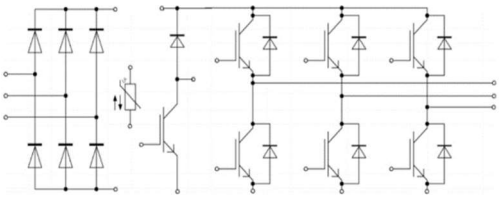
W1 package: 1200V 15A IGBT PIM module



Equivalent Circuit Schematic

Features:

- 1200V 15A,$VCE_{(sat)}$ = 1.85V
- High RBSOA capability
- High speed trench field-stop IGBT
- Low turn-off losses
- High short circuit capability

产品特性:

- 1200V 15A,$VCE_{(sat)}$ = 1.85V
- 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
- Air Conditioning
- Auxiliary Inverters

典型应用：

- 马达驱动
- 空调
- 辅助逆变器

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℃	V_{CES}	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{C\ nom}$	15	A
	T_C=80℃, T_{vjmax}=150℃	I_C	22	A
Repetitive Peak collector current 集电极可重复峰值电流	I_{CRM}=2×I_{Cnom}	I_{CRM}	30	A
Total power dissipation 总功率损耗	T_C=25℃, T_{vjmax}=150℃	P_{tot}	110	W
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=15A, V_{GE}=15V T_{vj}=25℃ I_C=15A, V_{GE}=15V T_{vj}=125℃ I_C=15A, V_{GE}=15V T_{vj}=150℃	V_{CEsat}		1.85 2.20 2.20	2.10	V
Gate Threshold Voltage 门极阈值电压	V_{CE}= V_{GE}, I_C=1mA, T_{vj}=25℃	V_{GEth}	4.50	5.80	6.50	V
Gate Charge 门极电荷	V_{CC}=600V,V_{GE}=15V, I_C=15A, T_{vj}=25℃	Q_G		70		nC
Input Capacitance 输入电容	V_{CE} = 25V,V_{GE} = 0V f = 1MHz	C_{ies}		1.12		nF
Reverse Transfer Capacitance 反向传输电容		C_{res}		0.05		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}			1	mA
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=15A,V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=30Ω T_{vj}=150℃	t_{don}		14 14 15		ns
Rise Time, Inductive Load 上升时间，感性负载	I_C=15A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=30Ω T_{vj}=150℃	t_r		20 20 21		ns
Turn-off Delay Time, Inductive Load 关断延迟时间，感性负载	I_C=15A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=30Ω T_{vj}=150℃	t_{doff}		85 100 105		ns
Fall Time, Inductive Load 下降时间，感性负载	I_C=15A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=30Ω T_{vj}=150℃	t_f		265 300 310		ns
Turn-on energy loss per pulse 开通损耗	I_C=15A, V_{CE}=600V, T_{vj}=25℃ L_o=80nH, V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V, R_{Gon}=30Ω T_{vj}=150℃	E_{on}		1.70 2.15 2.30		mJ
Turn-off energy loss per pulse 关断损耗	I_C=15A, V_{CE}=600V, T_{vj}=25℃ L_o=80nH, V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V, R_{Goff}=30Ω T_{vj}=150℃	E_{off}		0.60 0.90 1.05		mJ

Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.85	1.12	K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

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	15	A
Repetitive Peak Forward Current 可重复正向峰值电流	$I_{CRM}=2\times I_{Fnom}$	I_{FRM}	30	A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	I_F=15A, V_{GE}=0V T_{vj}=25℃ I_F=15A, V_{GE}=0V T_{vj}=125℃ I_F=15A, V_{GE}=0V T_{vj}=150℃	V_F		1.90 1.90 1.90	2.20	V
Peak Reverse Recovery Current 反向恢复峰值电流	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=530A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	I_{RM}		11 15 25		A
Recovery Charge 反向恢复电荷	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=530A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	Q_R		1.10 1.80 2.40		uC
Reverse Recovery Energy 反向恢复损耗	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=530A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	E_{rec}		0.30 0.45 0.50		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode /单个 Diode	R_{thJC}		1.80		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

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℃	V_{RRM}	1600	V
Maximum RMS Forward Current Per Chip 单芯片最大正向电流有效值		I_{FRMSM}	15	A
Surge Forward Current 正向浪涌电流	t_p=10ms, sin180°, T_{vj} =25℃	I_{FSM}	220	A
I^2t Value I^2t 值	tp=10ms, sin 180°, T_{vj} =25℃	I^2t	242	A^2S

