

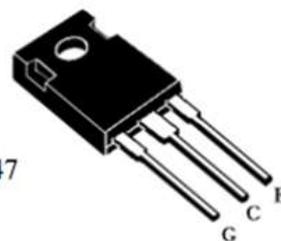
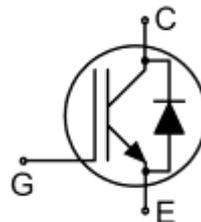


TT040U120EQ

主要参数 MAIN CHARACTERISTICS

I _c	40 A
V _{CEs}	1200V
V _{cesat-typ} (V _{ge} =15V)	2.0V

封装 Package



TO-247

用途

- 电焊机
- UPS 电源

APPLICATIONS

- Welding
- UPS

产品特性

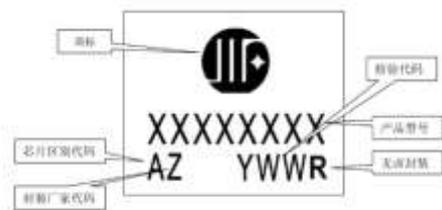
- 低栅极电荷
- Trench FS 技术
- RoHS 产品

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+参数规格+工艺版本+特殊特性+预留代码

TT040U120EQ

针 1200V 系列建议

- L:低频 推荐频率~5KHz
- N:中频 推荐频率 2~14KHz
- K:中高频 推荐频率 5~24KHz
- U:高频 推荐频率 14~40KHz
- F:超高频 推荐频率 20~60KHz
- UF:特高频 1200V 系列无

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		
TT040U120EQ-GE-BR	TT040U120EQ	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($T_C=100^\circ\text{C}$)	
最大脉冲集电极极电流 (注1) Collector Current – pulse (note 1)	I_{CM}	160	
二极管正向电流 Diode RMS forward current	I_F	80($T_C=25^\circ\text{C}$)	
		40($T_C=100^\circ\text{C}$)	
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	
栅极发射极电压 Gate-Emitter Voltage	V_{GE}	± 20	V
安全工作区 Turn-off safe area	-	160	A
耗散功率 Power Dissipation	P_D $T_C=25^\circ\text{C}$	568	W
存储温度 Storage Temperature Range	T_{STG}	$-55\sim+150$	$^\circ\text{C}$
结温 Junction Temperature Range	T_{vj}	$-55\sim+150$	
引线最高焊接温度 Maximum Lead Temperature for Soldering Purposes	T_L	300	

*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}	$I_C=250\mu A, V_{GE}=0V$	1200	-	-	V
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	
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	
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V_{TH}	$V_{CE} = V_{GE}, I_C=400\mu A$	4.5	-	6.5	V
饱和压降 Collector-Emitter saturation Voltage	V_{CESAT}	$V_{GE}=15V, I_C=40A, T_C=25^\circ C$	-	2.0	3.0	
		$V_{GE}=15V, I_C=40A, T_C=175^\circ C$	-	2.9	-	
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1.0MHz$	-	3626	-	pF
输出电容 Output capacitance	C_{oes}		-	232	-	
反向传输电容 Reverse transfer capacitance	C_{res}		-	74	-	
栅极电荷总量 Total Gate Charge	Q_g	$V_{CC}=960V, I_C=40A, V_{GE}=15V, T_C=25^\circ C$	-	147.7	-	nC
栅极-发射极电荷 Gate to emitter charge	Q_{ge}		-	36.1	-	
栅极-集电极电荷 Gate to collector charge	Q_{gc}		-	65.2	-	
栅极电阻-Gate resistance	R_g	$f=1 MHz, \text{open collector}$	-	2.1	-	Ω
短路电流-short current	I_{SC}	$V_{GE}=15V, V_{CE}=600V, t_{sc} \leq 5\mu s$	-	260	-	A



