



LOW SKEW PLL CLOCK DRIVER TURBOCLOCK™ JR.

IDT59910A

FEATURES:

- Eight zero delay outputs
- Selectable positive or negative edge synchronization
- Synchronous output enable
- Output frequency: 15MHz to 100MHz
- TTL outputs
- 3 skew grades:
 - IDT59910A-2: $t_{SKEW0} < 250ps$
 - IDT59910A-5: $t_{SKEW0} < 500ps$
 - IDT59910A-7: $t_{SKEW0} < 750ps$
- 3-level inputs for PLL range control
- PLL bypass for DC testing
- External feedback, internal loop filter
- 46mA IoL high drive outputs
- Low Jitter: <200ps peak-to-peak
- Outputs drive 50 Ω terminated lines
- Pin-compatible with Cypress CY7B9910
- Available in SOIC package

DESCRIPTION:

The IDT59910A is a high fanout phase lock loop clock driver intended for high performance computing and data-communications applications. The IDT59910A has eight zero delay TTL outputs.

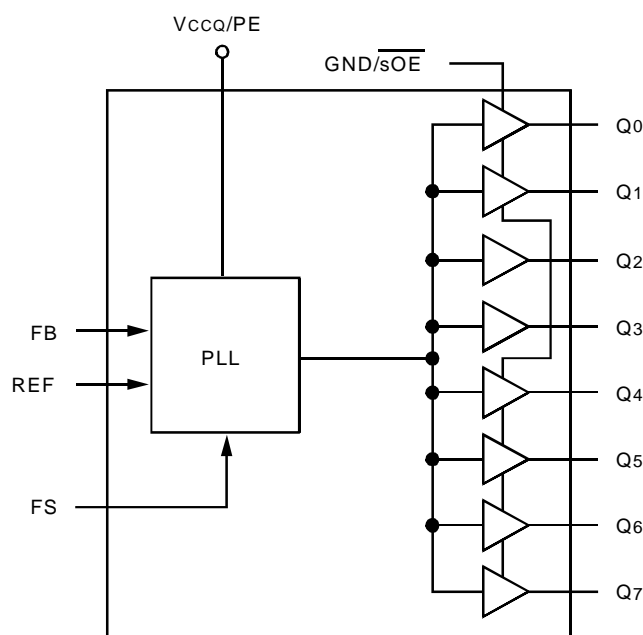
The IDT59910A maintains Cypress CY7B9910 compatibility while providing two additional features: Synchronous Output Enable (GND/\overline{sOE}), and Positive/Negative Edge Synchronization (V_{CCQ}/PE). When the GND/\overline{sOE} pin is held low, all the outputs are synchronously enabled (CY7B9910 compatibility). However, if GND/\overline{sOE} is held high, all the outputs except Q2 and Q3 are synchronously disabled.

Furthermore, when the V_{CCQ}/PE is held high, all the outputs are synchronized with the positive edge of the REF clock input (CY7B9910 compatibility). When V_{CCQ}/PE is held low, all the outputs are synchronized with the negative edge of REF.

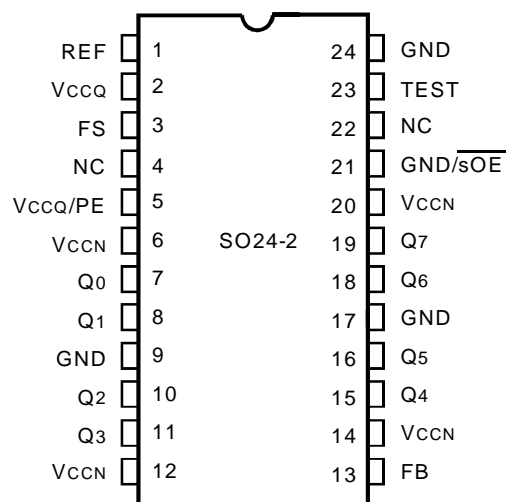
The FB signal is compared with the input REF signal at the phase detector in order to drive the VCO. Phase differences cause the VCO of the PLL to adjust upwards or downwards accordingly.

An internal loop filter moderates the response of the VCO to the phase detector. The loop filter transfer function has been chosen to provide minimal jitter (or frequency variation) while still providing accurate responses to input frequency changes.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
	Supply Voltage to Ground	-0.5 to +7	V
V _I	DC Input Voltage	-0.5 to +7	V
	Maximum Power Dissipation (T _A = 85°C)	530	mW
T _{STG}	Storage Temperature	-65 to +150	°C

NOTE:

- Stresses beyond those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

CAPACITANCE (T_A = +25°C, f = 1MHz, V_{IN} = 0V)

Parameter	Description	Typ.	Max.	Unit
C _{IN}	Input Capacitance	5	7	pF

NOTE:

- Capacitance applies to all inputs except TEST and FS. It is characterized but not production tested.

