

## Description

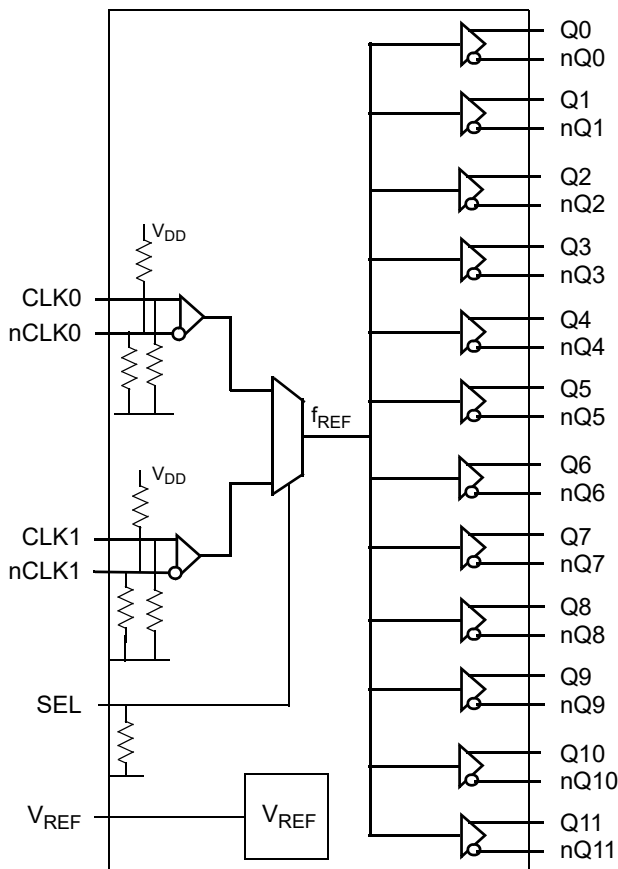
The IDT8P34S1212I is a high-performance differential LVDS fanout buffer. The device is designed for the fanout of high-frequency, very low additive phase-noise clock and data signals. The IDT8P34S1212I is characterized to operate from a 1.8V power supply. Guaranteed output-to-output and part-to-part skew characteristics make the IDT8P34S1212I ideal for those clock distribution applications that demand well-defined performance and repeatability.

Two selectable differential inputs and 12 low skew outputs are available. The integrated bias voltage reference enables easy interfacing of single-ended signals to the device inputs. The device is optimized for low power consumption and low additive phase noise.

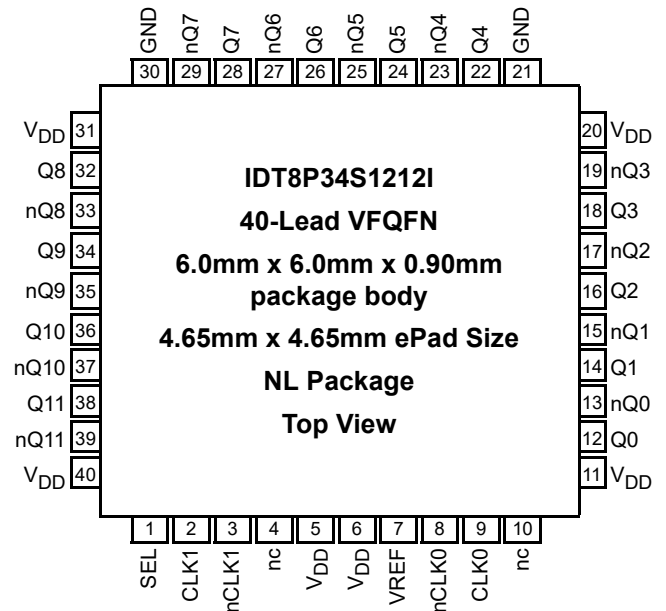
## Features

- 12 low skew, low additive jitter LVDS output pairs
- Two selectable, differential clock input pairs
- Differential CLK0, CLK1 pairs can accept the following differential input levels: LVDS, CML
- Maximum input clock frequency: 1.2GHz (maximum)
- LVCMOS/LVTTL interface levels for the control input select pin
- Output skew: 10ps (typical)
- Propagation delay: 340ps (typical)
- Low additive phase jitter, RMS;  $f_{REF} = 156.25\text{MHz}$ ,  $V_{PP} = 1\text{V}$ , 12kHz- 20MHz: 41fs (typical)
- Maximum device current consumption ( $I_{DD}$ ): 227mA (maximum) at 1.89V
- Full 1.8V supply voltage
- Lead-free (RoHS 6), 40-Lead VFQFN packaging
- -40°C to 85°C ambient operating temperature

## Block Diagram



## Pin Assignment



## Pin Descriptions and Characteristics

**Table 1. Pin Descriptions**<sup>Note 1.</sup>

Number	Name	Type		Description
1	SEL	Input	Pulldown	Reference select control. See Table 3 for function. LVCMOS/LVTTL interface levels.
2	CLK1	Input	Pulldown	Non-inverting differential clock/data input.
3	nCLK1	Input	Pulldown/ Pullup	Inverting differential clock/data input.
4, 10	nc	Unused		Do not connect.
5, 6, 11, 20, 31, 40	V <sub>DD</sub>	Power		Power supply pins.
7	V <sub>REF</sub>			Bias voltage reference. Provides an input bias voltage for the CLKx, nCLKx input pairs in AC-coupled applications. Refer to <i>Figures 2B and 2C</i> for applicable AC-coupled input interfaces.
8	nCLK0	Input	Pulldown/ Pullup	Inverting differential clock/data input.
9	CLK0	Input	Pulldown	Non-inverting differential clock/data input.
12, 13	Q0, nQ0	Output		Differential output pair 0. LVDS interface levels.
14, 15	Q1, nQ1	Output		Differential output pair 1. LVDS interface levels.
16, 17	Q2, nQ2	Output		Differential output pair 2. LVDS interface levels.
18, 19	Q3, nQ3	Output		Differential output pair 3. LVDS interface levels.
21, 30	GND	Power		Power supply ground.
22, 23	Q4, nQ4	Output		Differential output pair 4. LVDS interface levels.
24, 25	Q5, nQ5	Output		Differential output pair 5. LVDS interface levels.
26, 27	Q6, nQ6	Output		Differential output pair 6. LVDS interface levels.
28, 29	Q7, nQ7	Output		Differential output pair 7. LVDS interface levels.
32, 33	Q8, nQ8	Output		Differential output pair 8. LVDS interface levels.
34, 35	Q9, nQ9	Output		Differential output pair 9. LVDS interface levels.
36, 37	Q10, nQ10	Output		Differential output pair 10. LVDS interface levels.
38, 39	Q11, nQ11	Output		Differential output pair 11. LVDS interface levels.

1. Pulldown and Pullup refers to an internal input resistors. See Table 2, *Pin Characteristics*, for typical values.

**Table 2. Pin Characteristics**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
C <sub>IN</sub>	Input Capacitance			2		pF
R <sub>PULLDOWN</sub>	Input Pulldown Resistor			51		kΩ
R <sub>PULLUP</sub>	Input Pullup Resistor			51		kΩ

**Table 3. SEL Input Function Table**<sup>Note 1.</sup>

Input	Operation
SEL	
0 (Default)	CLK0, nCLK0 is the selected differential clock input.
1	CLK1, nCLK1 is the selected differential clock input.

