NB3L83948C

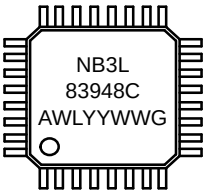
2.5 V / 3.3 V Differential and LVTTL/LVCMOS 2:1 MUX to 1:12 LVCMOS Fanout

ON Semiconductor®

http://onsemi.com

LQFP−32
FA SUFFIX
CASE 873A

MARKING DIAGRAMS*



A	= Assembly Location
WL	= Wafer Lot
YY	= Year
WW	= Work Week
G	= Pb−Free Package

(*Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

Description

The NB3L83948C is a pure 2.5 V / 3.3 V (V_{DD} = V_{DDO}) or mixed mode 3.3 V Core (V_{DD}) / 2.5 V Output (V_{DDO}) clock distribution buffer with the capability to select either a differential LVPECL / LVDS / LVHSTL / SSTL / HCSL or single ended LVCMOS / LVTTL compatible input clock, such as a Primary or a Test Clock. All other control inputs (CLK_SEL, CLK_EN, and OE) are LVTTL/LVCMOS level compatible.

The NB3L83948C provides an enable input, CLK_EN pin, which synchronously enables or disables the clock outputs while in the LOW state. Since this input is internally synchronized to the input clock, changing only when the input is LOW, potential output glitching or runt pulse generation is eliminated.

The 12 LVCMOS output pins drive 50 Ω series or parallel terminated transmission lines. The outputs can also be disabled to a high impedance (tri−stated) via the OE input, or enabled when High.

Fit, Form, and Function compatible with ICS83948I−147, ICS83948I−01, CY29948AXI, and MPC9448/9448L

Features

- 2.5 V / 3.3V (V_{DD} = V_{DDO}) or 3.3 V V_{DD} / 2.5 V V_{DDO} Operation:
  2.5 ±5%, 2.375 to 2.625 V
  3.3 ±5%; 3.135 to 3.465 V
- 350 MHz Clock Support
- Accepts LVPECL, LVDS, LVHSTL, SSTL, HCSL, or LVCMOS Clock Inputs
- LVCMOS Compatible Control Inputs
- 12 LVCMOS Clock Outputs
- Synchronous Clock Select
- Output Enable to High Z State Control
- 100 ps Max. Skew Between Outputs
- Industrial Temp. Range −40°C to +85°C
- 32−pin LQFP Package
- These are Pb−Free Devices

