



## 4-BIT MAGNITUDE COMPARATOR

- QUIESCENT CURRENT SPECIFIED UP TO 20V
- STANDARD B-SERIES OUTPUT DRIVE
- EXPANSION TO 8-16...4 N BITS BY CASCADING UNIT
- MEDIUM SPEED OPERATION : COMPARES TWO 4-BIT WORDS IN 250ns (Typ.) at 10V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_l = 100\text{nA (MAX) AT } V_{DD} = 18\text{V } T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



### ORDER CODES

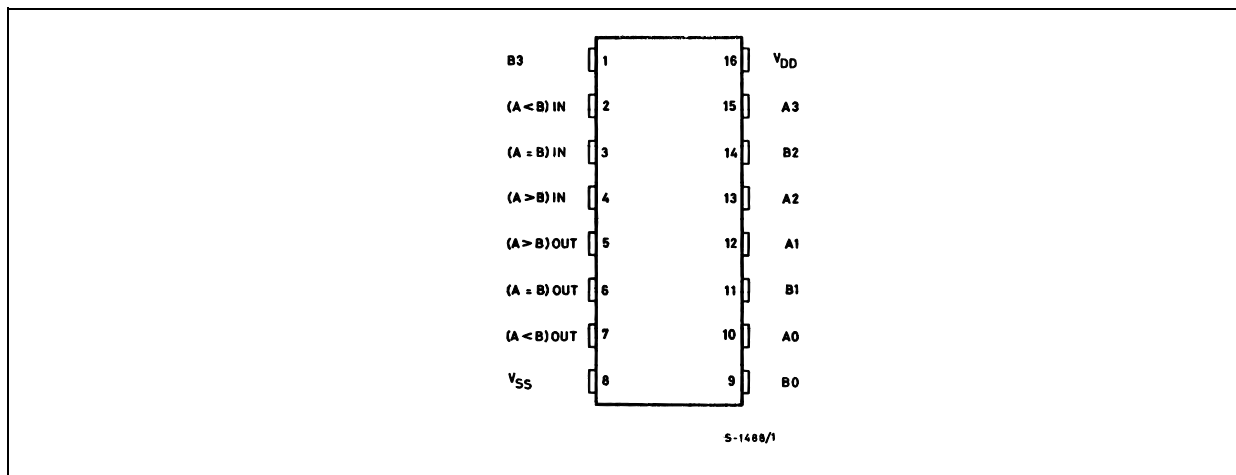
PACKAGE	TUBE	T & R
DIP	HCF4063BEY	
SOP	HCF4063BM1	HCF4063M013TR

### DESCRIPTION

The HCF4063B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The HCF4063B is a low power 4-bit magnitude comparator designed for use in computer and logic applications that require the comparison of two 4-bit words. This logic circuit determines whether one 4-bit word (Binary or BCD) is "less than", "equal to" or "greater than" a second 4 bit word. The HCF4063B has eight comparing inputs (A3, B3 through A0, B0), three outputs (A<B, A=B, A>B) and three cascading inputs (A<B, A=B, A>B)

that permit system s designers to expand the comparator function to 8, 12, 16...4N bits. When a single HCF4063B is used the cascading inputs are connected as follows :  
 (A<B) = low, (A=B) = high, (A>B) = low.  
 For words longer than 4 bits, HCF4063B device may be cascaded by connecting the outputs of the less-significant comparator to the corresponding cascading inputs of the more significant comparator. Cascading inputs (A<B, A=B, and A>B) on the least significant comparator are connected to a low, a high, and a low level, respectively.

