



TT040K120GQ

主要参数 MAIN CHARACTERISTICS

I_C	40 A
V_{CES}	1200V
$V_{cesat-tp}(V_{ge}=15V)$	1.8V

用途

- 逆变器
- UPS 电源
- 焊接

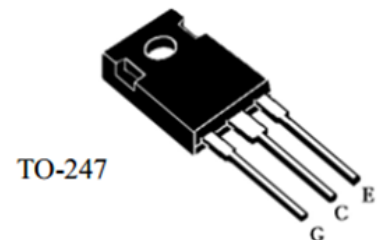
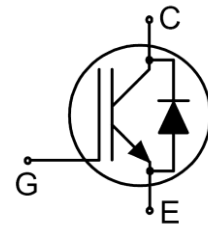
APPLICATIONS

- General purpose inverters
- UPS
- Welding

产品特性

- Trench FS 技术
- 无铅铅镀层; 符合 RoHS 标准
- 针对高速硬开关拓扑进行优化
- 采用华微电子 7Gen 微沟槽技术平台
- 合封强过载、全电流、软恢复 FRD 二极管

封装 Package



FEATURES

- Trench FS Technology
- Pb-free lead plating; RoHS compliant
- Optimized for high efficiency in high speed hard switching topologies
- Adopt Jilin sino-microelectronics 7GEN micro trench technology platform
- Best-in-class high speed IGBT co-packed with full rated current, low Q_{rr} and soft-commutating high speed diode

订货型号 Order codes		印 记 Marking	封 装 Package
无卤-条管 Halogen-Free-Tube	无卤-编带 Halogen-Free-Reel		
TT040K120GQ-GE-BR	N/A	TT040K120GQ	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	80($T_c=25^{\circ}\text{C}$)	A
		40($T_c=100^{\circ}\text{C}$)	A
最大脉冲集电极极电流 (注 1) Collector Current – pulse (note 1)	I_{CM}	160	A
二极管正向电流 Diode RMS forward current	I_F	80($T_c=25^{\circ}\text{C}$)	A
		40($T_c=100^{\circ}\text{C}$)	A
二极管正向不重复峰值电流 (浪涌电流) Surge non repetitive forward current $t_p=10\text{ ms}$ sinusoidal	I_{FSM}	160	A
栅极发射极电压 Gate-Emitter Voltage	V_{GE}	± 20	V
瞬态栅极发射极电压 Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)	V_{GE}	± 25	V
安全工作区 Turn-off safe area	-	160	A
耗散功率 Power Dissipation	P_D $T_c=25^{\circ}\text{C}$	319	W
存储温度 Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^{\circ}\text{C}$
最高结温 Max Junction Temperature Range	T_{VJ}	175	$^{\circ}\text{C}$
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
关态特性 Off –Characteristics						
集电极—发射极击穿电压 Collector-Emitter Voltage	BV _{CES}	I _C =250μA, V _{GE} =0V	1200	-	-	V
击穿电压温度特性 Breakdown Voltage Temperature Coefficient	ΔBV _{CES} /ΔT _J	I _C =0.4mA, referenced to 25°C	-	0.7	-	V/°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°C	-	-	0.2	mA
		V _{CE} =1200V, V _{GE} =0V, T _C =175°C	-	0.8		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
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C =250μA	4.7	5.5	6.2	V
饱和压降 Collector-Emitter saturation Voltage	V _{CESAT}	V _{GE} =15V I _C =40A T _C =25°C	-	1.8	2.2	V
		V _{GE} =15V I _C =40A T _C =175°C	-	2.2	-	V
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C _{ies}	V _{CE} =25V, V _{GE} =0V, f=1.0MHz		7922		pF
输出电容 Output capacitance	C _{oes}			176		pF
反向传输电容 Reverse transfer capacitance	C _{res}			31		pF
栅极电荷总量 Total Gate Charge	Q _g	V _{CC} =960V,I _C =40A, V _{GE} =15 V T _C =25°C		290		nC
栅极-发射极电荷 Gate to emitter charge	Q _{ge}		-	64	-	
栅极-集电极电荷 Gate to collector charge	Q _{gc}		-	89.5	-	
栅极电阻-Gate resistance	R _g	f=1 MHz, open collector		0.7		Ω





