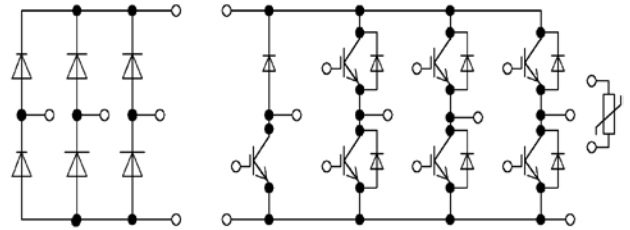


N2 package: 1200V 75A IGBT PIM module



等效电路图

Equivalent Circuit Schematic

Features:

- 1200V 75A, $V_{CE(sat)} = 1.45V @ 25^{\circ}C$
- Trench/FS Technology
- Low Losses
- High RBSOA capability
- Low reverse-recovery losses

产品特性:

- 1200V 75A, $V_{CE(sat)} = 1.45V @ 25^{\circ}C$
- 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		$I_{C\text{ nom}}$	75	A			
	$T_C=100^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	I_C	95	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}	150	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 集电极-发射极饱和压降	$I_C=75\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	V_{CESat}	1.45	tbd	V	
	$I_C=75\text{A}, V_{GE}=15\text{V}$	$T_{vj}=125^{\circ}\text{C}$		1.65			
	$I_C=75\text{A}, V_{GE}=15\text{V}$	$T_{vj}=175^{\circ}\text{C}$		1.75			
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}	5.5	6.0	6.5	V
Gate Charge 门极电荷	$V_{GE}=-15\text{V}/15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	Q_G	0.91			μC
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$		R_{Gint}	1.25			Ω
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}$ $f=1\text{MHz}$		C_{ies}	16.5			nF
Reverse Transfer Capacitance 反向传输电容			C_{res}	0.052			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	μA
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}			± 200	nA
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=75\text{A}, V_{CE}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Gon}=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$	t_{don}	65			ns
		$T_{vj}=125^{\circ}\text{C}$		65			
		$T_{vj}=175^{\circ}\text{C}$		70			
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=75\text{A}, V_{CE}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Gon}=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$	t_r	30			ns
		$T_{vj}=125^{\circ}\text{C}$		35			
		$T_{vj}=175^{\circ}\text{C}$		40			
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=75\text{A}, V_{CE}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Goff}=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$	t_{doff}	240			ns
		$T_{vj}=125^{\circ}\text{C}$		280			
		$T_{vj}=175^{\circ}\text{C}$		290			
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=75\text{A}, V_{CE}=600\text{V}$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Goff}=5.0\Omega$	$T_{vj}=25^{\circ}\text{C}$	t_f	140			ns
		$T_{vj}=125^{\circ}\text{C}$		200			
		$T_{vj}=175^{\circ}\text{C}$		220			
Turn-on energy loss per pulse 开通损耗	$I_C=75\text{A}, V_{CE}=600\text{V},$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Gon}=5.0\Omega, di/dt =$ $1600\text{A}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj}=25^{\circ}\text{C}$	E_{on}	4.10			mJ
		$T_{vj}=125^{\circ}\text{C}$		5.60			
		$T_{vj}=175^{\circ}\text{C}$		6.80			
Turn-off energy loss per pulse 关断损耗	$I_C=75\text{A}, V_{CE}=600\text{V},$ $V_{GE}=15\text{V}/-8\text{V}$ $R_{Goff}=5.0\Omega, dv/dt =$ $7100\text{V}/\mu\text{s} (T_{vj}=175^{\circ}\text{C})$	$T_{vj}=25^{\circ}\text{C}$	E_{off}	5.50			mJ
		$T_{vj}=125^{\circ}\text{C}$		7.50			
		$T_{vj}=175^{\circ}\text{C}$		8.50			

SC Data 短路耐量	$V_{CE} = 800V, V_{GE} = 15V/-8V,$ $T_{vj} = 25^{\circ}C$	t_{psc}	8			us
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.297		K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		175	$^{\circ}C$

