3.3V Low Skew 1-to-4, 800MHz, Differential to LVDS Fanout Buffer

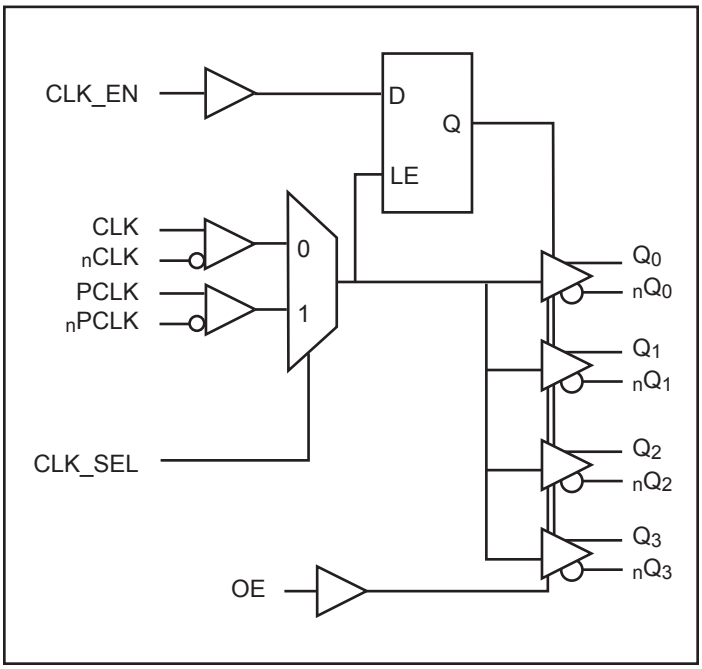
Features

- Maximum operation frequency: 800 MHz
- 4 pair of differential LVDS outputs
- Selectable differential CLK and PCLK inputs
- CLK, $_n$CLK pair accepts LVDS, LVPECL, LVHSTL, SSTL and HCSL input level
- PCLK, nPCLK pair supports LVPECL, CML and SSTL input level
- Output Skew: 40ps (maximum)
- Part-to-part skew: 300ps (maximum)
- Propagation delay: 2.2ns (maximum)
- 3.3V power supply
- Pin-to-pin compatible to ICS8543
- Operating Temperature: -40°C to 85°C
- Packaging (Pb-free & Green):
  -20-pin TSSOP (L)

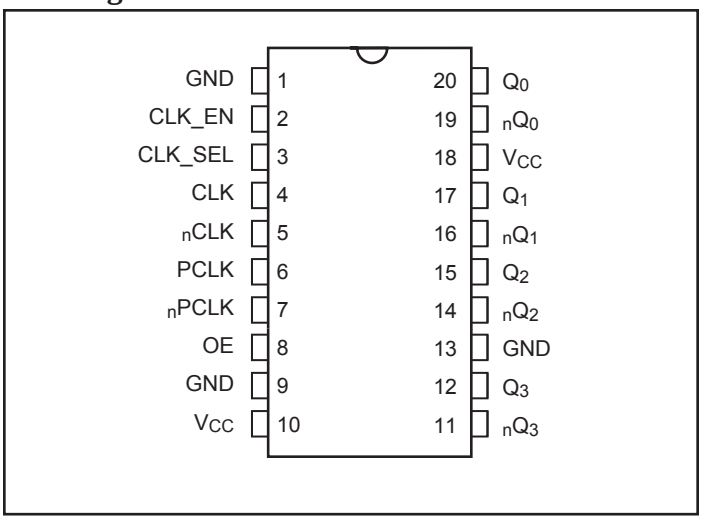
Description

The PI6C48543 is a high-performance low-skew LVDS fanout buffer. PI6C48543 features two selectable differential inputs and translates to four LVDS outputs. The inputs can also be configured to single-ended with external resistor bias circuit. The CLK input accepts LPECL or LVDS or LVHSTL or SSTL or HCSL signals, and PCLK input accepts LVPECL or SSTL or CML signals. The outputs are synchronized with input clock during asynchronous assertion/deassertion of CLK_EN pin. PI6C48543 is ideal for differential to LVDS translations and/or LVDS clock distribution. Typical clock translation and distribution applications are data-communications and telecommunications.

