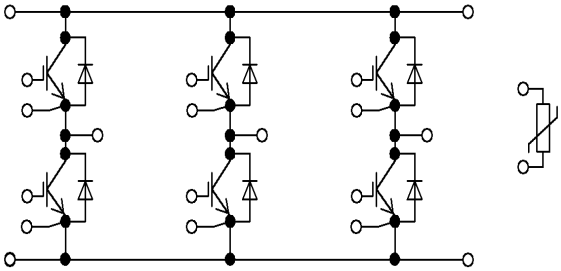
N3 package: 1200V 200A IGBT module



等效电路图
Equivalent Circuit Schematic

Features:

- 1200V 200A,$V_{CE(sat)}$ = 1.50V @25℃
- MPT Gate Technology
- Low Losses
- High RBSOA capability
- Low reverse-recovery losses

产品特性:

- 1200V 200A,$V_{CE(sat)}$ = 1.50V@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
- Servo Drives

典型应用：

- 电机驱动
- 伺服驱动

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

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		$I_{C\ nom}$	200	A
	T_C=100℃, T_{vjmax}=175℃	I_C	230	A
Repetitive Peak collector current 集电极可重复峰值电流	I_{CRM}=2×$I_{C\ nom}$	I_{CRM}	400	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=200A, V_{GE}=15V I_C=200A, V_{GE}=15V I_C=200A, V_{GE}=15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	V_{CEsat}		1.50 1.75 1.79	1.70	V
Gate Threshold Voltage 门极阈值电压	V_{CE}= V_{GE}, I_C=4mA,	T_{vj}=25℃	V_{GEth}	5.5	6.0	7.0	V
Gate Charge 门极电荷	V_{GE} =-8V/15V, V_{CE}=600V	T_{vj}=25℃	Q_G		1.78		uC
Internal Gate Resistor 内置门极电阻	T_{vj}=25℃		R_{Gint}		3.50		Ω
Input Capacitance 输入电容	V_{CE} = 25V, V_{GE} = 0V f = 100KHz, T_{vj}= 25℃		C_{ies}		42.5		nF
Reverse Transfer Capacitance 反向传输电容			C_{res}		0.12		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}			200	uA
Gate-emitter Leakage Current 门极-发射极漏电流	V_{CE}=0V, V_{GE}=20V,	T_{vj}=25℃	I_{GES}			200	nA
Turn-on Delay Time, Inductive Load 开通延迟时间，感性负载	I_C=200A, V_{CE}=600V V_{GE}=±15V R_{Gon}=1.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	t_{don}		160 190 195		ns
Rise Time, Inductive Load 上升时间，感性负载	I_C=200A, V_{CE}=600V V_{GE}=±15V R_{Gon}=1.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	t_r		50 60 65		ns
Turn-off Delay Time, Inductive Load 关断延迟时间，感性负载	I_C=200A, V_{CE}=600V V_{GE}=±15V R_{Goff}=2.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	t_{doff}		265 290 310		ns
Fall Time, Inductive Load 下降时间，感性负载	I_C=200A, V_{CE}=600V V_{GE}=±15V R_{Goff}=2.5Ω	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	t_f		140 220 270		ns
Turn-on energy loss per pulse 开通损耗	I_C=200A, V_{CE}=600V, V_{GE}=±15V R_{Gon}=1.5Ω, di/dt = 2400 A/μs (Tvj=175 °C)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	E_{on}		12.5 22.0 26.0		mJ
Turn-off energy loss per pulse 关断损耗	I_C=200A, V_{CE}=600V, V_{GE}=±15V R_{Goff}=2.5Ω, dv/dt = 7100 V/μs (Tvj=175°C)	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	E_{off}		15.5 21.5 23.5		mJ