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	$t_d(\text{on})$	$V_{CC}=600V, I_c=40A, R_G=12\Omega$ $V_{GE}=15V$, Parasitic ductance= $75nH$ $T_C=25^\circ C$	-	42	-	ns
上升时间 Turn-on rise time	t_r		-	70	-	
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	180	-	
下降时间 Turn-off Fall time	t_f		-	84	-	mJ
开通损耗 Turn-on energy	Eon		-	1.43	-	
关断损耗 Turn-off energy	Eoff		-	1.48	-	
总开关损耗 Total switching energy	Etot	-	2.91	-		
开启延迟时间 Turn-on delay time	$t_d(\text{on})$	$V_{CC}=600V, I_c=40A, R_G=12\Omega$ $V_{GE}=15V$, Parasitic ductance= $75nH$ $T_C=175^\circ C$	-	38	-	ns
上升时间 Turn-on rise time	t_r		-	70	-	
关断延迟时间 Turn-off delay time	$t_d(\text{off})$		-	220	-	
下降时间 Turn-off Fall time	t_f		-	164	-	mJ
开通损耗 Turn-on energy	Eon		-	1.63	-	
关断损耗 Turn-off energy	Eoff		-	2.08	-	
总开关损耗 Total switching energy	Etot	-	3.71	-		

反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings

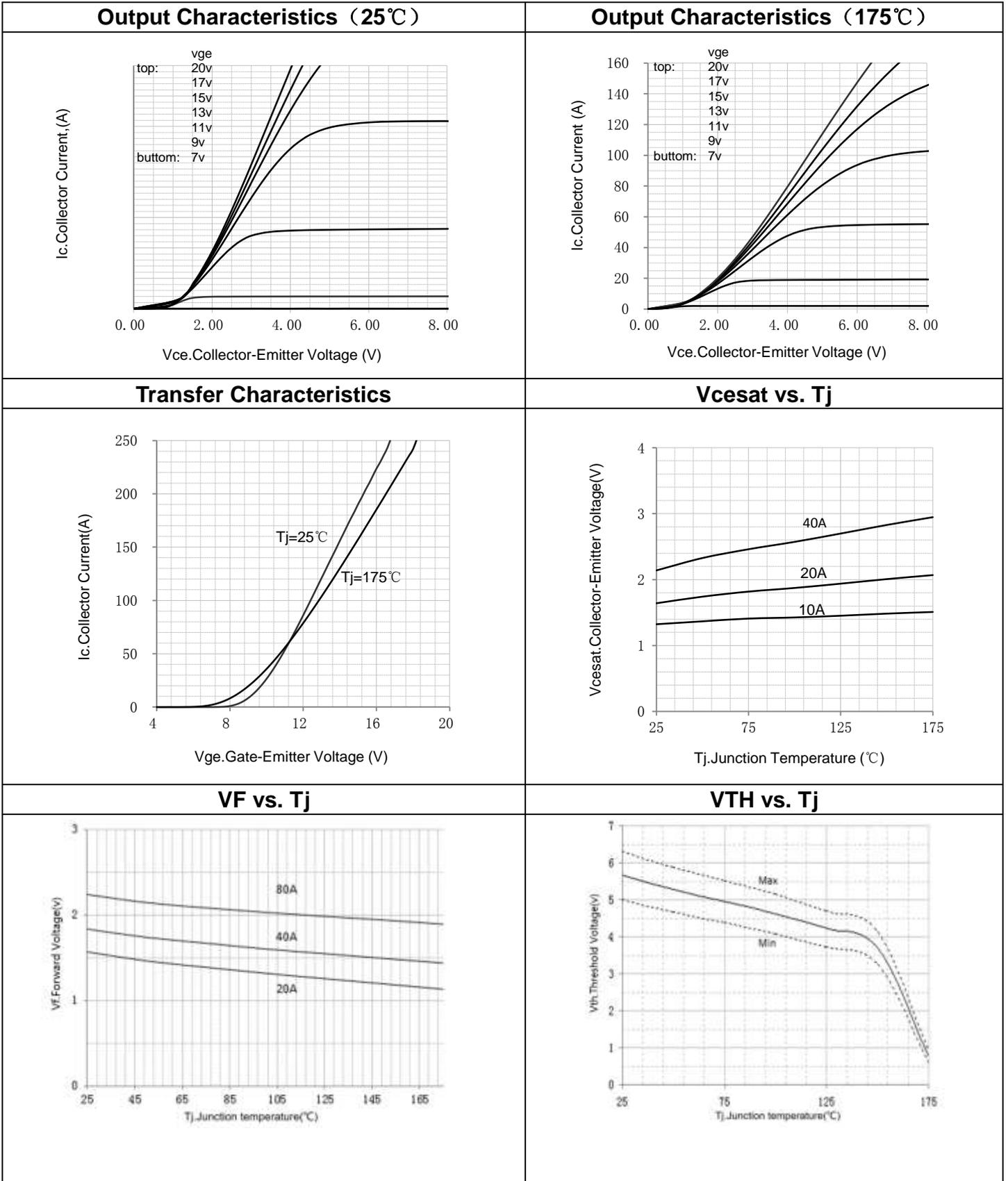
正向压降 Collector-Emitter Diode Forward Voltage	V_F	$V_{GE}=0V, I_f=40A, T_C=25^\circ C$	-	2.8	3.8	V
		$V_{GE}=0V, I_f=40A, T_C=150^\circ C$	-	2.0	3.0	
反向恢复时间 Diode Reverse recovery time	t_{rr}	$I_F=30A,$	-	43	-	ns
反向恢复电荷 Diode Reverse recovery charge	Q_{rr}	$V_R=200V, diF/dt=-200A/\mu s$ $T_j=25^\circ C$	-	79	-	nC
反向恢复电流 Diode Reverse recovery Current	I_{rrm}		-	3.3	-	A
反向恢复时间 Diode Reverse recovery time	t_{rr}	$I_F=30A,$ $V_R=200V, diF/dt=-200A/\mu s$ $T_j=125^\circ C$	-	207	-	ns
反向恢复电荷 Diode Reverse recovery charge	Q_{rr}		-	583	-	nC
反向恢复电流 Diode Reverse recovery Current	I_{rrm}		-	6.2	-	A

