



3.3V CMOS DUAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP-FLOP WITH CLEAR AND PRESET

IDT74ALVC74

FEATURES:

- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015;
> 200V using machine model (C = 200pF, R = 0)
- $V_{CC} = 3.3V \pm 0.3V$, Normal Range
- $V_{CC} = 2.7V$ to $3.6V$, Extended Range
- $V_{CC} = 2.5V \pm 0.2V$
- CMOS power levels (0.4μW typ. static)
- Rail-to-Rail output swing for increased noise margin
- Available in SOIC, SSOP and TSSOP packages

Drive Features for ALVC74:

- High Output Drivers: $\pm 24mA$
- Suitable for heavy loads

DESCRIPTION:

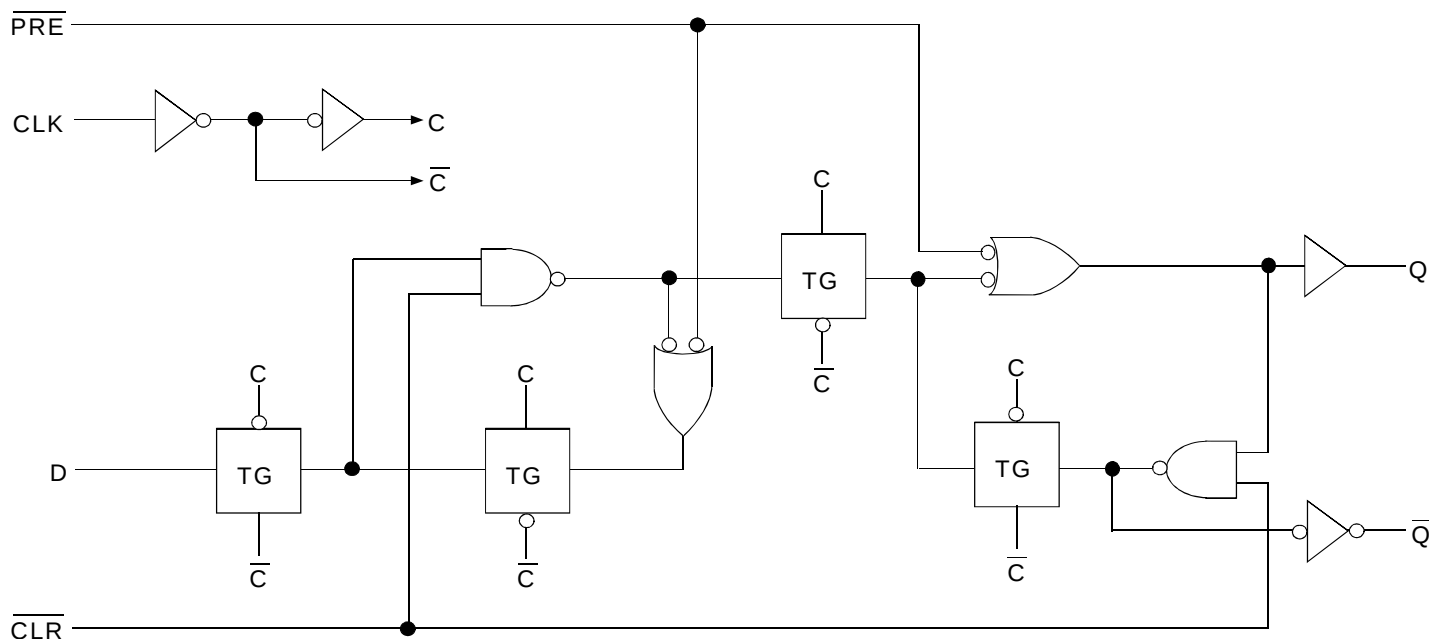
This dual positive-edge-triggered D-type flip-flop is built using advanced dual metal CMOS technology. A low level at the preset ($\overline{PRE}$) or clear ($\overline{CLR}$) inputs sets or resets the outputs, regardless of the levels of the other inputs. When $\overline{PRE}$ and $\overline{CLR}$ are inactive (high), data at the data (D) input meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input may be changed without affecting the levels at the outputs.

