


Industrial model	Popular name	H	Package Identification	Packing Method	Quantity Per Tube	Quantity Per Box	Quantity Per Carton
FQP7N65C FQPF7N65C	HQB7N65C HQF7N65C	HAOHAI	P: TO-220P F: TO-220F	TUBE	50Pcs	1000Pcs	5000Pcs

■ Features


- Original New Design
- Superior Avalanche Rugged Technology
- Robust Gate Oxide Technology
- Very Low Intrinsic Capacitances
- Excellent Switching Characteristics
- Unrivalled Gate Charge: 22nC(Typ.)
- Extended Safe Operating Area
- Lower $R_{DS(ON)}$: 1.16Ω(Typ.) @ $V_{GS}=10V$
- 100% Avalanche Tested
- Package: TO-220AB & TO-220F

$I_D=7A$
 $BV_{DSS}=650V$
 $R_{DS(on)}=1.16\Omega$

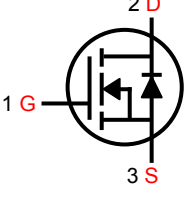
7N65 Series Pin Assignment



3-Lead Plastic TO-220P
Package Code: P
Pin 1: Gate
Pin 2 & Tab: Drain
Pin 3: Source



3-Lead Plastic TO-220F
Package Code: F
Pin 1: Gate
Pin 2: Drain
Pin 3: Source

Series Symbol: 

■ Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise specified)

Symbol	Parameter	Value		Units
		TO-220AB	TO-220F	
V_{DSS}	Drain-Source Voltage	650	650	V
I_D	Drain Current—Continuous ($T_c=25^\circ C$)	7	7*	A
	Drain Current—Continuous ($T_c=100^\circ C$)	4.7	4.7	
I_{DM}	Drain Current – Pulsed (Note 1)	30	30*	
V_{GS}	Gate-Source Voltage	±30	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	280	280	mJ
I_{AR}	Avalanche Current (Note 1)	7	7	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	15	4.8	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	4.5	V/ns
P_D	Power Dissipation ($T_c=25^\circ C$)	150	48	W
	Power Dissipation - Derate above 25°C	1.2	0.38	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-50 ~ +150		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		

* Drain current limited by maximum junction temperature (TO-220F)

■ Thermal Resistance Characteristics

Symbol	Parameter	TO-220P		TO-220F		Units
		Typ.	Max.	Typ.	Max.	
$R_{\theta JC}$	Junction-to-Case	--	0.82	--	2.60	°C/W
$R_{\theta CS}$	Case-to-Sink	0.5	--	--	--	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	--	62.5	

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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On Characteristics

V_{GS}	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.5	--	4.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=3.75\text{A}$	--	1.16	1.4	Ω

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	650	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D=250\mu\text{A}$, Referenced to 25°C	--	0.60	--	$\text{V}/^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650\text{V}, V_{GS}=0\text{V}$	--	--	1	μA
		$V_{DS}=520\text{V}, T_C=125^{\circ}\text{C}$	--	--	10	
I_{GSS}	Gate-Body Leakage Current, Forward	$V_{GS}=\pm 30\text{V}, V_{DS}=0\text{V}$	--	--	± 100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS}=25\text{V}$ $V_{GS}=0\text{V}$ $f=1.0\text{MHz}$	--	1200	1560	pF
C_{oss}	Output Capacitance		--	100	130	
C_{rss}	Reverse Transfer Capacitance		--	11	14.5	

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{DS}=325\text{V}$ $I_D=7.5\text{A}$ $R_G=25\Omega$ (Note 4,5)	--	35	70	nS
t_r	Turn-On Rise Time		--	50	100	
$t_{d(off)}$	Turn-Off Delay Time		--	120	240	
t_f	Turn-Off Fall Time		--	50	100	
Q_g	Total Gate Charge	$V_{DS}=520\text{V}$ $I_D=7.5\text{A}, V_{GS}=10\text{V}$ (Note 4,5)	--	22	29	nC
Q_{gs}	Gate-Source Charge		--	6.5	--	
Q_{gd}	Gate-Drain Charge		--	6.5	--	