项 目 Parameter	符 号 Symbol	最大值 MAX	单 位 Unit
结到管壳的热阻 IGBT Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.22	$^\circ C/W$
结到管壳的热阻 FRD Thermal Resistance, Junction to Case	$R_{th(j-c)}$	0.58	
结到环境的热阻 Thermal Resistance, Junction to Ambient	$R_{th(j-A)}$	40.0	



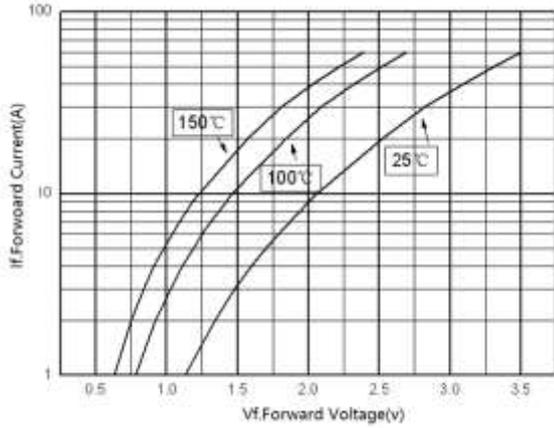


特征曲线 ELECTRICAL CHARACTERISTICS (curves)

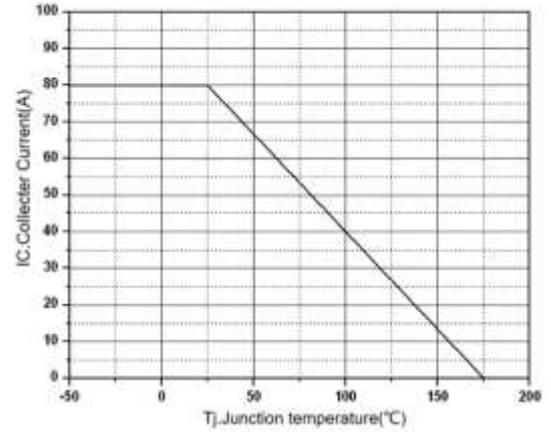




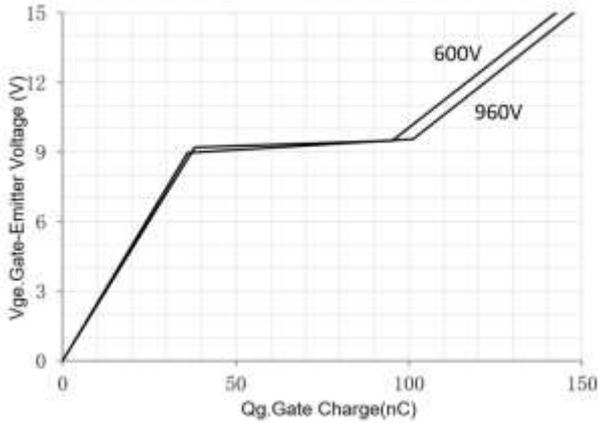
IF vs. VF



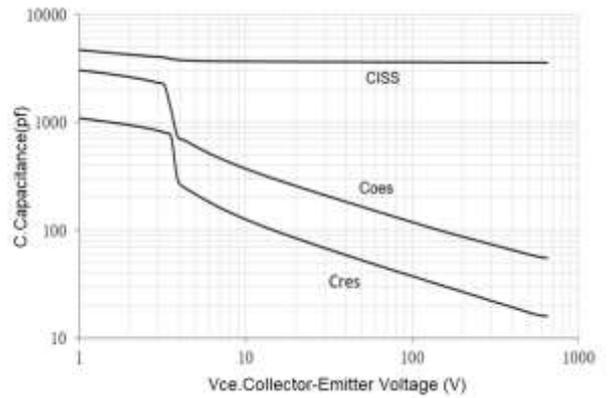