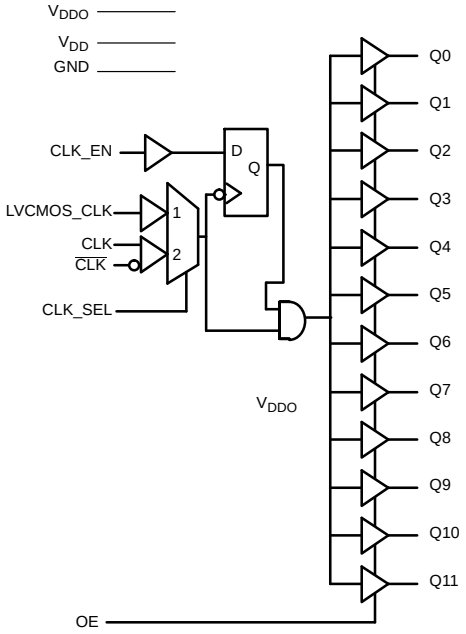


Figure 1. Simplified Logic Diagram

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

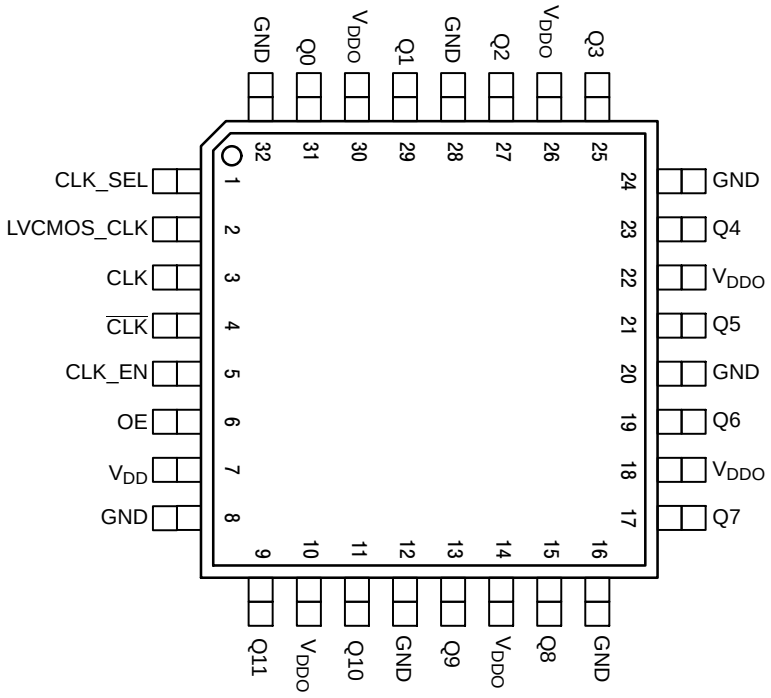


Figure 2. Pinout Configuration (Top View)

Table 1. PIN DESCRIPTION

Pin	Name	I/O	Open Default	Description
1	CLK_SEL	LVTTL/LVCMOS Input	Pullup	Clock Select Input. When LOW, the CLK/$\overline{CLK}$ differential inputs are selected. When HIGH, LVCMOS_CLK is selected.
2	LVCMOS_CLK	LVTTL/LVCMOS Input	Pullup	Single ended Test Clock Input
3	CLK	LVPECL, LVDS, LVHSTL, SSTL, HCSL, or LVCMOS	Pullup	True Clock Input (internal)
4	$\overline{CLK}$	LVPECL, LVDS, LVHSTL, SSTL, HCSL, or LVCMOS	Pulldown	Invert Clock Input
5	CLK_EN	LVTTL/LVCMOS Input	Pullup	Synchronous Clock Enable Input. When HIGH, outputs are enabled. When LOW, outputs are disabled (LOW).
6	OE	LVTTL/LVCMOS Input	Pullup	Output High Z State control. When HIGH, the outputs are active and enabled. When LOW, the outputs are high impedance disabled.
7	V_{DD}	POWER		V_{DD} Positive Supply pin for core logic. All V_{DD}, V_{DDO}, and GND pins must be externally connected to a power supply to guarantee proper operation. Bypass with 0.01 μF cap to GND.
8, 12, 16, 20, 24, 28, 32	GND	GND		GND Supply Ground. All V_{DD}, V_{DDO} and GND pins must be externally connected to power supply to guarantee proper operation.
9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31	Q[11:0]	LVCMOS Output		Clock Output Pins
10, 14, 18, 22, 26, 30	V_{DDO}	POWER		V_{DDO} Positive Supply pins. All V_{DD}, V_{DDO}, and GND pins must be externally connected to a power supply to guarantee proper operation. Bypass each supply pin with 0.01 μF to GND.

Table 2. CLOCK SELECT FUNCTION TABLE

Control Input	Clock	
CLK_SEL	**CLK, $\overline{CLK}$**	**LVCMOS_CLK**
0	Selected	De−Selected
1	De−Selected	Selected

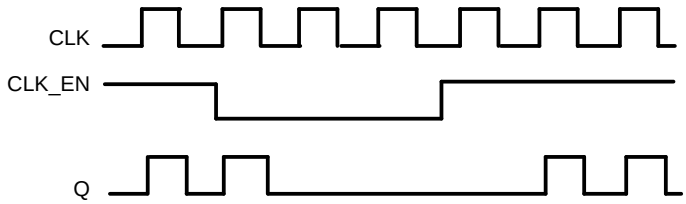


Figure 3. CLK_EN Control Timing Diagram

The CLK_EN control input synchronously enables or disables the outputs as shown in Figure 3. This control latches on the falling edge of the selected input CLK. When CLK_EN is LOW, the outputs are disabled in a LOW state. When CLK_EN is HIGH, the outputs are enabled as shown. CLK_EN to CLK Set up and Hold times must be satisfied.

Table 3. ATTRIBUTES (Note 1)

Characteristics		Value
Internal Input Pullup and Pulldown Resistor		50 kΩ
ESD Protection	Human Body Model Machine Model	> 1.5 kV > 200 V
Moisture Sensitivity (Note 1)		Level 2
Flammability Rating Oxygen Index		UL−94 code V−0 A 1/8” 28 to 34
Transistor Count		275 Devices
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

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

Table 4. MAXIMUM RATINGS (Note 2)

Symbol	Parameter	Condition	Rating	Unit
V_{DD}/V_{DDO}	Positive Power Supply	GND = 0 V	4.6	V
V_I	Input Voltage		$-0.3 \le V_I \le V_{DD} + 0.3$	V
T_A	Operating Temperature Range, Industrial		−40 to ≤ +85	°C
T_{stg}	Storage Temperature Range		−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	80 55	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	(Note 3)	12−17	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

2. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and not valid simultaneously. If stress limits are exceeded device functional operation is not implied, damage may occur and reliability may be affected.
3. JEDEC standard multilayer board − 2S2P (2 signal, 2 power).