SC Data 短路耐量	V_{CE} =800V, V_{GE} =±15V	$t_p \leqslant$ 8us,T_{vj} =150℃	I_{sc}		610		A
		$t_p \leqslant$7us,T_{vj} =175℃			600		
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT		R_{thJC}		0.135		K/W
Temperature under switching conditions[2)] 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		$I_{F\,nom}$	200		A
Repetitive Peak Forward Current 可重复正向峰值电流	I_{FRM}=2×$I_{F\,nom}$	I_{FRM}	400		A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage[1)] 正向通态压降	I_F=200A, V_{GE}=0V I_F=200A, V_{GE}=0V I_F=200A, V_{GE}=0V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	V_F		2.08 2.20 2.20	2.40	V
Peak Reverse Recovery Current 反向恢复峰值电流	I_F=200A, V_R=600V -di$_F$/dt=2380A/us(T_{vj}=175℃), V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	I_{RM}		145 145 165		A
Recovery Charge 反向恢复电荷	I_F=200A, V_R=600V -di$_F$/dt=2380A/us(T_{vj}=175℃), V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	Q_R		8.30 12.5 19.5		uC
Reverse Recovery Energy 反向恢复损耗	I_F=200A, V_R=600V -di$_F$/dt=2380A/us(T_{vj}=175℃ V_{GE}=-15V	T_{vj}=25℃ T_{vj}=125℃ T_{vj}=175℃	E_{rec}		2.10 5.50 8.50		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode /单个 Diode		R_{thJC}		0.194		K/W
Temperature under switching conditions[2)] 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		
	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	$B_{25/100}$		3520		

Module / 模块

Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	V_{ISOL}	3.0	KV
Material of Module Baseplate 模块底板材料			Cu	
Internal Isolation 内部绝缘	基本绝缘（class 1, IEC 61140） Basic insulation (class1,IEC 61140		Al_2O_3	
Creepage Distance 爬电距离	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		10.0	mm
Clearance 电气间隙	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		7.5	mm
Comparative Tracking Index[3)] 相对漏电起痕指数		CTI	>200	

			min.	typ.	max.	
Stray Inductance Module 模块杂散电感		L_{sCE}		27		nH
Module lead resistance 模块引脚电阻	T_C =25°C,每个开关 per switch	$R_{CC'+EE}$		1.5		mΩ
Storage Temperature 贮存温度		T_{stg}	-40		125	℃
Modul Mounting torque 模块安装扭距	M5	M	4.0		6.0	Nm
Weight 重量		G		310		g

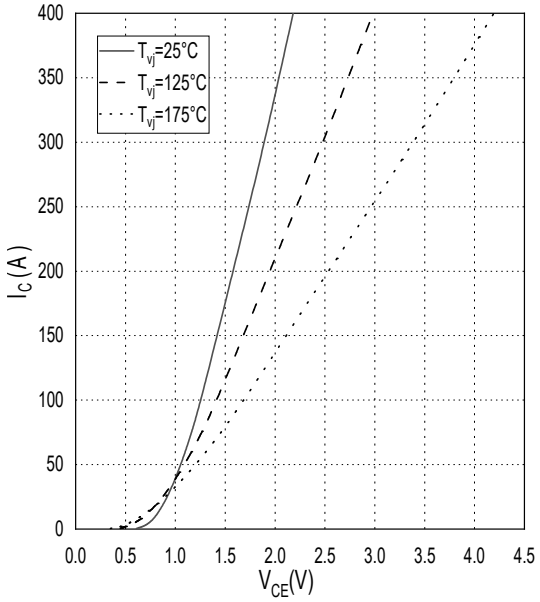
注： 1）Terminal impedance is not included.

不包含端子阻抗。

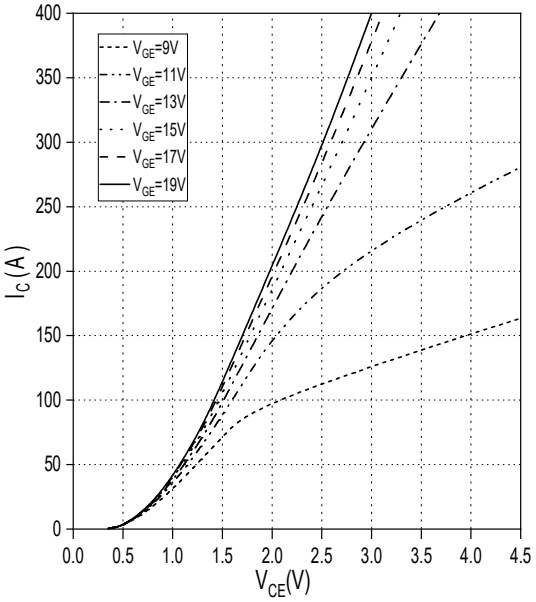
2）Tvj op > 150 °C is only allowed for operation at overload conditions

