

MC10EP101, MC100EP101

3.3V / 5V ECL Quad 4-Input OR/NOR

The MC10/100EP101 is a Quad 4-input OR/NOR gate. The device is functionally equivalent to the E101. With AC performance faster than the E101 device, the EP101 is ideal for applications requiring the fastest AC performance available.

The 100 Series contains temperature compensation.

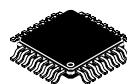
- 250 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- PECL Mode Operating Range: $V_{CC} = 3.0\text{ V}$ to 5.5 V with $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range: $V_{CC} = 0\text{ V}$ with $V_{EE} = -3.0\text{ V}$ to -5.5 V
- Open Input Default State



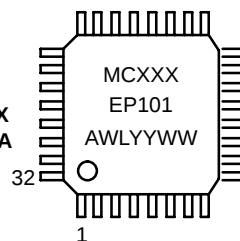
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MARKING DIAGRAM*



**LQFP-32
FA SUFFIX
CASE 873A**



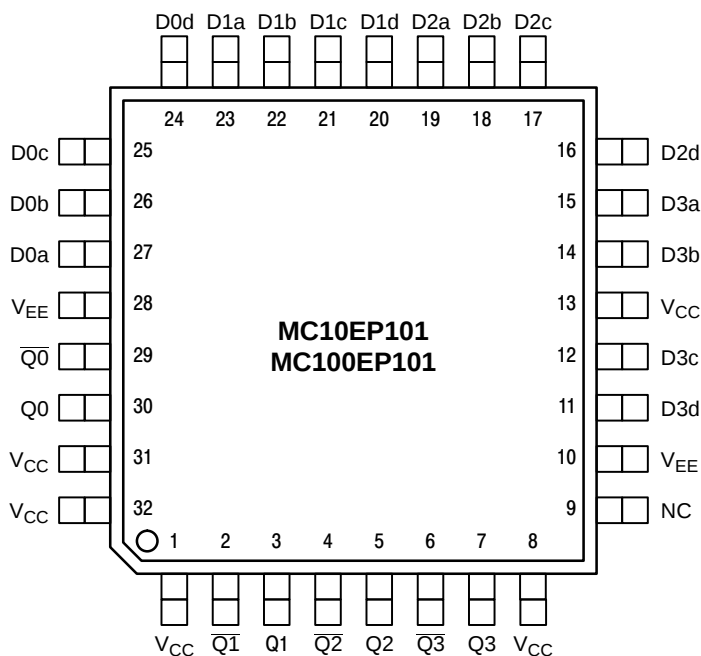
xxx = 10 or 100
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week

*For additional information, see Application Note
AND8002/D

ORDERING INFORMATION

Device	Package	Shipping
MC10EP101FA	LQFP-32	250 Units/Tray
MC10EP101FAR2	LQFP-32	2000 Tape & Reel
MC100EP101FA	LQFP-32	250 Units/Tray
MC100EP101FAR2	LQFP-32	2000 Tape & Reel

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Warning: All V_{CC} and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 32-Lead LQFP Pinout (Top View)

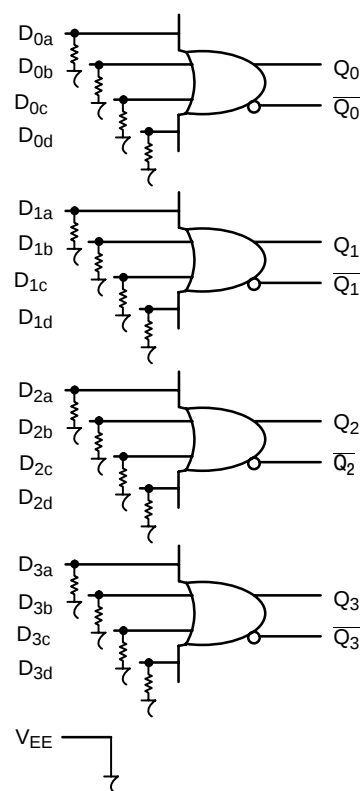


Figure 2. Logic Diagram

PIN DESCRIPTION

PIN	FUNCTION
D0a*-D3d*	ECL Data Inputs
Q0-Q3, $\overline{Q0-Q3}$	ECL Data Outputs
V_{CC}	Positive Supply
V_{EE}	Negative Supply
NC	No Connect

* Pins will default LOW when left open.

