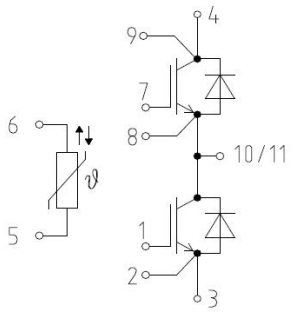
M series package: 1200V600A IGBT module Datasheet



等效电路图
Equivalent Circuit Schematic

Features:

- 1200V 600A, $V_{CE(sat)}$ =1.5 V@25℃
- MPT Gate Technology
- Low Losses
- High RBSOA capability
- Low reverse-recovery losses

产品特性:

- 1200V 600A, $V_{CE(sat)}$ = 1.5V@25℃
- 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℃	V_{CES}	1200	V
Continuous DC Collector Current 集电极连续直流电流	Tc=85℃， T_{vjmax}≤175℃	I_C	600	A
Repetitive Peak Collector Current 集电极可重复峰值电流	t_p=1ms	I_{CRM}	1200	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=600A,V_{GE}=15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	V_{CEsat}	1.40	1.50 1.77 1.79	1.70	V
Gate Threshold Voltage 门极阈值电压	V_{CE}=V_{GE},I_C=24mA,T_{vj}=25℃		V_{GEth}	5.0	6.0	7.0	V
Gate Charge 门极电荷	V_{GE}=-15V/15V,V_{CE}=600V		Q_G	-	7.08	-	μC
Internal Gate Resistor 内置门极电阻	T_{vj}=25℃		R_{Gint}	-	0.43	-	Ω
Input Capacitance 输入电容	V_{CE}=25V,V_{GE}=0V,T_{vj}=25℃,f=100KHz		C_{ies}	-	128	-	nF
Reverse Transfer Capacitance 反向传输电容	V_{CE}=25V,V_{GE}=0V,T_{vj}=25℃,f=100KHz		C_{res}	-	0.48	-	nF
Collector-Emitter Cutoff Current 集电极-发射极关断漏电流	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25℃		I_{CES}	-	-	0.1	mA
Gate-Emitter Leakage Current 门极-发射极漏电流	V_{CE}=0V,V_{GE}=20V,T_{vj}=25℃		I_{GES}	-	-	500	nA
Turn-on Delay Time, Inductive Load 开通延迟时间，感性负载	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V R_{Gon}=0.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	t_{don}	-	250 255 260 251	-	ns
Rise Time, Inductive Load 上升时间，感性负载	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V R_{Gon}=0.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	t_r	-	79 95 95 93	-	ns
Turn-off Delay Time, Inductive Load 关断延迟时间，感性负载	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V R_{Goff}=3.6Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	t_{doff}	-	883 943 960 906	-	ns
Fall Time, Inductive Load 下降时间，感性负载	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V R_{Goff}=3.6Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	t_f	-	68 119 151 164	-	ns
Turn-on Energy Loss Per Pulse 开通损耗	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V,Lσ=35nH R_{Gon}=0.5Ω di/dt=5200A/us(T_{vj}=175℃)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	E_{on}	-	40.3 59.4 65.2 86.5	-	mJ

Turn-off Energy Loss Per Pulse 关断损耗	I_C=600A,V_{CE}=600V V_{GE}=-8V/15V,L_σ=35nH R_{Goff}=3.6Ω dv/dt=5500V/us(T_{vj}=175℃)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	E_{off}	-	54.6 69.7 72.9 80.7	-	mJ
SC Data 短路耐量	V_{GE}=-8V/15V V_{CC}=600V	t_P≤8μs,T_{vj}=150℃ t_P≤6μs,T_{vj}=175℃	I_{sc}	-	3000 2600	-	A
Thermal Resistance, Junction to Case 结-外壳热阻	Per IGBT/单个 IGBT		R_{thJC}	-	0.051	-	K/W
Thermal Resistance, Case to Heatsink 外壳-散热器热阻	Per IGBT/单个 IGBT λ_{grease} = 1W(m•K)		R_{thCH}	-	0.019	-	K/W
Temperature under switching conditions 工作温度			$T_{vj\ op}$	-40	-	175	℃

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℃	V_{RRM}	1200		V
Continuous DC Forward Current 可连续正向直流电流		I_{Fnom}	600		A
Repetitive Peak Forward Current 可重复正向峰值电流	I_{FRM}=2×I_F	I_{FRM}	1200		A