Block Diagram



Pin Diagram



Pin Description

Name	Pin #	Type	Description
GND	1, 9, 13	P	Connect to Ground
CLK_EN	2	I_PU	Synchronized clock enable. When high, clock outputs follow clock input. When low, Q_X outputs are forced low, $_nQ_X$ outputs are forced high. LVCMOS/LVTTL level with 80kΩ pull up.
CLK_ SEL	3	I_PD	Clock select input. When high, selects CLK_1 input. When low, selects CLK_0 input. LVCMOS/ LVTTL level with 80kΩ pull down.
CLK	4	I_PD	Non-inverting differential clock input
$_n$CLK	5	I_PU	Inverting differential clock input
PCLK	6	I_PD	Non-inverting differential clock input
$_n$PCLK	7	I_PU	Inverting differential clock input
OE	8	I_PU	Output Enable, Controls outputs Q_0, $_nQ_0$ through Q_3, $_nQ_3$
V_{CC}	10, 18	P	Connect to 3.3V.
Q_3, $_nQ_3$	11, 12	O	Differential output pair, LVDS interface level.
Q_2, $_nQ_2$	14, 15	O	Differential output pair, LVDS interface level.
Q_1, $_nQ_1$	16, 17	O	Differential output pair, LVDS interface level.
Q_0, $_nQ$	19, 20	O	Differential output pair, LVDS interface level.

Notes:
1. I = Input, O = Output, P = Power supply connection, I_PD = Input with pull down, I_PU = Input with pull up

Pin Characteristics

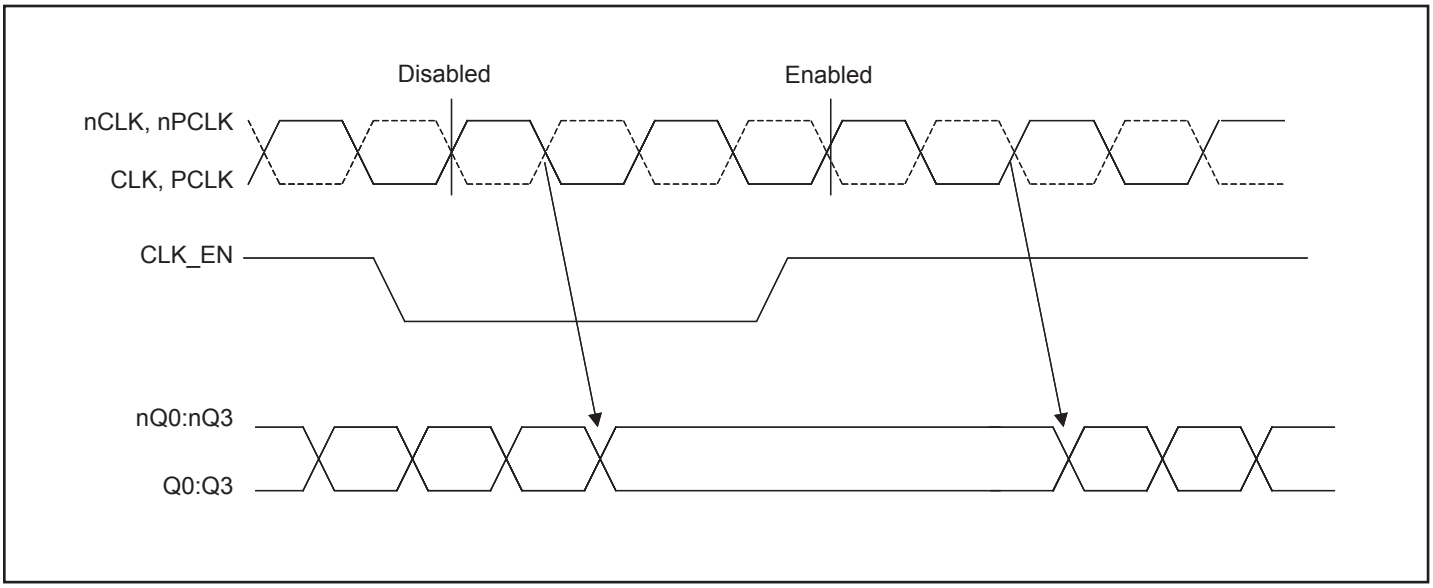
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
C_{IN}	Input Capacitance			6		pF
R_pullup	Input Pullup Resistance			80		kΩ
R_pulldown	Input Pulldown Resistance			80		