Collector current vs. case temperature
 $V_{GE} \geq 15V, T_j \leq 175^\circ C$



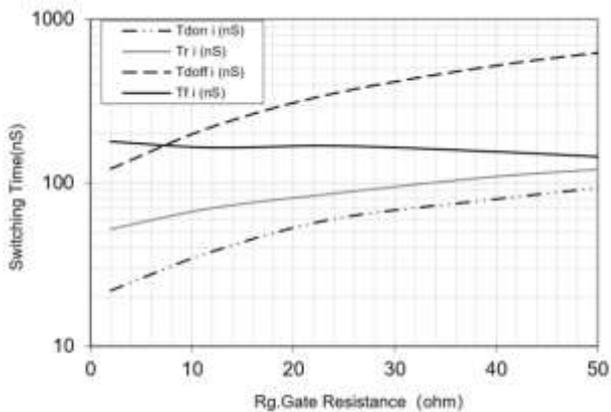
Gate Charge Characteristics
 $V_{GE}=15V, I_C=40A$



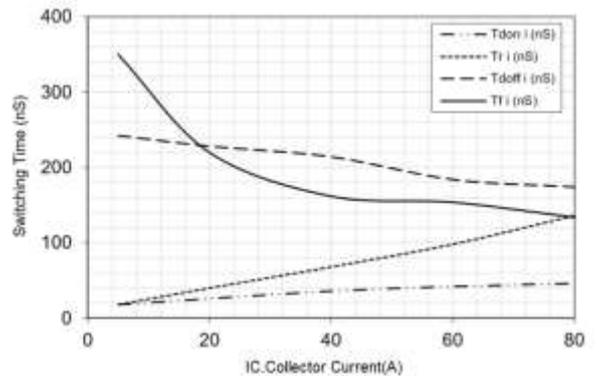
Capacitance Characteristic
 $V_{GE} = 0V, f = 1.0MHz$



Switching Time vs. Rg(175°C)
 $V_{GE}=15V, V_{CE}=600V, I_C=40A$



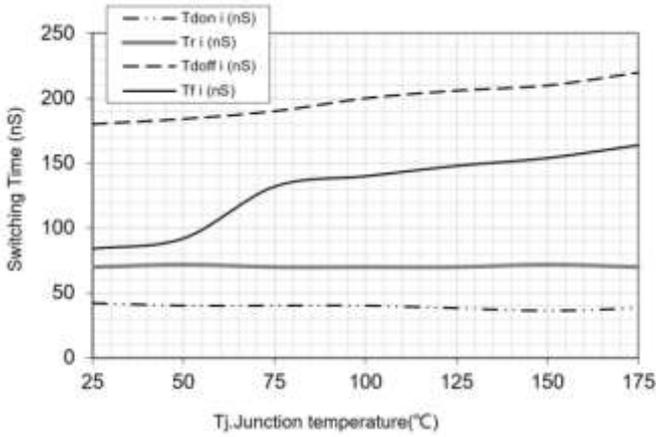
Switching Time vs. IC(175°C)
 $V_{CE}=600V, V_{GE}=15V, R_G=10\Omega, T_j=175^\circ C$





