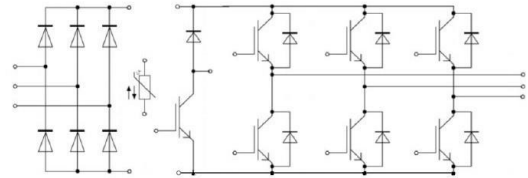


N3 package: 1200V 100A IGBT PIM



等效电路图

Equivalent Circuit Schematic

Features:

- 1200V 100A, $V_{CE(sat)} = 2.00V$
- High RBSOA capability
- Trench/FS Technology
- Low switching losses
- High SC capability

产品特性:

- 1200V 100A, $V_{CE(sat)} = 2.00V$
- 高 RBSOA 能力
- 沟槽栅/场终止技术
- 低开关损耗
- 高短路能力

Typical Applications:

- Motor Drives
- Servo Drivers

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		$I_{C\text{ nom}}$	100	A
Continuous DC collector current 集电极连续直流电流	$T_C=90^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	I_C	194	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}	200	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	$I_C=100\text{A}, V_{GE}=15\text{V}$ $I_C=100\text{A}, V_{GE}=15\text{V}$ $I_C=100\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	V_{CESat}	1.98 2.02 2.08	2.20	V
Gate Threshold Voltage 门极阈值电压	$V_{CE}=10\text{V}, I_C=4.00\text{mA}, T_{vj}=25^{\circ}\text{C}$		V_{GEth}	5.0	5.7	6.0
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$		R_{Gint}	7.5		Ω
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$ $T_{vj}=25^{\circ}\text{C}$		C_{ies}	8.3		nF
Reverse Transfer Capacitance 反向传输电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$ $T_{vj}=25^{\circ}\text{C}$		C_{res}	0.29		nF
Gate Charge 门极电荷	$V_{GE}=-15\text{V}\sim+15\text{V}$		Q_G	0.62		μC
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}		500	μA
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}		500	nA
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=100\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{don}	90 96 98		ns
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=100\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_r	24 27 27		ns
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=100\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{doff}	303 354 378		ns
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=100\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_f	179 257 278		ns
Turn-on energy loss per pulse 开通损耗	$I_C=100\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}, L_s=55\text{nH}$ $R_{Gon}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{on}	5.56 8.76 9.74		mJ
Turn-off energy loss per pulse 关断损耗	$I_C=100\text{A}, V_{CE}=600\text{V},$ $V_{GE}=-8\text{V}/15\text{V}, L_s=55\text{nH}$ $R_{Goff}=1.5\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{off}	6.34 9.40 10.45		mJ

SC Data 短路耐量	$V_{CE}=600V, V_{GE}=15V/-8V,$ $T_{vj}=150^{\circ}C$	t_{psc}		10		μs
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.27		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	100	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{FRM}=2 \times I_F$	I_{FRM}	200	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$I_F=100A, V_{GE}=0V$ $I_F=100A, V_{GE}=0V$ $I_F=100A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	V_F	2.35 2.24 2.15	2.57	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=100A, V_R=600V$ $-di_F/dt=3200A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-8V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	I_{RM}	128 134 142		A
Recovery Charge 反向恢复电荷	$I_F=100A, V_R=600V$ $-di_F/dt=3200A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-8V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	Q_r	7.83 11.46 13.36		μC
Reverse Recovery Energy 反向恢复损耗	$I_F=100A, V_R=600V$ $-di_F/dt=3200A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-8V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{rec}	3.92 6.16 7.71		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per FRD/单个 FRD	R_{thJC}		0.42		K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^{\circ}C$

IGBT, Brake Chopper / IGBT , 刹车部分
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
Continuous DC collector current 集电极连续直流电流	$T_C=80^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	I_C	70	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
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.

