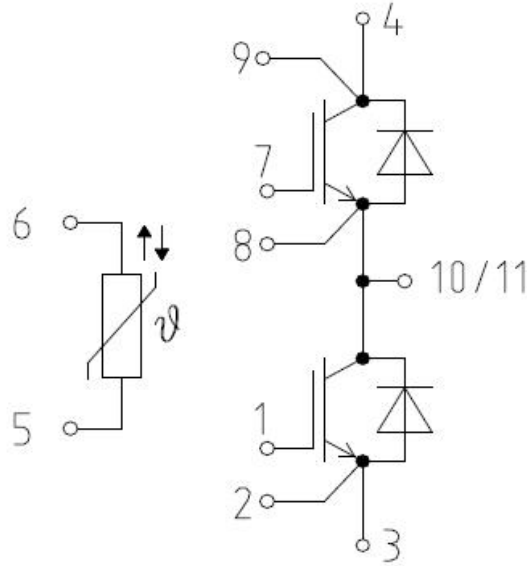
NTC-Thermistor-temperature characteristic(typical)

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