Characteristic Values / 性能参数			min.	typ.	max.	
Forward Voltage 正向通态压降	I_F=15A，T_{vj}=25℃ I_F=15A，T_{vj}=125℃ I_F=15A，T_{vj}=150℃	V_F		1.05 1.00 0.95		V
Reverse Current 反向漏电流	V_{RRM}=1800V, T_{vj}=25℃	I_{RM}			1	mA
Thermal Resistance, Junction to Case 结-壳热阻		R_{thJC}		1.75		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

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℃	V_{CES}	1200	V
Continuous DC collector current 集电极连续直流电流		$I_{C\ nom}$	15	A
	T_C=80℃, T_{vjmax}=150℃	I_C	22	A
Repetitive Peak collector current 集电极可重复峰值电流	I_{CRM}=2×I_{Cnom}	I_{CRM}	30	A
Total power dissipation 总功率损耗	T_C=25℃, T_{vjmax}=150℃	P_{tot}	110	W
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=15A, V_{GE}=15V T_{vj}=25℃ I_C=15A, V_{GE}=15V T_{vj}=125℃ I_C=15A, V_{GE}=15V T_{vj}=150℃	V_{CEsat}		1.85 2.20 2.20	2.10	V
Gate Threshold Voltage 门极阈值电压	V_{CE}= V_{GE}, I_C=1mA, T_{vj}=25℃	V_{GEth}	4.50	5.80	6.50	V
Gate Charge 门极电荷	V_{CC}=600V,V_{GE}=15V, I_C=15A, T_{vj}=25℃	Q_G		70		nC
Input Capacitance 输入电容	V_{CE} = 25V,V_{GE} = 0V f = 1MHz	C_{ies}		1.12		nF
Reverse Transfer Capacitance 反向传输电容		C_{res}		0.05		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}			1	mA
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=15A,V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=30Ω T_{vj}=150℃	t_{don}		14 14 15		ns
Rise Time, Inductive Load 上升时间，感性负载	I_C=15A, V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Gon}=30Ω T_{vj}=150℃	t_r		20 20 21		ns

Turn-off Delay Time, Inductive Load 关断延迟时间，感性负载	I_C=15A，V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=30Ω T_{vj}=150℃	t_{doff}		85 100 105		ns
Fall Time, Inductive Load 下降时间，感性负载	I_C=15A，V_{CE}=600V T_{vj}=25℃ V_{GE}= ±15V T_{vj}=125℃ R_{Goff}=30Ω T_{vj}=150℃	t_f		265 300 310		ns
Turn-on energy loss per pulse 开通损耗	I_C=15A，V_{CE}=600V， T_{vj}=25℃ L_σ=80nH，V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V,R_{Gon}=30Ω,T_{vj}=150℃	E_{on}		1.70 2.15 2.30		mJ
Turn-off energy loss per pulse 关断损耗	I_C=15A，V_{CE}=600V， T_{vj}=25℃ L_σ=80nH，V_{GE}=±15V T_{vj}=125℃ V_{GE}= ±15V,R_{Goff}=30Ω,T_{vj}=150℃	E_{off}		0.60 0.90 1.05		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per IGBT/单个 IGBT	R_{thJC}		0.85	1.12	K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

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℃	V_{RRM}	1200		V
Continuous DC Forward Current 可连续正向直流电流		I_F	15		A
Repetitive Peak Forward Current 可重复正向峰值电流	I_{CRM}=2×I_{Fnom}	I_{FRM}	30		A

Characteristic Values / 性能参数

			min.	typ.	max.	
Forward Voltage 正向通态压降	I_F=15A，V_{GE}=0V T_{vj}=25℃ I_F=15A，V_{GE}=0V T_{vj}=125℃ I_F=15A，V_{GE}=0V T_{vj}=150℃	V_F		1.90 1.90 1.90	2.20	V
Peak Reverse Recovery Current 反向恢复峰值电流	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=150A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	I_{RM}		11 15 25		A
Recovery Charge 反向恢复电荷	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=150A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	Q_R		1.10 1.80 2.40		uC
Reverse Recovery Energy 反向恢复损耗	I_F=15A, V_R=600V T_{vj}=25℃ -di$_F$/dt=150A/us T_{vj}=125℃ V_{GE}=-15V T_{vj}=150℃	E_{rec}		0.30 0.45 0.50		mJ
Thermal Resistance, Junction to Case 结-壳热阻	Per Diode /单个 Diode	R_{thJC}		1.80		K/W
Temperature under switching conditions 工作温度		$T_{vj\ op}$	-40		150	℃