### PIN CONNECTION



# HCF4063B

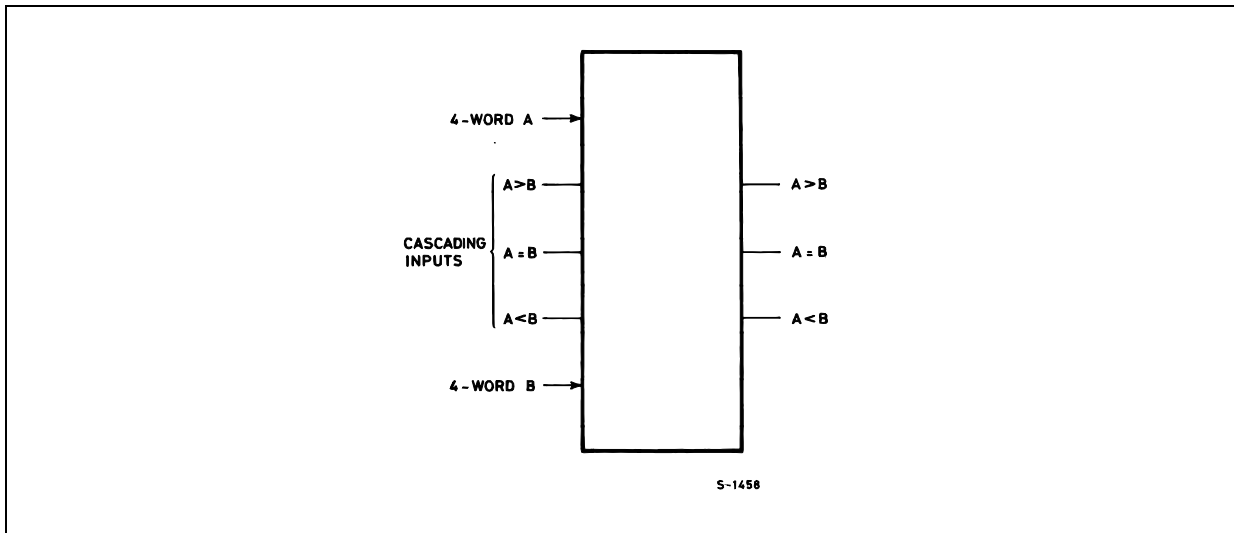
## IINPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
10, 12, 13, 15	A0 to A3	Word A Inputs
9, 11, 14, 1	B0 to B3	Word B Inputs
5, 6, 7	A>B, A=B, A<B	Outputs
4, 3, 2	A>B, A=B, A<B	Cascading Inputs
8	V <sub>SS</sub>	Negative Supply Voltage
16	V <sub>DD</sub>	Positive Supply Voltage

