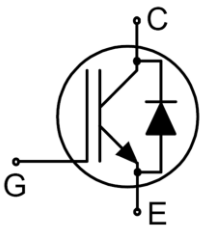
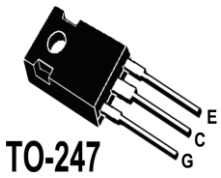
TT060U065FQ

主要参数 MAIN CHARACTERISTICS

I_C	60A
V_{CE}	650V
$V_{cesat-typ}$	1.9V

封装 **Package**





用途 APPLICATIONS

- ●PFC
- ●储能

- ●Power factor corrector (PFC)
- ●Energy Storage

产品特性 FEATURES

- ●低栅极电荷
- ●Trench FS 技术
- ●RoHS 产品
- ●快开关速度
- ●低开关损耗
- ●VCE(sat)正温度系数

- ●Low gate charge
- ●Trench FS Technology
- ●RoHS product
- ●Fast switching speed
- ●Low switching losses
- ●VCE(sat) with positive temperature coefficient

订货信息 ORDER MESSAGE

订 货 型 号 Order codes	印 记	封 装
无卤-条管 Halogen-Free-Tube	Marking	Package
TT060U065FQ-GE-BR	TT060U065FQ	TO-247

绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

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}	650	V
*连续集电极电流 Collector current-continuous	I_C	120(T_C=25°C)	A
		60(T_C=100°C)	A
最大脉冲集电极极电流（注 1） Collector current – pulse（note 1）	I_{CM}	240	A
*二极管正向测试电流 Diode RMS forward current	I_F	120 (T_C=25°C)	A
		60 (T_C=100°C)	A
二极管正向不重复峰值电流（浪涌电流） Surge non repetitive forward current tp= 10 ms sinusoidal	I_{FSM}	240	A
最高栅极发射极电压 Gate-emitter voltage	V_{GE}	±20	V
瞬态栅极发射极电压 Transient gate-emitter voltage (t_p≤10us，D＜0.010)	V_{GE}	±30	V
安全工作区 Turn-off safe area VCE≤650V，Tvj≤175℃，tp=1us	-	240	A
耗散功率(TO-247) Power dissipation	P_D T_C=25℃ P_D T_C=100℃	375 187	W
耗散功率(TO-3PH) Power dissipation	P_D T_C=25℃ P_D T_C=100℃	90 45	W
工作结温（注 2） Operating junction temperature range	T_{VJ}	-40～+175	℃
存储温度 Storage temperature	T_{STG}	-55～+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.

For optimum lifetime and reliability, JSMC recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet

注释：

1：脉冲宽度由最高结温限制.

2：过载工况时，允许在最高结温 Tvjop=175℃下运行，最大占空比＜20%（最多持续 60s）

Notes:

1：Pulse width limited by maximum junction temperature.

2：Under overload condition, it is allowed to operate at the maximum junction temperature Tvjop=175 ℃, and the maximum duty ratio is less than 20% (lasting for 60 s at most)

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	650	-	-	V
零栅压下集电极漏电流 Zero gate voltage collector current	I_{CES}	V_{CE}=650V, V_{GE}=0V,Tvj=25℃	-	-	80	uA
正向栅极体漏电流 Gate-body leakage current, forward	I_{GESF}	V_{CE}=0V, V_{GE} =20V,Tvj=25℃	-	-	200	nA
反向栅极体漏电流 Gate-body leakage current, reverse	I_{GESR}	V_{CE}=0V, V_{GE} =-20V,Tvj=25℃	-	-	-200	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE},　I_C=0.6mA	3.5	4.5	5.5	V
饱和压降 Collector-emitter saturation voltage	V_{CESAT}	V_{GE}=15V , I_C=60A Tvj=25℃ Tvj=150℃	 - -	 1.9 2.3	 2.3 -	V
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C_{ies}	V_{CE}=25V V_{GE}=0V f=1.0MHz	-	3280	-	pF
输出电容 Output capacitance	C_{oes}		-	213	-	pF
反向传输电容 Reverse transfer capacitance	C_{res}		-	36	-	pF
栅极电荷总量 Total gate charge	Qg	V_{CC}=480V,I_c=60A,V_{GE}=15V	-	128	-	nC
栅极-发射极 Gate to emitter charge	Qge		-	21	-	
栅极-集电极 Gate to collector charge	Qgc		-	71	-	