PIN DESCRIPTION

Pin Name	Type	Description
REF	IN	Reference Clock Input
FB	IN	Feedback Input
TEST ⁽¹⁾	IN	When MID or HIGH, disables PLL (except for conditions of Note 1). REF goes to all outputs. Set LOW for normal operation.
GND/ \overline{sOE} ⁽¹⁾	IN	Synchronous Output Enable. When HIGH, it stops clock outputs (except Q2 and Q3) in a LOW state - Q2 and Q3 may be used as the feedback signal to maintain phase lock. Set GND/ \overline{sOE} LOW for normal operation.
VccQ/PE	IN	Selectable positive or negative edge control. When LOW/HIGH the outputs are synchronized with the negative/positive edge of the reference clock.
FS ⁽²⁾	IN	Frequency range select. 3 level input. FS = GND: 15 to 35MHz FS = MID (or open): 25 to 60MHz FS = Vcc: 40 to 100MHz
Q0 - Q7	OUT	Eight clock output
VccN	PWR	Power supply for output buffers
VccQ	PWR	Power supply for phase locked loop and other internal circuitry
GND	PWR	Ground

NOTES:

- When TEST = MID and GND/ \overline{sOE} = HIGH, PLL remains active.
- This input is wired to Vcc, GND, or unconnected. Default is MID level. If it is switched in the real time mode, the outputs may glitch, and the PLL may require an additional lock time before all data sheet limits are achieved.

RECOMMENDED OPERATING RANGE

Symbol	Description	IDT59910A-5, -7 (Industrial)		IDT59910A-2 (Commercial)		Unit
		Min.	Max.	Min.	Max.	
V _{CC}	Power Supply Voltage	4.5	5.5	4.75	5.25	V
T _A	Ambient Operating Temperature	-40	+85	0	+70	°C

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter	Conditions	Min.	Max.	Unit
V _{IH}	Input HIGH Voltage	Guaranteed Logic HIGH (REF, FB Inputs Only)	2	—	V
V _{IL}	Input LOW Voltage	Guaranteed Logic LOW (REF, FB Inputs Only)	—	0.8	V
V _{IHH}	Input HIGH Voltage ⁽¹⁾	3-Level Inputs Only	V _{CC} - 1	—	V
V _{IMM}	Input MID Voltage ⁽¹⁾	3-Level Inputs Only	V _{CC} /2 - 0.5	V _{CC} /2 + 0.5	V
V _{ILL}	Input LOW Voltage ⁽¹⁾	3-Level Inputs Only	—	1	V
I _{IN}	Input Leakage Current (REF, FB Inputs Only)	V _{IN} = V _{CC} or GND V _{CC} = Max.	—	±5	μA
I ₃	3-Level Input DC Current (TEST, FS)	V _{IN} = V _{CC} HIGH Level	—	±200	μA
		V _{IN} = V _{CC} /2 MID Level	—	±50	
		V _{IN} = GND LOW Level	—	±200	
I _{PU}	Input Pull-Up Current (V _{CCO} /PE)	V _{CC} = Max., V _{IN} = GND	—	±100	μA
I _{PD}	Input Pull-Down Current (GND/sOE)	V _{CC} = Max., V _{IN} = V _{CC}	—	±100	μA
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = -16mA	2.4	—	V
		V _{CC} = Min., I _{OH} = -40mA	—	—	
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 46mA	—	0.45	V
I _{OS}	Output Short Circuit Current ⁽²⁾	V _{CC} = Max., V _O = GND	—	-250	mA

NOTES:

- These inputs are normally wired to V_{CC}, GND, or unconnected. Internal termination resistors bias unconnected inputs to V_{CC}/2. If these inputs are switched, the function and timing of the outputs may be glitched, and the PLL may require an additional lock time before all datasheet limits are achieved.
- This is to be measured at 25°C with 10:1 duty cycle, one output at a time, and one second maximum.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Typ. ⁽²⁾	Max.	Unit
I _{CCQ}	Quiescent Power Supply Current	V _{CC} = Max., TEST = MID, REF = LOW, GND/sOE = LOW, All outputs unloaded	10	40	mA
ΔI _{CC}	Power Supply Current per Input HIGH	V _{CC} = Max., V _{IN} = 3.4V	0.4	1.5	mA
I _{CCD}	Dynamic Power Supply Current per Output	V _{CC} = Max., C _L = 0pF	100	160	μA/MHz
I _{TOT}	Total Power Supply Current	V _{CC} = 5V, F _{REF} = 25MHz, C _L = 240pF ⁽¹⁾	53	—	mA
		V _{CC} = 5V, F _{REF} = 33MHz, C _L = 240pF ⁽¹⁾	63	—	
		V _{CC} = 5V, F _{REF} = 66MHz, C _L = 240pF ⁽¹⁾	117	—	

NOTE:

- For eight outputs, each loaded with 30pF.