## FUNCTIONAL DIAGRAM

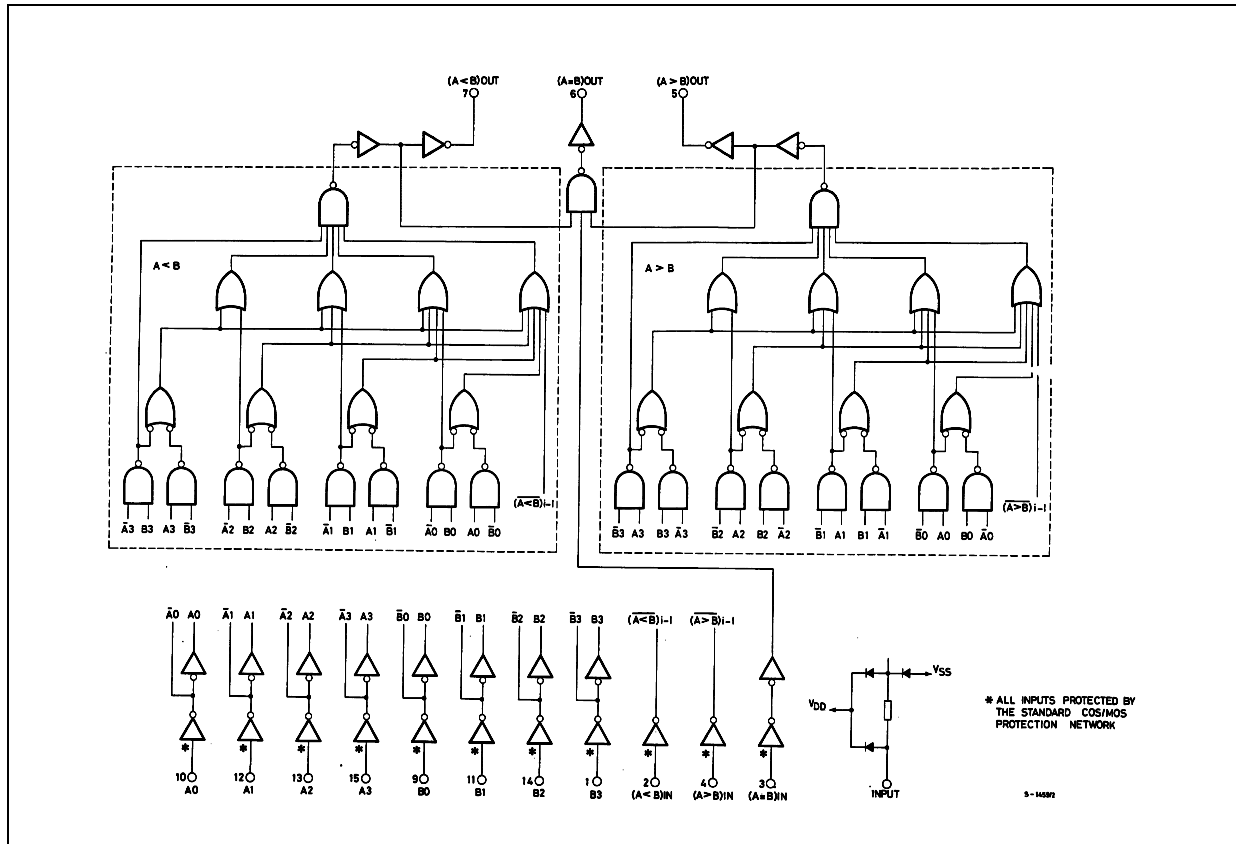


## TRUTH TABLE

INPUTS							OUTPUTS		
COMPARING				CASCADING					
A3, B3	A2, B2	A1, B1	A0, B0	A<B	A=B	A>B	A<B	A=B	A>B
A3 > B3	X	X	X	X	X	X	L	L	H
A3 = B3	A2 > B2	X	X	X	X	X	L	L	H
A3 = B3	A2 = B2	A1 > B1	X	X	X	X	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	H	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	L	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	H	L	L
A3 = B3	A2 < B2	X	X	X	X	X	H	L	L
A3 < B3	X	X	X	X	X	X	H	L	L

X : Don't Care

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	-0.5 to +22	V
$V_I$	DC Input Voltage	-0.5 to $V_{DD} + 0.5$	V
$I_I$	DC Input Current	$\pm 10$	mA
$P_D$	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
$T_{op}$	Operating Temperature	-55 to +125	$^{\circ}C$
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

All voltage values are referred to  $V_{SS}$  pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	3 to 20	V
$V_I$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature	-55 to 125	$^{\circ}C$

DC SPECIFICATIONS

Symbol	Parameter	Test Condition				Value						Unit	
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>ol</sub>   ( $\mu$ A)	V <sub>DD</sub> (V)	T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.		Max.
I <sub>L</sub>	Quiescent Current	0/5			5		0.04	5		150		150	$\mu$ A
		0/10			10		0.04	10		300		300	
		0/15			15		0.04	20		600		600	
		0/20			20		0.08	100		3000		3000	
V <sub>OH</sub>	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V <sub>OL</sub>	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V <sub>IH</sub>	High Level Input Voltage		0.5/4.5	<1	5	3.5			3.5		3.5		V
			1/9	<1	10	7			7		7		
			1.5/13.5	<1	15	11			11		11		
V <sub>IL</sub>	Low Level Input Voltage		4.5/0.5	<1	5			1.5		1.5		1.5	V
			9/1	<1	10			3		3		3	
			13.5/1.5	<1	15			4		4		4	
I <sub>OH</sub>	Output Drive Current	0/5	2.5	<1	5	-1.36	-3.2		-1.1		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I <sub>OL</sub>	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I <sub>I</sub>	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu$ A
C <sub>I</sub>	Input Capacitance		Any Input				5	7.5					pF

The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>=5V, 2V min. with V<sub>DD</sub>=10V, 2.5V min. with V<sub>DD</sub>=15V

