



3.3V CMOS 20-BIT BUS-INTERFACE FLIP- FLOP WITH 3-STATE OUT- PUTS AND BUS-HOLD

IDT74ALVCH16821

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical $t_{sk(o)}$ (Output Skew) < 250ps
- 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 ($0.4\mu W$ typ. static)
- Rail-to-Rail output swing for increased noise margin
- Available in SSOP, TSSOP, and TVSOP packages

DRIVE FEATURES:

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

APPLICATIONS:

- 3.3V high speed systems
- 3.3V and lower voltage computing systems

DESCRIPTION:

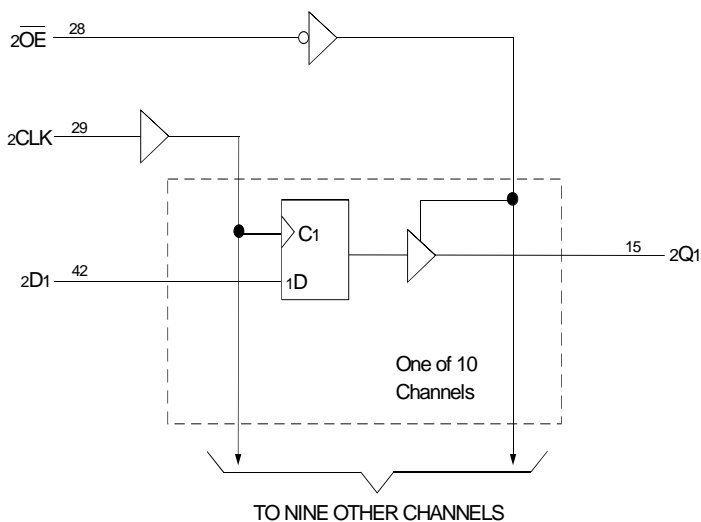
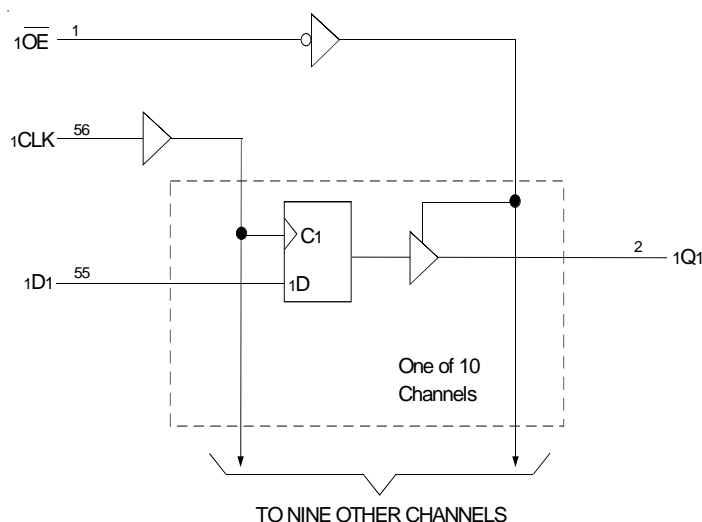
This high speed, 20-bit bus-interface flip-flop is built using advanced CMOS technology. The ALVCH16821 device can be used as two 10-bit flip-flops or one 20-bit flip-flop. On the positive transition of the clock (CLK) input, the device provides true data at the Q outputs.

A buffered output-enable (\overline{OE}) input can be used to place the ten outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without the need for interface or pullup components. \overline{OE} input does not affect the internal operation of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

The ALVCH16821 has been designed with a $\pm 24mA$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

The ALVCH16821 has "bus-hold" which retains the inputs' last state whenever the input goes to a high impedance. This prevents floating inputs and eliminates the need for pull-up/down resistor.

