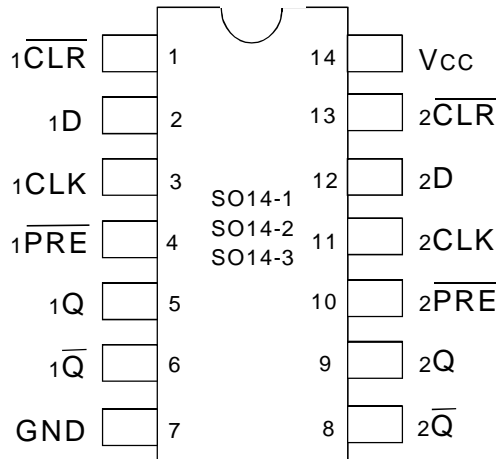


PIN CONFIGURATION



SOIC/ SSOP/ TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS (1)

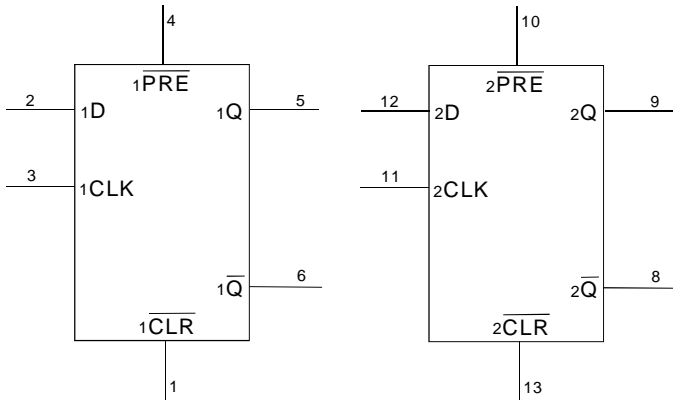
Symbol	Description	Max.	Unit
VTERM(2)	Terminal Voltage with Respect to GND	- 0.5 to + 4.6	V
VTERM(3)	Terminal Voltage with Respect to GND	- 0.5 to VCC + 0.5	V
TSTG	Storage Temperature	- 65 to + 150	°C
IOUT	DC Output Current	- 50 to + 50	mA
I _{IK}	Continuous Clamp Current, V _I < 0 or V _I > V _{CC}	± 50	mA
I _{OK}	Continuous Clamp Current, V _O < 0	- 50	mA
I _{CC}	Continuous Current through each V _{CC} or GND	± 100	mA

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NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating 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 rating conditions for extended periods may affect reliability.
- V_{CC} terminals.
- All terminals except V_{CC}.

LOGIC SYMBOLS



PIN DESCRIPTION

Pin Names	Description
xCLK	Clock Inputs
xCLR	Clear Inputs
xPRE	Preset Inputs
xD	Data Inputs
xQ, xQ-bar	Data Outputs

CAPACITANCE (TA = +25°C, f = 1.0MHz)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	5	7	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V	7	9	pF
C _{I/O}	I/O Port Capacitance	V _{IN} = 0V	7	9	pF

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NOTE:

- As applicable to the device type.

FUNCTION TABLE (1)

Inputs				Outputs	
xPRE	xCLR	xCLK	xD	xQ	xQ-bar
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H ⁽²⁾	H ⁽²⁾
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q ₀ ⁽³⁾	Q ₀ -bar ⁽⁴⁾

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-Impedance
↑ = LOW-to-HIGH Transition
- This configuration is unstable; that is, it does not persist when PRE or CLR returns to its inactive (HIGH) level.
- Q₀ = Level of Q before the indicated steady-state input conditions were established.
- Q₀ = Complement of Q₀ or level of Q₀ before the indicated steady-state input conditions were established.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
V _{IH}	Input HIGH Voltage Level	V _{CC} = 2.3V to 2.7V		1.7	—	—	V
		V _{CC} = 2.7V to 3.6V		2	—	—	
V _{IL}	Input LOW Voltage Level	V _{CC} = 2.3V to 2.7V		—	—	0.7	V
		V _{CC} = 2.7V to 3.6V		—	—	0.8	
I _{IH}	Input HIGH Current	V _{CC} = 3.6V	V _I = V _{CC}	—	—	± 5	μA
I _{IL}	Input LOW Current	V _{CC} = 3.6V	V _I = GND	—	—	± 5	
I _{OZH}	High Impedance Output Current (3-State Output pins)	V _{CC} = 3.6V	V _O = V _{CC}	—	—	± 10	μA
I _{OZL}			V _O = GND	—	—	± 10	μA
V _{IK}	Clamp Diode Voltage	V _{CC} = 2.3V, I _{IN} = -18mA		—	-0.7	-1.2	V
V _H	Input Hysteresis	V _{CC} = 3.3V		—	100	—	mV
I _{CC1}	Quiescent Power Supply Current	V _{CC} = 3.6V		—	0.1	10	μA
I _{CC2}		V _{IN} = GND or V _{CC}					
I _{CC3}							
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at V _{CC} - 0.6V, other inputs at V _{CC} or GND		—	—	750	μA

