Description

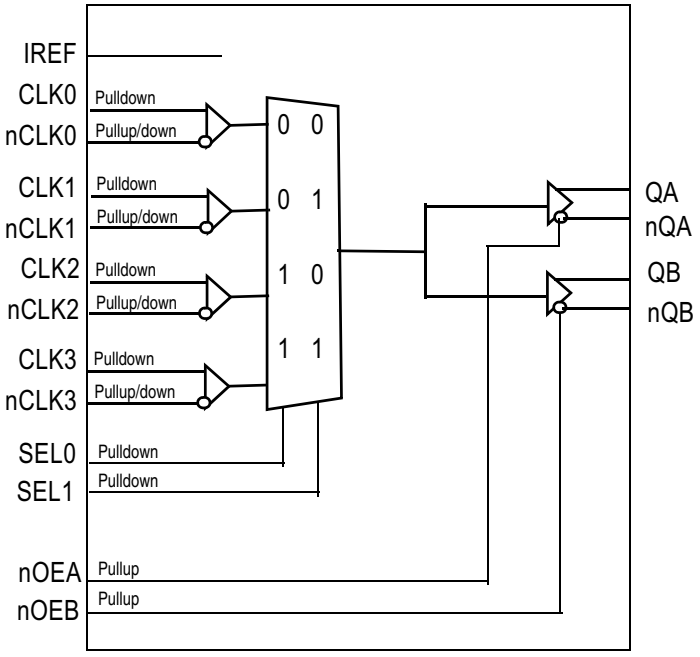
The 831742I is a high-performance, differential HCSL clock/data multiplexer and fanout buffer. The device is designed for the multiplexing and fanout of high-frequency clock and data signals. The device has four differential, selectable clock/data inputs. The selected input signal is distributed to two low-skew differential HCSL outputs. Each input pair accepts HCSL, LVDS and LVPECL levels.

The 831742I is characterized to operate from a 3.3V power supply. Guaranteed input, output-to-output and part-to-part skew characteristics make the 831742I ideal for those clock and data distribution applications demanding well-defined performance and repeatability. The 831742I supports the clock multiplexing and distribution of PCI Express (2.5Gb/s), Gen2 (5Gb/s), Gen3 (8Gb/s) and Gen4 (16Gb/s) clock signals.

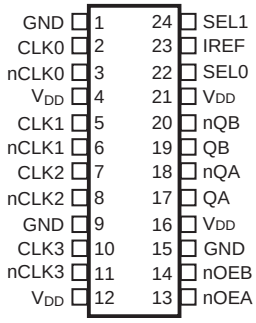
Features

- 4:2 differential clock/data multiplexer with fanout
- Four selectable, differential input pairs
- Each differential input pair can accept the following levels: HCSL, LVDS and LVPECL
- Two differential HCSL output pairs
- Maximum input/output clock frequency: 700MHz
- Maximum input/output data rate: 1400Mb/s (NRZ)
- LVCMOS interface levels for all control inputs
- PCI Express (2.5Gb/s), Gen2 (5 Gb/s), Gen3 (8 Gb/s) and Gen4 (16 Gb/s) clock jitter compliant
- Input skew: 110ps max
- Part-to-part skew: 225ps max
- Full 3.3V supply voltage
- Available in lead-free (RoHS 6)
- -40°C to 85°C ambient operating temperature

Block Diagram



Pin Assignment



831742AGI

24-Lead TSSOP
4.4mm x 7.8mm x 0.925mm package body
G Package
Top View

Table 1. Pin Descriptions

Number	Name	Type		Description
1, 9, 15	GND	Power		Power supply ground.
2	CLK0	Input	Pulldown	Non-inverting clock/data input.
3	nCLK0	Input	Pulldown/Pullup	Inverting differential clock/data input. $V_{DD}/2$ default when left floating.
4, 12, 16, 21	V_{DD}	Power		Positive power supply.
5	CLK1	Input	Pulldown	Non-inverting clock/data input.
6	nCLK1	Input	Pulldown/Pullup	Inverting differential clock/data input. $V_{DD}/2$ default when left floating.
7	CLK2	Input	Pulldown	Non-inverting clock/data input.
8	nCLK2	Input	Pulldown/Pullup	Inverting differential clock/data input. $V_{DD}/2$ default when left floating.
10	CLK3	Input	Pulldown	Non-inverting clock/data input.
11	nCLK3	Input	Pulldown/Pullup	Inverting differential clock/data input. $V_{DD}/2$ default when left floating.
13	nOEA	Input	Pullup	Output enable for the QA output. See Table 3A for function. LVCMOS/LVTTL interface levels.
14	nOEB	Input	Pullup	Output enable for the QB output. See Table 3B for function. LVCMOS/LVTTL interface levels.
17, 18	QA, nQA	Output		Differential output pair. HCSL interface levels.
19, 20	QB, nQB	Output		Differential output pair. HCSL interface levels.
22, 24	SEL0, SEL1	Input	Pulldown	Differential clock/data Input select. See Table 3C for function. LVCMOS/LVTTL interface levels.
23	IREF	Input		An external fixed precision resistor (475Ω) from this pin to ground provides a reference current used for the differential current-mode QX, nQX outputs.

NOTE: *Pullup* and *Pulldown* refer to internal input resistors. See Table 2, *Pin Characteristics,* for typical values.

Table 2. Pin Characteristics

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
C_{IN}	Input Capacitance			4		pF
R_{PULLUP}	Input Pullup Resistor			51		kΩ
$R_{PULLDOWN}$	Input Pulldown Resistor			51		kΩ

Function Tables

Table 3A. nOEA Configuration Table

Input	
nOEA	**Operation**
0	Output QA, nQA is enabled.
1 (default)	Output QA, nQA is in a high-impedance state.

NOTE: nOEA is an asynchronous control.

Table 3B. nOEB Configuration Table

Input	
nOEB	**Operation**
0	Output QB, nQB is enabled.
1 (default)	Output QB, nQB is in a high-impedance state.

NOTE: nOEB is an asynchronous control.

Table 3C. SELx Configuration Table

Input		
SEL1	**SEL0**	**Selected**
0 (default)	0 (default)	CLK0, nCLK0
0	1	CLK1, nCLK1
1	0	CLK2, nCLK2
1	1	CLK3, nCLK3

NOTE: SEL1 and SEL0 are asynchronous controls

Absolute Maximum Ratings

NOTE: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the *DC Characteristics or AC Characteristics* is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Item	Rating
Supply Voltage, V_{DD}	4.6V
Inputs, V_I	-0.5V to V_{DD} + 0.5V
Outputs, V_O	-0.5V to V_{DD} + 0.5V
Package Thermal Impedance, θ_{JA}	87.8°C/W (0 mps)
Storage Temperature, T_{STG}	-65°C to 150°C

DC Electrical Characteristics

Table 4A. Power Supply DC Characteristics, V_{DD} = 3.3V ± 0.3V, T_A = -40°C to 85°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
V_{DD}	Positive Supply Voltage		3.0	3.3	3.6	V
I_{DD}	Power Supply Current	Outputs Unloaded			26	mA

Table 4B. LVCMOS/LVTTL Input DC Characteristics, V_{DD} = 3.3V ± 0.3V, T_A = -40°C to 85°C

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
V_{IH}	Input High Voltage			2		V_{DD} + 0.3	V
V_{IL}	Input Low Voltage			-0.3		0.8	V
I_{IH}	Input High Current	nOEA, nOEB	V_{DD} = V_{IN} = 3.6V			5	µA
		SEL0, SEL1	V_{DD} = V_{IN} = 3.6V			150	µA
I_{IL}	Input Low Current	nOEA, nOEB	V_{DD} = 3.6V, V_{IN} = 0V	-150			µA
		SEL0, SEL1	V_{DD} = 3.6V, V_{IN} = 0V	-5			µA

Table 4C. Differential DC Characteristics, V_{DD} = 3.3V ± 0.3V, T_A = -40°C to 85°C

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
I_{IH}	Input High Current	CLK0, nCLK0; CLK1, nCLK1; CLK2, nCLK2; CLK3, nCLK3	V_{DD} = V_{IN} = 3.6V			150	µA
I_{IL}	Input Low Current	CLK[0:3]	V_{DD} = 3.6V, V_{IN} = 0V	-5			µA
		nCLK[0:3]	V_{DD} = 3.6V, V_{IN} = 0V	-150			µA
V_{PP}	Peak-to-Peak Voltage; NOTE 1			0.15		1.3	V
V_{CMR}	Common Mode Input Voltage; NOTE 1, 2			0.5		V_{DD} – 0.85	V

NOTE 1: V_{IL} should not be less than -0.3V.
NOTE 2: Common mode input voltage is defined as V_{IH}.