1. SEL is an asynchronous control.

## 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 the 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, $I_O$ Continuous Current Surge Current	10mA 15mA
Input Sink/Source, $I_{REF}$	$\pm 2mA$
Maximum Junction Temperature, $T_{J,MAX}$	125°C
Storage Temperature, $T_{STG}$	-65°C to 150°C
ESD - Human Body Model <sup>Note 1.</sup>	2000V
ESD - Charged Device Model <sup>Note 1.</sup>	1500V

1. According to JEDEC JS-001-2012/JESD11-C101E.

## DC Electrical Characteristics

**Table 4A. Power Supply DC Characteristics,  $V_{DD} = 1.8V \pm 5\%$ ,  $T_A = -40^\circ C$  to  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{DD}$	Power Supply Voltage		1.71	1.8	1.89	V
$I_{DD}$	Power Supply Current	Q0 to Q11 terminated 100Ω between nQx, Qx		185	227	mA

**Table 4B. LVC MOS/LVTTL DC Characteristics,  $V_{DD} = 1.8V \pm 5\%$ ,  $T_A = -40^\circ C$  to  $85^\circ C$**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{IH}$	Input High Voltage		$0.65 * V_{DD}$		$V_{DD} + 0.3$	V
$V_{IL}$	Input Low Voltage		-0.3		$0.35 * V_{DD}$	V
$I_{IH}$	Input High Current	SEL $V_{DD} = V_{IN} = 1.89V$			150	μA
$I_{IL}$	Input Low Current	SEL $V_{DD} = 1.89V, V_{IN} = 0V$	-10			μA

**Table 4C. Differential Inputs Characteristics,  $V_{DD} = 1.8V \pm 5\%$ ,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter		Test Conditions	Minimum	Typical	Maximum	Units
$I_{IH}$	Input High Current	CLK0, CLK1, nCLK0, nCLK1	$V_{IN} = V_{DD} = 1.89V$			150	$\mu\text{A}$
$I_{IL}$	Input Low Current	CLK0, CLK1	$V_{IN} = 0V, V_{DD} = 1.89V$	-10			$\mu\text{A}$
		nCLK0, nCLK1	$V_{IN} = 0V, V_{DD} = 1.89V$	-150			$\mu\text{A}$
$V_{REF}$	Reference Voltage for Input Bias <sup>Note 1.</sup> Note 3.		$I_{REF} = +100\mu\text{A}, V_{DD} = 1.8V$	0.9		1.30	V
$V_{PP}$	Peak-to-Peak Voltage		$V_{DD} = 1.89V$	0.2		1.0	V
$V_{CMR}$	Common Mode Input Voltage <sup>Note 2. Note 3.</sup>			0.9		$V_{DD} - (V_{PP}/2)$	V

- $V_{REF}$  specification is applicable to the AC-coupled input interfaces shown in *Figures 2B and 2C*.
- Common mode input voltage is defined as crosspoint voltage.
- $V_{IL}$  should not be less than  $-0.3V$  and  $V_{IH}$  should not be higher than  $V_{DD}$ .

**Table 4D. LVDS DC Characteristics,  $V_{DD} = 1.8V \pm 5\%$ ,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$  <sup>Note 1.</sup>**

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$V_{OD}$	Differential Output Voltage	outputs loaded with $100\Omega$	247		454	mV
$\Delta V_{OD}$	$V_{OD}$ Magnitude Change				50	mV
$V_{OS}$	Offset Voltage		1.00		1.40	V
$\Delta V_{OS}$	$V_{OS}$ Magnitude Change				50	mV

- Output drive current must be sufficient to drive up to 30cm of PCB trace (assume nominal  $50\Omega$  impedance).

## AC Electrical Characteristics

**Table 5. AC Electrical Characteristics,  $V_{DD} = 1.8V \pm 5\%$ ,  $T_A = -40^\circ C$  to  $85^\circ C$  <sup>Note 1.</sup>**

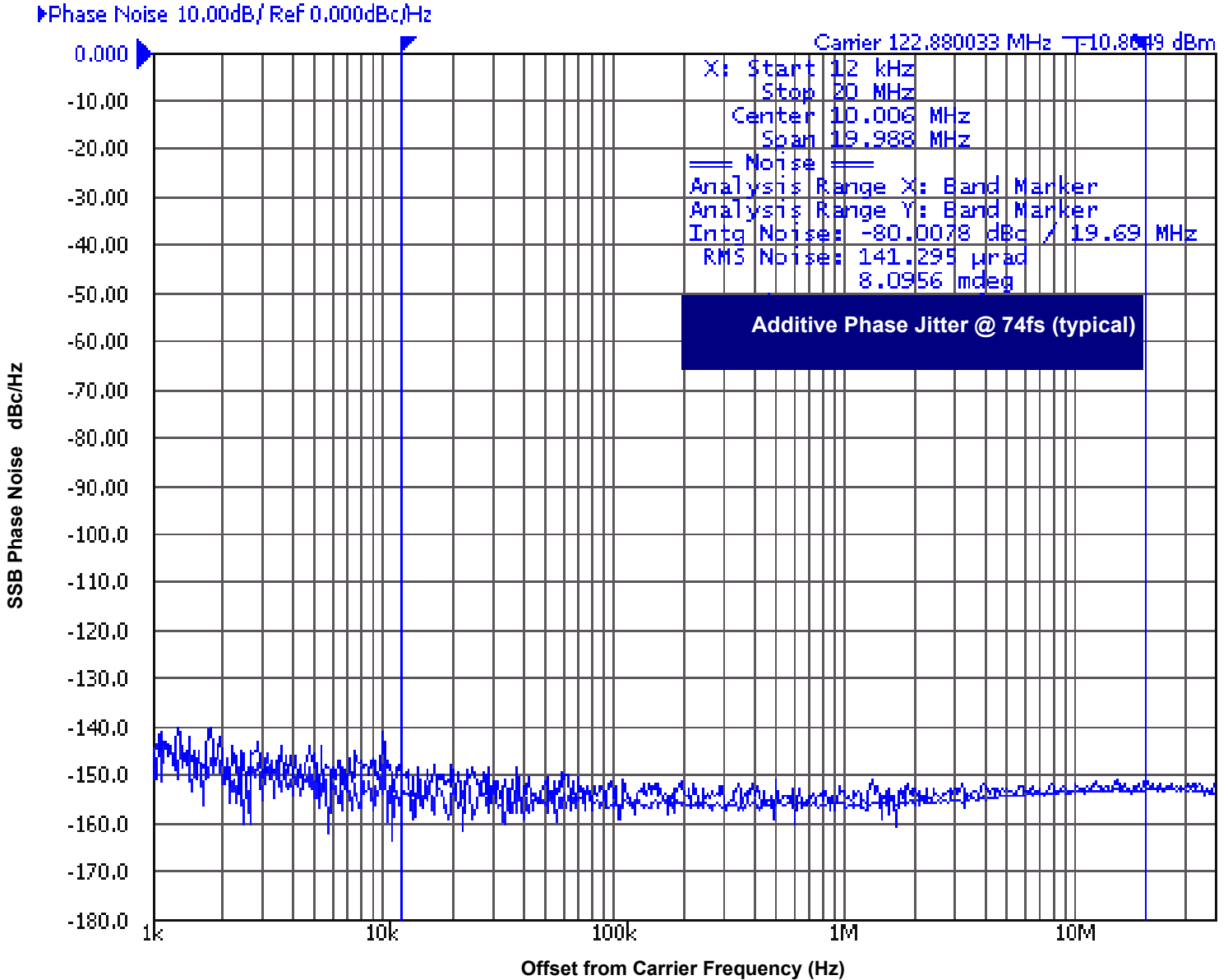
Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$f_{REF}$	Input Frequency CLK[0:1], nCLK[0:1]				1.2	GHz
$\Delta V/\Delta t$	Input Edge Rate CLK[0:1], nCLK[0:1]		1.5			V/ns
$t_{PD}$	Propagation Delay <sup>Note 2.</sup> Note 3.	CLK[0:1]; nCLK[0:1] to any Qx, nQx	200	340	450	ps
$t_{sk(o)}$	Output Skew <sup>Note 4. Note 5.</sup>			10	45	ps
$t_{sk(i)}$	Input Skew <sup>Note 5.</sup>			5	45	ps
$t_{sk(p)}$	Pulse Skew	$f_{REF} = 100MHz$		3	20	ps
$t_{sk(pp)}$	Part-to-Part Skew <sup>Note 6.</sup>				250	ps
$t_{JIT}$	Buffer Additive Phase Jitter, RMS; refer to Additive Phase Jitter Section	$f_{REF} = 122.88MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 1kHz – 40MHz		89	200	fs
		$f_{REF} = 122.88MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 10kHz – 20MHz		74	150	fs
		$f_{REF} = 122.88MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 12kHz – 20MHz		74	150	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 1kHz – 40MHz		58	81	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 10kHz – 20MHz		41	60	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 1V$ , Integration Range: 12kHz – 20MHz		41	60	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 0.5V$ , Integration Range: 1kHz – 40MHz		85	123	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 0.5V$ , Integration Range: 10kHz – 20MHz		61	87	fs
		$f_{REF} = 156.25MHz$ Square Wave, $V_{PP} = 0.5V$ , Integration Range: 12kHz – 20MHz		61	87	fs
$t_R / t_F$	Output Rise/ Fall Time	10% to 90%, outputs loaded with 100 $\Omega$		225	400	ps
		20% to 80%, outputs loaded with 100 $\Omega$		110	260	ps
$MUX_{ISOLATION}$	Mux Isolation <sup>Note 7.</sup>	$f_{REF} = 100MHz$		72.6		dB

