

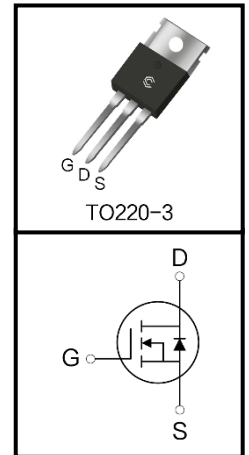
500V N-Channel MOSFET

FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



Device Marking and Package Information		
Device	Package	Marking
CS13N50FP	TO220-3	CS13N50FP

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted			
Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS} = 0V$)	V_{DSS}	500	V
Continuous Drain Current	I_D	13	A
Pulsed Drain Current (note1)	I_{DM}	52	A
Gate-Source Voltage	V_{GSS}	± 30	V
Single Pulse Avalanche Energy (note2)	E_{AS}	304.2	mJ
Avalanche Current (note1)	I_{AS}	7.8	A
Repetitive Avalanche Energy (note1)	E_{AR}	1.2	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	150.6	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55~+150	$^\circ\text{C}$

Thermal Resistance			
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	R_{thJC}	0.83	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62.5	

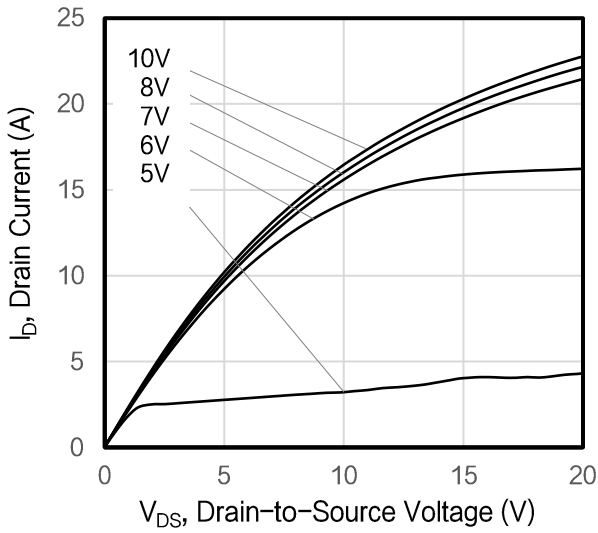
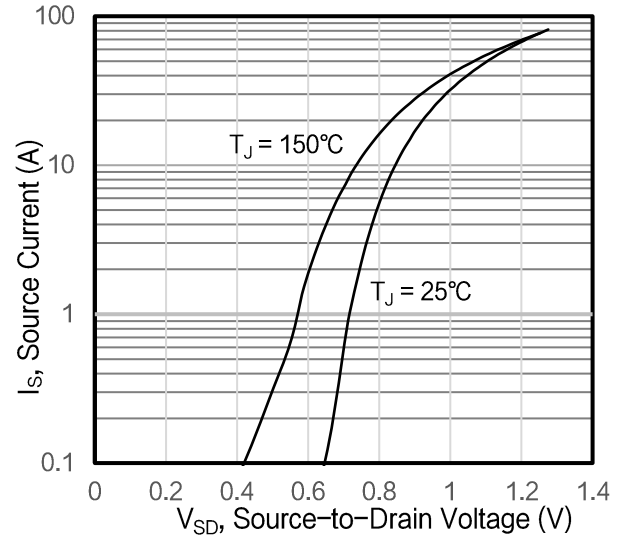
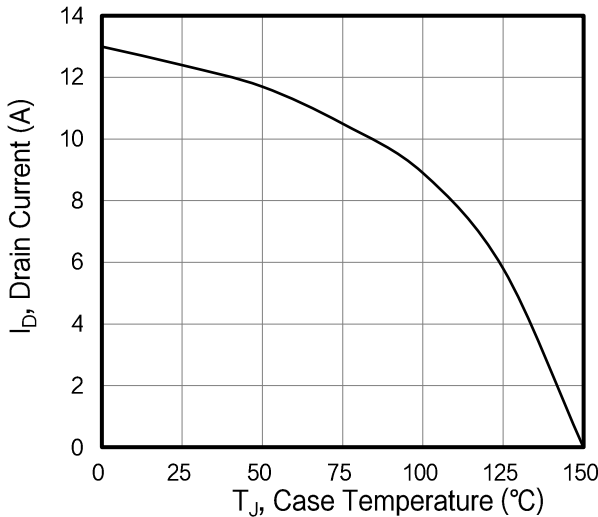
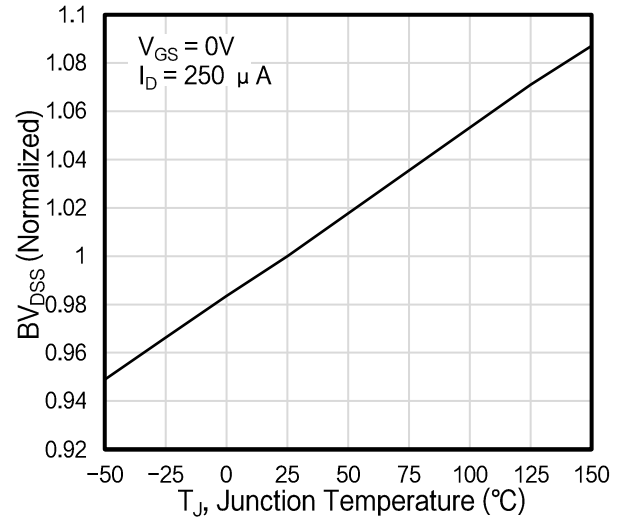
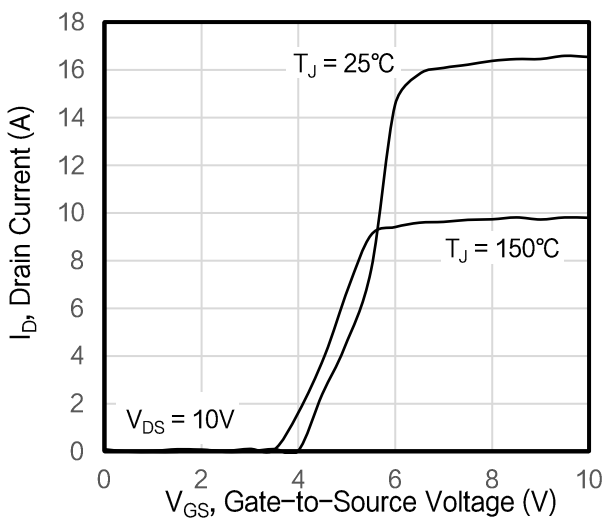
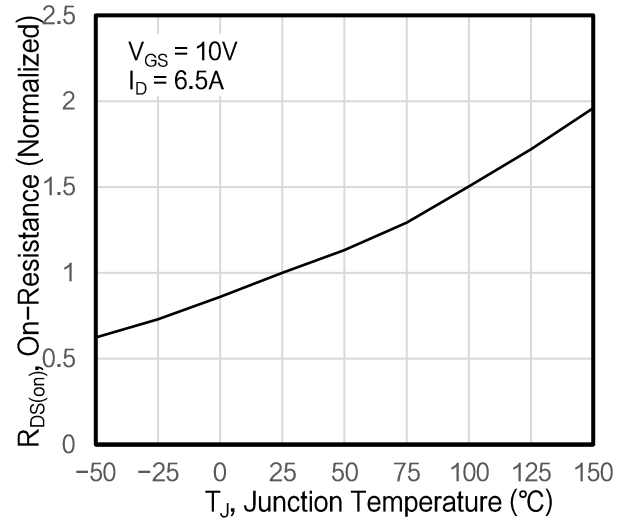
Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	μA