NTC-Thermistor/ NTC-热敏电阻

Characteristic Values / 性能参数

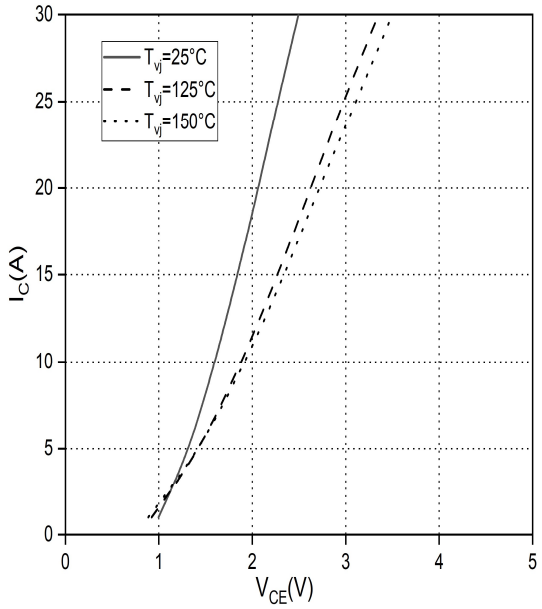
			min.	typ.	max.	
Rated Resistance 标称电阻	T_{vj}=25℃	R_{25}		5		KΩ
Deviation of R100 R100 偏移值	T_C=100℃,R_{100}=481Ω	△R/R	-5		5	%
Power Dissipation 功率耗散	T_C=25℃	P_{25}		50		mW
B-Value B 值	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$		3380		K
B-Value B 值	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$		3440		K

Module / 模块

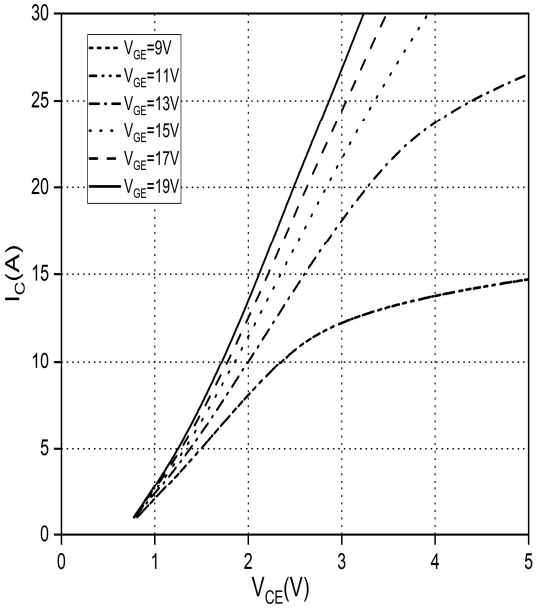
Isolation Test Voltage 绝缘测试电压	RMS, f=50Hz, t=1min	V_{ISOL}	2.5	KV
Internal Isolation 内部绝缘	基本绝缘（class 1, IEC 61140） Basic insulation (class1,IEC 61140		Al_2O_3	
Creepage Distance 爬电距离	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		11.5 6.3	mm
Clearance 电气间隙	端子-散热片 terminal to heatsink 端子-端子 terminal to terminal		10.0 5.5	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}		30		nH
Module Lead Resistance, Terminals-Chip 模块引脚电阻，端子-芯片	T_C =25°C,每个开关 per switch	$R_{CC'+EE}$ $R_{AA'+CC}$		8.00 6.00		mΩ
Storage Temperature 贮存温度		T_{stg}	-40		125	℃
Mounting torque for modul mounting 模块安装的安装扭距	M4	M	1.2		1.8	N-m
Weight 重量		G		24		g