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 =40A,R _G =10Ω V _{GE} =15 V, T _C =25℃		46		ns	
上升时间 Turn-On rise time	t _r			61		ns	
关断延迟时间 Turn-Off delay time	t _{d(off)}			305		ns	
下降时间 Turn-Off Fall time	t _f			78		ns	
开通损耗 Turn-On energy	E _{on}			1.82		mJ	
关断损耗 Turn-Off energy	E _{off}			0.84		mJ	
总开关损耗 Total switching energy	E _{tot}			2.66		mJ	
开启延迟时间 Turn-On delay time	t _{d(on)}	V _{CC} =600V,I _c =40A,R _G =10Ω V _{GE} =15 V, T _C =175℃		41		ns	
上升时间 Turn-On rise time	t _r			57		ns	
关断延迟时间 Turn-Off delay time	t _{d(off)}			367		ns	
下降时间 Turn-Off Fall time	t _f			176		ns	
开通损耗 Turn-On energy	E _{on}			1.89		mJ	
关断损耗 Turn-Off energy	E _{off}			1.04		mJ	
总开关损耗 Total switching energy	E _{tot}			2.93		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	V _F	V _{GE} =0V, I _F =40A, T _C =25℃	-	2.6		V	
Diode Forward Voltage		V _{GE} =0V, I _F =40A, T _C =175℃	-	1.6	-	V	
反向恢复时间	t _{rr}	V _{GE} =0V, V _R =600V I _F =40A dl _F /dt=100A/μs T _C =25℃	-	69.4	-	ns	
Diode Reverse recovery time							
反向恢复电荷	Q _{rr}			-	150.9	-	nC
Diode Reverse recovery charge							
反向恢复电流	I _{rrm}	V _{GE} =0V, V _R =600V I _F =40A dl _F /dt=100A/μs T _C =175℃	-	3.96	-	A	
Diode Reverse recovery Current							
反向恢复时间	t _{rr}			-	662.5	-	ns
Diode Reverse recovery time							
反向恢复电荷	Q _{rr}		-	4746	-	nC	
Diode Reverse recovery charge							
反向恢复电流	I _{rrm}		-	11.8	-	A	
Diode Reverse recovery Current							





TT040K120GQ

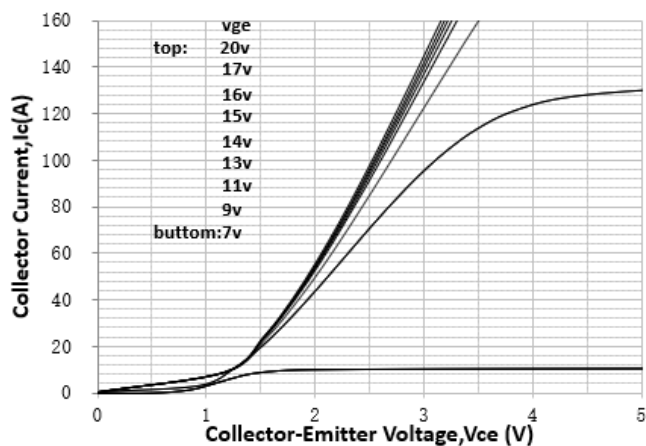
项 目 Parameter	符 号 Symbol	典型 Typ	最大值 MAX	单 位 Unit
		TO-247		
结到管壳的热阻 IGBT Thermal Resistance, Junction to Case	R _{th(j-c)}	0.345	0.47	°C/W
结到管壳的热阻 FRD Thermal Resistance, Junction to Case	R _{th(j-c)}	0.421	0.58	°C/W
结到环境的热阻 Thermal Resistance, Junction to Ambient	R _{th(j-A)}		40	°C/W



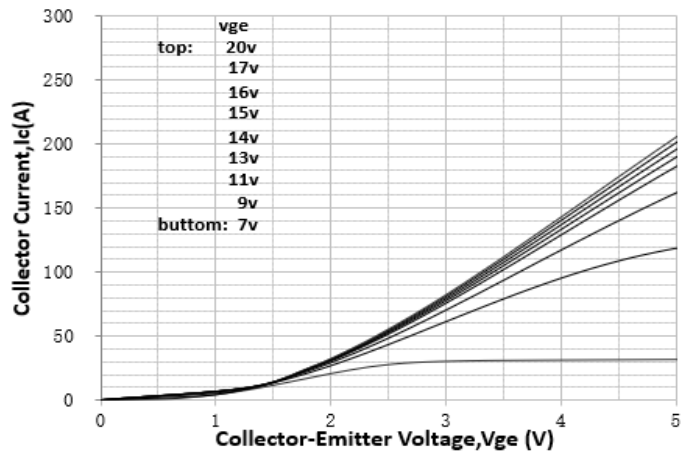


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

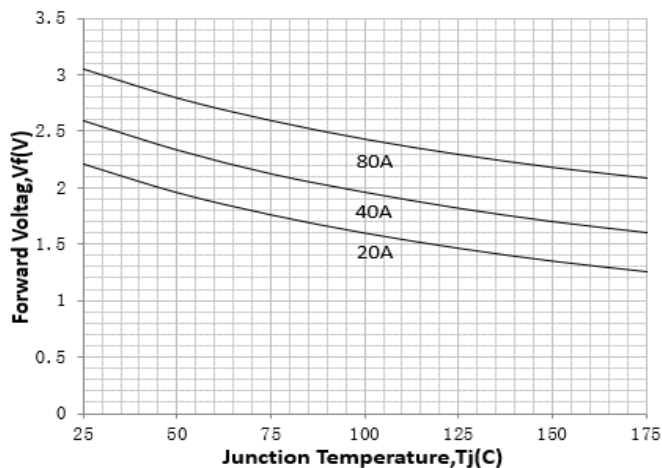
Output Characteristics (25°C)