Characteristic Values / 性能参数

				min.	typ.	max.	
Forward Voltage[2)] 正向通态压降	I_F=600A, V_{GE}=0V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	V_F	1.75	2.15 2.30 2.25	2.50	V
Peak Reverse Recovery Current 反向恢复峰值电流	I_F=600A, V_R=600V -di$_F$/dt=6300A/us(T_{vj}=175℃) V_{GE}=-8V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	I_{RM}	-	264 320 352 384	-	A
Recovery Charge 反向恢复电荷	I_F=600A, V_R=600V -di$_F$/dt=6300A/us(T_{vj}=175℃) V_{GE}=-8V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	Q_R	-	19.4 33.8 40.3 50.1	-	μC
Reverse Recovery Energy 反向恢复损耗	I_F=600A, V_R=600V -di$_F$/dt=6300A/us(T_{vj}=175℃) V_{GE}=-8V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=150℃ T_{vj}=175℃	E_{rec}	-	3.3 12.4 14.1 18.5	-	mJ
Thermal Resistance, Junction to Case 结-外壳热阻	Per FRD/单个 FRD		R_{thJC}	-	0.072	-	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_{thJC}	-	0.023	-	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℃	R_{25}	-	5	-	KΩ
Deviation of R100 R100 偏移值	T_{NTC}=100℃，R_{100}=465Ω	△R/R	-7.3	-	7.3	%
Power Dissipation 功率耗散	T_{NTC}=25℃	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}	3		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		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)]		

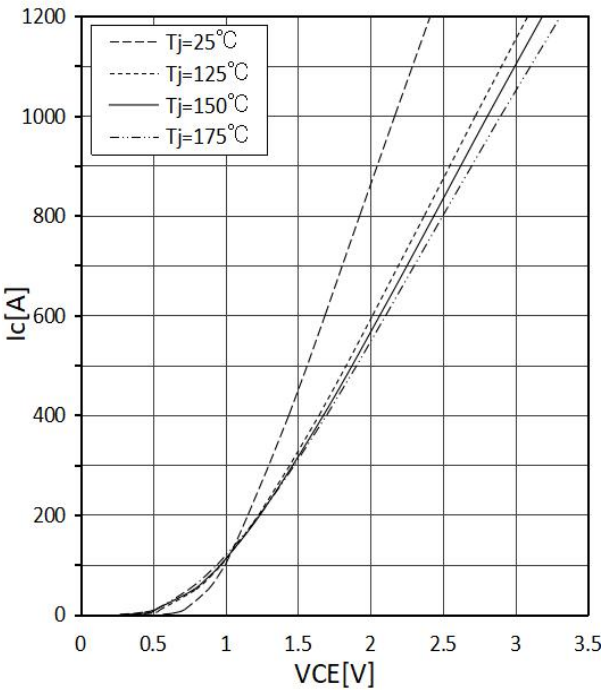
			min.	typ.	max.	
Stray Inductance Module 模块杂散电感		L_{sCE}	-	20	-	nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻，端子-芯片	T_C=25℃，Per Switch	$R_{CC'+EE'}$	-	0.8	-	mΩ
Storage Temperature 贮存温度		T_{stg}	-40	-	125	℃
Mounting Torque for Module Mounting 模块安装力矩	Screw M5 / M5 螺丝	M	3.0	-	6.0	Nm
Power Terminal Installation 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。