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30V$	--	--	± 100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 6.5A$	--	0.39	0.46	Ω
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 200kHz$	--	1219	--	pF
Output Capacitance	C_{oss}		--	118	--	
Reverse Transfer Capacitance	C_{rss}		--	25	--	
Internal Gate Resistance	R_g		--	3	--	
Total Gate Charge	Q_g	$V_{DD} = 400V, I_D = 13A,$ $V_{GS} = 10V$	--	48.5	--	nC
Gate-Source Charge	Q_{gs}		--	6.5	--	
Gate-Drain Charge	Q_{gd}		--	29	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 250V, I_D = 13A,$ $R_G = 25\Omega$	--	38.5	--	ns
Turn-on Rise Time	t_r		--	7	--	
Turn-off Delay Time	$t_{d(off)}$		--	69	--	
Turn-off Fall Time	t_f		--	32	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	$T_C = 25^\circ\text{C}$	--	--	13	A
Pulsed Diode Forward Current	I_{SM}		--	--	52	
Body Diode Voltage	V_{SD}	$T_J = 25^\circ\text{C}, I_{SD} = 6.5A, V_{GS} = 0V$	--	--	1.4	V
Reverse Recovery Time	t_{rr}	$V_R = 250V, I_S = 13A,$ $di_f/dt = 100A/\mu s$	--	323	--	ns
Reverse Recovery Charge	Q_{rr}		--	3.88	--	μC

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 10.0mH, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