Tvj op > 150 °C 仅允许在过载条件下运行。

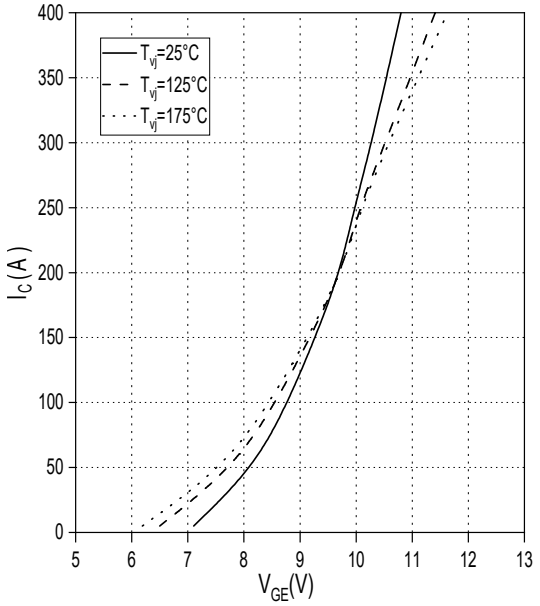
输出特性 IGBT,逆变器(典型值)
Output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$V_{GE} = 15V$



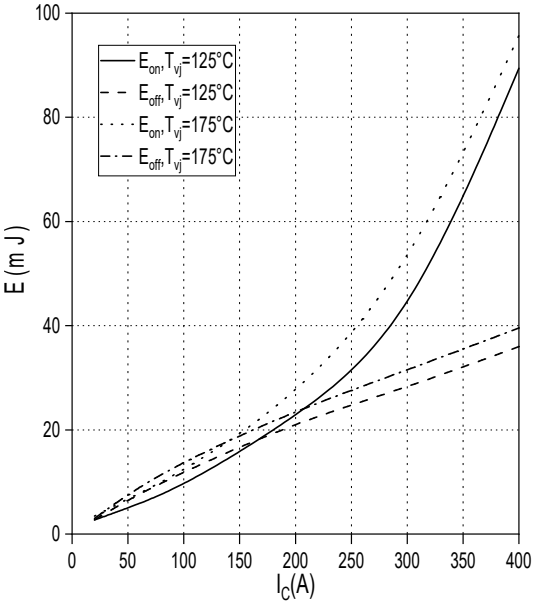
输出特性 IGBT, 逆变器(典型值)
Output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$T_{vj} = 175℃$



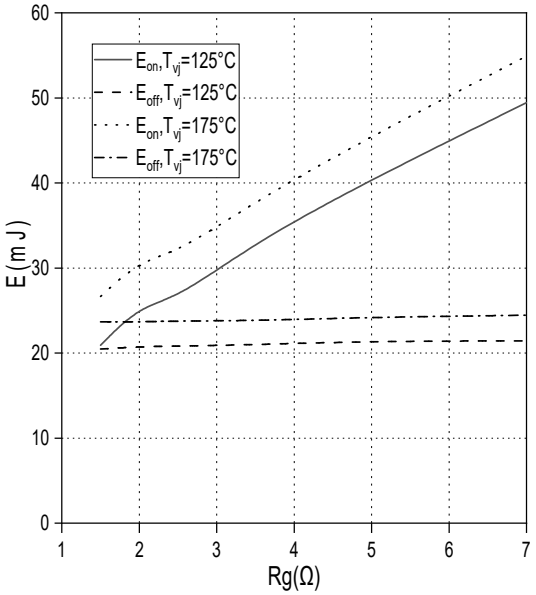
传输特性 IGBT, 逆变器 (典型值)
Transfer characteristic IGBT, Inverter (typical)
$I_C = f(V_{GE})$,
$V_{CE} = 20V$