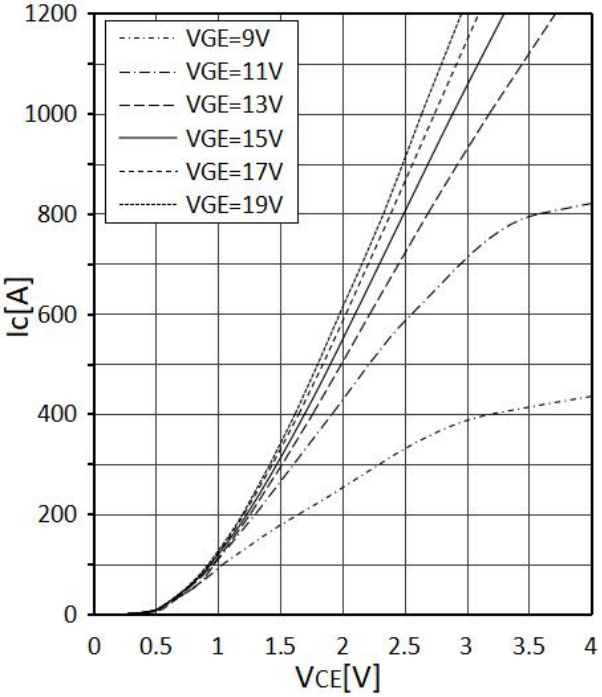
2）CTI is about 200.
CTI 约等于 200。

Circuit Diagram / 曲线图

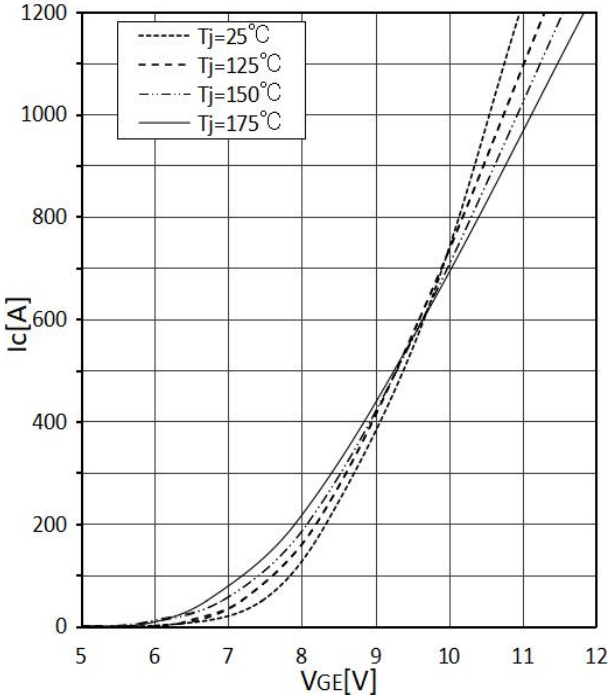
Output characteristic IGBT, Inverter (typical),
输出特性 IGBT，逆变器（典型值）
$I_C=f(V_{CE}), V_{GE}=15V$



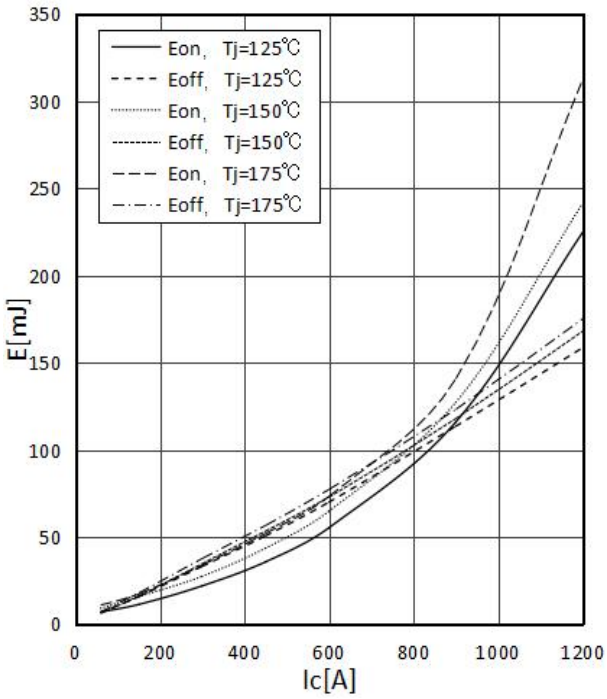
Output characteristic IGBT, Inverter (typical)
输出特性 IGBT，逆变器（典型值）
$I_C=f(V_{CE}), T_{vj}=175℃$



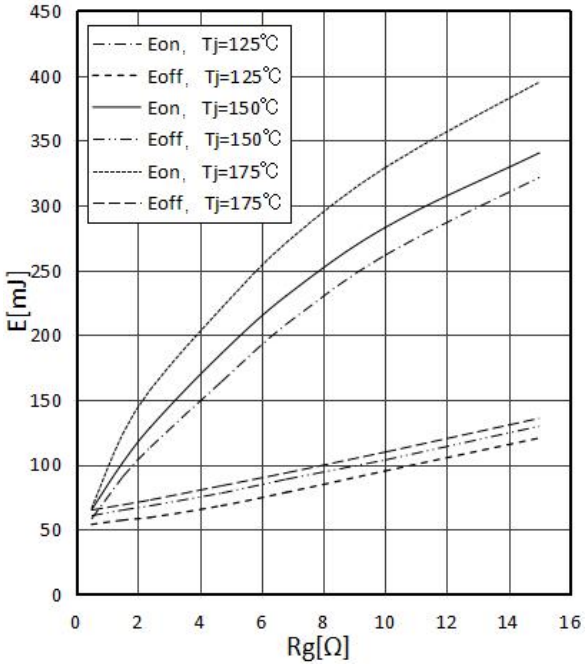
Transfer characteristic IGBT, Inverter (typical)
传输特性 IGBT ，逆变器（典型值）
$I_C=f(V_{GE}), V_{CE}=20V$



