Integrated Device Technology, Inc.

HIGH-SPEED CMOS NON-INVERTING BUFFER TRANSCEIVER

IDT54AHCT645

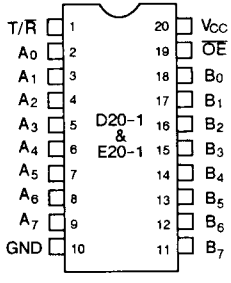
FEATURES:

- Equivalent to ALS speeds and output drive over full temperature and voltage supply extremes
- 8ns typical data to output delay
- I_{OL} = 14mA over full military temperature range
- CMOS power levels (5μW typ. static)
- Both CMOS and TTL output compatible
- Substantially lower input current levels than ALS (5μA max.)
- Non-inverting buffer transceiver
- JEDEC standard pinout for DIP and LCC
- Military product compliant to MIL-STD-883, Class B

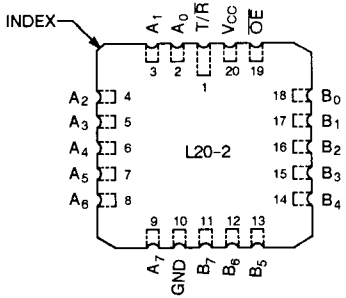
DESCRIPTION:

The IDT54AHCT645 are 8-bit non-inverting buffer transceivers built using advanced CEMOS™, a dual metal CMOS technology. These non-inverting buffer transceivers are designed for asynchronous two-way communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus, depending upon the l/74evel at the direction control ($T/\overline{R}$) input. The enable input ($\overline{OE}$) can be used to disable the device so the buses are effectively isolated.

PIN CONFIGURATIONS

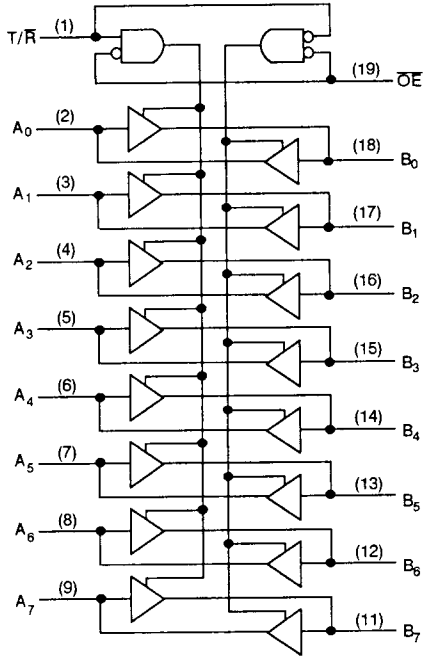


DIP/CERPACK TOP VIEW



LCC TOP VIEW

FUNCTIONAL BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (1)

SYMBOL	RATING	VALUE	UNIT
V_{TERM}	Terminal Voltage with Respect to GND	-0.5 to +7.0	V
T_A	Operating Temperature	-55 to +125	°C
T_{BIAS}	Temperature Under Bias	-65 to +135	°C
T_{STG}	Storage Temperature	-65 to +150	°C
P_T	Power Dissipation	0.5	W
I_{OUT}	DC Output Current	120	mA

NOTE:

1. 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	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	8	12	pF

NOTE:

1. This parameter is measured at characterization but not tested.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
T_A = -55°C to + 125°C
V_{CC} = 5.0V ± 10%
V_{LC} = 0.2V
V_{HC} = V_{CC} -0.2V