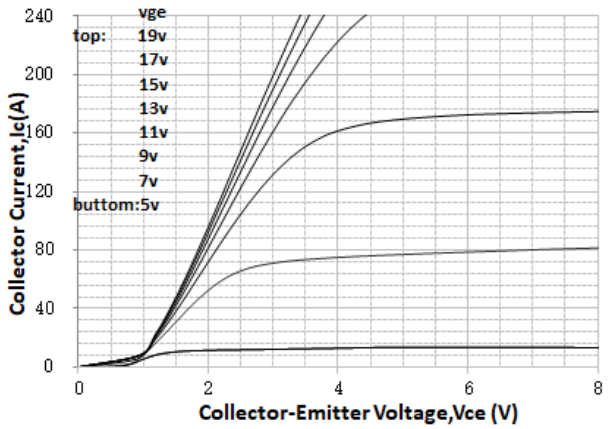
电特性 ELECTRICAL CHARACTERISTICS

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}=400V,I_c=60A,R_G=5Ω V_{GE}=15 V Tvj=25℃	-	12	-	ns
上升时间 Turn-on rise time	t_r		-	80	-	ns
关断延迟时间 Turn-off delay time	t_d(off)		-	98	-	ns
下降时间 Turn-off fall time	t_f		-	82	-	ns
开通损耗 Turn-on energy	Eon		-	1.46	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.34	-	mJ
总开关损耗 Total switching energy	Etot		-	2.80	-	mJ
开启延迟时间 Turn-on delay time	t_d(on)	V_{CC}=400V,I_c=60A,R_G=5Ω V_{GE}=15 V Tvj =150℃	-	14	-	ns
上升时间 Turn-on rise time	t_r		-	80	-	ns
关断延迟时间 Turn-off delay time	t_d(off)		-	122	-	ns
下降时间 Turn-off fall time	t_f		-	112	-	ns
开通损耗 Turn-on energy	Eon		-	1.60	-	mJ
关断损耗 Turn-off energy	Eoff		-	1.84	-	mJ
总开关损耗 Total switching energy	Etot		-	3.44	-	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	I_F=60A，Tvj =25℃	-	1.6	2.0	V
反向恢复时间 Diode reverse recovery time	t_{rr}	VR=200V, IF=50A dIF/dt=200A/μs Tvj =25℃	-	160	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	0.79	-	uC
反向恢复电流 Diode reverse recovery current	I_{rrm}		-	8.0	-	A
反向恢复时间 Diode reverse recovery time	t_{rr}	VR=200V, IF=50A dIF/dt=200A/μs Tvj =150℃	-	270	-	ns
反向恢复电荷 Diode reverse recovery charge	Q_{rr}		-	3.1	-	uC
反向恢复电流 Diode reverse recovery current	I_{rrm}		-	17	-	A

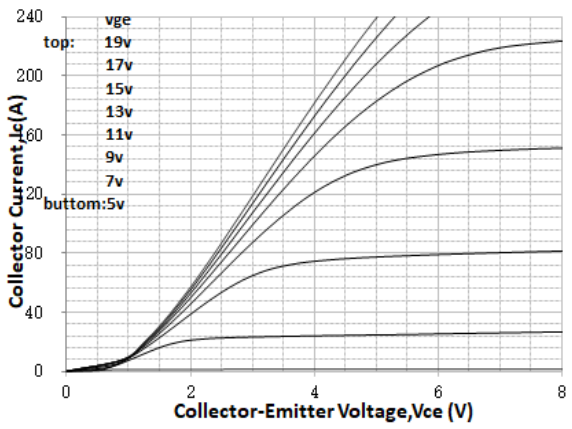
项　　目 Parameter	符　号 Symbol	MAX	单　位 Unit
结到管壳的热阻 Junction to case IGBT	$R_{th(j-c)}$	0.4	℃/W
结到管壳的热阻 Junction to case Diode	$R_{th(j-c)}$	0.6	℃/W
结到环境的热阻 Junction to ambient	$R_{th(j-a)}$	40	℃/W

