

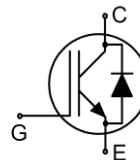


# TT010N120EQ

## 主要参数 MAIN CHARACTERISTICS

I <sub>c</sub>	10 A
V <sub>CES</sub>	1200V
V <sub>cesat-typ</sub> (V <sub>ge</sub> =15V)	1.6V

## 封装 Package



TO-247

### 用途

- 逆变器

### APPLICATIONS

- General purpose inverters

### 产品特性

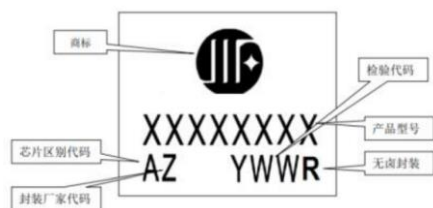
- 低栅极电荷
- Trench FS 技术
- RoHS 产品

### FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product

## 印记定义

## Mark definition



检验代码说明: Y(年代码, 执行内部定义)+WW (周代码)

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。

## 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		
TT010N120EQ-GE-BR	TT010N120EQ	TO-247

绝对最大额定值 ABSOLUTE RATINGS ( $T_c=25^\circ\text{C}$ )

项 目 Parameter	符 号 Symbol	数 值 Value	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	$I_C$ $T=25^\circ\text{C}$	20	A
	$I_C$ $T=100^\circ\text{C}$	10	A
最大脉冲集电极极电流 (注 1) Collector Current – pulse (note 1)	$I_{CM}$	20	A
二极管正向电流 Diode RMS forward current	$I_F$ $T=25^\circ\text{C}$	20	A
	$I_F$ $T=100^\circ\text{C}$	10	A
二极管正向不重复峰值电流 (浪涌电流) Surge non repetitive forward current $t_p=10$ ms sinusoidal	$I_{FSM}$	20	A
栅极发射极电压 Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
耗散功率 Power Dissipation	$P_D$ $T_c=25^\circ\text{C}$	176(TO-247)	W
结温 Junction Temperature Range	$T_{vj}$	$-40\sim+175$	$^\circ\text{C}$
存储温度 Storage Temperature Range	$T_{STG}$	$-55\sim+150$	$^\circ\text{C}$
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	$T_L$	260	$^\circ\text{C}$

\*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
<b>关态特性 Off –Characteristics</b>						
集电极-发射极击穿电压 Collector-Emitter Voltage	$BV_{CES}$	$I_C=250\mu A, V_{GE}=0V$	1200	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	$\Delta BV_{CES}/\Delta T_J$	$I_C=0.5mA$ , referenced to $25^\circ C$	-	0.6	-	V/ $^\circ C$
零栅压下集电极漏电流 Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_C=25^\circ C$	-	-	0.2	mA
		$V_{CE}=1200V, V_{GE}=0V, T_C=175^\circ C$	-	2	-	mA
正向栅极体漏电流 Gate-body leakage current, forward	$I_{GESF}$	$V_{CE}=0V, V_{GE}=20V$	-	-	200	nA
反向栅极体漏电流 Gate-body leakage current, reverse	$I_{GESR}$	$V_{CE}=0V, V_{GE}=-20V$	-	-	-200	nA
<b>通态特性 On-Characteristics</b>						
阈值电压 Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C=250\mu A$	4.5	5.5	6.5	V
饱和压降 Collector-Emitter saturation Voltage	$V_{CESAT}$	$V_{GE}=15V, I_C=10A, T_C=25^\circ C$	-	1.6	2.1	V
		$V_{GE}=15V, I_C=10A, T_C=175^\circ C$	-	1.9	-	V
<b>动态特性 Dynamic Characteristics</b>						
输入电容 Input capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1.0MHz$	-	900	-	pF
输出电容 Output capacitance	$C_{oes}$		-	60	-	pF
反向传输电容 Reverse transfer capacitance	$C_{res}$		-	30	-	pF
栅极电荷总量 Total Gate Charge	$Q_g$	$V_{CC}=600V, I_C=10A, V_{GE}=15V, T_C=25^\circ C$	-	80	-	nC
栅极-反射极 Gate to emitter charge	$Q_{ge}$		-	6	-	
栅极-集电极 Gate to collector charge	$Q_{gc}$		-	60	-	
栅极电阻-Gate resistance	$R_g$	$f=1MHz$ , open collector	-	2	-	$\Omega$
短路电流-short current	$I_{sc}$	$V_{GE}=15V, V_{CE}=600V, t_{sc} < 10\mu s$	-	41.3	-	A



