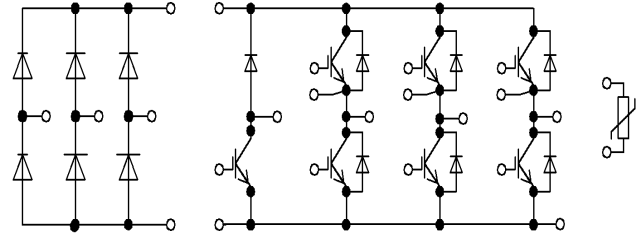
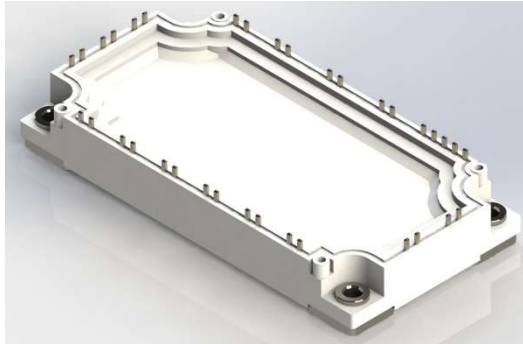


N3 package: 1200V 50A IGBT PIM module



等效电路图  
Equivalent Circuit Schematic

**Features:**

- 1200V 50A,  $V_{CE(sat)} = 1.80V$
- High RBSOA capability
- High speed trench field-stop IGBT
- Low turn-off losses
- High short circuit capability

**产品特性:**

- 1200V 50A,  $V_{CE(sat)} = 1.80V$
- 高 RBSOA 性能
- 沟槽栅场截止型 IGBT 芯片
- 低关断损耗
- 高短路耐量

**Typical Applications:**

- Motor Drives
- Servo drives

**典型应用:**

- 马达驱动
- 伺服驱动器

## 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		$I_{C\text{ nom}}$	50	A
	$T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	$I_C$	85	A
Repetitive Peak collector current 集电极可重复峰值电流	$I_{CRM}=2 \times I_{C\text{ nom}}$	$I_{CRM}$	100	A
Total power dissipation 总功率损耗	$T_C=25^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	$P_{\text{tot}}$	385	W
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 集电极-发射极饱和压降	$I_C=50\text{A}, V_{GE}=15\text{V}$ $I_C=50\text{A}, V_{GE}=15\text{V}$ $I_C=50\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$V_{CESat}$	1.80 2.00 2.00	2.30	V	
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=1\text{mA},$	$T_{vj}=25^{\circ}\text{C}$	$V_{G\text{Eth}}$	4.50	5.80	6.50	V
Gate Charge 门极电荷	$V_{GE}= -15\text{V} \dots +15\text{V}$		$Q_G$	0.29		$\mu\text{C}$	
Internal Gate Resistor 内置门极电阻		$T_{vj}=25^{\circ}\text{C}$	$R_{G\text{int}}$	4		$\Omega$	
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=1\text{MHz}$		$C_{\text{ies}}$	3.80		nF	
Reverse Transfer Capacitance 反向传输电容		$C_{\text{res}}$	0.14		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	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V},$	$T_{vj}=25^{\circ}\text{C}$	$I_{GES}$		$\pm 200$	nA	
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}= \pm 15\text{V}$ $R_{Gon}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_{don}$	40 42 42		ns	
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}= \pm 15\text{V}$ $R_{Gon}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_r$	15 17 17		ns	
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}= \pm 15\text{V}$ $R_{Goff}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_{doff}$	200 255 280		ns	
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}= \pm 15\text{V}$ $R_{Goff}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$t_f$	195 315 360		ns	
Turn-on energy loss per pulse 开通损耗	$I_C=50\text{A}, V_{CE}=600\text{V},$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}= \pm 15\text{V}, R_{Gon}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$E_{on}$	2.70 3.70 4.00		mJ	
Turn-off energy loss per pulse 关断损耗	$I_C=50\text{A}, V_{CE}=600\text{V},$ $L_o=80\text{nH}, V_{GE}=\pm 15\text{V}$ $V_{GE}= \pm 15\text{V}, R_{Goff}=10\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	$E_{off}$	3.10 4.80 5.50		mJ	

