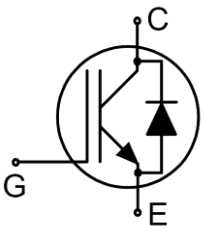
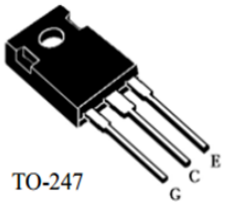
TT015N120EQ

主要参数 MAIN CHARACTERISTICS

I_C	15A
V_{CES}	1200V
V_{CESAT}-TYP	1.60V

封装 **Package**





用途

●逆变器

APPLICATIONS

- General purpose inverter

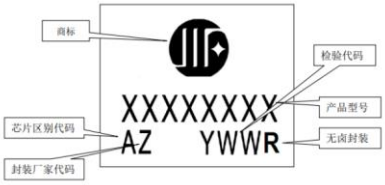
产品特性

●低栅极电荷
●Trench FS 技术
●RoHS 产品

FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product

印记定义 Mark definition



印章定义：
产品型号说明：产品类型+工艺平台+电流+频率+电压+工艺版本+特殊特性。
检验代码说明：Y(年代码，执行内部定义)+WW（周代码）

订货信息 ORDER MESSAGE

订 货 型 号 Order codes	印 记 Marking	封 装 Package
无卤-条管 Halogen-Free-Tube		
TT015N120EQ-GE-BR	TT015N120EQ	TO-247

绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

项 目 Parameter	符 号 Symbol	数 值 Value TO-247	单 位 Unit
最高集电极－发射极直流电压 Collector-Emitter Voltage	V_{CE}	1200	V
*连续集电极电流 Collector Current-continuous T_C=25°C T_C=100°C	I_C	30 15	A
最大脉冲集电极极电流（注 1） Collector Current – pulse（note 1）	I_{CM}	45	
二极管正向测试电流 Diode RMS forward current T_C=25°C T_C=100°C	I_F	30 15	
二极管正向脉冲电流 Diode pulse current	I_{FSM}	45	
最高栅极发射极电压 Gate-Emitter Voltage	V_{GE}	±20	V
Turn-off safe area 安全工作区	-	45	A
耗散功率 Power Dissipation	P_D TC=25℃	238	W
存储温度 Storage Temperature Range	T_{STG}	-55～+150	℃
结温 Junction Temperature Range	T_{Jmax}	-40～+175	
工作结温 Junction Temperature Range	T_{Jop}	-40～+150	
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T_L	260	

*连续集电极电流由最高结温限制

*Collector current limited by maximum junction temperature

注释：

1：脉冲宽度由最高结温限制

Notes:

1：Pulse width limited by maximum junction temperature

电特性 ELECTRICAL CHARACTERISTICS

项　　目 Parameter	符　号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
集电极－发射极击穿电压 Collector-Emitter Voltage	BVCES	IC=250μA, VGE=0V	1200	-	-	V
零栅压下集电极漏电流 Zero Gate Voltage Collector Current	ICES	VCE=1200V,　VGE=0V, Tvj=25℃	-	-	100	μA
		VCE=1200V,　VGE=0V, Tvj=150℃	-	-	2	mA
		VCE=1200V,　VGE=0V, Tvj=175℃	-	-	2	mA
正向栅极体漏电流 Gate-body leakage current,forward	IGESF	VCE=0V,　VGE =20V	-	-	150	nA
反向栅极体漏电流 Gate-body leakage current,reverse	IGESR	VCE=0V,　VGE =-20V	-	-	-150	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	VGE(th)	VCE = VGE , IC=250μA	4.5	-	6.5	V
饱和压降 Collector-Emitter saturation Voltage	VCESAT	VGE=15V　IC=15A　Tvj=25℃	-	1.6	2.1	
		VGE=15V　IC=15A　Tvj=125℃	-	1.9	-	
		VGE=15V　IC=15A　Tvj=150℃	-	2.0	-	
		VGE=15V　IC=15A　Tvj=175℃	-	2.1	-	
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	Cies	VCE=25V, VGE=0V, f=1.0MHZ	-	1260	-	pF
输出电容 Output capacitance	Coes		-	78	-	
反向传输电容 Reverse transfer capacitance	Cres		-	41	-	
栅极电荷总量 Total Gate Charge	Qg	VCC=960V,Ic=15A,VGE=15 V Tvj=25℃	-	112	-	nC
栅极-反射极 Gate to emitter charge	Qge		-	8.8	-	
栅极-集电极 Gate to collector charge	Qgc		-	80.7	-	
栅极电阻-Gate resistance	Rg	f=1 MHz, open collector	-	0.5	-	Ω
短路电流-short current	Isc	Vge=15V，Vce=600V，t≦10us		75		A

电特性 ELECTRICAL CHARACTERISTICS

开关特性 Switching Characteristics						
项　　目 **Parameter**	符　号 **Symbol**	测试条件 **Tests conditions**	最 小 **Min**	典 型 **Typ**	最 大 **Max**	单　位 **Units**
开启延迟时间 Turn-On delay time	td(on)	VCC=600V,Ic=15A,Rg=10Ω VGE=15 V Tvj=25℃	-	20	-	ns
上升时间 Turn-On rise time	tr		-	30	-	
关断延迟时间 Turn-Off delay time	td(off)		-	204	-	
下降时间 Turn-Off Fall time	tf		-	252	-	
开通损耗 Turn-On energy	Eon		-	0.47	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.3	-	
总开关损耗 Total switching energy	Etot		-	1.77	-	
开启延迟时间 Turn-On delay time	td(on)	VCC=600V,Ic=15A,Rg=10Ω VGE=15 V Tvj=25℃	-	18	-	ns
上升时间 Turn-On rise time	tr		-	30	-	
关断延迟时间 Turn-Off delay time	td(off)		-	290	-	
下降时间 Turn-Off Fall time	tf		-	402	-	
开通损耗 Turn-On energy	Eon		-	0.5	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.8	-	
总开关损耗 Total switching energy	Etot		-	2.3	-	
开启延迟时间 Turn-On delay time	td(on)	VCC=600V,Ic=15A,Rg=10Ω VGE=15 V Tvj=175℃	-	18	-	ns
上升时间 Turn-On rise time	tr		-	30	-	
关断延迟时间 Turn-Off delay time	td(off)		-	298	-	
下降时间 Turn-Off Fall time	tf		-	462	-	
开通损耗 Turn-On energy	Eon		-	0.5	-	mJ
关断损耗 Turn-off energy	Eoff		-	2	-	
总开关损耗 Total switching energy	Etot		-	2.5	-	
反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings						
正向压降 Drain-Source Diode Forward Voltage	VF	VGE=0V, IS=15A, Tvj=25℃	-	1.85	2.2	V
		VGE=0V, IS=15A, Tvj=150℃	-	1.55	-	
		VGE=0V, IS=15A, Tvj=175℃	-	1.5	-	
反向恢复时间 Diode Reverse recovery time	trr	VGE=0V, VR=600V IF=15A dIF/dt=450A/μs Tvj=25℃	-	283.8	-	ns
反向恢复电荷 Diode Reverse recovery charge	Qrr		-	1181	-	nC
反向恢复电流 Diode Reverse recovery Current	Irrm		-	9.8	-	A

