



CYPRESS

B9946

3.3V, 160-MHz, 1:10 Clock Distribution Buffer

Product Features

- 160-MHz Clock Support
- LVCMOS/LVTTL Compatible Inputs
- 10 Clock Outputs: Drive up to 20 Clock Lines
- 1X or 1/2X Configurable Outputs
- Output Three-state Control
- 250 ps Maximum Output-to-Output Skew
- Pin Compatible with MPC946
- Industrial Temp. Range: -40°C to +85°C
- 32-Pin TQFP Package

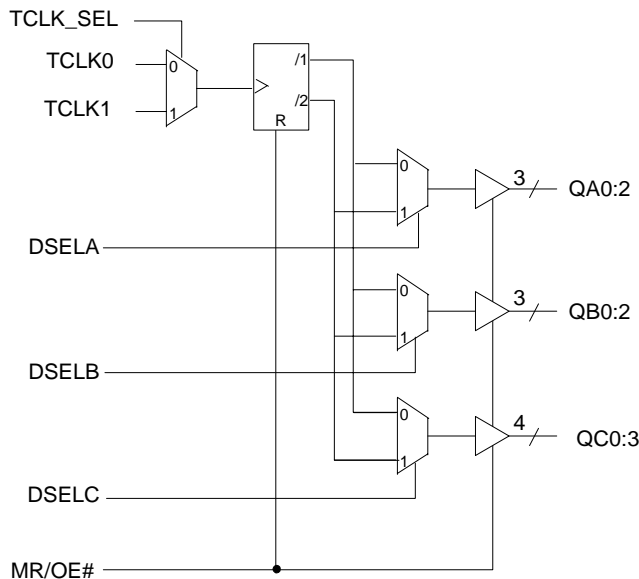
Description

The B9946 is a low-voltage clock distribution buffer with the capability to select one of two LVCMOS/LVTTL compatible input clocks. These clock sources can be used to provide for test clocks as well as the primary system clocks. All other control inputs are LVCMOS/LVTTL compatible. The 10 outputs are 3.3V LVCMOS or LVTTL compatible and can drive two series terminated 50Ω transmission lines. With this capability the B9946 has an effective fanout of 1:20.

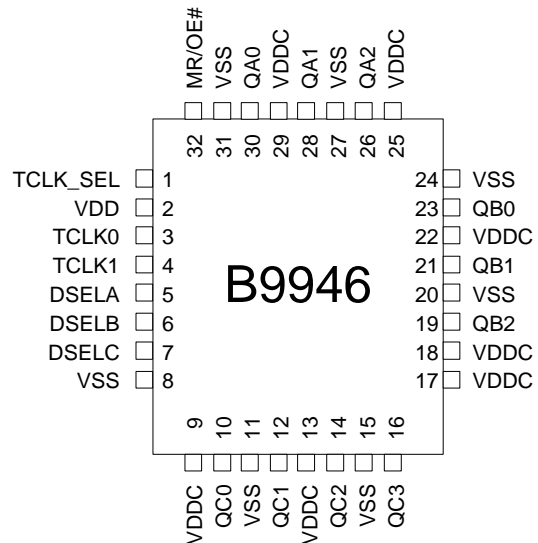
The B9946 is capable of generating 1X and 1/2X signals from a 1X source. These signals are generated and retimed internally to ensure minimal skew between the 1X and 1/2X signals. SEL(A:C) inputs allow flexibility in selecting the ratio of 1X to 1/2X outputs.

The B9946 outputs can also be three-stated via MR/OE# input. When MR/OE# is set HIGH, it resets the internal flip-flops and three-states the outputs.

Block Diagram



Pin Configuration



Pin Description^[1]

Pin	Name	PWR	I/O	Description
3, 4	TCLK(0,1)		I, PU	External Reference/Test Clock Input
26, 28, 30	QA(2:0)	VDDC	O	Clock Outputs
19, 21, 23	QB(2:0)	VDDC	O	Clock Outputs
10, 12, 14, 16	QC(0:3)	VDDC	O	Clock Outputs
5, 6, 7	DSEL(A:C)		I, PD	Divider Select Inputs. When HIGH, selects ÷2 input divider. When LOW, selects ÷1 input divider.
1	TCLK_SEL		I, PD	TCLK Select Input. When LOW, TCLK0 clock is selected and when HIGH TCLK1 is selected.
32	MR/OE#		I, PD	Output Enable Input. When asserted LOW, the outputs are enabled and when asserted HIGH, internal flip-flops are reset and the outputs are three-stated.
9, 13, 17, 18, 22, 25, 29	VDDC			3.3V Power Supply for Output Clock Buffers
2	VDD			3.3V Power Supply
8, 11, 15, 20, 24, 27, 31	VSS			Common Ground

Note:

1. PD = Internal Pull-Down, PU = Internal Pull-Up.

Maximum Ratings^[2]

Maximum Input Voltage Relative to V_{SS} : $V_{SS} - 0.3V$
 Maximum Input Voltage Relative to V_{DD} : $V_{DD} + 0.3V$
 Storage Temperature: $-65^{\circ}C$ to $+150^{\circ}C$
 Operating Temperature: $-40^{\circ}C$ to $+85^{\circ}C$
 Maximum ESD Protection 2 KV
 Maximum Power Supply: 5.5V
 Maximum Input Current: ± 20 mA

This device contains circuitry to protect the inputs against damage due to high static voltages or electric field; however, precautions should be taken to avoid application of any voltage higher than the maximum rated voltages to this circuit. For proper operation, V_{in} and V_{out} should be constrained to the range:

$$V_{SS} < (V_{in} \text{ or } V_{out}) < V_{DD}$$

Unused inputs must always be tied to an appropriate logic voltage level (either V_{SS} or V_{DD}).

