

# 2.5V LVDS, 1:10 GLITCHLESS CLOCK BUFFER TERABUFFER™ II

IDT5T93GL10

## General Description



The IDT5T93GL10 2.5V differential clock buffer is a user-selectable differential input to ten LVDS outputs. The fanout from a differential input to ten LVDS outputs reduces loading on the preceding driver and provides an efficient clock distribution

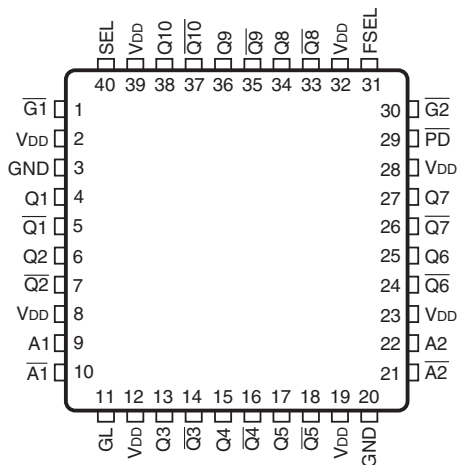
network. The IDT5T93GL10 can act as a translator from a differential HSTL, eHSTL, LVEPECL (2.5V), LVPECL (3.3V), CML, or LVDS input to LVDS outputs. A single-ended 3.3V / 2.5V LVTTTL input can also be used to translate to LVDS outputs. The redundant input capability allows for a glitchless change-over from a primary clock source to a secondary clock source. Selectable inputs are controlled by SEL. During the switchover, the output will disable low for up to three clock cycles of the previously-selected input clock. The outputs will remain low for up to three clock cycles of the newly-selected clock, after which the outputs will start from the newly-selected input. A FSEL pin has been implemented to control the switchover in cases where a clock source is absent or is driven to DC levels below the minimum specifications.

The IDT5T93GL10 outputs can be asynchronously enabled/disabled. When disabled, the outputs will drive to the value selected by the GL pin. Multiple power and grounds reduce noise.

## Applications

- Clock distribution

## Pin Assignment



**IDT5T93GL10**

**40-Lead VFQFPN**

6mm x 6mm x 0.925mm package body

**K package**

Top View

## Features

- Guaranteed low skew: <25ps (maximum)
- Very low duty cycle distortion: <100ps (maximum)
- High speed propagation delay: <2ns (maximum)
- Up to 650MHz operation
- Glitchless input clock switching
- Selectable inputs
- Hot insertable and over-voltage tolerant inputs
- 3.3V/2.5V LVTTTL, HSTL, eHSTL, LVEPECL (2.5V), LVPECL (3.3V), CML or LVDS input interfaces
- Selectable differential inputs to ten LVDS outputs
- Power-down mode
- At power-up, FSEL should be LOW
- 2.5V V<sub>DD</sub>
- -40°C to 85°C ambient operating temperature
- Available in VFQFPN package
- Recommends IDT5T9310 if glitchless input selection is not required

## Block Diagram

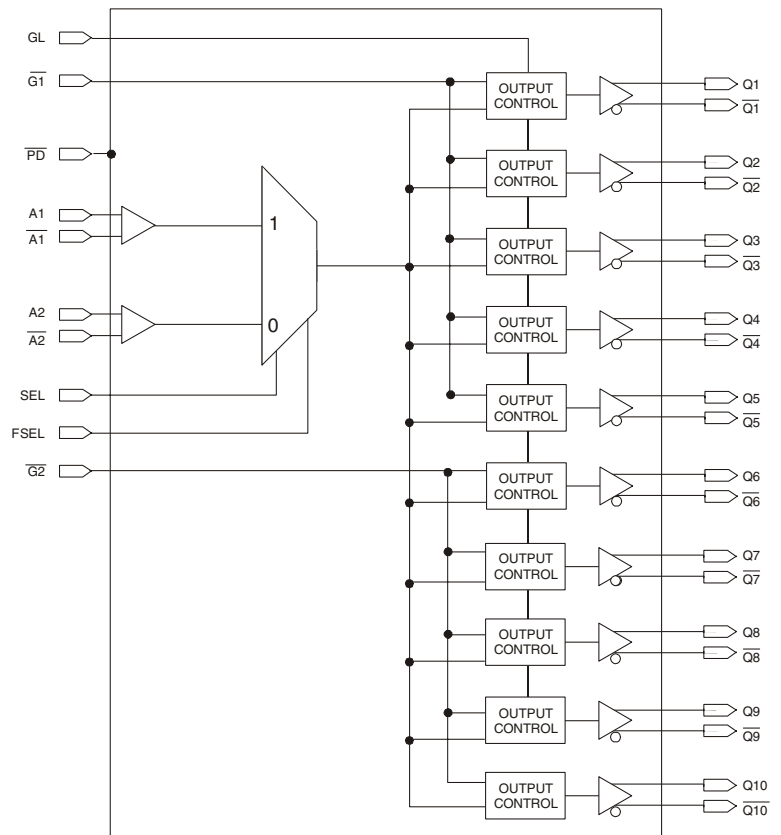


Table 1. Pin Descriptions

Name	Type		Description
A[1:2]	Input	Adjustable <sup>(1, 4)</sup>	Clock input. A[1:2] is the "true" side of the differential clock input.
$\overline{A[1:2]}$	Input	Adjustable <sup>(1, 4)</sup>	Complementary clock inputs. $\overline{A[1:2]}$ is the complementary side of A[1:2]. For LVTTTL single-ended operation, $\overline{A[1:2]}$ should be set to the desired toggle voltage for A[1:2]: 3.3V LVTTTL VREF = 1650mV 2.5V LVTTTL VREF = 1250mV
$\overline{G1}$	Input	LVTTTL	Gate control for differential outputs Q1 and $\overline{Q1}$ through Q5 and $\overline{Q5}$ . When $\overline{G1}$ is LOW, the differential outputs are active. When $\overline{G1}$ is HIGH, the differential outputs are asynchronously driven to the level designated by GL <sup>(2)</sup> .
$\overline{G2}$	Input	LVTTTL	Gate control for differential outputs Q6 and $\overline{Q6}$ through Q10 and $\overline{Q10}$ . When $\overline{G2}$ is LOW, the differential outputs are active. When $\overline{G2}$ is HIGH, the differential outputs are asynchronously driven to the level designated by GL <sup>(2)</sup> .
GL	Input	LVTTTL	Specifies output disable level. If HIGH, "true" outputs disable HIGH and "complementary" outputs disable LOW. If LOW, "true" outputs disable LOW and "complementary" outputs disable HIGH.
Q[1:10]	Output	LVDS	Clock outputs.
$\overline{Q[1:10]}$	Output	LVDS	Complementary clock outputs.
SEL	Input	LVTTTL	Reference clock select. When LOW, selects A2 and $\overline{A2}$ . When HIGH, selects A1 and $\overline{A1}$ .
$\overline{PD}$	Input	LVTTTL	Power-down control. Shuts off entire chip. If LOW, the device goes into LOW power mode. Inputs and outputs are disabled. Both "true" and "complementary" outputs will pull to VDD. Set HIGH for normal operation. <sup>(3)</sup>
FSEL	Input	LVTTTL	At a rising edge, FSEL forces select to the input designated by SEL. Apply a LOW-to-HIGH transition to force an input selection. Set to logic LOW level at startup and if a forced input selection is not needed.
V <sub>DD</sub>		Power	Power supply for the device core and inputs.
GND		Power	Ground.