AC Electrical Characteristics

Table 5A. PCI e Refclk Phase Jitter[1][2][3], V_{DD} = 3.3V ± 0.3V, T_A = -40°C to 85°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Specification Limit	Units
$t_{jphPCIeG1-CC}$	Additive PCIe Phase Jitter (Common Clocked Architecture)	PCIe Gen 1 (2.5 GT/s)		3.3	5	86 [5]	ps pk-pk
$t_{jphPCIeG2-CC}$		PCIe Gen 2 Lo Band (5.0 GT/s)		54	61	3000 [5]	fs (RMS)
		PCIe Gen 2 Hi Band (5.0 GT/s)		228	255	3100 [5]	
$t_{jphPCIeG3-CC}$		PCIe Gen 3 (8.0 GT/s)		116	130	1000 [5]	
$t_{jphPCIeG4-CC}$		PCIe Gen 4 (16.0 GT/s) [3] [4]		116	130	500 [5]	

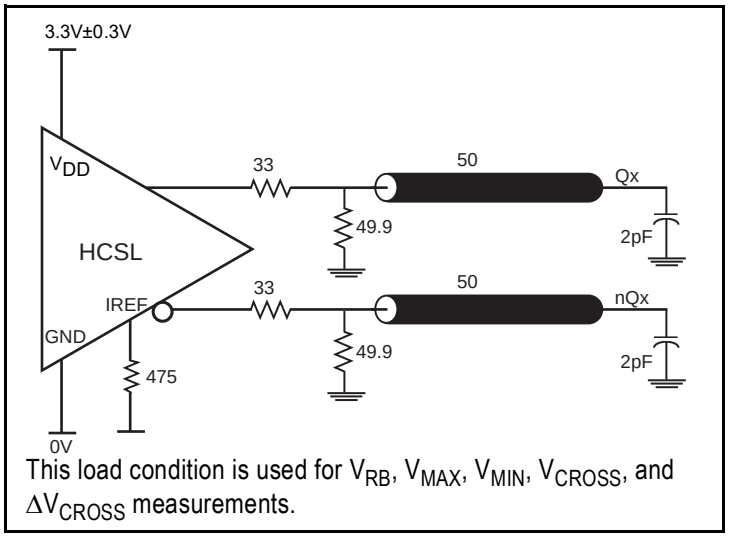
1. The Refclk jitter is measured after applying the filter functions found in PCI Express Base Specification 4.0, Revision 1.0. See the Test Loads section of the data sheet for the exact measurement setup. The worst case results for each data rate are summarized in this table. Equipment noise is removed from all measurements.
2. Jitter measurements shall be made with a capture of at least 100,000 clock cycles captured by a real-time oscilloscope (RTO) with a sample rate of 20 GS/s or greater. Broadband oscilloscope noise must be minimized in the measurement. The measured PP jitter is used (no extrapolation) for RTO measurements. Alternately - Jitter measurements may be used with a Phase Noise Analyzer (PNA) extending (flat) and integrating and folding the frequency content up to an offset from the carrier frequency of at least 200 MHz (at 300 MHz absolute frequency) below the Nyquist frequency. For PNA measurements for the 2.5 GT/s data rate, the RMS jitter is converted to peak-to-peak jitter using a multiplication factor of 8.83.
3. SSC spurs from the fundamental and harmonics are removed up to a cutoff frequency of 2 MHz taking care to minimize removal of any non-SSC content.
4. Note that 0.7 ps RMS is to be used in channel simulations to account for additional noise in a real system.
5. The rms sum of the source jitter and the additive jitter (arithmetic sum for PCIe Gen1) must be less than the jitter specification listed.

Table 5B. HCSL AC Characteristics, V_{DD} = 3.3V ± 0.3V, T_A = -40°C to 85°C

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
f_{OUT}	Output Frequency				700	MHz
t_{PD}	Propagation Delay; NOTE 1		1.5	2	2.5	ns
*t*sk(o)	Output Skew; NOTE 16	Across All Outputs		3	15	ps
tsk(i)	Input Skew; NOTE 13	Any Input to Q/nQ		30	110	ps
tsk(pp)	Part-to-Part Skew; NOTE 14, 15				225	ps
MUX_{ISOL}	Mux Isolation	f = 100MHz		40		dB
Rising Edge Rate	Rising Edge Rate; NOTE 2, 3	f = 100MHz	0.6		4	V/ns
Falling Edge Rate	Falling Edge Rate; NOTE 2, 3	f = 100MHz	0.6		4	V/ns
V_{RB}	Ringback Voltage; NOTE 2, 4	f = 100MHz	-100		100	mV
V_{MAX}	Absolute Max Output Voltage; NOTE 5, 6	f = 100MHz			1150	mV
V_{MIN}	Absolute Min Output Voltage; NOTE 5, 7	f = 100MHz	-300			mV
V_{CROSS}	Absolute Crossing Voltage; NOTE 5, 8, 9	f = 100MHz	250		550	mV
ΔV_{CROSS}	Total Variation of V_{CROSS} over all edges; NOTE 5, 8, 10	f = 100MHz			140	mV
odc	Output Duty Cycle; NOTE 11	f ≤ 200MHz	48	50	52	%

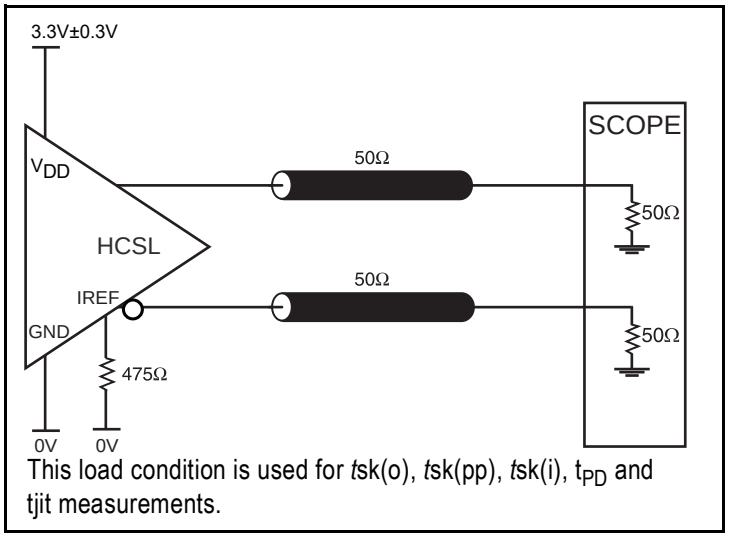
NOTE: Electrical parameters are guaranteed over the specified ambient operating temperature range, which is established when the device is mounted in a test socket with maintained transverse airflow greater than 500 lfpm. The device will meet specifications after thermal equilibrium has been reached under these conditions.
NOTE 1: Measured from the differential input cross point to the differential output crossing point.
NOTE 2: Measurement taken from differential waveform.
NOTE 3: Measurement from -150mV to +150mV on the differential waveform (derived from QX minus nQX). The signal must be monotonic through the measurement region for rise and fall time. The 300mV measurement window is centered on the differential zero crossing.
NOTE 4: T_{STABLE} is the time the differential clock must maintain a minimum ±150mV differential voltage after rising/falling edges before it is allowed to drop back into the V_{RB} = ±100 differential range. See Parameter Measurement Information Section.
NOTE 5: Measurement taken from single-ended waveform.
NOTE 6: Defined as the maximum instantaneous voltage including overshoot. See Parameter Measurement Information Section.
NOTE 7: Defined as the minimum instantaneous voltage including undershoot. See Parameter Measurement Information Section.
NOTE 8: Measured at crossing point where the instantaneous voltage value of the rising edge of QX equals the falling edge of nQX. See Parameter Measurement Information Section
NOTE 9: Refers to the total variation from the lowest crossing point to the highest, regardless of which edge is crossing. Refers to all crossing points for this measurement. See Parameter Measurement Information Section.
NOTE 10: Defined as the total variation of all crossing voltage of rising QX and falling nQX. This is the maximum allowed variance in the V_{CROSS} for any particular system. See Parameter Measurement Information Section.
NOTE 11: Input duty cycle must be 50%.
NOTE 12: Matching applies to rising edge rate for QX and falling edge rate for nQX. It is measured using a ±75mV window centered on the median crosspoint where QX meets nQX falling. The median crosspoint is used to calculate the voltage thresholds the oscilloscope is to use for the edge rate calculations. The rise edge rate of QX should be compared to the fall edge rate of nQX, the maximum allowed difference should not exceed 20% of the slowest edge rate.
NOTE 13: Defined as skew between input paths on the same device, using the same input signal levels, measured at one specific output at the differential cross points.
NOTE 14: This parameter is defined in accordance with JEDEC Standard 65.
NOTE 15: Defined as skew between outputs on different devices operating at the same supply voltage and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at the differential cross points.
NOTE 16: Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at the differential cross points.