SC Data 短路耐量	$V_{CE}=600V, V_{GE}=15V/-8V,$ $T_{vj}=150^{\circ}C$	$t_{psc}$	10			$\mu s$
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	$R_{thJC}$		0.39		K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^{\circ}C$

### 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		$I_F$	50	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{CRM}=2 \times I_{Fnom}$	$I_{FRM}$	100	A

#### Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F=50A, V_{GE}=0V$ $T_{vj}=25^{\circ}C$ $I_F=50A, V_{GE}=0V$ $T_{vj}=125^{\circ}C$ $I_F=50A, V_{GE}=0V$ $T_{vj}=150^{\circ}C$	$V_F$		1.70 1.80 1.80	2.20	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=50A, V_R=600V$ $-di_F/dt=2500A/\mu s$ $V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$I_{RM}$		55 60 60		A
Recovery Charge 反向恢复电荷	$I_F=50A, V_R=600V$ $-di_F/dt=2500A/\mu s$ $V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$Q_R$		2.50 5.00 6.00		$\mu C$
Reverse Recovery Energy 反向恢复损耗	$I_F=50A, V_R=600V$ $-di_F/dt=2500A/\mu s$ $V_{GE}=-15V$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$E_{rec}$		1.50 2.60 3.30		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode / 单个 Diode	$R_{thJC}$		0.57		K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^{\circ}C$

### Diode, Rectifier / 二极管, 整流部分

#### Maximum Rated Values / 最大标称参数

Repetitive peak reverse voltage 可重复反向峰值电压	$T_{vj}=25^{\circ}C$	$V_{RRM}$	1800	V
Maximum RMS Forward Current Per Chip 单芯片最大正向电流有效值		$I_{FRMSM}$	50	A
Surge Forward Current 正向浪涌电流	$t_p=10ms, \sin 180^{\circ},$ $T_{vj}=25^{\circ}C$	$I_{FSM}$	600	A
$I^2t$ Value $I^2t$ 值	$t_p=10ms, \sin 180^{\circ},$ $T_{vj}=25^{\circ}C$	$I^2t$	1800	$A^2s$

**Characteristic Values / 性能参数**

		min.	typ.	max.		
Forward Voltage 正向通态压降	$I_F=50A, T_{vj}=25^{\circ}C$ $I_F=50A, T_{vj}=125^{\circ}C$ $I_F=50A, T_{vj}=150^{\circ}C$	$V_F$	1.15 1.10 1.10			V
Reverse Current 反向漏电流	$V_{RRM}=1800V, T_{vj}=25^{\circ}C$	$I_{RM}$		1		mA
Thermal Resistance, Junction to Case 结-壳热阻		$R_{thJC}$	0.56			K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40	150		$^{\circ}C$

**IGBT, Brake-Choppe / IGBT , 制动-斩波器**
**Maximum Rated Values / 最大标称参数**

Collector-emitter Voltage 集电极-发射极电压	$T_{vj}=25^{\circ}C$	$V_{CES}$	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{c\ nom}$	25	A
	$T_C=80^{\circ}C, T_{vj\ max}=150^{\circ}C$	$I_c$	30	A
Repetitive Peak collector current 集电极可重复峰值电流	$I_{CRM}=2 \times I_{c\ nom}$	$I_{CRM}$	60	A
Total power dissipation 总功率损耗	$T_C=25^{\circ}C, T_{vj\ max}=150^{\circ}C$	$P_{tot}$	135	W
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 集电极-发射极饱和压降	$I_C=25A, V_{GE}=15V, T_{vj}=25^{\circ}C$ $I_C=25A, V_{GE}=15V, T_{vj}=125^{\circ}C$ $I_C=25A, V_{GE}=15V, T_{vj}=150^{\circ}C$	$V_{CESat}$	2.00 2.50 2.50	2.50		V
Gate Threshold Voltage 门极阈值电压	$V_{CE}=V_{GE}, I_C=1mA, T_{vj}=25^{\circ}C$	$V_{Geth}$	4.50	5.80	6.50	V
Gate Charge 门极电荷	$V_{GE}= -15V \dots +15V$	$Q_G$	100			nC
Input Capacitance 输入电容	$V_{CE}=25V, V_{GE}=0V$ $f=1MHz$	$C_{ies}$	1.79			nF
Reverse Transfer Capacitance 反向传输电容		$C_{res}$	0.08			nF
Collector-emitter Cutoff Current 集电极-发射极关断漏电流	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$	$I_{CES}$		1		mA
Gate-emitter Leakage Current 门极-发射极漏电流	$V_{CE}=0V, V_{GE}=\pm 20V, T_{vj}=25^{\circ}C$	$I_{GES}$		$\pm 200$		nA
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=25A, V_{CE}=600V, V_{GE}=\pm 15V, R_{Gon}=30\Omega$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_{don}$	15 16 16			ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=25A, V_{CE}=600V, V_{GE}=\pm 15V, R_{Gon}=30\Omega$ $T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	$t_r$	20 22 22			ns

Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_{Goff}=30\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_{doff}$		90 100 105		ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=25A, V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_{Goff}=30\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$t_f$		210 275 290		ns
Turn-on energy loss per pulse 开通损耗	$I_C=25A, V_{CE}=600V,$ $L_o=80nH, V_{GE}=\pm 15V$ $V_{GE}=\pm 15V, R_{Gon}=30\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$E_{on}$		2.30 3.00 3.30		mJ
Turn-off energy loss per pulse 关断损耗	$I_C=25A, V_{CE}=600V,$ $L_o=80nH, V_{GE}=\pm 15V$ $V_{GE}=\pm 15V, R_{Goff}=30\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$E_{off}$		1.20 1.60 1.75		mJ
SC Data 短路耐量	$V_{CE}=600V, V_{GE}=15V/-8V,$ $T_{vj}=150^\circ C$		$t_{psc}$	10			$\mu s$
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT		$R_{thJC}$		0.90		K/W
Temperature under switching conditions 工作温度			$T_{vj op}$	-40		150	$^\circ C$

## Diode, Brake-Chopper / 二极管, 制动-斩波器

### 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		$I_F$	25	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{CRM}=2 \times I_{Fnom}$	$I_{FRM}$	50	A

### Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F=25A, V_{GE}=0V$ $I_F=25A, V_{GE}=0V$ $I_F=25A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$V_F$	1.95 1.90 1.85	2.30	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=25A, V_R=600V$ $-di_f/dt=660A/\mu s$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$I_{RM}$	20 23 25		A
Recovery Charge 反向恢复电荷	$I_F=25A, V_R=600V$ $-di_f/dt=660A/\mu s$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$Q_R$	1.50 2.70 3.10		$\mu C$
Reverse Recovery Energy 反向恢复损耗	$I_F=25A, V_R=600V$ $-di_f/dt=660A/\mu s$ $V_{GE}=-15V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=150^\circ C$	$E_{rec}$	0.10 0.55 0.67		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode / 单个 Diode		$R_{thJC}$	1.20		K/W
Temperature under switching conditions 工作温度			$T_{vj op}$	-40	150	$^\circ C$

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

			min.	typ.	max.	
Rated Resistance 标称电阻	$T_{NTC}=25^{\circ}\text{C}$	$R_{25}$		5		$\text{K}\Omega$
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	$T_{NTC}=25^{\circ}\text{C}$	$P_{25}$		50		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
B-Value B 值	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	$B_{25/80}$		3440		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	基本绝缘 (class 1, IEC 61140) Basic insulation (class1,IEC 61140)			$\text{Al}_2\text{O}_3$		
Creepage Distance 爬电距离	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal			10		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 相对漏电起痕指数		CTI		>200		