注： $T_{vj op}$ 仅允许在过载工况下运行结温可以大于 $150^{\circ}C$ 。

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		$I_{F nom}$	75	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{FRM} = 2 \times I_{F nom}$	I_{FRM}	150	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F = 75A, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$ $I_F = 75A, V_{GE} = 0V$ $T_{vj} = 125^{\circ}C$ $I_F = 75A, V_{GE} = 0V$ $T_{vj} = 175^{\circ}C$	V_F		1.95 2.00 1.95	2.60	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F = 75A, V_R = 600V$ $-di_F/dt = 950A/us (T_{vj} = 175^{\circ}C),$ $V_{GE} = -8V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	I_{RM}		50 55 60		A
Recovery Charge 反向恢复电荷	$I_F = 75A, V_R = 600V$ $-di_F/dt = 950A/us (T_{vj} = 175^{\circ}C),$ $V_{GE} = -8V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	Q_R		2.00 4.90 7.00		uC
Reverse Recovery Energy 反向恢复损耗	$I_F = 75A, V_R = 600V$ $-di_F/dt = 950A/us (T_{vj} = 175^{\circ}C),$ $V_{GE} = -8V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	E_{rec}		0.95 2.35 3.65		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode / 单个 Diode	R_{thJC}		0.487		K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		175	$^{\circ}C$

注： $T_{vj op}$ 仅允许在过载工况下运行结温可以大于 $150^{\circ}C$ 。

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}	75	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	$t_p=10\text{ms}$, $\sin 180^\circ$,	$T_{vj} = 25^\circ\text{C}$	I^2t	1800	A^2s
Characteristic Values / 性能参数			min.	typ.	max.
Forward Voltage 正向通态压降	$I_F=75\text{A}$, $I_F=75\text{A}$, $I_F=75\text{A}$,	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=150^\circ\text{C}$	V_F	1.10 1.15 1.20	V
Reverse Current 反向漏电流	$V_{RRM}=1800\text{V}$,	$T_{vj}=25^\circ\text{C}$	I_{RM}		200 μA
Thermal Resistance, Junction to Case 结-壳热阻			R_{thJC}	0.413	K/W
Temperature under switching conditions 工作温度			$T_{vj\text{op}}$	-40	175 $^\circ\text{C}$

注： $T_{vj\text{op}}$ 仅允许在过载工况下运行结温可以大于 150°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	$T_{vj}=25^\circ\text{C}$	V_{CES}	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{c\text{nom}}$	75	A
	$T_C=100^\circ\text{C}$, $T_{vj\text{max}}=175^\circ\text{C}$	I_c	95	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}	150	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 集电极-发射极饱和压降	$I_c=75\text{A}$, $V_{GE}=15\text{V}$ $I_c=75\text{A}$, $V_{GE}=15\text{V}$ $I_c=75\text{A}$, $V_{GE}=15\text{V}$	$T_{vj}=25^\circ\text{C}$ $T_{vj}=125^\circ\text{C}$ $T_{vj}=175^\circ\text{C}$	V_{CEsat}	1.45 1.65 1.75	tbd V
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	6.5 V
Gate Charge 门极电荷	$V_{GE} = -15\text{V}/15\text{V}$	$T_{vj}=25^\circ\text{C}$	Q_G	0.91	μC
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^\circ\text{C}$		R_{Gint}	1.25	Ω
Input Capacitance 输入电容	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$ $f = 1\text{MHz}$		C_{ies}	16.5	nF
Reverse Transfer Capacitance 反向传输电容			C_{res}	0.052	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 μA
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}		± 200 nA

Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=75A, V_{CE}=600V$ $V_{GE}=15V/-8V$ $R_{Gon}=5.0\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	t_{don}		65 65 70		ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=75A, V_{CE}=600V$ $V_{GE}=15V/-8V$ $R_{Gon}=5.0\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	t_r		30 35 40		ns
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=75A, V_{CE}=600V$ $V_{GE}=15V/-8V$ $R_{Goff}=5.0\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	t_{doff}		240 280 290		ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=75A, V_{CE}=600V$ $V_{GE}=15V/-8V$ $R_{Goff}=5.0\Omega$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	t_f		140 200 220		ns
Turn-on energy loss per pulse 开通损耗	$I_C=75A, V_{CE}=600V,$ $V_{GE}=15V/-8V$ $R_{Gon}=5.0\Omega, di/dt =$ $1600 A/\mu s (T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	E_{on}		4.10 5.60 6.80		mJ
Turn-off energy loss per pulse 关断损耗	$I_C=75A, V_{CE}=600V,$ $V_{GE}=15V/-8V$ $R_{Goff}=5.0\Omega, dv/dt =$ $7100 V/\mu s (T_{vj}=175^\circ C)$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	E_{off}		5.50 7.50 8.50		mJ
SC Data 短路耐量	$V_{CE} = 800V, V_{GE} = 15V/-8V,$ $T_{vj} = 25^\circ C$		t_{psc}	8			us
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT		R_{thJC}		0.297		K/W
Temperature under switching conditions 工作温度			$T_{vj op}$	-40		175	$^\circ C$

注: $T_{vj op}$ 仅允许在过载工况下运行结温可以大于 $150^\circ C$ 。

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		$I_{F nom}$	75	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{FRM}=2 \times I_{F nom}$	I_{FRM}	150	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F=75A, V_{GE}=0V$ $I_F=75A, V_{GE}=0V$ $I_F=75A, V_{GE}=0V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	V_F	1.95 2.00 1.95	2.60	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=75A, V_R=600V$ $-di_F/dt=950A/us(T_{vj}=175^\circ C)$ $V_{GE}=-8V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	I_{RM}	50 55 60		A
Recovery Charge 反向恢复电荷	$I_F=75A, V_R=600V$ $-di_F/dt=950A/us(T_{vj}=175^\circ C)$ $V_{GE}=-8V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	Q_R	2.00 4.90 7.00		μC

Reverse Recovery Energy 反向恢复损耗	$I_F=75A, V_R=600V$ $-di_F/dt=950A/\mu s(T_{vj}=175^\circ C)$ $V_{GE}=-8V$	$T_{vj}=25^\circ C$ $T_{vj}=125^\circ C$ $T_{vj}=175^\circ C$	E_{rec}		0.95 2.35 3.65		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode /单个 Diode		R_{thJC}		0.487		K/W
Temperature under switching conditions 工作温度			$T_{vj op}$	-40		175	$^\circ C$

注： $T_{vj op}$ 仅允许在过载工况下运行结温可以大于 $150^\circ C$ 。

NTC-Thermistor/ NTC-热敏电阻

Characteristic Values / 性能参数

			min.	typ.	max.	
Rated Resistance 标称电阻	$T_{NTC}=25^\circ C$	R_{25}		5		K Ω
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
B-Value B 值	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$		3470		K

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 相对漏电起痕指数		CTI		>200		

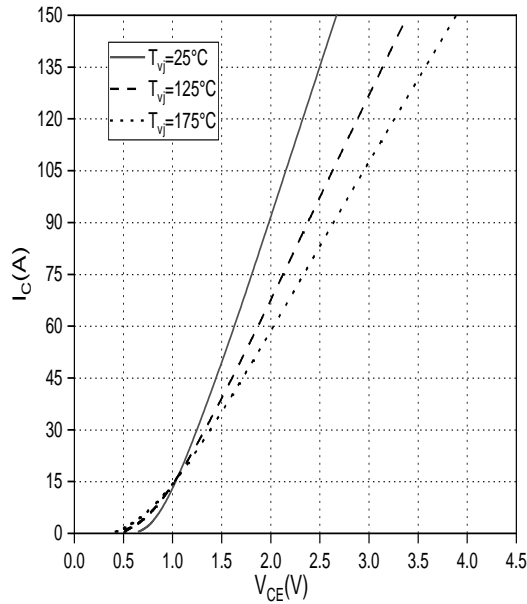
			min.	typ.	max.	
Stray Inductance Module 模块杂散电感		L_{sCE}		35		nH
Module lead resistance 模块引脚电阻	$T_C=25^\circ C$, 每个开关 per switch	R_{AA+CC}		5.6		m Ω
Module lead resistance 模块引脚电阻	$T_C=25^\circ C$, 每个开关 per switch	R_{CC+EE}		5.3		m Ω
Storage Temperature 贮存温度		T_{stg}	-40		125	$^\circ C$
Modul Mounting torque 模块安装扭距	M5	M	3.0		6.0	Nm
Weight 重量		G		180		g