Parameter Measurement Information



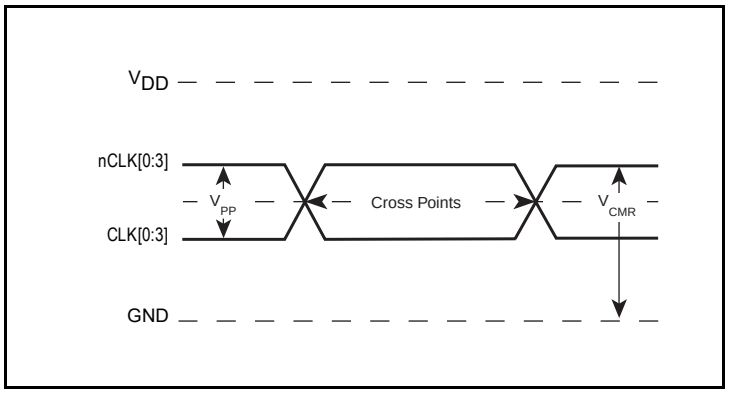
This load condition is used for V_{RB}, V_{MAX}, V_{MIN}, V_{CROSS}, and ΔV_{CROSS} measurements.

3.3V HCSL Output Load AC Test Circuit

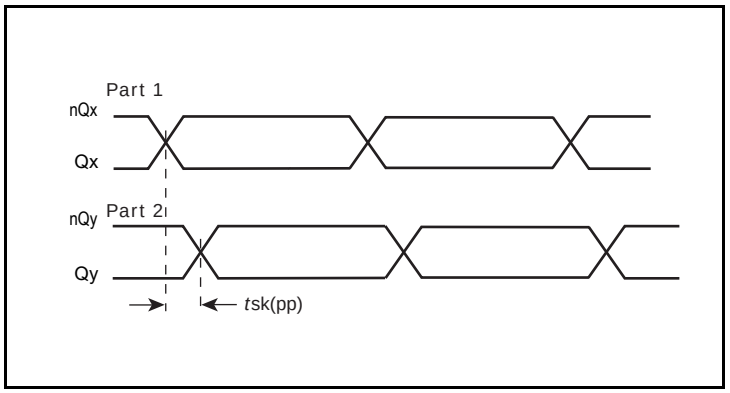


This load condition is used for *t*sk(o), *t*sk(pp), *t*sk(i), t_{PD} and tjit measurements.

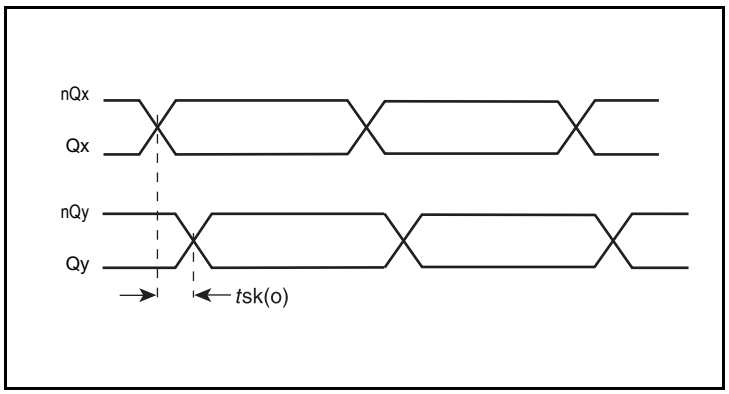
3.3V HCSL Output Load AC Test Circuit



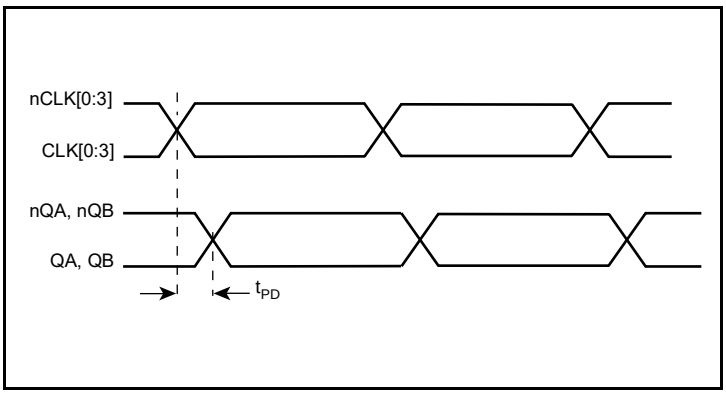
Differential Input Level



Part-to-Part Skew

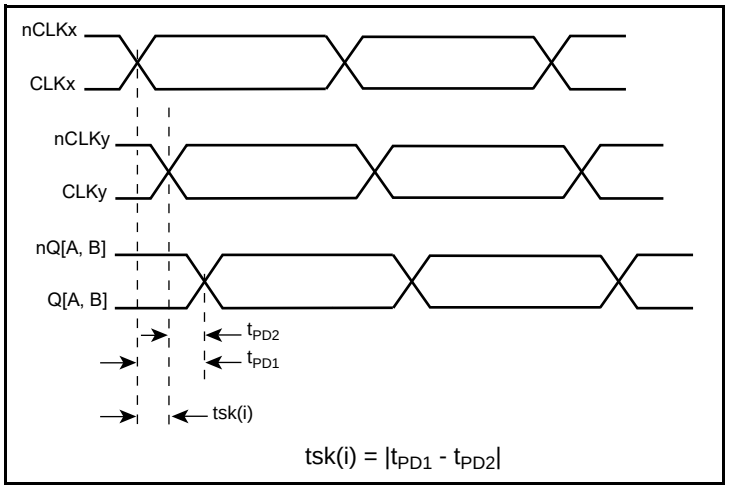


Output Skew

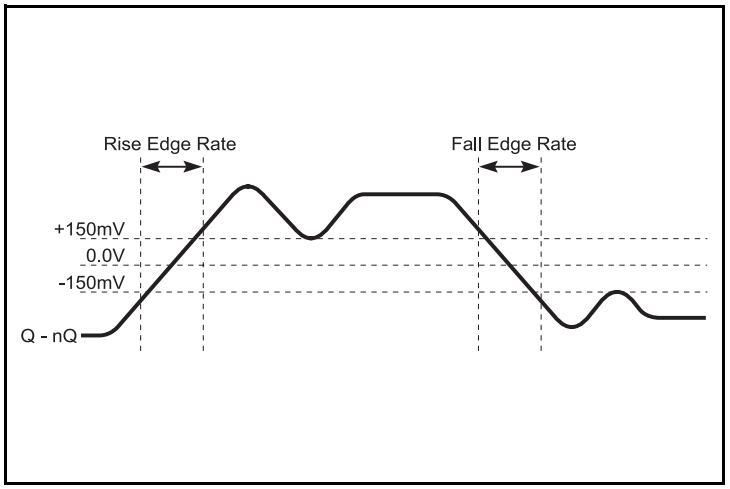


Propagation Delay

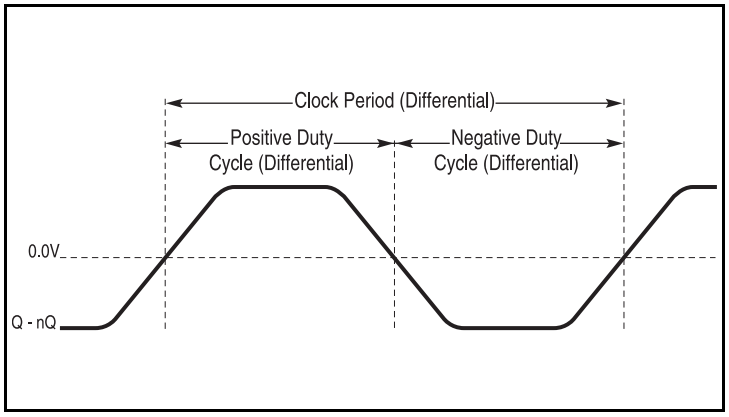
Parameter Measurement Information, continued



