



3.3V CMOS LOW VOLTAGE 20-BIT TRANSPARENT LATCH WITH 3-STATE OUTPUTS, 5 VOLT TOLERANT I/O

IDT74LVC16841A

FEATURES:

- 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
- CMOS power levels ($0.4\mu W$ typ. static)
- All inputs, outputs, and I/O are 5V tolerant
- Supports hot insertion
- Available in TSSOP package

DRIVE FEATURES:

- High Output Drivers: $\pm 24mA$
- Reduced system switching noise

APPLICATIONS:

- 5V and 3.3V mixed voltage systems
- Data communication and telecommunication systems

DESCRIPTION:

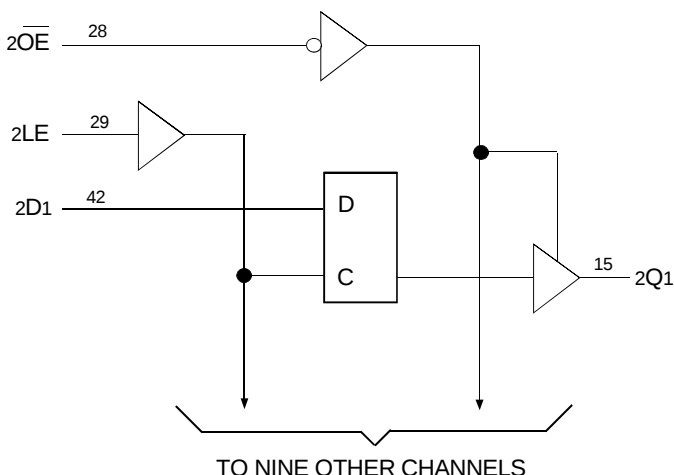
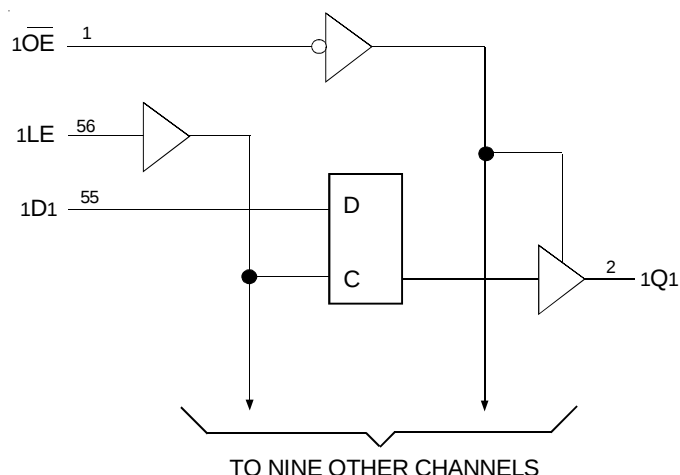
The LVC16841A low voltage 20-bit transparent latch is built using advanced dual metal CMOS technology. This high speed, low power latch is ideal for temporary storage of data. The LVC16841A can be used for implementing memory address latches, I/O ports, and bus drivers. The output enable ($\overline{OE}$) and latch enable (LE) controls are organized to operate each device as two 10-bit latches or one 20-bit latch. Flow through organization of signal pins simplifies layout. All inputs are designed with hysteresis for improved noise margin.

The LVC16841A is ideally suited for driving high capacitance loads and low-impedance backplanes. The output buffers are designed with power off disable capability to allow "live insertion" of boards when used as a backplane drivers.

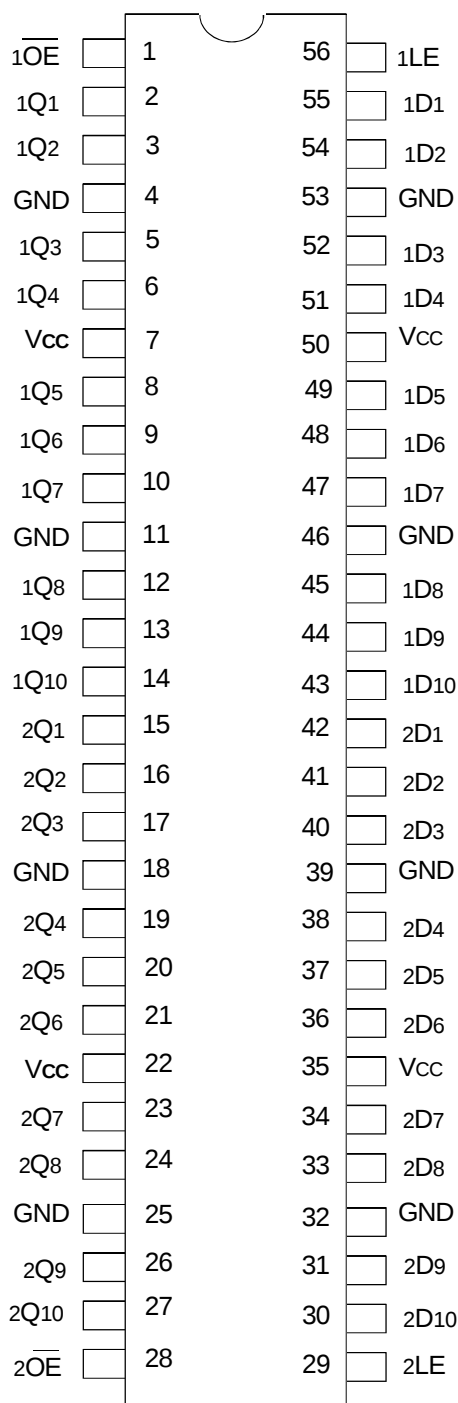
All pins can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V supply system.