			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}	1.74 2.14 2.19	2.0	V	
Gate Threshold Voltage 门极阈值电压	$V_{CE}=10\text{V}, I_C=1.7\text{mA}, T_{vj}=25^{\circ}\text{C}$		V_{GEth}	5.0	5.8	6.5	V
Gate Charge 门极电荷	$V_{GE}=-15\text{V}/15\text{V}$		Q_G	0.17		μC	
Internal Gate Resistor 内置门极电阻	$T_{vj}=25^{\circ}\text{C}$		R_{Gint}	4		Ω	
Input Capacitance 输入电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		C_{ies}	3800		pF	
Reverse Transfer Capacitance 反向传输电容	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		C_{res}	140		pF	
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	$V_{CE}=0\text{V}, V_{GE}=20\text{V}, T_{vj}=25^{\circ}\text{C}$		I_{GES}		500	nA	
Turn-on Delay Time, Inductive Load 开通延迟时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{don}		46.5 48.0 48.0	ns	
Rise Time, Inductive Load 上升时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_r		23.0 27.0 28.0	ns	
Turn-off Delay Time, Inductive Load 关断延迟时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_{doff}		240 285 300	ns	
Fall Time, Inductive Load 下降时间, 感性负载	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Goff}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	t_f		180 320 360	ns	
Turn-on energy loss per pulse 开通损耗	$I_C=50\text{A}, V_{CE}=600\text{V}$ $V_{GE}=-8\text{V}/15\text{V}$ $R_{Gon}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{on}		4.10 6.10 6.80	mJ	
Turn-off energy loss per pulse 关断损耗	$I_C=50\text{A}, V_{CE}=600\text{V}, L_o=80\text{nH}$ $V_{GE}=-8\text{V}/15\text{V}$ $V_{GE}=-8\text{V}/15\text{V}, R_{Goff}=15.0\Omega$	$T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	E_{off}		2.90 4.80 5.40	mJ	

SC Data 短路耐受	$V_{CE}=600V, V_{GE}=15V/-8V,$ $T_{vj}=25^{\circ}C$	t_{psc}		10		μs
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}			0.5	K/W
Temperature under switching conditions 工作温度		$T_{vj op}$	-40		150	$^{\circ}C$

Diode, Brake Chopper / 二极管，刹车部分

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	$I_{FRM}=2 \times I_F$	I_{FRM}		100		A

Characteristic Values / 性能参数

			min.	typ.	max.		
Forward Voltage 正向通态压降	$I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$ $I_F=50A, V_{GE}=0V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	V_F		1.67 2.02 2.07	2.0	V
Peak Reverse Recovery Current 反向恢复峰值电流	$I_F=50A, V_R=600V$ $-di_f/dt=2500A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	I_{RM}		23 28 30		A
Recovery Charge 反向恢复电荷	$I_F=50A, V_R=600V$ $-di_f/dt=2500A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	Q_R		3.4 6.5 7.8		μC
Reverse Recovery Energy 反向恢复损耗	$I_F=50A, V_R=600V$ $-di_f/dt=2500A/\mu s(T_{vj}=150^{\circ}C)$ $V_{GE}=-15V$	$T_{vj}=25^{\circ}C$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$	E_{rec}			1.30 2.70 3.40	mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per FRD/单个 FRD		R_{thJC}			0.72	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	$T_j=25^{\circ}\text{C}$, $I_{RRM}=5\mu\text{A}$	V_{RRM}	1600	V
Maximum RMS Forward Current Per Chip 单芯片最大正向电流有效值		I_{FRMSM}	90	A
Maximum RMS Current at Rectifier Output 最大整流输出有效值	$T_C=80^{\circ}\text{C}$, $T_{vjmax}=150^{\circ}\text{C}$	I_{RMSM}	102	A
Surge Forward Current 正向浪涌电流	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_j=25^{\circ}\text{C}$	I_{FSM}	840	A
I^2t Value I^2t 值	$t_p=10\text{ms}$, $\sin 180^{\circ}$, $T_j=25^{\circ}\text{C}$	I^2t	3528	A^2s

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	$T_{vj}=25^{\circ}\text{C}$, $I_F=70\text{A}$	V_F		1.2		V
Reverse Current 反向漏电流	$T_{vj}=25^{\circ}\text{C}$, $V_{RRM}=1600\text{V}$	I_{RM}			2	mA
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode/ 单个 Diode	R_{thJC}			0.5	K/W
Temperature under switching conditions 工作温度		$T_{vj\text{ op}}$	-40		150	$^{\circ}\text{C}$