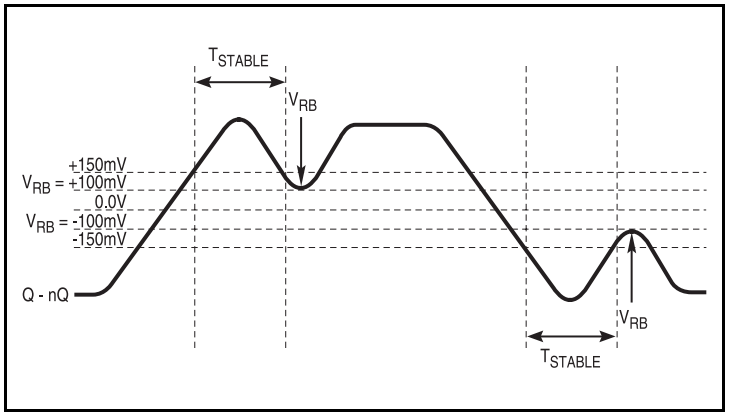
Input Skew



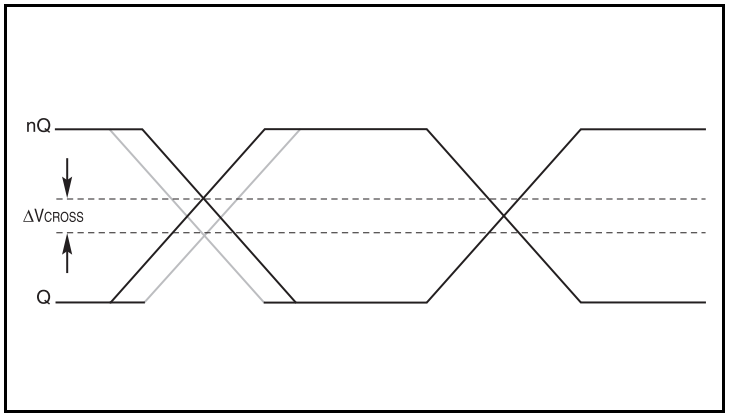
Differential Measurement Points for Rise/Fall Edge Rate



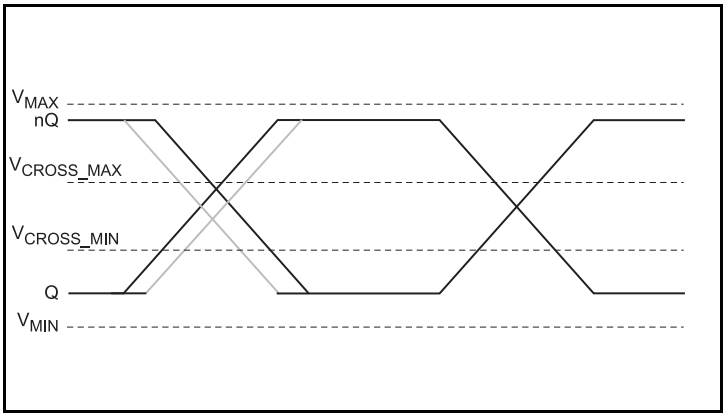
Differential Measurement Points for Duty Cycle/Period



Differential Measurement Points for Ringback

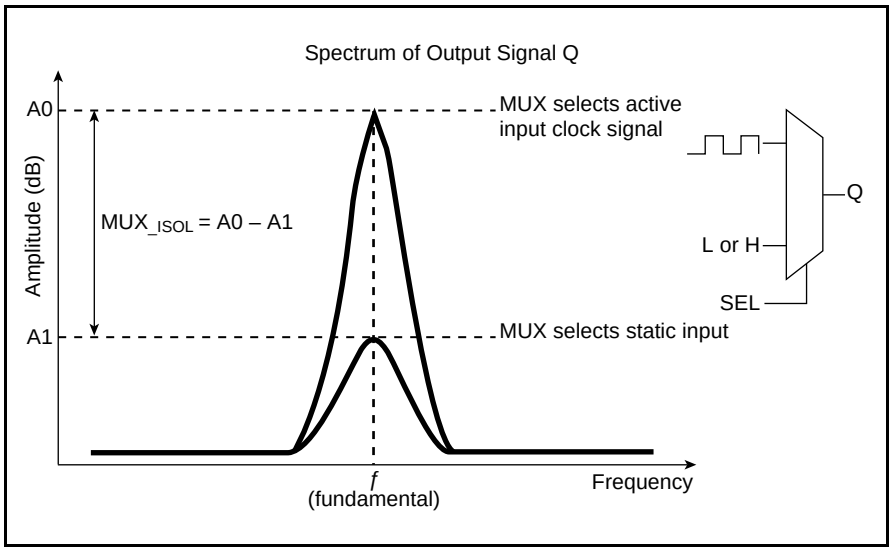


Single-ended Measurement Points for Delta Cross Point



Single-ended Measurement Points for Absolute Cross Point/Swing

Parameter Measurement Information, continued



MUX Isolation

Applications Information

Recommendations for Unused Input and Output Pins

Inputs:

LVCMOS Control Pins

All control pins have internal pullup or pulldown; additional resistance is not required but can be added for additional protection. A 1kΩ resistor can be used.

CLK/nCLK Inputs

For applications not requiring the use of the all differential inputs, any CLK/nCLK input can be left floating. Though not required, but for additional protection, a 1kΩ resistor can be tied from CLK to ground.

Outputs:

Differential Outputs

The unused differential output can be left floating. We recommend that there is no trace attached. Both sides of the differential output pair should either be left floating or terminated.

Wiring the Differential Input to Accept Single-Ended Levels

Figure 1 shows how a differential input can be wired to accept single ended levels. The reference voltage $V_1 = V_{DD}/2$ is generated by the bias resistors R1 and R2. The bypass capacitor (C1) is used to help filter noise on the DC bias. This bias circuit should be located as close to the input pin as possible. The ratio of R1 and R2 might need to be adjusted to position the V_1 in the center of the input voltage swing. For example, if the input clock swing is 2.5V and V_{DD} = 3.3V, R1 and R2 value should be adjusted to set V_1 at 1.25V. The values below are for when both the single ended swing and V_{DD} are at the same voltage. This configuration requires that the sum of the output impedance of the driver (Ro) and the series resistance (Rs) equals the transmission line impedance. In addition, matched termination at the input will attenuate the signal in half. This can be done in one of two ways. First, R3 and R4 in parallel should equal the transmission line impedance. For most 50Ω applications, R3 and R4 can be 100Ω. The values of the resistors can be increased to reduce the loading for slower and weaker LVCMOS driver. When using single-ended signaling, the noise rejection benefits of differential signaling are reduced. Even though the differential input can handle full rail LVCMOS signaling, it is recommended that the amplitude be reduced. The datasheet specifies a lower differential amplitude, however this only applies to differential signals. For single-ended applications, the swing can be larger, however V_{IL} cannot be less than -0.3V and V_{IH} cannot be more than V_{DD} + 0.3V. Though some of the recommended components might not be used, the pads should be placed in the layout. They can be utilized for debugging purposes. The datasheet specifications are characterized and guaranteed by using a differential signal.