Control Input Function Table

Inputs				Outputs	
OE	**CLK_EN**	**CLK_SEL**	**Selected Source**	**Q_0:Q_3**	**$_nQ_0$:$_nQ_3$**
1	0	0	CLK, $_n$CLK	Diasbled: Low	Diasbled: High
1	0	1	PCLK, $_n$PCLK	Disabled: Low	Disabled: High
1	1	0	CLK, $_n$CLK	Enabled	Enabled
1	1	1	PCLK, $_n$PCLK	Enabled	Enabled
0	x	x		Hi-Z	Hi-Z

Notes:
1. After CLK_EN switches, the clock outputs are disabled or enabled following a rising and falling input clock edge as show below.

Figure 1. CLK_EN Timing Diagram



Clock Input Function Table (See Figure 2)

Inputs		Outputs		Input to Output Mode	Polarity
CLK or PCLK	$_nCLK$ or $_nPCLK$	$Q_0:Q_3$	$_nQ_0:_nQ_3$		
0	1	LOW	HIGH	Differential to Differential	None Inverting
1	0	HIGH	LOW	Differential to Differential	None Inverting
0	Biased; $V_{IN} = V_{CC}/2$	LOW	HIGH	Single Ended to Differential	None Inverting
1	Biased; $V_{IN} = V_{CC}/2$	HIGH	LOW	Single Ended to Differential	None Inverting
Biased; V_{IN} = Vcc/2	0	HIGH	LOW	Single Ended to Differential	Inverting
Biased; $V_{IN} = V_{CC}/2$	1	LOW	HIGH	Single Ended to Differential	Inverting

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{CC}	Supply voltage	Referenced to GND			4.6	V
V_{IN}	Input voltage	Referenced to GND	-0.5		V_{CC}+0.5V	
V_{OUT}	Output voltage	Referenced to GND	-0.5		V_{CC}+0.5V	
T_{STG}	Storage temperature		-65		150	°C

Notes:
1. Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. These ratings are stress speci fications only and correct functional operation of the device at these or any other conditions above those listed in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Operating Conditions

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{CC}	Power Supply Voltage		3.135	3.3	3.465	V
T_A	Ambient Temperature		-40		85	°C
I_{CC}	Power Supply Current				60	mA

LVCMOS/LVTTL DC Characteristics (T_A = -40°C to 85°C, V_{CC} = 3.135V to 3.465V unless otherwise stated below.)

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Units
V_{IH}	Input High Voltage			2		3.765	V
V_{IL}	Input Low Voltage			-0.3		0.8	V
I_{IH}	Input High Current	CLK_SEL	$V_{IN} = V_{CC}$ = 3.465V			150	µA
		CLK_EN, OE	$V_{IN} = V_{CC}$ = 3.465V			5	
I_{IL}	Input Low Current	CLK_SEL	V_{IN} = 0V, V_{CC} = 3.465V	-5			
		CLK_EN, OE	V_{IN} = 0V, V_{CC} = 3.465V	-150			

Differential DC Characteristics (T_A = -40°C to 85°C, V_{CC} = 3.135V to 3.465V unless otherwise stated below.)

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Units
I_{IH}	Input High Current	$_n$CLK, $_n$PCLK	$V_{IN} = V_{CC}$ = 3.465V			5	uA
		CLK, PCLK	$V_{IN} = V_{CC}$ = 3.465V			150	uA
I_{IL}	Input Low Current	$_n$CLK, $_n$PCLK	V_{CC} = 3.465V, V_{IN} = 0V	-150			uA
		CLK, PCLK	V_{CC} = 3.465V, V_{IN} = 0V	-5			uA
V_{PP}	Peak-to-peak Voltage			0.15		1.3	V
V_{CMR}	Common Mode Input Voltage(1)			0.5		V_{CC}-0.85V	V

Notes:
1. For single ended applications, the maximum input voltage for CLK and nCLK is V_{CC}+0.3V

LVPECL DC Characteristics (T_A = -40°C to 85°C, V_{CC} = 3.135V to 3.465V unless otherwise stated below.)