特征曲线 ELECTRICAL CHARACTERISTICS (curves)

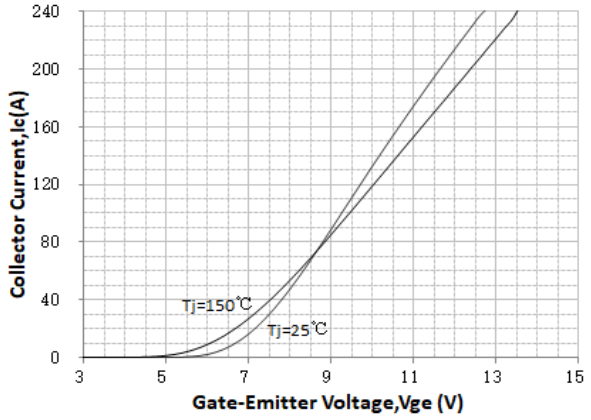
Output Characteristics（25℃）



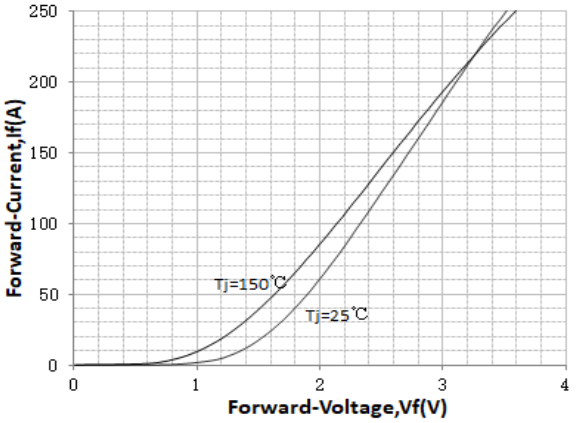
Output Characteristics（150℃）



Transfer Characteristics

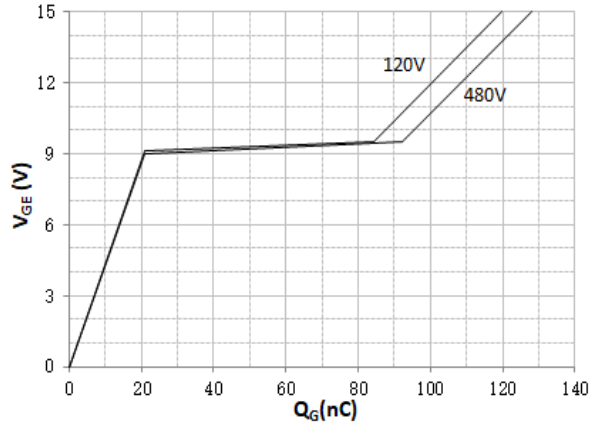


I_F vs. V_F



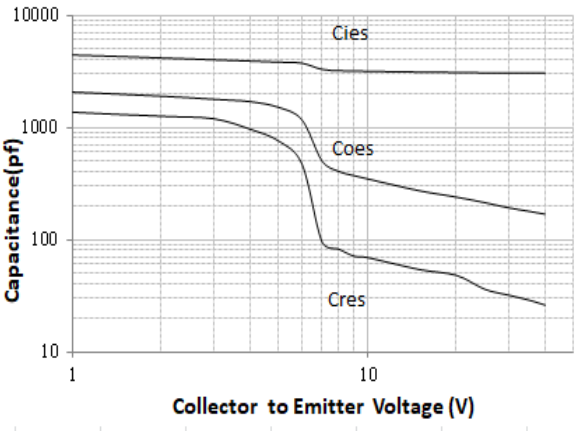
Gate Charge Characteristics

V_{GE}=15V，I_C=60A