TRUTH TABLE

Dna	Dnb	Dnc	Dnd	Qn	$\overline{Qn}$
L	L	L	L	L	H
H	X	X	X	H	L
X	H	X	X	H	L
X	X	H	X	H	L
X	X	X	H	H	L
H	H	H	H	H	L

ATTRIBUTES

Characteristics	Value
Internal Input Pulldown Resistor	75 k Ω
Internal Input Pullup Resistor	N/A
ESD Protection	Human Body Model Machine Model Charged Device Model
	> 4 kV > 100 V > 2 kV
Moisture Sensitivity (Note 1)	Level 2
Flammability Rating Oxygen Index	UL-94 code V-0 A 1/8" 28 to 34
Transistor Count	173 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test	

1. For additional information, see Application Note AND8003/D.

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MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
V _{CC}	PECL Mode Power Supply	V _{EE} = 0 V		6	V
V _{EE}	NECL Mode Power Supply	V _{CC} = 0 V		-6	V
V _I	PECL Mode Input Voltage NECL Mode Input Voltage	V _{EE} = 0 V V _{CC} = 0 V	V _I ≤ V _{CC} V _I ≤ V _{EE}	6 -6	V V
I _{out}	Output Current	Continuous Surge		50 100	mA mA
I _{BB}	V _{BB} Sink/Source			± 0.5	mA
TA	Operating Temperature Range			-40 to +85	°C
T _{stg}	Storage Temperature Range			-65 to +150	°C
θ _{JA}	Thermal Resistance (Junction-to-Ambient)	0 LFPM 500 LFPM	32 LQFP 32 LQFP	80 55	°C/W °C/W
θ _{JC}	Thermal Resistance (Junction-to-Case)	std bd	32 LQFP	12 to 17	°C/W
T _{sol}	Wave Solder	< 2 to 3 sec @ 248°C		265	°C

2. Maximum Ratings are those values beyond which device damage may occur.

10EP DC CHARACTERISTICS, PECL V_{CC} = 3.3 V, V_{EE} = 0 V (Note 3)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I _{EE}	Power Supply Current	45	57	75	45	58	75	45	59	75	mA
V _{OH}	Output HIGH Voltage (Note 4)	2165	2290	2415	2230	2355	2480	2290	2415	2540	mV
V _{OL}	Output LOW Voltage (Note 4)	1365	1490	1615	1430	1555	1680	1490	1615	1740	mV
V _{IH}	Input HIGH Voltage (Single-Ended)	2090		2415	2155		2480	2215		2540	mV
V _{IL}	Input LOW Voltage (Single-Ended)	1365		1690	1460		1755	1490		1815	mV
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

3. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +0.3 V to -2.2 V.

4. All loading with 50 Ω to V_{CC}-2.0 volts.

10EP DC CHARACTERISTICS, PECL V_{CC} = 5.0 V, V_{EE} = 0 V (Note 5)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I _{EE}	Power Supply Current	45	57	75	45	58	75	45	59	75	mA
V _{OH}	Output HIGH Voltage (Note 6)	3865	3990	4115	3930	4055	4180	3990	4115	4240	mV
V _{OL}	Output LOW Voltage (Note 6)	3065	3190	3315	3130	3255	3380	3190	3315	3440	mV
V _{IH}	Input HIGH Voltage (Single-Ended)	3790		4115	3855		4180	3915		4240	mV
V _{IL}	Input LOW Voltage (Single-Ended)	3065		3390	3130		3455	3190		3515	mV
I _{IH}	Input HIGH Current			150			150			150	μA
I _{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

5. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary +2.0 V to -0.5 V.