FUNCTIONAL BLOCK DIAGRAM

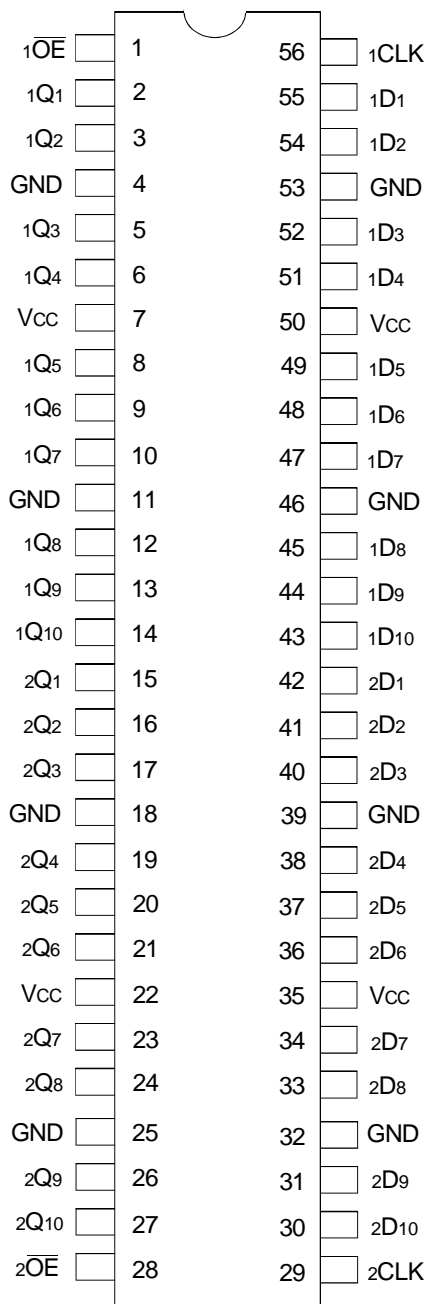


The IDT logo is a registered trademark of Integrated Device Technology, Inc.

INDUSTRIAL TEMPERATURE RANGE

APRIL 1999

PIN CONFIGURATION



SSOP/ TSSOP/ TVSOP
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 > Vcc	±50	mA
I _{OK}	Continuous Clamp Current, V _O < 0	-50	mA
I _{CC} I _{SS}	Continuous Current through each Vcc or GND	±100	mA

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.
- Vcc terminals.
- All terminals except Vcc.

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 _{OUT}	I/O Port Capacitance	V _{IN} = 0V	7	9	pF

NOTE:

- As applicable to the device type.

PIN DESCRIPTION

Pin Names	Description
xD _x	Data Inputs ⁽¹⁾
xCLK	Clock Input
xQ _x	3-State Outputs
\overline{xOE}	3-State Output Enable Inputs (Active LOW)

NOTE:

- These pins have "Bus-Hold". All other pins are standard inputs, outputs, or I/Os.

FUNCTION TABLE (EACH 10-BIT FLIP-FLOP)⁽¹⁾

Inputs			Output
\overline{xOE}	xCLK	D _x	xQ _x
L	↑	H	H
L	↑	L	L
L	H or L	X	Q ₀ ⁽²⁾
H	X	X	Z

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High Impedance
↑ = LOW-to-HIGH transition
- Output level 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	μA
I _{OZH} I _{OZL}	High Impedance Output Current (3-State Output pins)	V _{CC} = 3.6V		—	—	±10	μA
		V _O = GND		—	—	±10	
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} I _{CC2} I _{CC3}	Quiescent Power Supply Current	V _{CC} = 3.6V V _{IN} = GND or V _{CC}		—	0.1	40	μA
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at V _{CC} - 0.6V, other inputs at V _{CC} or GND		—	—	750	μA

NOTE:

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

BUS-HOLD CHARACTERISTICS

Symbol	Parameter ⁽¹⁾	Test Conditions		Min.	Typ. ⁽²⁾	Max.	Unit
I _{BHH} I _{BHL}	Bus-Hold Input Sustain Current	V _{CC} = 3V		—75	—	—	μA
		V _I = 0.8V		75	—	—	
I _{BHH} I _{BHL}	Bus-Hold Input Sustain Current	V _{CC} = 2.3V		-45	—	—	μA
		V _I = 0.7V		45	—	—	
I _{BHHO} I _{BHLO}	Bus-Hold Input Overdrive Current	V _{CC} = 3.6V		—	—	±500	μA

NOTES:

1. Pins with Bus-Hold are identified in the pin description.
2. 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} = 3V		2.4	—	
		V _{CC} = 3V		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} = 3V	I _{OL} = 24mA	—	0.55	

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°C

Symbol	Parameter	Test Conditions	V _{CC} = 2.5V ± 0.2V	V _{CC} = 3.3V ± 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance per Flip Flop Outputs enabled	C _L = 0pF, f = 10Mhz	36	40	pF
CPD	Power Dissipation Capacitance per Flip Flop Outputs disabled		22	24	