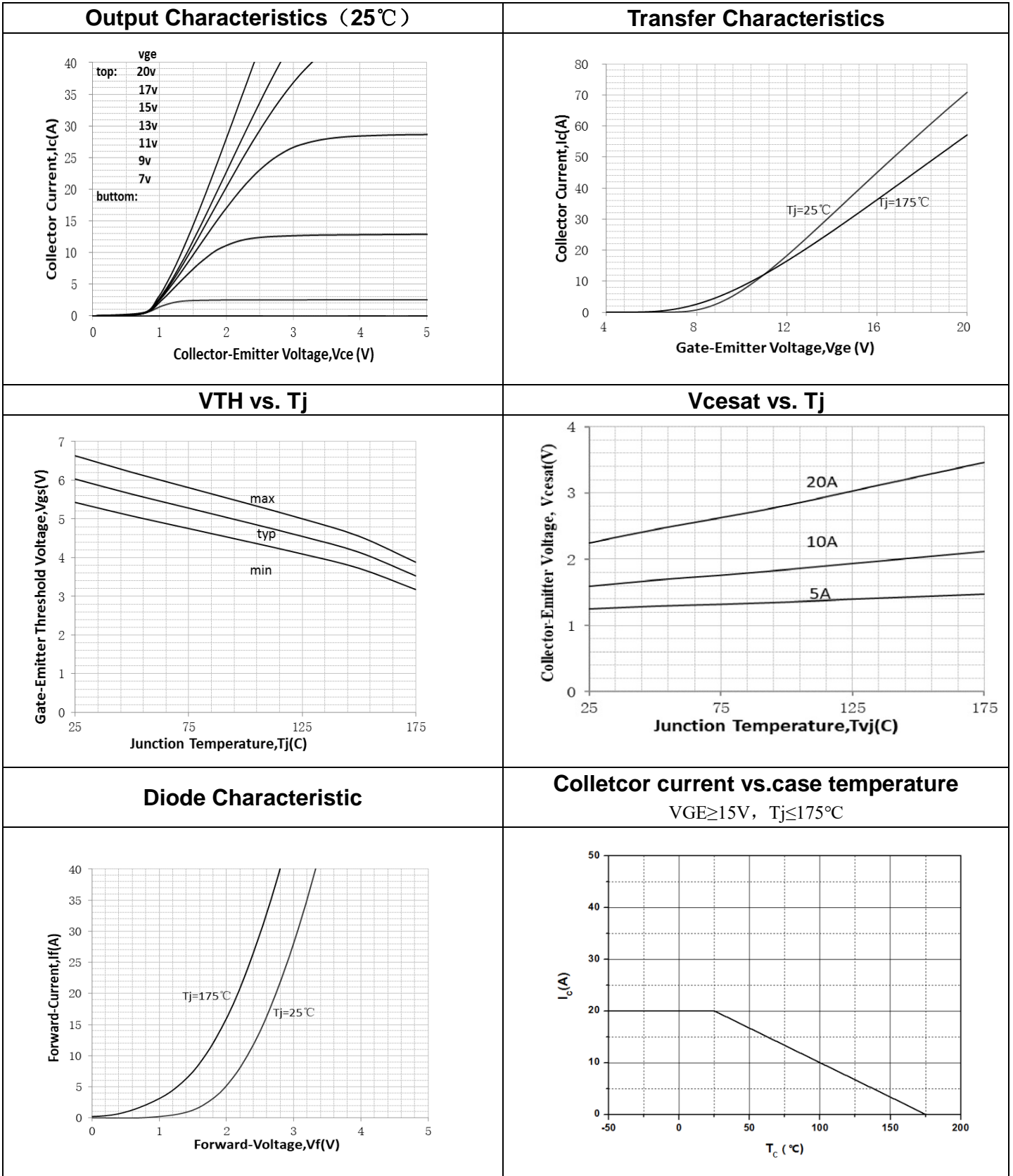
## 电特性 ELECTRICAL CHARACTERISTICS

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	$t_{d(on)}$	$V_{CC}=600V, I_c=10A, R_G=10\Omega$ $V_{GE}=15V, T_C=25^\circ C$	-	17.5	-	ns
上升时间 Turn-on rise time	$t_r$		-	18.7	-	ns
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	109	-	ns
下降时间 Turn-off Fall time	$t_f$		-	340	-	ns
开通损耗 Turn-on energy	Eon		-	0.24	-	mJ
关断损耗 Turn-off energy	Eoff		-	0.93	-	mJ
总开关损耗 Total switching energy	Etot		-	1.17	-	mJ
开启延迟时间 Turn-on delay time	$t_{d(on)}$	$V_{CC}=600V, I_c=10A, R_G=10\Omega$ $V_{GE}=15V, T_C=175^\circ C$	-	17	-	ns
上升时间 Turn-on rise time	$t_r$		-	22	-	ns
关断延迟时间 Turn-off delay time	$t_{d(off)}$		-	131	-	ns
下降时间 Turn-off Fall time	$t_f$		-	537	-	ns
开通损耗 Turn-on energy	Eon		-	0.46	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.38	-	mJ
总开关损耗 Total switching energy	Etot		-	1.84	-	mJ
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 Diode Forward Voltage	$V_F$	$V_{GE}=0V, I_F=10A$	-	2.4	2.8	V