6. All loading with 50 Ω to V_{CC}-2.0 volts.

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10EP DC CHARACTERISTICS, NECL $V_{CC} = 0\text{ V}$, $V_{EE} = -5.5\text{ V}$ to -3.0 V (Note 7)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	45	57	75	45	58	75	45	59	75	mA
V_{OH}	Output HIGH Voltage (Note 8)	-1.135	-1010	-885	-1070	-945	-820	-1010	-885	-760	mV
V_{OL}	Output LOW Voltage (Note 8)	-1935	-1810	-1685	-1870	-1745	-1620	-1810	-1685	-1560	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	-1210		-885	-1.145		-820	-1085		-760	mV
V_{IL}	Input LOW Voltage (Single-Ended)	-1935		-1610	-1870		-1545	-1810		-1485	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

7. Input and output parameters vary 1:1 with V_{CC} .

8. All loading with 50 Ω to V_{CC} -2.0 volts.

100EP DC CHARACTERISTICS, PECL $V_{CC} = 3.3\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 9)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	50	63	80	55	67	85	60	70	88	mA
V_{OH}	Output HIGH Voltage (Note 10)	2155	2280	2405	2155	2280	2405	2155	2280	2405	mV
V_{OL}	Output LOW Voltage (Note 10)	1355	1480	1605	1355	1480	1605	1355	1480	1605	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	2075		2420	2075		2420	2075		2420	mV
V_{IL}	Input LOW Voltage (Single-Ended)	1355		1675	1355		1675	1355		1675	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

9. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +0.3 V to -2.2 V.

10. All loading with 50 Ω to V_{CC} -2.0 volts.

100EP DC CHARACTERISTICS, PECL $V_{CC} = 5.0\text{ V}$, $V_{EE} = 0\text{ V}$ (Note 11)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	50	63	80	55	67	85	60	70	88	mA
V_{OH}	Output HIGH Voltage (Note 12)	3855	3980	4105	3855	3980	4105	3855	3980	4105	mV
V_{OL}	Output LOW Voltage (Note 12)	3055	3180	3305	3055	3180	3305	3055	3180	3305	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	3775		4120	3775		4120	3775		4120	mV
V_{IL}	Input LOW Voltage (Single-Ended)	3055		3375	3055		3375	3055		3375	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

11. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary +2.0 V to -0.5 V.

12. All loading with 50 Ω to V_{CC} -2.0 volts.

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100EP DC CHARACTERISTICS, NECL $V_{CC} = 0\text{ V}$, $V_{EE} = -5.5\text{ V}$ to -3.0 V (Note 13)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current	50	63	80	55	67	85	60	70	88	mA
V_{OH}	Output HIGH Voltage (Note 14)	-1.145	-1020	-895	-1.145	-1020	-895	-1.145	-1020	-895	mV
V_{OL}	Output LOW Voltage (Note 14)	-1945	-1820	-1695	-1945	-1820	-1695	-1945	-1820	-1695	mV
V_{IH}	Input HIGH Voltage (Single-Ended)	-1225		-880	-1225		-880	-1225		-880	mV
V_{IL}	Input LOW Voltage (Single-Ended)	-1945		-1625	-1945		-1625	-1945		-1625	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	-150			-150			-150			μA

NOTE: EP circuits are designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained.

13. Input and output parameters vary 1:1 with V_{CC} .

14. All loading with 50 Ω to V_{CC} -2.0 volts.

AC CHARACTERISTICS $V_{CC} = 0\text{ V}$; $V_{EE} = -3.0\text{ V}$ to -5.5 V or $V_{CC} = 3.0\text{ V}$ to 5.5 V ; $V_{EE} = 0\text{ V}$ (Note 15)

