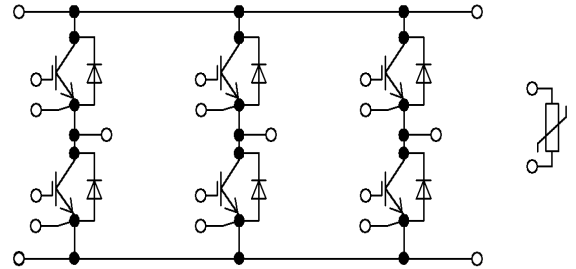


N3 package: 1200V 150A IGBT module



等效电路图

Equivalent Circuit Schematic

### Features:

- 1200V 150A,  $V_{CE(sat)} = 1.50V @ 25^{\circ}C$
- MPT Gate Technology
- Low Losses
- High RBSOA capability
- Low reverse-recovery losses

### 产品特性:

- 1200V 150A,  $V_{CE(sat)} = 1.50V @ 25^{\circ}C$
- 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
- 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	$T_{vj}=25^{\circ}\text{C}$	$V_{CES}$	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{C\text{ nom}}$	150	A
	$T_C=100^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	$I_C$	175	A
Repetitive Peak collector current 集电极可重复峰值电流	$I_{CRM}=2 \times I_{C\text{ nom}}$	$I_{CRM}$	300	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	$I_C=150\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	$V_{CESat}$	1.50	1.70	V	
	$I_C=150\text{A}, V_{GE}=15\text{V}$	$T_{vj}=125^{\circ}\text{C}$		1.70			
	$I_C=150\text{A}, V_{GE}=15\text{V}$	$T_{vj}=175^{\circ}\text{C}$		1.84			
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=3\text{mA},$	$T_{vj}=25^{\circ}\text{C}$	$V_{GEth}$	5.5	6.0	7.0	V
Gate Charge 门极电荷	$V_{GE}=-8\text{V}/15\text{V}, V_{CE}=600\text{V}$		$T_{vj}=25^{\circ}\text{C}$	$Q_G$	1.42		$\mu\text{C}$
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$		$R_{Gint}$	3.50		$\Omega$	
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=100\text{KHz}, T_{vj}=25^{\circ}\text{C}$		$C_{ies}$	36.0		nF	
Reverse Transfer Capacitance 反向传输电容			$C_{res}$	0.09		nF	
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	$V_{CE}=1200\text{V}, V_{GE}=0\text{V},$	$T_{vj}=25^{\circ}\text{C}$	$I_{CES}$		200	$\mu\text{A}$	
Gate-emitter Leakage Current 门极-发射极漏电流	$V_{CE}=0\text{V}, V_{GE}=20\text{V},$	$T_{vj}=25^{\circ}\text{C}$	$I_{GES}$		200	nA	
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=3.3\Omega$	$T_{vj}=25^{\circ}\text{C}$	$t_{don}$	140	ns		
		$T_{vj}=125^{\circ}\text{C}$		150			
		$T_{vj}=175^{\circ}\text{C}$		170			
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=3.3\Omega$	$T_{vj}=25^{\circ}\text{C}$	$t_r$	55	ns		
		$T_{vj}=125^{\circ}\text{C}$		70			
		$T_{vj}=175^{\circ}\text{C}$		75			
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Goff}=3.3\Omega$	$T_{vj}=25^{\circ}\text{C}$	$t_{doff}$	275	ns		
		$T_{vj}=125^{\circ}\text{C}$		310			
		$T_{vj}=175^{\circ}\text{C}$		340			
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=150\text{A}, V_{CE}=600\text{V}$ $V_{GE}=\pm 15\text{V}$ $R_{Goff}=3.3\Omega$	$T_{vj}=25^{\circ}\text{C}$	$t_f$	140	ns		
		$T_{vj}=125^{\circ}\text{C}$		235			
		$T_{vj}=175^{\circ}\text{C}$		280			
Turn-on energy loss per pulse 开通损耗	$I_C=150\text{A}, V_{CE}=600\text{V},$ $V_{GE}=\pm 15\text{V}$ $R_{Gon}=3.3\Omega, di/dt =$ $1600\text{ A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj}=25^{\circ}\text{C}$	$E_{on}$	12.5	mJ		
		$T_{vj}=125^{\circ}\text{C}$		20.0			
		$T_{vj}=175^{\circ}\text{C}$		22.0			
Turn-off energy loss per pulse 关断损耗	$I_C=150\text{A}, V_{CE}=600\text{V},$ $V_{GE}=\pm 15\text{V}$ $R_{Goff}=3.3\Omega, dv/dt =$ $6300\text{ V}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj}=25^{\circ}\text{C}$	$E_{off}$	11.8	mJ		
		$T_{vj}=125^{\circ}\text{C}$		16.3			
		$T_{vj}=175^{\circ}\text{C}$		18.5			