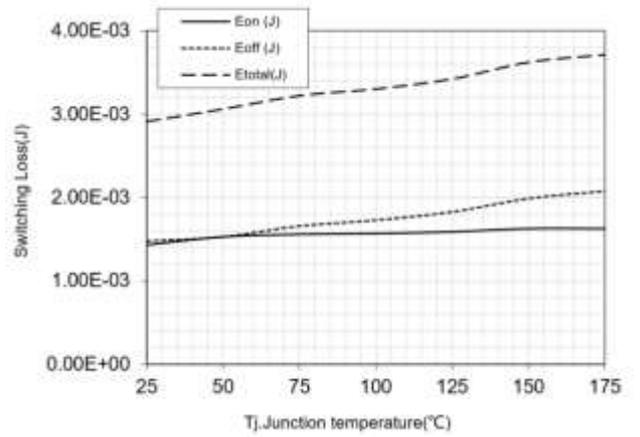
Switching Time vs. Tj

VGE=15V, VCE=600V, IC=40A, Rg=12Ω



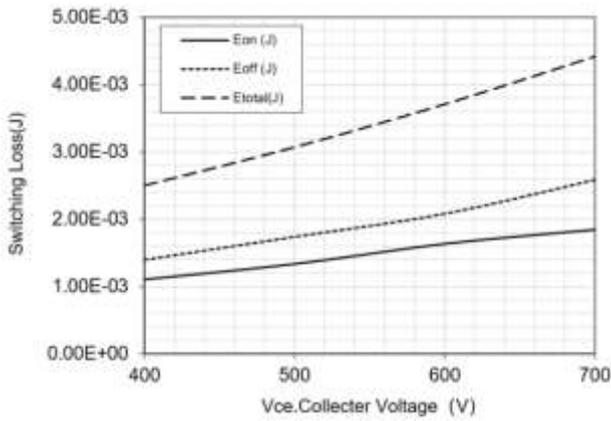
Switching Loss vs. Tj

VGE=15V, VCE=600V, IC=40A, Rg=12Ω



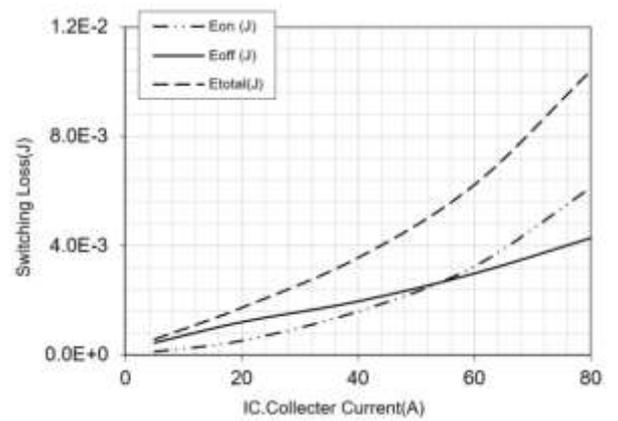
Switching Loss vs. VCE(175°C)

VGE=15V, IC=40A, Rg=12Ω



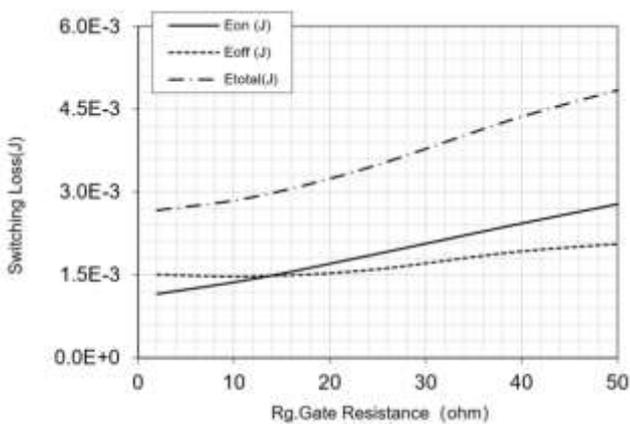
Switching Loss vs. IC(175°C)

