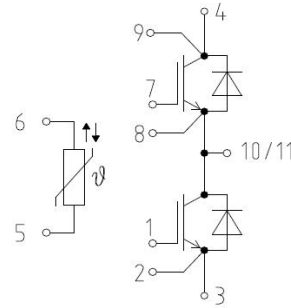


M series package: 1200V 300A IGBT module

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}	± 20	V

Characteristic Values / 性能参数

			min.	typ.	max.	
Collector-emitter Saturation Voltage ¹⁾ 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_{CESat}	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_{GEth}	5.0	6.0	7.0	V
Gate Charge 门极电荷	$V_{GE}=15\text{V/-8V}, V_{CE}=600\text{V}$	Q_G	-	3.0	-	μC
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$	R_{Gint}	-	0.65	-	Ω
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	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=15\text{V/-8V}$ $R_{Gon}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_{don}	-	193 195 203 205	-	ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=15\text{V/-8V}$ $R_{Gon}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_r	-	41 51 53 66	-	ns
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V/15V}$ $R_{Goff}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_{doff}	-	361 408 418 440	-	ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V/15V}$ $R_{Goff}=1\Omega$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	t_f	-	125 190 219 220	-	ns
Turn-on energy Loss Per Pulse 开通损耗	$I_C=300\text{A}, V_{CC}=600\text{V}$ $V_{GE}=-8\text{V/15V}$ $R_{Gon}=1\Omega, L_{\sigma}=35\text{nH}$ $di/dt=3600(T_{vj}=175^{\circ}\text{C})$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	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

Forward Voltage ¹⁾ 正向通态压降	I _F =300A, V _{GE} =0V	T _{vj} =25℃ T _{vj} =150℃ T _{vj} =175℃	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/us(T _{vj} =175℃)	T _{vj} =25℃ T _{vj} =125℃ T _{vj} =150℃ T _{vj} =175℃	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/us(T _{vj} =175℃)	T _{vj} =25℃ T _{vj} =125℃ T _{vj} =150℃ T _{vj} =175℃	Q _R	- 16.5 28.5 32.6 37.6	-	μC
Reverse Recovery Energy 反向恢复损耗	I _F =300A, V _{CC} =600V V _{GE} =-8V -di _F /dt=3600A/us(T _{vj} =175℃)	T _{vj} =25℃ T _{vj} =125℃ T _{vj} =150℃ T _{vj} =175℃	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 λ _{grease} = 1W(m•K)		R _{thCH}	-	0.026	K/W
Temperature under switching conditions 工作温度			T _{vj op}	-40	-	175℃

NTC-Thermistor/ NTC-热敏电阻

Characteristic Values / 性能参数

			min.	typ.	max.	
Rated Resistance 标称电阻	$T_{NTC}=25^{\circ}\text{C}$	R_{25}	-	5	-	K Ω
Deviation of R100 R100 偏移值	$T_{NTC}=100^{\circ}\text{C}$, $R_{100}=465\Omega$	$\Delta R/R$	-7.3	-	7.3	%
Power Dissipation 功率耗散	$T_{NTC}=25^{\circ}\text{C}$	P_{25}	-	-	10	mW
B-Value B 值	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	$B_{25/50}$	-	3380	-	K
	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	$B_{25/80}$	-	3470	-	K
	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$	$B_{25/100}$	-	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_2O_3		
Creepage Distance 爬电距离	Terminal to heatsink Terminal to terminal			15.0 13.0		mm
Clearance 电气间隙	Terminal to heatsink Terminal to terminal			12.5 10.0		mm
Comparative Tracking Index 相对漏电起痕指数		CTI		200 ²⁾		
			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	$T_C=25^{\circ}\text{C}$, Per Switch	R_{CC+EE}	-	0.8	-	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 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。