## NOTES:

- Inputs are capable of translating the following interface standards:  
Single-ended 3.3V and 2.5V LVTTTL levels  
Differential HSTL and eHSTL levels  
Differential LVEPECL (2.5V) and LVPECL (3.3V) levels  
Differential LVDS levels  
Differential CML levels
- Because the gate controls are asynchronous, runt pulses are possible. It is the user's responsibility to either time the gate control signals to minimize the possibility of runt pulses or be able to tolerate them in down stream circuitry.
- It is recommended that the outputs be disabled before entering power-down mode. It is also recommended that the outputs remain disabled until the device completes power-up after asserting  $\overline{PD}$ .
- The user must take precautions with any differential input interface standard being used in order to prevent instability when there is no input signal.

Table 2. Pin Characteristics (T<sub>A</sub> = +25°C, F = 1.0MHz)

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
C <sub>IN</sub>	Input Capacitance				3	pF

NOTE: This parameter is measured at characterization but not tested.

## Function Tables

Table 3A. Gate Control Output Table

Control Outputs		Outputs	
GL	$\overline{G}$	Q[1:16]	$\overline{Q[1:16]}$
0	0	Toggling	Toggling
0	1	LOW	HIGH
1	0	Toggling	Toggling
1	1	HIGH	LOW

Table 3B. Input Selection Table

Selection SEL pin	Inputs
0	$A2/\overline{A2}$
1	$A1/\overline{A1}$

## 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
Power Supply Voltage, $V_{DD}$	-0.5V to +3.6V
Input Voltage, $V_I$	-0.5V to +3.6V
Output Voltage, $V_O$ Not to exceed 3.6V	-0.5 to $V_{DD} + 0.5V$
Storage Temperature, $T_{STG}$	-65°C to +150°C
Junction Temperature, $T_J$	150°C

## Recommended Operating Range

Symbol	Description	Minimum	Typical	Maximum	Units
$T_A$	Ambient Operating Temperature	-40	+25	+85	°C
$V_{DD}$	Internal Power Supply Voltage	2.3	2.5	2.7	V

## DC Electrical Characteristics

Table 4A. LVDS Power Supply DC Characteristics<sup>(1)</sup>,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$

Symbol	Parameter	Test Conditions	Minimum	Typical <sup>(2)</sup>	Maximum	Units
$I_{DDQ}$	Quiescent $V_{DD}$ Power Supply Current	$V_{DD} = \text{Max.}$ , All Input Clocks = LOW <sup>(2)</sup> ; Outputs enabled			295	mA
$I_{TOT}$	Total Power $V_{DD}$ Supply Current	$V_{DD} = 2.7V$ ; $F_{REFERENCE}$ Clock = 650MHz			305	mA
$I_{PD}$	Total Power Down Supply Current	$\overline{PD} = \text{LOW}$			5	mA

NOTE 1: These power consumption characteristics are for all the valid input interfaces and cover the worst case conditions.

NOTE 2: The true input is held LOW and the complementary input is held HIGH.

**Table 4B. LVTTTL DC Characteristics**<sup>(1)</sup>,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ 

Symbol	Parameter	Test Conditions	Minimum	Typical <sup>(2)</sup>	Maximum	Units
$I_{IH}$	Input High Current	$V_{DD} = 2.7\text{V}$			$\pm 5$	$\mu\text{A}$
$I_{IL}$	Input Low Current	$V_{DD} = 2.7\text{V}$			$\pm 5$	$\mu\text{A}$
$V_{IK}$	Clamp Diode Voltage	$V_{DD} = 2.3\text{V}$ , $I_{IN} = -18\text{mA}$		-0.7	-1.2	V
$V_{IN}$	DC Input Voltage		-0.3		3.6	V
$V_{IH}$	DC Input High Voltage		1.7			V
$V_{IL}$	DC Input Low Voltage				0.7	V
$V_{THI}$	DC Input Threshold Crossing Voltage			$V_{DD}/2$		V
$V_{REF}$	Single-Ended Reference Voltage <sup>(3)</sup>	3.3V LVTTTL		1.65		V
		2.5V LVTTTL		1.25		V

NOTE 1: See *Recommended Operating Range* table.

NOTE 2: Typical values are at  $V_{DD} = 2.5\text{V}$ ,  $+25^{\circ}\text{C}$  ambient.

NOTE 3: For A[1:2] single-ended operation,  $\bar{A}[1:2]$  is tied to a DC reference voltage.

**Table 4C. Differential DC Characteristics**<sup>(1)</sup>,  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ 

Symbol	Parameter	Test Conditions	Minimum	Typical <sup>(2)</sup>	Maximum	Units
$I_{IH}$	Input High Current	$V_{DD} = 2.7\text{V}$			$\pm 5$	$\mu\text{A}$
$I_{IL}$	Input Low Current	$V_{DD} = 2.7\text{V}$			$\pm 5$	$\mu\text{A}$
$V_{IK}$	Clamp Diode Voltage	$V_{DD} = 2.3\text{V}$ , $I_{IN} = -18\text{mA}$		-0.7	-1.2	V
$V_{IN}$	DC Input Voltage		-0.3		3.6	V
$V_{DIF}$	DC Differential Voltage <sup>(3)</sup>		0.1			V
$V_{CM}$	DC Common Mode Input Voltage		0.05		$V_{DD}$	V

NOTE 1: See *Recommended Operating Range* table.

NOTE 2:  $V_{DIF}$  specifies the minimum input differential voltage ( $V_{TR} - V_{CP}$ ) required for switching where  $V_{TR}$  is the "true" input level and  $V_{CP}$  is the "complement" input level. The DC differential voltage must be maintained to guarantee retaining the existing HIGH or LOW input. The AC differential voltage must be achieved to guarantee switching to a new state.

NOTE 3:  $V_{CM}$  specifies the maximum allowable range of  $(V_{TR} + V_{CP}) / 2$ .

NOTE 4: Typical values are at  $V_{DD} = 2.5\text{V}$ ,  $+25^{\circ}\text{C}$  ambient.

**Table 4D. LVDS DC Characteristics**<sup>(1)</sup>,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ 

Symbol	Parameter	Test Conditions	Minimum	Typical <sup>(2)</sup>	Maximum	Units
$V_{OT(+)}$	Differential Output Voltage for the True Binary State		247		454	mV
$V_{OT(-)}$	Differential Output Voltage for the False Binary State		247		454	mV
$\Delta V_{OT}$	Change in $V_{OT}$ Between Complementary Output States				50	mV
$V_{OS}$	Output Common Mode Voltage (Offset Voltage)		1.125	1.2	1.375	V
$\Delta V_{OS}$	Change in $V_{OS}$ Between Complementary Output States				50	mV
$I_{OS}$	Outputs Short Circuit Current	$V_{OUT+}$ and $V_{OUT-} = 0V$		12	24	mA
$I_{OSD}$	Differential Outputs Short Circuit Current	$V_{OUT+} = V_{OUT-}$		6	12	mA

NOTE 1: See *Recommended Operating Range* table.

NOTE 2: Typical values are at  $V_{DD} = 2.5V$ ,  $+25^\circ\text{C}$  ambient.