- 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 lpm. The device will meet specifications after thermal equilibrium has been reached under these conditions.
- Measured from the differential input crossing point to the differential output crossing point
- Input  $V_{PP} = 400mV$
- Defined as skew between outputs at the same supply voltage and with equal load conditions. Measured at the differential cross points.
- This parameter is defined in accordance with JEDEC Standard 65.
- Defined as skew between outputs on different devices operating at the same supply voltage, same frequency, same temperature and with equal load conditions. Using the same type of inputs on each device, the outputs are measured at the differential cross points.
- Qx, nQx outputs measured differentially. See *MUX Isolation diagram* in the *Parameter Measurement Information* section.

## Additive Phase Jitter

The spectral purity in a band at a specific offset from the fundamental compared to the power of the fundamental is called the **dBc Phase Noise**. This value is normally expressed using a Phase noise plot and is most often the specified plot in many applications. Phase noise is defined as the ratio of the noise power present in a 1Hz band at a specified offset from the fundamental frequency to the power value of the fundamental. This ratio is expressed in decibels (dBm) or a ratio

of the power in the 1Hz band to the power in the fundamental. When the required offset is specified, the phase noise is called a **dBc** value, which simply means dBm at a specified offset from the fundamental. By investigating jitter in the frequency domain, we get a better understanding of its effects on the desired application over the entire time record of the signal. It is mathematically possible to calculate an expected bit error rate given a phase noise plot.



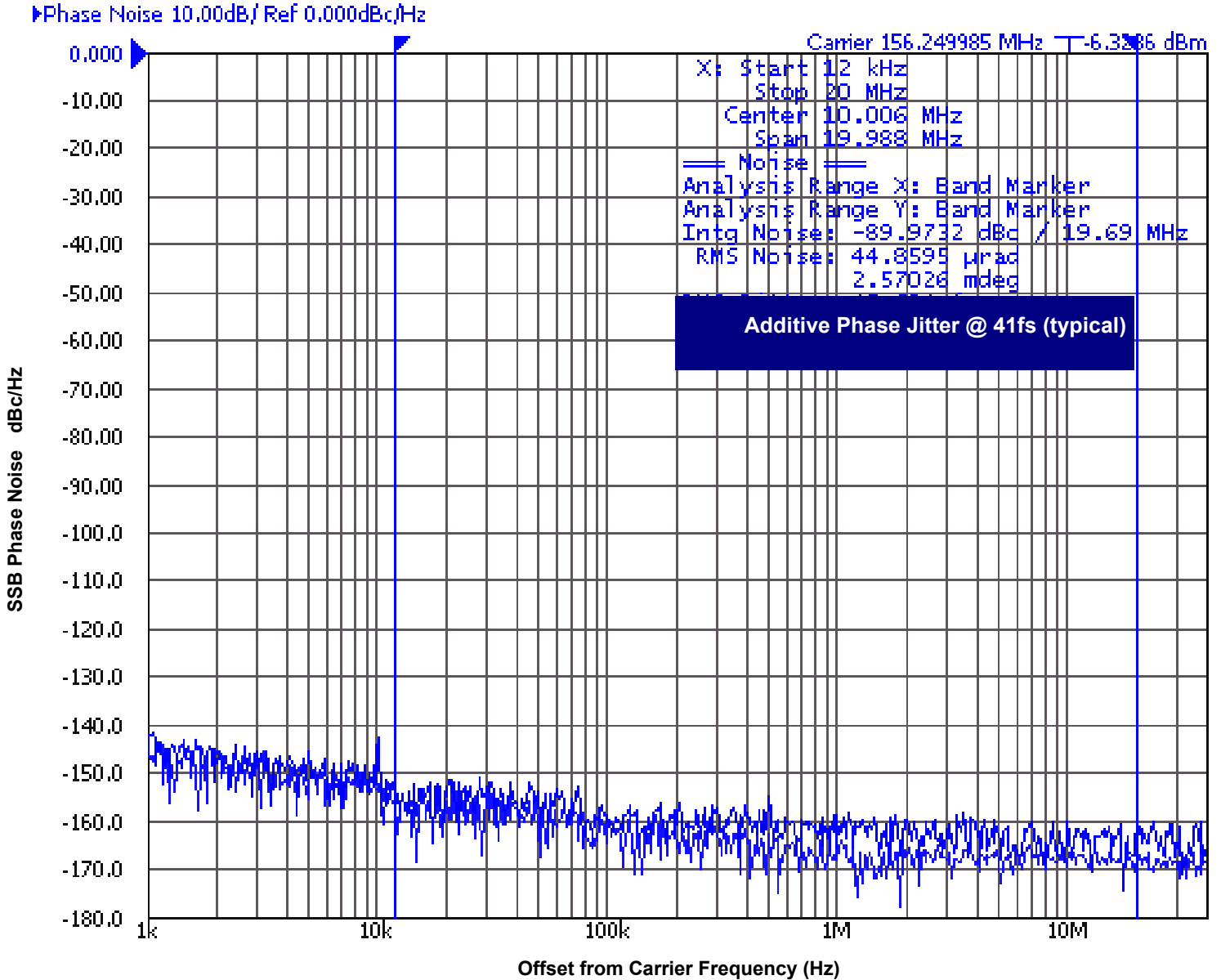
As with most timing specifications, phase noise measurements have issues relating to the limitations of the measurement equipment. The noise floor of the equipment can be higher or lower than the noise floor of the device. Additive phase noise is dependent on both the noise floor of the input source and measurement equipment.

Measured using a Wenzel Oscillator as the input source.

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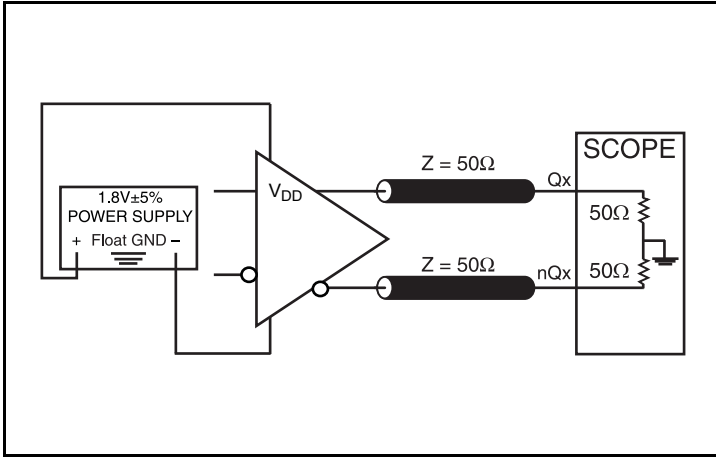
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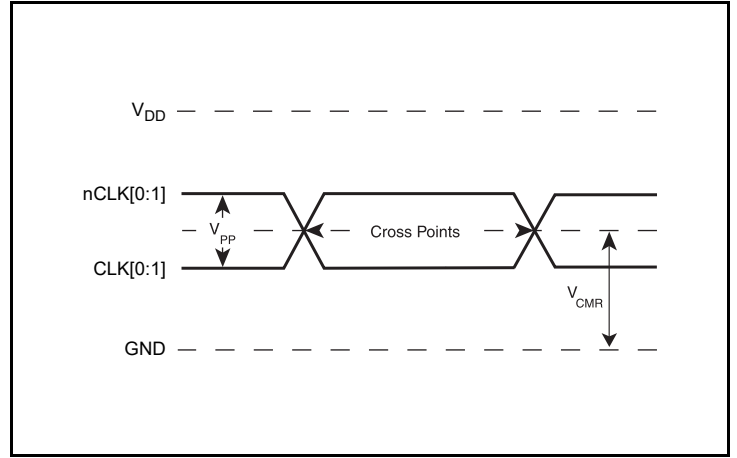
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Measured using a Wenzel Oscillator as the input source.