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

			min.	typ.	max.	
Rated Resistance 标称电阻	$T_{vj}=25^{\circ}\text{C}$	R_{25}		5		K Ω
Deviation of R100 R100 偏移值	$T_C=100^{\circ}\text{C}$, $R_{100}=481\Omega$	$\Delta R/R$	-5		5	%
Power Dissipation 功率耗散	$T_C=25^{\circ}\text{C}$	P_{25}			10	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		

Module / 模块

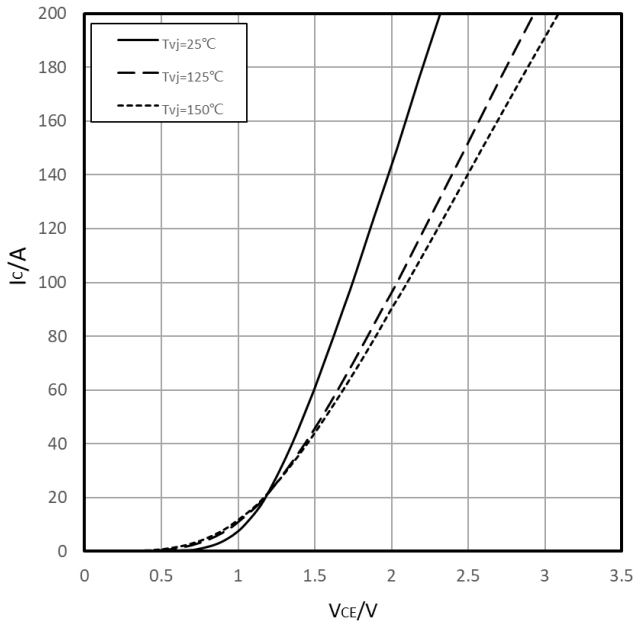
Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	V_{ISOL}	2.5		KV
Material of Module Baseplate 模块底板材料			Cu		
Internal Isolation 内部绝缘			Al ₂ O ₃		
Creepage Distance 爬电距离	Terminal to heatsink Terminal to terminal		10.0		mm
Clearance 电气间隙	Terminal to heatsink Terminal to terminal		7.5		mm
Comparative Tracking 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}		40	nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻, 端子-芯片	$T_C=25^{\circ}C$, Per Switch	R_{CC+EE}		3.7	m Ω
Storage Temperature 贮存温度		T_{stg}	-40		125 $^{\circ}C$
Mounting Torque for Module Mounting 模块安装力矩	Screw M5 / M5 螺丝	M	3.0		6.0 Nm
Weight 重量		G		310	g

Circuit Diagram / 曲线图

Output characteristic , Inverter IGBT (typical)

输出特性, 逆变IGBT (典型)

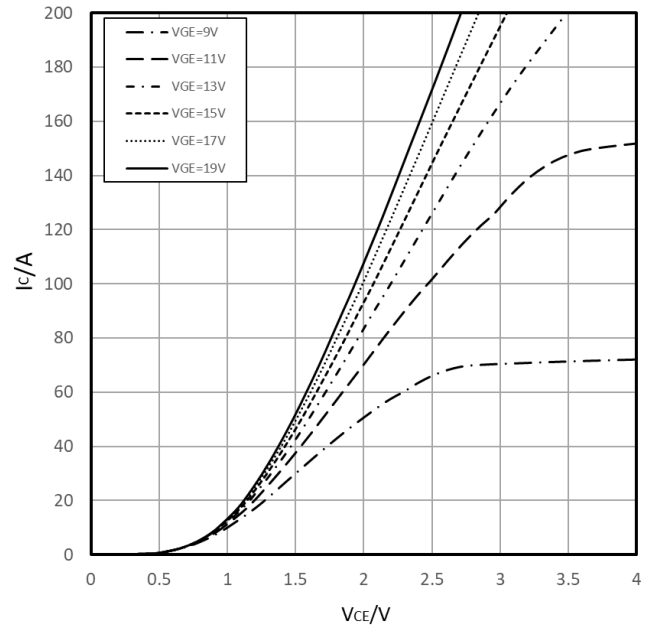
$I_c=f(V_{CE})$, $V_{GE}=15V$ (Inclusive R_{CC+EE})