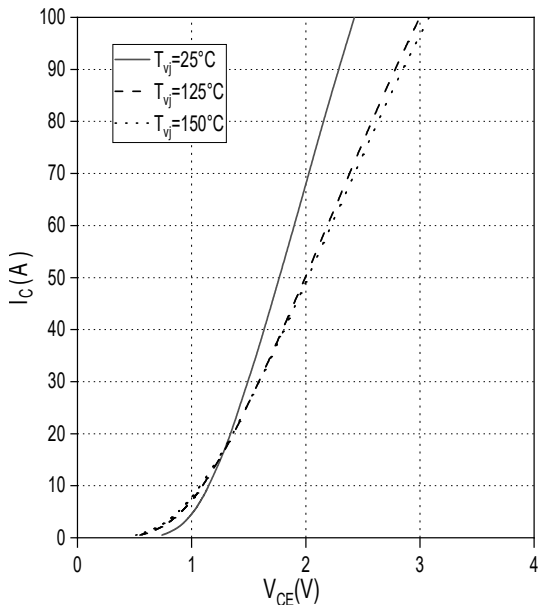
			min.	typ.	max.	
Thermal resistance, case to heatsink 外壳-散热器热阻	每个模块/per module $\lambda_{\text{Paste}} = 1\text{W}/(\text{m}\cdot\text{K})/\lambda \text{ grease}$ $= 1\text{W}/(\text{m}\cdot\text{K})$	$R_{thCH}$		0.009		K/W
Stray Inductance Module 模块杂散电感		$L_{sCE}$		50		nH
Module lead resistance 模块引脚电阻	$T_C = 25^{\circ}\text{C}$ , 每个开关 per switch	$R_{CC+EE}$		4.0		$\text{m}\Omega$
Storage Temperature 贮存温度		$T_{stg}$	-40		125	$^{\circ}\text{C}$
Modul Mounting torque 模块安装扭距	M5	M	3.0		6.0	Nm
Weight 重量		G		310		g