SC Data 短路耐量	$V_{CE} = 800V$ , $V_{GE} = \pm 15V$	$t_p \leq 6\mu s, T_{vj} = 150^\circ C$	$I_{sc}$		840		A
		$t_p \leq 6\mu s, T_{vj} = 175^\circ C$			760		
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT		$R_{thJC}$		0.163		K/W
Temperature under switching conditions <sup>2)</sup> 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		$I_{F\ nom}$	150	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{FRM} = 2 \times I_{F\ nom}$	$I_{FRM}$	300	A

### Characteristic Values / 性能参数

			min.	typ.	max.		
Forward Voltage <sup>1)</sup> 正向通态压降	$I_F = 150A, V_{GE} = 0V$	$T_{vj} = 25^\circ C$	$V_F$		1.85	2.20	V
	$I_F = 150A, V_{GE} = 0V$	$T_{vj} = 125^\circ C$			2.05		
	$I_F = 150A, V_{GE} = 0V$	$T_{vj} = 175^\circ C$			2.05		
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F = 150A, V_R = 600V$	$T_{vj} = 25^\circ C$	$I_{RM}$		108		A
	$-di_F/dt = 1580A/\mu s (T_{vj} = 175^\circ C)$ ,	$T_{vj} = 125^\circ C$			120		
	$V_{GE} = -15V$	$T_{vj} = 175^\circ C$			130		
Recovery Charge 反向恢复电荷	$I_F = 150A, V_R = 600V$	$T_{vj} = 25^\circ C$	$Q_R$		6.5		$\mu C$
	$-di_F/dt = 1580A/\mu s (T_{vj} = 175^\circ C)$ ,	$T_{vj} = 125^\circ C$			13.0		
	$V_{GE} = -15V$	$T_{vj} = 175^\circ C$			17.0		
Reverse Recovery Energy 反向恢复损耗	$I_F = 150A, V_R = 600V$	$T_{vj} = 25^\circ C$	$E_{rec}$		1.65		mJ
	$-di_F/dt = 1580A/\mu s (T_{vj} = 175^\circ C)$	$T_{vj} = 125^\circ C$			4.75		
	$V_{GE} = -15V$	$T_{vj} = 175^\circ C$			6.40		
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode / 单个 Diode		$R_{thJC}$		0.245		K/W
Temperature under switching conditions <sup>2)</sup> 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		
	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15K))]$	$B_{25/100}$		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 <sup>3)</sup> 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	$T_C=25^{\circ}C$ , 每个开关 per switch	$R_{CC+EE}$		1.6		m $\Omega$
Storage Temperature 贮存温度		$T_{stg}$	-40		125	$^{\circ}C$
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)  $T_{vj op} > 150^{\circ}C$  is only allowed for operation at overload conditions

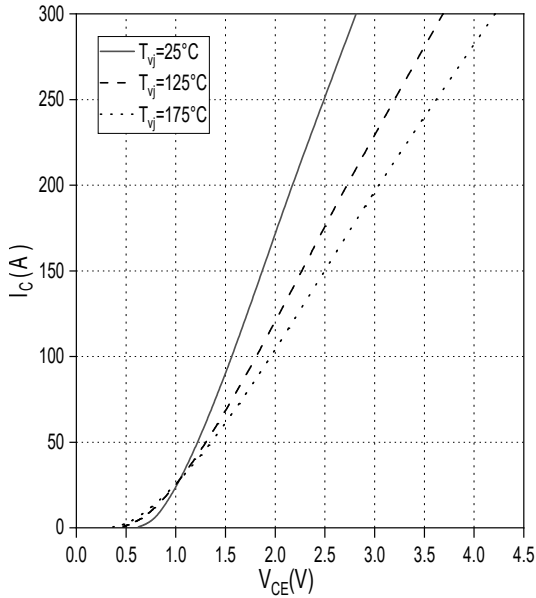
$T_{vj op} > 150^{\circ}C$  仅允许在过载条件下运行。