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Units
I_{IH}	Input High Current	$_n$CLK, $_n$PCLK	$V_{IN} = V_{CC}$ = 3.465V			5	µA
		CLK, PCLK	$V_{IN} = V_{CC}$ = 3.465V			150	
I_{IL}	Input Low Current	$_n$CLK, $_n$PCLK	V_{CC} = 3.465V, V_{IN} = 0V	-150			
		CLK, PCLK	V_{CC} = 3.465V, V_{IN} = 0V	-5			
V_{PP}	Peak-to-peak Voltage			0.3		1	V
V_{CMR}	Common Mode Input Voltage; Note(1)			1.5		V_{CC}	

Notes:
1. For single ended applications, the maximum input voltage for PCLK and $_n$PCLK is V_{CC}+0.3V.

LVDS DC Characteristics (T_A = -40°C to 85°C, V_{CC} = 3.135V to 3.465V unless otherwise stated below.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{OD}	Differential Output Voltage		200	280	360	mV
ΔV_{OD}	VOD Magnitude Change			0	40	
V_{OS}	Offset Voltage		1.125	1.25	1.375	V
ΔV_{OS}	VOS Magnitude Change			5	25	mV
I_{OZ}	High Impedance Leakage Current		-10		+10	µA
I_{OFF}	Power OFF Leakage		-20	±1	+20	
I_{OSD}	Differential Output Short Circuit Current			-3.5	-5	mA
I_{OS}	Output Short Circuit Current			-3.5	-5	
V_{OH}	Output Voltage High			1.34	1.6	V
V_{OL}	Output Voltage Low		0.9	1.06		

AC Characteristics (T_A = -40°C to 85°C, V_{CC} = 3.135V to 3.465V)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
f_{max}	Output Frequency				800	MHz
t_{Pd}	Propagation Delay(1)	f ≤ 800 MHz	1.0		2.2	ns
Tsk(o)	Output-to-output Skew(2)				40	ps
Tsk(pp)	Part-to-part Skew(3)				300	
t_r/t_f	Output Rise/Fall time	20% - 80%	100		300	
odc	Output duty cycle		48		52	%

Notes:

1. Measured from the differenital input crossing point to the differential output crossing point
2. Skew between outputs with the same supply voltage and equal load conditions. Measured at the differential outputs crossing point.
3. Skew between outputs on different parts operating with the same supply voltage and equal load conditions. Measured at the differential outputs crossing point.
4. All parameters are measured at 500 MHz unless noted otherwise

Applications Information

Wiring the differential input to accept single ended levels

Figure 1 shows how the differential input can be wired to accept single ended levels. The reference voltage V_REF = V_{DD}/2 is generated by the bias resistors R1, R2 and C1. This bias circuit should be located as close as possible to the input pin. The ratio of R1 and R2 might need to be adjusted to postion the V_REF in the center of the input voltage swing. For example, if the input clock swing is only 2.5V and V_{DD} = 3.3V, V_REF should be 1.25V and R1/R2 = 0.609.