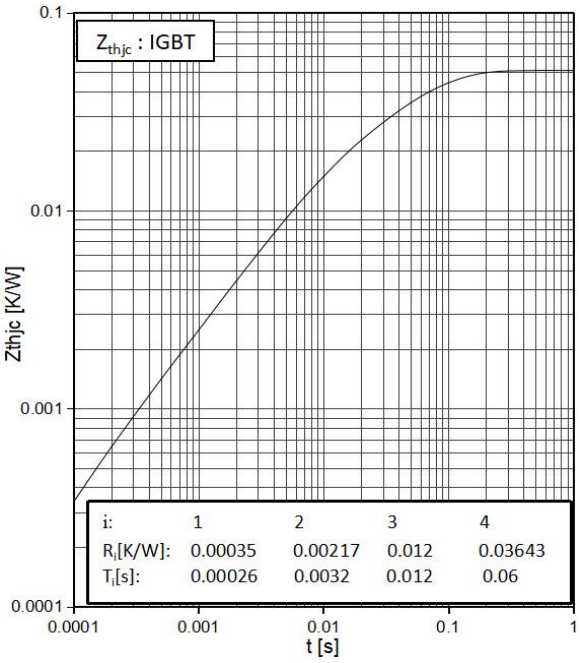
Switching losses IGBT, Inverter (Typical)
开关损耗 IGBT，逆变器（典型值）
$E_{on}=f(I_C)$, $E_{off}=f(I_C)$
V_{GE}=+15V/-8V, R_{Gon}=0.5Ω, R_{Goff}=3.6Ω, V_{CC}=600V



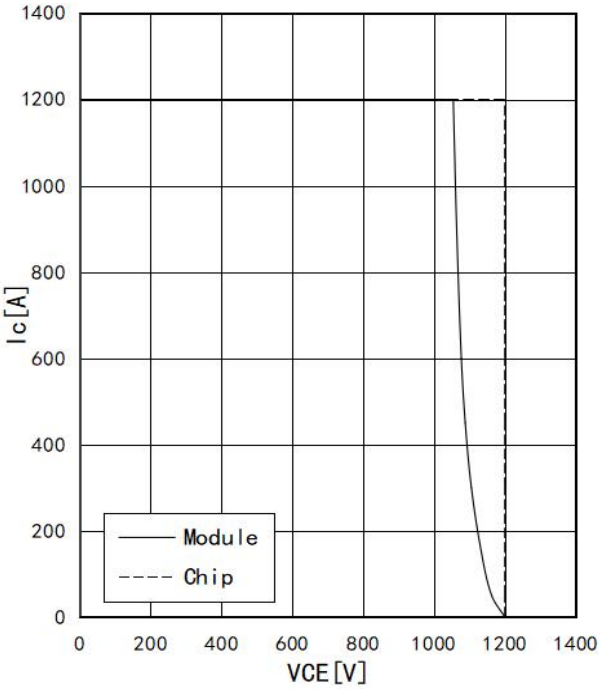
Switching losses IGBT, Inverter (Typical)
开关损耗 IGBT，逆变器（典型值）
$E_{on}=f(R_G)$,$E_{off}=f(R_G)$,
V_{GE}=+15V/-8V,I_C=600A,V_{CE}=600V