Table 5. DC CHARACTERISTICS V_{DD} = V_{DDO} = 3.3 ±5% (3.135 to 3.465 V) or 2.5 ±5% (2.375 to 2.625 V); V_{DD} = 3.3 ±5% (3.135 to 3.465 V) and V_{DDO} = 2.5 ±5% (2.375 to 2.625 V) GND = 0 V, T_A = −40°C to +85°C; (Note 4)

Symbol	Characteristic	Min	Typ	Max	Unit
I_{DD}	Quiescent Power Supply Current 3.3V V_{DD} = V_{DDO} or 3.3 V V_{DD}, 2.5 V_{DDO} 2.5 V V_{DD} = V_{DDO}			 55 52	mA
V_{IH}	Input HIGH Voltage at 3.465 V V_{DD} CLK_SEL; LVCMOS_CLK, CLK_EN, OE	2.0		V_{DD}+0.3	V
	Input HIGH Voltage 2.625 V_{DD} CLK_SEL; LVCMOS_CLK, CLK_EN, OE	1.7		V_{DD}+0.3	
V_{IL}	Input LOW Voltage 3.465 V V_{DD} CLK_SEL; LVCMOS_CLK, CLK_EN, OE	−0.3		0.8	V
	Input LOW Voltage 2.625 V V_{DD} CLK_SEL; LVCMOS_CLK, CLK_EN, OE	−0.3		0.7	
I_{IN}	Input Current (V_{IN} = V_{DD})			300	μA
V_{OH}	Output HIGH Voltage I_{OH} = −24 mA 3.3 V ±5% = V_{DD} = V_{DDO}	2.4			V
	Output HIGH Voltage I_{OH} = −15 mA 3.3 V ±5% or 2.5 V ±5% = V_{DD}; 2.5 V +5% = V_{DDO}	1.8			
V_{OL}	Output LOW Voltage I_{OL} = 24 mA 3.3 V ±5% = V_{DD} = V_{DDO}			0.55	V
	Output LOW Voltage I_{OL} = 12 mA 3.3 V ±5% = V_{DD} = V_{DDO}			0.3	
	Output LOW Voltage I_{OL} = 15 mA 0.3 V ±5% = V_{DD}; 2.5 V ±5% = V_{DDO}			0.6	
V_{CMR}	Common Mode Voltage Range (CLK/$\overline{CLK}$) 3.3 V ±5% or 2.5 V ±5% = V_{DD}	GND+0.5		V_{DD}−0.85	V
V_{PP}	Input Voltage (Peak−to−Peak) CLK/$\overline{CLK}$ 3.3 V ±5% or 2.5 V ±5% = V_{DD}	0.15		1.3	V
Z_O	Output Impedance	5	7	12	Ω
C_{IN}	Input Capacitance			4	pF
C_{PD}	Power Dissipation Capacitance (per Output)		25		pF

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

4. Parallel terminated 50 Ω to V_{DDO}/2. See Figure 5.

Table 6. AC CHARACTERISTICS V_{DD} = V_{DDO} = 3.3 ±5% (3.135 to 3.465 V) or 2.5 ±5% (2.375 to 2.625 V); V_{DD} = 3.3 ±5% (3.135 to 3.465 V) and V_{DDO} = 2.5 ±5% (2.375 to 2.625 V) GND = 0 V, T_A = −40°C to +85°C; (Note 5)