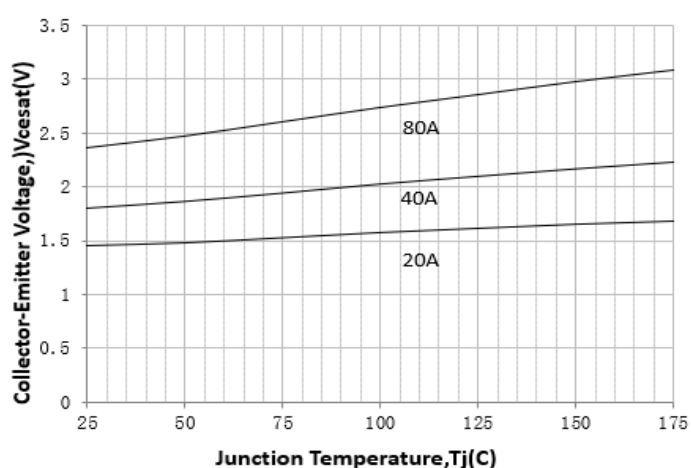
Output Characteristics (175°C)



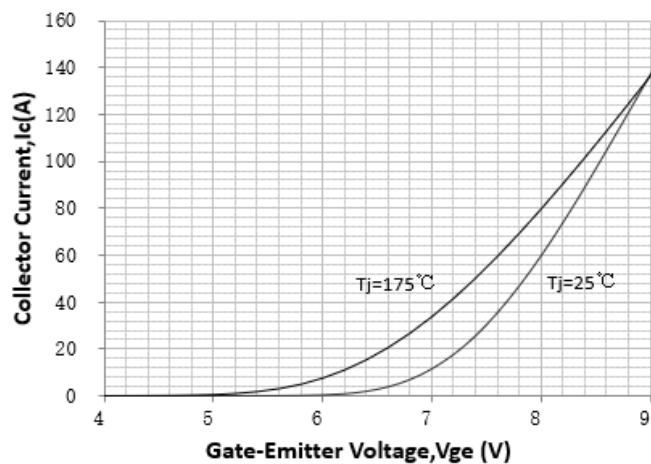
VF vs. Tj



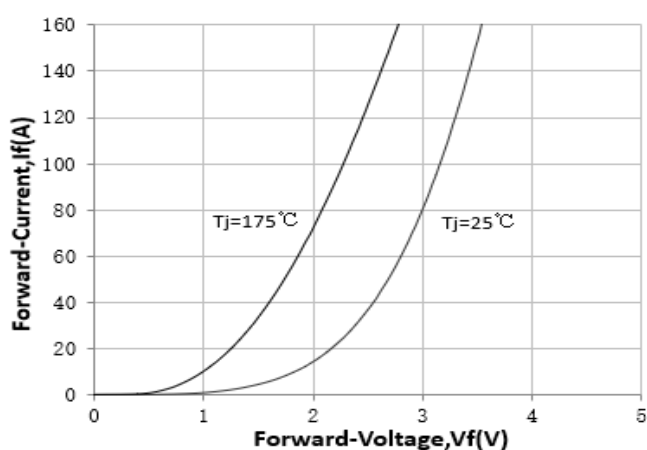
Vcesat vs. Tj



Transfer Characteristics



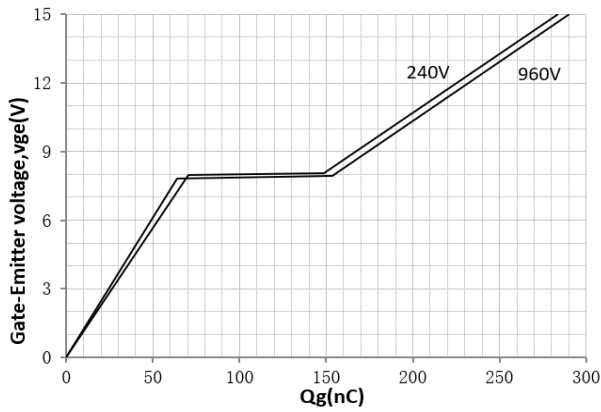
Diode Characteristic



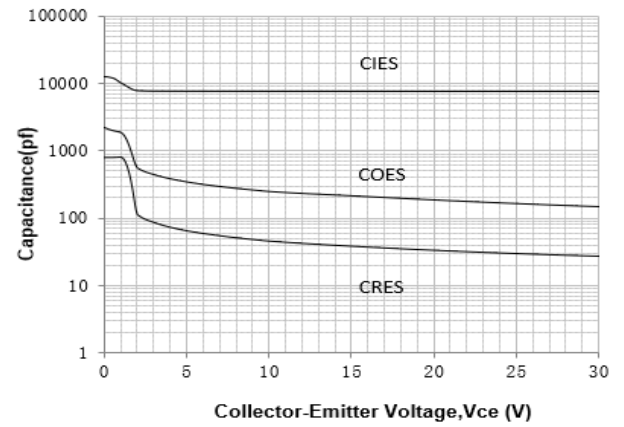


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