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

$V_{GE} = 15V$

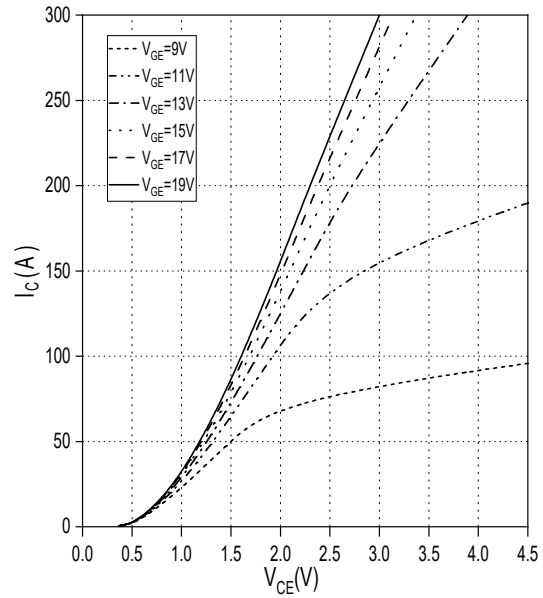


输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

$T_{vj} = 175^\circ C$

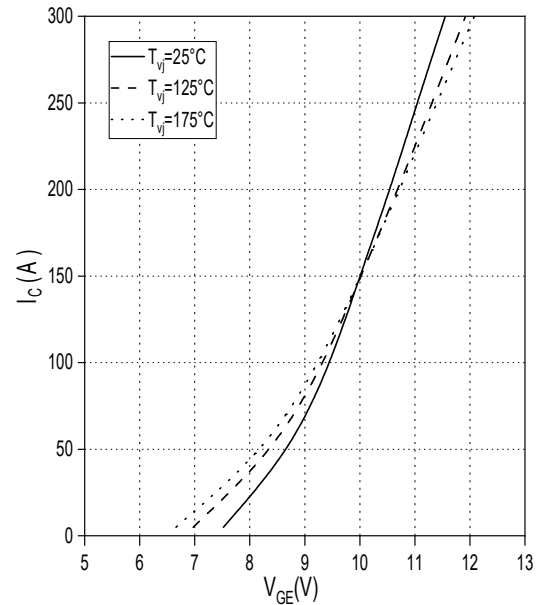


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$ ,

$V_{CE} = 20V$

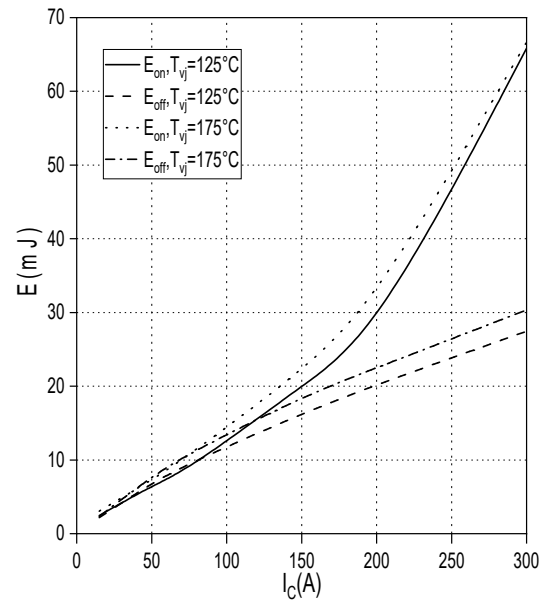


开关损耗 IGBT, 逆变器 (典型值)

Switching losses IGBT, Inverter (typical)

$E_{on} = f(I_C), E_{off} = f(I_C), V_{GE} = \pm 15V$ ,

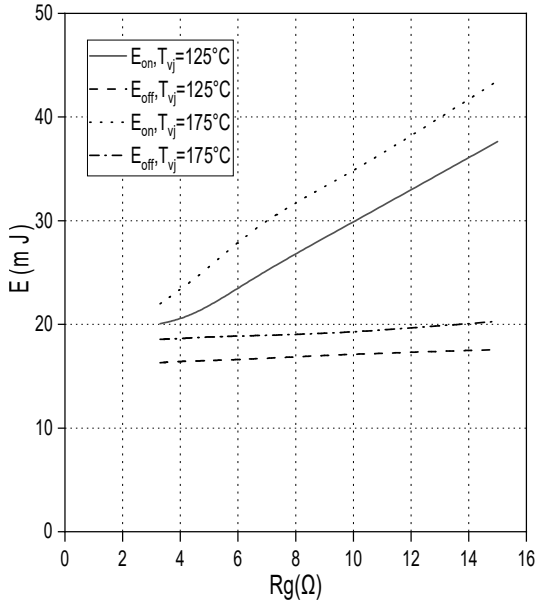
$R_{Gon} = 3.3\Omega, R_{Goff} = 3.3\Omega, V_{CE} = 600V$