反向恢复时间 Diode Reverse recovery time	$t_{rr}$	$V_{GE}=0V, V_{CE}=600V, I_F=10A,$ $di_F/dt=200A/\mu s, T_C=25^\circ C$	-	208	-	ns
反向恢复电荷 Diode Reverse recovery charge	Qrr		-	735	-	nC
反向恢复电流 Diode Reverse recovery Current	$I_{RRM}$		-	7.8	-	A
反向恢复能量 Diode Reverse recovery Energy	Erec			0.32		mJ
反向恢复时间 Diode Reverse recovery time	$t_{rr}$		$V_{GE}=0V, V_{CE}=600V,$ $I_F=10A, di_F/dt=200A/\mu s$ $T_C=175^\circ C$	-	420	-
反向恢复电荷 Diode Reverse recovery charge	Qrr	-		2898	-	nC
反向恢复电流 Diode Reverse recovery Current	$I_{RRM}$	-		15.6	-	A
反向恢复能量 Diode Reverse recovery Energy	Erec			2.1		mJ

项 目 Parameter	符 号 Symbol	最大值 MAX		单 位 Unit
		TO-247		
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)IGBT}$	0.85		$^\circ C/W$
结到管壳的热阻 Thermal Resistance, Junction to Case	$R_{th(j-c)FRD}$	2.2		$^\circ C/W$
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	40		$^\circ C/W$



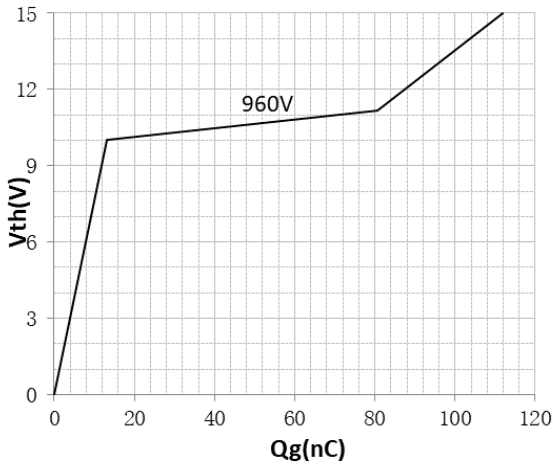
特征曲线 ELECTRICAL CHARACTERISTICS (curves)