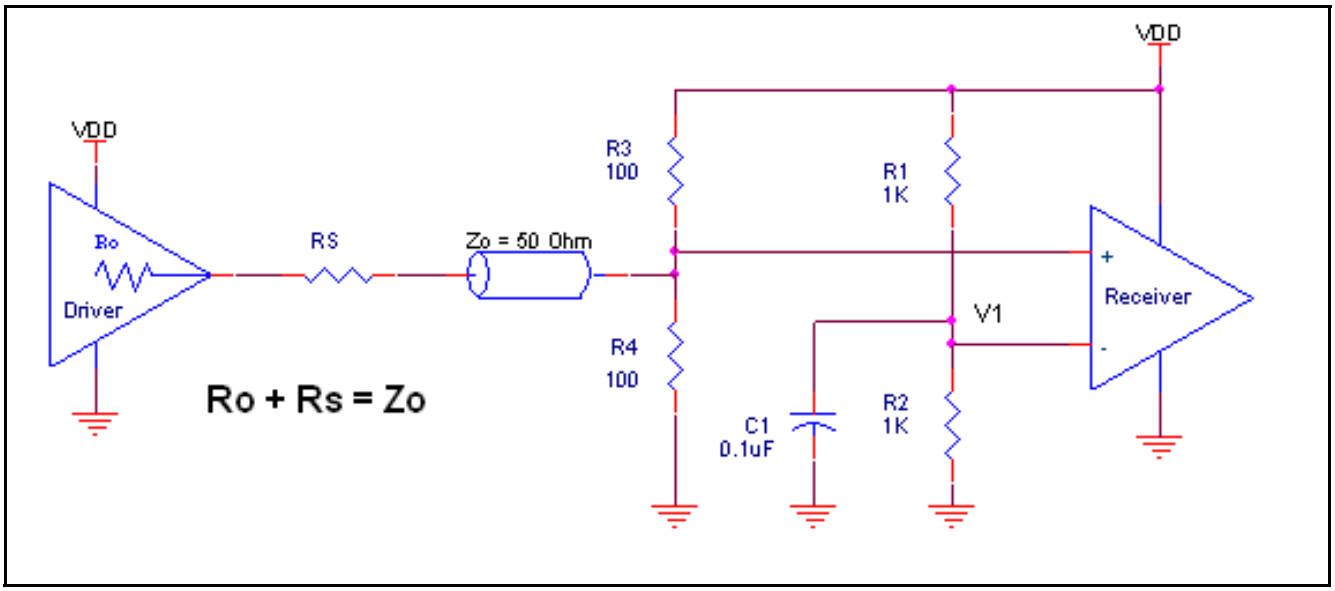


Figure 1. Recommended Schematic for Wiring a Differential Input to Accept Single-ended Levels

Differential Clock Input Interface

The CLK /nCLK accepts LVDS, LVPECL, LVHSTL, HCSL and other differential signals. Both signals must meet the V_{PP} and V_{CMR} input requirements. *Figures 2A to 2E* show interface examples for the CLK/nCLK input driven by the most common driver types. The input interfaces suggested here are examples only. Please consult with the vendor of the driver component to confirm the driver termination requirements. For example, in Figure 2A, the input termination applies for IDT open emitter LVHSTL drivers. If you are using an LVHSTL driver from another vendor, use their termination recommendation.

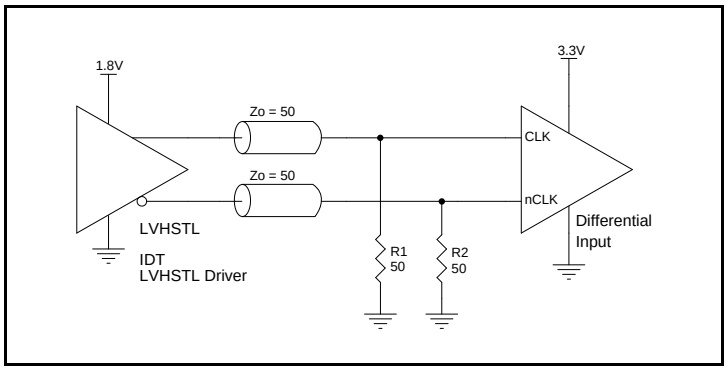


Figure 2A. CLK/nCLK Input Driven by an IDT Open Emitter HiPerClockS LVHSTL Driver

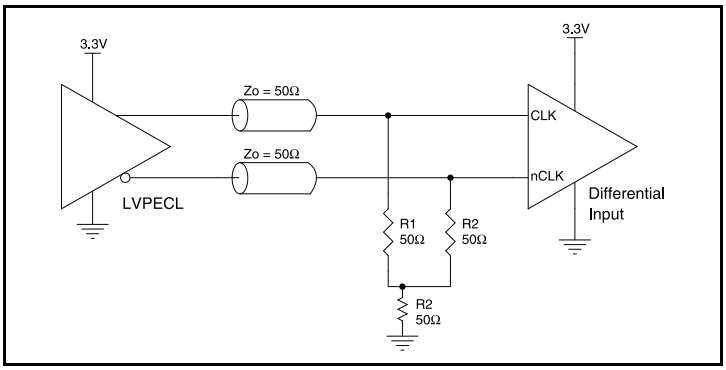


Figure 2B. CLK/nCLK Input Driven by a 3.3V LVPECL Driver

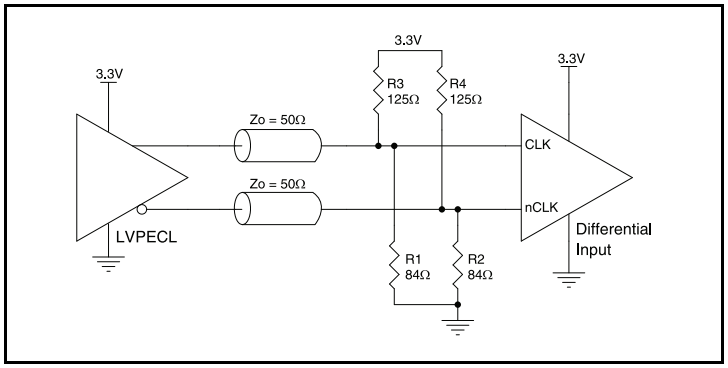


Figure 2C. CLK/nCLK Input Driven by a 3.3V LVPECL Driver

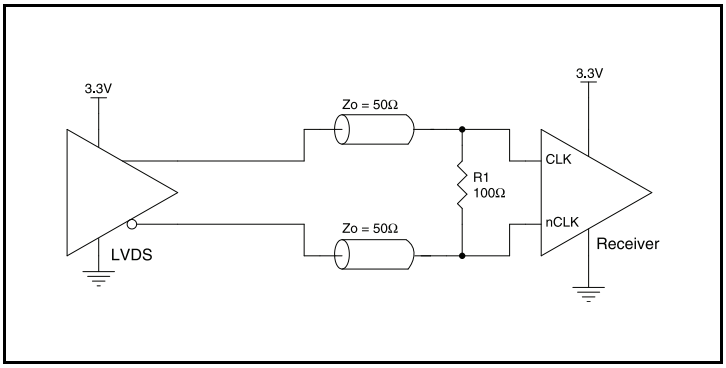


Figure 2D. CLK/nCLK Input Driven by a 3.3V LVDS Driver

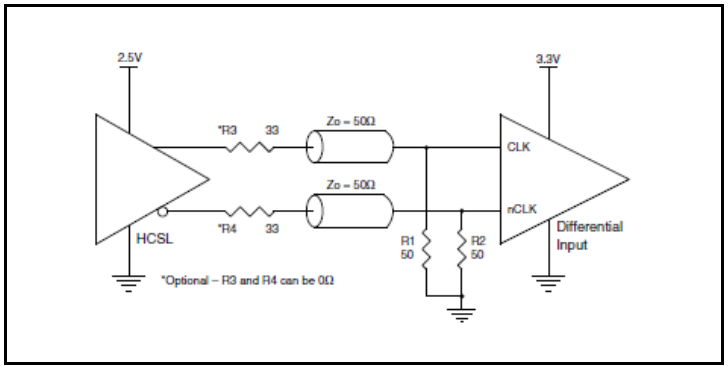


Figure 2E. CLK/nCLK Input Driven by a 3.3V HCSL Driver

Recommended Termination

Figure 3A is the recommended source termination for applications where the driver and receiver will be on a separate PCBs. This termination is the standard for PCI Express™ and HCSL output types.

All traces should be 50Ω impedance single-ended or 100Ω differential.