输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

$V_{GE} = 15V$

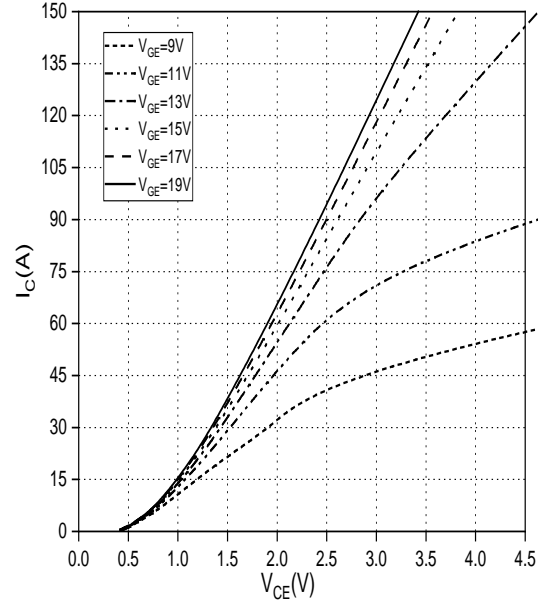


输出特性 IGBT, 逆变器(典型值)

Output characteristic IGBT Inverter (typical)

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

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

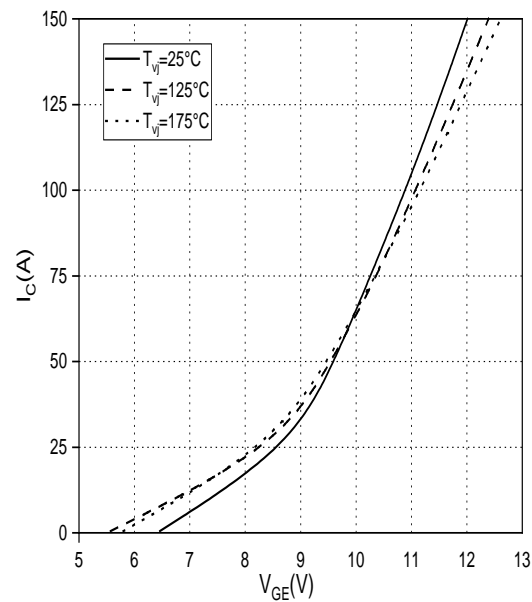


传输特性 IGBT, 逆变器 (典型值)

Transfer characteristic IGBT, Inverter (typical)

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

$V_{CE} = 20V$

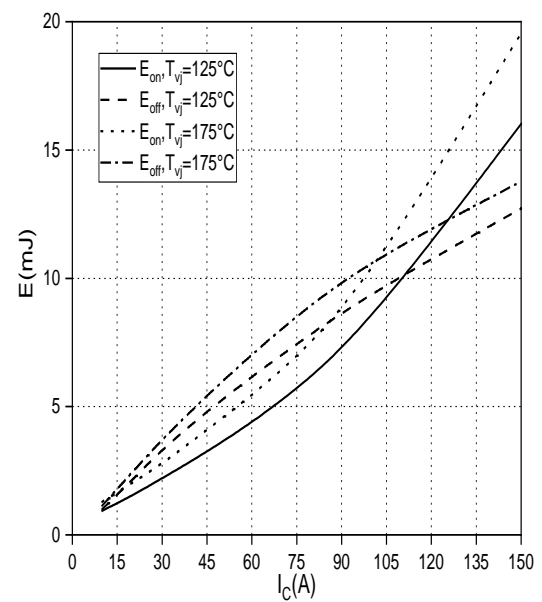


开关损耗 IGBT, 逆变器 (典型值)