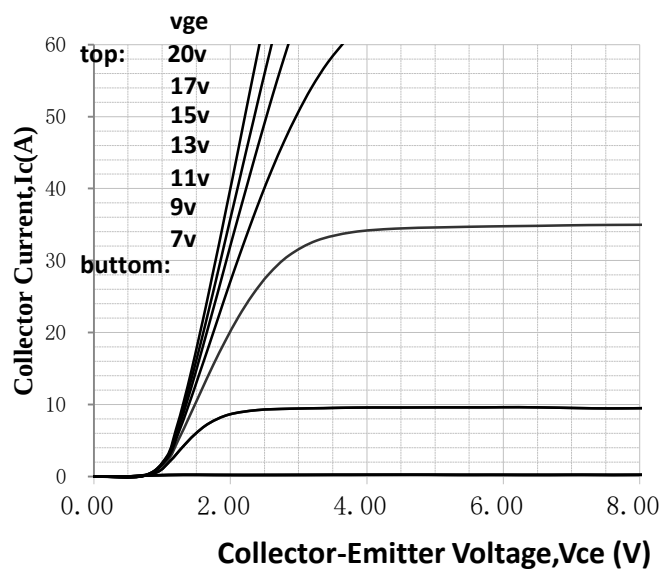
电特性 ELECTRICAL CHARACTERISTICS

反并联二极管特性及最大额定值 **Anti-Parallel Diode Characteristics and Maximum Ratings**						
反向恢复时间 Diode Reverse recovery time	trr	VGE=0V, VR=600V IF=15A dIF/dt=450A/μs Tvj=150℃	-	401	-	ns
反向恢复电荷 Diode Reverse recovery charge	Qrr		-	3500	-	nC
反向恢复电流 Diode Reverse recovery Current	Irrm		-	18	-	A
反向恢复时间 Diode Reverse recovery time	trr	VGE=0V, VR=600V IF=15A dIF/dt=450A/μs Tvj=175℃	-	412.9	-	ns
反向恢复电荷 Diode Reverse recovery charge	Qrr		-	3710	-	nC
反向恢复电流 Diode Reverse recovery Current	Irrm		-	20	-	A

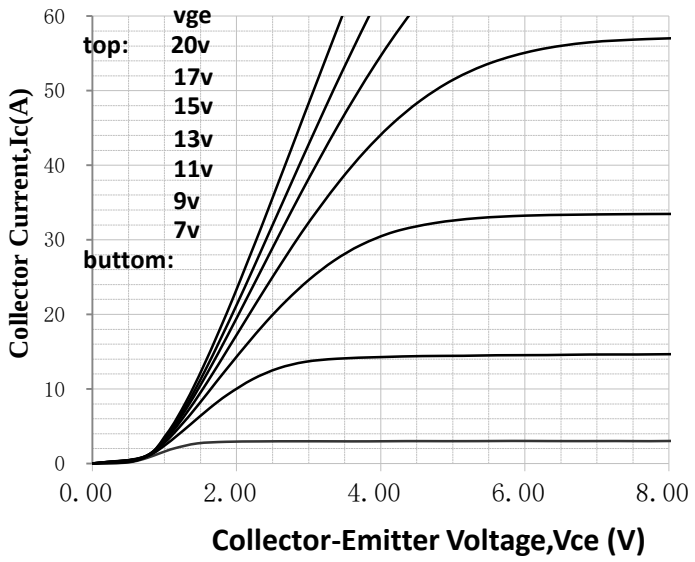
项　　目 **Parameter**	符　号 **Symbol**	最大 **MAX** **TO-247**	单 位 **Unit**
结到管壳的热阻 Thermal Resistance, Junction to Case	Rth(j-c) IGBT	0.63	℃/W
	Rth(j-c) FWD	1.0	
结到环境的热阻 Thermal Resistance, Junction to Ambient	Rth(j-A)	40	

特征曲线 ELECTRICAL CHARACTERISTICS (curves)