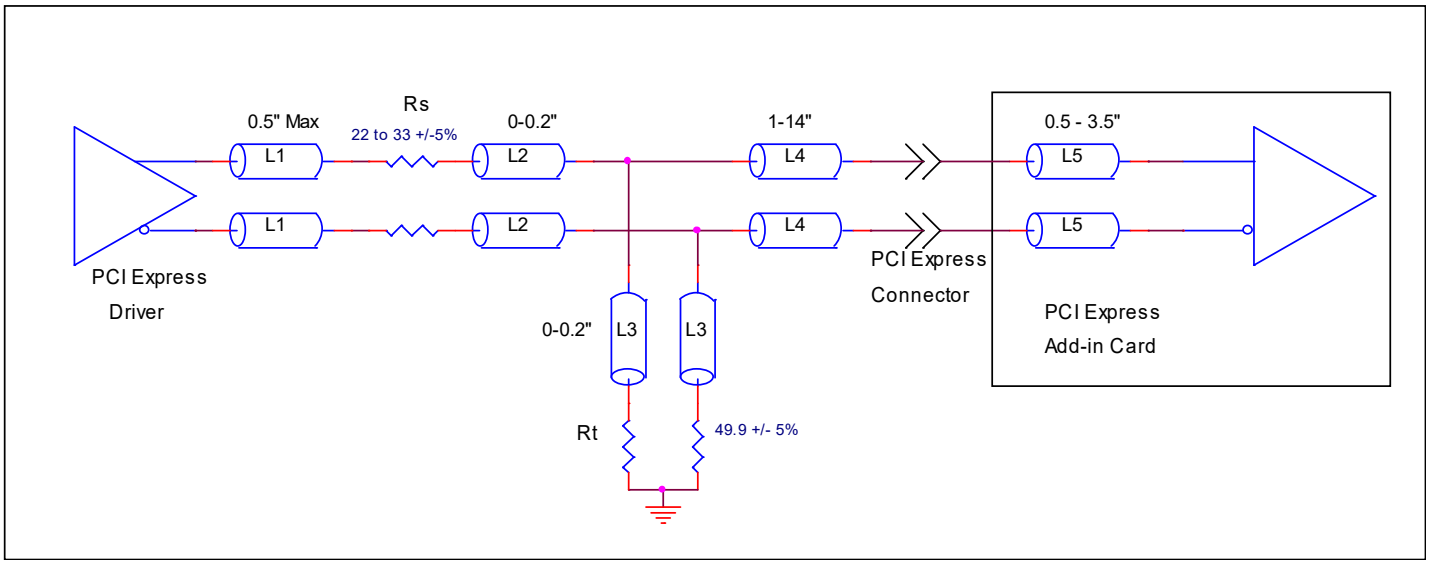


Figure 3A. Recommended Source Termination (where the driver and receiver will be on separate PCBs)

Figure 3B is the recommended termination for applications where a point-to-point connection can be used. A point-to-point connection contains both the driver and the receiver on the same PCB. With a matched termination at the receiver, transmission-line reflections will be minimized. In addition, a series resistor (Rs) at the driver offers flexibility and can help dampen unwanted reflections. The optional resistor can range from 0Ω to 33Ω. All traces should be 50Ω impedance single-ended or 100Ω differential.

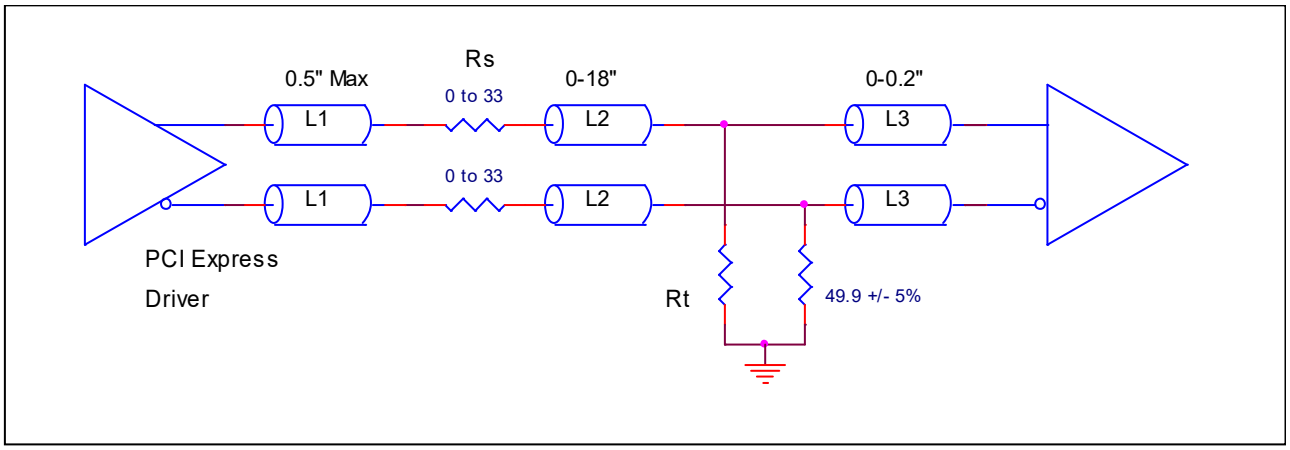


Figure 3B. Recommended Termination (where a point-to-point connection can be used)

PCI Express Application Note

PCI Express jitter analysis methodology models the system response to reference clock jitter. The block diagram below shows the most frequently used *Common Clock Architecture* in which a copy of the reference clock is provided to both ends of the PCI Express Link.

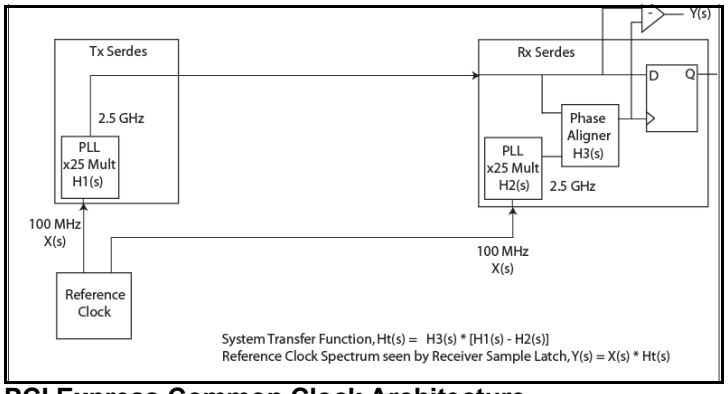
In the jitter analysis, the transmit (Tx) and receive (Rx) SerDes PLLs are modeled as well as the phase interpolator in the receiver. These transfer functions are called H1, H2, and H3 respectively. The overall system transfer function at the receiver is:

$$Ht(s) = H3(s) \times [H1(s) - H2(s)]$$

The jitter spectrum seen by the receiver is the result of applying this system transfer function to the clock spectrum X(s) and is:

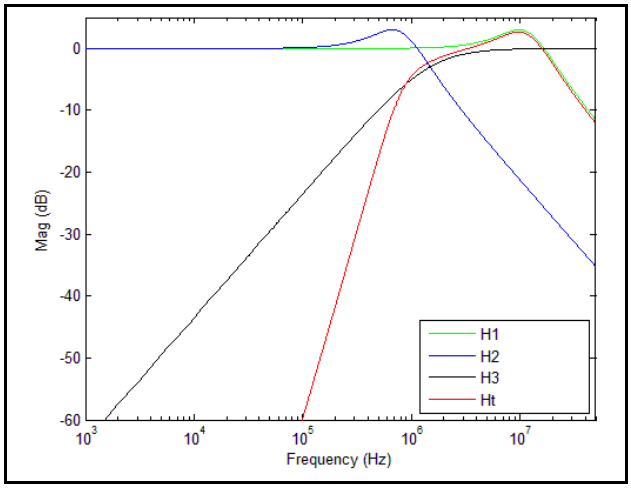
$$Y(s) = X(s) \times H3(s) \times [H1(s) - H2(s)]$$

In order to generate time domain jitter numbers, an inverse Fourier Transform is performed on X(s)*H3(s) * [H1(s) - H2(s)].



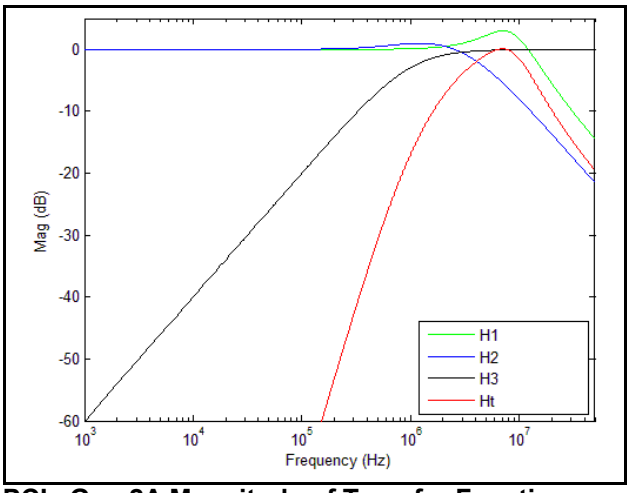
PCI Express Common Clock Architecture

For **PCI Express Gen 1**, one transfer function is defined and the evaluation is performed over the entire spectrum: DC to Nyquist (e.g for a 100MHz reference clock: 0Hz – 50MHz) and the jitter result is reported in peak-peak.

