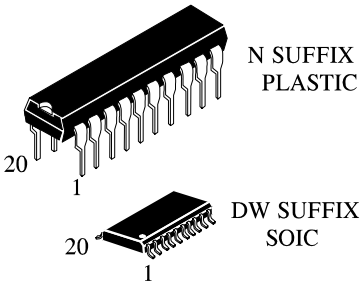
OCTAL 3-STATE INVERTING BUS TRANSCEIVER

High-Speed Silicon-Gate CMOS

The IN74AC640 is identical in pinout to the LS/ALS640, HC/HCT640. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LS/ALS outputs.

The IN74AC640 is a 3-state transceiver that is used for 2-way asynchronous communication between data buses. The device has an active-low Output Enable pin, which is used to place the I/O ports into high-impedance states. The Direction control determines whether data flows from A to B or from B to A.

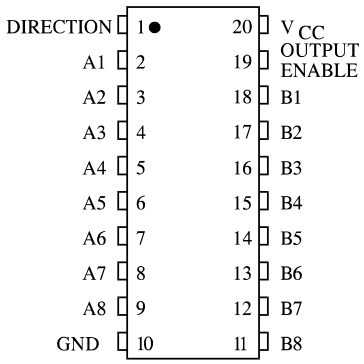
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0 μA; o.1 μA @ 25°C
- High Noise Immunity Characteristic of CMOS Devices
- Outputs Source/Sink 24 mA



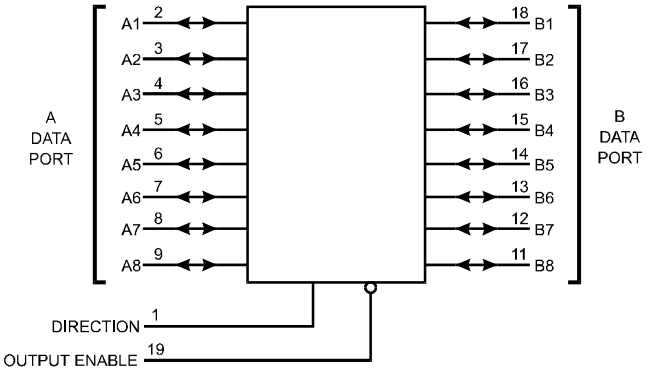
ORDERING INFORMATION

IN74AC640N Plastic
IN74AC640DW SOIC
T_A = -40° to 85° C for all packages

PIN ASSIGNMENT



LOGIC DIAGRAM



PIN 20=V_{CC}
PIN 10 = GND

FUNCTION TABLE

Control Inputs		Operation
Output Enable	Direction	
L	L	Data Transmitted from Bus B to Bus A (inverted)
L	H	Data Transmitted from Bus A to Bus B (inverted)
H	X	Buses Isolated (High Impedance State)

X = don't care

INTEGRAL

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V_{IN}	DC Input Voltage (Referenced to GND)	-0.5 to V_{CC} +0.5	V
V_{OUT}	DC Output Voltage (Referenced to GND)	-0.5 to V_{CC} +0.5	V
I_{IN}	DC Input Current, per Pin	±20	mA
I_{OUT}	DC Output Sink/Source Current, per Pin	±50	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±50	mA
P_D	Power Dissipation in Still Air, Plastic DIP+ SOIC Package+	750 500	mW
Tstg	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°C

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.
+Derating - Plastic DIP: - 10 mW/°C from 65° to 125°C
SOIC Package: : - 7 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)		2.0	6.0	V
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage (Referenced to GND)		0	V_{CC}	V
T_J	Junction Temperature (PDIP)			140	°C
T_A	Operating Temperature, All Package Types		-40	+85	°C
I_{OH}	Output Current - High			-24	mA
I_{OL}	Output Current - Low			24	mA
t_r, t_f	Input Rise and Fall Time * (except Schmitt Inputs)	V_{CC} =3.0 V V_{CC} =4.5 V V_{CC} =5.5 V	0 0 0	150 40 25	ns/V