The ALVC74 has been designed with a $\pm 24mA$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

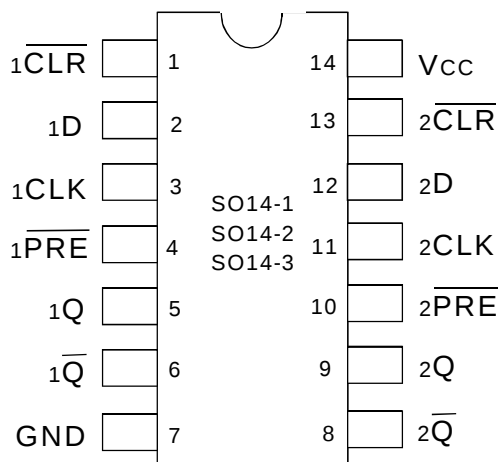
APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ SSOP/ TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

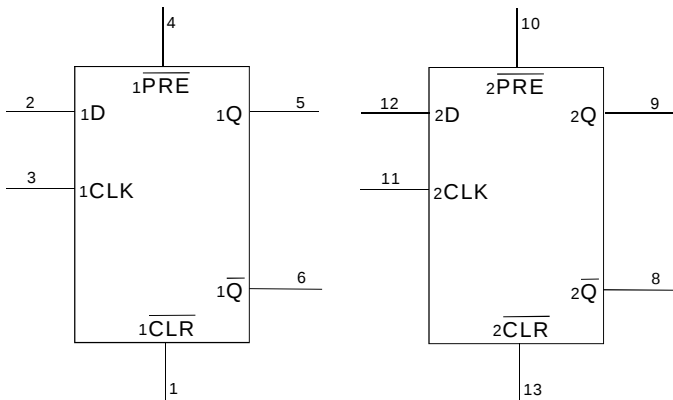
Symbol	Description	Max.	Unit
V _{TERM} ⁽²⁾	Terminal Voltage with Respect to GND	- 0.5 to + 4.6	V
V _{TERM} ⁽³⁾	Terminal Voltage with Respect to GND	- 0.5 to V _{CC} + 0.5	V
T _{STG}	Storage Temperature	- 65 to + 150	°C
I _{OUT}	DC Output Current	- 50 to + 50	mA
I _{IK}	Continuous Clamp Current, V _I < 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

ALVC QUAD Link

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



CAPACITANCE (T_A = +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

ALVC QUAD Link

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.

PIN DESCRIPTION

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

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	$V_{CC} = 2.3\text{V}$ to 2.7V		1.7	—	—	V
		$V_{CC} = 2.7\text{V}$ to 3.6V		2	—	—	
V_{IL}	Input LOW Voltage Level	$V_{CC} = 2.3\text{V}$ to 2.7V		—	—	0.7	V
		$V_{CC} = 2.7\text{V}$ to 3.6V		—	—	0.8	
I_{IH}	Input HIGH Current	$V_{CC} = 3.6\text{V}$	$V_I = V_{CC}$	—	—	± 5	μA
I_{IL}	Input LOW Current	$V_{CC} = 3.6\text{V}$	$V_I = \text{GND}$	—	—	± 5	
I_{OZH}	High Impedance Output Current (3-State Output pins)	$V_{CC} = 3.6\text{V}$	$V_O = V_{CC}$	—	—	± 10	μA
I_{OLZ}			$V_O = \text{GND}$	—	—	± 10	μA
V_{IK}	Clamp Diode Voltage	$V_{CC} = 2.3\text{V}$, $I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
V_H	Input Hysteresis	$V_{CC} = 3.3\text{V}$		—	100	—	mV
I_{CCL} I_{CCH} I_{CCZ}	Quiescent Power Supply Current	$V_{CC} = 3.6\text{V}$ $V_{IN} = \text{GND}$ or V_{CC}		—	0.1	10	μA
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at $V_{CC} - 0.6\text{V}$, other inputs at V_{CC} or GND		—	—	750	μA

ALVC QUAD Link

NOTE:

1. Typical values are at $V_{CC} = 3.3\text{V}$, $+25^{\circ}\text{C}$ ambient.

OUTPUT DRIVE CHARACTERISTICS

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

ALVC QUAD Link

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. $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$.

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 $\overline{PRE}$ or x $\overline{CLR}$ to xQ or x $\bar{Q}$	1	6.2	1	5.2	1	4	ns
t_W	Pulse Duration, x $\overline{PRE}$ or x $\overline{CLR}$ 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 $\overline{PRE}$ or x $\overline{CLR}$ 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 $+85^\circ\text{C}$.