VGE=15V, VCE=600V, Rg=12Ω



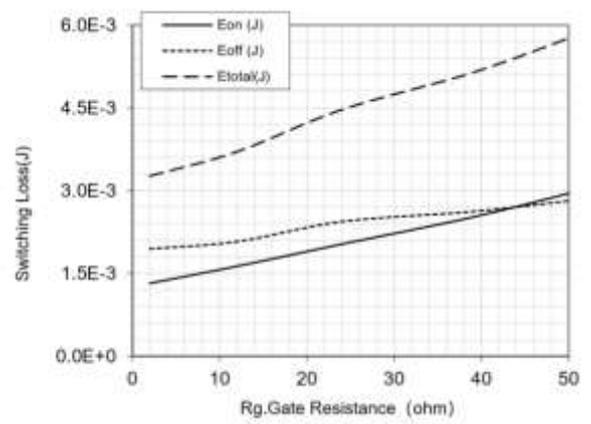
Switching Loss vs. Rg(25°C)

VGE=15V, VCE=600V, IC=40A



Switching Loss vs. Rg(175°C)

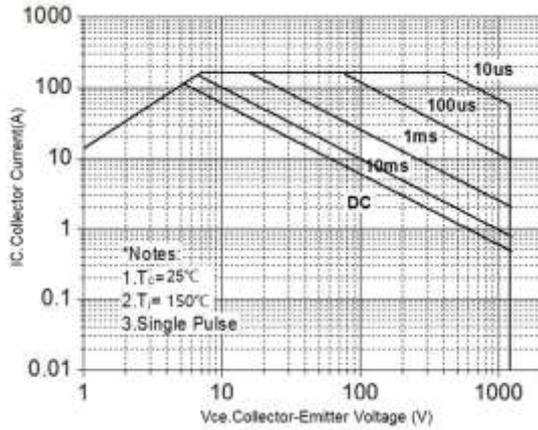
VGE=15V, VCE=600V, IC=40A



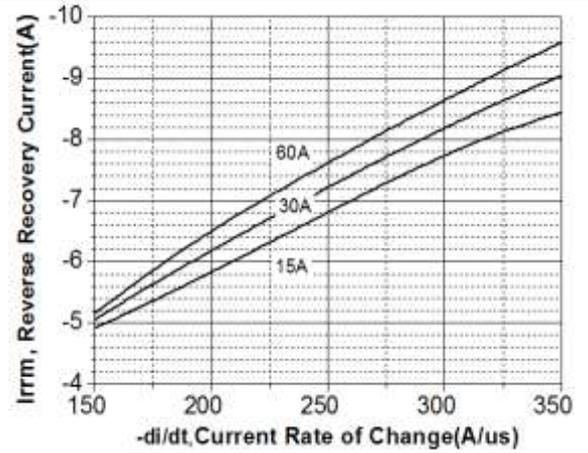


Forward Bias SOA

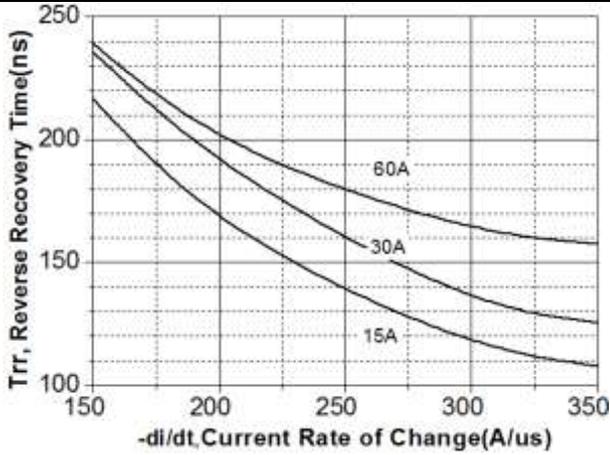
$T_c=25^\circ\text{C}$, $V_{GE}=15\text{V}$, $T_j \leq 175^\circ\text{C}$