Output Characteristics（25℃）

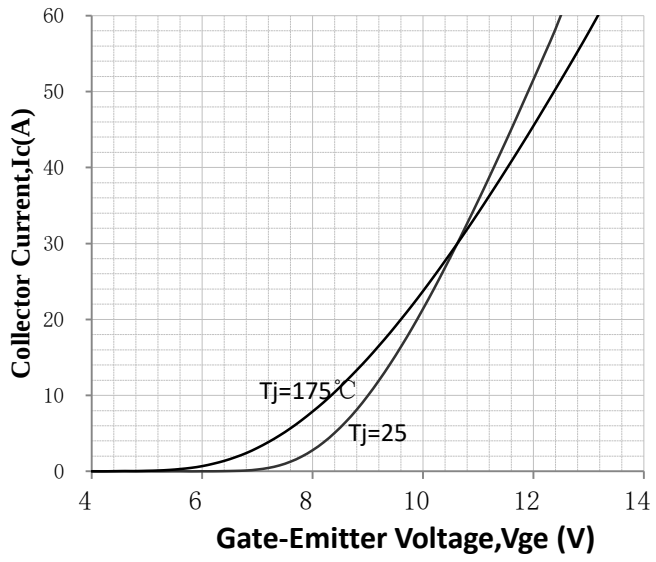


Output Characteristics（150℃）



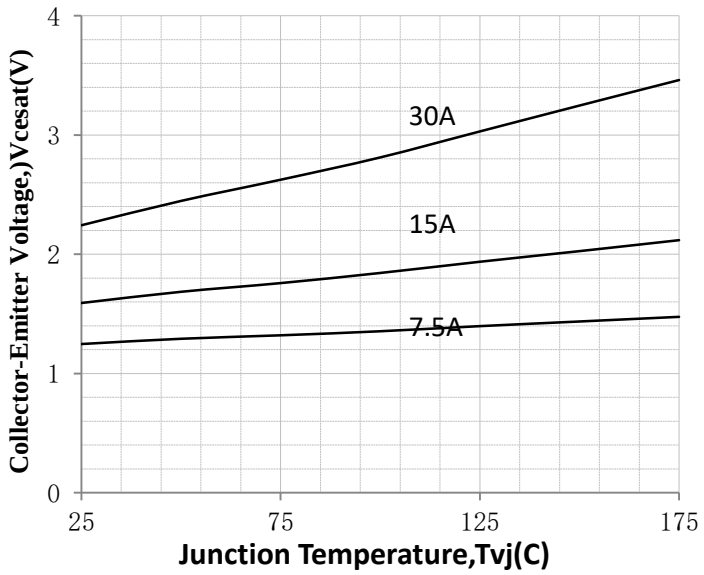
Transfer Characteristics

Vce=20 V



Vcesat vs. Tvj

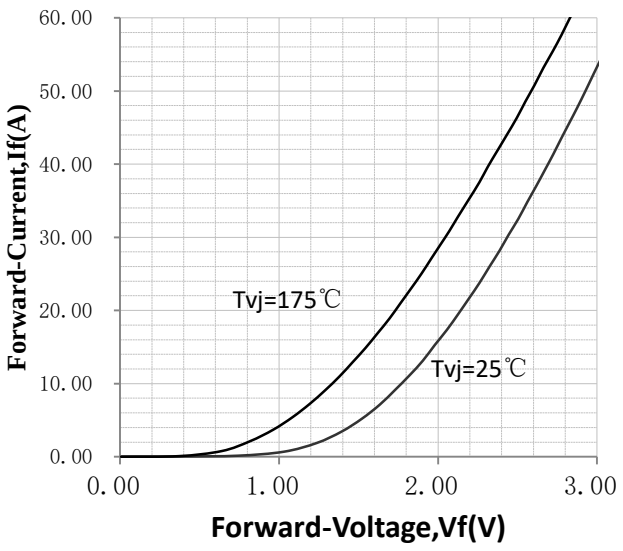
Vge=15V, Ic=7.5A、15A、30A



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

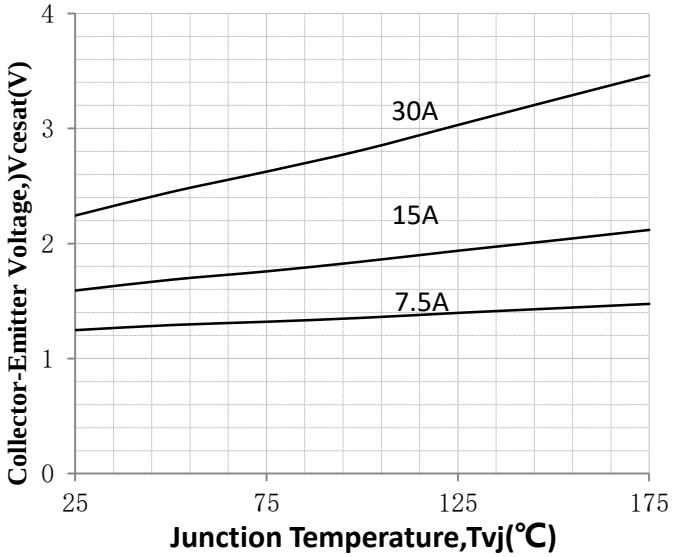
Diode Characteristic

Tvj=25℃、175℃



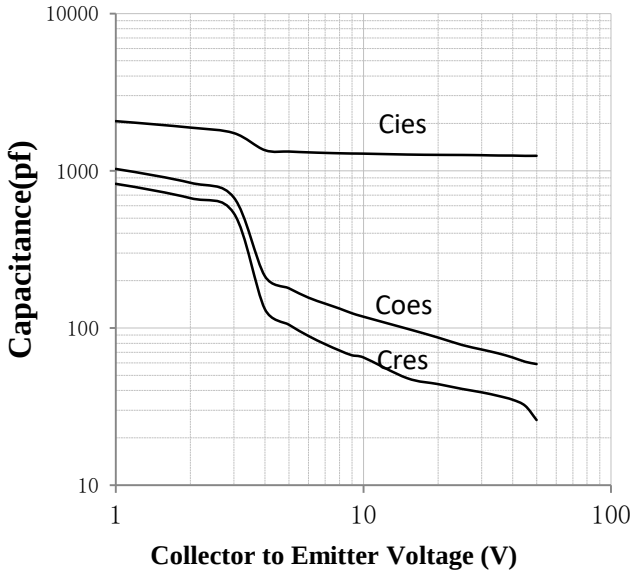
Vf vs. Tvj

Ic=7.5A、15A、30A



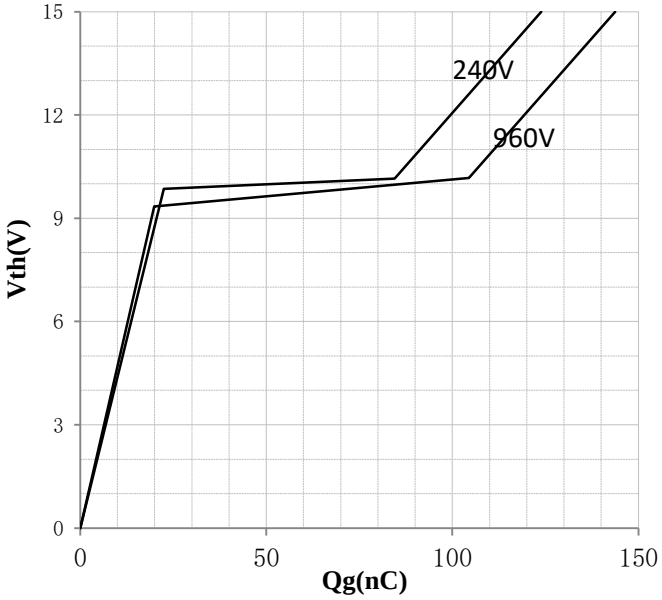
Capacitance Characteristic

f=1.0MHZ



Gate Charge Characteristics

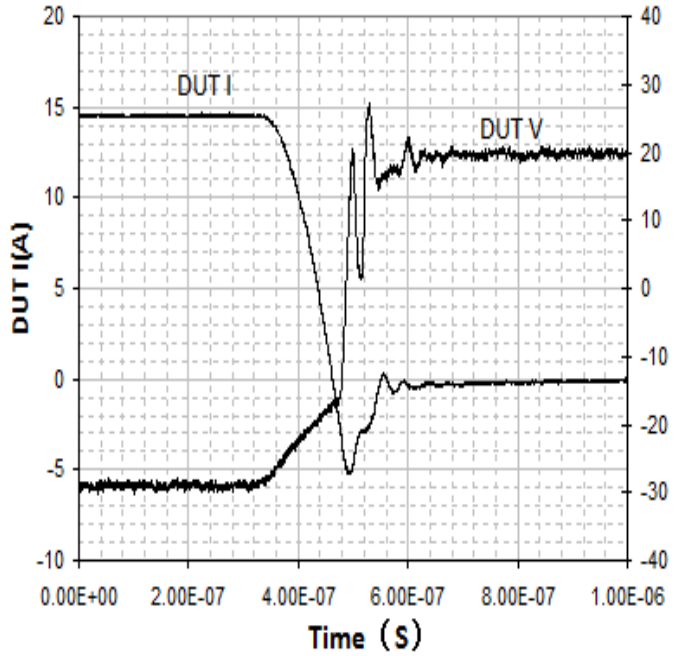