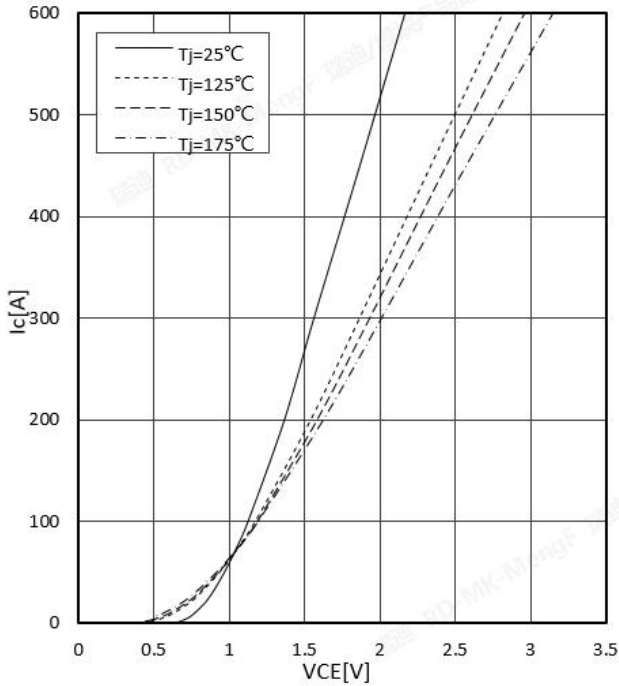
2) CTI is about 200.

CTI 约等于 200。

Circuit Diagram / 曲线图

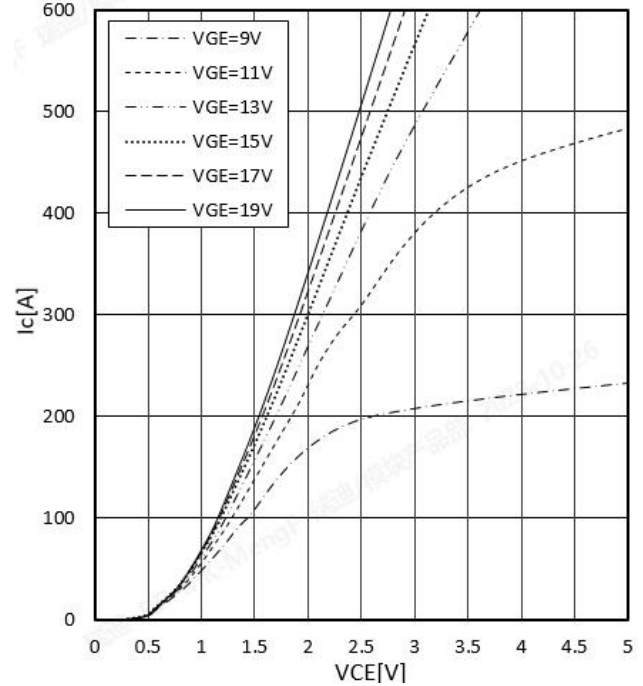
Output characteristic IGBT, Inverter (typical),
输出特性 IGBT, 逆变器 (典型值)

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



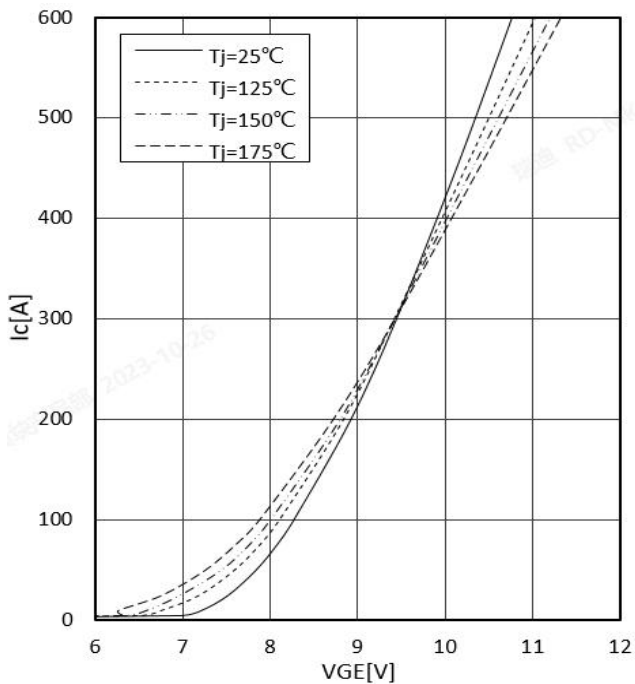
Output characteristic IGBT, Inverter (typical),
输出特性 IGBT, 逆变器 (典型值)