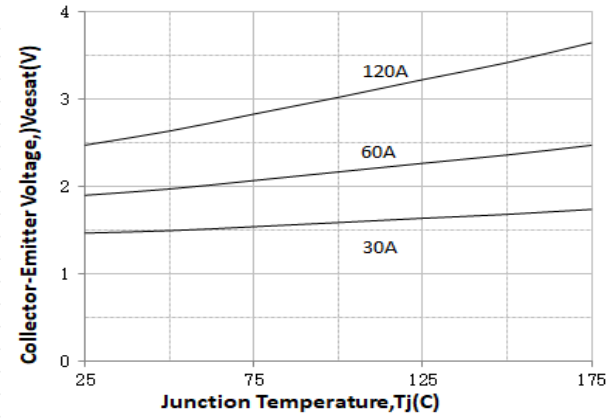
Capacitance Characteristic

V_{GE} =0V，f=1.0MHZ



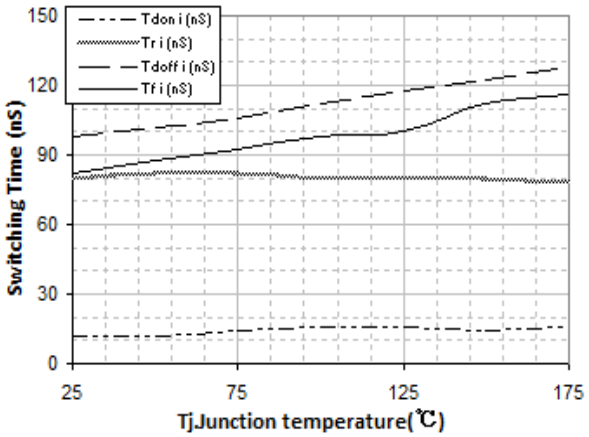
Vcesat vs. Tj

V_{GE}=15V， I_C=30A、60A、120A



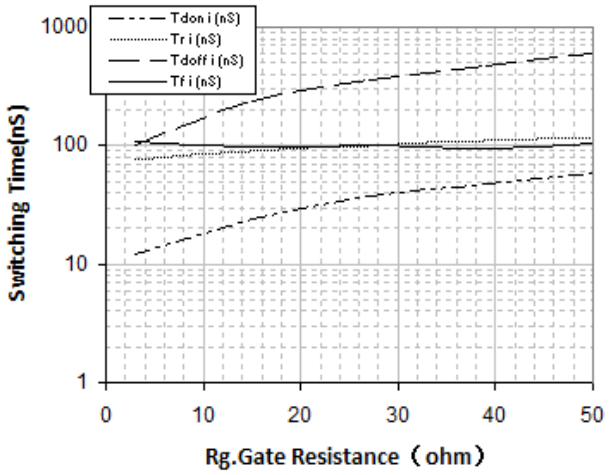
Switching Time vs.Tj

V_{GE}=15V，V_{GE}=400V，I_C=60A，R_G=5Ω



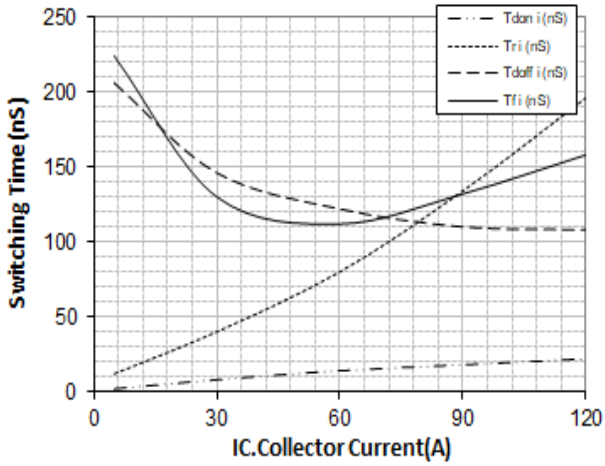
Switching Time vs. Rg(150℃)