## AC Electrical Characteristics

**Table 5A. HSTL Differential Input AC Characteristics**,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ 

Symbol	Parameter	Value	Units
$V_{DIF}$	Input Signal Swing <sup>(1)</sup>	1	V
$V_X$	Differential Input Signal Crossing Point <sup>(2)</sup>	750	mV
$D_H$	Duty Cycle	50	%
$V_{THI}$	Input Timing Measurement Reference Level <sup>(3)</sup>	Crossing Point	V
$t_R / t_F$	Input Signal Edge Rate <sup>(4)</sup>	2	V/ns

NOTE 1. The 1V peak-to-peak input pulse level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_{DIF}$  (AC) specification under actual use conditions.

NOTE 2. A 750mV crossing point level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_X$  specification under actual use conditions.

NOTE 3. In all cases, input waveform timing is marked at the differential cross-point of the input signals.

NOTE 4. The input signal edge rate of 2V/ns or greater is to be maintained in the 20% to 80% range of the input waveform.

**Table 5B. eHSTL AC Differential Input Characteristics,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter	Value	Units
$V_{DIF}$	Input Signal Swing <sup>(1)</sup>	1	V
$V_X$	Differential Input Signal Crossing Point <sup>(2)</sup>	900	mV
$D_H$	Duty Cycle	50	%
$V_{THI}$	Input Timing Measurement Reference Level <sup>(3)</sup>	Crossing Point	V
$t_R / t_F$	Input Signal Edge Rate <sup>(4)</sup>	2	V/ns

NOTE 1. The 1V peak-to-peak input pulse level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_{DIF}$  (AC) specification under actual use conditions.

NOTE 2. A 900mV crossing point level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_X$  specification under actual use conditions.

NOTE 3. In all cases, input waveform timing is marked at the differential cross-point of the input signals.

NOTE 4. The input signal edge rate of 2V/ns or greater is to be maintained in the 20% to 80% range of the input waveform.

**Table 5C. LVEPECL (2.5V) and LVPECL (3.3V) Differential Input AC Characteristics,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter	Maximum	Units
$V_{DIF}$	Input Signal Swing <sup>(1)</sup>	732	mV
$V_X$	Differential Input Signal Crossing Point <sup>(2)</sup>	LVEPECL	1082
		LVPECL	1880
$D_H$	Duty Cycle	50	%
$V_{THI}$	Input Timing Measurement Reference Level <sup>(3)</sup>	Crossing Point	V
$t_R / t_F$	Input Signal Edge Rate <sup>(4)</sup>	2	V/ns

NOTE 1. The 732mV peak-to-peak input pulse level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_{DIF}$  (AC) specification under actual use conditions.

NOTE 2. A 1082mV LVEPECL (2.5V) and 1880mV LVPECL (3.3V) crossing point level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_X$  specification under actual use conditions.

NOTE 3. In all cases, input waveform timing is marked at the differential cross-point of the input signals.

NOTE 4. The input signal edge rate of 2V/ns or greater is to be maintained in the 20% to 80% range of the input waveform.

**Table 5D. LVDS Differential Input AC Characteristics,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter	Maximum	Units
$V_{DIF}$	Input Signal Swing <sup>(1)</sup>	400	mV
$V_X$	Differential Input Signal Crossing Point <sup>(2)</sup>	1.2	V
$D_H$	Duty Cycle	50	%
$V_{THI}$	Input Timing Measurement Reference Level <sup>(3)</sup>	Crossing Point	V
$t_R / t_F$	Input Signal Edge Rate <sup>(4)</sup>	2	V/ns

NOTE 1. The 400mV peak-to-peak input pulse level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_{DIF}$  (AC) specification under actual use conditions.

NOTE 2. A 1.2mV crossing point level is specified to allow consistent, repeatable results in an automatic test equipment (ATE) environment. This device meets the  $V_X$  specification under actual use conditions.

NOTE 3. In all cases, input waveform timing is marked at the differential cross-point of the input signals.

NOTE 4. The input signal edge rate of 2V/ns or greater is to be maintained in the 20% to 80% range of the input waveform.

**Table 5E. AC Differential Input Characteristics<sup>(1)</sup>,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter	Minimum	Typical	Maximum	Units
$V_{DIF}$	AC Differential Voltage <sup>(2)</sup>	0.1		3.6	V
$V_{IX}$	Differential Input Crosspoint Voltage	0.05		$V_{DD}$	V
$V_{CM}$	Common Mode Input Voltage Range <sup>(3)</sup>	0.05		$V_{DD}$	V
$V_{IN}$	Input Voltage	-0.3		+3.6	V

NOTE 1. The output will not change state until the inputs have crossed and the minimum differential voltage range defined by  $V_{DIF}$  has been met or exceeded.

NOTE 2.  $V_{DIF}$  specifies the minimum input voltage ( $V_{TR} - V_{CP}$ ) required for switching where  $V_{TR}$  is the “true” input level and  $V_{CP}$  is the “complement” input level. The AC differential voltage must be achieved to guarantee switching to a new state.

NOTE 3.  $V_{CM}$  specified the maximum allowable range of  $(V_{TR} + V_{CP}) / 2$ .

**Table 5F. AC Characteristics<sup>(1,5)</sup>,  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$** 

Symbol	Parameter	Test Conditions	Minimum	Typical	Maximum	Units
$t_{sk(o)}$	Same Device Output Pin-to-Pin Skew <sup>(2)</sup>				25	ps
$t_{sk(p)}$	Pulse Skew <sup>(3)</sup>				100	ps
$t_{sk(pp)}$	Part-to-Part Skew <sup>(4)</sup>				300	ps
$t_{PLH}$	Propagation Delay, Low-to-High	$A/\bar{A}$ Crosspoint to $Q_n/\bar{Q}_n$ Crosspoint		1.5	2	ns
$t_{PHL}$	Propagation Delay, High-to-Low			1.5	2	ns
$f_o$	Frequency Range <sup>(6)</sup>				650	MHz
$t_{PGE}$	Output Gate Enable Crossing $V_{THI}$ -to- $Q_n/\bar{Q}_n$ Crosspoint				3.5	ns
$t_{PGD}$	Output Gate Disable Crossing $V_{THI}$ -to- $Q_n/\bar{Q}_n$ Crosspoint Driven to GL Designated Level				3.5	ns
$t_{PWRDN}$	$\overline{PD}$ Crossing $V_{THI}$ -to- $Q_n = V_{DD}$ , $\bar{Q}_n = V_{DD}$				100	$\mu\text{S}$
$t_{PWRUP}$	Output Gate Disable Crossing $V_{THI}$ to $Q_n/\bar{Q}_n$ Driven to GL Designated Level				100	$\mu\text{S}$

NOTE 1. AC propagation measurements should not be taken within the first 100 cycles of startup.

NOTE 2. Skew measured between crosspoints of all differential output pairs under identical input and output interfaces, transitions and load conditions on any one device.

NOTE 3. Skew measured is the difference between propagation delay times  $t_{PHL}$  and  $t_{PLH}$  of any single differential output pair under identical input and output interfaces, transitions and load conditions on any one device.

NOTE 4. Skew measured is the magnitude of the difference in propagation times between any single differential output pair of two devices, given identical transitions and load conditions at identical  $V_{DD}$  levels and temperature.