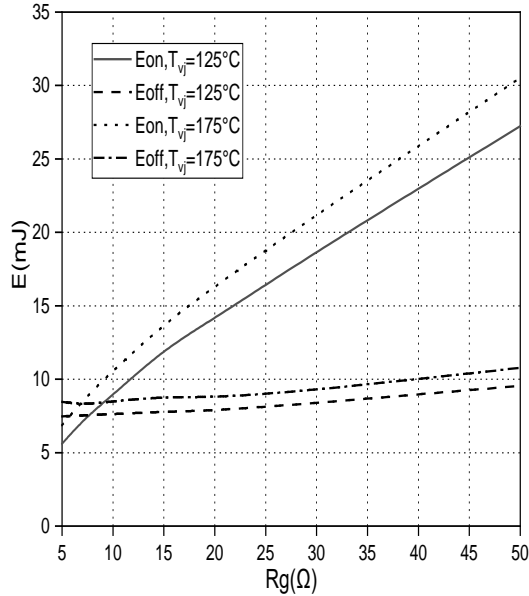
switching losses IGBT, Inverter (typical)

$E_{on} = f(I_c), E_{off} = f(I_c), V_{GE} = 15V/-8V$,

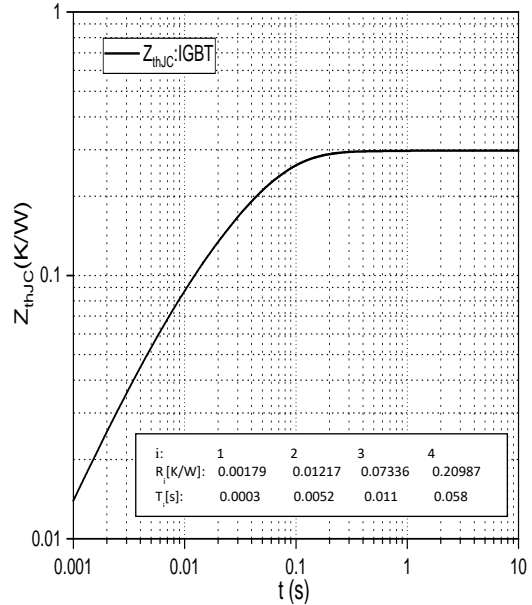
$R_{Gon} = 5.0\Omega, R_{Goff} = 5.0\Omega, V_{CE} = 600V$



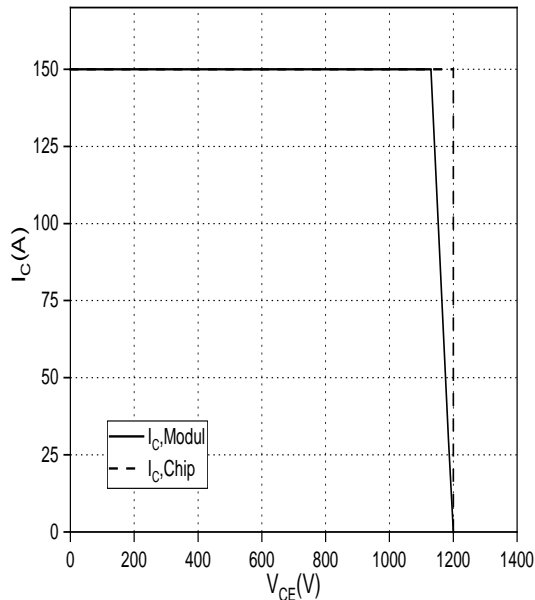
开关损耗 IGBT, 逆变器 (典型值)
Switching losses IGBT, Inverter (typical)
 $V_{GE} = 15V/-8V, I_C = 75A, V_{CE} = 600V$