* V_{IN} from 30% to 70% V_{CC}

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range GND≤(V_{IN} or V_{OUT})≤V_{CC}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS(Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limits 25 °C	Guaranteed Limits -40°C to 85°C	Unit
V_{IH}	Minimum High-Level Input Voltage	V_{OUT}=0.1 V or V_{CC}-0.1 V	3.0 4.5 5.5	2.1 3.15 3.85	2.1 3.15 3.85	V
V_{IL}	Maximum Low - Level Input Voltage	V_{OUT}=0.1 V or V_{CC}-0.1 V	3.0 4.5 5.5	0.9 1.35 1.65	0.9 1.35 1.65	V
V_{OH}	Minimum High-Level Output Voltage	$I_{OUT} \leq$ -50 μA	3.0 4.5 5.5	2.9 4.4 5.4	2.9 4.4 5.4	V
		*V_{IN}=V_{IH} or V_{IL} I_{OH}=-12 mA I_{OH}=-24 mA I_{OH}=-24 mA	 3.0 4.5 5.5	 2.56 3.86 4.86	 2.46 3.76 4.76	
V_{OL}	Maximum Low-Level Output Voltage	$I_{OUT} \leq$ 50 μA	3.0 4.5 5.5	0.1 0.1 0.1	0.1 0.1 0.1	V
		*V_{IN}=V_{IH} or V_{IL} I_{OL}=12 mA I_{OL}=24 mA I_{OL}=24 mA	 3.0 4.5 5.5	 0.36 0.36 0.36	 0.44 0.44 0.44	
I_{IN}	Maximum Input Leakage Current	V_{IN}=V_{CC} or GND	5.5	±0.1	±1.0	μA
I_{OZ}	Maximum Three-State Leakage Current	V_{IN}(OE)= V_{IH} or V_{IL} V_{IN}=V_{CC} or GND V_{OUT}=V_{CC} or GND	5.5	±0.6	±6.0	μA
I_{OLD}	+Minimum Dynamic Output Current	V_{OLD}=1.65 V Max	5.5		75	mA
I_{OHD}	+Minimum Dynamic Output Current	V_{OHD}=3.85 V Min	5.5		-75	mA
I_{CC}	Maximum Quiescent Supply Current (per Package)	V_{IN}=V_{CC} or GND	5.5	8.0	80	μA

* All outputs loaded; thresholds on input associated with output under test.

+Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}

AC ELECTRICAL CHARACTERISTICS(C_L=50pF,Input t_r=t_f=3.0 ns)

Symbol	Parameter	V_{CC}* V	Guaranteed Limits				Unit
			25 °C		-40°C to 85°C		
			Min	Max	Min	Max	
t_{PLH}	Propagation Delay, A to B or B to A (Figure 1)	3.3 5.0	1.5 1.5	8.5 6.5	1.0 1.0	9.5 7.5	ns
t_{PHL}	Propagation Delay, A to B or B to A (Figure 1)	3.3 5.0	1.5 1.5	8.5 6.5	1.0 1.0	9.5 7.5	ns
t_{PZH}	Propagation Delay, Direction or Output Enable to A or B (Figure 2)	3.3 5.0	2.5 1.5	11.5 8.0	2.0 1.0	12.5 9.0	ns
t_{PZL}	Propagation Delay, Directionor Output Enable to A or B (Figure 2)	3.3 5.0	2.5 1.5	12.5 9.5	2.0 1.0	13.5 10.0	ns
t_{PHZ}	Propagation Delay, Directionor Output Enable to A or B (Figure 2)	3.3 5.0	2.0 1.5	12.0 9.0	1.0 1.0	12.5 10.0	ns
t_{PLZ}	Propagation Delay, Direction or Output Enable to A or B (Figure 2)	3.3 5.0	2.0 1.5	12.0 9.5	1.5 1.0	13.5 10.5	ns
C_{IN}	Maximum Input Capacitance	5.0	4.5		4.5		pF
C_{OUT}	Maximum Tree-State I/O Capacitance (Output in High-Impedance State0	5.0	15		15		pF