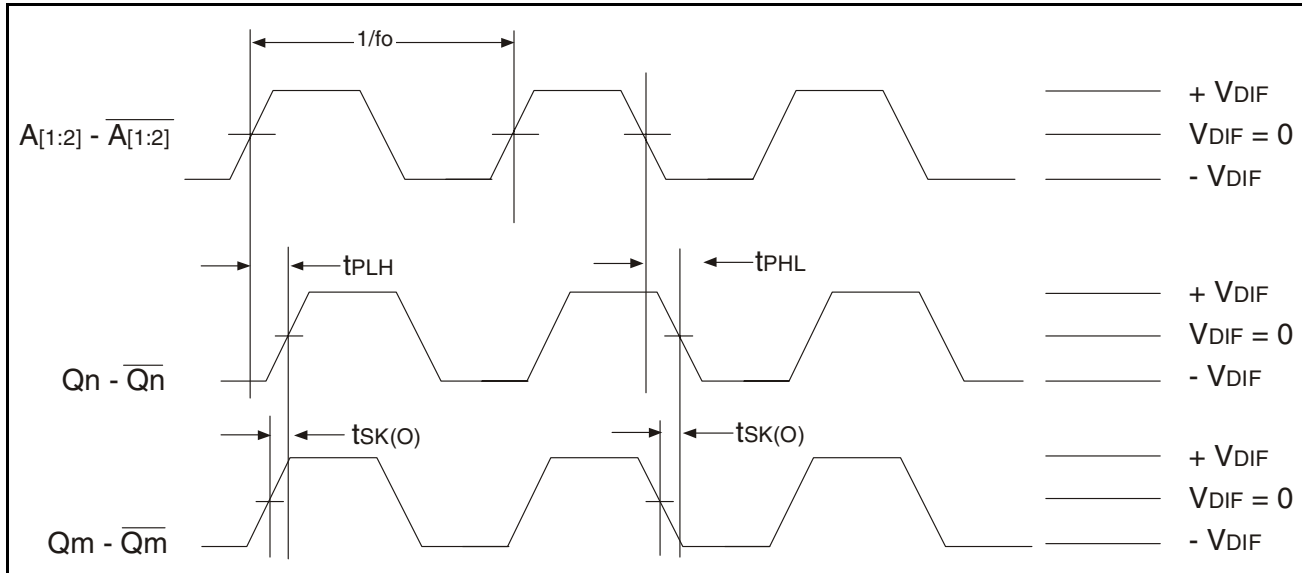
NOTE 5. All parameters are tested with a 50% input duty cycle.

NOTE 6. Guaranteed by design but not production tested.



## Differential AC Timing Waveforms

### Output Propagation and Skew Waveforms



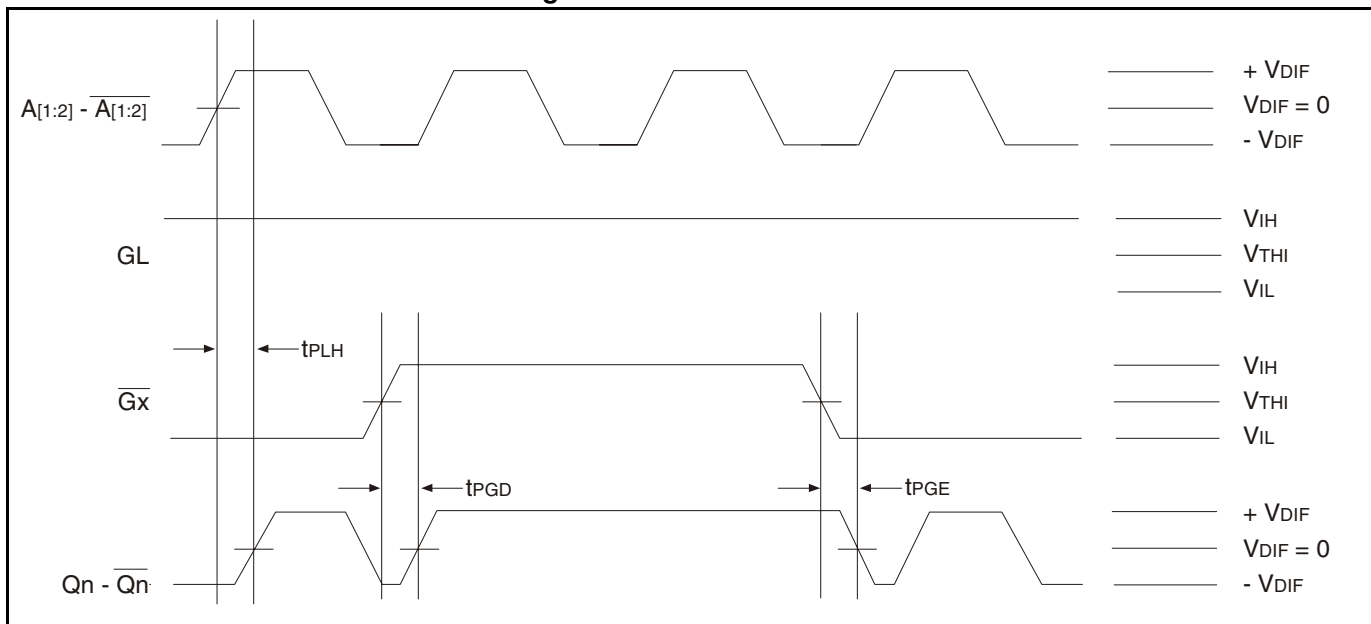
NOTE 1: Pulse skew is calculated using the following expression:

$$t_{sk(p)} = |t_{p_{HL}} - t_{p_{LH}}|$$

Note that the  $t_{p_{HL}}$  and  $t_{p_{LH}}$  shown above are not valid measurements for this calculation because they are not taken from the same pulse.