DC Parameters: $V_{DDC} = 3.3V \pm 10\%$, $V_{DD} = 3.3V \pm 10\%$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$

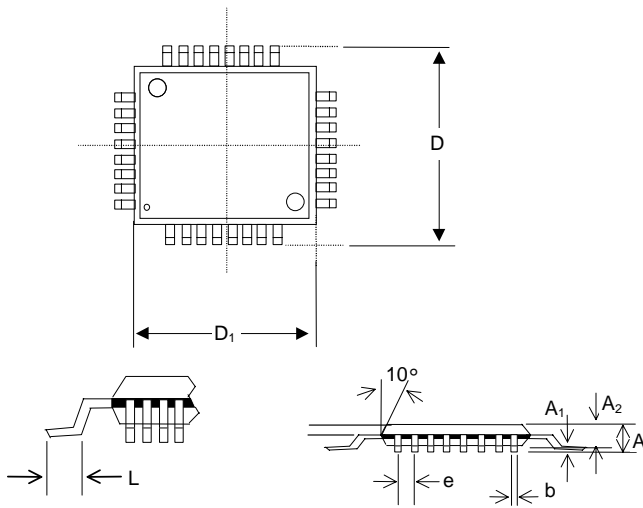
Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
V_{IL}	Input Low Voltage		V_{SS}		0.8	V
V_{IH}	Input High Voltage		2.0		V_{DD}	V
I_{IL}	Input Low Current (@ $V_{IL} = V_{SS}$)	Note 3			-100	μA
I_{IH}	Input High Current (@ $V_{IL} = V_{DD}$)				100	μA
V_{OL}	Output Low Voltage	$I_{OL} = 20$ mA, Note 4			0.4	V
V_{OH}	Output High Voltage	$I_{OH} = -20$ mA, $V_{DDC} = 3.3V$, Note 4	2.5			V
I_{DD}	Quiescent Supply Current	All V_{DDC} and V_{DD}	-	1	2	mA
C^{in}	Input Capacitance		-	-	4	pF

AC Parameters^[5]: $V_{DDC} = 3.3V \pm 10\%$, $V_{DD} = 3.3V \pm 10\%$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
Fmax	Maximum Input Frequency ^[6]		160			MHz
Tpd	TTL_CLK to Q Delay ^[6]		5.0	-	11.5	ns
FoutDC	Output Duty Cycle ^[6,7]	Measured at $V_{DDC}/2$	TCYCLE/2 - 1		TCYCLE/2 + 1	ns
tpZL, tpZH	Output enable time (all outputs)		2		10	ns
tpLZ, tpHZ	Output disable time (all outputs)		2		10	ns
Tskew	Output-to-Output Skew ^[6,8]				250	ps
Tskew(pp)	Part-to-Part Skew ^[9]			2.0	4.5	ns
Tr/Tf	Output Clocks Rise/Fall Time ^[8]	0.8V to 2.0V	0.10		1.0	ns

Notes:

2. The voltage on any input or I/O pin cannot exceed the power pin during power-up. Power supply sequencing is NOT required.
3. Inputs have pull-up/pull-down resistors that effect input current.
4. Driving series or parallel terminated 50Ω (or 50Ω to $V_{DD}/2$) transmission lines.
5. Parameters are guaranteed by design and characterization. Not 100% tested in production. All parameters specified with loaded outputs.
6. Outputs driving 50Ω transmission lines.
7. 50% input duty cycle.
8. Outputs loaded with 30 pF each
9. Part-to-Part skew at a given temperature and voltage.

Package Drawing and Dimensions

32-Pin TQFP Outline Dimensions

Symbol	Inches			Millimeters		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	0.047	-	-	1.20
A ₁	0.002	-	0.006	0.05	-	0.15
A ₂	0.037	-	0.041	0.95	-	1.05
D	-	0.354	-	-	9.00	-
D ₁	-	0.276	-	-	7.00	-
b	0.012	-	0.018	0.30	-	0.45
e	0.031 BSC			0.80 BSC		
L	0.018	-	0.030	0.45	0	0.75

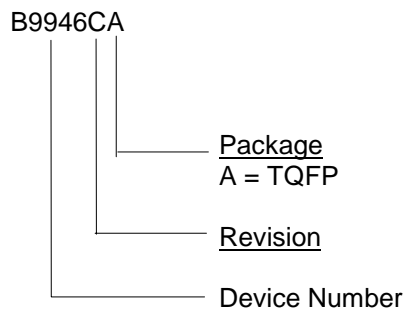
Ordering Information

Part Number ^[10]	Package Type	Production Flow
B9946CA	32-Pin TQFP	Industrial, -40°C to +85°C

Note:

10. The ordering part number is formed by a combination of device number, device revision, package style, and screening as shown below.

Marking: Example: Cypress
 B9946CA
 Date Code, Lot #



Document Title: B9946 3.3V, 160-MHz, 1:10 Clock Distribution Buffer				
Document Number: 38-07077				
REV.	ECN NO.	Issue Date	Orig. of Change	Description of Change
**	107113	06/06/01	IKA	Convert from IMI to Cypress
*A	108057	07/03/01	NDP	Changed Commercial to Industrial (See page 4)
*B	109803	01/31/02	DSG	Convert from Word to Frame
*C	122762	12/22/02	RBI	Add power up requirements to maximum ratings information