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

$V_{GE} = 15V$

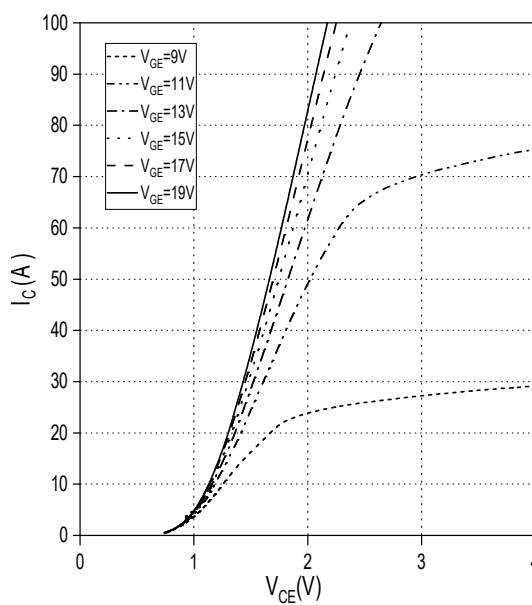


输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

$T_{vj} = 150^\circ C$

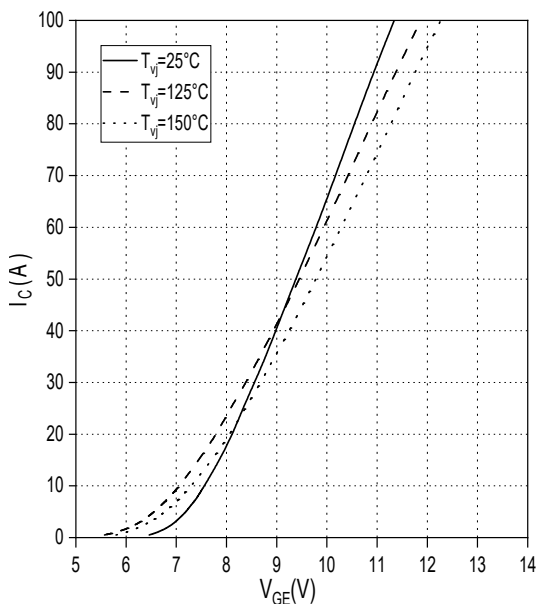


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

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

$V_{CE} = 20V$

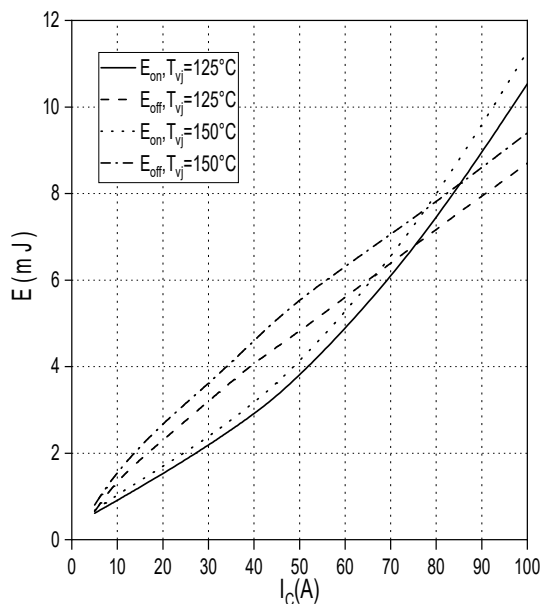


开关损耗 IGBT, 逆变器 (典型值)

switching losses IGBT, Inverter (typical)

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

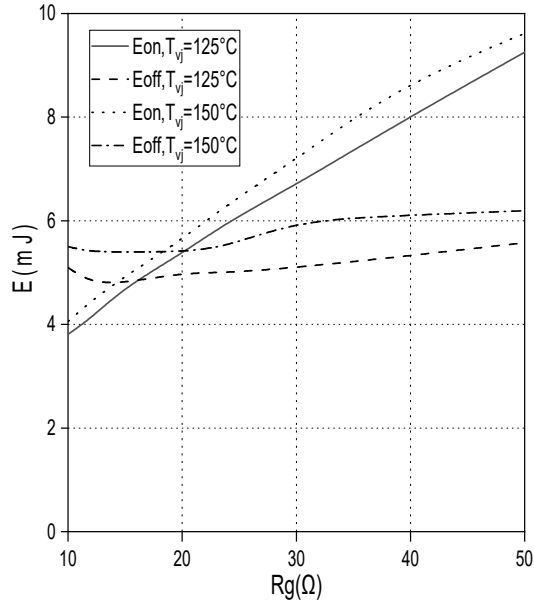
$R_{Gon} = 10\Omega, R_{Goff} = 10\Omega, V_{CE} = 600V$



开关损耗 IGBT, 逆变器 (典型值)

Switching losses IGBT, Inverter (typical)

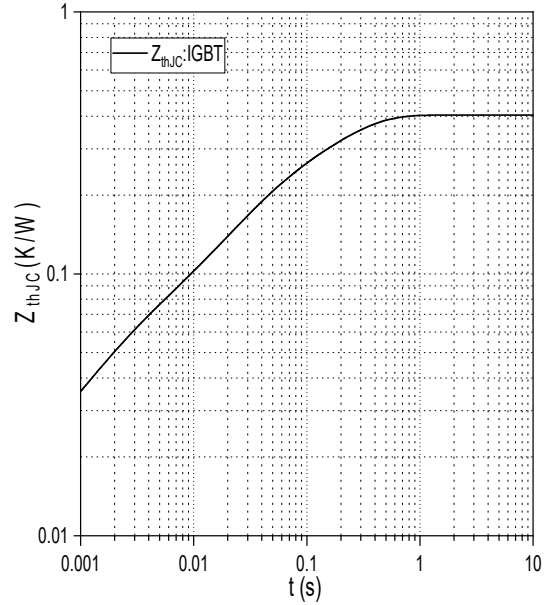
$V_{GE} = \pm 15V, I_C = 50A, V_{CE} = 600V$