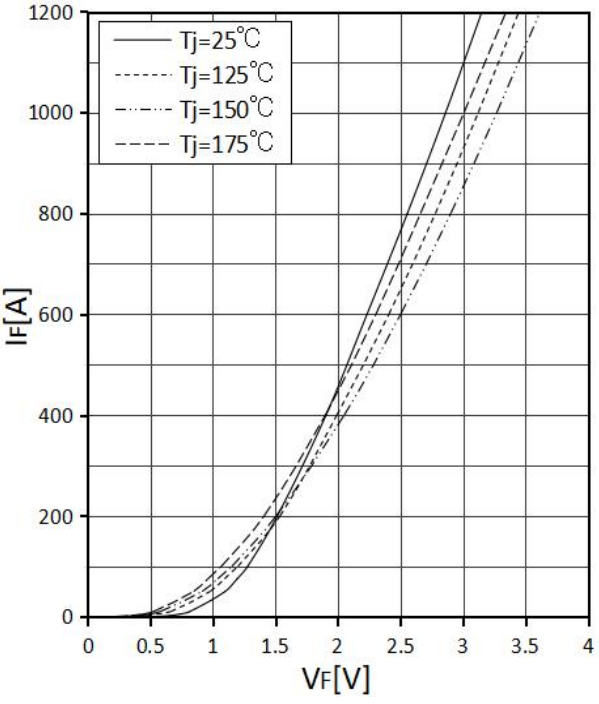
Transient thermal impedance IGBT, Inerter
瞬态热阻 IGBT，逆变器
$Z_{thJC}=f(t)$



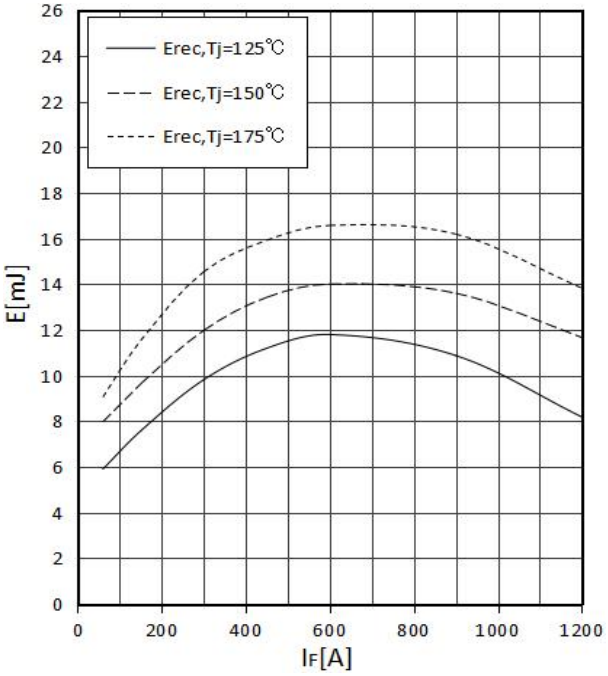
Reverse bias safe operating area IGBT, Inverter (RBSOA)
反向安全工作区 IGBT，逆变器(RBSOA)
$I_C=f(V_{CE})$
V_{GE}=+15V/-8V, R_{Goff}=3.6Ω ,T_{vj}=175℃



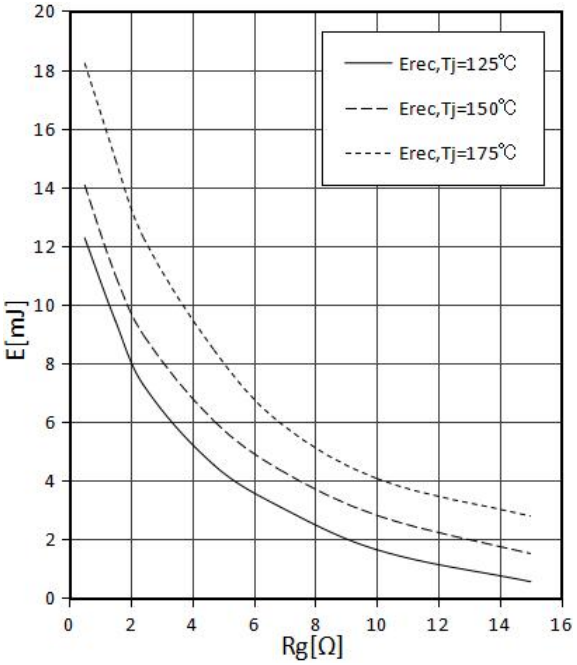
Forward characteristic of Diode, Inverter (typical)
正向偏压特性 二极管，逆变器（典型值）
$I_F=f(V_F)$