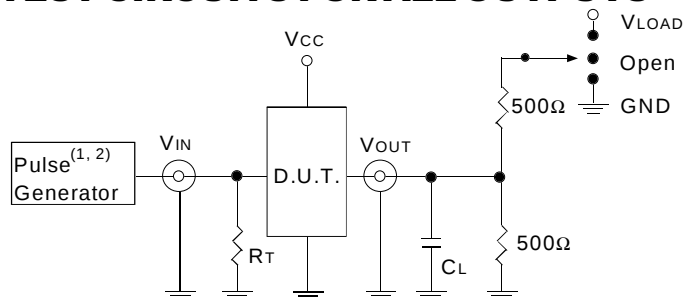
TEST CIRCUITS AND WAVEFORMS:

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

ALVC QUAD Link

TEST CIRCUITS FOR ALL OUTPUTS



ALVC Link

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:

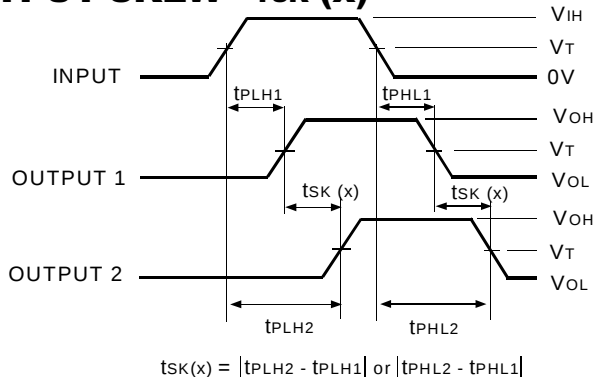
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_r ≤ 2.5ns; t_r ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_r ≤ 2ns; t_r ≤ 2ns.

SWITCH POSITION

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

ALVC QUAD Link

OUTPUT SKEW - t_{SK} (x)

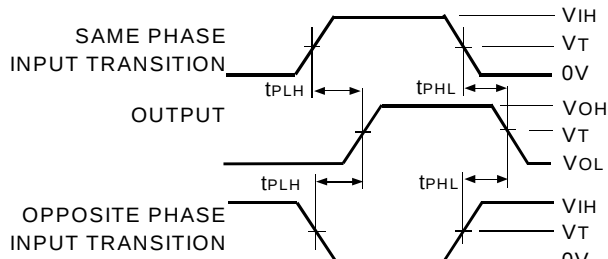


ALVC Link

NOTES:

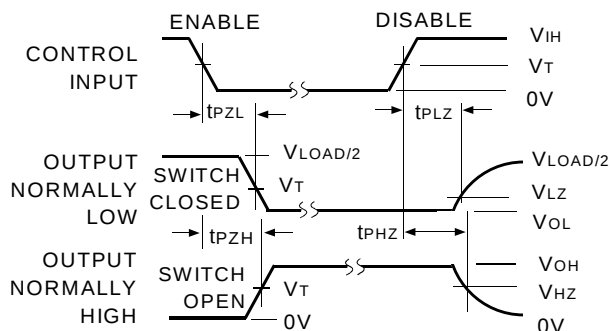
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



ALVC Link

ENABLE AND DISABLE TIMES

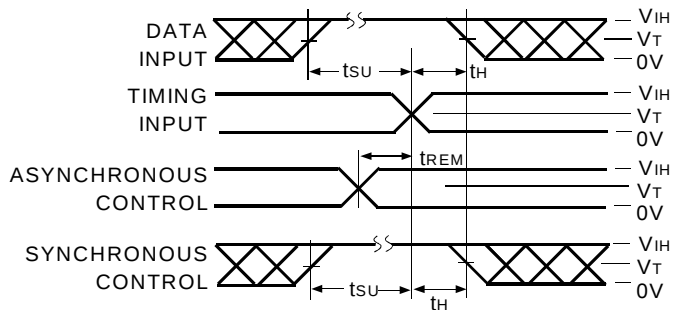


ALVC Link

NOTE:

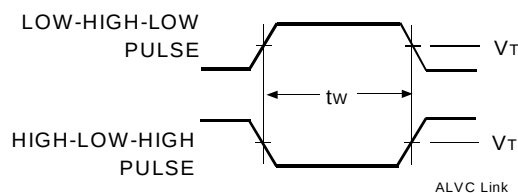
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



ALVC Link

PULSE WIDTH



ALVC Link

ORDERING INFORMATION

IDT	XX	ALVC	XXX	XX	
	Temp. Range		Device Type	Package	
				DC	Small Outline IC (SO14-1)
				PY	Shrink Small Outline Package (SO14-2)
				PG	Thin Shrink Small Outline Package (SO14-3)
			74		Dual Positive-Edge-Triggered D-Type Flip-Flop with Clear and Preset, $\pm 24\text{mA}$
			74		-40°C to $+85^{\circ}\text{C}$



CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
800-345-7015 or 408-727-6116
fax: 408-492-8674
www.idt.com*

*To search for sales office near you, please click the sales button found on our home page or dial the 800# above and press 2.
The IDT logo is a registered trademark of Integrated Device Technology, Inc.