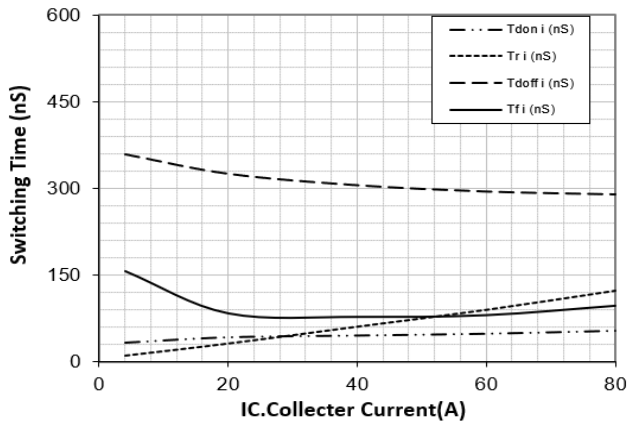
Gate Charge Characteristics

 $V_{GE}=15V, I_C=40A$ 

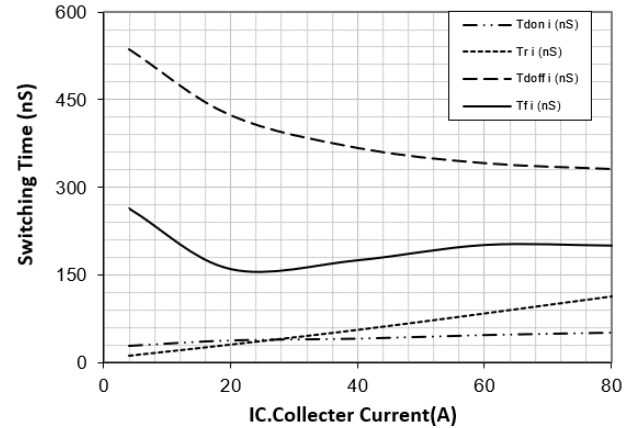
Capacitance Characteristic

 $V_{CE}=30V, V_{GE}=0V, f=1.0MHz$ 

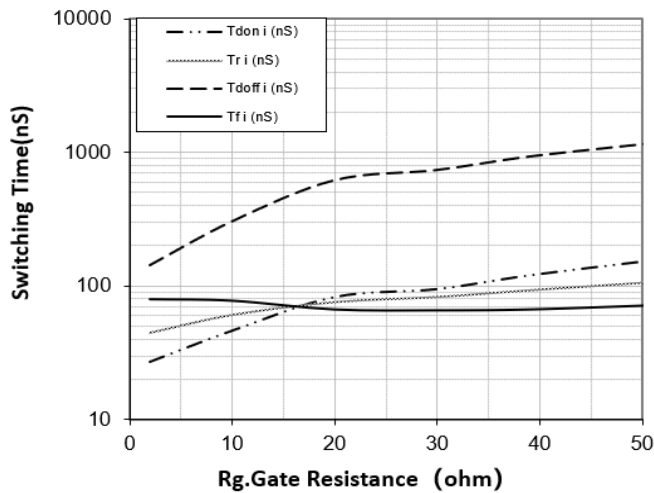
Switching Time vs. IC(25°C)

 $V_{GE}=15V, V_{CE}=600V, I_C=40A$ 

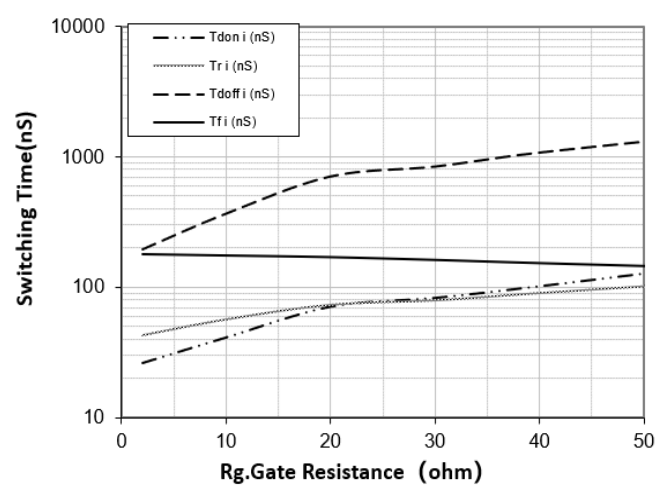
Switching Time vs. IC(175°C)