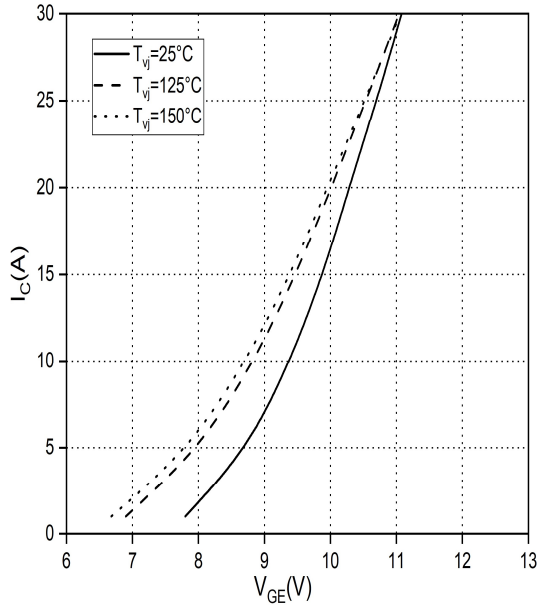
输出特性 IGBT,逆变器(典型值)
Output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$V_{GE} = 15V$



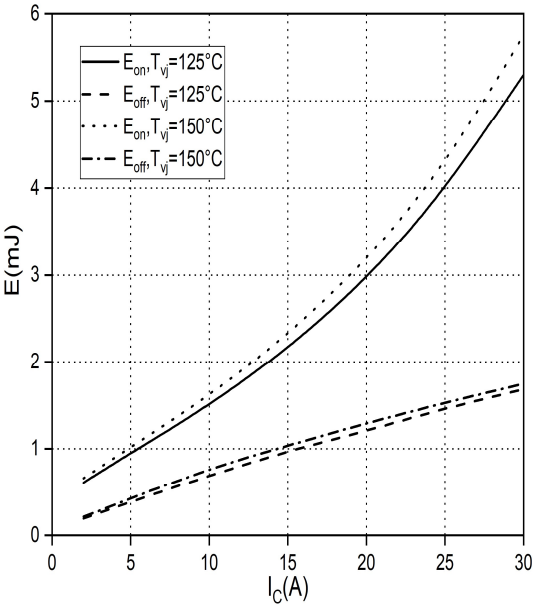
输出特性 IGBT, 逆变器(典型值)
output characteristic IGBT Inverter (typical)
$I_C = f(V_{CE})$,
$T_{vj} = 150℃$



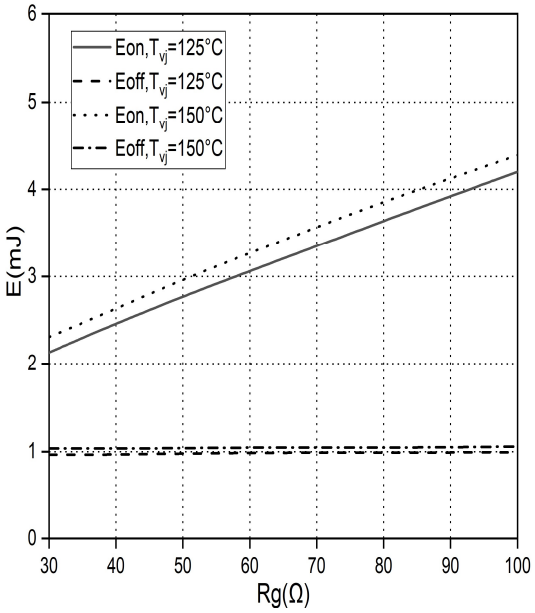
传输特性 IGBT, 逆变器 (典型值)
Transfer characteristic IGBT, Inverter (typical)
$I_C = f(V_{GE})$,
$V_{CE} = 20V$



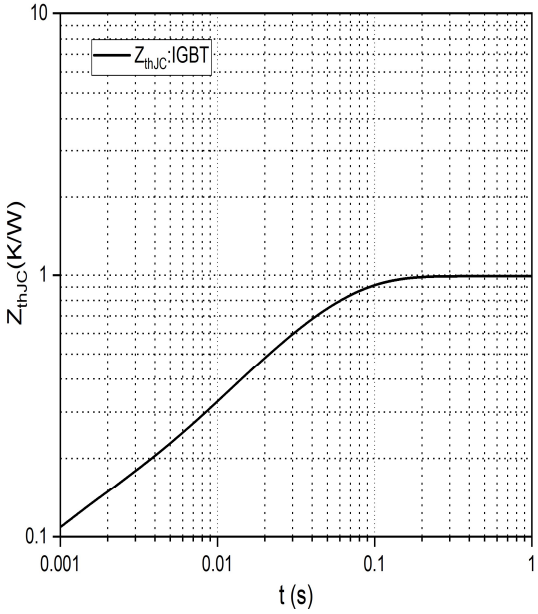
开关损耗 IGBT ,逆变器（典型值)
switching losses IGBT , Inverter (typical)
$E_{on} = f(I_C)$,$E_{off} = f(I_C)$, $V_{GE} = \pm 15V$,
$R_{Gon} = 30\Omega$,$R_{Goff} = 30\Omega$,$V_{CE} = 600V$