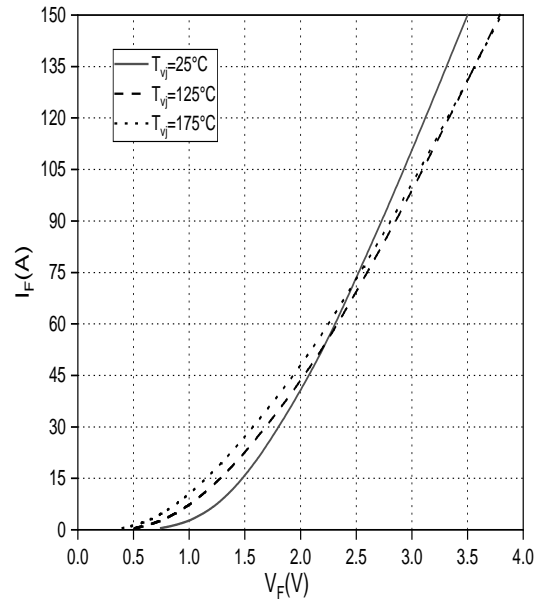
瞬态热阻抗 IGBT, 逆变器
transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$



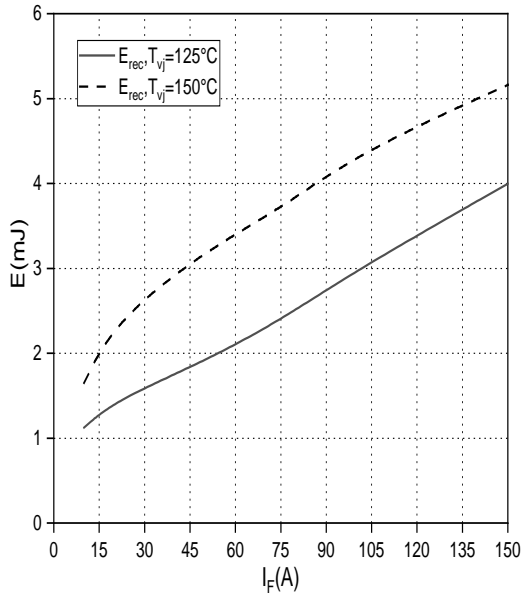
反偏安全工作区 IGBT, 逆变器 (RBSOA)
Reverse bias safe operating area IGBT, Inverter (RBSOA) $I_C = f(V_{CE})$
 $V_{GE} = 15V/-8V, R_{Goff} = 5.0\Omega, T_{vj} = 175^\circ C$



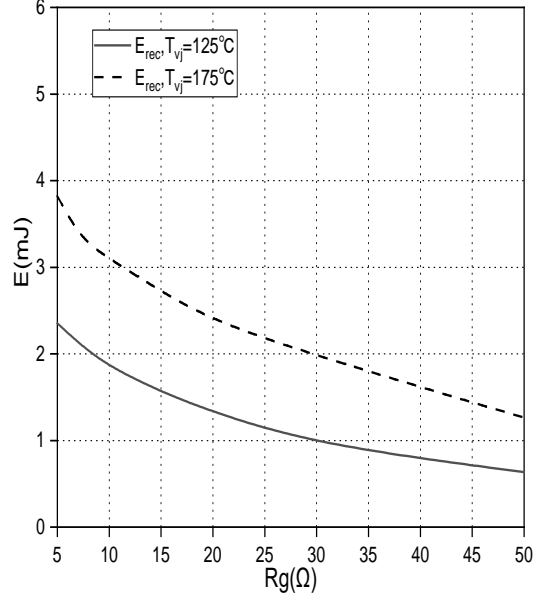
正向偏压特性二极管, 逆变器 (典型值)
forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_F)$