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



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

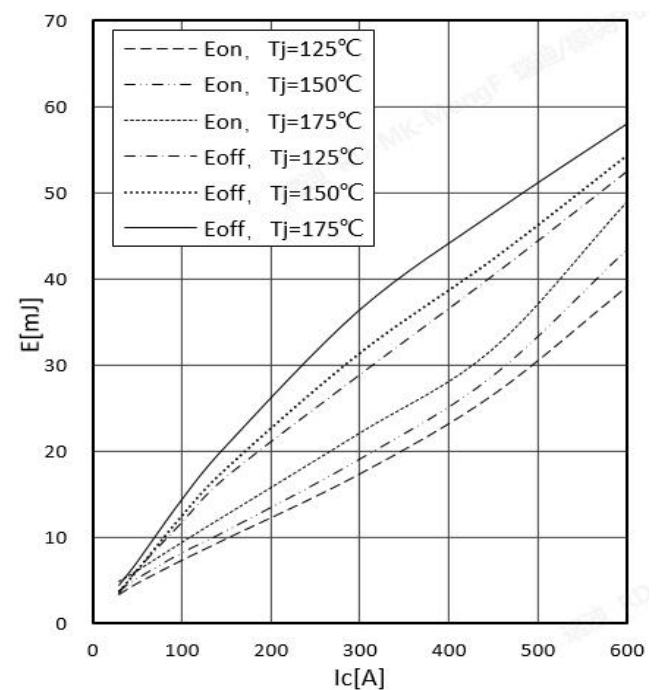
$$I_c = f(V_{GE}), V_{CE} = 20V$$



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

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

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

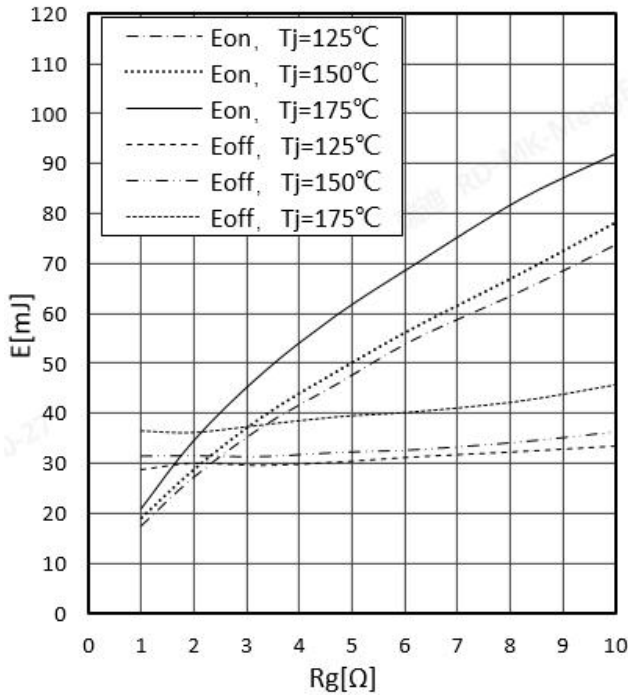


Switching losses IGBT, Inverter (Typical)

开关损耗 IGBT, 逆变器 (典型值)