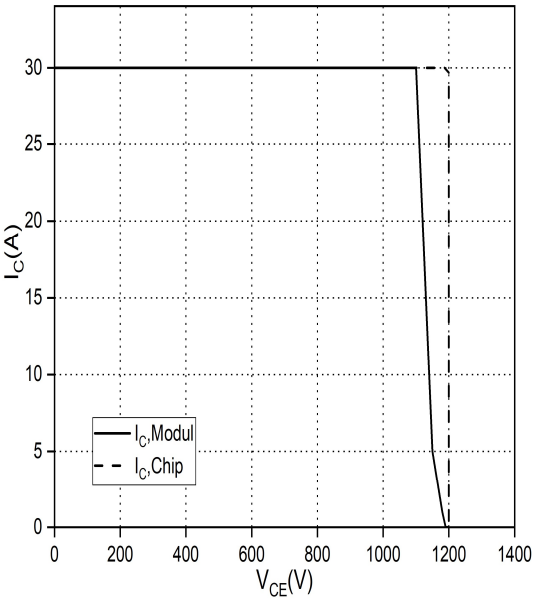
开关损耗 IGBT, 逆变器（典型值）
Switching losses IGBT, Inverter (typical)
V_{GE} = ±15V,I_C = 15A,V_{CE} = 600V



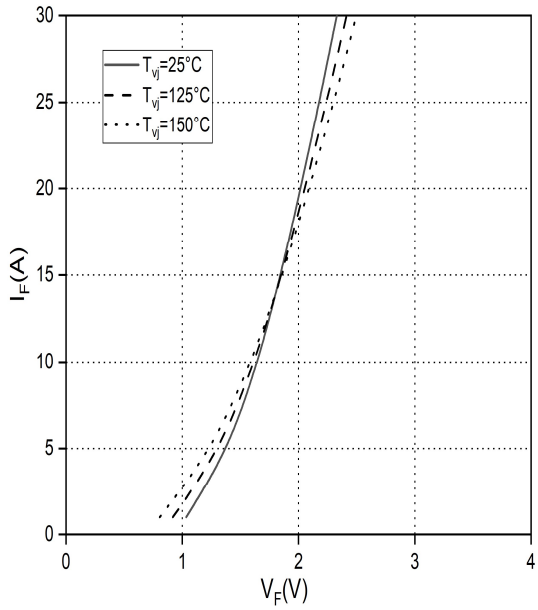
瞬态热阻抗 IGBT,逆变器
transient thermal impedance IGBT , Inverter
Z_{thJC} = f(t)



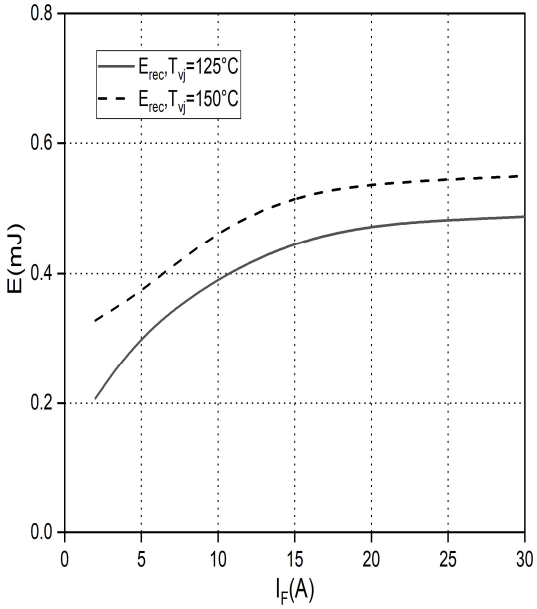
反偏安全工作区 IGBT,逆变器(RBSOA）
Reverse bias safe operating area IGBT, Inverter (RBSOA) I_C = f(V_{CE}),
V_{GE} = ±15V,R_{Goff} = 30Ω,T_{vj} = 150°C