Figure 2. Body Diode Forward Voltage

Figure 3. Drain Current vs. Temperature

Figure 4. BV_{DSS} Variation vs. Temperature

Figure 5. Transfer Characteristics

Figure 6. On-Resistance vs. Temperature


Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

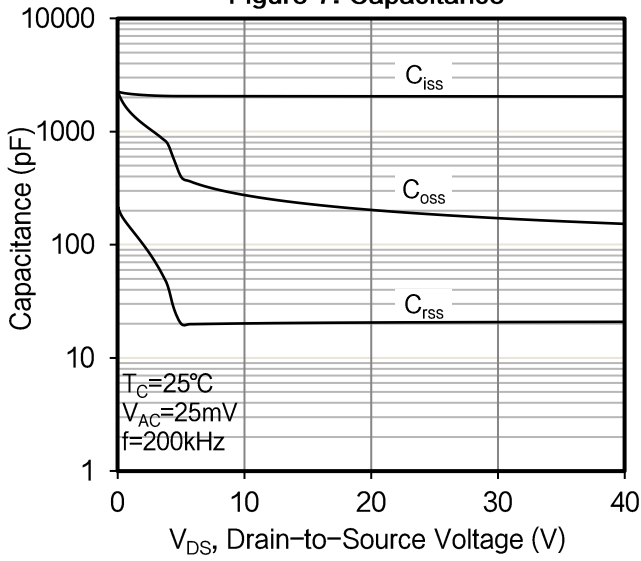


Figure 8. Gate Charge

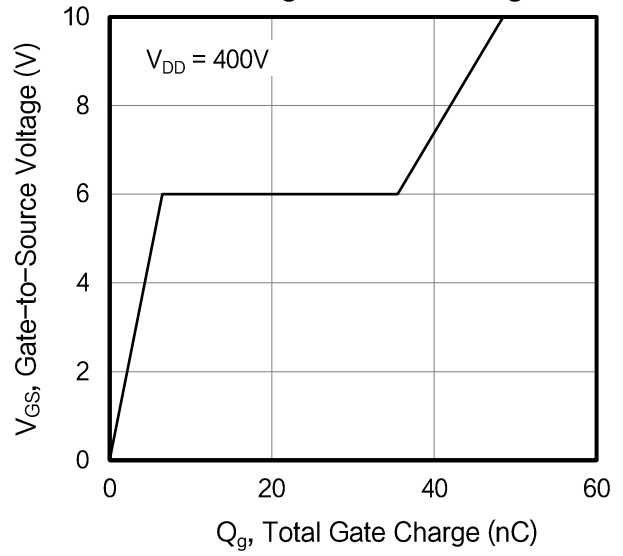