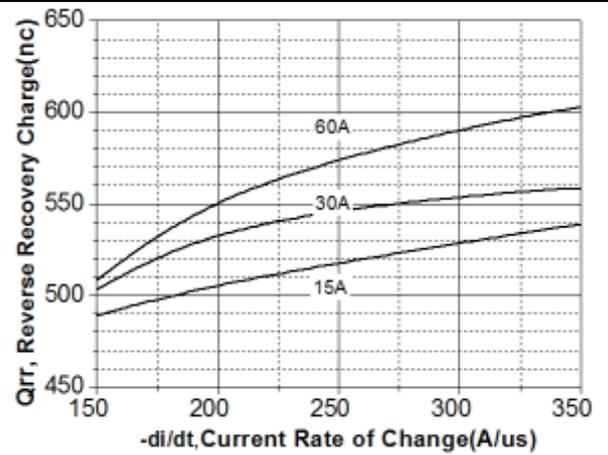
I_{RRM} vs d_{iF}/d_t



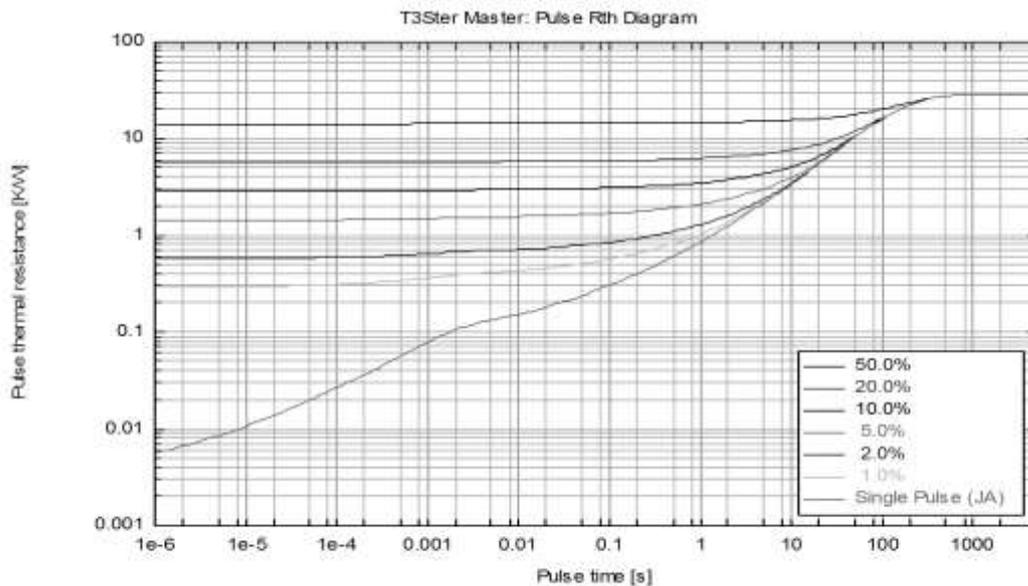
t_{rr} vs d_{iF}/d_t



Q_{rr} vs d_{iF}/d_t

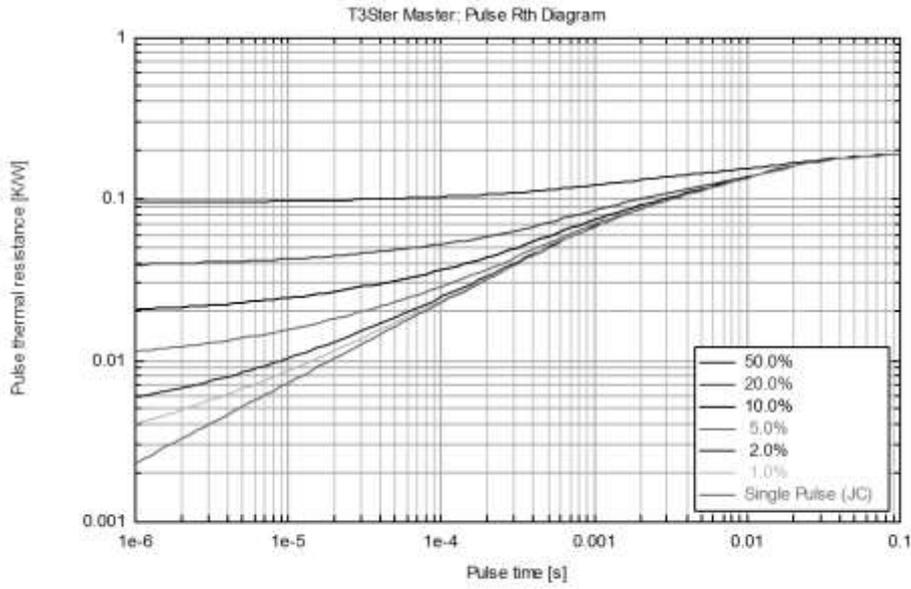


Normalized Maximum Transient Thermal Impedance for IGBT(RJA)