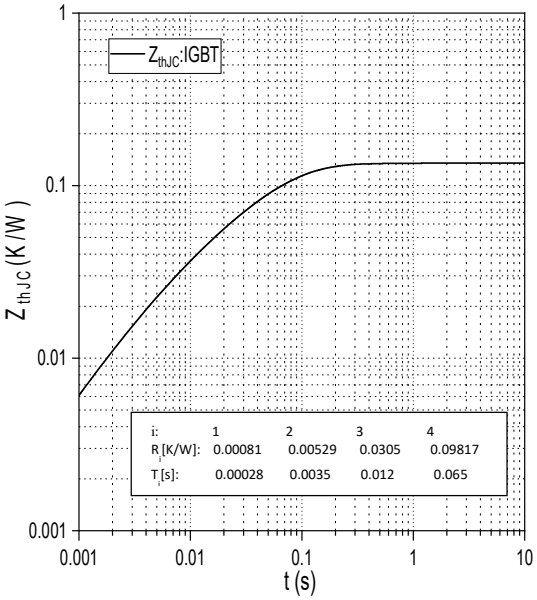
开关损耗 IGBT ,逆变器（典型值)
Switching losses IGBT , Inverter (typical)
$E_{on} = f(I_C), E_{off} = f(I_C)$, $V_{GE} = \pm 15V$,
$R_{Gon} = 1.5\Omega, R_{Goff} = 2.5\Omega, V_{CE} = 600V$



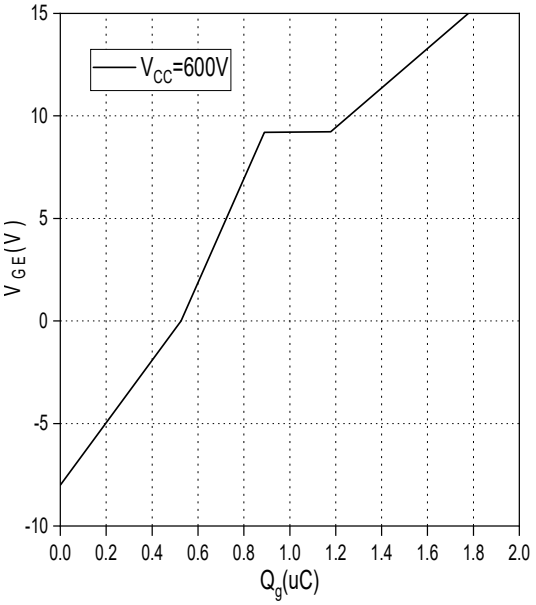
开关损耗 IGBT, 逆变器（典型值）
Switching losses IGBT, Inverter (typical)
E = f(Rg) V_{GE} = ±15V,I_C = 200A,V_{CE} = 600V



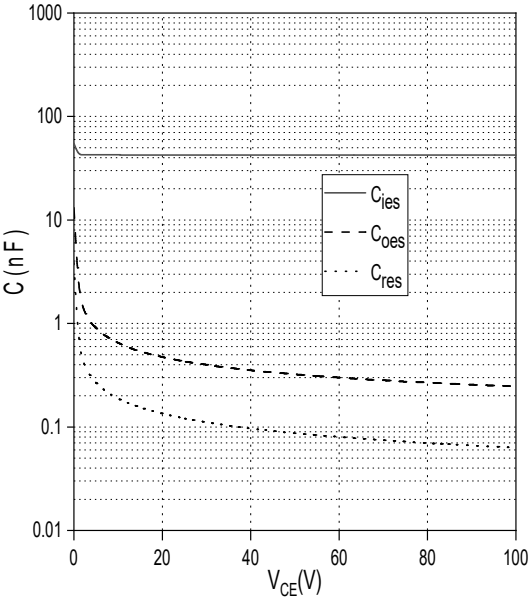
瞬态热阻抗 IGBT,逆变器
Transient thermal impedance IGBT , Inverter
Z_{thJC} = f(t)



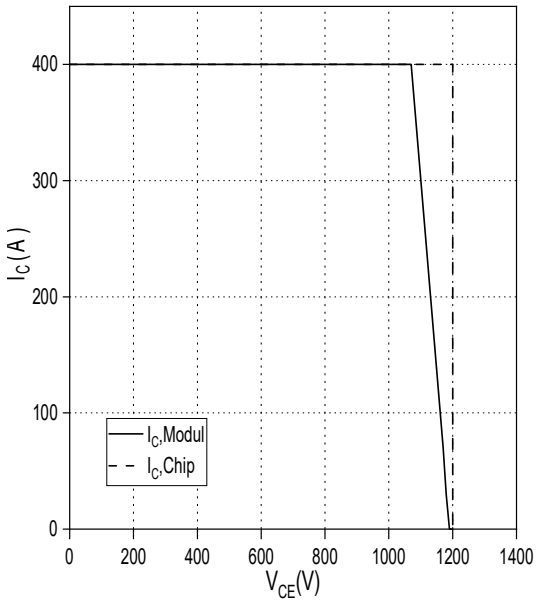
栅极电荷特性, IGBT, 逆变器（典型）
Gate charge characteristic, IGBT, Inverter (typical)
V_{GE} = f(Q_G)
I_C = 200 A, Tvj = 25 °C