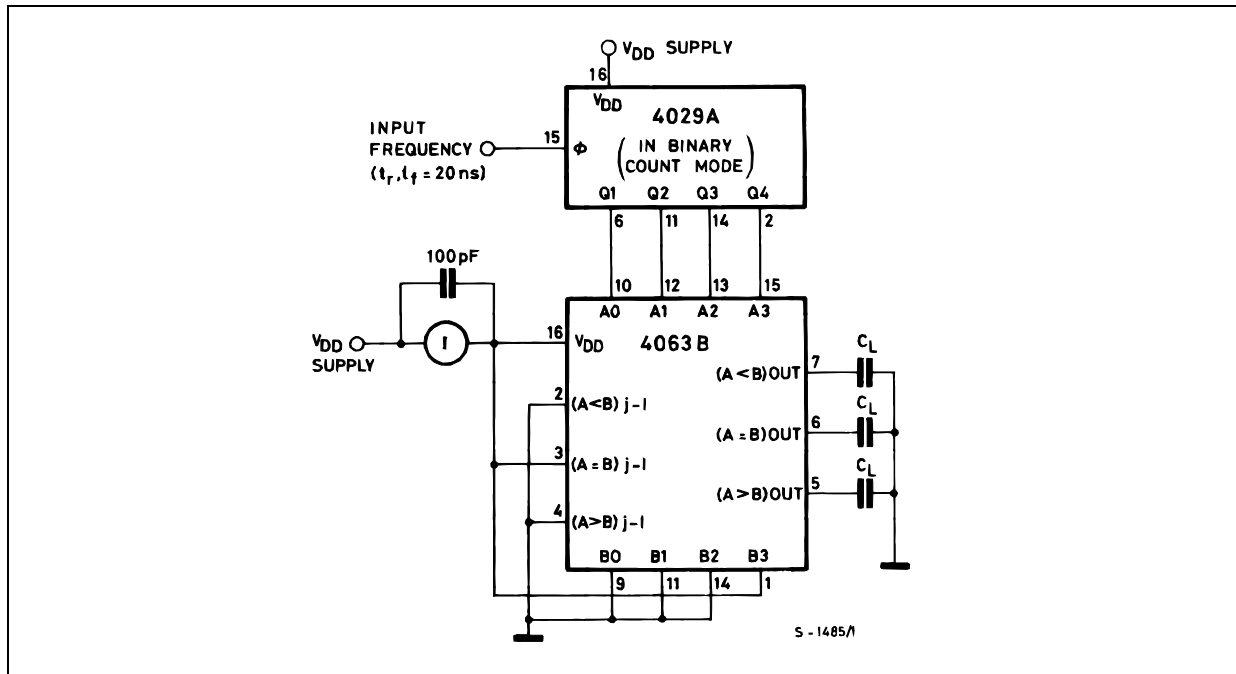
DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25°C, C<sub>L</sub> = 50pF, R<sub>L</sub> = 200K $\Omega$ , t<sub>r</sub> = t<sub>f</sub> = 20 ns)

Symbol	Parameter	Test Condition		Value (*)			Unit
		V <sub>DD</sub> (V)		Min.	Typ.	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	5	Comparing Inputs to Outputs		625	1250	ns
		10			250	500	
		15			175	350	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	5	Cascading Inputs to Outputs		500	1000	ns
		10			200	400	
		15			140	280	
t <sub>THL</sub> t <sub>TLH</sub>	Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	

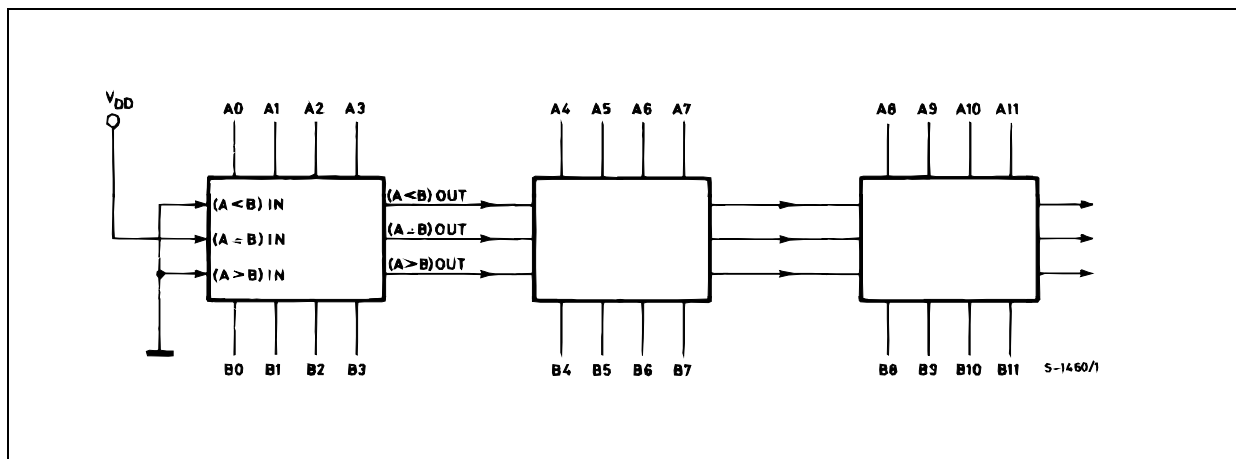
(\*) Typical temperature coefficient for all V<sub>DD</sub> value is 0.3 %/°C.