瞬态热阻抗 IGBT, 逆变器

transient thermal impedance IGBT, Inverter

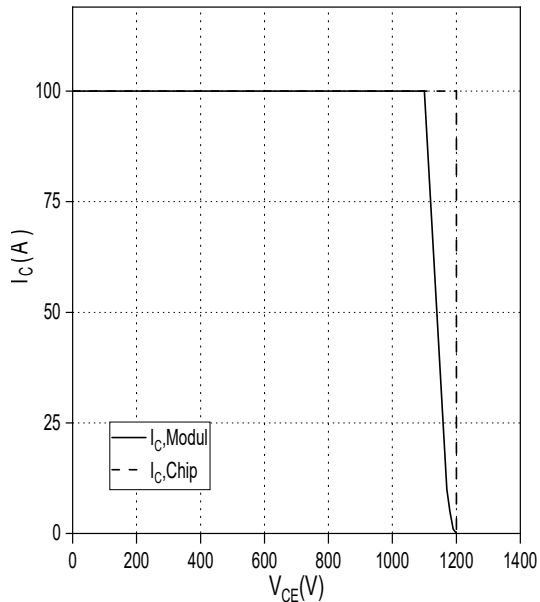
$Z_{thJC} = f(t)$



反偏安全工作区 IGBT, 逆变器(RBSOA)

Reverse bias safe operating area IGBT, Inverter (RBSOA)  $I_C = f(V_{CE})$ ,

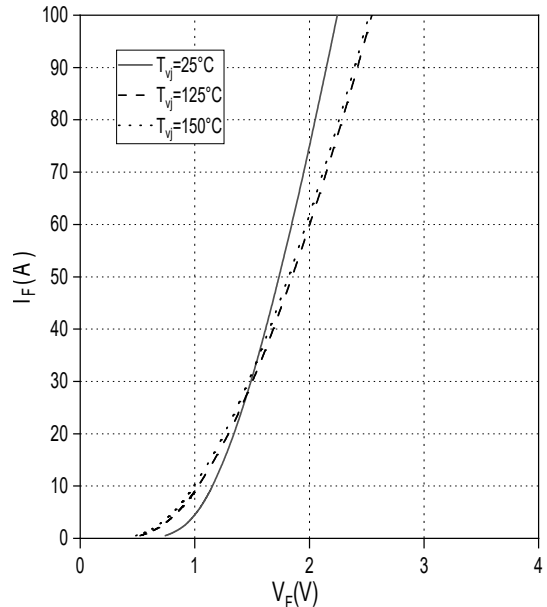
$V_{GE} = \pm 15V, R_{Goff} = 10\Omega, T_{vj} = 150^\circ C$



正向偏压特性二极管, 逆变器 (典型值)

forward characteristic of Diode, Inverter (typical)

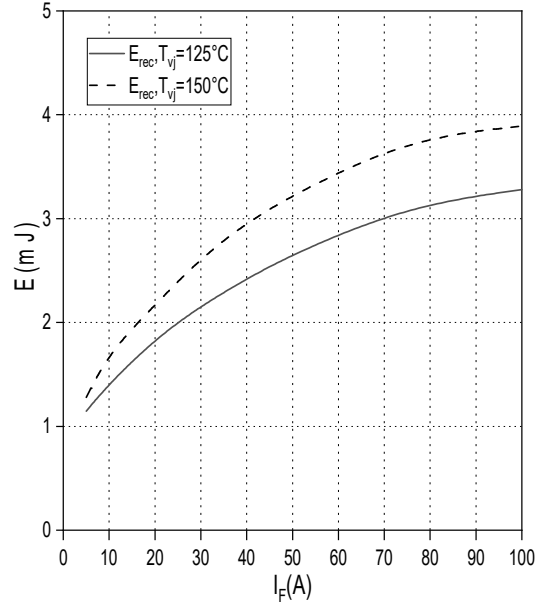
$I_F = f(V_F)$





开关损耗二极管,逆变器 开关损耗 (典型值)  
Switching losses Diode, Inverter (typical)

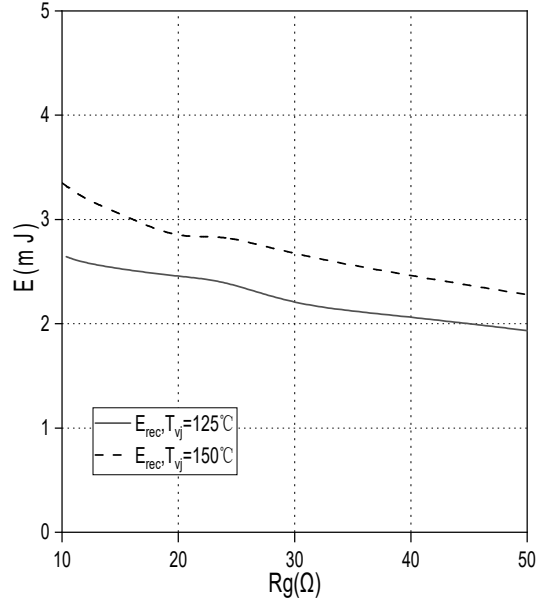
$E_{rec} = f(I_F)$   
 $R_{Gon} = 10\Omega, V_{CE} = 600V$