VGE=15V,IC=15A,VCE=240V/960V



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

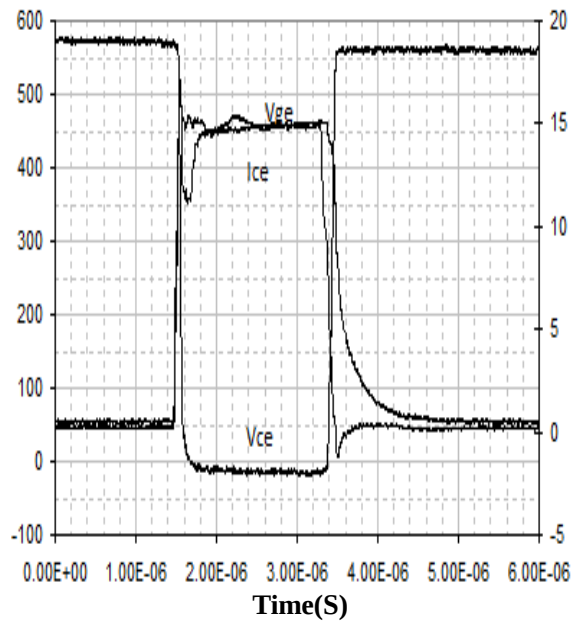
Diode Peak Reverse Recovery Current

IF=15A Tvj=25℃



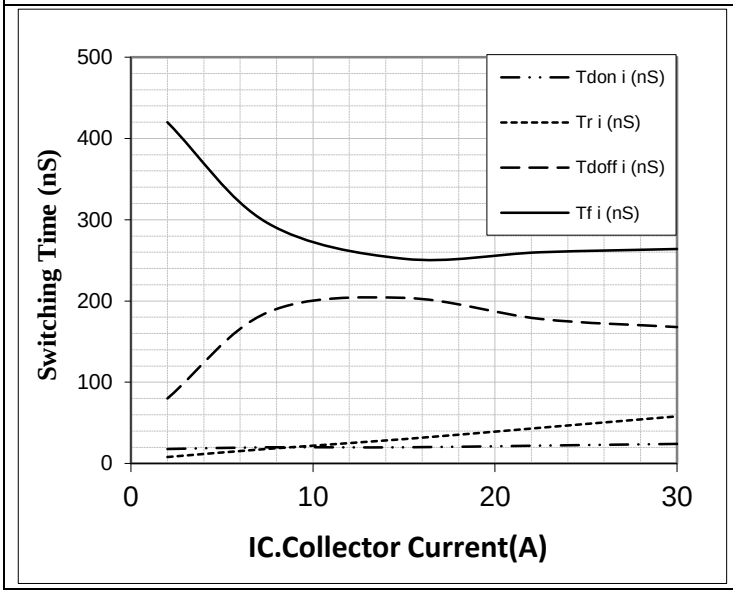
IGBT Switch

VGE=15V,IC=15A,VCE=600V,Tvj=25℃



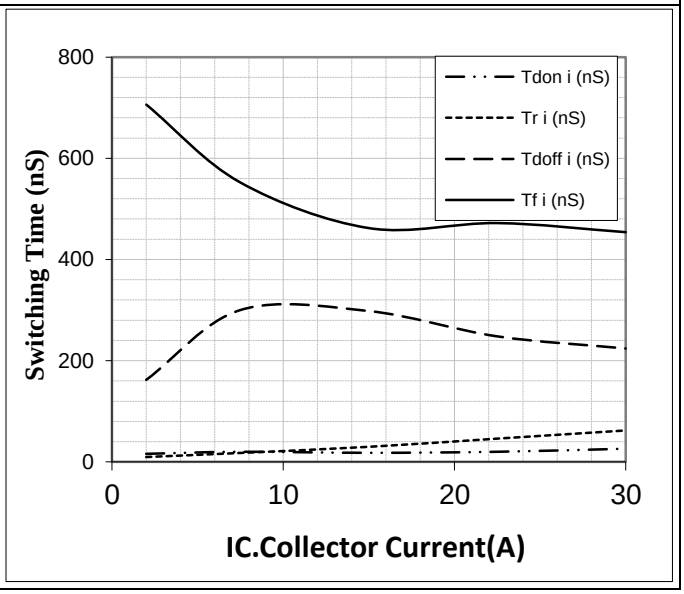
Switching Time vs. IC(25℃)

VCE=600V,VGE=15V, RG=10Ω



Switching Time vs. IC(175℃)

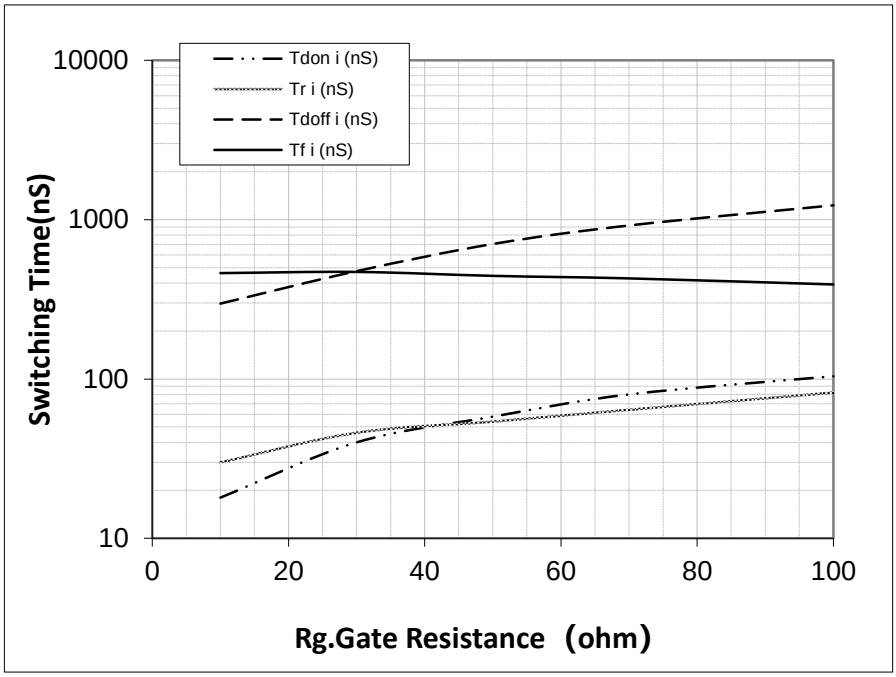
VCE=600V,VGE=15V, RG=10Ω



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

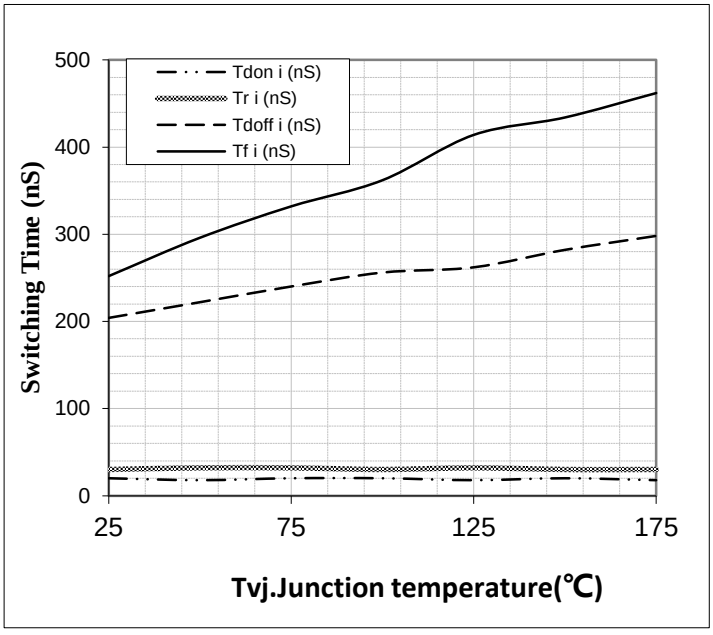
Switching Time vs. Rg(175℃)