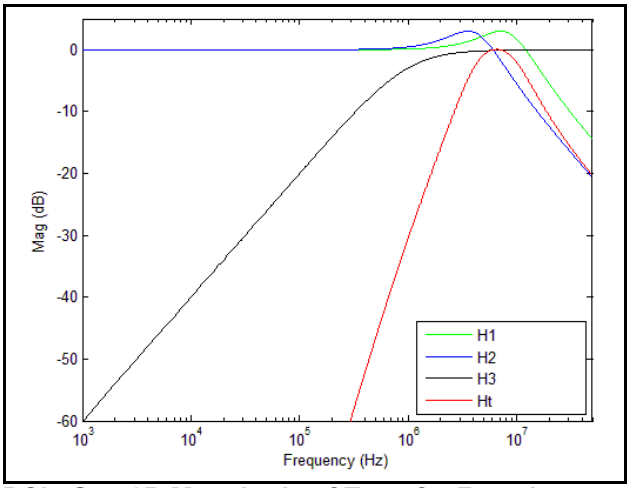


PCIe Gen 1 Magnitude of Transfer Function

For **PCI Express Gen 2**, two transfer functions are defined with 2 evaluation ranges and the final jitter number is reported in RMS. The two evaluation ranges for PCI Express Gen 2 are 10kHz – 1.5MHz (Low Band) and 1.5MHz – Nyquist (High Band). The plots show the individual transfer functions as well as the overall transfer function Ht.

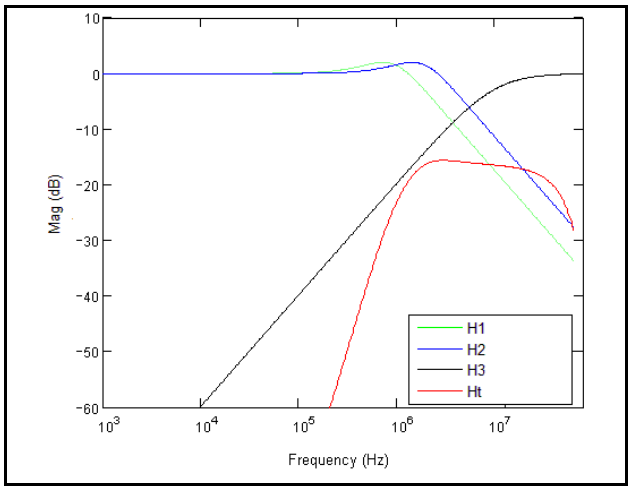


PCIe Gen 2A Magnitude of Transfer Function



PCIe Gen 2B Magnitude of Transfer Function

For **PCI Express Gen 3**, one transfer function is defined and the evaluation is performed over the entire spectrum. The transfer function parameters are different from Gen 1 and the jitter result is reported in RMS.



PCIe Gen 3 Magnitude of Transfer Function

For a more thorough overview of PCI Express jitter analysis methodology, please refer to IDT Application Note *PCI Express Reference Clock Requirements.*

Power Considerations

This section provides information on power dissipation and junction temperature for the 831742I.
Equations and example calculations are also provided.

1.Power Dissipation.

The total power dissipation for the 831742I is the sum of the core power plus the power dissipated in the load(s).
The following is the power dissipation for V_{DD} = 3.3V + 0.3V = 3.6V, which gives worst case results.

NOTE: Please refer to Section 3 for details on calculating power dissipated in the load.

- Power $(core)_{MAX} = V_{DD_MAX} * I_{DD_MAX}$= 3.6V * 26mA = **93.6mW**
- Power $(outputs)_{MAX}$ = **46.8mW/Loaded Output pair**
  If all outputs are loaded, the total power is 2 * 46.8mW = **93.6mW**

Total Power$_{MAX}$ = 93.6mW + 93.6mW = **187.2mW**

2. Junction Temperature.

Junction temperature, Tj, is the temperature at the junction of the bond wire and bond pad and directly affects the reliability of the device. The maximum recommended junction temperature for devices is 125°C.

The equation for Tj is as follows: $Tj = \theta_{JA} * Pd_total + T_A$

Tj = Junction Temperature

θ_{JA} = Junction-to-Ambient Thermal Resistance

Pd_total = Total Device Power Dissipation (example calculation is in section 1 above)

T_A = Ambient Temperature

In order to calculate junction temperature, the appropriate junction-to-ambient thermal resistance θ_{JA} must be used. Assuming no air flow and a multi-layer board, the appropriate value is 87.8°C/W per Table 6 below.

Therefore, Tj for an ambient temperature of 85°C with all outputs switching is:

85°C + 0.187W * 87.8°C/W = 101.4°C. This is below the limit of 125°C.

This calculation is only an example. Tj will obviously vary depending on the number of loaded outputs, supply voltage, air flow and the type of board (single layer or multi-layer).

Table 6. Thermal Resistance θ_{JA} for 24 Lead TSSOP, Forced Convection

θ_{JA} **vs. Air Flow**			
Meters per Second	**0**	**1**	**2.5**
Multi-Layer PCB, JEDEC Standard Test Boards	87.8°C/W	83.5°C/W	81.3°C/W

3. Calculations and Equations.

The purpose of this section is to calculate power dissipation on the IC per HCSL output pair.

HCSL output driver circuit and termination are shown in *Figure 4.*

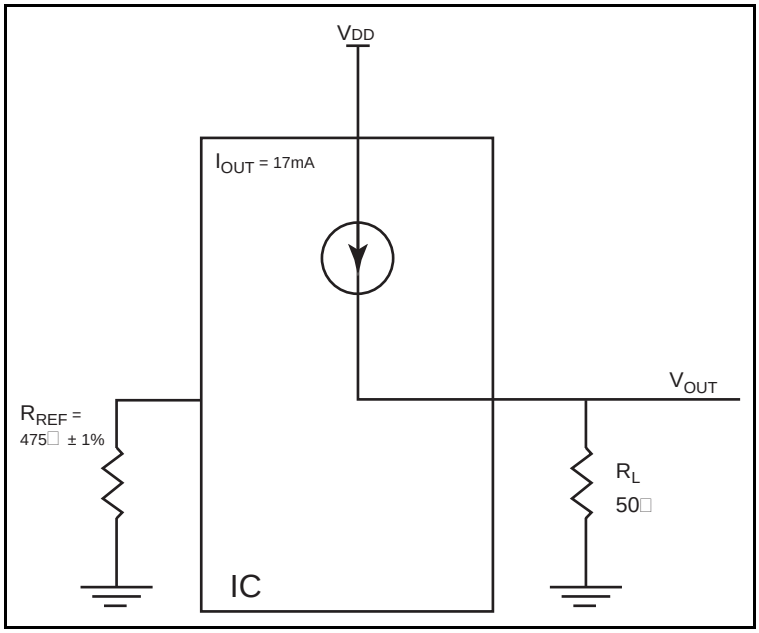


Figure 4. HCSL Driver Circuit and Termination

HCSL is a current steering output which sources a maximum of 17mA of current per output. To calculate worst case on-chip power dissipation, use the following equations which assume a 50Ω load to ground.

The highest power dissipation occurs when V_{DD_MAX}.

Power = $(V_{DD_MAX} – V_{OUT}) * I_{OUT}$,
since $V_{OUT} = I_{OUT} * R_L$

$= (V_{DD_MAX} – I_{OUT} * R_L) * I_{OUT}$

$= (3.6V – 17mA * 50\Omega) * 17mA$

Total Power Dissipation per output pair = **46.8mW**

Reliability Information

Table 7. θ_{JA} vs. Air Flow Table for a 24 Lead TSSOP

θ_{JA} vs. Air Flow			
Meters per Second	**0**	**1**	**2.5**
Multi-Layer PCB, JEDEC Standard Test Boards	87.8°C/W	83.5°C/W	81.3°C/W

Transistor Count

The transistor count for the 831742I is: 765

Package Outline Drawings

The package outline drawings are located at the end of this document and are accessible from the Renesas website (see Ordering Information for POD links). The package information is the most current data available and is subject to change without revision of this document.