Source-Drain Diode Maximum Ratings and Characteristics

I_S	Continuous Source-Drain Diode Forward Current	--	--	7	A	
I_{SM}	Pulsed Source-Drain Diode Forward Current	--	--	30		
V_{SD}	Source-Drain Diode Forward Voltage	$I_S=7.5\text{A}, V_{GS}=0\text{V}$	--	--	1.4	V
t_{rr}	Reverse Recovery Time	$I_S=7.5\text{A}, V_{GS}=0\text{V}$ $di_F/dt=100\mu\text{A}/\mu\text{s}$ (Note 4)	--	350	--	nS
Q_{rr}	Reverse Recovery Charge		--	3.3	--	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature ;
2. $L=7.3\text{mH}, I_{AS}=7.2\text{A}, V_{DD}=50\text{V}, R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
3. $I_{SD}\leq 7.2\text{A}, di/dt\leq 200\text{A}/\mu\text{s}, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^{\circ}\text{C}$;
4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$;
5. Essentially Independent of Operating Temperature

Typical Performance Characteristics

Fig-1. On Region Characteristics

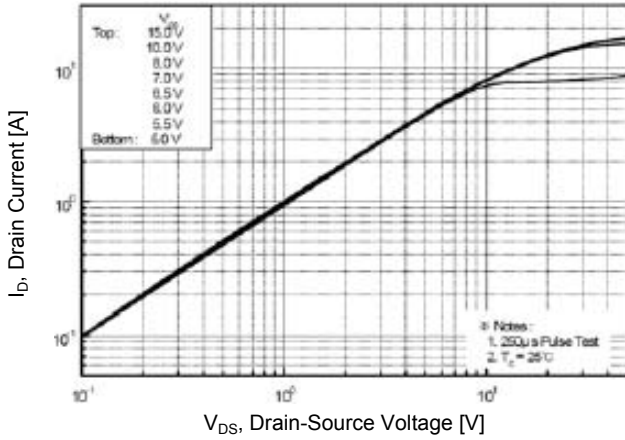


Fig-2. Transfer Characteristics

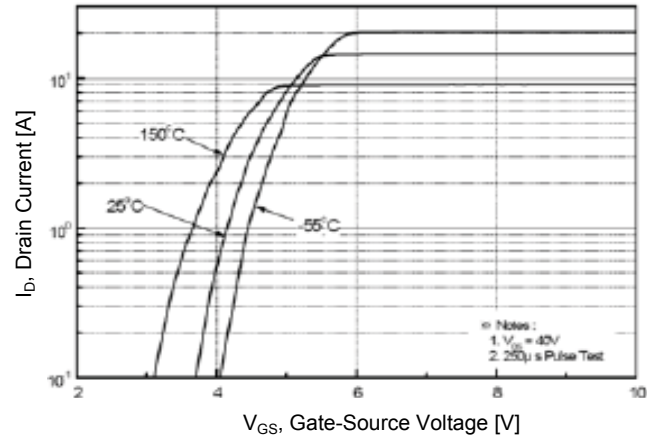


Fig-3. On Resistance Variation vs I_D and V_{GS}

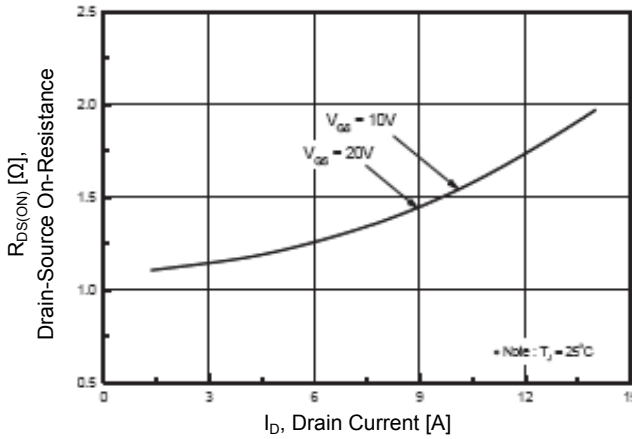


Fig-4. Body Diode Forward Voltage Variation with Source Current and Temperature

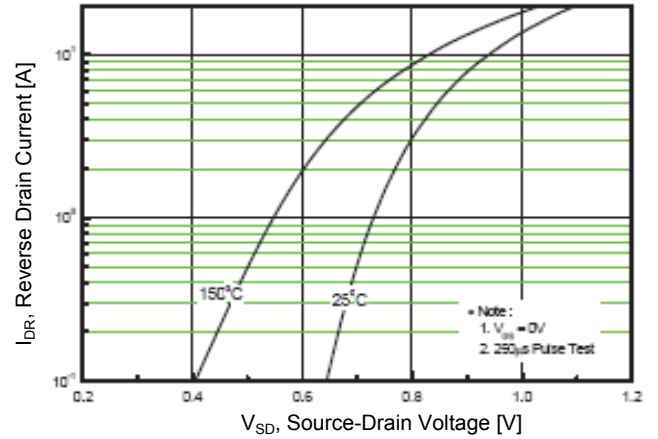


Fig-5. Capacitance Characteristics

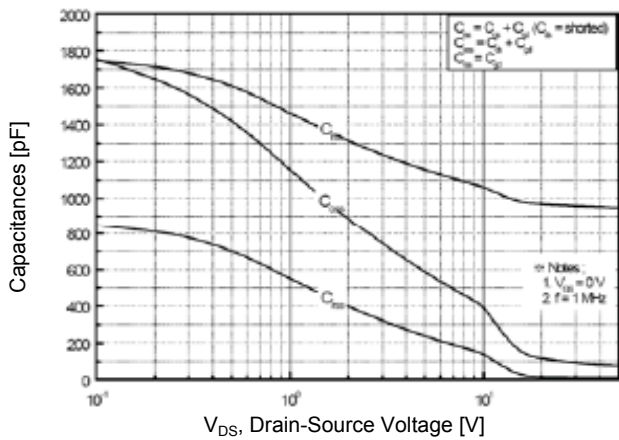
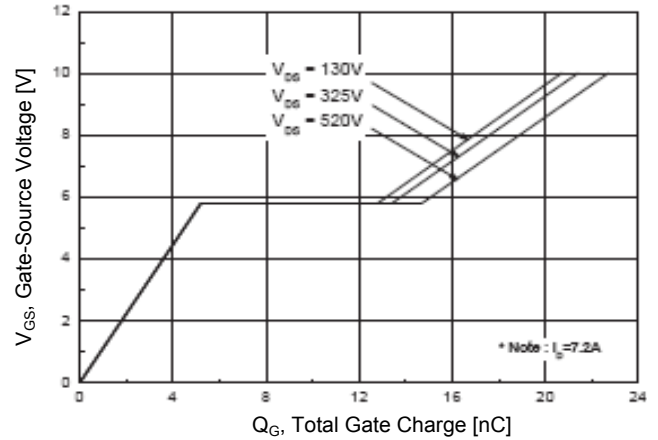


Fig-6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Fig-7. Breakdown Voltage Variation vs Temperature