二极管,逆变器 (典型值)

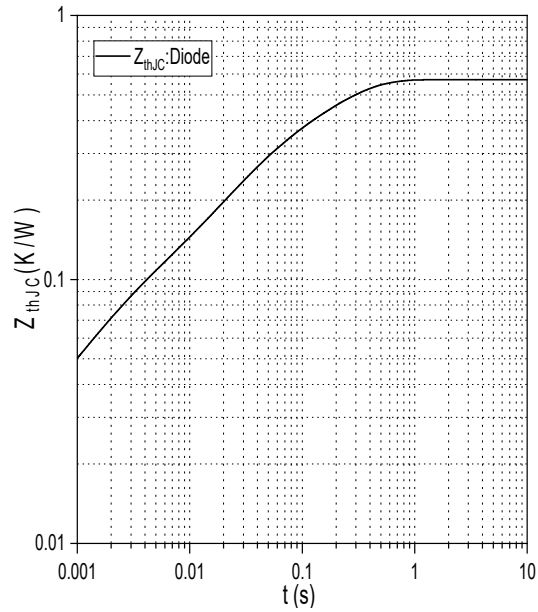
Switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$   
 $I_F = 50A, V_{CE} = 600V$



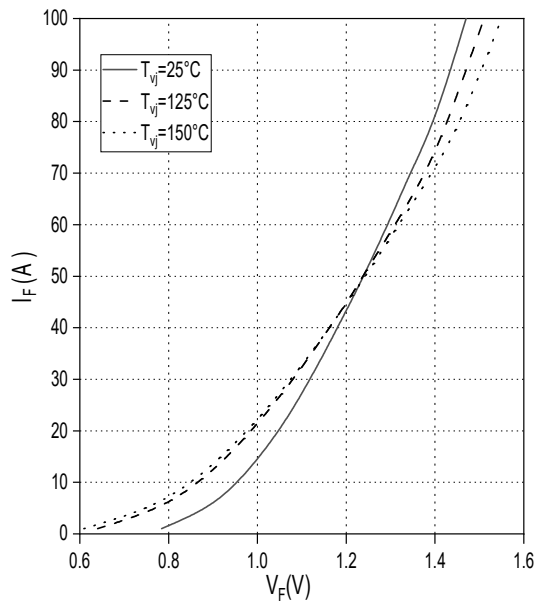
瞬态热阻抗二极管,逆变器  
transient thermal impedance Diode, Inverter

$Z_{thJC} = f(t)$



正向偏压特性 二极管,整流器 (典型值)  
forward characteristic of Diode Rectifier (typical)

$I_F = f(V_F)$

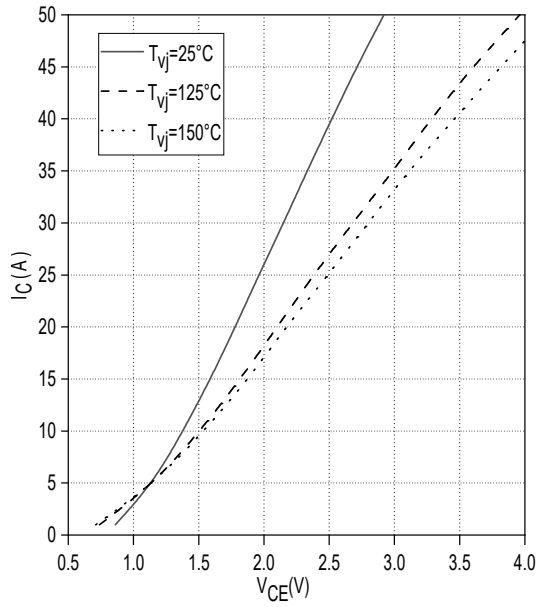


输出特性 IGBT, 制动-斩波器 (典型值)