SYMBOL	PARAMETER	TEST CONDITIONS(1)		MIN.	TYP.(2)	MAX.	UNIT
V_{IH}	Input HIGH Level	Guaranteed Logic HIGH Level		2.0	–	–	V
V_{IL}	Input LOW Level	Guaranteed Logic LOW Level		–	–	0.8	V
I_{IH}	Input HIGH Current (Except I/O Pins)	V_{CC} = Max., V_{IN} = V_{CC}		–	–	5	µA
I_{IL}	Input LOW Current (Except I/O Pins)	V_{CC} = Max., V_{IN} = GND		–	–	-5	µA
I_{IH}	Input HIGH Current (I/O Pins)	V_{CC} = Max.	V_I = V_{CC}	–	–	15	µA
I_{IL}	Input LOW Current (I/O Pins)	V_{CC} = Max.	V_I = GND	–	–	-15	µA
I_{SC}	Short Circuit Current	V_{CC} = Max.(3)		-60	-100	–	mA
V_{OH}	Output HIGH Voltage	V_{CC} = 3V, V_{IN} = V_{LC} or V_{HC}, I_{OH} = -32µA		V_{HC}	V_{CC}	–	V
		V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OH} = -150µA	V_{HC}	V_{CC}	–	
			I_{OH} = -12mA	2.4	4.3	–	
V_{OL}	Output LOW Voltage	V_{CC} = 3V, V_{IN} = V_{LC} or V_{HC}, I_{OL} = 300µA		–	GND	V_{LC}	V
		V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OL} = 300µA	–	GND	V_{LC}	
			I_{OL} = 14mA	–	–	0.4	

NOTES:

1. For conditions shown as max. or min. use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.

POWER SUPPLY CHARACTERISTICS

V_{LC} = 0.2V; V_{HC} = V_{CC} - 0.2V

SYMBOL	PARAMETER	TEST CONDITIONS [1]		MIN.	TYP.[2]	MAX.	UNIT
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max. $V_{IN} \geq V_{HC}$; $V_{IN} \leq V_{LC}$ f_I = 0		–	0.001	1.5	mA
I_{CCT}	Power Supply Current Per TTL Input HIGH	V_{CC} = Max. V_{IN} = 3.4V[3]		–	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current [5]	V_{CC} = Max. Outputs Open $\overline{OE}$ = GND $T/\overline{R}$ = GND or V_{CC} One Input Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$	–	0.15	0.25	mA/MHz
I_{CC}	Total Power Supply Current [4]	V_{CC} = Max. Outputs Open f_I = 1.0MHz, 50% Duty Cycle $\overline{OE}$ = GND One Bit Toggling	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (AHCT)	–	0.15	1.8	mA
			V_{IN} = 3.4V or V_{IN} = GND	–	0.4	2.8	
		V_{CC} = Max. Outputs Open f_I = 250kHz 50% Duty Cycle $\overline{OE}$ = GND Eight Bits Toggling	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (AHCT) [6]	–	0.3	2.0	
			V_{IN} = 3.4V[6] or V_{IN} = GND	–	2.3	10.0	

NOTES:

1. For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
3. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
4. $I_{CC} = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_{CC} = I_{CCQ} + I_{CCT} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
   I_{CCQ} = Quiescent Current
   I_{CCT} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
   D_H = Duty Cycle for TTL inputs High
   N_T = Number of TTL inputs at D_H
   I_{CCD} = Dynamic Current caused by an input Transition pair (HLH or LHL)
   f_{CP} = ClockFrequency for Register Devices (Zero for Non-Register Devices)
   f_I = Input Frequency
   N_I = Number of inputs at f_I
   All currents are in milliamps and all frequencies are in megahertz.
5. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
6. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

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DEFINITION OF FUNCTIONAL TERMS

PIN NAMES	DESCRIPTION
$\overline{OE}$	Output Enable Input (Active LOW)
$T/\overline{R}$	Transmit/Receive Input
A_0-A_7	Side A Inputs or 3-State Outputs
B_0-B_7	Side B Inputs or 3-State Outputs

FUNCTION TABLE

INPUTS		OPERATION
$\overline{OE}$	$T/\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Isolation

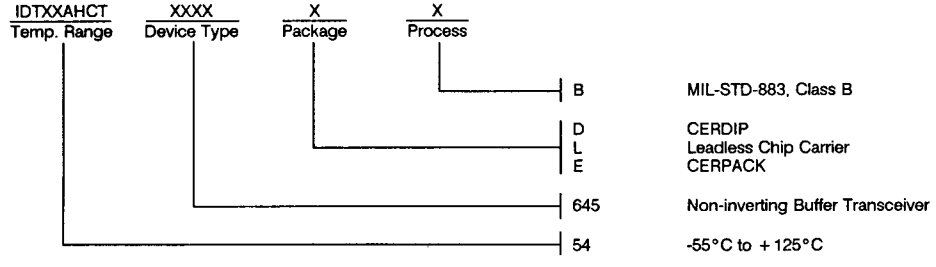
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