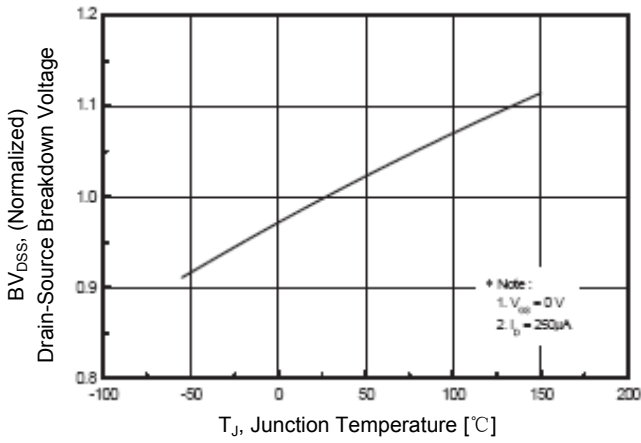


Fig-8. On-Resistance Variation vs Temperature

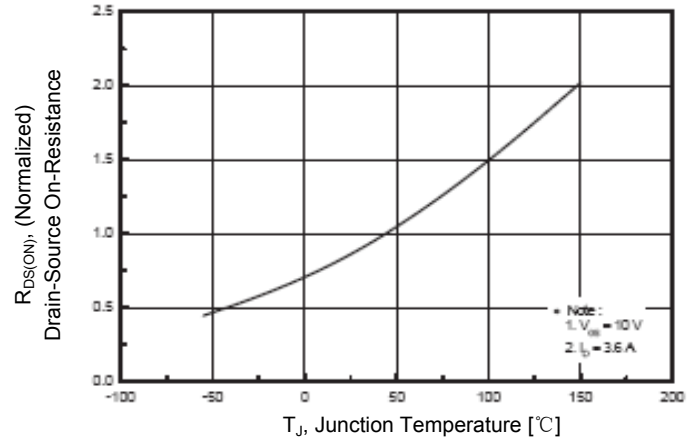


Fig-9. Maximum Safe Operating Area

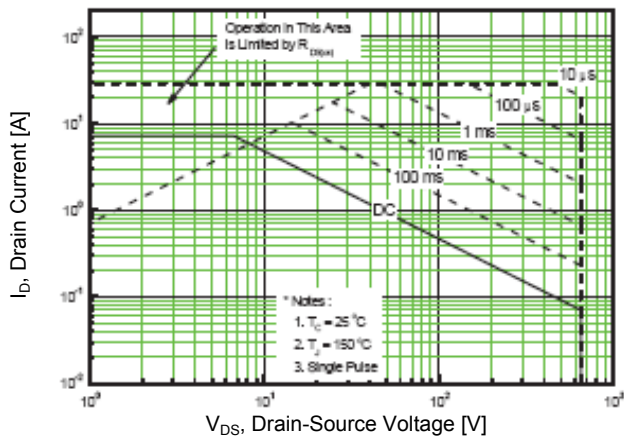


Fig-10. Maximum Drain Current vs Case Temperature

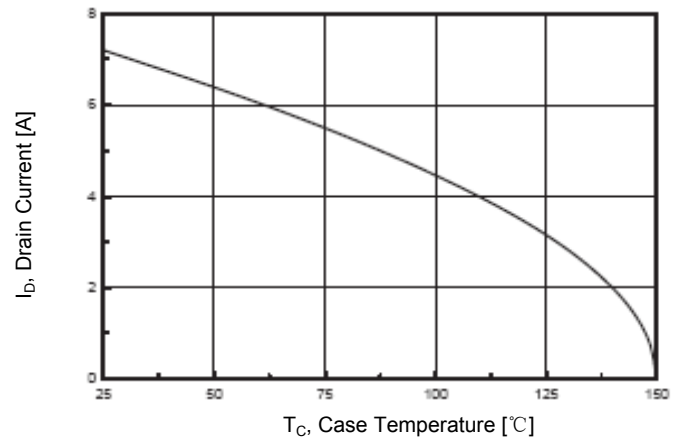


Fig-11. Transient Thermal Response Curve

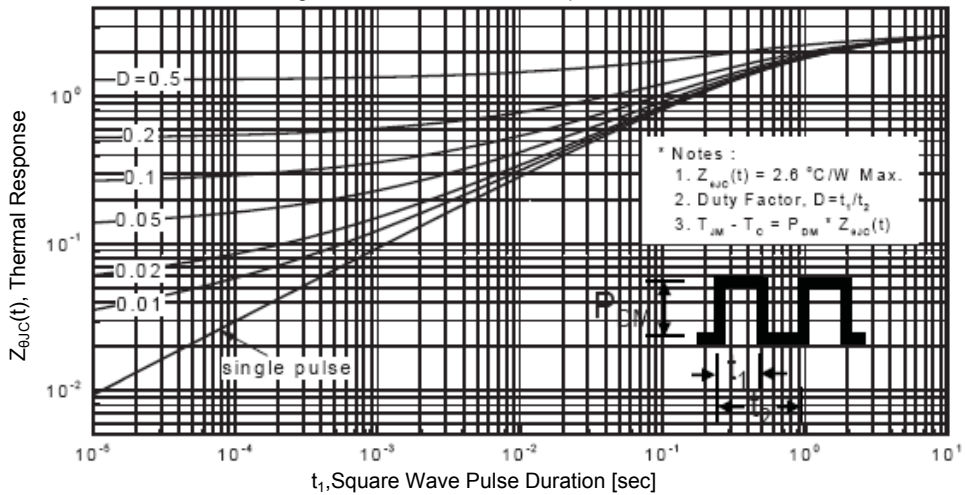


Fig-12. Gate Charge Test Circuit & Waveform

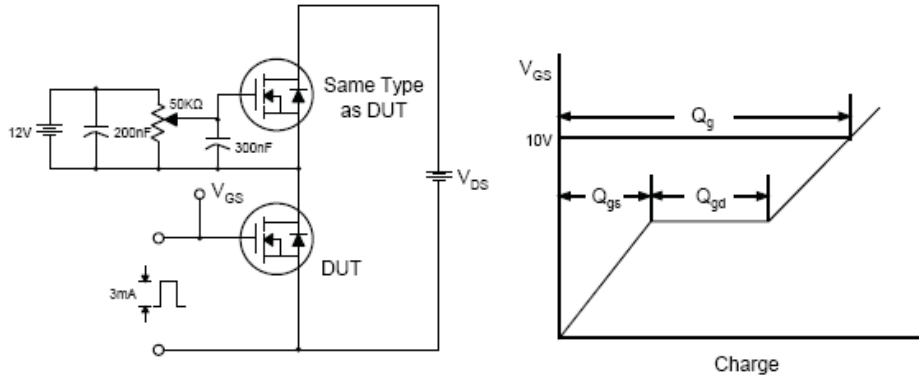


Fig-13. Resistive Switching Test Circuit & Waveforms

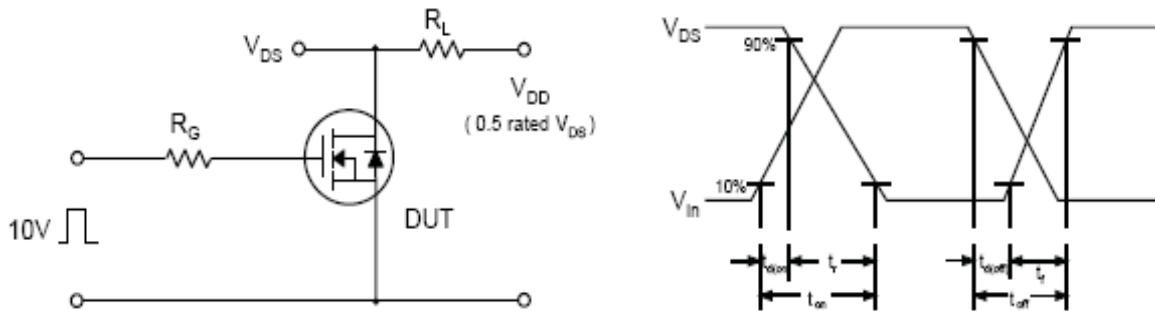


Fig-14. Unclamped Inductive Switching Test Circuit & Waveforms