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NOTE:

1. Typical values are at V_{CC} = 3.3V, +25°C ambient.

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Max.	Unit
V _{OH}	Output HIGH Voltage	V _{CC} = 2.3V to 3.6V	I _{OH} = -0.1mA	V _{CC} - 0.2	—	V
		V _{CC} = 2.3V	I _{OH} = -6mA	2	—	
		V _{CC} = 2.3V	I _{OH} = -12mA	1.7	—	
		V _{CC} = 2.7V		2.2	—	
		V _{CC} = 3.0V		2.4	—	
		V _{CC} = 3.0V	I _{OH} = -24mA	2	—	
V _{OL}	Output LOW Voltage	V _{CC} = 2.3V to 3.6V	I _{OL} = 0.1mA	—	0.2	V
		V _{CC} = 2.3V	I _{OL} = 6mA	—	0.4	
			I _{OL} = 12mA	—	0.7	
		V _{CC} = 2.7V	I _{OL} = 12mA	—	0.4	
		V _{CC} = 3.0V	I _{OL} = 24mA	—	0.55	

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NOTE:

1. V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = -40°C to +85°C.

OPERATING CHARACTERISTICS, $T_A = 25^\circ\text{C}$

Symbol	Parameter	Test Conditions	$V_{CC} = 2.5V \pm 0.2V$	$V_{CC} = 3.3V \pm 0.3V$	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance per flip-flop	$C_L = 0\text{pF}$, $f = 10\text{MHz}$	20	31	pF

SWITCHING CHARACTERISTICS ⁽¹⁾

Symbol	Parameter	$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
f_{MAX}								MHz
t_{PLH} t_{PHL}	Propagation Delay xCLK to xQ or x \bar{Q}	1	6	1	5	1	3.8	ns
t_{PLH} t_{PHL}	Propagation Delay x \bar{PRE} or x \bar{CLR} to xQ or x \bar{Q}	1	6.2	1	5.2	1	4	ns
t_w	Pulse Duration, x \bar{PRE} or x \bar{CLR} LOW	3.3	—	3.3	—	3.3	—	ns
t_w	Pulse Duration, xCLK HIGH or LOW	3.3	—	3.3	—	3.3	—	ns
t_{SU}	Setup Time, data before xCLK \uparrow	3	—	3	—	3	—	ns
t_{SU}	Setup Time, x \bar{PRE} or x \bar{CLR} inactive	2	—	2	—	2	—	ns
t_H	Hold Time, data after xCLK \uparrow	1	—	1	—	0	—	ns

NOTE:

1. See test circuits and waveforms. $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$.

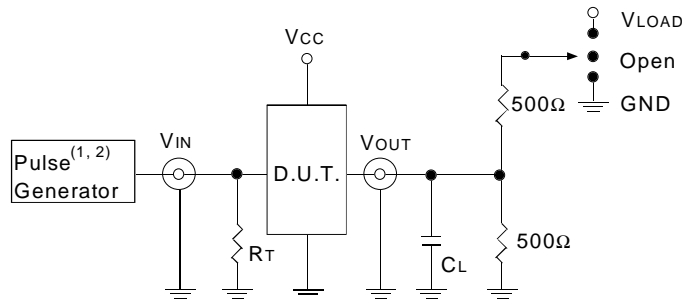
TEST CIRCUITS AND WAVEFORMS:

TEST CONDITIONS

Symbol	V _{CC} (1) = 3.3V ± 0.3V	V _{CC} (1) = 2.7V	V _{CC} (2) = 2.5V ± 0.2V	Unit
V _{LOAD}	6	6	2 x V _{CC}	V
V _{IH}	2.7	2.7	V _{CC}	V
V _T	1.5	1.5	V _{CC} / 2	V
V _{LZ}	300	300	150	mV
V _{HZ}	300	300	150	mV
C _L	50	50	30	pF

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TEST CIRCUITS FOR ALL OUTPUTS



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DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

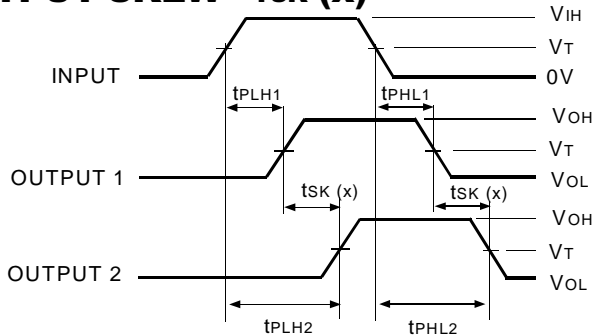
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other tests	Open