The LVC16841A has been designed with a $\pm 24mA$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
V _{TERM}	Terminal Voltage with Respect to GND	-0.5 to +6.5	V
T _{STG}	Storage Temperature	-65 to +150	°C
I _{OUT}	DC Output Current	-50 to +50	mA
I _{IK} I _{OK}	Continuous Clamp Current, V _I < 0 or V _O < 0	-50	mA
I _{CC} I _{SS}	Continuous Current through each V _{CC} or GND	±100	mA

NOTE:

- 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.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	4.5	6	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V	6.5	8	pF
C _{I/O}	I/O Port Capacitance	V _{IN} = 0V	6.5	8	pF

NOTE:

- As applicable to the device type.

PIN DESCRIPTION

Pin Names	Description
x Dx	Data Inputs
x LE	Latch Enable Input (Active HIGH)
x $\overline{OE}$	Output Enable Input (Active LOW)
x Q x	3-State Outputs

FUNCTION TABLE⁽¹⁾

Inputs			Outputs
x Dx	x LE	x $\overline{OE}$	x Q x
H	H	L	H
L	H	L	L
X	L	L	Q ⁽²⁾
X	X	H	Z

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High Impedance
- Output level before xLE HIGH-to-LOW transition.

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} I_{IL}	Input Leakage Current	$V_{CC} = 3.6\text{V}$	$V_I = 0$ to 5.5V	—	—	± 5	μA
I_{OZH} I_{OZL}	High Impedance Output Current (3-State Output pins)	$V_{CC} = 3.6\text{V}$	$V_O = 0$ to 5.5V	—	—	± 10	μA
I_{OFF}	Input/Output Power Off Leakage	$V_{CC} = 0\text{V}$, V_{IN} or $V_O \leq 5.5\text{V}$		—	—	± 50	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}	—	—	10	μA
			$3.6 \leq V_{IN} \leq 5.5\text{V}^{(2)}$	—	—	10	
ΔI_{CC}	Quiescent Power Supply Current Variation	One input at $V_{CC} - 0.6\text{V}$, other inputs at V_{CC} or GND		—	—	500	μA

NOTES:

- Typical values are at $V_{CC} = 3.3\text{V}$, $+25^{\circ}\text{C}$ ambient.
- This applies in the disabled state only.

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	—	
		$V_{CC} = 3\text{V}$		2.4	—	
		$V_{CC} = 3\text{V}$	$I_{OH} = -24\text{mA}$	2.2	—	
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	
		$V_{CC} = 3\text{V}$	$I_{OL} = 24\text{mA}$	—	0.55	

NOTE:

- 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, $V_{CC} = 3.3V \pm 0.3V$, $T_A = 25^\circ C$

Symbol	Parameter	Test Conditions	Typical	Unit
CPD	Power Dissipation Capacitance per Latch Outputs enabled	$C_L = 0pF$, $f = 10MHz$	—	pF
CPD	Power Dissipation Capacitance per Latch Outputs disabled		—	

SWITCHING CHARACTERISTICS⁽¹⁾

Symbol	Parameter	V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay xDx to xQx (LE = HIGH)	1	8	1.5	7	ns
t _{PLH} t _{PHL}	Propagation Delay xLE to xQx	1	9	2	8	ns
t _{PZH} t _{PZL}	Output Enable Time x $\overline{OE}$ to xQx	1	9	1.5	8	ns
t _{PHZ} t _{PLZ}	Output Disable Time x $\overline{OE}$ to xQx	1	8	1.5	7	ns
t _{SU}	Set-up Time HIGH or LOW, xDx to xLE	2	—	2	—	ns
t _H	Hold Time HIGH or LOW, xDx to xLE	2	—	2	—	ns
t _W	xLE Pulse Width HIGH	4	—	4	—	ns
t _{SK(0)}	Output Skew ⁽²⁾	—	—	—	500	ps