开关损耗 IGBT, 逆变器 (典型值)

Switching losses IGBT, Inverter (typical)

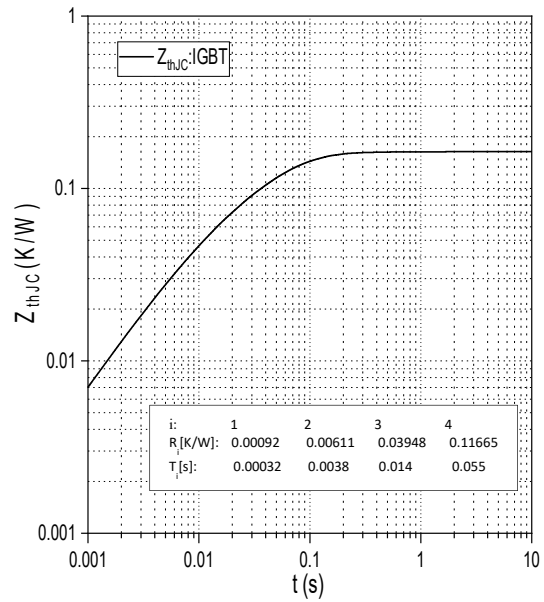
$E = f(R_g) V_{GE} = \pm 15V, I_c = 150A, V_{CE} = 600V$



瞬态热阻抗 IGBT, 逆变器

Transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$

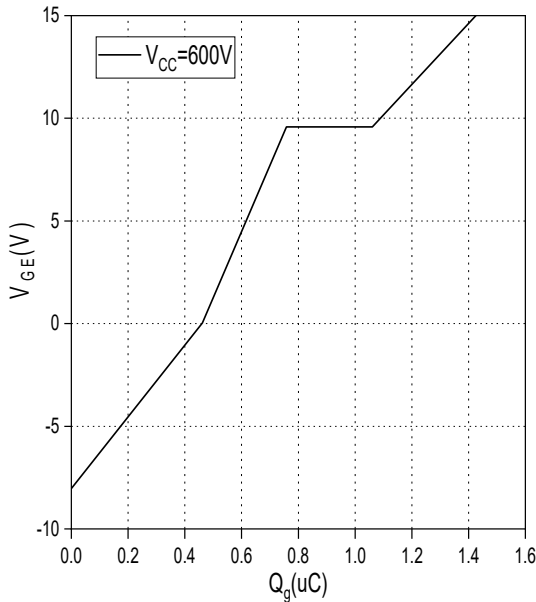


栅极电荷特性, IGBT, 逆变器 (典型)

Gate charge characteristic, IGBT, Inverter (typical)

$V_{GE} = f(Q_G)$

$I_c = 150 A, T_{vj} = 25^\circ C$

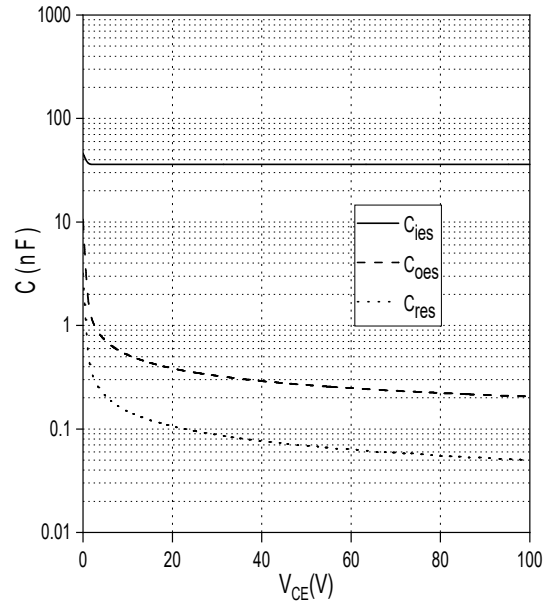


电容特性, IGBT, 逆变器 (典型)