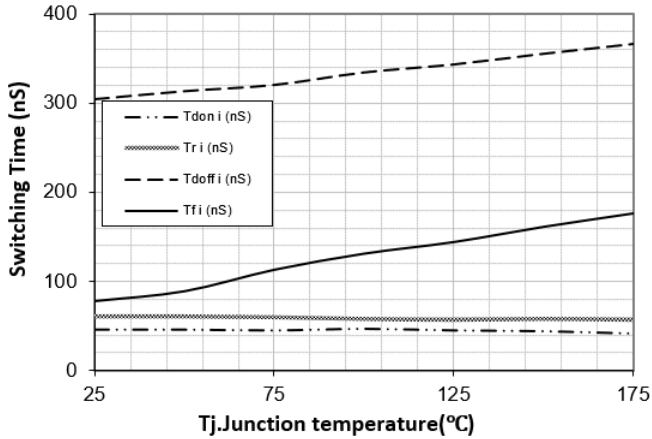
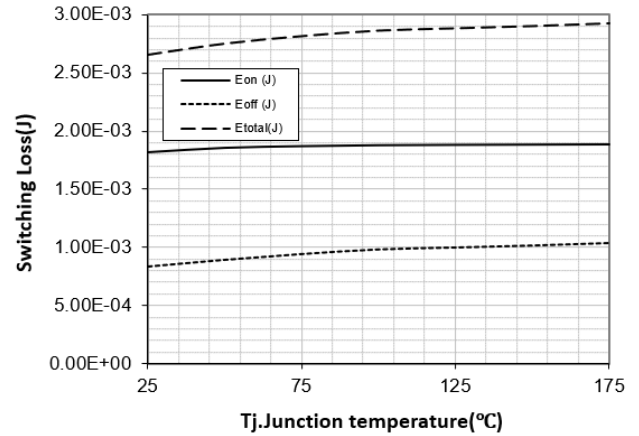
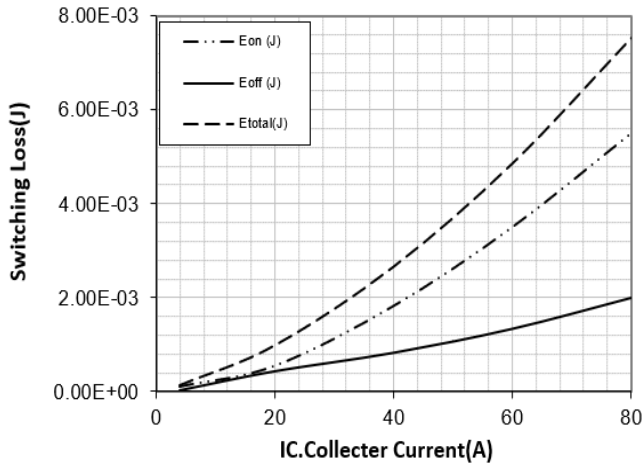
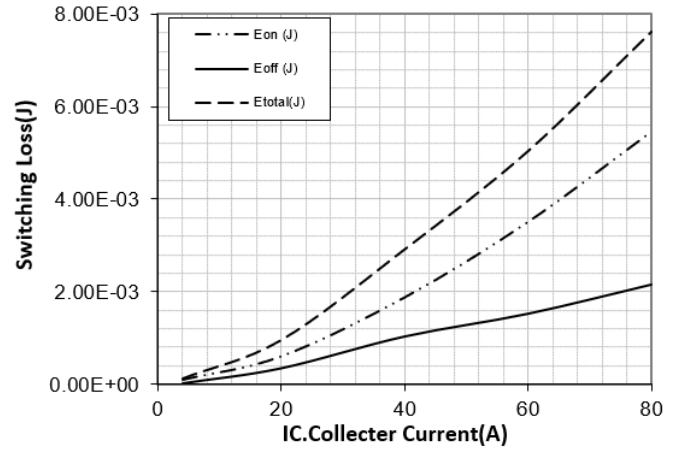
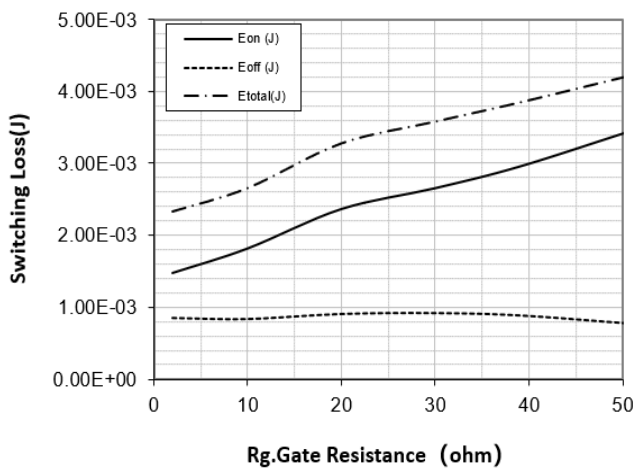
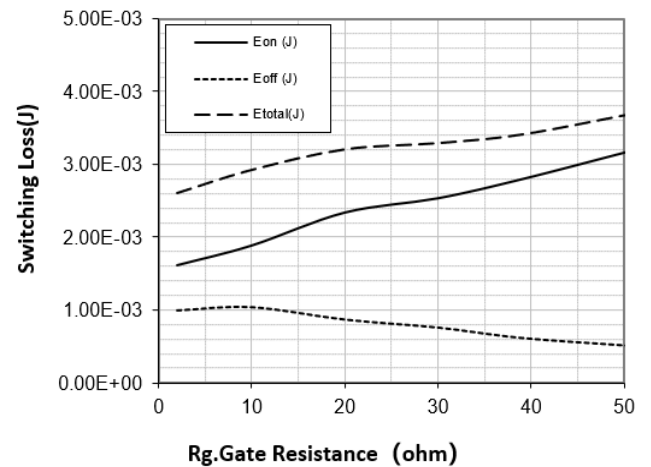
 $V_{GE}=15V, V_{CE}=600V, I_C=40A$ 