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

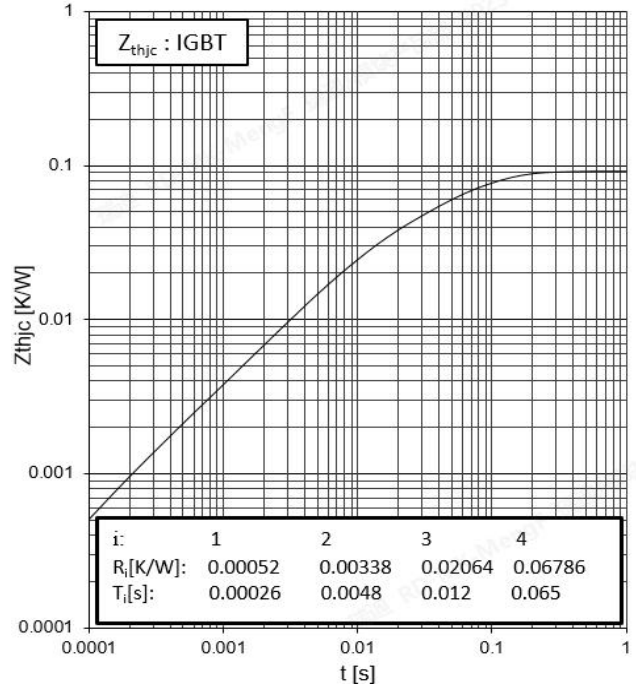
$$V_{GE}=+15V/-8V, I_C=300A, V_{CC}=600V$$



Transient thermal impedance IGBT, Inverter

瞬态热阻 IGBT, 逆变器

$$Z_{thjc}=f(t)$$

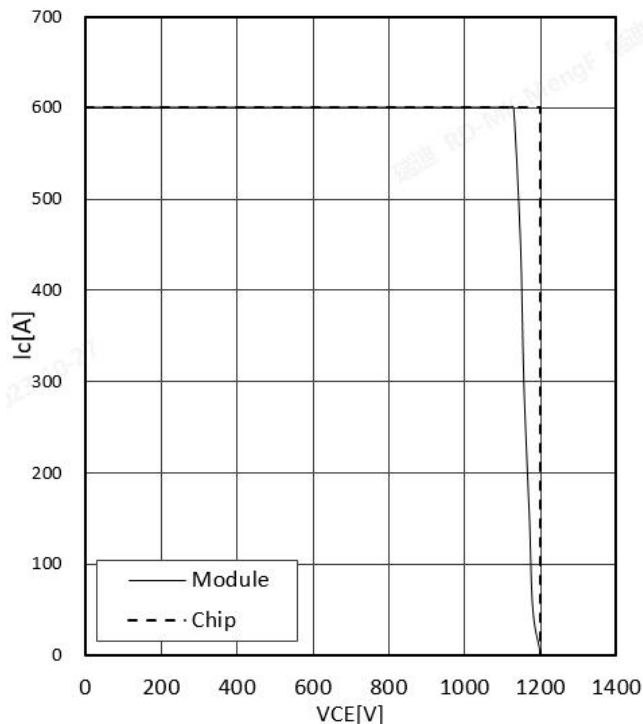


Reverse bias safe operating area IGBT, Inverter (RBSOA)

反向安全工作区 IGBT, 逆变器 (RBSOA)

$$I_C=f(V_{CE})$$

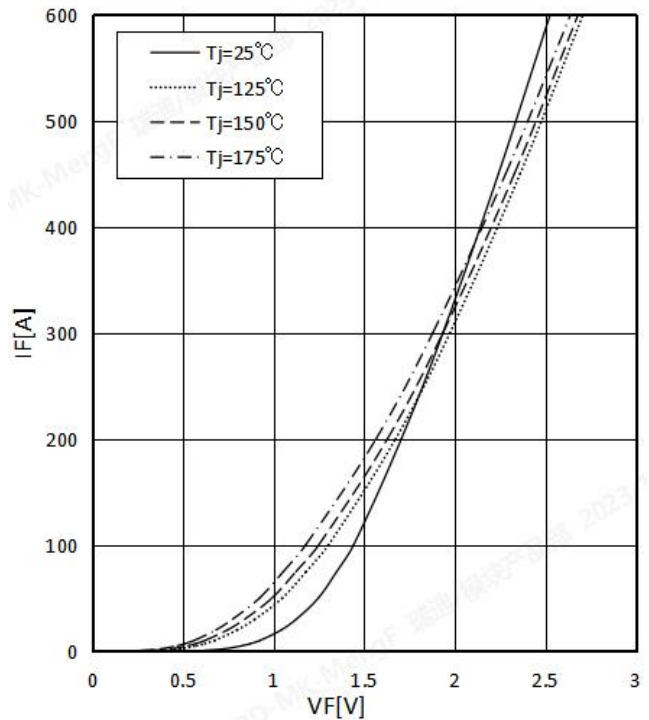
$$V_{GE}=+15V/-8V, R_{Goff}=1\Omega, T_{vj}=175^\circ\text{C}$$