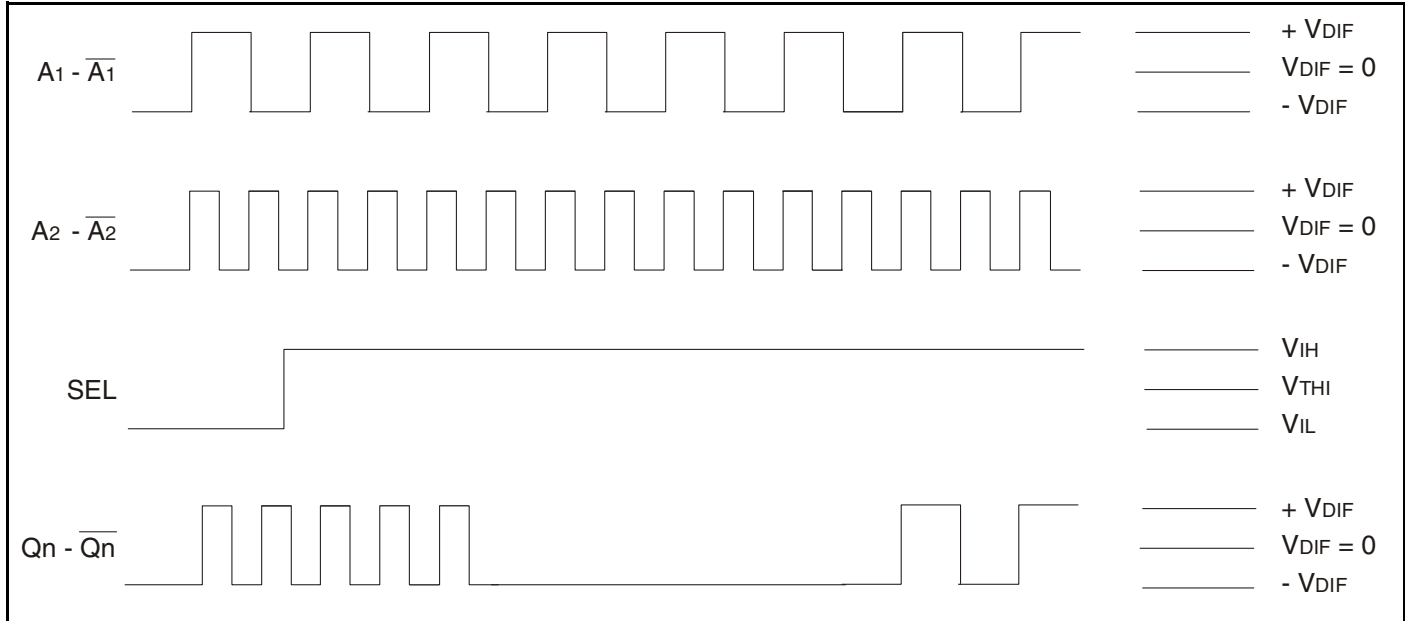
NOTE 2: AC propagation measurements should not be taken within the first 100 cycles of startup.

### Differential Gate Disabled/Endable Showing Runt Pulse Generation



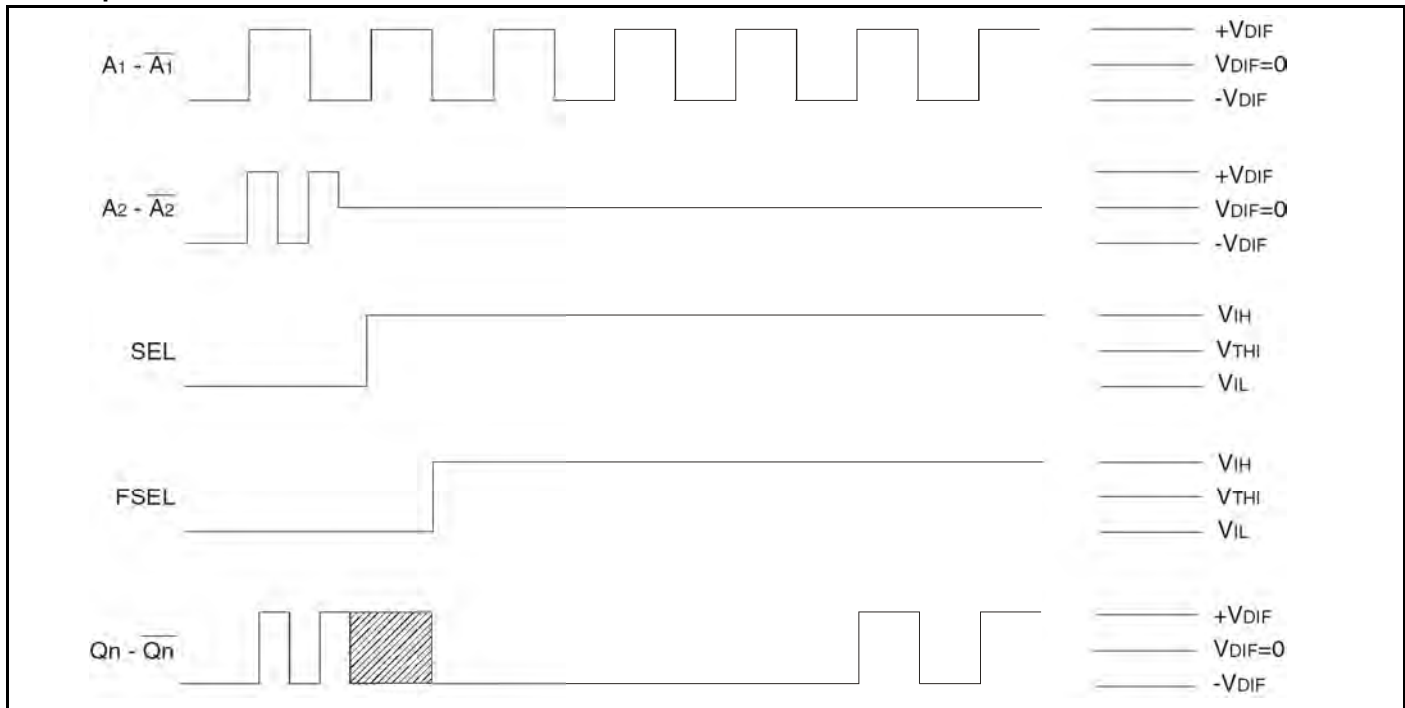
NOTE 1: As shown, it is possible to generate runt pulses on gate disable and enable of the outputs. It is the user's responsibility to time the  $\overline{G}$  signal to avoid this problem.

**Glitchless Output Operation with Switching Input Clock Selection**



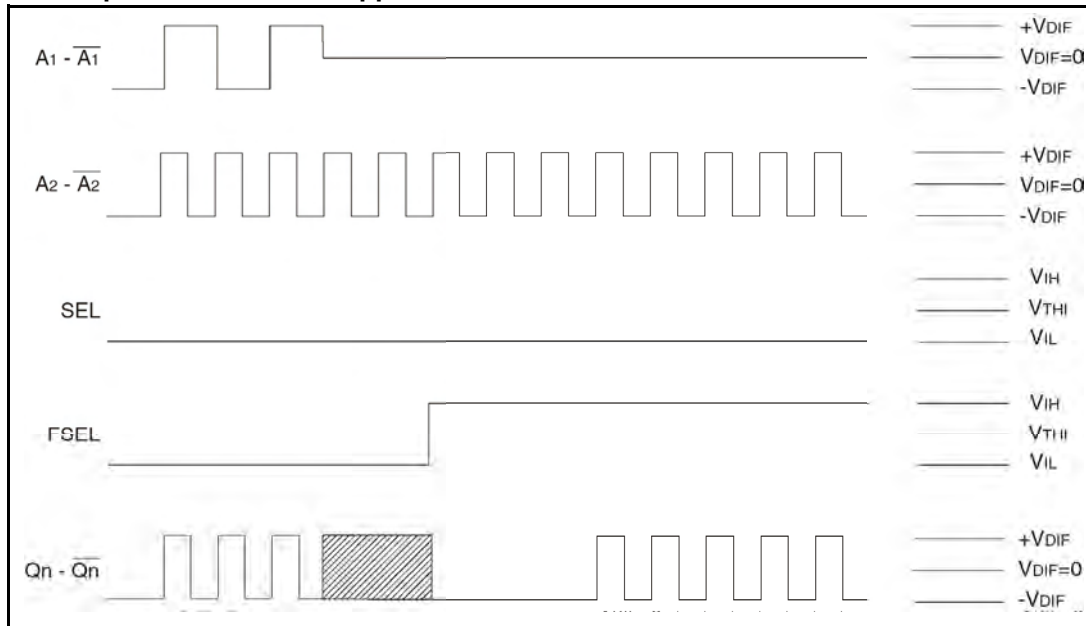
1. When SEL changes, the output clock goes LOW on the falling edge of the output clock up to three cycles later. The output then stays LOW for up to three clock cycles of the new input clock. After this, the output starts with the rising edge of the new input clock.
2. AC propagation measurements should not be taken within the first 100 cycles of startup.