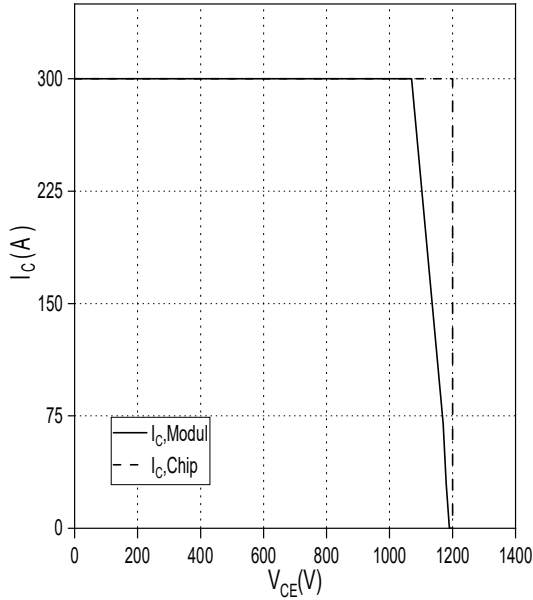
Capacity characteristic, IGBT, Inverter (typical)

$C = f(V_{CE})$

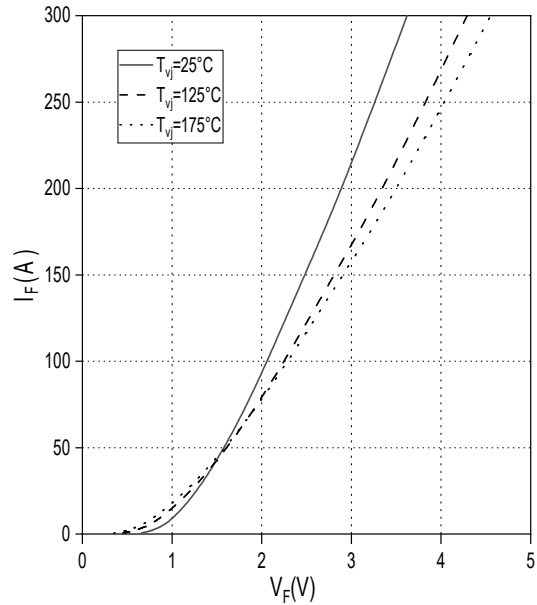
$f = 100 kHz, V_{GE} = 0 V, T_{vj} = 25^\circ C$



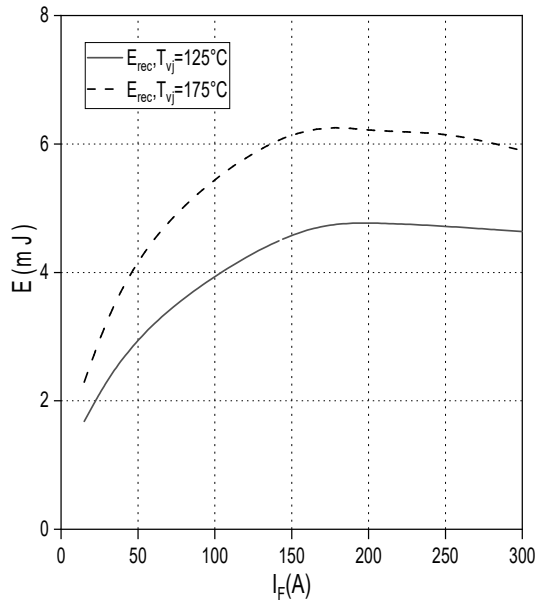
反偏安全工作区 IGBT, 逆变器(RBSOA)  
Reverse bias safe operating area IGBT, Inverter (RBSOA)  $I_C = f(V_{CE})$ ,  
 $V_{GE} = 15V, R_{Goff} = 3.3\Omega, T_{vj} = 175^\circ C$



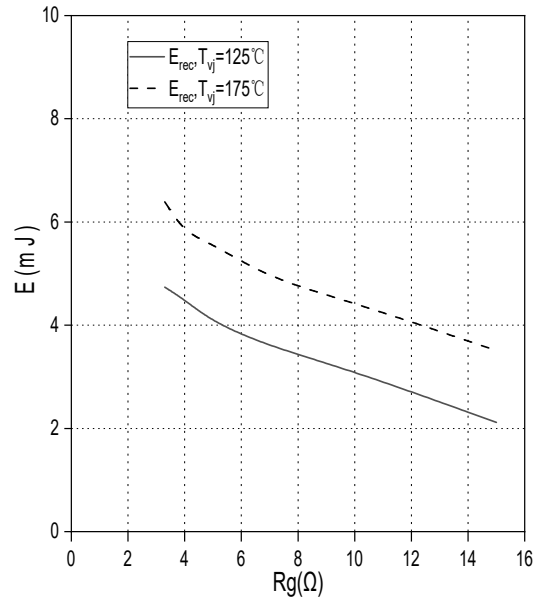
正向偏压特性二极管, 逆变器 (典型值)  
Forward characteristic of Diode, Inverter (typical)  
 $I_F = f(V_F)$