Symbol	Characteristic	Min	Typ	Max	Unit
F_{max}	Maximum Operating Frequency	350			MHz
t_{PLH}/t_{PHL}	Propagation Delay, (crosspoint to V_{DDO}/2) f ≤ 350 MHz				ns
	3.3 V V_{DD} = V_{DDO} or 3.3 V V_{DD}, 2.5 V V_{DDO}; CLK/$\overline{CLK}$ to Qx	1.6		3.6	ns
	3.3 V V_{DD} = V_{DDO} or 3.3 V V_{DD}, 2.5 V V_{DDO}; 3.3 V LVCMOS_CLK to Qx	1.0		3.0	
	2.5 V V_{DD} = V_{DDO} CLK/$\overline{CLK}$ to Qx	1.6		3.6	
	2.5 V V_{DD} = V_{DDO} LVCMOS_CLK to Qx	1.0		3.0	
t_{PZL}/t_{PZH}	Output Enable Time OE to Qx			5	ns
t_{PLZ}/t_{PHZ}	Output Disable Time OE to Qx			5	ns
$tSKEW_{DC}$	Duty Cycle Skew at V_{DD} / 2				%
	At 150 MHz; 3.3 V V_{DD} = V_{DDO}	45		55	
	At 200 MHz; 2.5 V V_{DD} = V_{DDO}	45		55	
	At 150 MHz; 2.5 V V_{DD} = V_{DDO}	40		60	
$tSKEW_{D-D}$	Device to Device Skew (similar condition)				ns
	CLK/$\overline{CLK}$ to Qx; CLK to Qx			1.0	
$tSKEW_{O-O}$	Output to Output Skew Within A Device		25	100	ps
t_S	Set−up Time to CLK tf				ns
	CLK_EN to CLK/$\overline{CLK}$	1.0			
	CLK_EN to CLK	0.0			
t_H	Hold Time to CLK tf				ns
	CLK/$\overline{CLK}$ to CLK_EN	0.0			
	CLK to CLK_EN	1.0			
tr/tf	Output rise and fall times				ns
	(0.8 V and 2.0 V) 3.3 V V_{DD} = V_{DDO}			1.0	
	(0.6 V and 1.8 V) or 3.3 V V_{DD}, 2.5 V_{DDO}			1.0	
	(0.6 V and 1.8 V) 2.5 V V_{DD} = V_{DDO}			1.3	

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

5. Outputs loaded with 50 Ω to V_{TT} (V_{DDO}/2); see Figure 5. CLOCK input with 50% duty cycle. Measured at CLK/$\overline{CLK}$ crosspoint to Qx V_{DDO}/2, CLK V_{DDO}/2 to Qx V_{DDO}/2; see Figure 4.

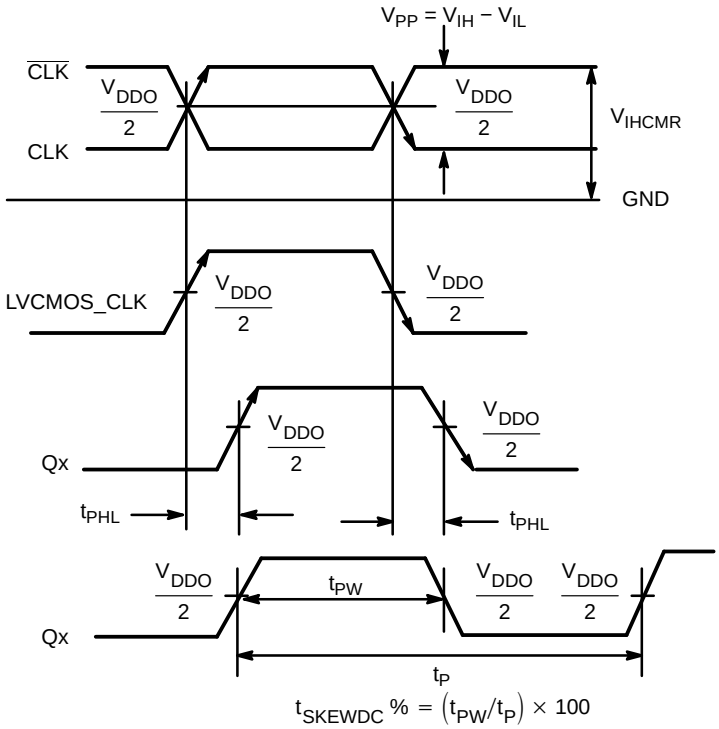


Figure 4. AC Reference Measurement

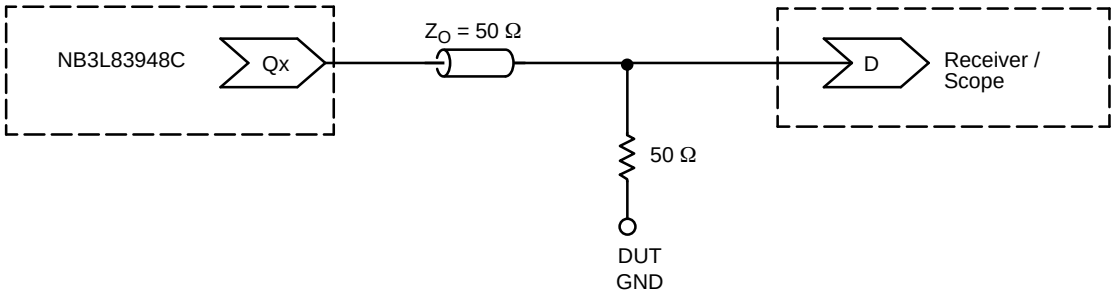


Figure 5. Typical Termination for Output Driver and Device Evaluation. Supplies may be centered on GND (±1.65 V or ±1.25 V) to permit direct connection into 50 Ω to GND Scope modules