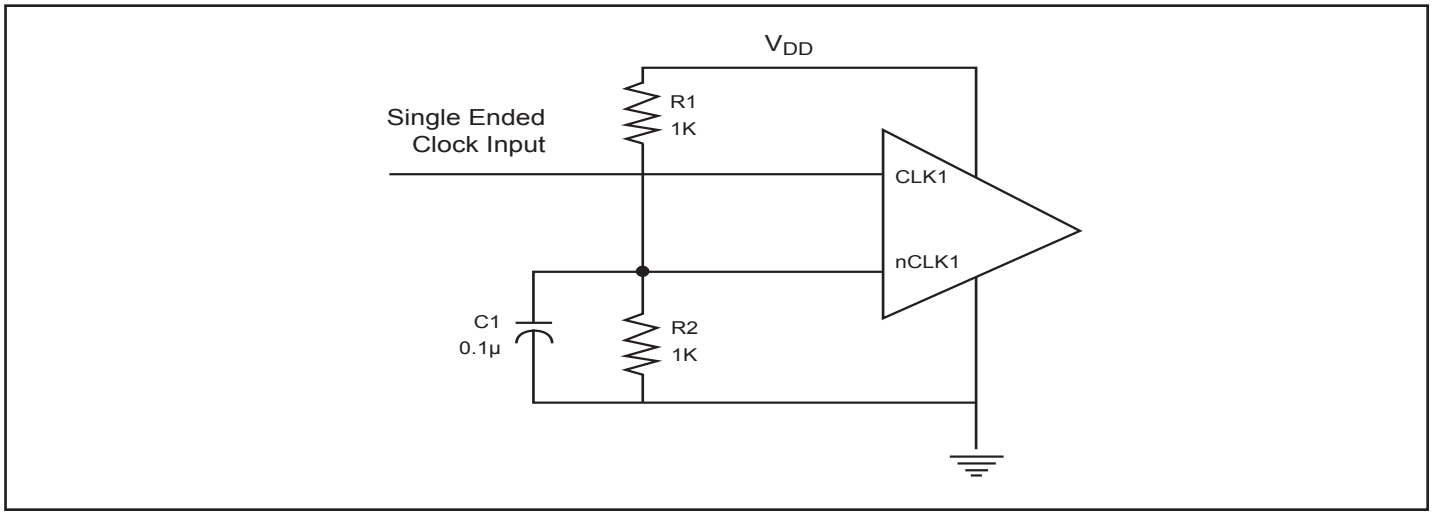
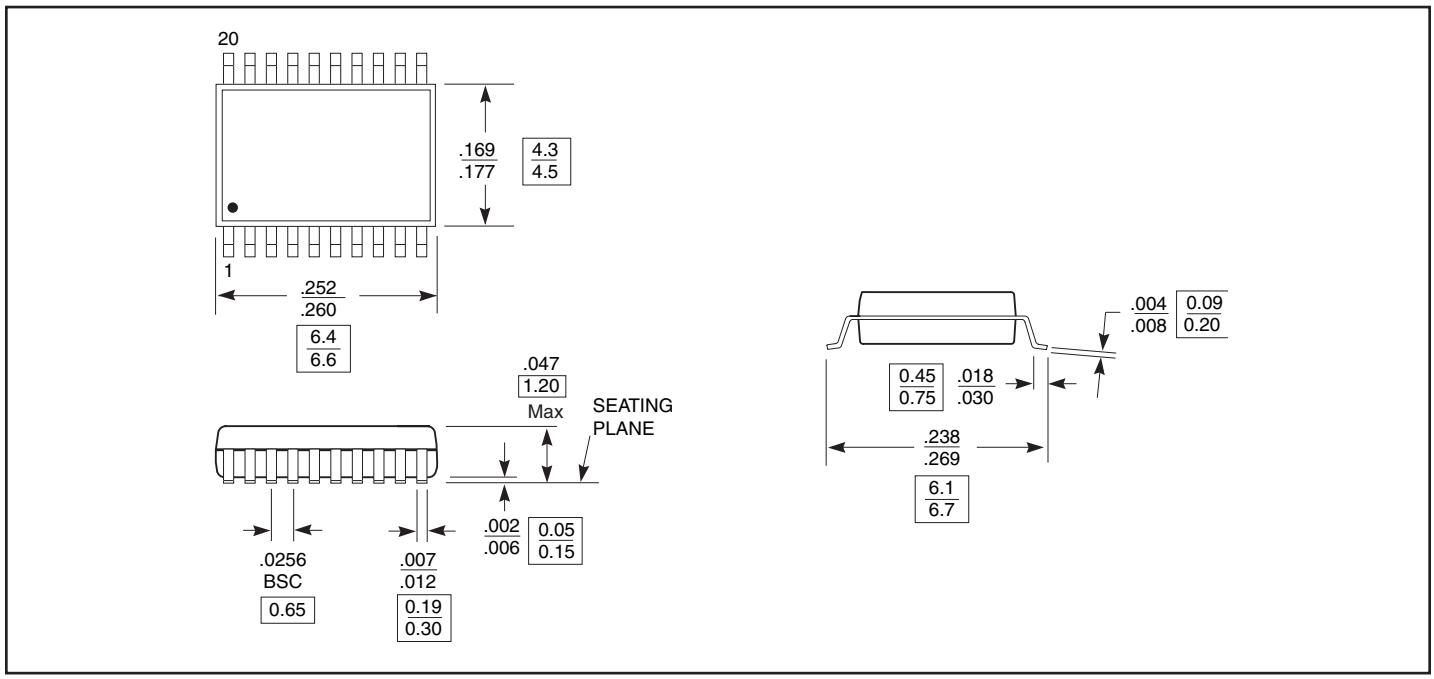


Figure 1: Single-ended Signal Driving Differential Input

Packaging Mechanical: 20-Pin TSSOP (L)



Ordering Information

Ordering Code	Package Code	Package Description
PI6C48543LE	L	Pb-free & Green 20-pin 173-mil wide TSSOP

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/

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