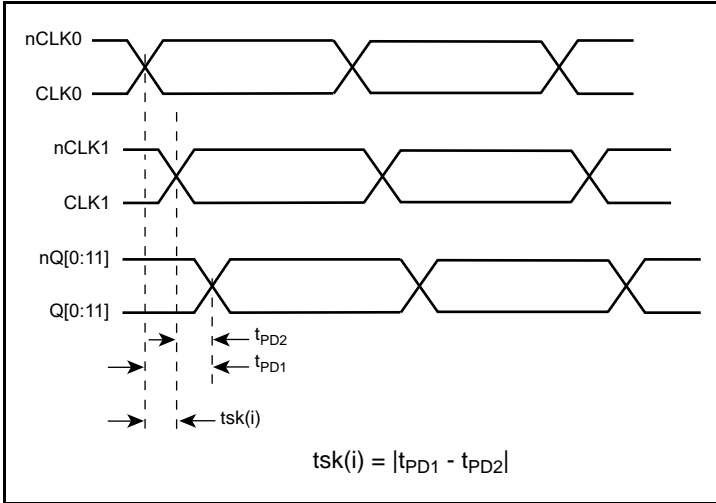
## Parameter Measurement Information



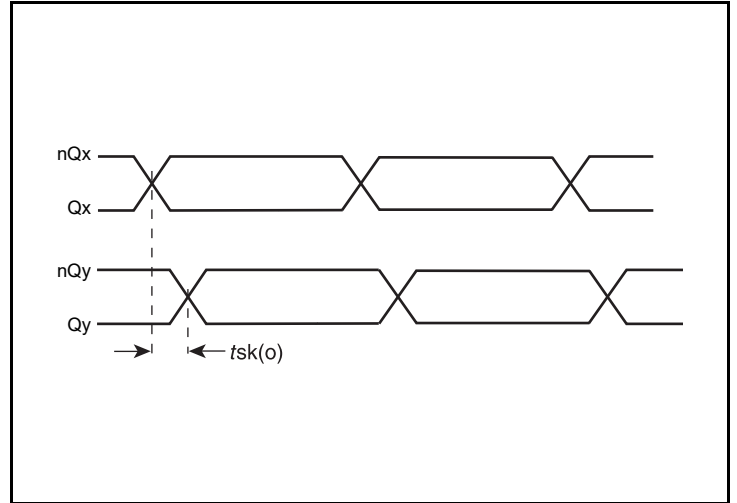
1.8V ±5% LVDS Output Load Test Circuit



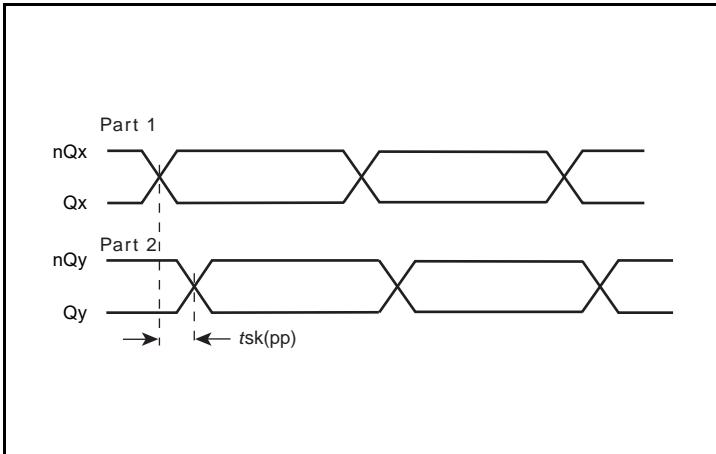
Differential Input Level



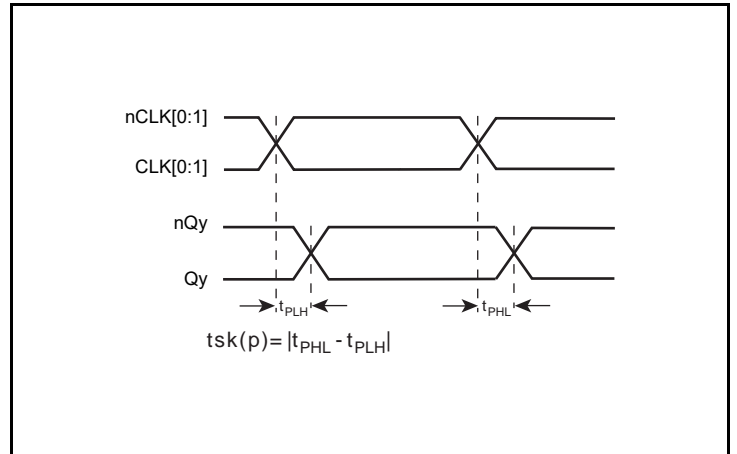
Input Skew



Output Skew



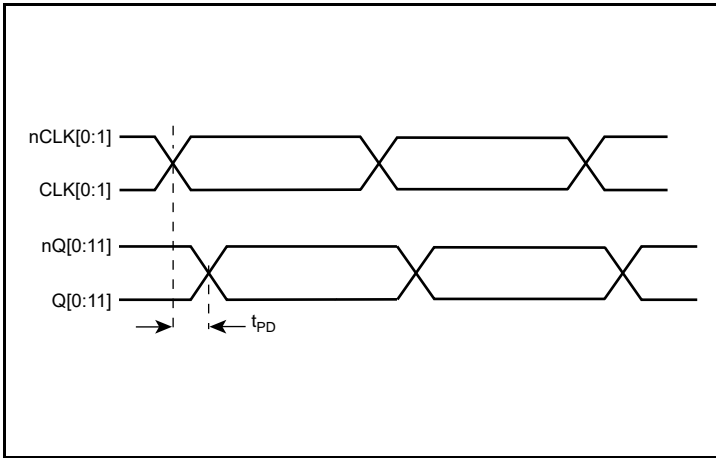
Part-to-Part Skew



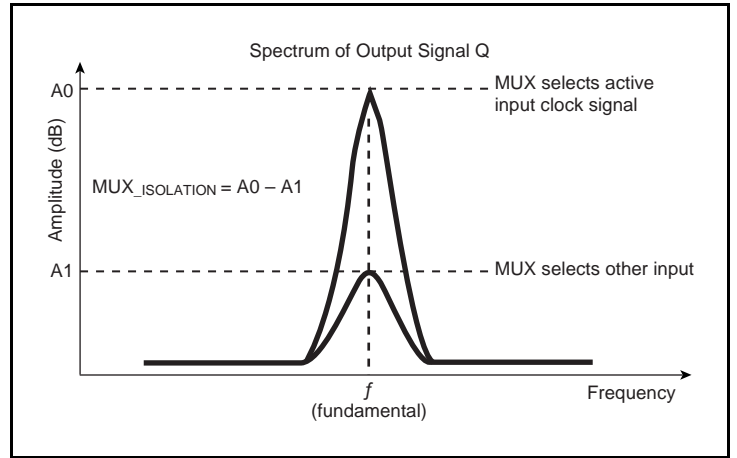
Pulse Skew



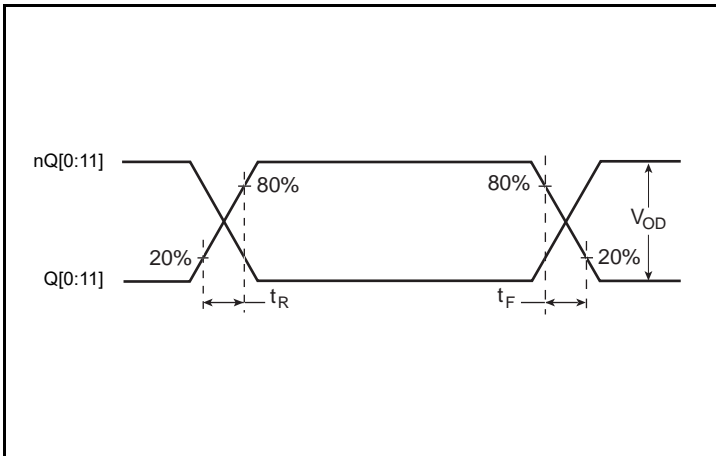
## Parameter Measurement Information, continued



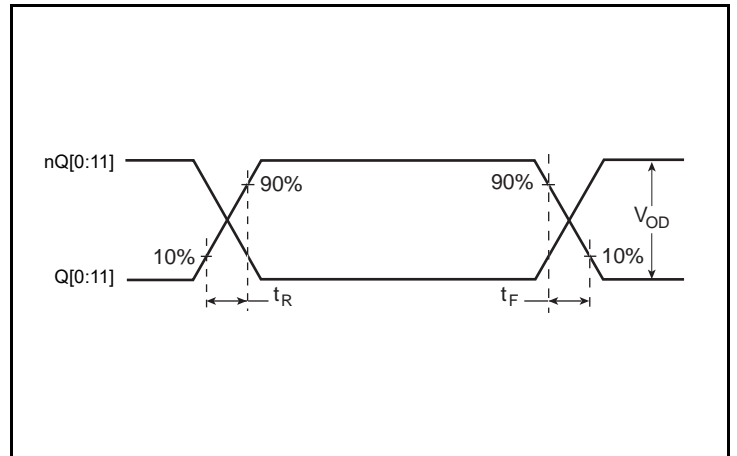
**Propagation Delay**



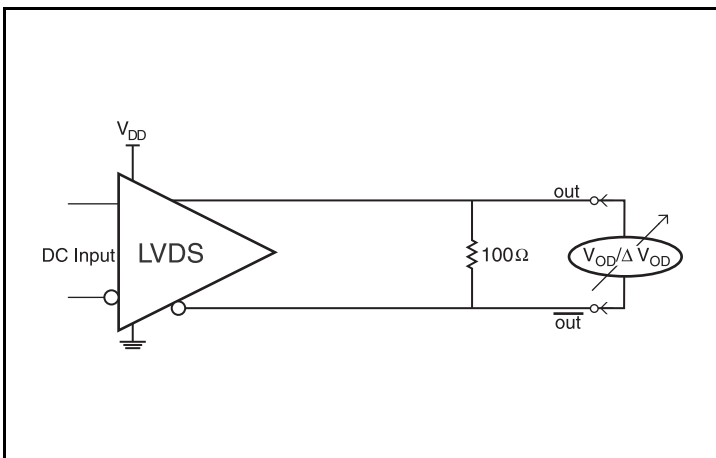
**MUX Isolation**



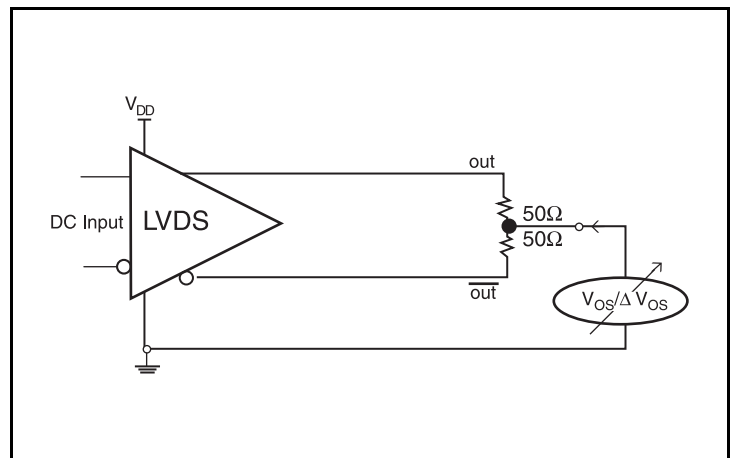
**Output Rise/Fall Time, 20% - 80%**



**Output Rise/Fall Time, 10% - 90%**



**Differential Output Voltage Setup**



**Offset Voltage