SWITCHING CHARACTERISTICS⁽¹⁾

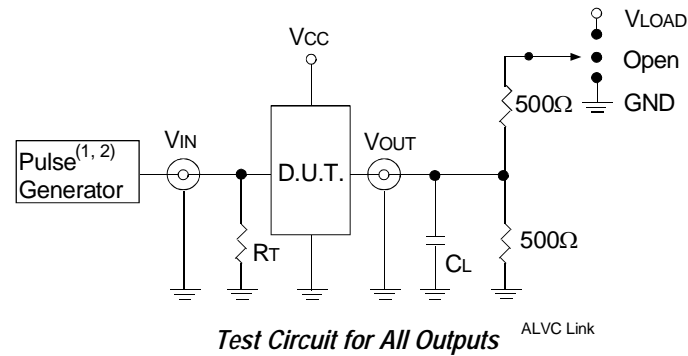
Symbol	Parameter	V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
f _{MAX}		150	—	150	—	150	—	MHz
t _{PLH}	Propagation Delay	1	5.8	—	5.3	1	4.5	ns
t _{PHL}	xCLK to xQx							
t _{PZH}	Output Enable Time	1	6.6	—	6.2	1	5.1	ns
t _{PZL}	$\overline{\text{xOE}}$ to xQx							
t _{PHZ}	Output Disable Time	1	5.7	—	5	1	4.6	ns
t _{PLZ}	$\overline{\text{xOE}}$ to xQx							
t _w	Pulse Duration, xCLK HIGH or LOW	3.3	—	3.3	—	3.3	—	ns
t _{SU}	Set-up Time, data before CLK↑	4.4	—	3.9	—	3.4	—	ns
t _H	Hold Time, data after CLK↑	0	—	0	—	0	—	ns
t _{SK(O)}	Output Skew ⁽²⁾	—	—	—	—	—	500	ps

NOTES:
1. See TEST CIRCUITS AND WAVEFORMS. T_A = - 40°C to + 85°C.
2. Skew between any two outputs of the same package and switching in the same direction.

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



DEFINITIONS:

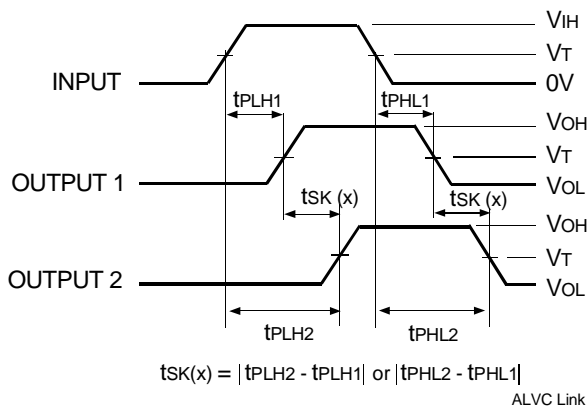
C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t_r ≤ 2.5ns; t_r ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t_r ≤ 2ns; t_r ≤ 2ns.

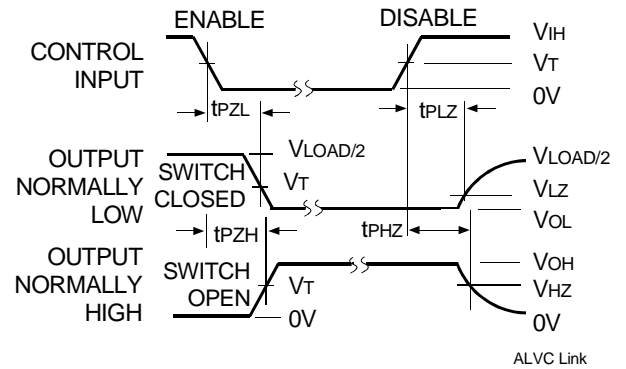
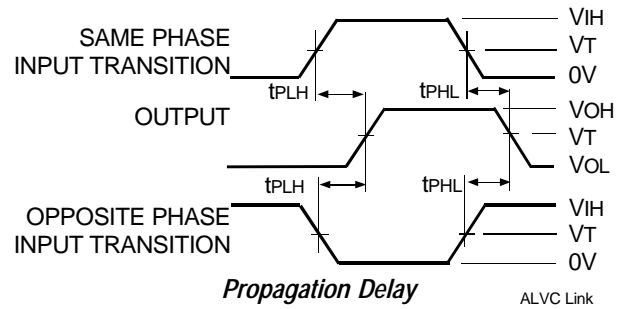
SWITCH POSITION