VGE=15V,VCE=600V, IC:15A



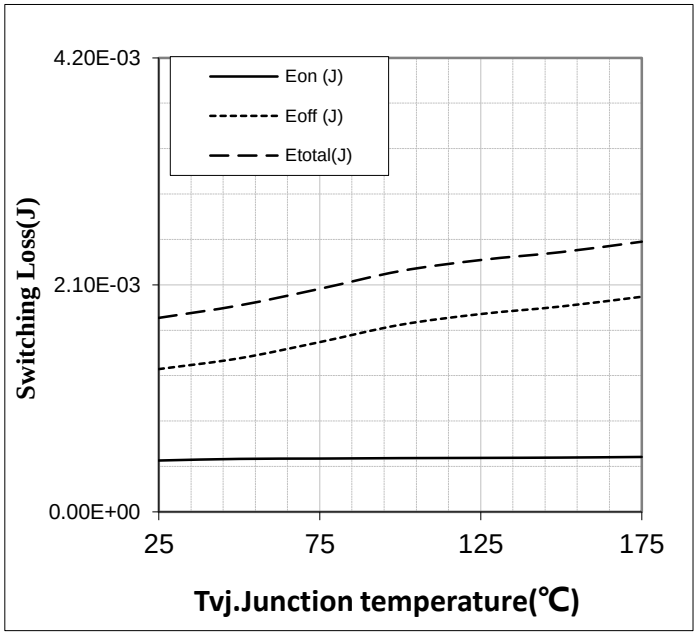
Switching Time vs.Tvj

VGE=15V，VCE=600V，IC=15A，Rg=10Ω



Switching Loss vs. Tvj

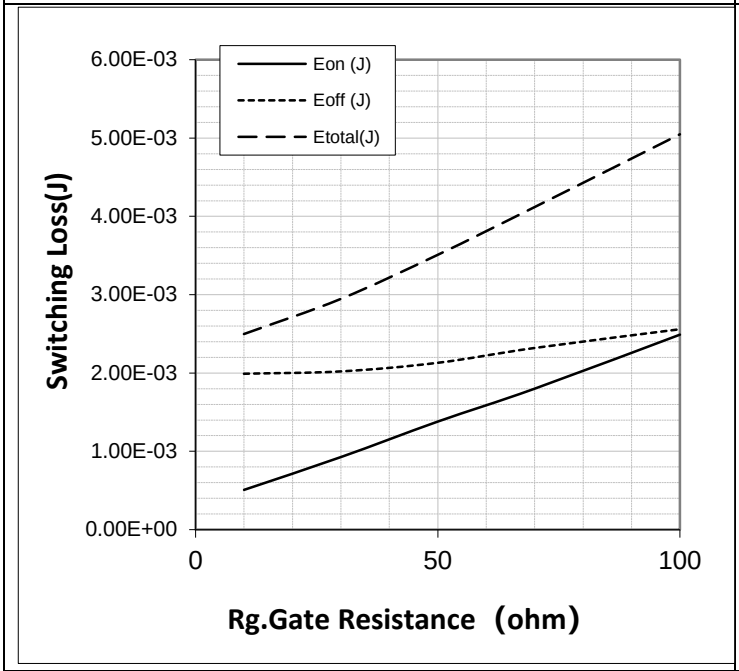
VGE=15V，VCE=600V，IC=15A ，Rg=10Ω



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

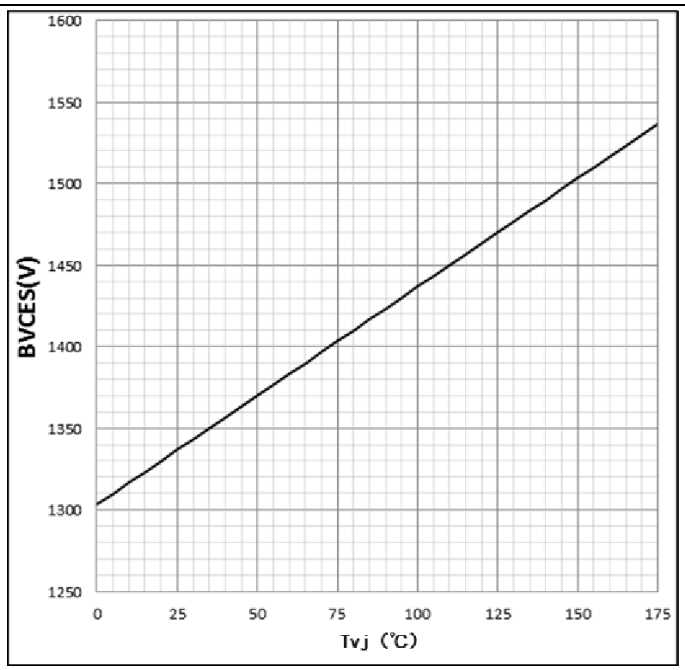
Switching Loss vs. Rg(175℃)