INPUT TIMING REQUIREMENTS

Symbol	Description ⁽¹⁾	Min.	Max.	Unit
t _R , t _F	Maximum input rise and fall times, 0.8V to 2V	—	10	ns/V
t _{PWC}	Input clock pulse, HIGH or LOW	3	—	ns
D _H	Input duty cycle	10	90	%
REF	Reference clock input	15	100	MHz

NOTE:

- Where pulse width implied by D_H is less than t_{PWC} limit, t_{PWC} limit applies.

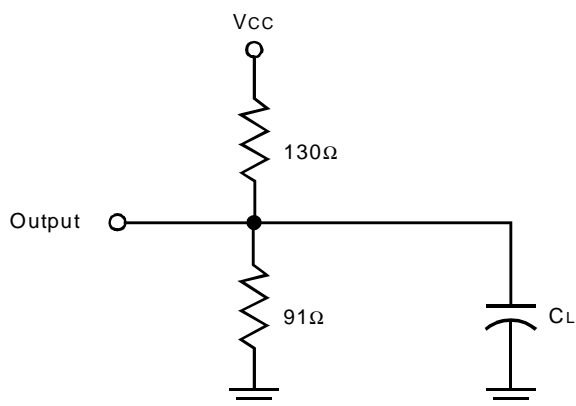
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter		IDT59910A-2			IDT59910A-5			IDT59910A-7			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
F _{REF}	REF Frequency Range	FS = LOW	15	—	35	15	—	35	15	—	35	MHz
		FS = MED	25	—	60	25	—	60	25	—	60	
		FS = HIGH	40	—	100	40	—	100	40	—	100	
t _{RPWH}	REF Pulse Width HIGH ^(1,8)		3	—	—	3	—	—	3	—	—	ns
t _{RPWL}	REF Pulse Width LOW ^(1,8)		3	—	—	3	—	—	3	—	—	ns
t _{SKEW0}	Zero Output Skew (All Outputs) ^(1,3,4)		—	0.1	0.25	—	0.25	0.5	—	0.3	0.75	ns
t _{DEV}	Device-to-Device Skew ^(1,2,5)		—	—	0.75	—	—	1.25	—	—	1.65	ns
t _{PD}	REF Input to FB Propagation Delay ^(1,7)		−0.25	0	0.25	−0.5	0	0.5	−0.7	0	0.7	ns
t _{ODCV}	Output Duty Cycle Variation from 50% ⁽¹⁾		−1.2	0	1.2	−1.2	0	1.2	−1.2	0	1.2	ns
t _{ORISE}	Output Rise Time ⁽¹⁾		0.15	1	1.2	0.15	1	1.5	0.15	1.5	2.5	ns
t _{OFALL}	Output Fall Time ⁽¹⁾		0.15	1	1.2	0.15	1	1.5	0.15	1.5	2.5	ns
t _{LOCK}	PLL Lock Time ^(1,6)		—	—	0.5	—	—	0.5	—	—	0.5	ms
t _{JR}	Cycle-to-Cycle Output Jitter ⁽¹⁾	RMS	—	—	25	—	—	25	—	—	25	ps
		Peak-to-Peak	—	—	200	—	—	200	—	—	200	

NOTES:

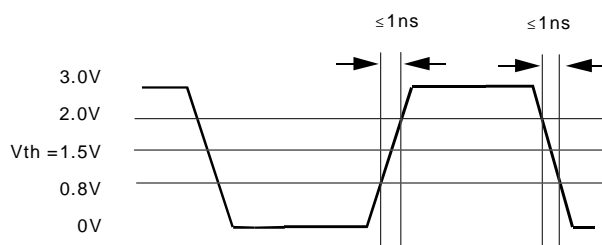
- All timing and jitter tolerances apply for F_{NOM} ≥ 25MHz.
- Skew is the time between the earliest and the latest output transition among all outputs with the specified load.
- t_{SKEW} is the skew between all outlets. See AC TEST LOADS.
- For IDT59910A-2 t_{SKEW0} is measured with C_L = 0pF; for C_L = 30pF, t_{SKEW0} = 0.35ns Max.
- t_{DEV} is the output-to-output skew between any two devices operating under the same conditions (V_{CC}, ambient temperature, air flow, etc.)
- t_{LOCK} is the time that is required before synchronization is achieved. This specification is valid only after V_{CC} is stable and within normal operating limits. This parameter is measured from the application of a new signal or frequency at REF or FB until t_{PD} is within specified limits.
- t_{PD} is measured with REF input rise and fall times (from 0.8V to 2V) of 1ns.
- Refer to INPUT TIMING REQUIREMENTS for more detail.

AC TEST LOADS AND WAVEFORMS

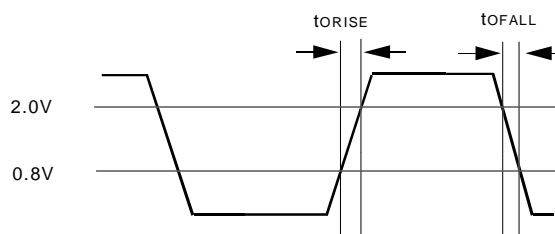


$C_L = 50\text{pF}$ ($C_L = 30\text{pF}$ for -2 and -5 devices)

Test Load

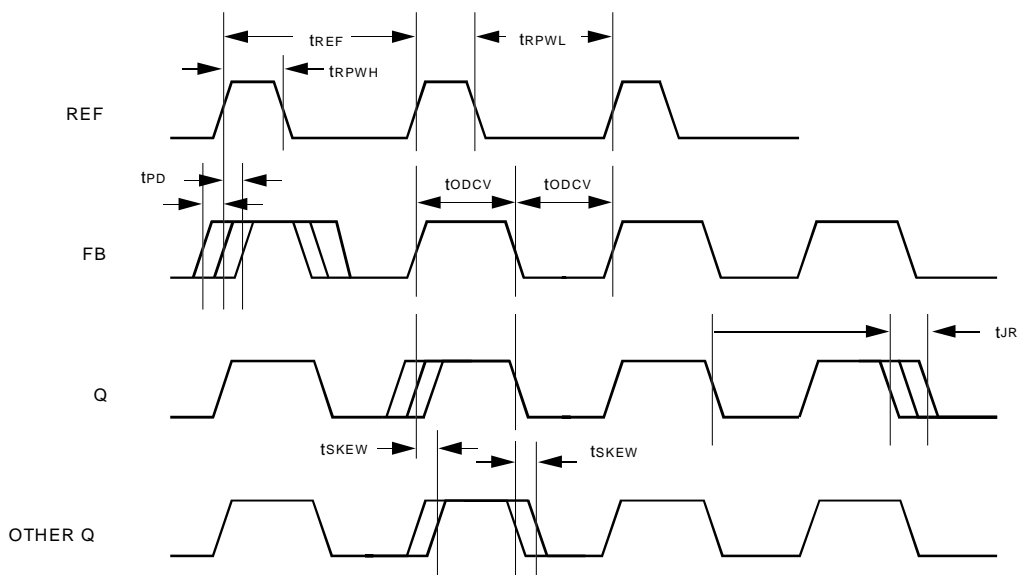


TTL Input Test Waveform



TTL Output Waveform

AC TIMING DIAGRAM



NOTES:

- Skew: The time between the earliest and the latest output transition among all outputs when all are loaded with 50pF (30pF for -2 and -5) and terminated with 50Ω to 2.06V.
- t_{SKEW} : The skew between all outputs.
- t_{DEV} : The output-to-output skew between any two devices operating under the same conditions (V_{cc} , ambient temperature, air flow, etc.)
- t_{ODCV} : The deviation of the output from a 50% duty cycle.
- t_{ORISE} and t_{OFALL} are measured between 0.8V and 2V.
- t_{LOCK} : The time that is required before synchronization is achieved. This specification is valid only after V_{cc} is stable and within normal operating limits. This parameter is measured from the application of a new signal or frequency at REF or FB until t_{PD} is within specified limits.

ORDERING INFORMATION

IDT	XXXXX	XX	X		
	Device Type	Package	Process		
				Blank	Commercial (0°C to +70°C)
				I	Industrial (-40°C to +85°C)
				SO	Small Outline IC (300-mil) (SO24-2)
				59910A-2	Low Skew PLL Clock Driver TurboClock Jr.
				59910A-5	
				59910A-7	



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