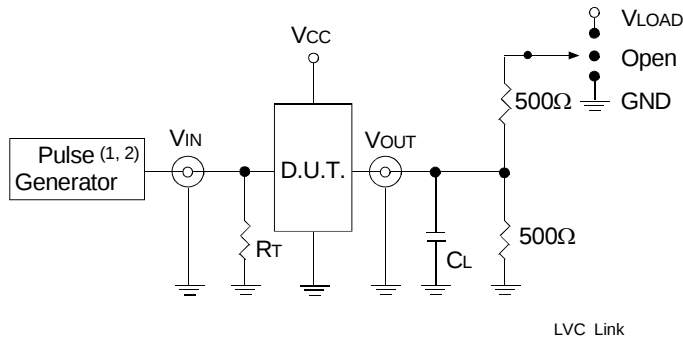
NOTES:

- See TEST CIRCUITS AND WAVEFORMS. $T_A = -40^\circ C$ to $+85^\circ C$.
- 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



Test Circuit for All Outputs

DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

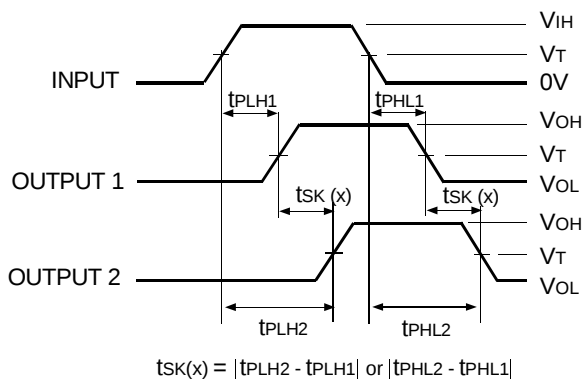
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

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

SWITCH POSITION

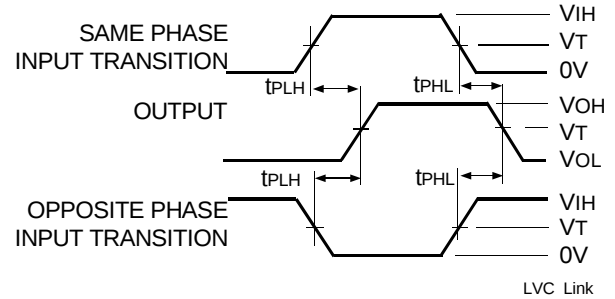
Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other Tests	Open



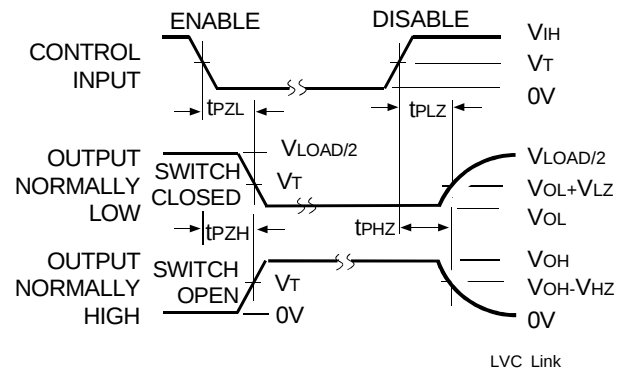
Output Skew - tsK(x)

NOTES:

1. For tsK(0) OUTPUT1 and OUTPUT2 are any two outputs.
2. For tsK(b) OUTPUT1 and OUTPUT2 are in the same bank.



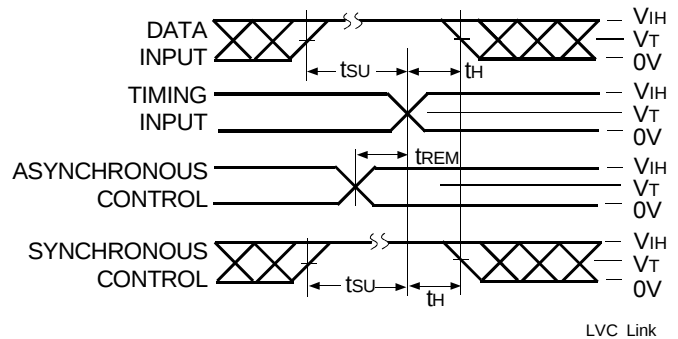
Propagation Delay



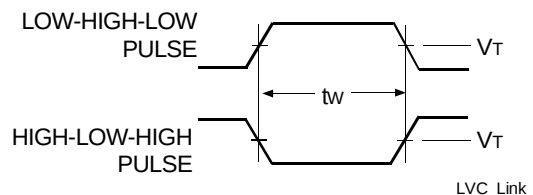
Enable and Disable Times

NOTE:

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



Set-up, Hold, and Release Times



Pulse Width

ORDERING INFORMATION

IDT	XX	LVC	X	XX	XXXX	XX	
Temp. Range	Bus-Hold	Family	Device Type	Package			
						PA	Thin Shrink Small Outline Package
						841A	20-Bit Transparent Latch
						16	Double-Density, $\pm 24\text{mA}$
						Blank	No Bus-hold
						74	-40°C to $+85^{\circ}\text{C}$



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