SYMBOL	PARAMETER	CONDITION[1]	TYP.	MIN.[2]	MAX.	UNIT
t_{PLH} t_{PHL}	Propagation Delay A to B B to A	C_L = 50pF R_L = 500Ω	8.0	1.5	15.0	ns
t_{ZH} t_{ZL}	Output Enable Time		15.0	1.5	25.0	ns
t_{HZ} t_{LZ}	Output Disable Time		11.0	1.5	18.0	ns
t_{PLH} t_{PHL}	Propagation Delay $T/\overline{R}$ to A or B[3]		15.0	–	–	ns

NOTES:

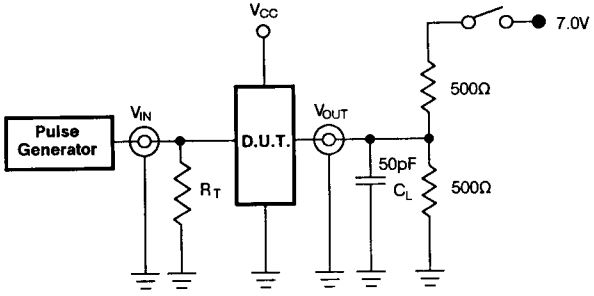
1. See test circuit and waveform.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not tested.

ORDERING INFORMATION



TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR THREE-STATE OUTPUTS



SWITCH POSITION

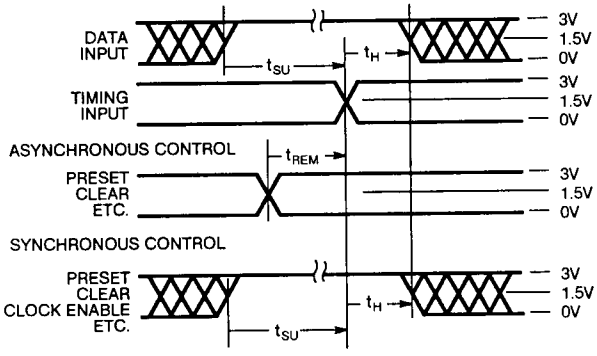
TEST	SWITCH
Open Drain Disable Low Enable Low	Closed
All Other Outputs	Open

DEFINITIONS

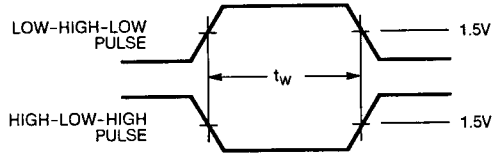
C_L = Load capacitance: includes jig and probe capacitance

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

SET-UP, HOLD, AND RELEASE TIMES



PULSE WIDTH



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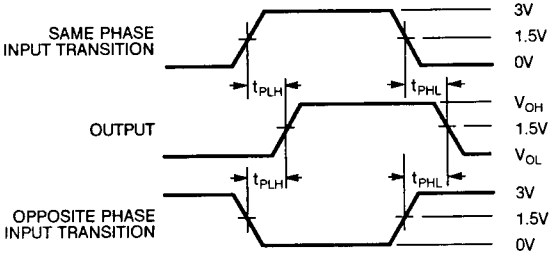
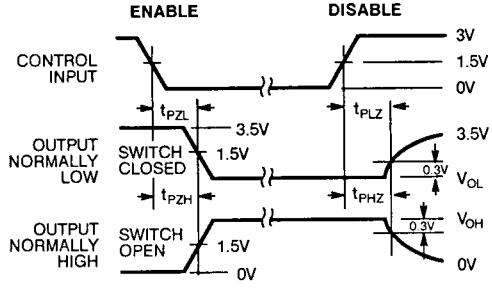
PROPAGATION DELAY



ENABLE AND DISABLE TIMES



NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH
2. Pulse Generator for All Pulses: Rate ≤ 1.0 MHz; Z_O ≤ 50Ω; t_F ≤ 2.5ns; t_R ≤ 2.5ns