Forward characteristic of Diode, Inverter (typical)

正向偏压特性 二极管, 逆变器 (典型值)

$$I_F=f(V_F)$$

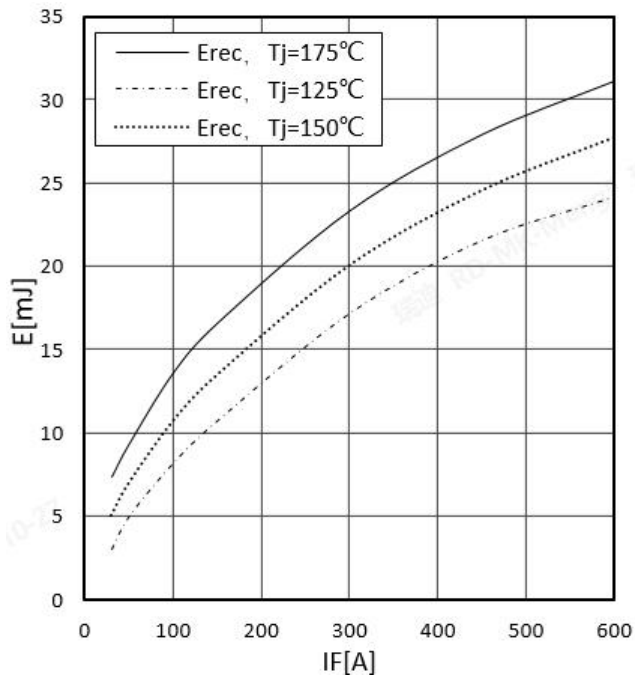


Switching losses Diode, Inverter (typical)

开关损耗 二极管, 逆变器 (典型值)

$E_{rec}=f(I_F)$,

$R_{gon}=1\ \Omega, V_{CE}=600V$

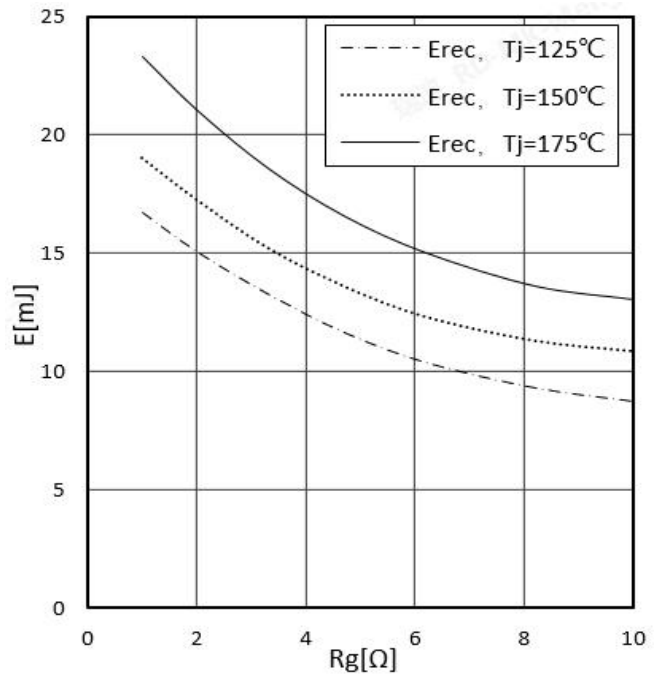


Switching losses Diode, Inverter (typical)

开关损耗 二极管, 逆变器 (典型值)