Symbol	Characteristic	-40 °C			25 °C			85 °C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Frequency (See Figure 3. $F_{\max}/\text{JITTER}$)		> 3			> 3			> 3		GHz
t_{PLH} , t_{PHL}	Propagation Delay D to Q, $\bar{Q}$ 10 100	125 180	225 280	325 380	150 200	250 300	370 400	170 250	300 320	420 450	ps
t_{SKEW}	Within Device Skew Q, $\bar{Q}$ Device to Device Skew (Note 16)		15	50 200		20	50 200		20	50 200	ps
t_{JITTER}	Cycle-to-Cycle Jitter (See Figure 3. $F_{\max}/\text{JITTER}$)		0.2	< 1		0.2	< 1		0.2	< 1	ps
t_r , t_f	Output Rise/Fall Times (20% - 80%) Q, $\bar{Q}$	100	150	200	120	170	220	150	190	250	ps

15. Measured using a 750 mV source, 50% duty cycle clock source. All loading with 50 Ω to V_{CC} -2.0 V.

16. Skew is measured between outputs under identical transitions.

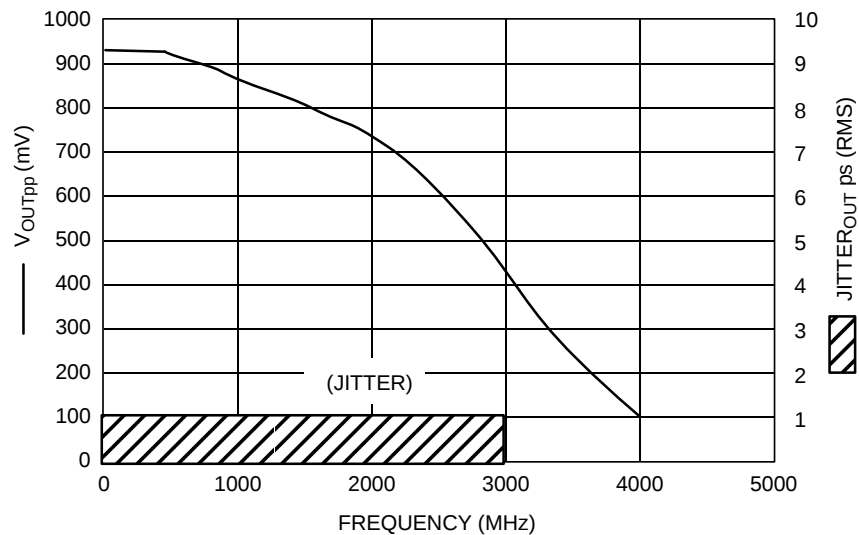


Figure 3. $F_{\max}/\text{Jitter}$

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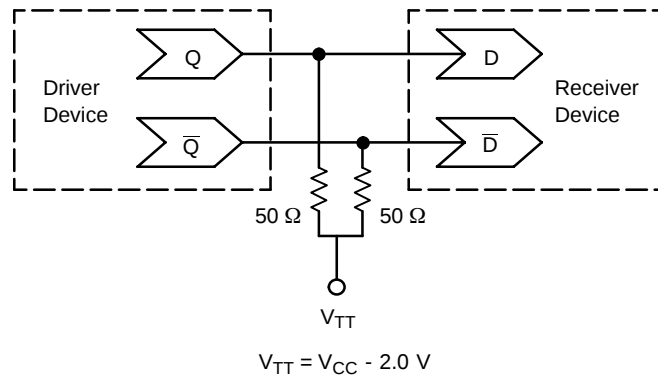


Figure 4. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020 - Termination of ECL Logic Devices.)