TYPICAL APPLICATIONS

DINAMIC POWER DISSIPATION



TYPICAL SPEED CHARACTERISTICS OF A 12-BIT COMPARATOR

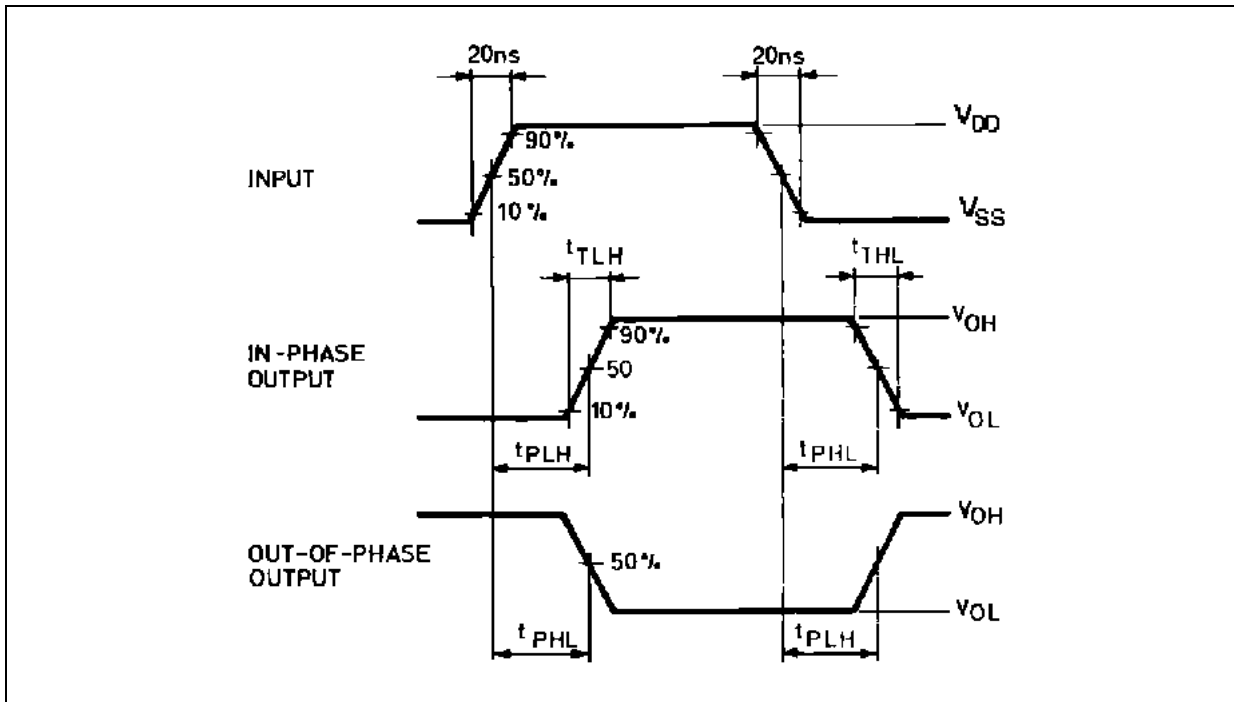


TEST CIRCUIT



$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_L = 200\text{K}\Omega$   
 $R_T = Z_{\text{OUT}}$  of pulse generator (typically  $50\Omega$ )

WAVEFORM : PROPAGATION DELAY TIMES ( $f=1\text{MHz}$ ; 50% duty cycle)



### Plastic DIP-16 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



**SO-16 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



PO13H



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