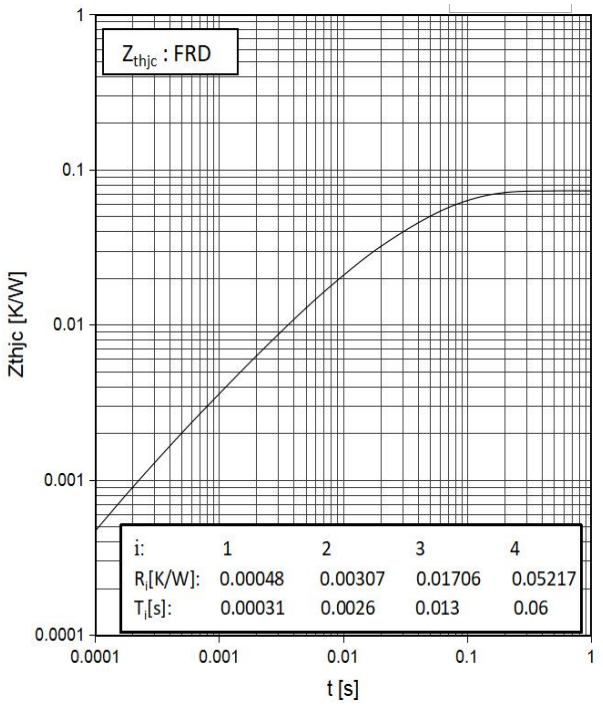
Switching losses Diode, Inverter (typical)
开关损耗 二极管，逆变器（典型值）
$E_{rec}=f(I_F)$,
$R_{gon}=0.5\,\Omega$,$V_{CE}=600V$



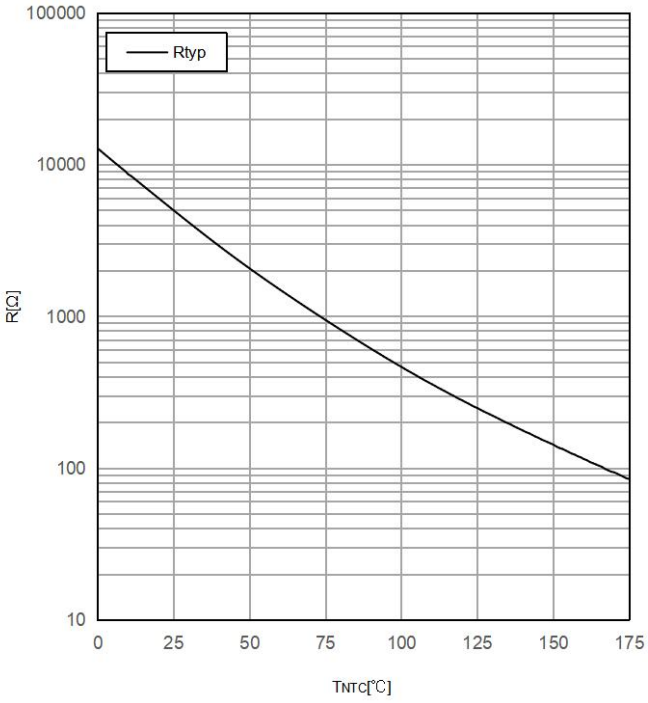
Switching losses Diode, Inverter (typical)
开关损耗 二极管，逆变器（典型值）
$E_{rec}=f(R_G)$,
$I_F=600A$,$V_{CE}=600V$



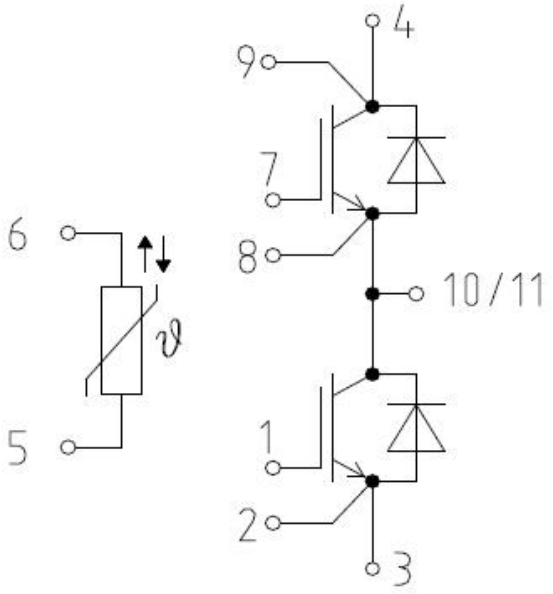
Transient thermal impedance Diode, Inerter
瞬态热阻抗 二极管，逆变器
$Z_{thJC}=f(t)$



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