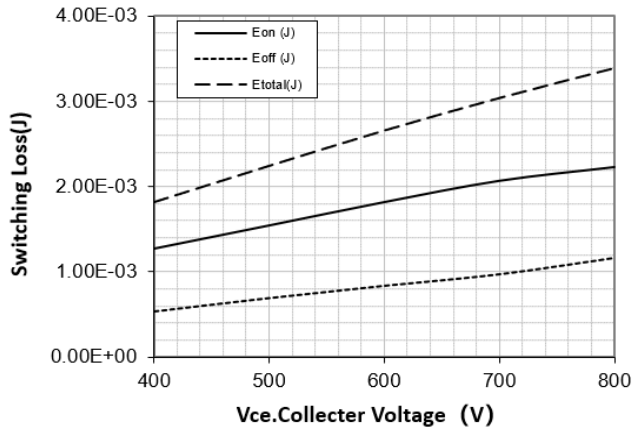
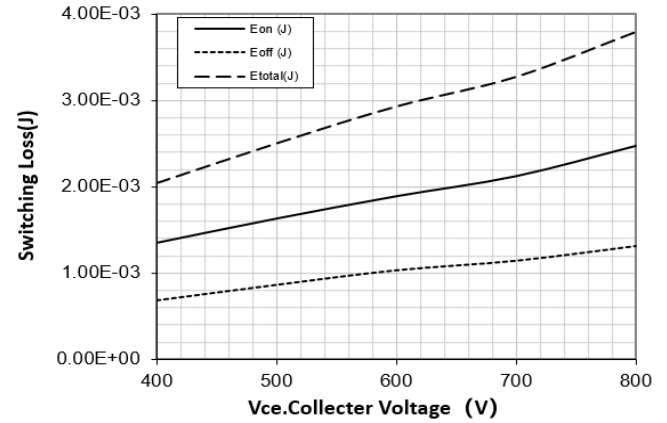
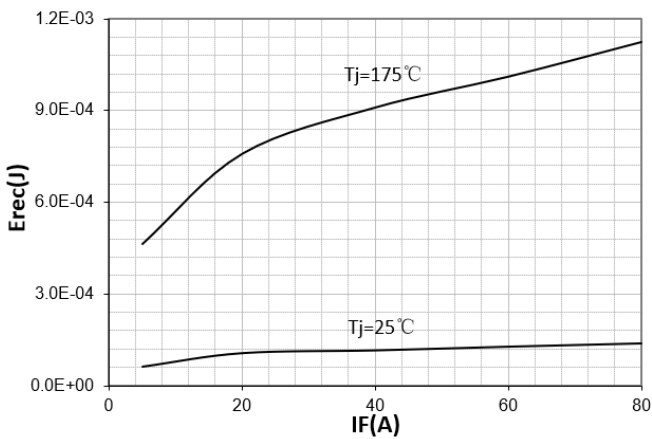
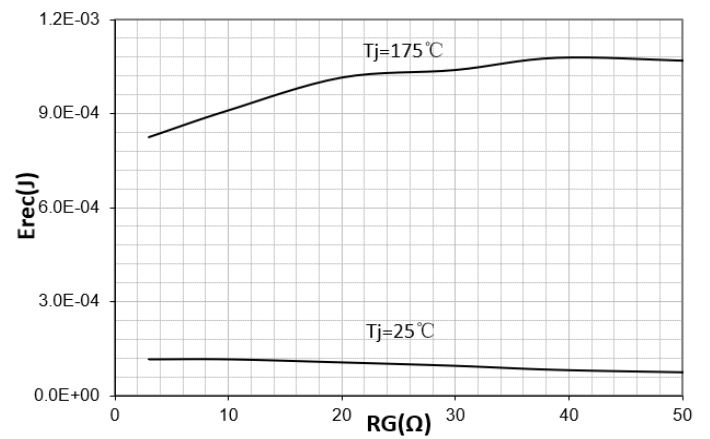
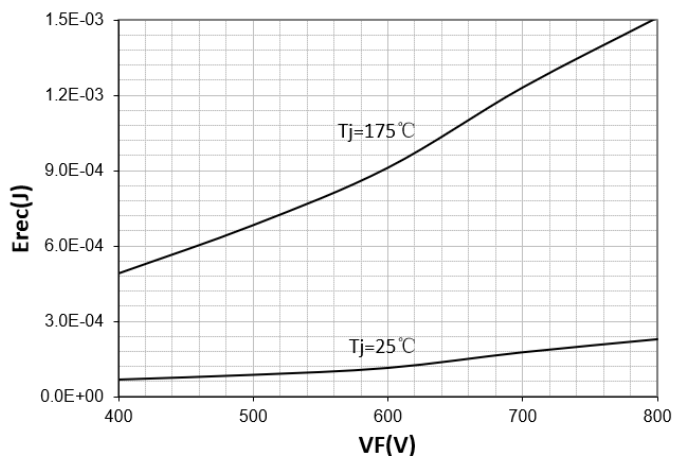
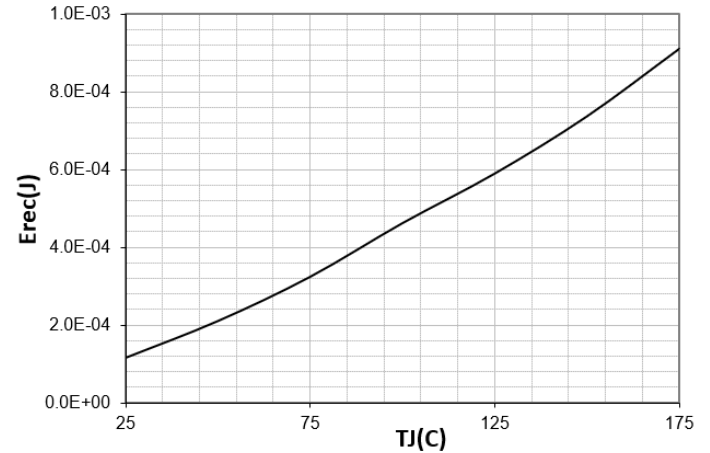
Switching Time vs. Rg(25°C)