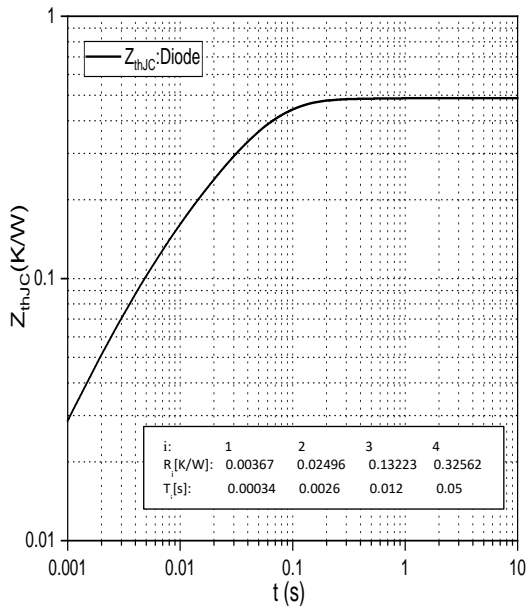
开关损耗 二极管,逆变器 (典型值)
Switching losses Diode, Inverter (typical)
 $E_{rec} = f(I_F)$
 $R_{Gon} = 5.0\Omega, V_{CE} = 600V$



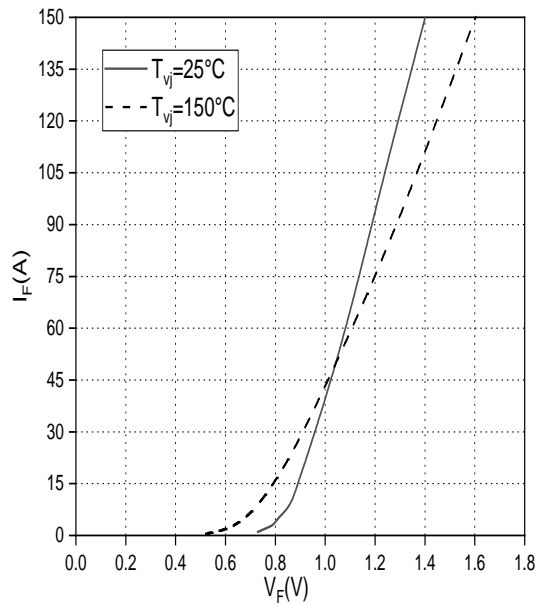
开关损耗 二极管,逆变器 (典型值)
switching losses Diode, Inverter (typical)
 $E_{rec} = f(R_G)$
 $I_F = 75A, V_{CE} = 600V$



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)
 $I_F = f(V_F)$

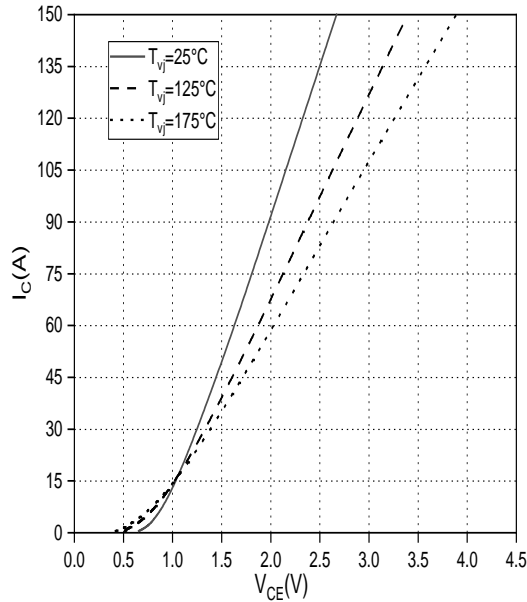


输出特性 IGBT, 制动-斩波器 (典型值)

Output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

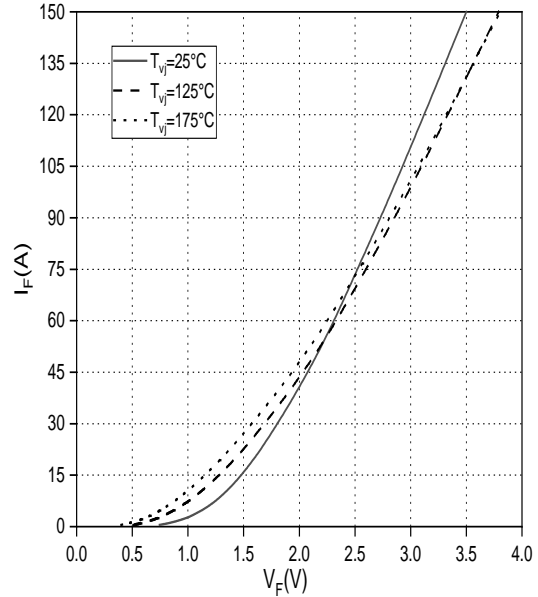
$V_{GE} = 15V$



正向偏压特性 二极管, 制动-斩波器 (典型值)

forward characteristic of Diode, Brake-Chopper (typical)