VGE=15V,VCE=600V, IC:15A



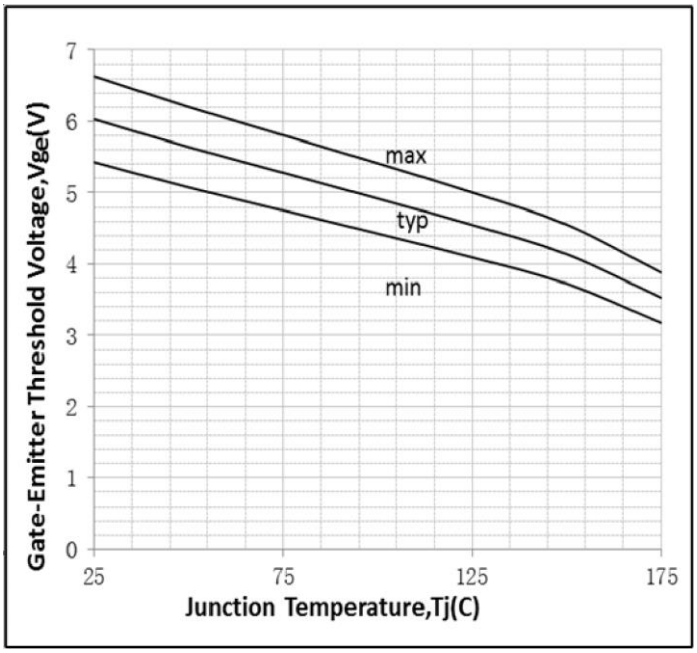
BVCES vs. Tvj

Ic=250uA



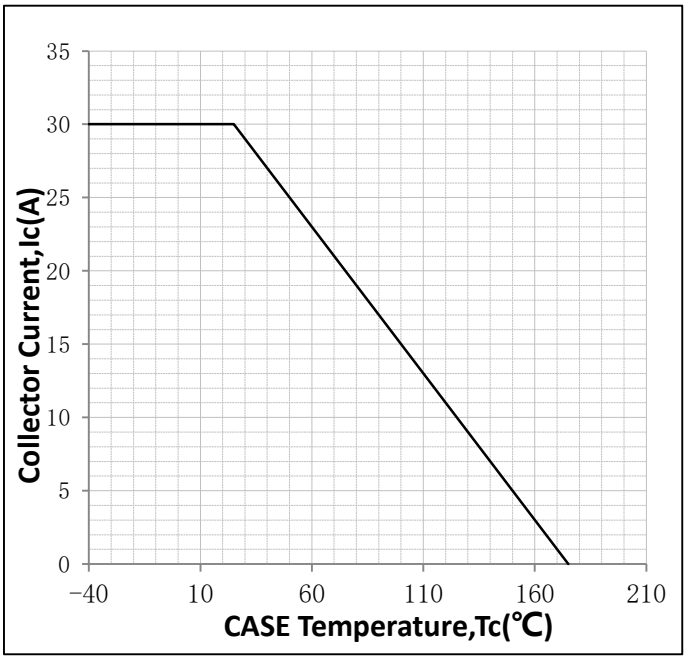
VTH vs. Tvj

Ic=250uA



Colletcor current vs.case temperature

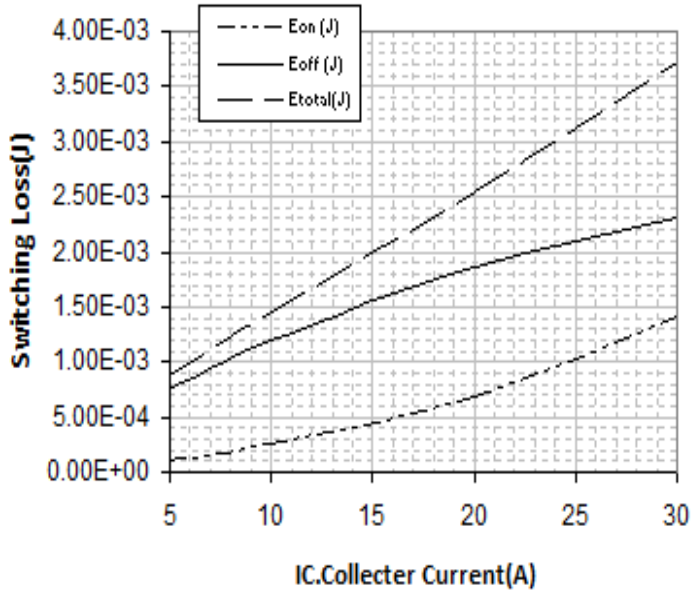
VGE≥15V，Tvj≤175℃



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

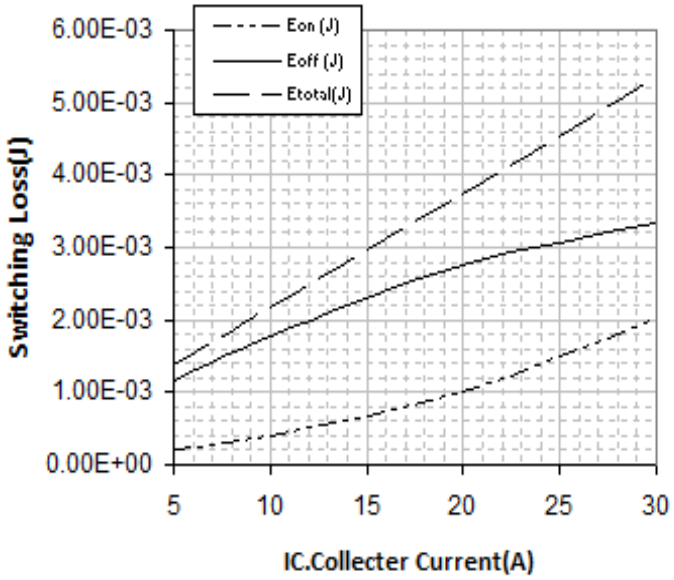
Switching Loss vs. IC(25℃)

VGE=15V,VCE=600V,Rg=10Ω

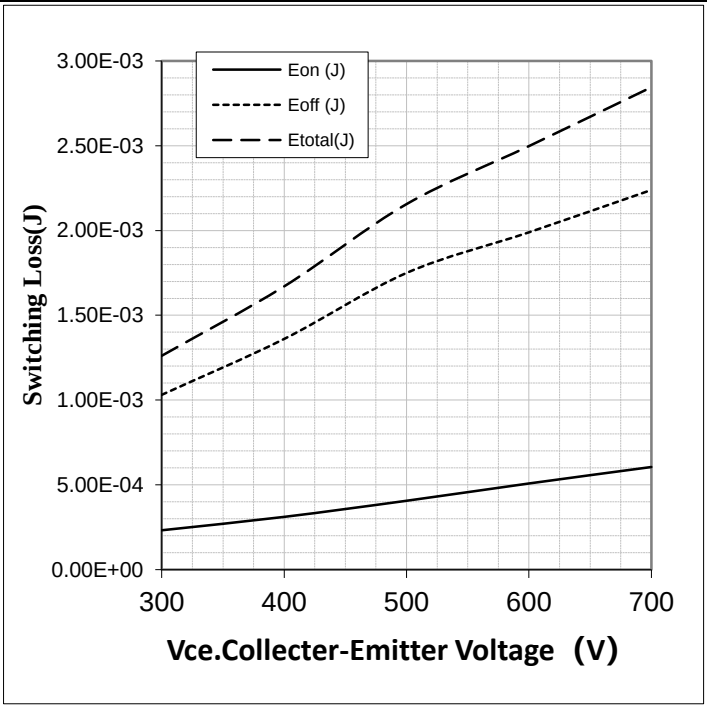


Switching Loss vs. IC(175℃)

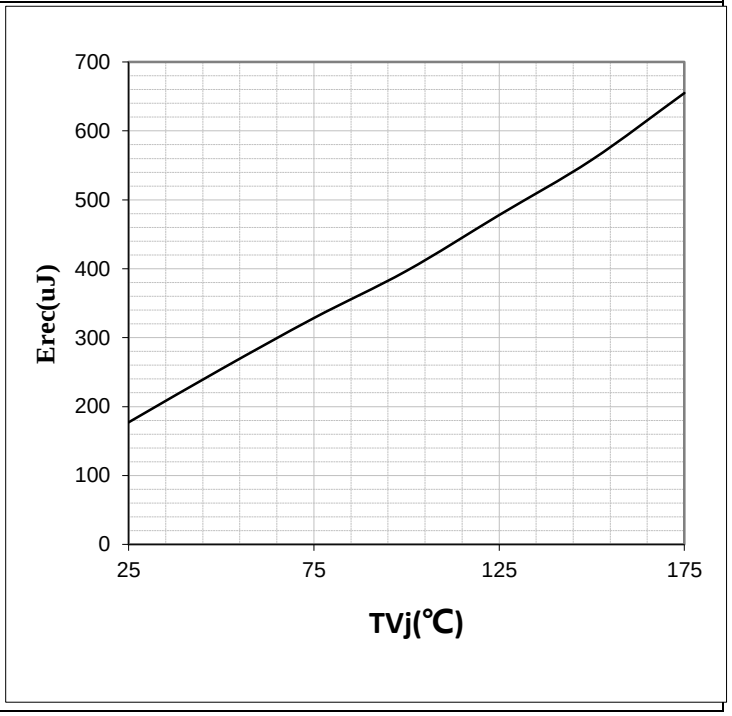
VGE=15V,VCE=600V,Rg=10Ω



Switching Loss vs. VCE(175℃)