Output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

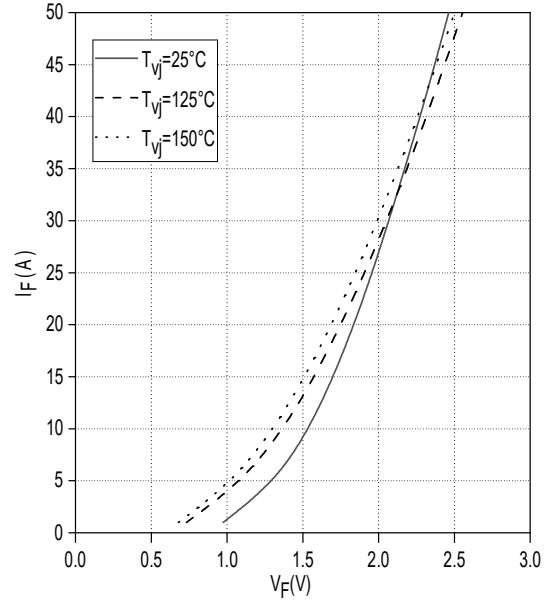
$V_{GE} = 15V$



正向偏压特性 二极管, 制动-斩波器 (典型值)

forward characteristic of Diode, Brake-Chopper (typical)

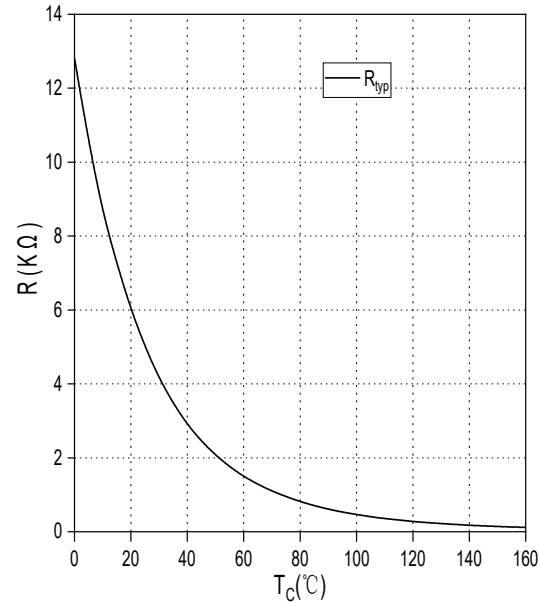
$I_F = f(V_F)$



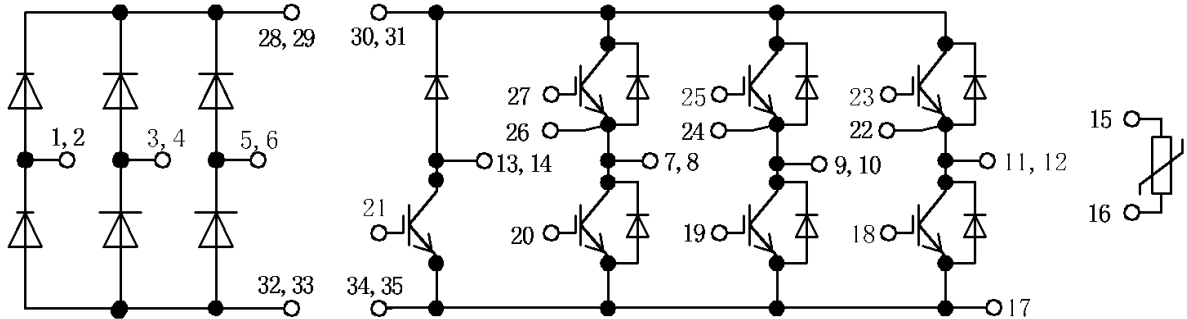
负温度系数热敏电阻 温度特性 (典型值)

NTC-Thermistor-temperature characteristic (typical)

$R = f(T)$



**Internal Circuit:**



**Package Dimension  
Dimensions in Millimeters**