		Typical @25°C,V_{CC}=5.0 V	
C_{PD}	Power Dissipation Capacitance	45	pF

*Voltage Range 3.3 V is 3.3 V ±0.3 V
Voltage Range 5.0 V is 5.0 V ±0.5 V

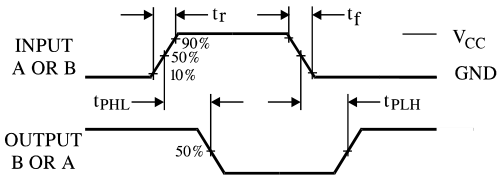


Figure 1. Switching Waveforms

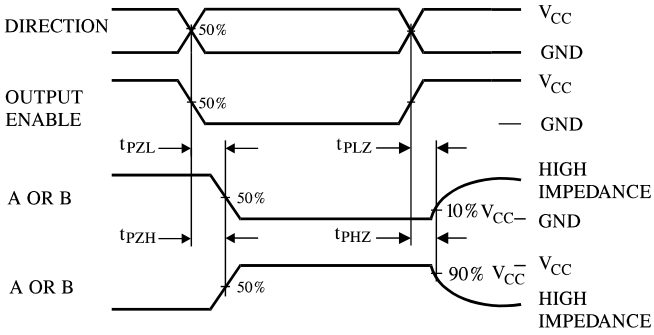


Figure 2. Switching Waveforms

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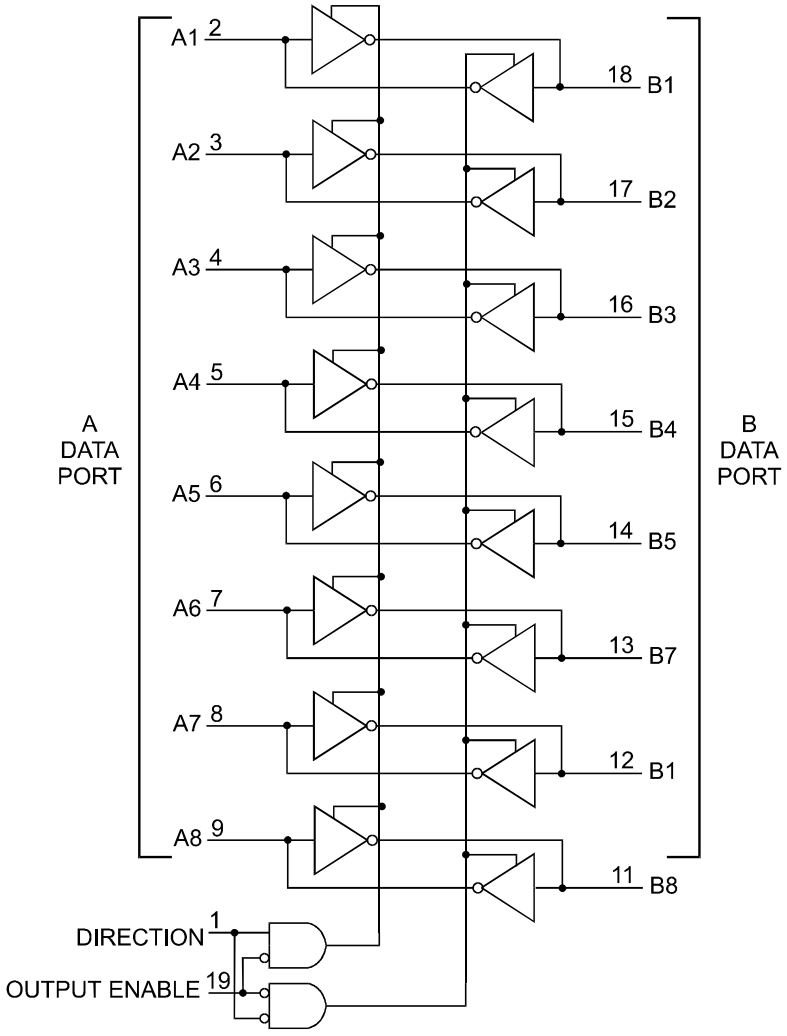
EXPANDED LOGIC DIAGRAM



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