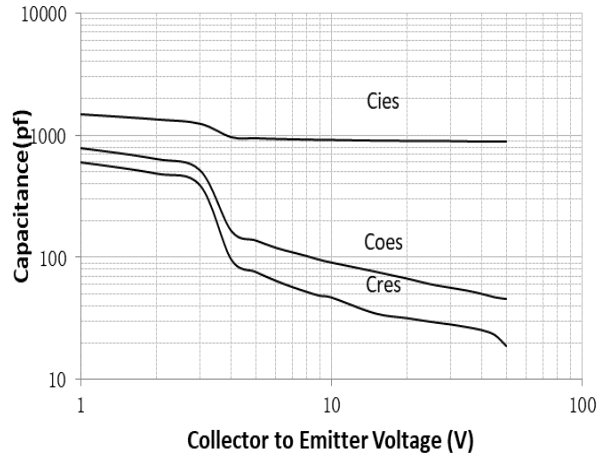
Gate Charge Characteristics

VGE=15V, IC=25A



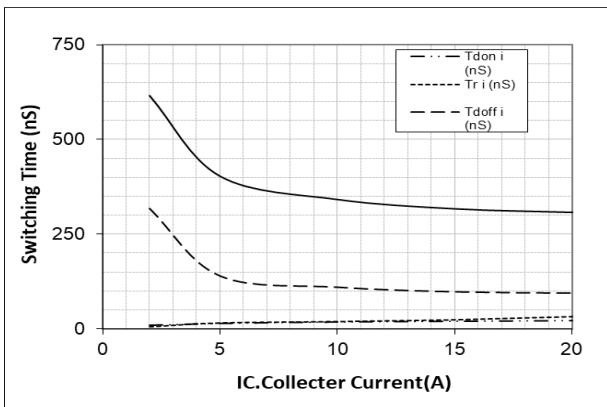
Capacitance Characteristic

Vce=25V, VGE =0V, f=1.0MHZ



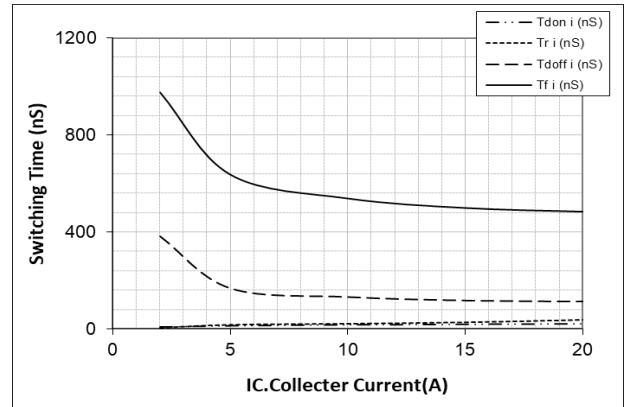
Switching Time vs. IC(25°C)

VCE=600V, VGE=15V, RG=10Ω



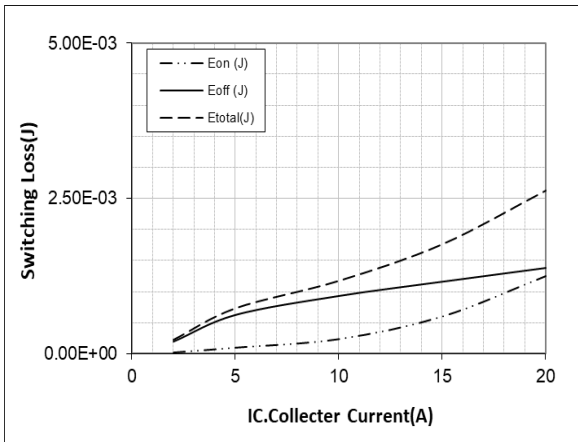
Switching Time vs. IC(175°C)