V_{GE}=15V，V_{CE}=400V， I_C=60A



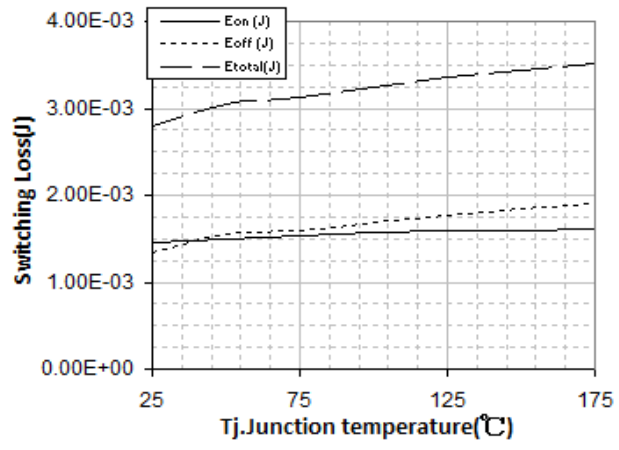
Switching Time vs. Ic(150℃)

V_{CE}=400V，V_{GE}=15V， R_G=5Ω



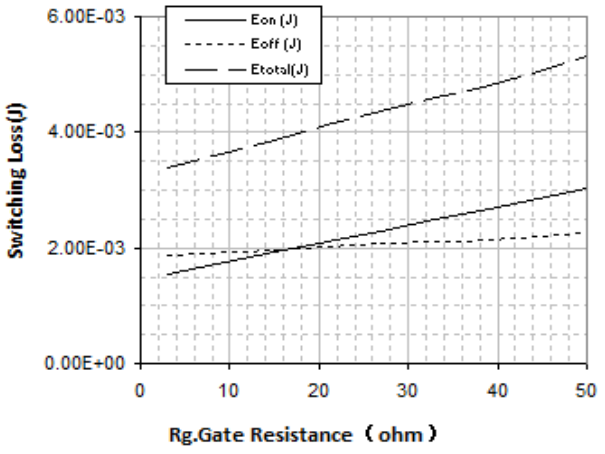
Switching Loss vs. Tj

V_{GE}=15V，V_{CE}=400V，I_C=60A，R_G=5Ω



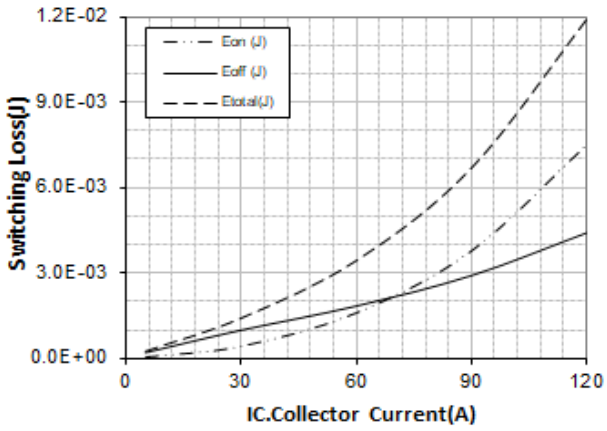
Switching Loss vs. Rg(150℃)