$E_{rec}=f(R_g)$,

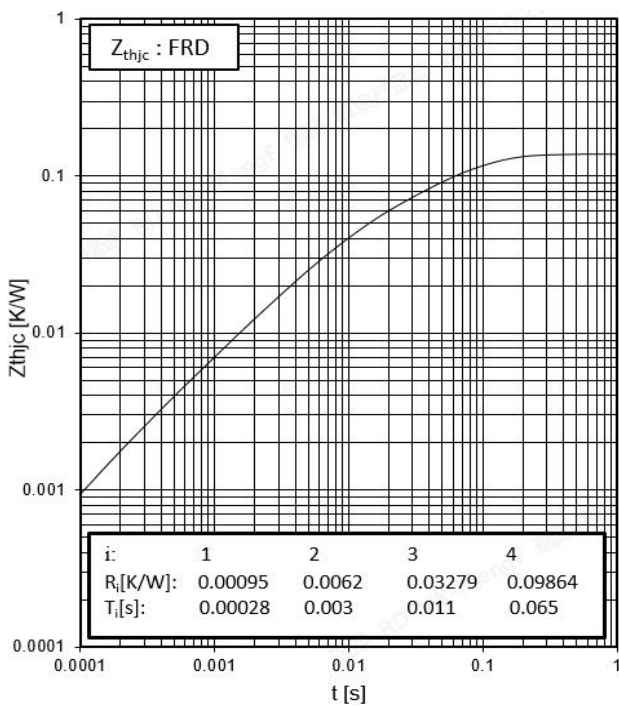
$I_F=300A, V_{CE}=600V$



Transient thermal impedance Diode, Inverter

瞬态热阻抗 二极管, 逆变器

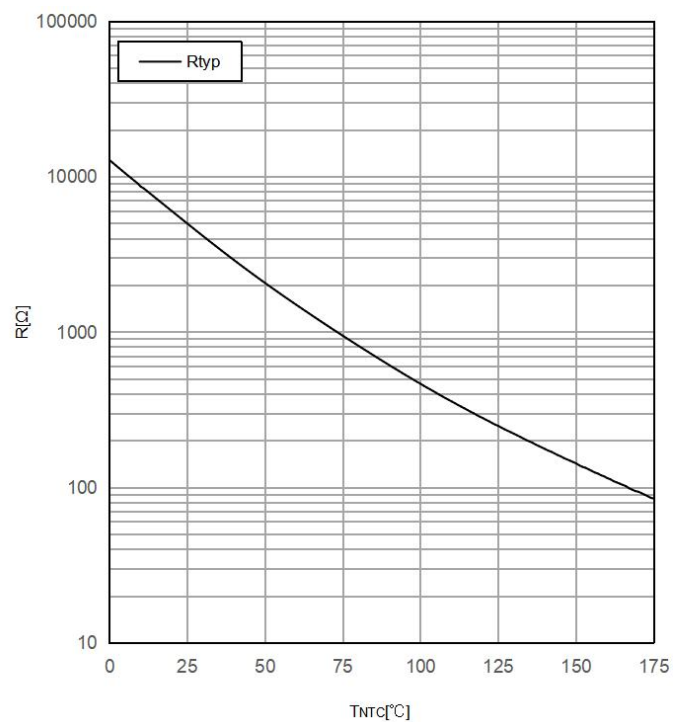
$Z_{thjc}=f(t)$



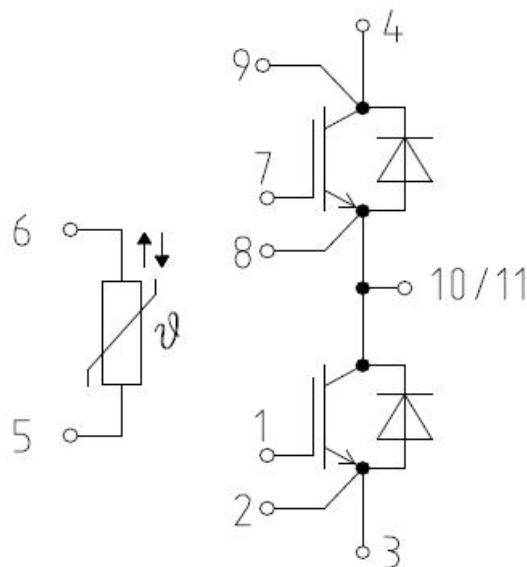
NTC-Thermistor-temperature characteristic (typical)

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