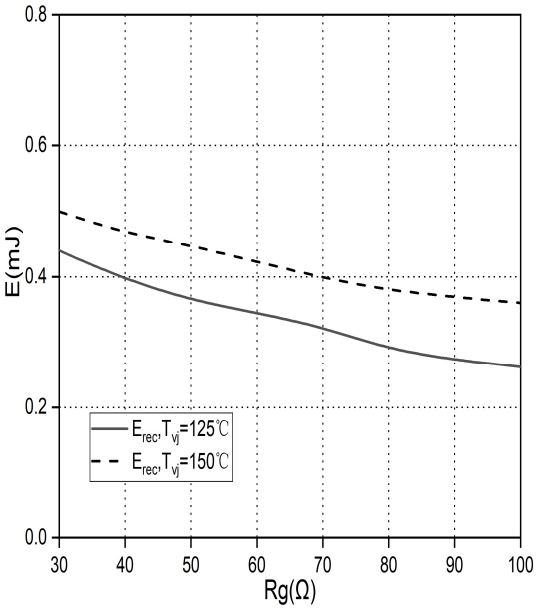
正向偏压特性二极管,逆变器（典型值)
forward characteristic of Diode, Inverter (typical)
I_F = f(V_F)



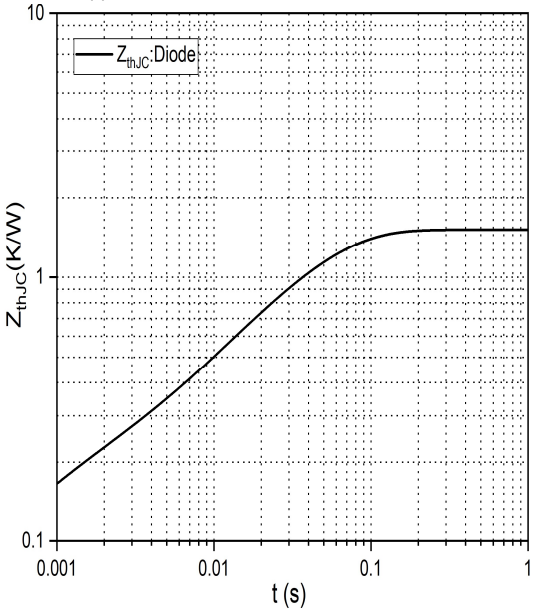
开关损耗二极管,逆变器 开关损耗（典型值)
Switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 30\Omega, V_{CE} = 600V$



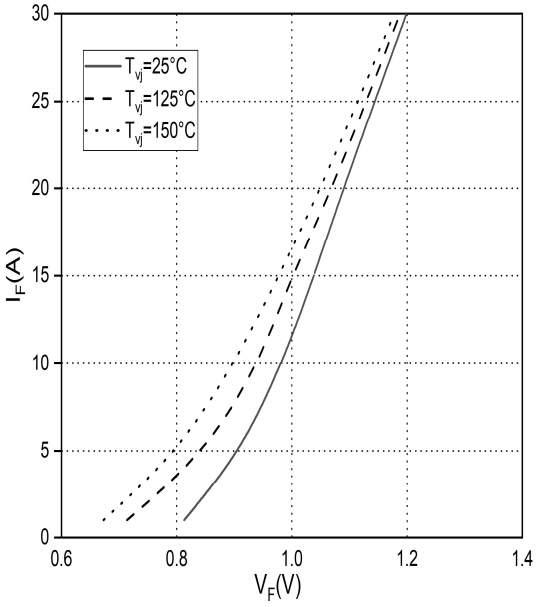
二极管,逆变器（典型值)
switching losses Diode, Inverter (typical)
$E_{rec} = f(R_G)$
$I_F = 15A, V_{CE} = 600V$



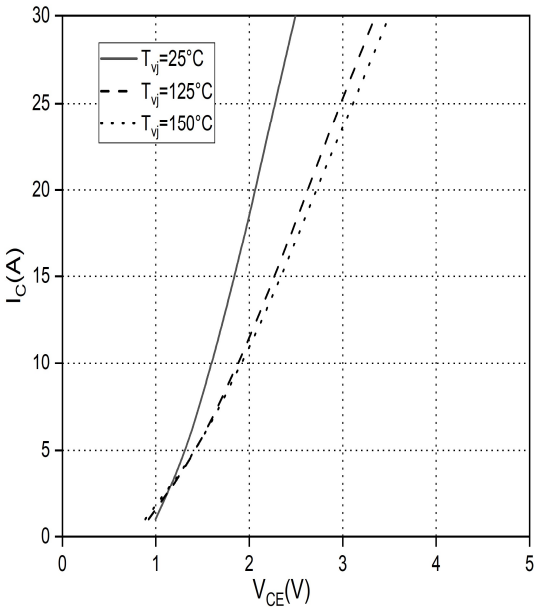
瞬态热阻抗二极管,逆变器
transient thermal impedance Diode , Inverter
$Z_{thJC} = f(t)$