VCE=600V, VGE=15V, RG=10Ω



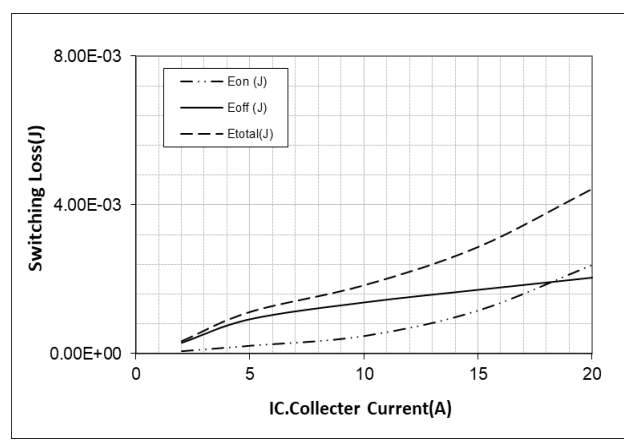
Switching Loss vs. IC(25°C)

VGE=15V, VCE=600V, Rg=10Ω



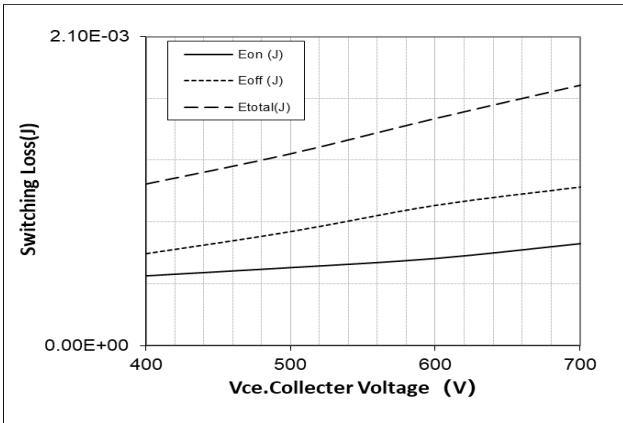
Switching Loss vs. IC(175°C)

VGE=15V, VCE=600V, Rg=10Ω

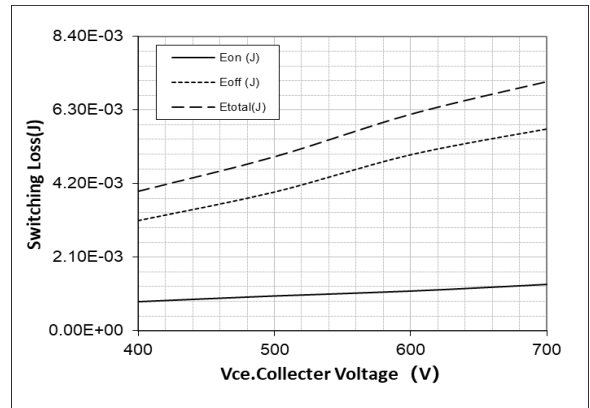




Switching Loss vs. VCE(25°C)

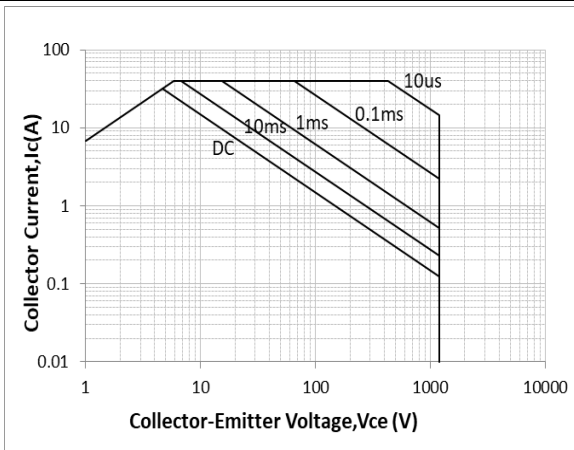


Switching Loss vs. VCE(175°C)