Output characteristic , Inverter IGBT (typical)

输出特性, 逆变IGBT (典型)

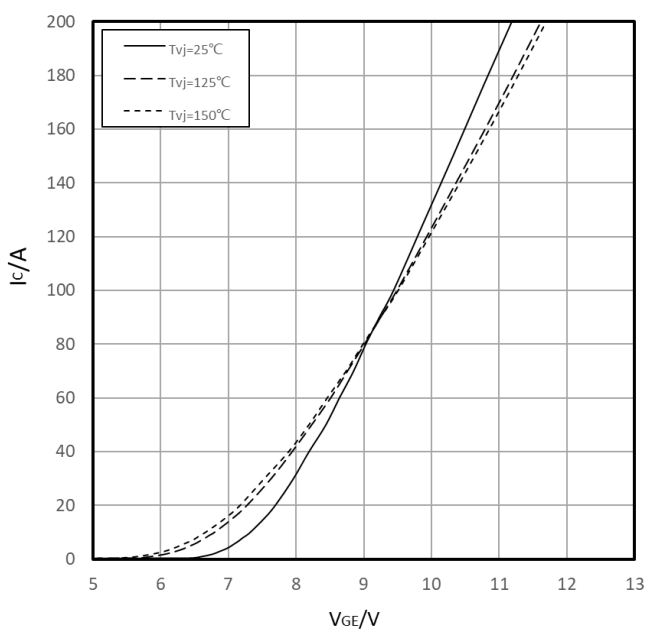
$I_c=f(V_{CE})$, $T_{vj}=150^{\circ}C$



Transfer characteristic , Inverter IGBT (typical)

传输特性, 逆变IGBT (典型)

$I_c=f(V_{GE})$, $V_{CE}=20V$

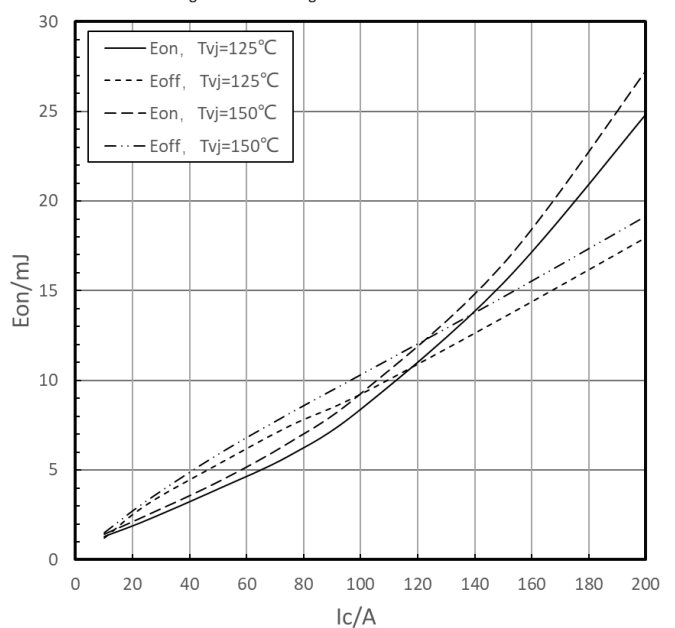


Switching losses , Inverter IGBT (typical)

开关损耗, 逆变IGBT (典型)