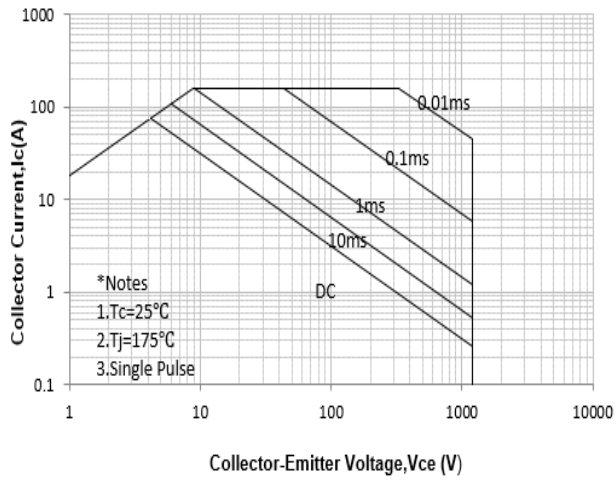
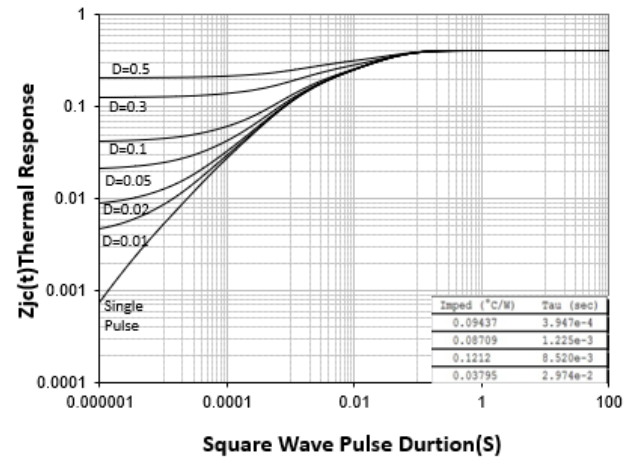
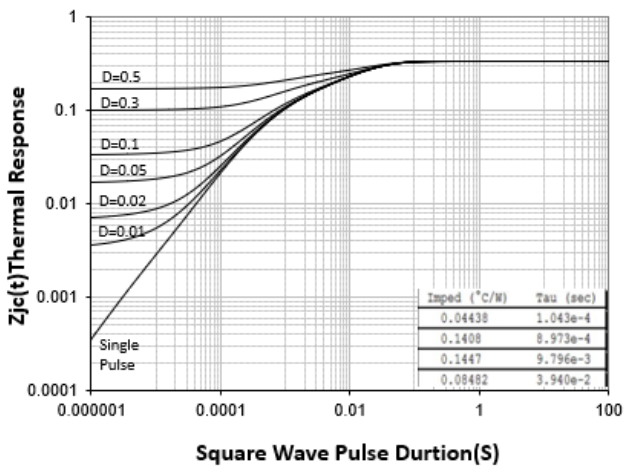
 $V_{GE}=15V, V_{CE}=600V, I_C=40A$ 