Setup**

## Applications Information

### 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 1.8V and  $V_{DD} = 1.8V$ , R1 and R2 value should be adjusted to set  $V_1$  at 0.9V. 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 ( $R_o$ ) and the series resistance ( $R_s$ ) 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.

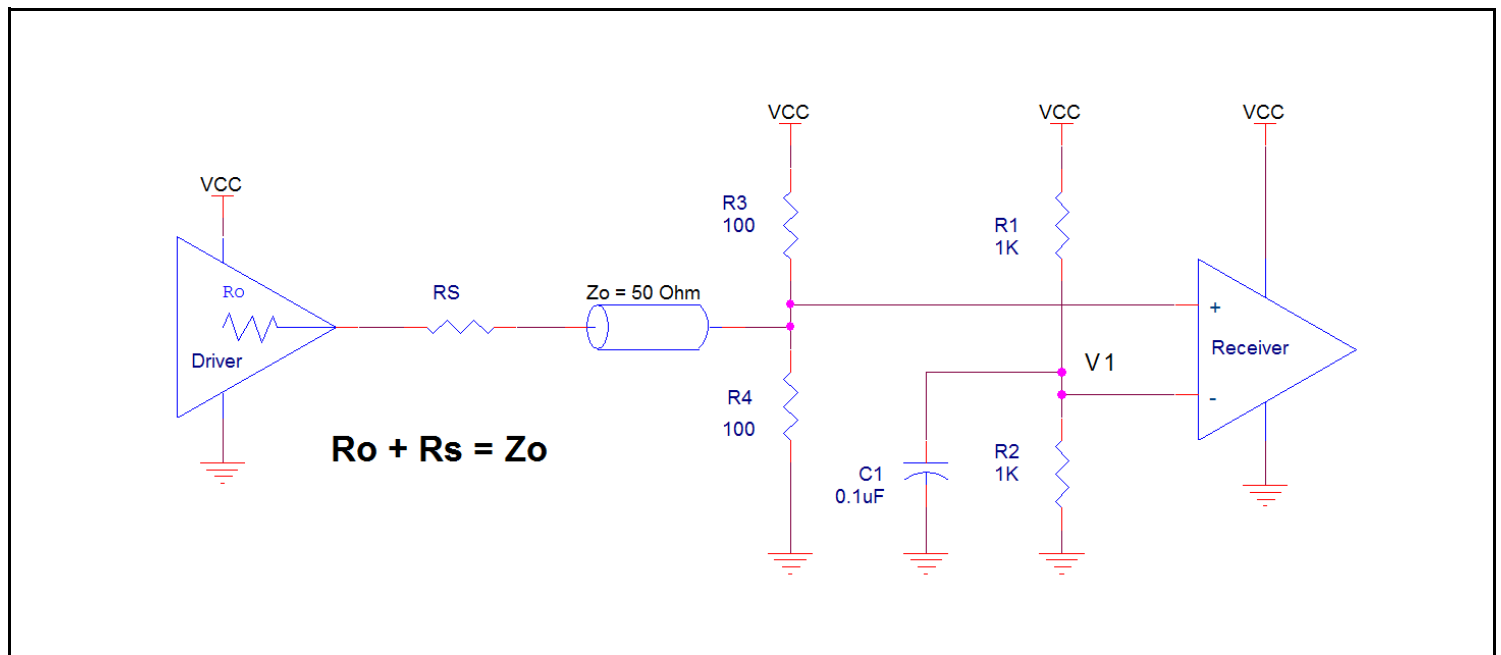


Figure 1. Recommended Schematic for Wiring a Differential Input to Accept Single-ended Levels

### Recommendations for Unused Input and Output Pins

#### Inputs:

##### CLK/nCLK Inputs

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

#### Outputs:

##### LVDS Outputs

Unused LVDS outputs must either have a 100Ω differential termination or have a 100Ω pull-up resistor to  $V_{DD}$  in order to ensure proper device operation.