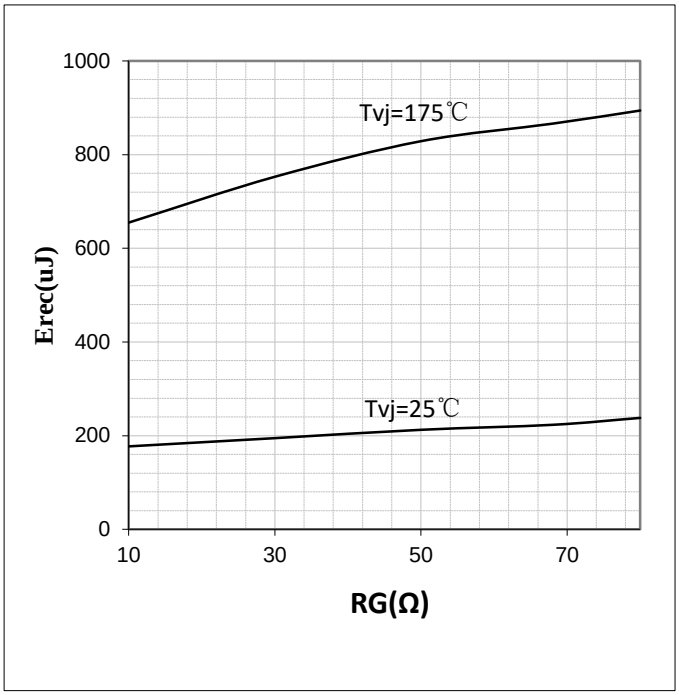
Erec 与 Tvj 的曲线 VGE=15V,VCE=600V,Rg=10Ω



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

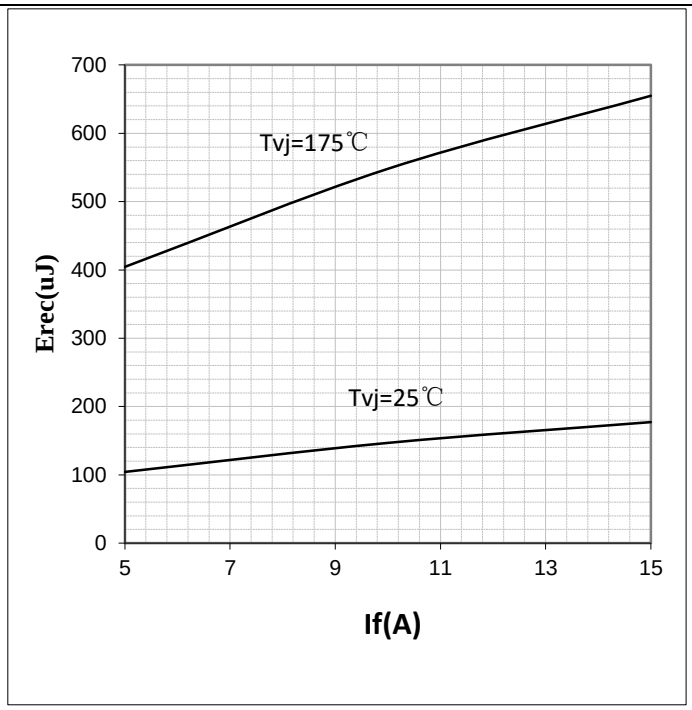
Erec 与 Rg 的曲线

VGE=15V,VCE=600V

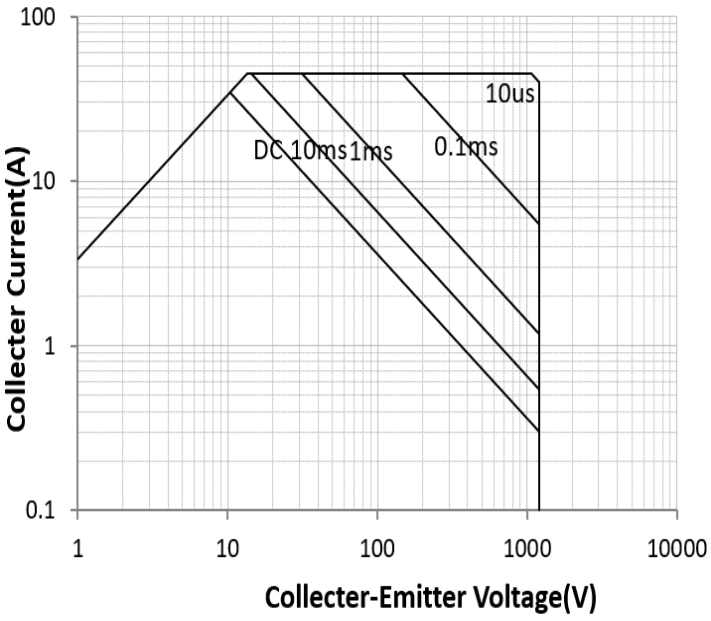


Erec 与 If 的曲线

VGE=15V,VCE=600V,Rg=10Ω

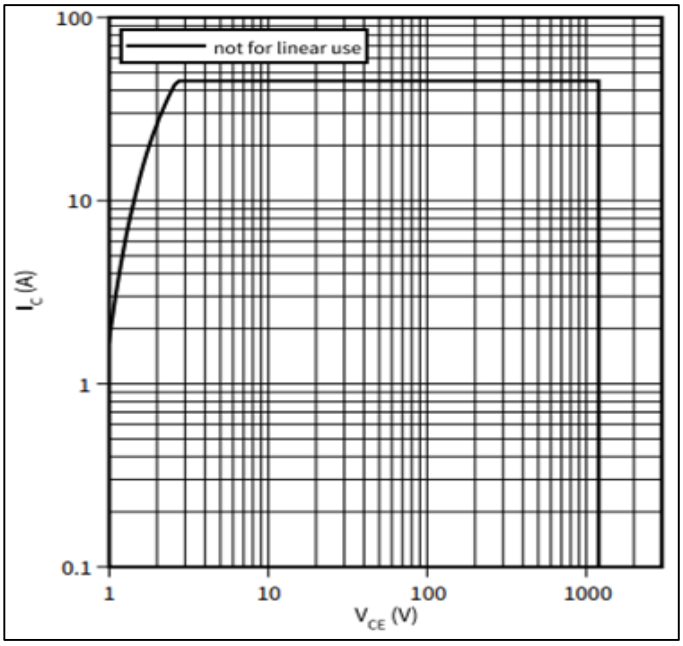


Forward Bias SOA



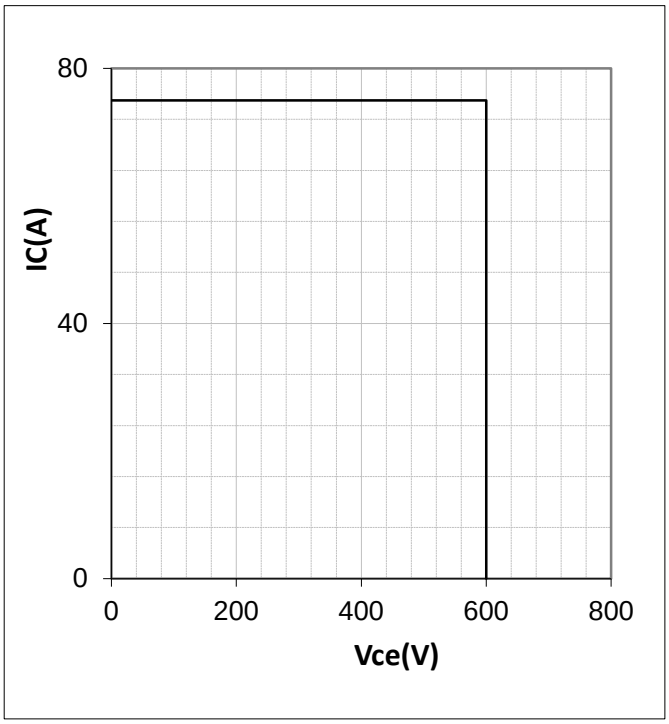
Reverse bias SOA

VGE=15V，Tvj≤175℃

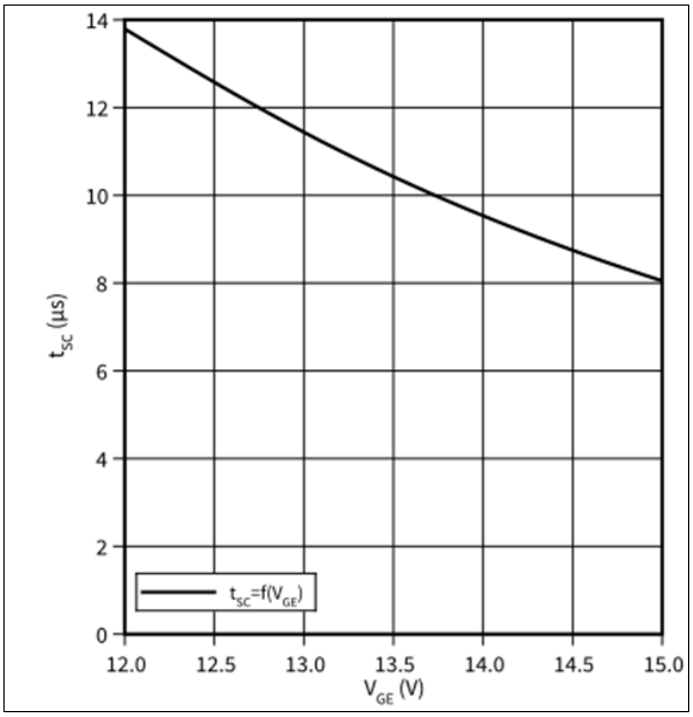


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

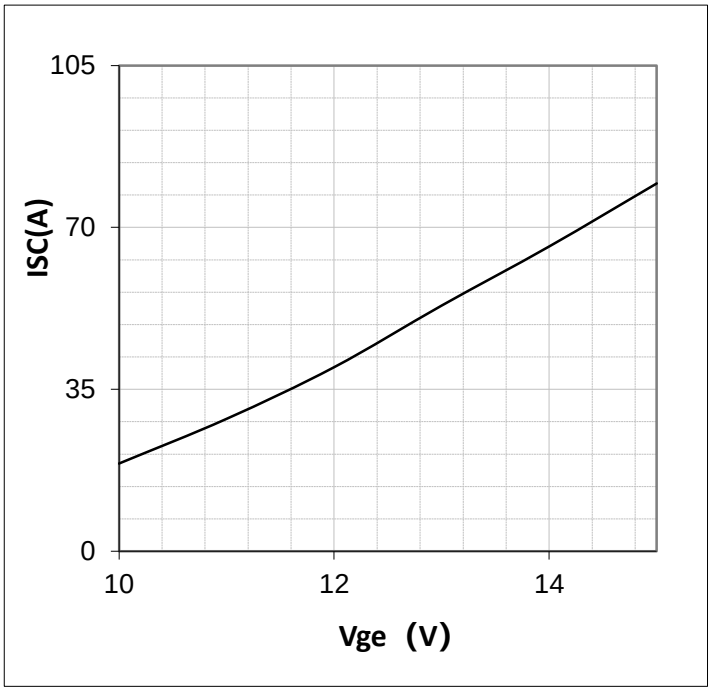
短路安全工作区



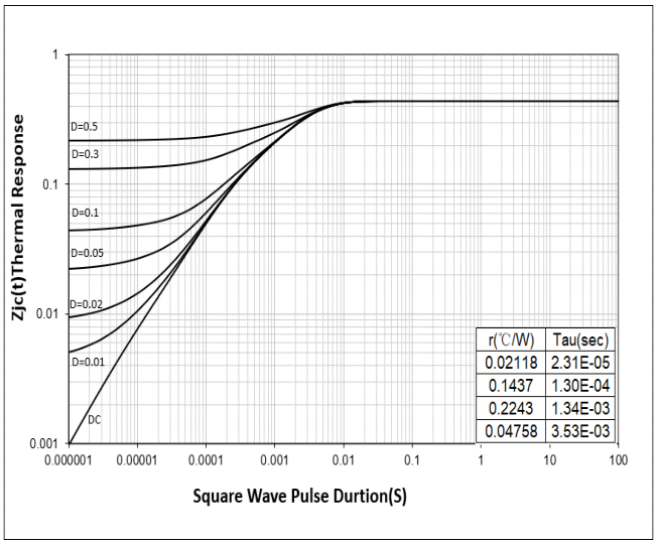
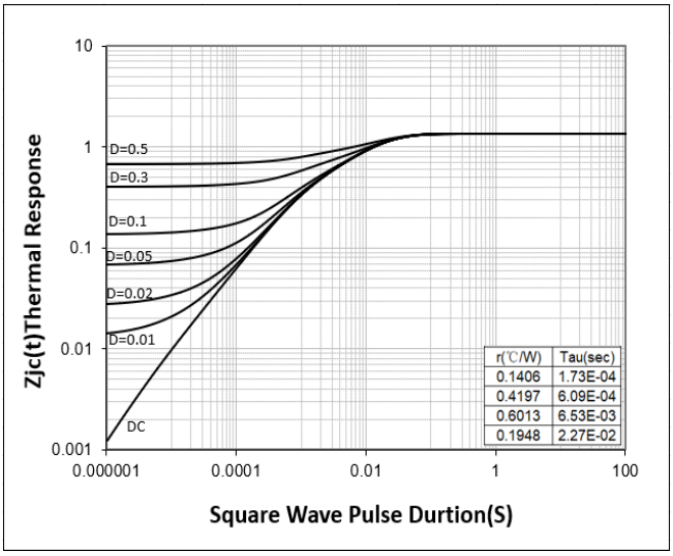
Tsc 与 Vge 的曲线（150℃，VCE=600V）



Isc 与 Vge 的曲线（150℃，VCE=600V）



特征曲线 ELECTRICAL CHARACTERISTICS (curves)

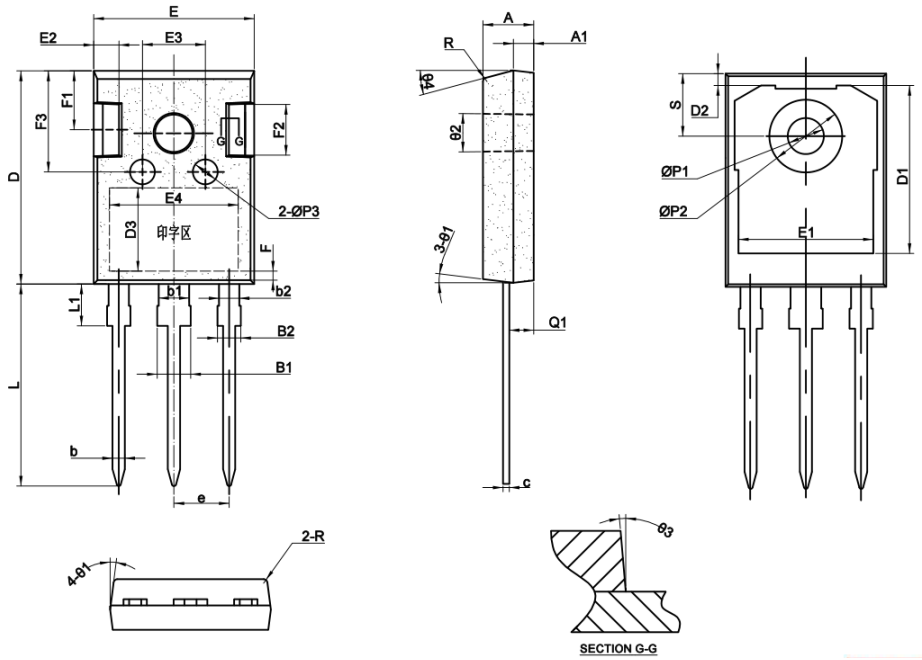