Switching Time vs. Rg(175°C)

 $V_{GE}=15V, V_{CE}=600V, I_C=40A$ 

**Switching Time vs. Tj** $V_{GE}=15V, V_{CE}=600V, I_C=40A, R_g=10\Omega$ **Switching Loss vs. Tj** $V_{GE}=15V, V_{CE}=600V, I_C=40A, R_g=10\Omega$ **Switching Loss vs. IC(25°C)** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ **Switching Loss vs. IC(175°C)** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ **Switching Loss vs. Rg(25°C)** $V_{GE}=15V, V_{CE}=600V, I_C=40A$ **Switching Loss vs. Rg(175°C)** $V_{GE}=15V, V_{CE}=600V, I_C=40A$ 

**Switching Loss vs. VCE(25°C)** $V_{GE}=15V, I_C=40A, R_g=10\Omega$ **Switching Loss vs. VCE(175°C)** $V_{GE}=15V, I_C=40A, R_g=10\Omega$ **Erec vs IF** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ **Erec vs RG** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ **Erec vs VF** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ **Erec vs TJ** $V_{GE}=15V, V_{CE}=600V, R_g=10\Omega$ 

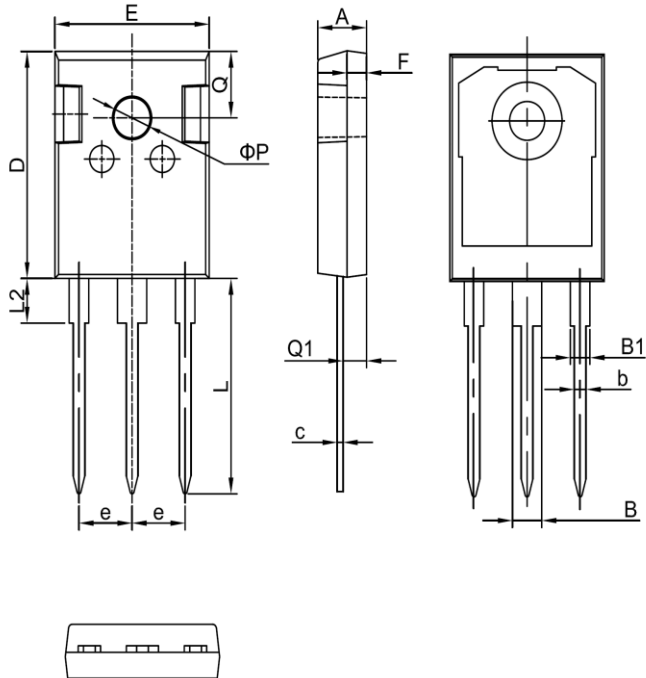
**Forward Bias SOA** $T_c=25^{\circ}\text{C}$, $V_{GE}=15\text{V}$, $T_j \leq 175^{\circ}\text{C}$ **Normalized TYP Transient Thermal Impedance for IGBT(RJC)****Normalized TYP Transient Thermal Impedance for FRD(RJC)**



外形尺寸 PACKAGE MECHANICAL DATA

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





注意事项

1. 吉林华微电子股份有限公司的产品销售分为直销和销售代理，无论哪种方式，订货时请与公司核实。
2. 购买时请认清公司商标，如有疑问请与公司本部联系。
3. 在电路设计时请不要超过器件的绝对最大额定值，否则会影响整机的可靠性。
4. 本说明书如有版本变更不另外告知。

NOTE

1. Jilin Sino-microelectronics co., Ltd sales its product either through direct sales or sales agent , thus, for customers, when ordering , please check with our company.
2. We strongly recommend customers check carefully on the trademark when buying our product, if there is any question, please don't be hesitate to contact us.
3. Please do not exceed the absolute maximum ratings of the device when circuit designing.
4. Jilin Sino-microelectronics co., Ltd reserves the right to make changes in this. specification sheet and is subject to change without prior notice.

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