## 1.8V Differential Clock Input Interface

The CLK /nCLK accepts LVDS and other differential signals. The differential input signal must meet both the  $V_{PP}$  and  $V_{CMR}$  input requirements. Figures 2A to 2D show interface examples for the CLK /nCLK input driven by the most common driver types. The input

interfaces suggested here are examples only. If the driver is from another vendor, use their termination recommendation. Please consult with the vendor of the driver component to confirm the driver termination requirements.

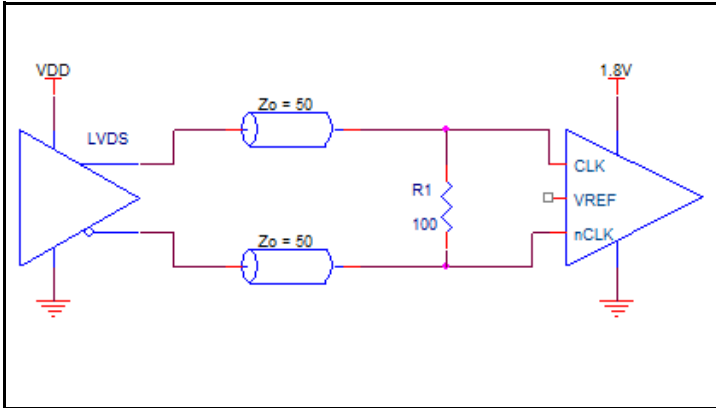


Figure 2A. Differential Input Driven by an LVDS Driver - DC Coupling

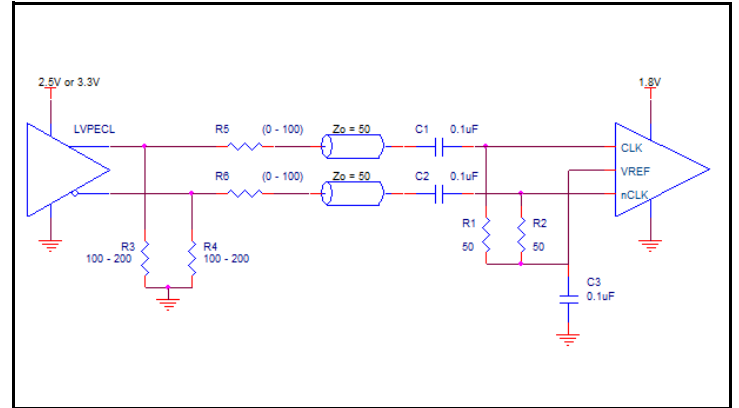


Figure 2B. Differential Input Driven by an LVPECL Driver - AC Coupling

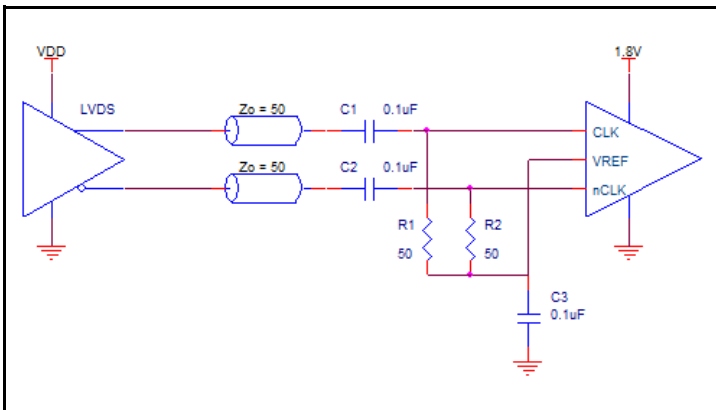


Figure 2C. Differential Input Driven by an LVDS Driver - AC Coupling

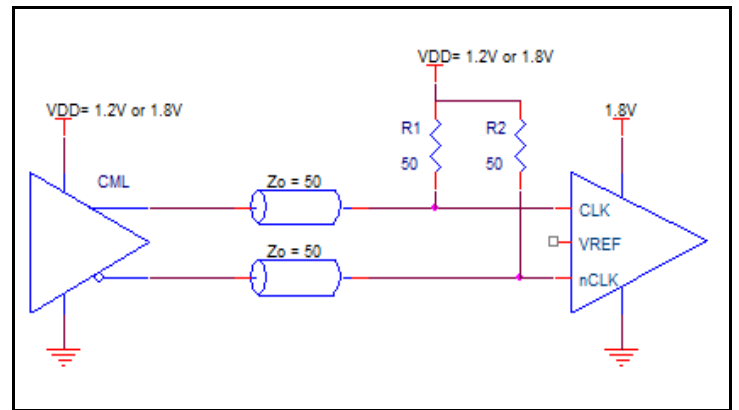
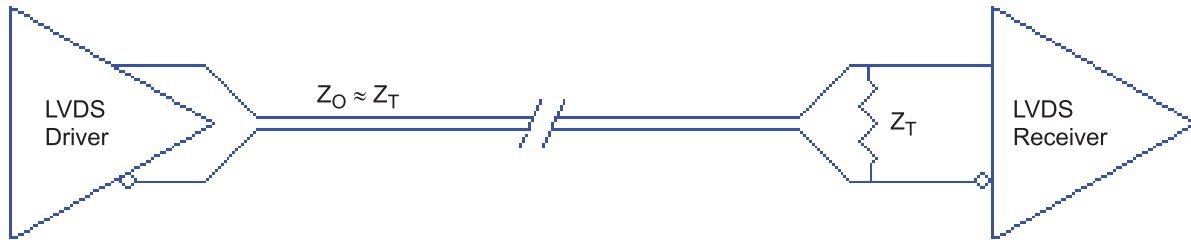


Figure 2D. Differential Input Driven by a CML Driver

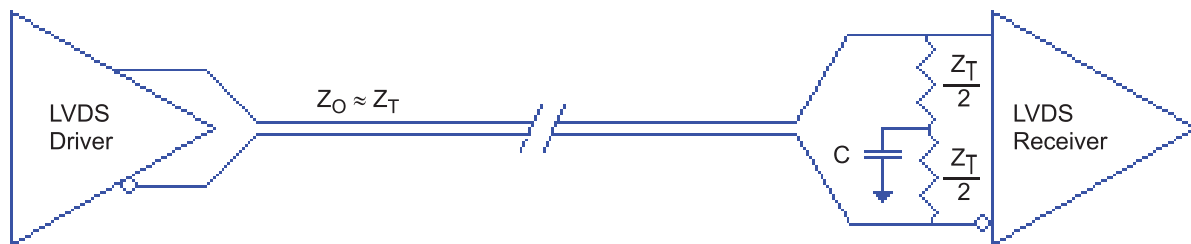
## LVDS Driver Termination

For a general LVDS interface, the recommended value for the termination impedance ( $Z_T$ ) is between  $90\Omega$  and  $132\Omega$ . The actual value should be selected to match the differential impedance ( $Z_0$ ) of your transmission line. A typical point-to-point LVDS design uses a  $100\Omega$  parallel resistor at the receiver and a  $100\Omega$  differential transmission-line environment. In order to avoid any transmission-line reflection issues, the components should be surface mounted and must be placed as close to the receiver as possible. IDT offers a full line of LVDS compliant devices with two types of output structures: current source and voltage source. The

standard termination schematic as shown in *Figure 3A* can be used with either type of output structure. *Figure 3B*, which can also be used with both output types, is an optional termination with center tap capacitance to help filter common mode noise. The capacitor value should be approximately  $50\text{pF}$ . If using a non-standard termination, it is recommended to contact IDT and confirm if the output structure is current source or voltage source type. In addition, since these outputs are LVDS compatible, the input receiver's amplitude and common-mode input range should be verified for compatibility with the output.