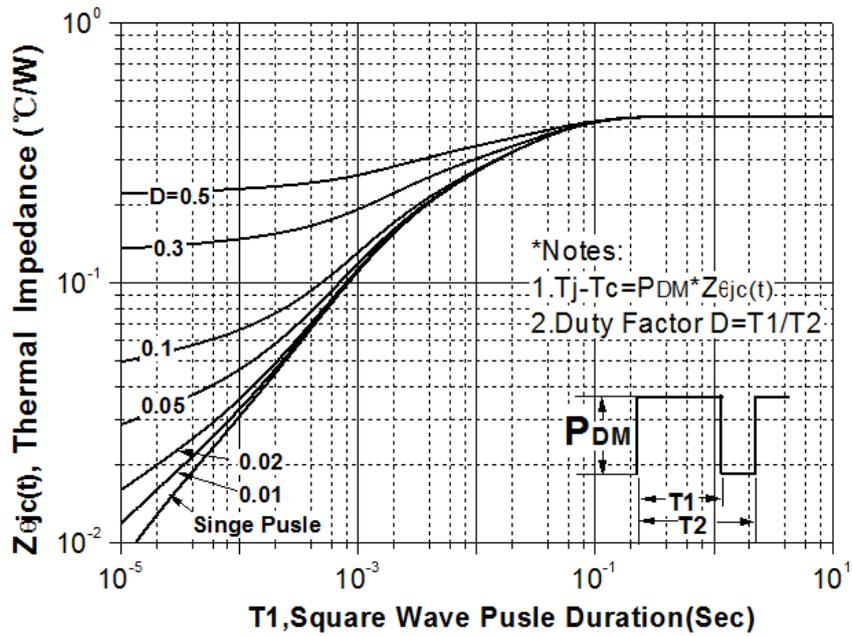




Normalized Maximum Transient Thermal Impedance for IGBT(RJC)



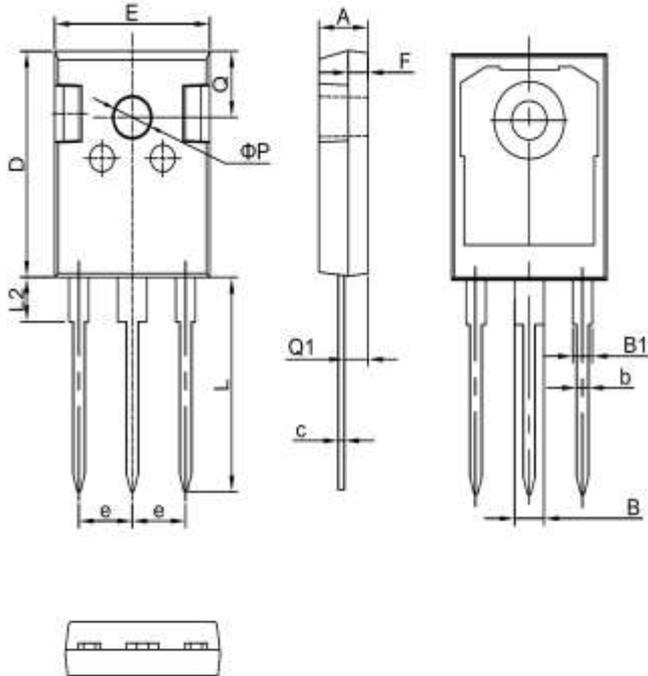
Normalized Maximum Transient Thermal Impedance for FRD(RJC)





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

重点尺寸：b、e、A、D、E。





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3. Please do not exceed the absolute maximum ratings of the device when circuit designing.
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