Resource Reference of Application Notes

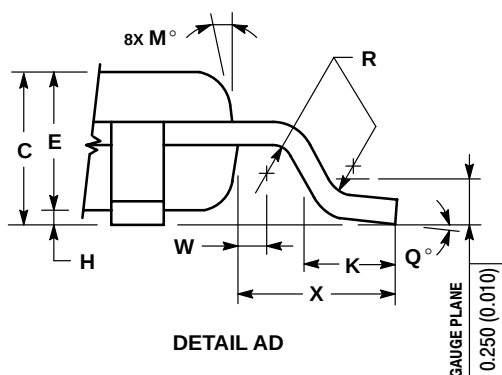
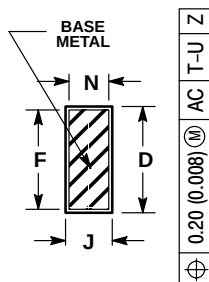
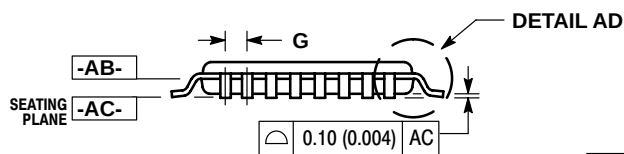
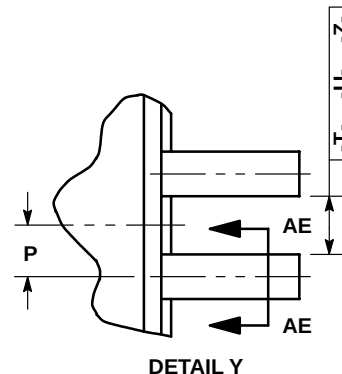
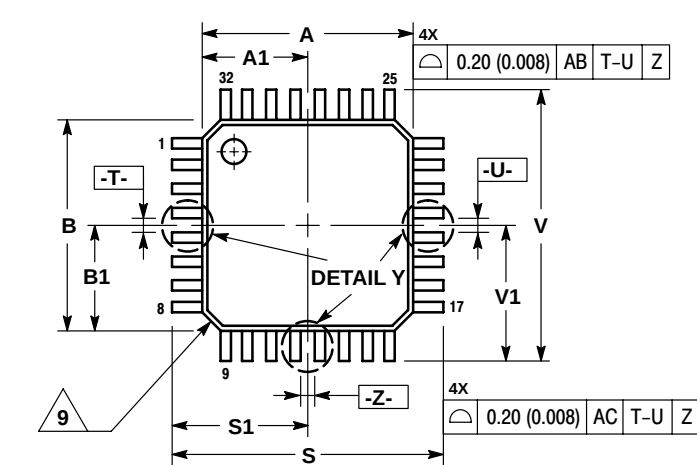
- AN1404** - ECLinPS Circuit Performance at Non-Standard V_{IH} Levels
- AN1405** - ECL Clock Distribution Techniques
- AN1406** - Designing with PECL (ECL at +5.0 V)
- AN1504** - Metastability and the ECLinPS Family
- AN1568** - Interfacing Between LVDS and ECL
- AN1650** - Using Wire-OR Ties in ECLinPS Designs
- AN1672** - The ECL Translator Guide
- AND8001** - Odd Number Counters Design
- AND8002** - Marking and Date Codes
- AND8009** - ECLinPS Plus Spice I/O Model Kit
- AND8020** - Termination of ECL Logic Devices

For an updated list of Application Notes, please see our website at <http://onsemi.com>.

MC10EP101, MC100EP101

PACKAGE DIMENSIONS

LQFP
FA SUFFIX
32-LEAD PLASTIC PACKAGE
CASE 873A-02
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -T-, -U-, AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -AC-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.520 (0.020).
 8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
 9. EXACT SHAPE OF EACH CORNER MAY VARY FROM DEPICTION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.000 BSC		0.276 BSC	
A1	3.500 BSC		0.138 BSC	
B	7.000 BSC		0.276 BSC	
B1	3.500 BSC		0.138 BSC	
C	1.400	1.600	0.055	0.063
D	0.300	0.450	0.012	0.018
E	1.350	1.450	0.053	0.057
F	0.300	0.400	0.012	0.016
G	0.800 BSC		0.031 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.400 BSC		0.016 BSC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	9.000 BSC		0.354 BSC	
S1	4.500 BSC		0.177 BSC	
V	9.000 BSC		0.354 BSC	
V1	4.500 BSC		0.177 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	

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