**Figure 3A. Standard LVDS Termination**



**Figure 3B. Optional LVDS Termination**

## VFQFN EPAD Thermal Release Path

In order to maximize both the removal of heat from the package and the electrical performance, a land pattern must be incorporated on the Printed Circuit Board (PCB) within the footprint of the package corresponding to the exposed metal pad or exposed heat slug on the package, as shown in *Figure 4*. The solderable area on the PCB, as defined by the solder mask, should be at least the same size/shape as the exposed pad/slug area on the package to maximize the thermal/electrical performance. Sufficient clearance should be designed on the PCB between the outer edges of the land pattern and the inner edges of pad pattern for the leads to avoid any shorts.

While the land pattern on the PCB provides a means of heat transfer and electrical grounding from the package to the board through a solder joint, thermal vias are necessary to effectively conduct from the surface of the PCB to the ground plane(s). The land pattern must be connected to ground through these vias. The vias act as “heat pipes”. The number of vias (i.e. “heat pipes”) are application specific

and dependent upon the package power dissipation as well as electrical conductivity requirements. Thus, thermal and electrical analysis and/or testing are recommended to determine the minimum number needed. Maximum thermal and electrical performance is achieved when an array of vias is incorporated in the land pattern. It is recommended to use as many vias connected to ground as possible. It is also recommended that the via diameter should be 12 to 13mils (0.30 to 0.33mm) with 1oz copper via barrel plating. This is desirable to avoid any solder wicking inside the via during the soldering process which may result in voids in solder between the exposed pad/slug and the thermal land. Precautions should be taken to eliminate any solder voids between the exposed heat slug and the land pattern. Note: These recommendations are to be used as a guideline only. For further information, please refer to the Application Note on the Surface Mount Assembly of Amkor’s Thermally/Electrically Enhance Leadframe Base Package, Amkor Technology.

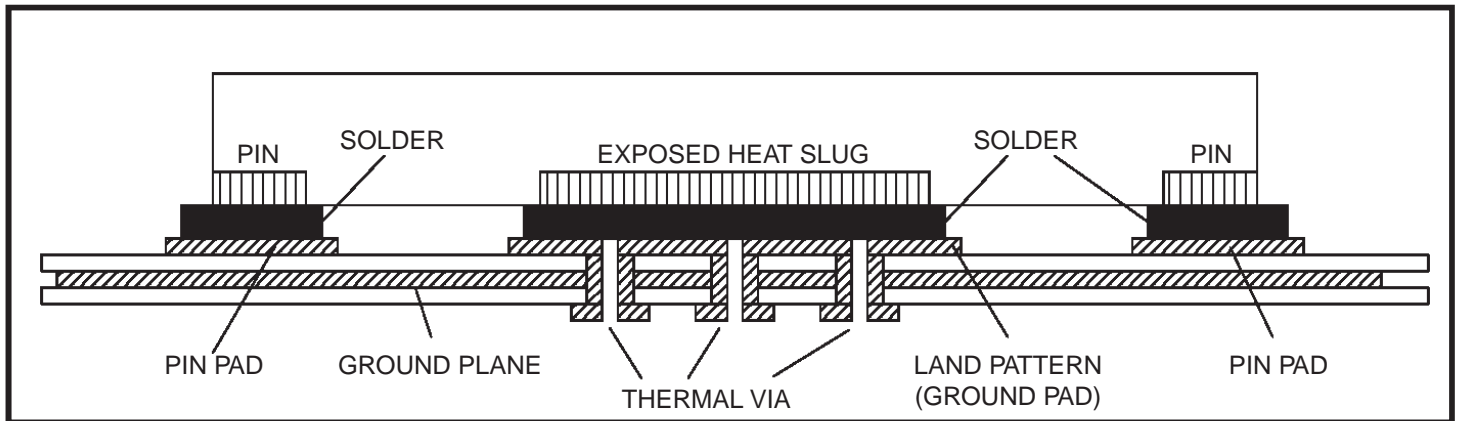


Figure 4. P.C. Assembly for Exposed Pad Thermal Release Path – Side View (drawing not to scale)

## Power Considerations

This section provides information on power dissipation and junction temperature for the IDT8P34S1212I. Equations and example calculations are also provided.

### 1. Power Dissipation.

The total power dissipation for the IDT8P34S1212I is the sum of the core power plus the output power dissipation into the load. The following is the power dissipation for  $V_{DD} = 1.8V + 5\% = 1.89V$ , which gives worst case results.

The maximum current at 85°C is as follows:

$$I_{DD\_MAX} = 227mA$$

$$Power_{(core)MAX} = V_{DD\_MAX} * I_{DD\_MAX} = 1.89V * 227mA = \mathbf{429.03mW}$$

$$\mathbf{Total\ Power\_MAX = 429.03mW}$$

### 2. Junction Temperature.

Junction temperature,  $T_j$ , is the temperature at the junction of the bond wire and bond pad directly affects the reliability of the device. The maximum recommended junction temperature is 125°C. Limiting the internal transistor junction temperature,  $T_j$ , to 125°C ensures that the bond wire and bond pad temperature remains below 125°C.

The equation for  $T_j$  is as follows:  $T_j = \theta_{JA} * Pd\_total + T_A$

$T_j$  = Junction Temperature

$\theta_{JA}$  = 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  $\theta_{JA}$  must be used. Assuming no air flow and a multi-layer board, the appropriate value is 33°C/W per Table 6 below.

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

$$85^\circ C + 0.429W * 33^\circ C/W = 99.16^\circ C. \text{ This is below the limit of } 125^\circ C.$$

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

**Table 6.  $\theta_{JA}$  vs. Air Flow Table for a 40-Lead VFQFN**

$\theta_{JA}$ vs. Air Flow (m/s)			
Meters per Second	0	1	2
Multi-Layer PCB, JEDEC Standard Test Boards	33.0°C/W	26.3°C/W	24.0°C/W