V_{GE}=15V，V_{CE}=400V，I_C=60A

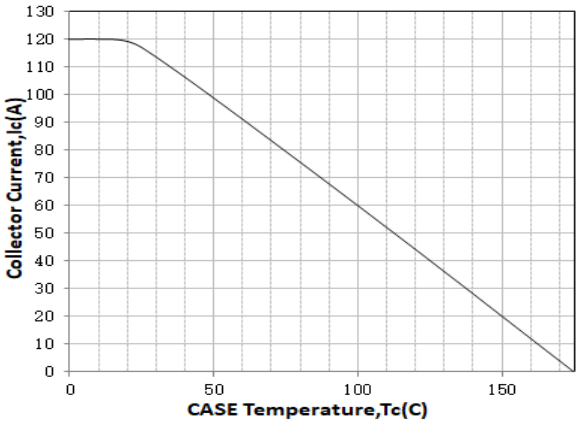


Switching Loss vs. I_C(150℃)

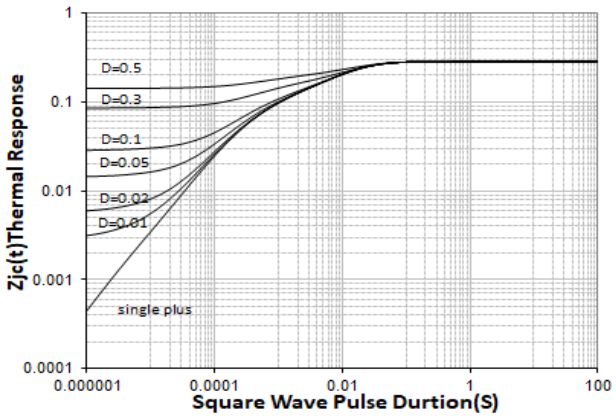
V_{GE}=15V，V_{CE}=400V，R_G=5Ω



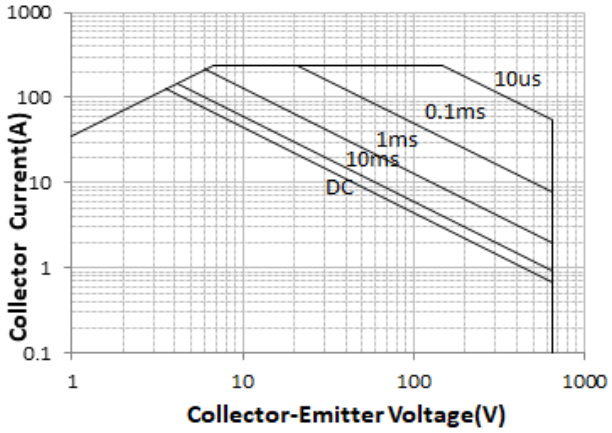
Colletcor current vs.case temperature



Transient Thermal Impedance for IGBT TO-247



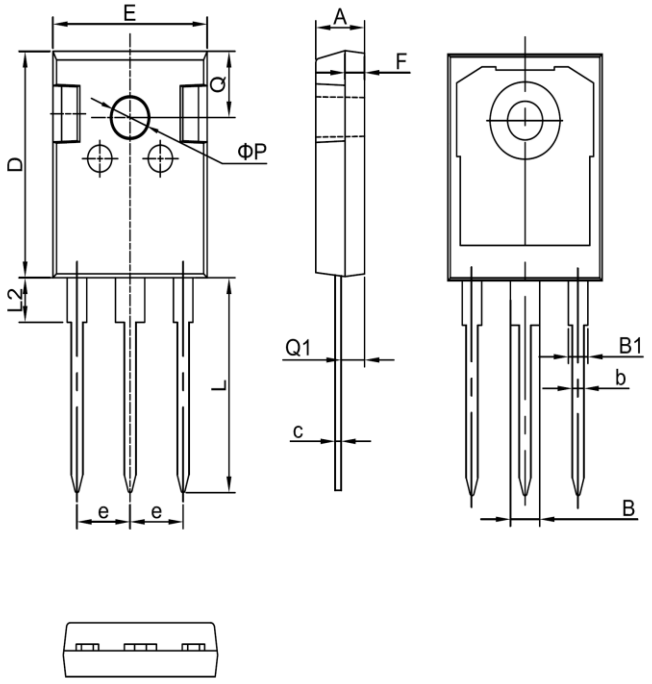
Forward Bias Safe Operating Area TO-247



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

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