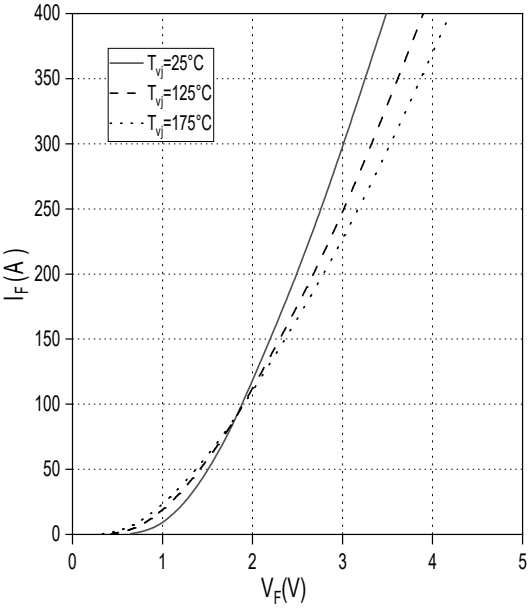
电容特性, IGBT, 逆变器 (典型)
Capacity characteristic, IGBT, Inverter (typical)
C = f(V_{CE})
f = 100 kHz, V_{GE} = 0 V, Tvj = 25 °C



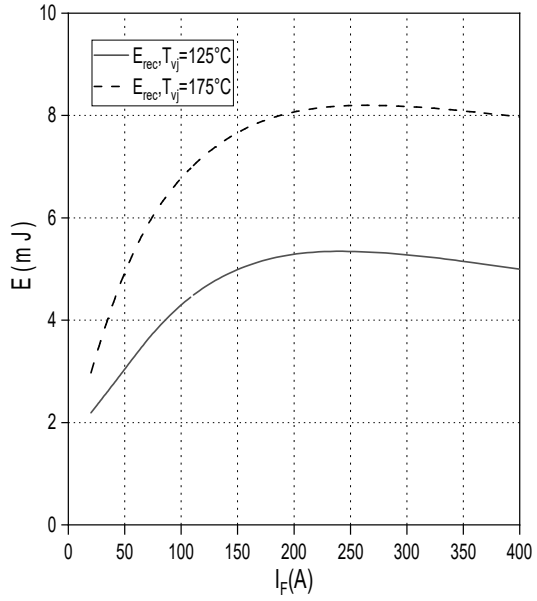
反偏安全工作区 IGBT,逆变器(RBSOA)
Reverse bias safe operating area IGBT, Inverter (RBSOA) $I_C = f(V_{CE})$,
$V_{GE} = \pm 15V, R_{Goff} = 2.5\Omega, T_{vj} = 175°C$



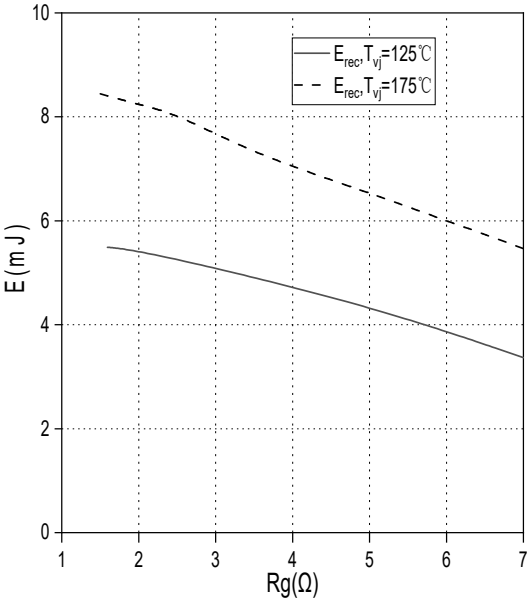
正向偏压特性二极管,逆变器（典型值)
Forward characteristic of Diode, Inverter (typical)
$I_F = f(V_F)$