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OUTPUT SKEW - T_{SK} (x)



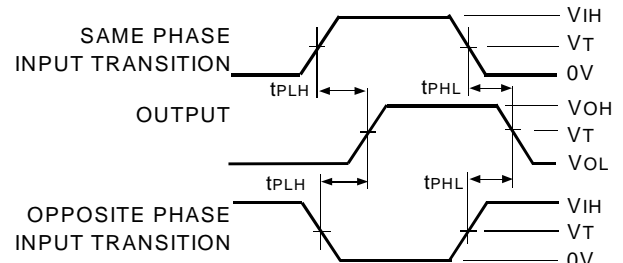
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

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NOTES:

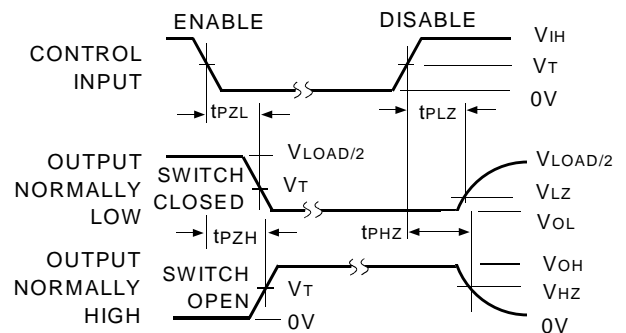
1. For t_{SK}(a) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



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ENABLE AND DISABLE TIMES

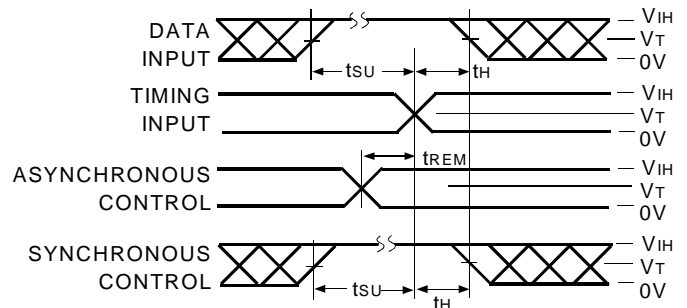


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NOTE:

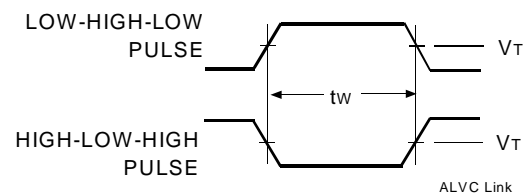
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



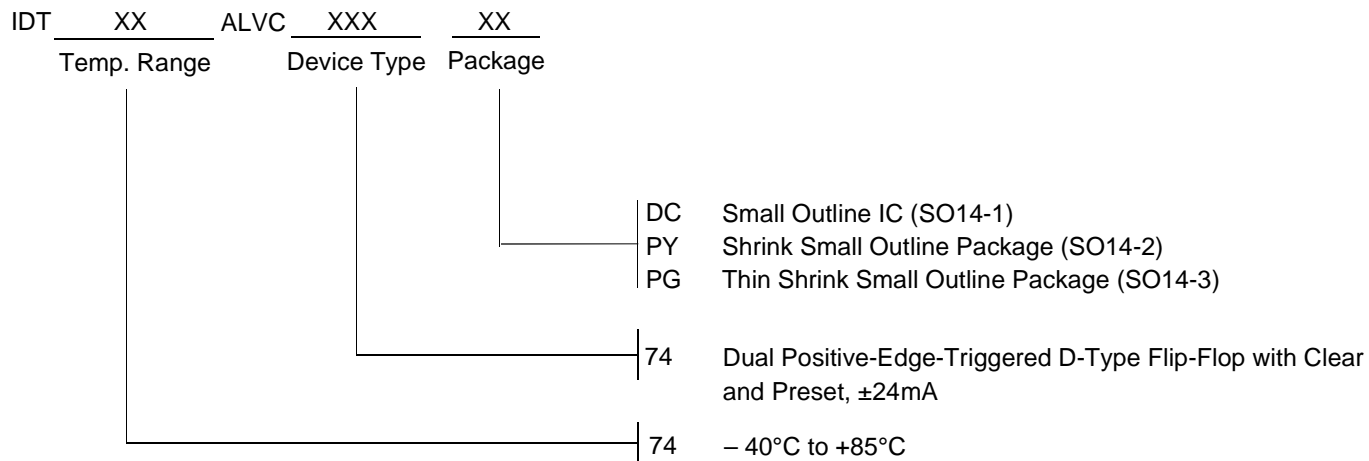
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PULSE WIDTH



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CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
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