**FSEL Operation for When Current Clock Dies**



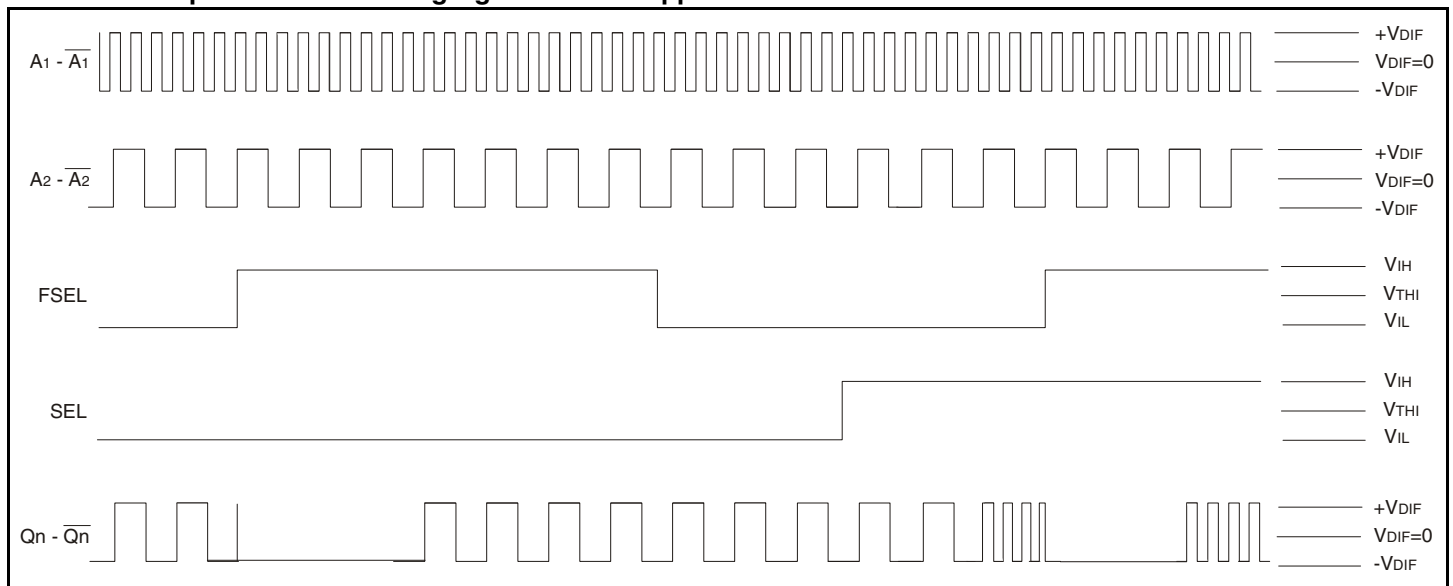
1. When the differential on the selected clock goes below the minimum DC differential, the outputs clock goes to an unknown state. When this happens, the SEL pin should be toggled and FSEL asserted in order to force selection of the new input clock. The output clock will start up after a number of cycles of the newly-selected input clock.
2. The FSEL pin should stay asserted until the problem with the dead clock can be fixed in the system.
3. It is recommended that the FSEL be tied LOW for systems that use only one input. If this is not possible, the user must guarantee that the unused input have a differential greater than or equal to the minimum DC differential specified in the datasheet.

**FSEL Operation for When Opposite Clock Dies**



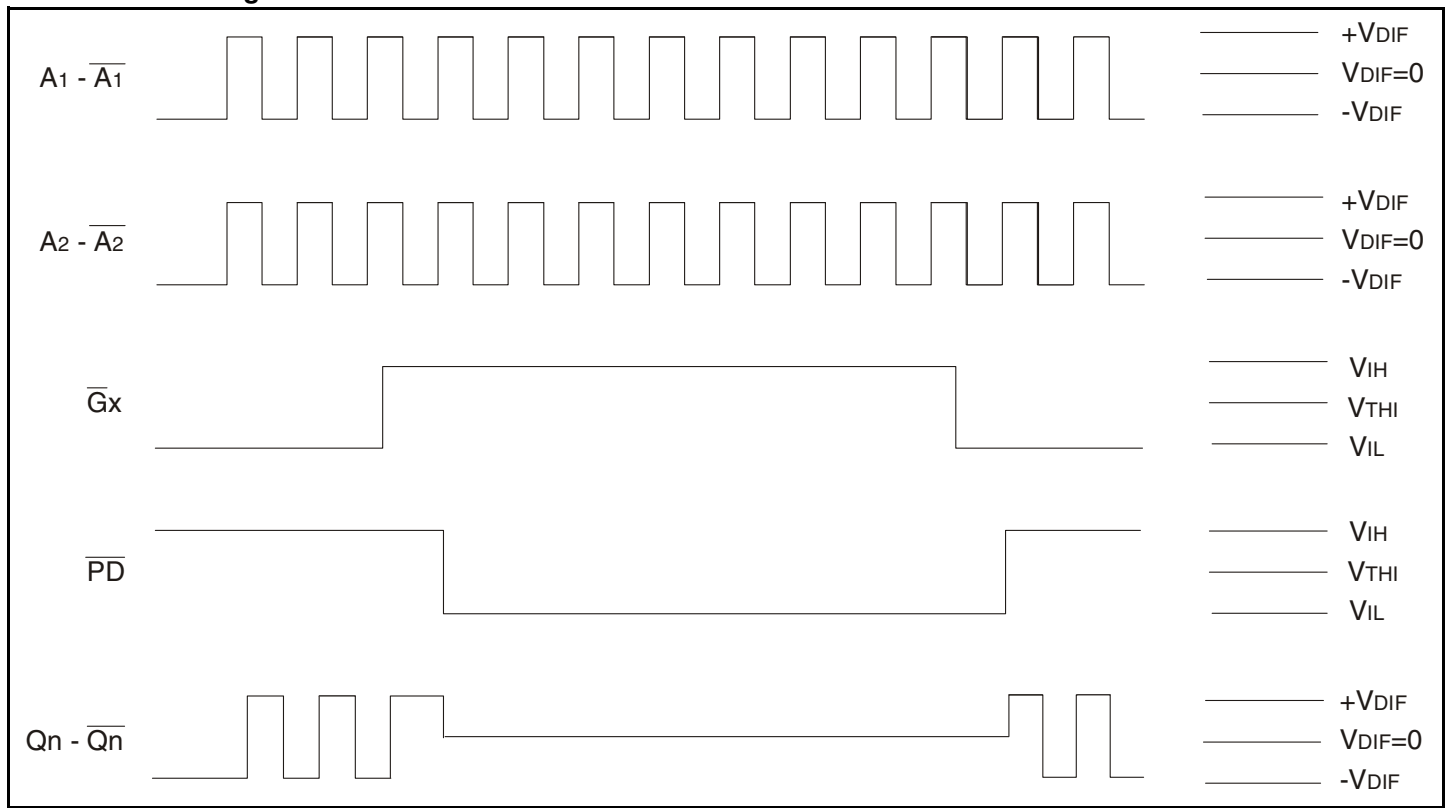
1. When the differential on the non-selected clock goes below the minimum DC differential, the outputs clock goes to an unknown state. When this happens, the FSEL pin should be asserted in order to force selection of the new input clock. The output clock will start up after a number of cycles of the newly-selected input clock.
2. The FSEL pin should stay asserted until the problem with the dead clock can be fixed in the system.
3. It is recommended that the FSEL be tied LOW for systems that use only one input. If this is not possible, the user must guarantee that the unused input have a differential greater than or equal to the minimum DC differential specified in the datasheet.