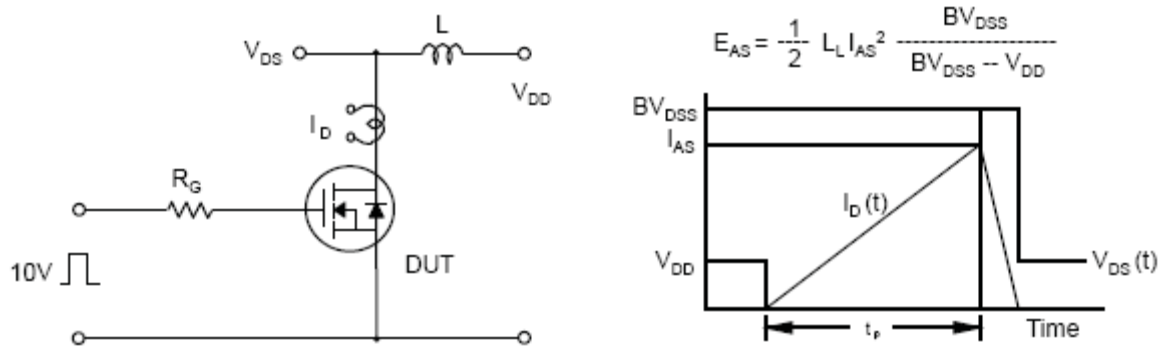
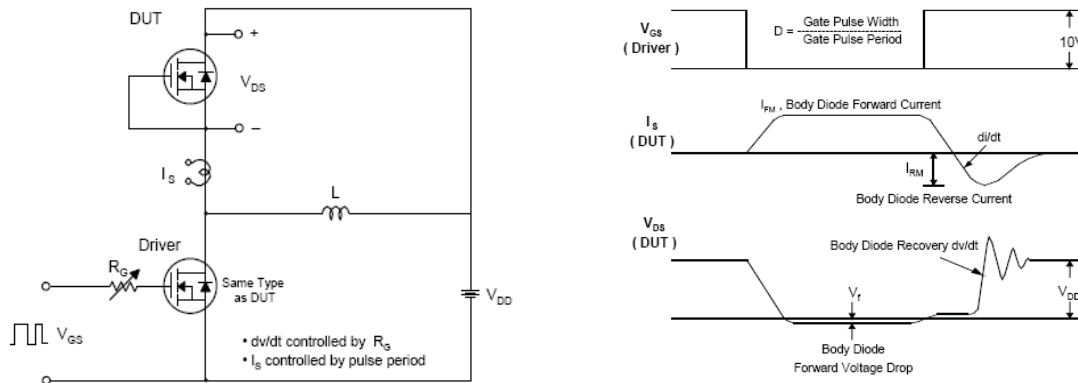


Fig-15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



PACKAGE DIMENSIONS

■ TO-220P Package mechanical data (mm)				Marking
	DIM	Min.	Max.	<p>Upper left corner: LOGO AAA: Chip code BBBBB: Batch identification code aabb: Production batch among them: aa: Year of manufacture bb: Factory nature week (01~53) XXXXXXXX: Device model</p>
	A	6.48	7.40	
	C	4.40	4.90	
	D	2.34	3.00	
	E	0.45	0.80	
	F	9.80	10.36	
	G	3.10	3.60	
	I	2.70	3.43	
	J	0.60	1.00	
	K	2.34	2.74	
	L	12.48	13.60	
	M	15.67	16.20	
	N	0.90	1.47	
	O	2.00	2.96	
	alpha1/2/4/5	-	*5°	
alpha3	-	*27°		

■ TO-220F Package mechanical data (mm)				Marking
	DIM	Min.	Max.	<p>Upper left corner: LOGO AAA: Chip code BBBBB: Batch identification code aabb: Production batch among them: aa: Year of manufacture bb: Factory nature week (01~53) XXXXXXXX: Device model</p>
	A	5.58	7.49	
	B	8.38	8.90	
	C	4.40	4.70	
	D	1.15	1.39	
	E	0.35	0.60	
	F	2.03	2.92	
	G	9.66	10.28	
	H	--	*16.25	
	I	--	*3.83	
	J	3.00	4.00	
	K	0.75	0.95	
	L	2.54	3.42	
	M	1.14	1.40	
	N	--	*2.54	
O	12.70	14.27		
P	14.48	15.87		



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