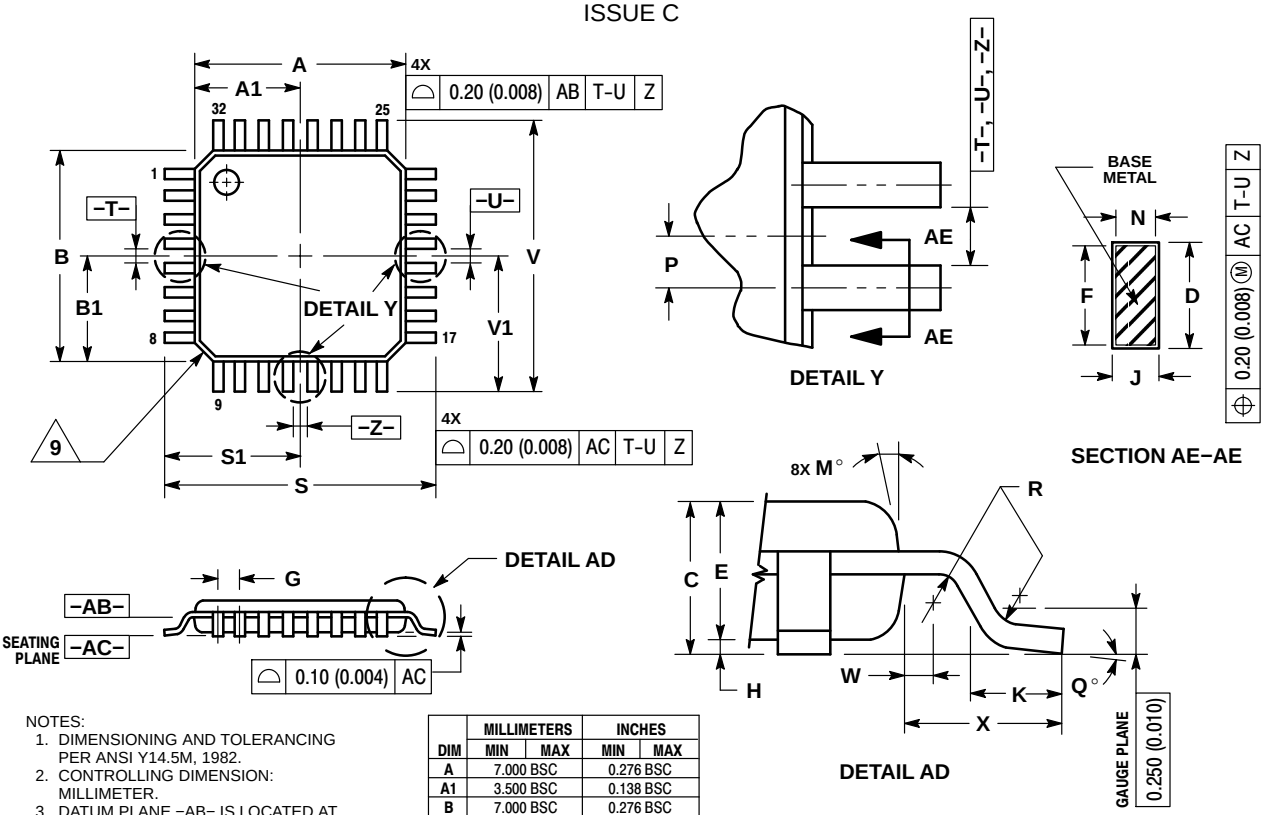
ORDERING INFORMATION

Device	Package	Shipping†
NB3L83948CFAG	LQFP−32 (Pb−Free)	250 Units / Tray
NB3L83948CFAR2G	LQFP−32 (Pb−Free)	2000 Units / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

32 LEAD LQFP
CASE 873A−02
ISSUE C



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.

	MILLIMETERS		INCHES	
DIM	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	0.450	0.750	0.018	0.030
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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