Figure 9. Transient Thermal Impedance

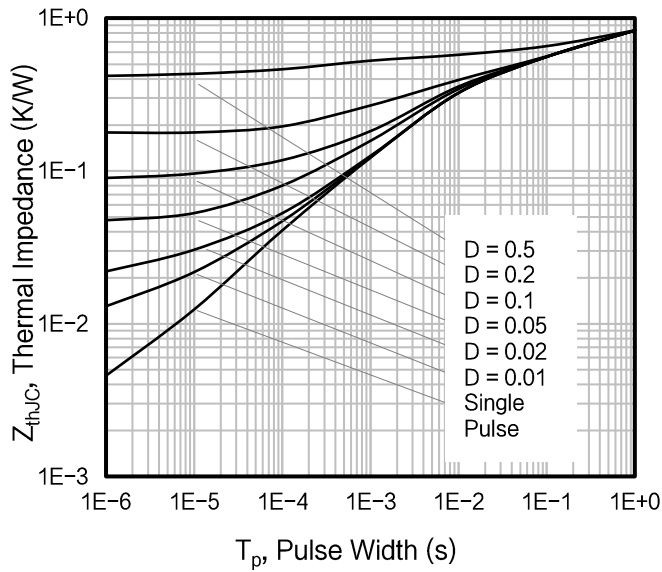


Figure A: Gate Charge Test Circuit and Waveform

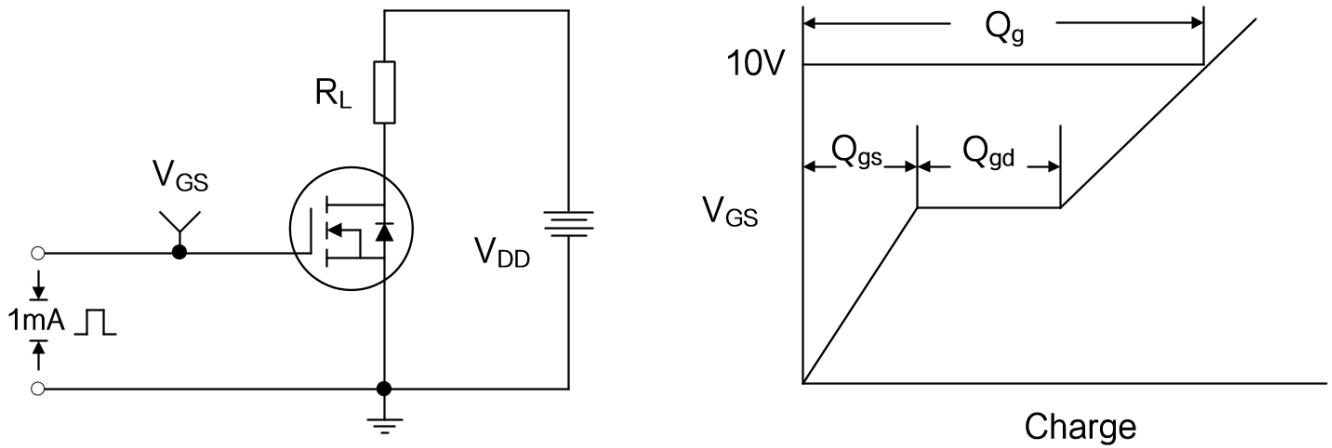


Figure B: Resistive Switching Test Circuit and Waveform

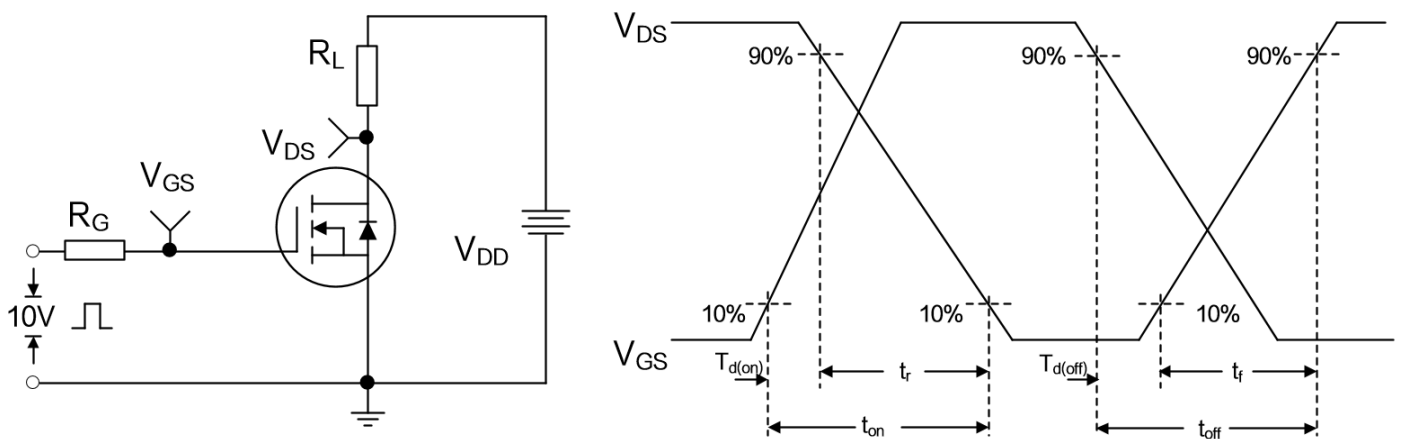
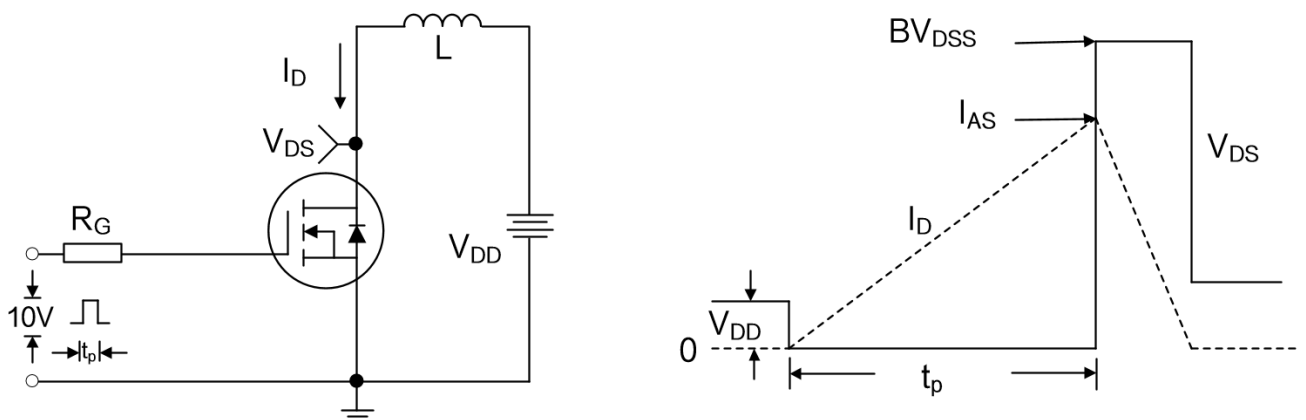
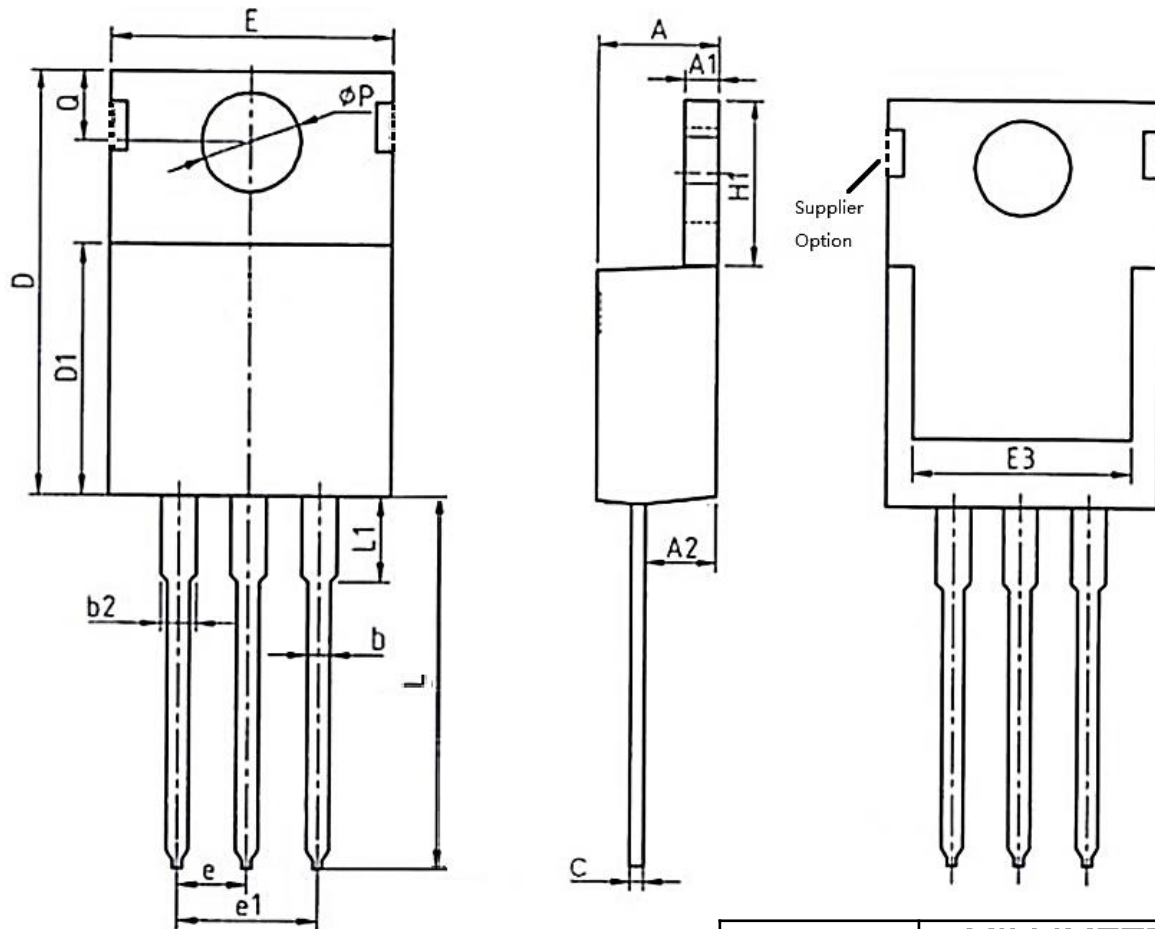


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



TO220-3



SYMBOLS	MILLIMETERS	
	MIN	MAX
A	4.30	4.70
A1	1.20	1.40
A2	2.20	3.00
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.50
E	9.70	10.50
E3	6	--
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.8
L1	2.4	3.80
ΦP	3.4	3.90
Q	2.40	3.00

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