Normalized Transient Thermal Impedance for IGBT （TO-247）	Normalized Transient Thermal Impedance for FRD （TO-247）
	

外形尺寸 **PACKAGE MECHANICAL DATA**

TO-247

重点尺寸：**b、e、A、D、E。**

单位 Unit：mm



SYMBOL	MM		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
A1	1.90	2.00	2.10
*b	1.15	1.20	1.25
b1	2.95	3.00	3.05
b2	1.95	2.00	2.05
*B1	3.00	3.10	3.20
*B2	2.00	2.10	2.20
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.45	16.55	16.65
D2	1.07	1.17	1.27
D3	8.15	8.20	8.25
*E	15.70	15.80	15.90
E1	13.16	13.26	13.36
E2	2.40	2.50	2.60
E3	6.10	6.20	6.30
E4	12.70	12.80	12.90
F	0.75	0.85	0.95
F1	5.70	5.80	5.90
F2	4.90	5.00	5.10
F3	9.90	10.00	10.10
*e	5.39	5.44	5.49
*L	19.72	19.92	20.12
*L1	4.03	4.13	4.23
θ1	5°	7°	9°
θ2	1°	2°	3°
θ4	13°	15°	17°
*ΦP1	3.50	3.60	3.70
ΦP2	7.09	7.19	7.29
ΦP3	2.40	2.50	2.60
*Q1	2.31	2.41	2.51
S	6.05	6.15	6.25
R	0.30	0.40	0.50

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