$E_{on}=f(I_c)$, $E_{off}=f(I_c)$

$V_{GE}=+15V/-8V$, $R_{gon}=1.5\Omega$, $R_{goff}=1.5\Omega$, $V_{CE}=600V$

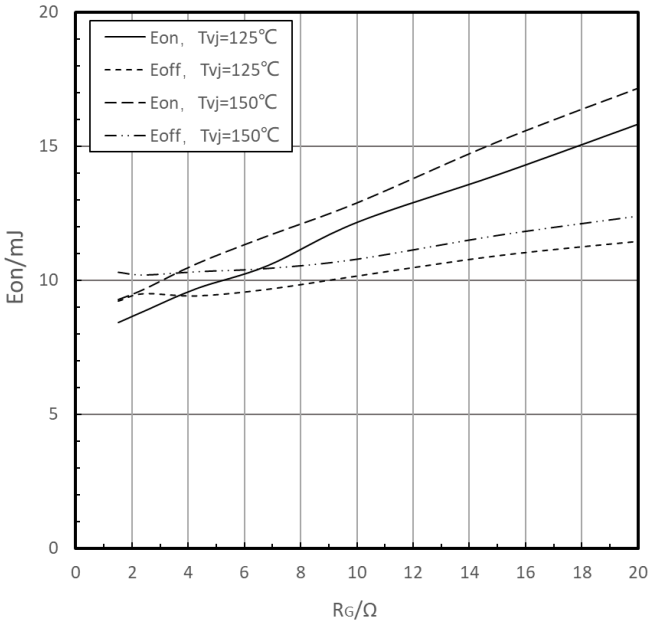


Switching losses , Inverter IGBT (typical)

开关损耗, 逆变IGBT (典型)

$E_{on}=f(R_g), E_{off}=f(R_g)$

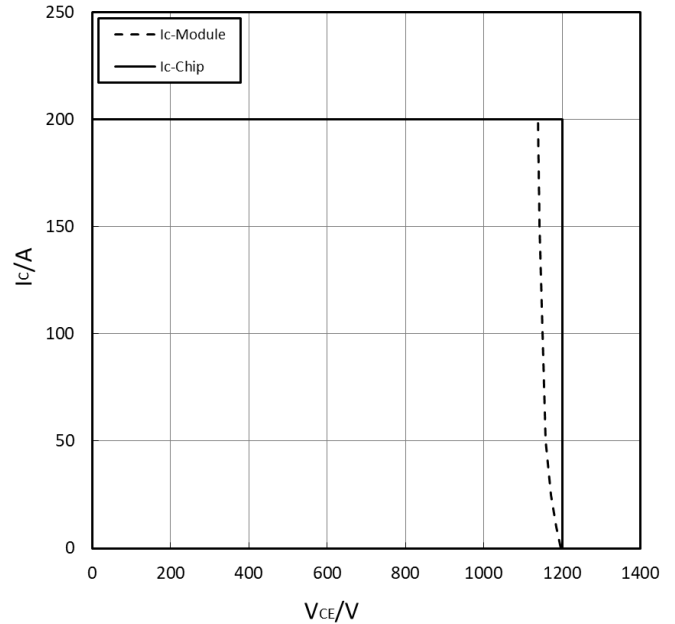
$V_{GE}=+15V/-8V, I_c=100A, V_{CE}=600V$



Reverse bias safe operating area , Inverter IGBT (RBSOA)

反偏安全工作区, 逆变IGBT (RBSOA)

$I_c=f(V_{CE}), V_{GE}=+15V/-8V, R_{goff}=1.5\Omega, T_{vj}=150^\circ C$

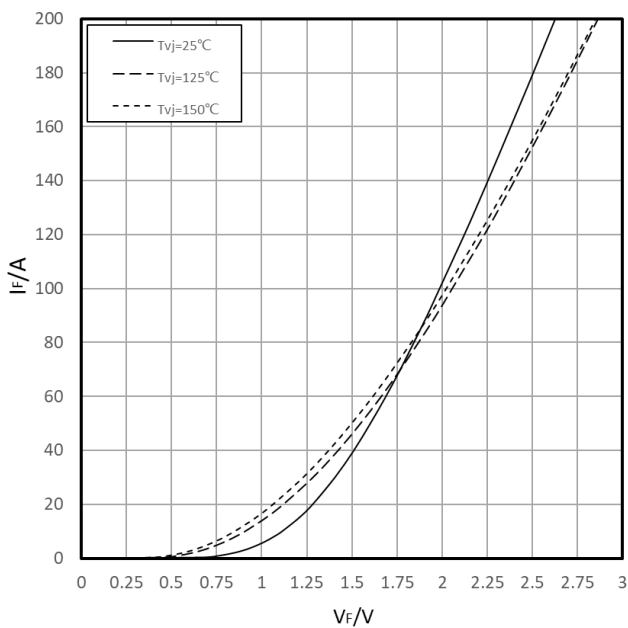


Forward characteristic , Inverter FRD (typical)