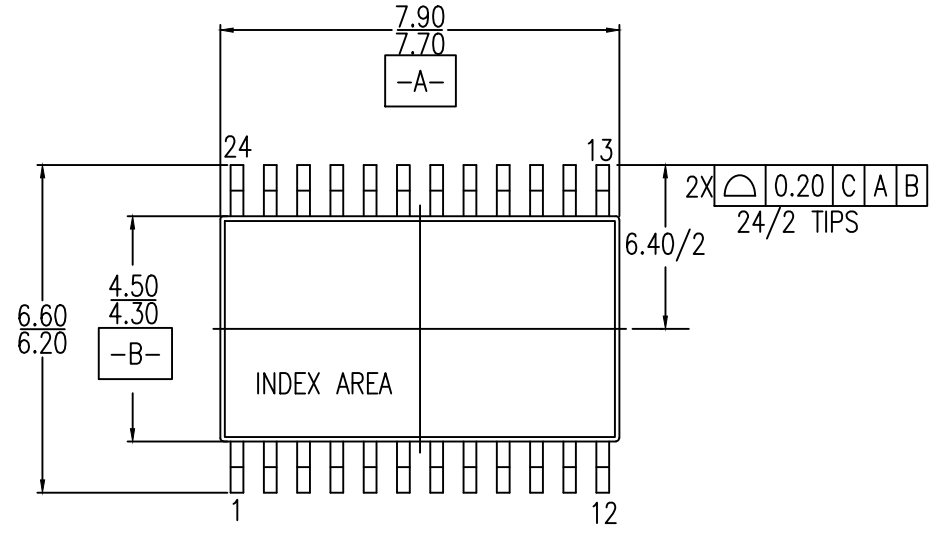
Table 9. Ordering Information

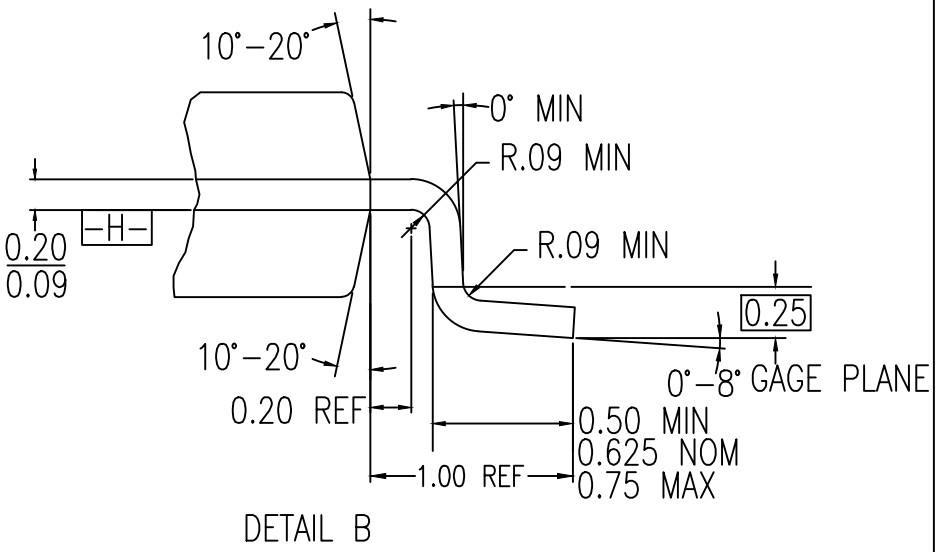
Part/Order Number	Marking	Package	Shipping Packaging	Temperature
831742AGILF	ICS831742AGIL	4.4 × 7.8 × 0.925 mm 24-TSSOP	Tube	-40°C to 85°C
831742AGILFT	ICS831742AGIL		Tape & Reel	-40°C to 85°C

Revision History

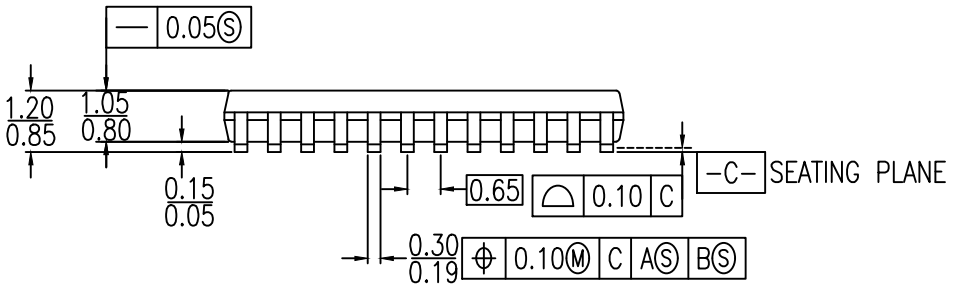
Revision Date	Description of Change
July 30, 2021	▪ Updated first page description and features to Gen4. ▪ Updated Phase Jitter table 5A. ▪ Updated Package Outline Drawings section and Ordering Information table.
August 18, 2017	Updated the block diagram.

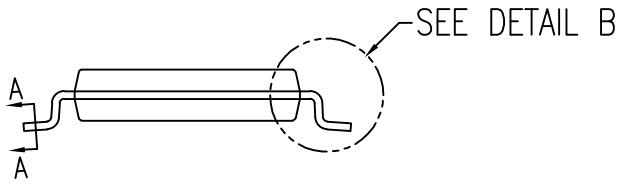
DATE CREATED	REVISIONS		
	REV	DESCRIPTION	APPROVED
7/18/18	00	Revised from PSC-4056_09	R.C

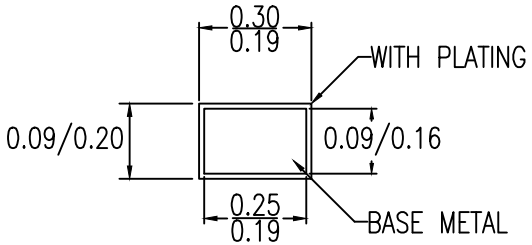




DETAIL B







SECTION A-A

NOTES:
1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. ALL DIMENSION ARE IN MM.

TOLERANCES UNLESS SPECIFIED
DECIMAL ANGULAR
XX± ±
XXX±
XXXX±

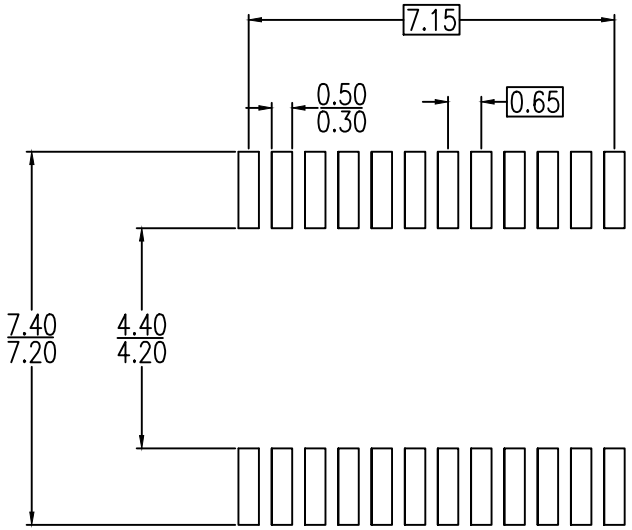
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PHONE: (408) 284-8200
FAX: (408) 284-3572

TITLE: PGG24 Package Outline Drawing
4.4 mm Body, 0.65mm Pitch
TSSOP

SIZE	DRAWING No.	REV
C	PSC-4771	00

DO NOT SCALE DRAWING | SHEET 1 OF 2

DATE CREATED	REVISIONS		
	REV	DESCRIPTION	APPROVED
7/18/18	00	Revised from PSC-4056_09	R.C



RECOMMENDED LAND PATTERN DIMENSIONS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS

TOLERANCES UNLESS SPECIFIED		
DECIMAL	ANGULAR	
XX±	±	
XXX±		
XXXX±		

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(Rev.1.0 Mar 2020)

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