开关损耗 二极管,逆变器（典型值)
Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 1.5\Omega, V_{CE} = 600V$



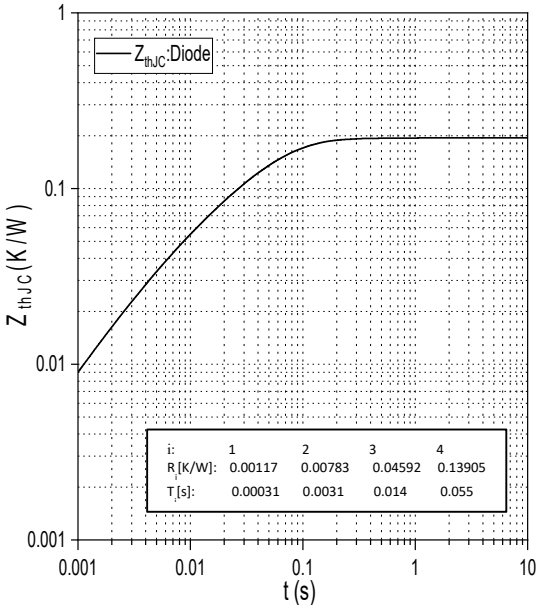
开关损耗 二极管,逆变器（典型值)
Switching losses Diode, Inverter (typical)
$E_{rec} = f(R_g)$
$I_F = 200A, V_{CE} = 600V$



瞬态热阻抗二极管,逆变器

Transient thermal impedance Diode , Inverter

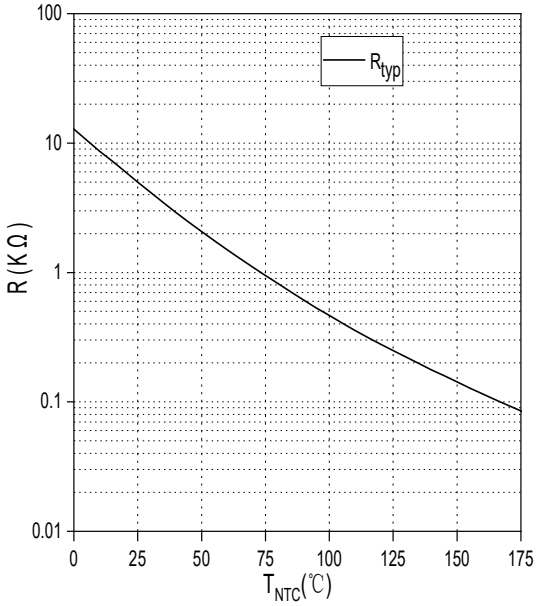
$Z_{thJC} = f(t)$



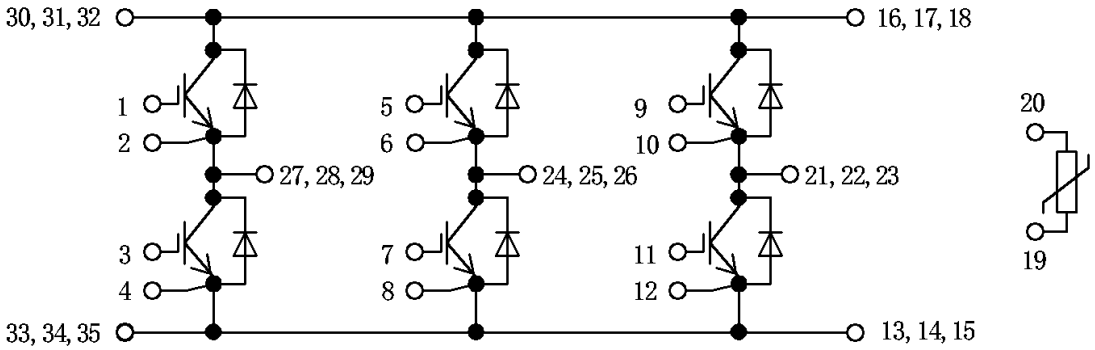
负温度系数热敏电阻 温度特性

NTC-Thermistor-temperature characteristic

$R = f(T_{NTC})$



Internal Circuit:



Package Dimension
Dimensions in Millimeters