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



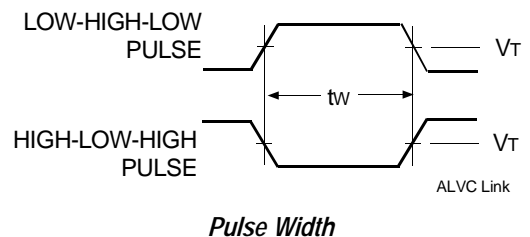
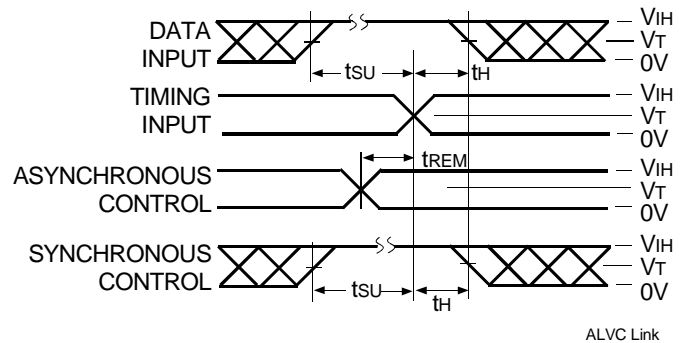
NOTES:

1. For tsk(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For tsk(b) OUTPUT1 and OUTPUT2 are in the same bank.

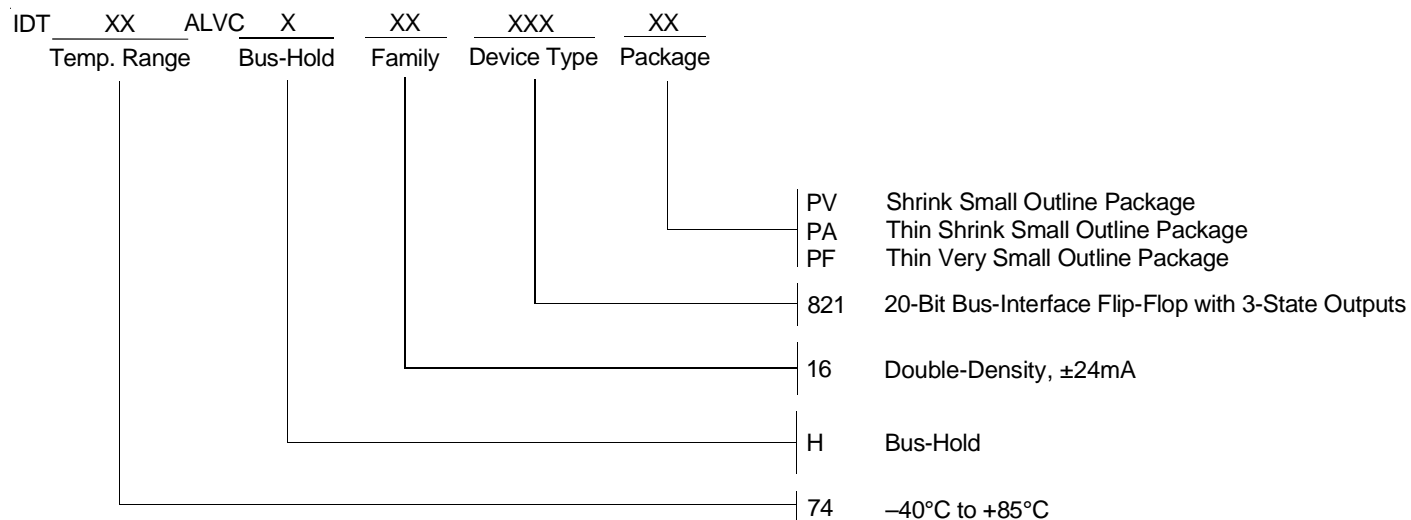


NOTE:

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



ORDERING INFORMATION



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

for Tech Support:
logichelp@idt.com
 (408) 654-6459