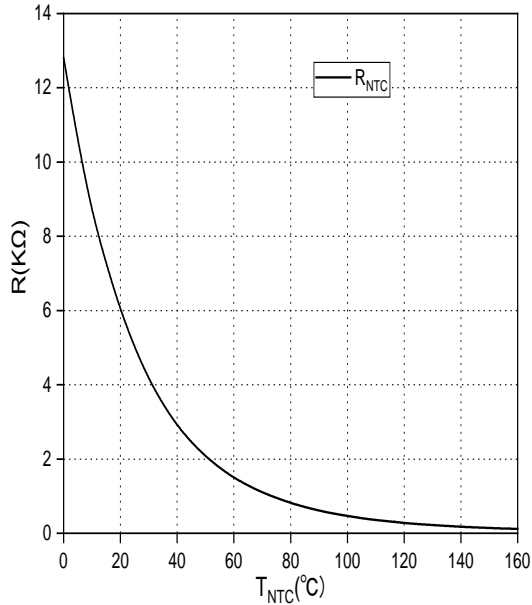
$I_F = f(V_F)$



负温度系数热敏电阻 温度特性 (典型值)

NTC-Thermistor-temperature characteristic (typical)

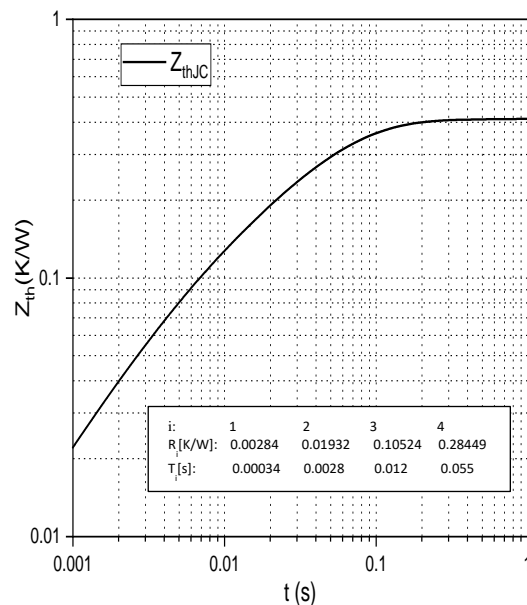
$R = f(T)$



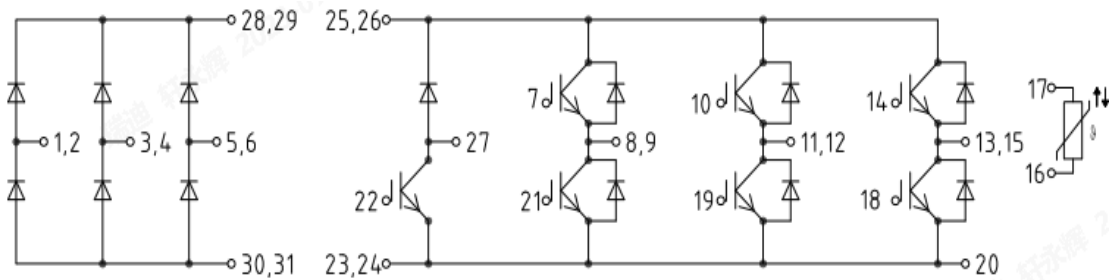
瞬态热阻抗二极管, 整流

transient thermal impedance Diode, Rectifier

$Z_{thJC} = f(t)$



Internal Circuit:



Package Dimension
Dimensions in Millimeters