开关损耗 二极管, 逆变器 (典型值)  
Switching losses Diode, Inverter (typical)  
 $E_{rec} = f(I_F)$   
 $R_{Gon} = 3.3\Omega, V_{CE} = 600V$



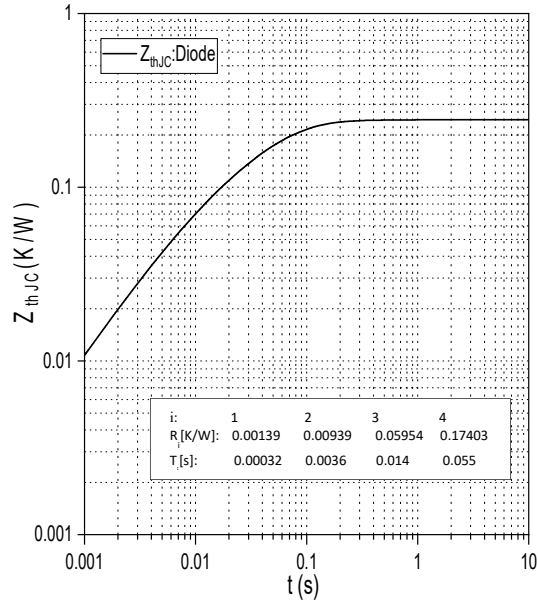
开关损耗 二极管, 逆变器 (典型值)  
Switching losses Diode, Inverter (typical)  
 $E_{rec} = f(R_g)$   
 $I_F = 150A, V_{CE} = 600V$



瞬态热阻抗二极管, 逆变器

Transient thermal impedance Diode , Inverter

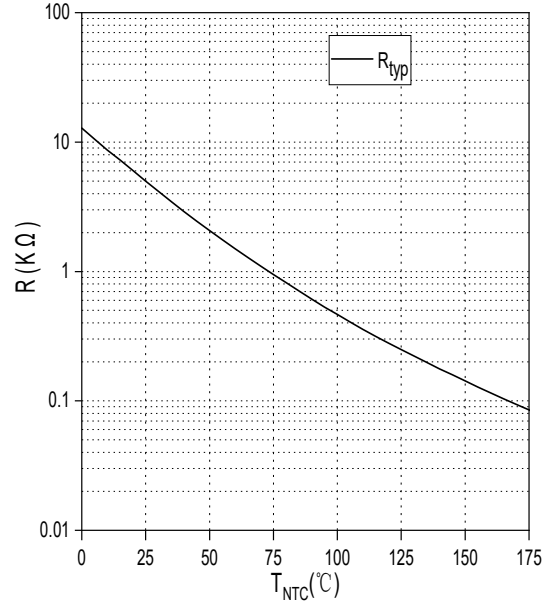
$Z_{thJC} = f(t)$



负温度系数热敏电阻 温度特性

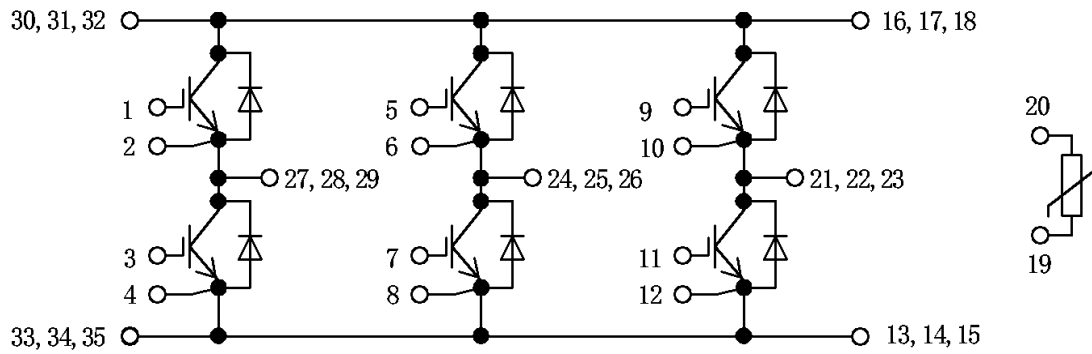
NTC-Thermistor-temperature characteristic

$R = f(T_{NTC})$





**Internal Circuit:**



**Package Dimension  
Dimensions in Millimeters**