## Reliability Information

**Table 7.  $\theta_{JA}$  vs. Air Flow Table for a 40-Lead VFQFN**

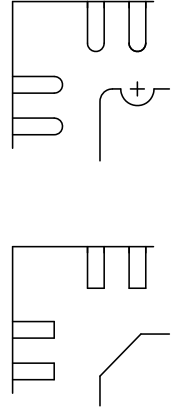
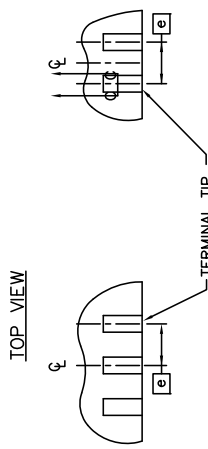
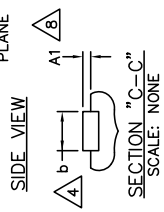
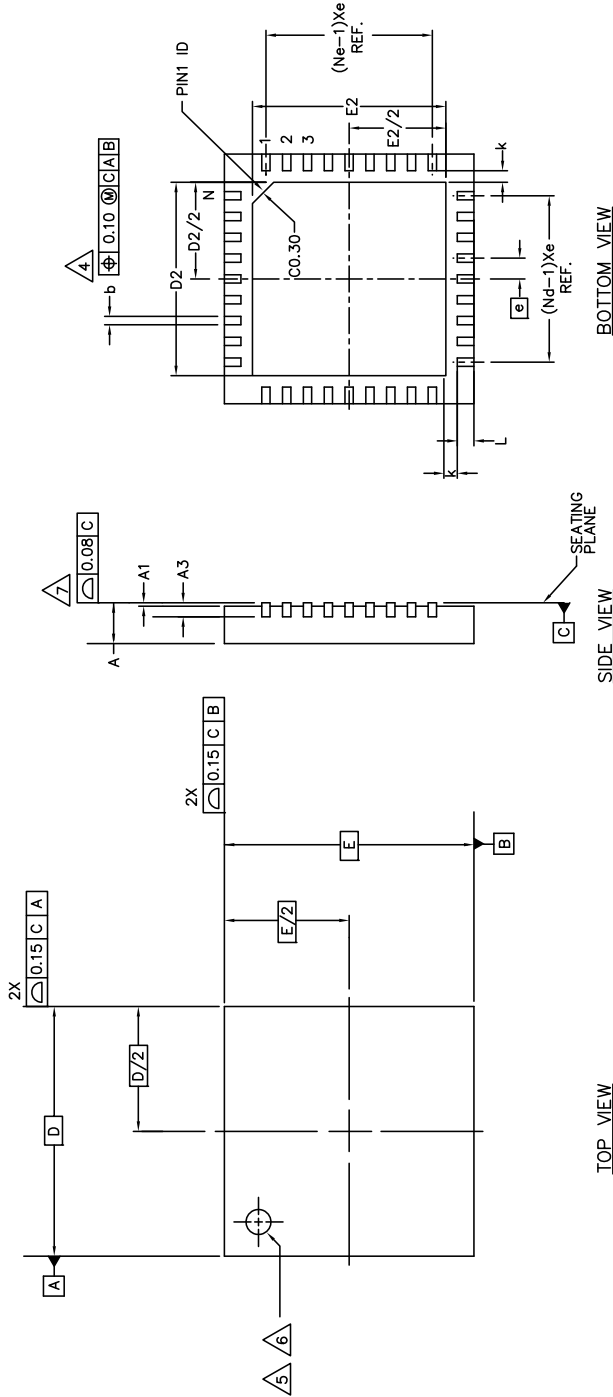
$\theta_{JA}$ vs. Air Flow (m/s)			
Meters per Second	<b>0</b>	<b>1</b>	<b>2</b>
Multi-Layer PCB, JEDEC Standard Test Boards	33.0°C/W	26.3C/W	24.0°C/W

## Transistor Count

The transistor count for the IDT8P34S1212I is: 8438

Package Outline Drawings – Page 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	02/4/16	JH
01	ADD CHAMFER ON EPAD	6/7/16	JH



TOLERANCES UNLESS SPECIFIED	6024 SILVERCREEK
DECIMAL	FULLY DIMENSIONED
ANGULAR	MINIMUM 0.5°
±	PHONE: (408) 284-8200
XXX.X	FAX: (408) 284-8591
XXX.XX	WWW.IDT.COM
APPROVALS	TITLE NL/NLG 40 PACKAGE OUTLINE
DATE 02/4/16	6.0 x 6.0 mm BODY
DRAWN/24C	EPAD 4.65 x 4.65 mm QFN
CHECKED	SIZE DRAWING No.
	C PSC-4115-02
	REV 01
	DO NOT SCALE DRAWING
	SHEET 1 OF 3



Package Outline Drawings – Page 2

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	02/14/16	JH
01	ADD CHAMFER ON EPAD	6/7/16	JH

SYMBOL	DIMENSION			NOTE
	MIN	NOM	MAX	
b	0.18	0.25	0.30	4
D	6.00 BSC			
E	6.00 BSC			
D2	4.50	4.65	4.75	
E2	4.50	4.65	4.75	
L	0.30	0.40	0.50	
e	0.50 BSC			
k	0.275 REF.			
N	40			2
A	0.80	0.90	1.00	
A1	0.00	0.02	0.05	7
A3	0.2 REF			
Nd	10			2
Ne	10			2

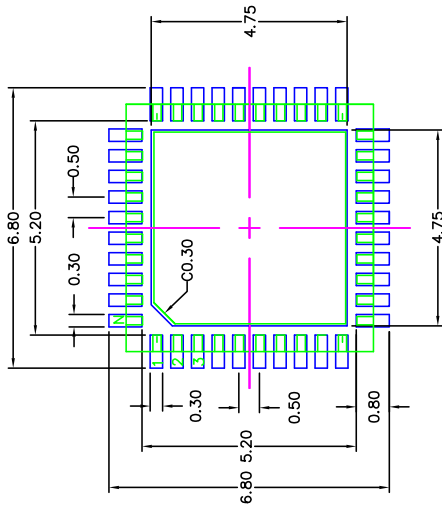
NOTES:

- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M. – 1994.
- N IS THE NUMBER OF TERMINALS.  
Nd IS THE NUMBER OF TERMINALS IN X-DIRECTION &  
Ne IS THE NUMBER OF TERMINALS IN Y-DIRECTION.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.30mm FROM TERMINAL TIP.
- THE PIN #1 IDENTIFIER MUST EXIST ON THE TOP SURFACE OF THE PACKAGE BY USING INDENTATION MARK OR OTHER FEATURE OF PACKAGE BODY.
- EXACT SHAPE AND SIZE OF THIS FEATURE IS OPTIONAL.
- APPLIED TO EXPOSED PAD AND TERMINALS. EXCLUDE EMBEDDED PART OF EXPOSED PAD FROM MEASURING.
- APPLIED ONLY FOR TERMINALS.
- THIS OUTLINE CONFORMS TO JEDEC PUBLICATION 95 REGISTRATION MO-220, VARIATION VJJC-3 & VJJD-5 WITH THE EXCEPTION OF D2 & E2.

TOLERANCES UNLESS SPECIFIED	6021 SAN MATEO CREEK VALLEY ROAD SAN JOSE, CA 95138 PHONE: (408) 284-8200 FAX: (408) 284-8591	
DECIMAL ±	<b>IDT</b> www.IDT.com	
ANGULAR ±		
XXX±		
XXXX±		
APPROVALS	DATE	TITLE
DRAWN: JAC	02/12/16	NL/NLG 40 PACKAGE OUTLINE
CHECKED		6.0 x 6.0 mm BODY
		EPAD 4.65 x 4.65 mm QFN
	SIZE	DRAWING No.
	C	PSC-4115-02
		REV 01
		SHEET 2 OF 3

Package Outline Drawings – Page 3

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
00	INITIAL RELEASE	02/4/16	JH
01	ADD CHAMFER ON EPAD	6/7/16	JH



RECOMMENDED LAND PATTERN DIMENSION

NOTES:

1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
2. TOP DOWN VIEW, AS VIEWED ON PCB.
3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR SURFACE MOUNT DESIGN AND LAND PATTERN.

TOLERANCES UNLESS SPECIFIED DECIMAL XXX± XXXXX±	6024 SILVERCREEK VALLEY ROAD SAN JOSE, CA 95138 TEL: (408) 284-8200 FAX: (408) 284-8591
APPROVALS DRAWN @JAC CHECKED	www.IDT.com IDT™ NL/NLG 40 PACKAGE OUTLINE 6.0 x 6.0 mm BODY EPAD 4.65 x 4.65 mm QFN
DATE 02/4/16	DRAWING No. PSC-4115-02
SIZE C	REV 01
DO NOT SCALE DRAWING	
SHEET 3 OF 3	

## Ordering Information

Table 8. Ordering Information

Part/Order Number	Marking	Package	Shipping Packaging	Temperature
8P34S1212NLGI	IDT8P34S1212NLGI	"Lead-Free" 40-Lead VFQFN	Tray	-40°C to 85°C
8P34S1212NLGI8	IDT8P34S1212NLGI	"Lead-Free" 40-Lead VFQFN	Tape & Reel	-40°C to 85°C

## Revision History

Revision Date	Description
November 24, 2017	Updated the description of pins 3, 8, and 9 in Table 1 Updated the package drawings; however, no technical changes Completed other minor changes
January 20, 2014	Initial release.

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(Rev.4.0-1 November 2017)

## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
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