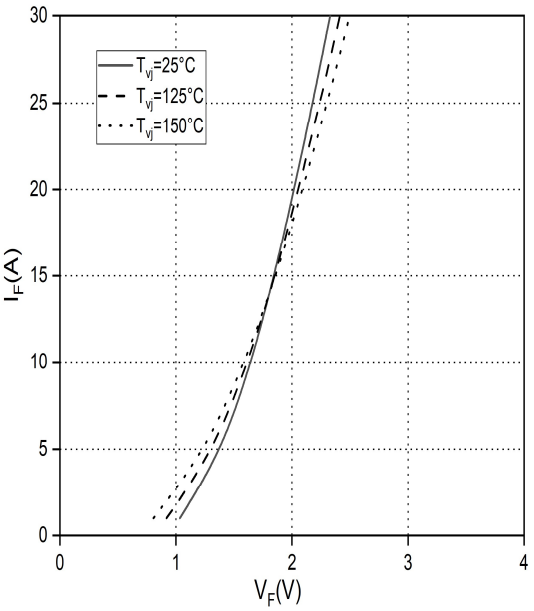
正向偏压特性 二极管,整流器（典型值)
forward characteristic of Diode Rectifier (typical)
$I_F = f(V_F)$



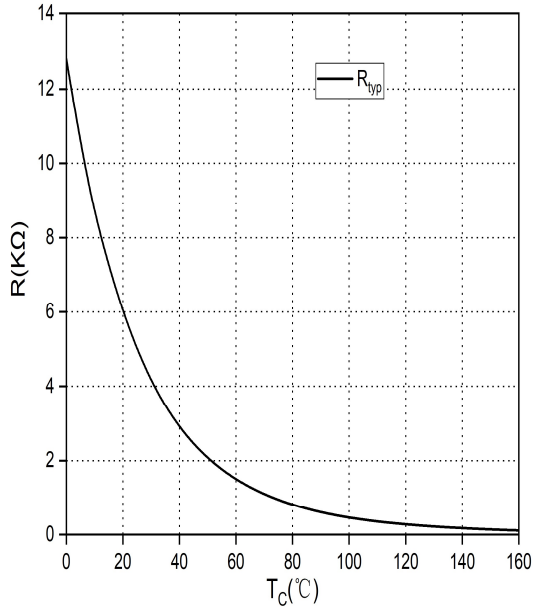
输出特性 IGBT,制动-斩波器（典型值）
Output characteristic IGBT, Brake-Chopper (typical)
$I_C = f(V_{CE})$
V_{GE} =15V



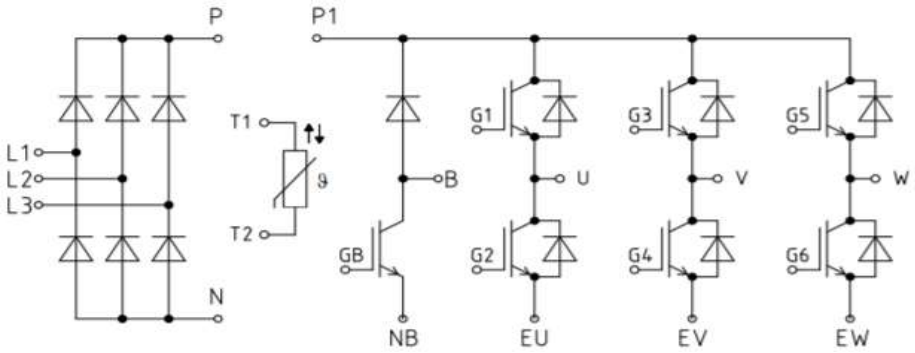
正向偏压特性 二极管，制动-斩波器（典型值）
forward characteristic of Diode, Brake-Chopper (typical)
$I_F = f(V_F)$



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