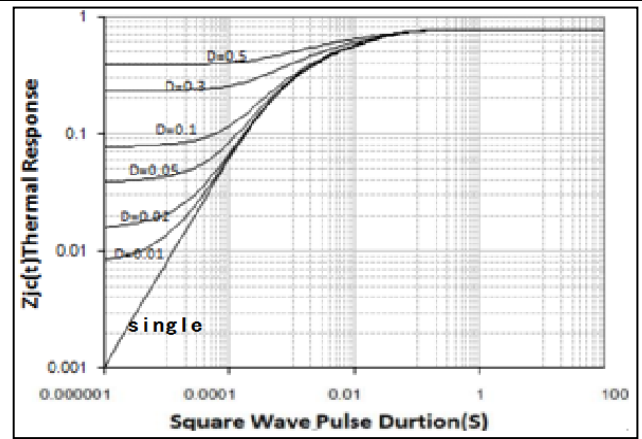


Forward Bias SOA

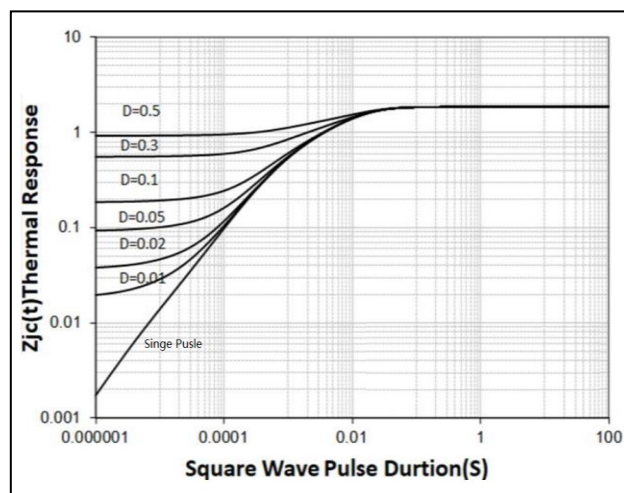
$T_c=25^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $T_j \leq 175^\circ\text{C}$



Normalized Maximum Transient Thermal Impedance for IGBT(RJC)-TO-247



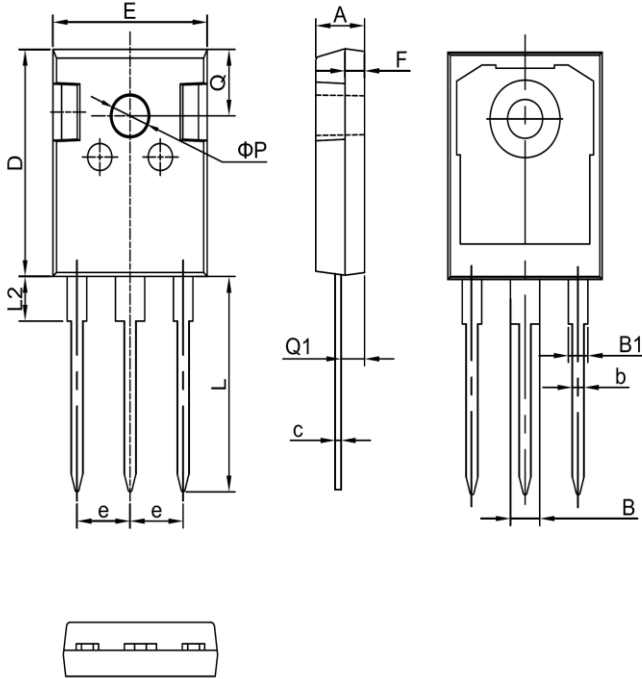
Impedance for FRD(RJC) -TO-247





TO-247

单位 Unit : mm



符号 symbol	MIN	MAX
A	4.90	5.10
B	2.95	3.35
B1	1.95	2.35
b	1.15	1.35
c	0.50	0.70
D	20.90	21.10
E	15.70	15.90
e	5.34	5.54
F	1.90	2.10
L	19.40	20.40
L2	4.03	4.23
Q	6.00	6.40
Q1	2.30	2.50
P	3.50	3.70





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### 联系方式

#### 吉林华微电子股份有限公司

公司地址：吉林省吉林市深圳街 99 号

邮编：132013

总机：86-432-64678411

传真：86-432-64665812

网址：[www.hwdz.com.cn](http://www.hwdz.com.cn)

### CONTACT

#### JILIN SINO-MICROELECTRONICS CO., LTD.

ADD: No.99 Shenzhen Street, Jilin City, Jilin Province, China.

Post Code: 132013

Tel: 86-432-64678411

Fax: 86-432-64665812

Web Site: [www.hwdz.com.cn](http://www.hwdz.com.cn)