**Selection of Input While Protecting Against When Opposite Clock Dies**



1. If the user holds FSEL HIGH, the output will not be affected by the deselected input clock.
2. The output will immediately be driven to LOW once FSEL is asserted. This may cause glitching on the output. The output will restart with the input clock selected by the SEL pin.
3. If the user decides to switch input clocks, the user must de-assert FSEL, then assert FSEL after toggling the SEL input pin. The output will be driven LOW and will restart with the input clock selected by the SEL pin.

## Power Down Timing



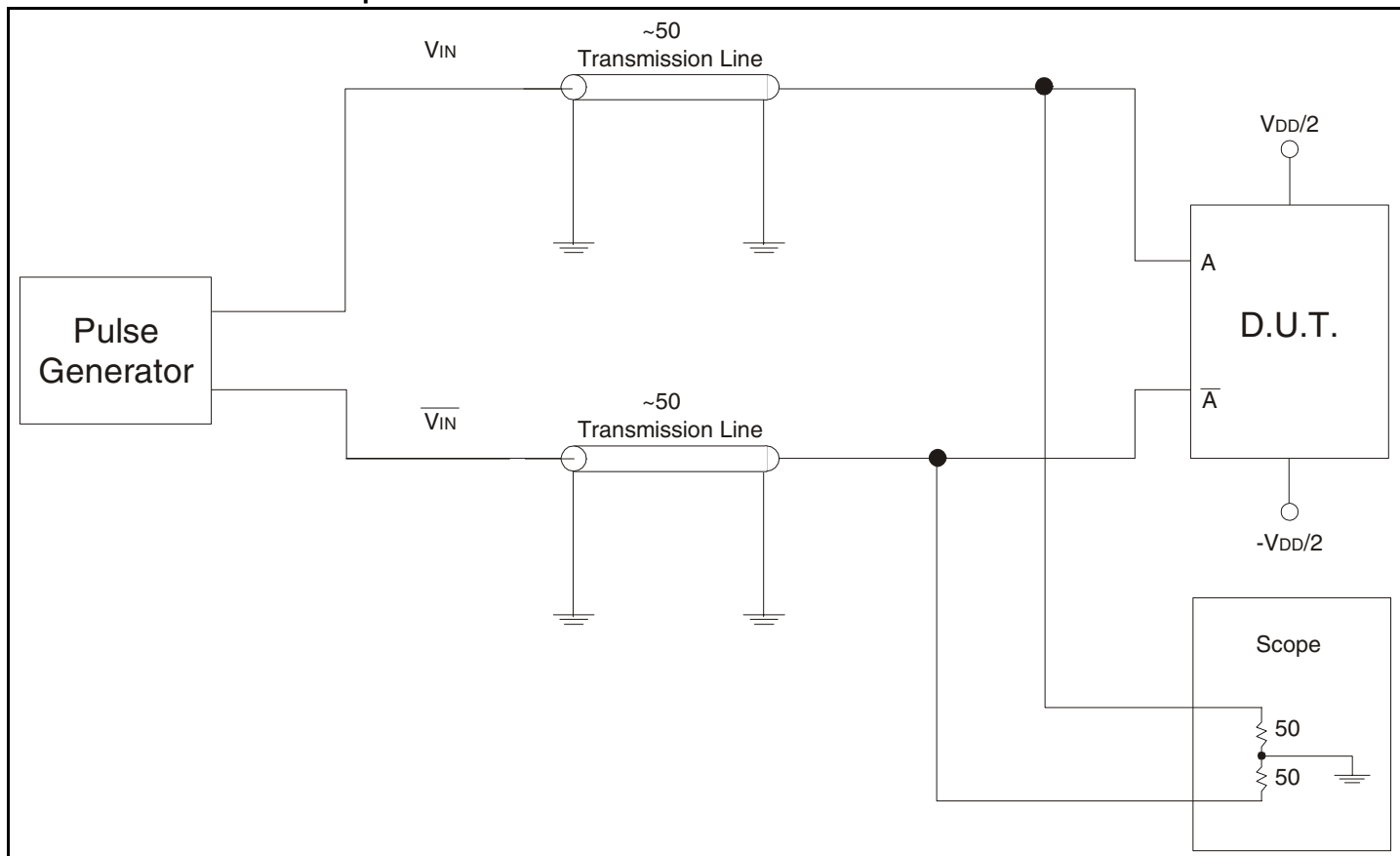
NOTE 1: It is recommended that outputs be disabled before entering power-down mode. It is also recommended that the outputs remain disabled until the device completes power-up after asserting  $\overline{PD}$ .

NOTE 2: The *Power Down Timing* diagram assumes that GL is HIGH.

NOTE 3: It should be noted that during power-down mode, the outputs are both pulled to  $V_{DD}$ . In the *Power Down Timing* diagram this is shown when Qn/ $\overline{Qn}$  goes to  $V_{DIF} = 0$ .