正向偏压特性, 逆变FRD (典型)

$I_F=f(V_F)$

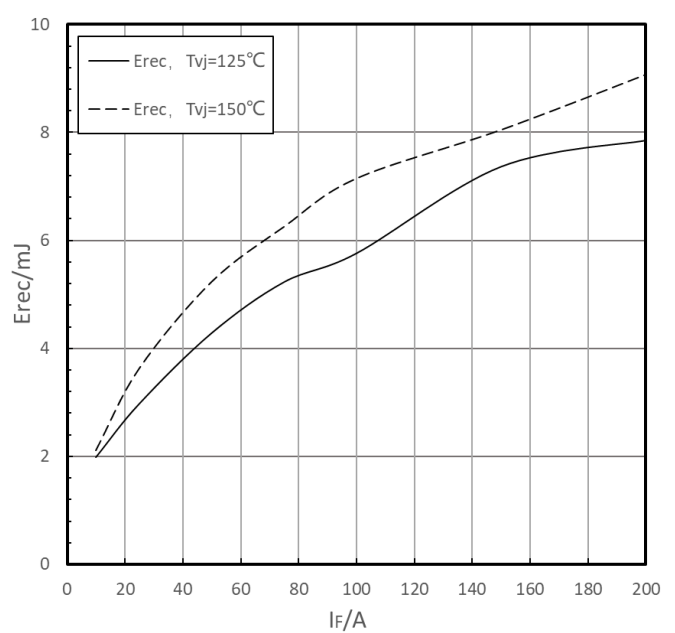
(Inclusive R_{CC+EE})



Switching losses , Inverter IGBT (typical)

开关损耗, 逆变FRD (典型)

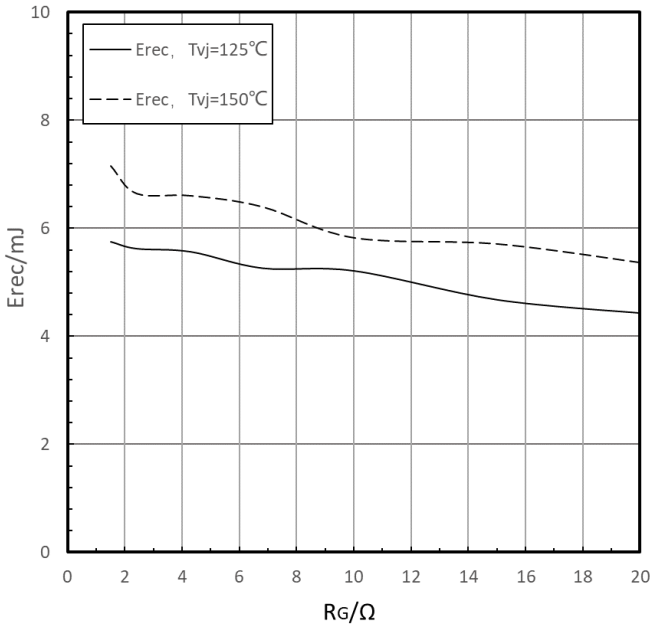
$E_{rec}=f(I_F), R_{gon}=1.5\Omega, V_{CE}=600V$



Switching losses , Inverter FRD (typical)

开关损耗, 逆变FRD (典型)