## Test Circuits and Conditions

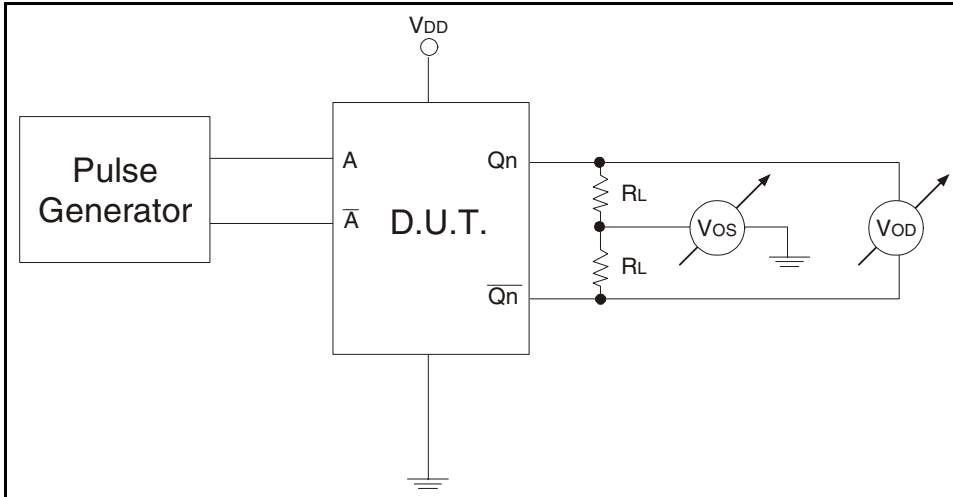
### Test Circuit for Differential Input



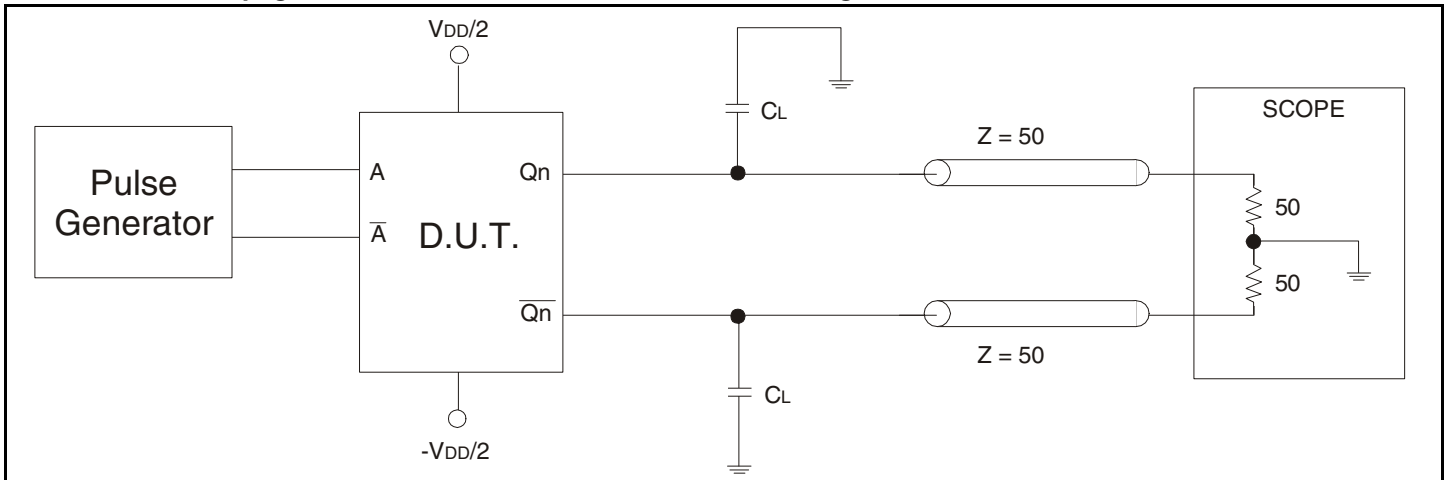
**Table 6A. Differential Input Test Conditions**

Symbol	$V_{DD} = 2.5V \pm 0.2V$	Unit
$V_{THI}$	Crossing of $A$ and $\overline{A}$	V

**Test Circuit for DC Outputs and Power Down Tests**



**Test Circuit for Propagation, Skew, and Gate Enable/Disable Timing**



**Table 6B. LVDS Output Test Conditions**

Symbol	$V_{DD} = 2.5V \pm 0.2V$	Unit
$C_L$	$0^{(1)}$	pF
	$8^{(1,2)}$	pF
$R_L$	50	$\Omega$

NOTE 1: Specifications only apply to “Normal Operations” test condition. The  $T_{IA}/E_{IA}$  specification load is for reference only.  
 NOTE 2: The scope inputs are assumed to have a 2pF load to ground.  $T_{IA}/E_{IA} - 644$  specifies 5pF between the output pair. With  $C_L = 8pF$ , this gives the test circuit appropriate 5pF equivalent load.

## Package Outline and Package Dimensions

### Package Outline - K Suffix for 40 Lead VFQFPN

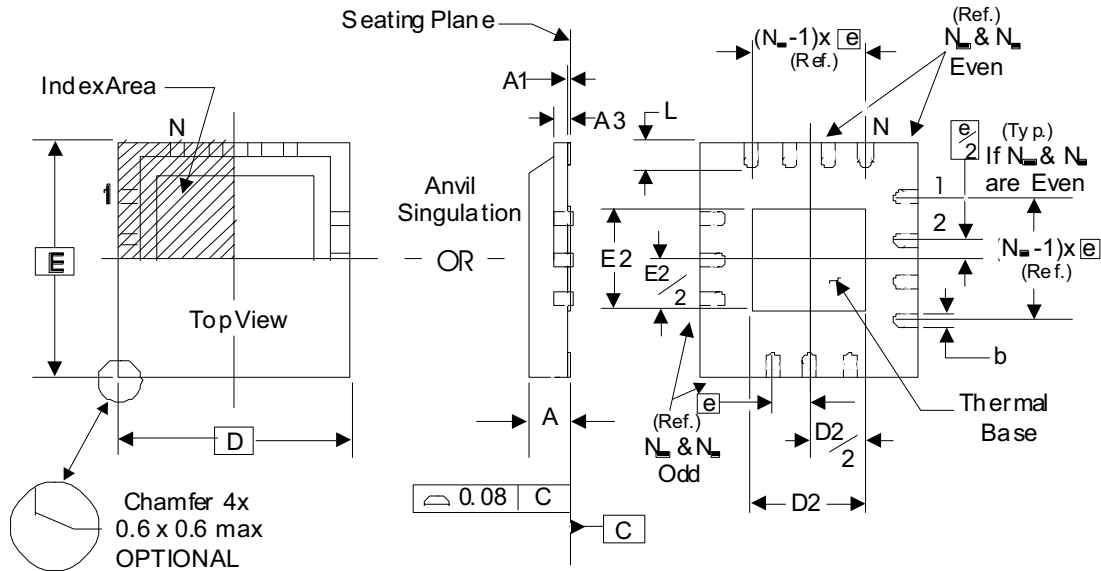


Table 7. Package Dimensions

JEDEC Variation: VJJD-2/-5 All Dimensions in Millimeters		
Symbol	Minimum	Maximum
N	40	
A	0.80	1.00
A1	0	0.05
A3	0.25 Ref.	
b	0.18	0.30
N <sub>D</sub> & N <sub>E</sub>	10	
D & E	6.00 Basic	
D2 & E2	1.75	4.80
e	0.50 Basic	
L	0.30	0.50

Reference Document: JEDEC Publication 95, MO-220

NOTE: The following package mechanical drawing is a generic drawing that applies to any pin count VFQFPN package. This drawing is not intended to convey the actual pin count or pin layout of this device. The pin count and pinout are shown on the front page. The package dimensions are in Table 7 below

## Ordering Information

Table 8. Ordering Information

IDT	XXXXX	XX	X		
	Device Type	Package	Process		
			I		-40°C to +85°C (Industrial)
		NL			Thermally Enhanced Plastic Very Fine Pitch Quad Flat No Lead Package VFQFPN - Green
		NLG			
	5T93GL10				2.5V LVDS 1:10 Glitchless Clock Buffer Terabuffer™ II



## Revision History Sheet

Rev	Table	Page	Description of Change	Date
A	T1 T3A, T3B	1	Features Section added bullet "Recommends IDT5T9310 if glitchless input selection is not required".	3/16/09
		2	Pin Description Table - FSEL pin, replaced description text.	
		3	Added Function Tables.	
		10 - 11	NOTE 3, replaced "HIGH" with "LOW".	
		15	Added Package Outline and Dimensions.	
		17	Converted datasheet format.	
A			Changed VFQFN to VFQFPN through the datasheet.	3/18/09

**IDT5T93GL10**

**2.5V LVDS 1:10 GLITCHLESS CLOCK BUFFER TERABUFFER™ II**

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