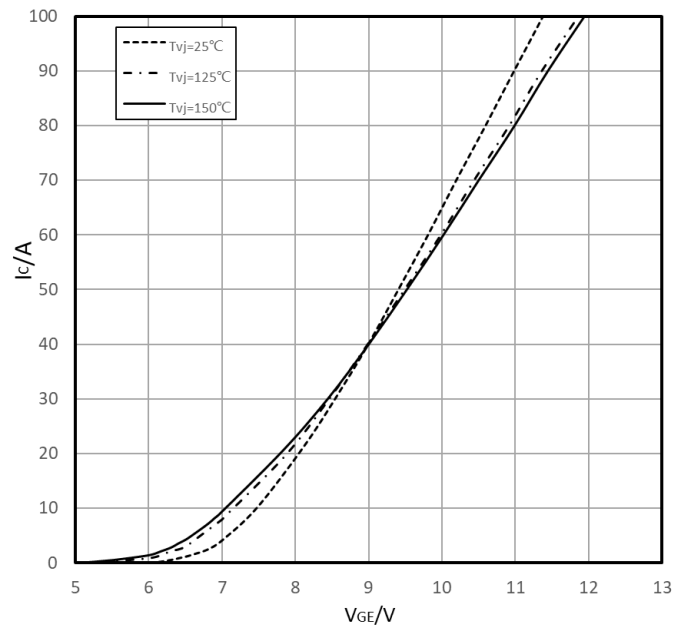
$E_{rec}=f(R_G)$, $I_F=100A$, $V_{CE}=600V$



Transfer characteristic IGBT, Brake Chopper(typical)

转移特性, 刹车IGBT

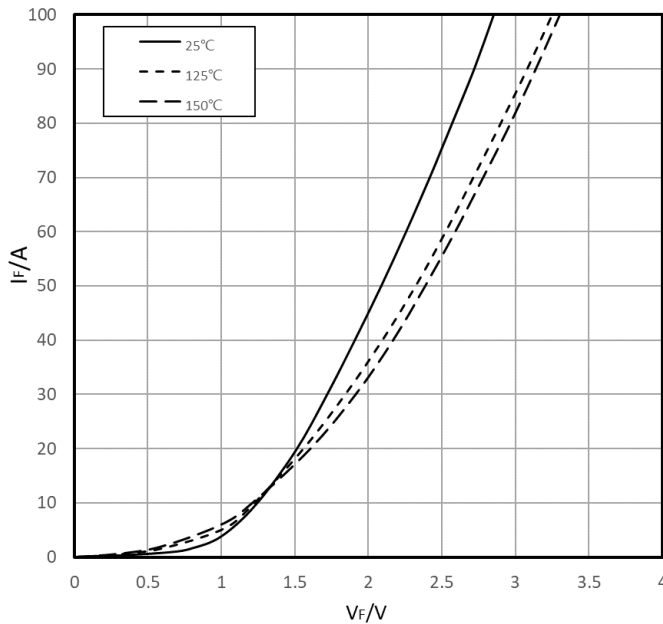
$I_C=f(V_{GE})$, $V_{CE}=20V$



Output characteristic FRD, Brake Chopper(typical)

输出特性, 刹车FRD

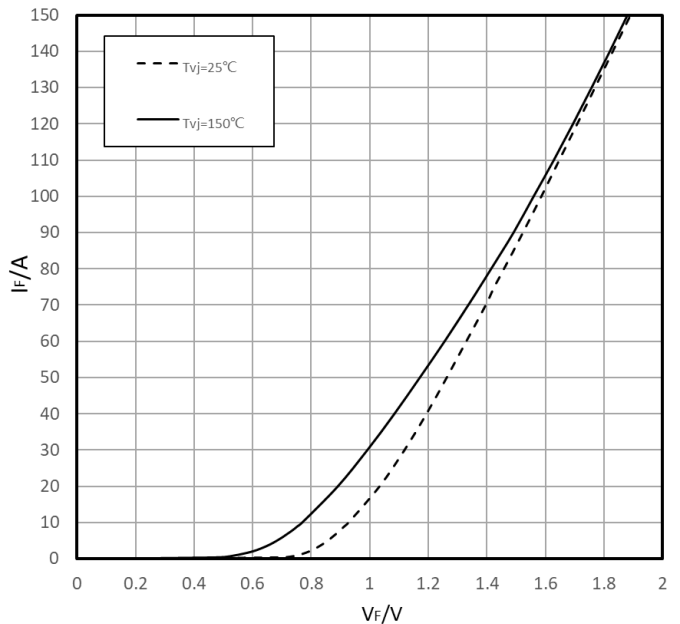
$I_F=f(V_F)$



Forward characteristic of Diode, Rectifier(typical)

正向特性, 整流Diode

$I_F=f(V_F)$



NTC-Thermistor-temperature characteristic

负温度系数热敏电阻 温度特性

$R=f(T)$

