



Integrated Device Technology, Inc.

HIGH-SPEED CMOS OCTAL INVERTING BUFFER TRANSCEIVER

IDT54AHCT640

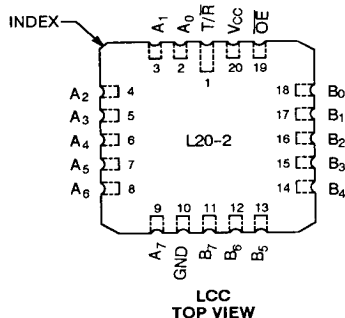
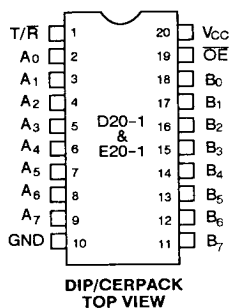
FEATURES:

- Equivalent to ALS speeds and output drive over full temperature and voltage supply extremes
- 10ns data to output
- $I_{OL} = 14\text{mA}$ over full military temperature range
- CMOS power levels (5 μW typ. static)
- Both CMOS and TTL output compatible
- Substantially lower input current levels than ALS (5 μA max.)
- Inverting buffer transceiver
- JEDEC standard pinout for DIP and LCC
- Military product compliant to MIL-STD-883, Class B

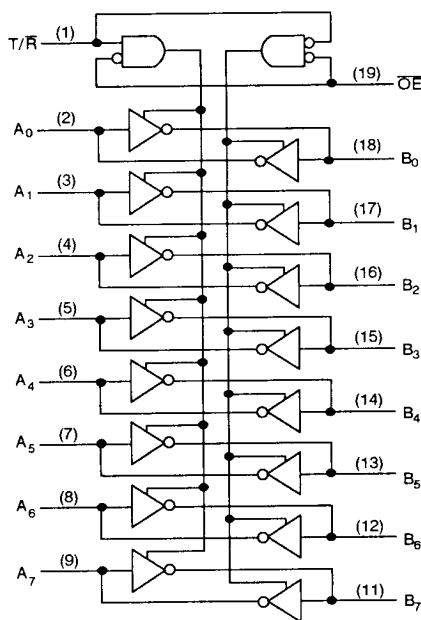
DESCRIPTION:

The IDT54AHCT640 are 8-bit inverting buffer transceivers built using advanced CEMOS™, a dual metal CMOS technology. These octal bus 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 level at the direction control (T/R) input. The enable input ($\overline{OE}$) can be used to disable the device so the buses are effectively isolated.

PIN CONFIGURATIONS



FUNCTIONAL BLOCK DIAGRAM



10

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MILITARY TEMPERATURE RANGE

DECEMBER 1987

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10-277

DSC-4057/-

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:

- 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 ⁽¹⁾ ($T_A = +25^\circ\text{C}$, $f = 1.0\text{MHz}$)

SYMBOL	PARAMETER ⁽¹⁾	CONDITIONS	TYP.	MAX.	UNIT
C_{IN}	Input Capacitance	$V_{\text{IN}} = 0\text{V}$	6	10	pF
C_{OUT}	Output Capacitance	$V_{\text{OUT}} = 0\text{V}$	8	12	pF

NOTE:

- This parameter is measured at characterization but not tested.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

$$T_A = -55^\circ\text{C to } +125^\circ\text{C}$$

$$V_{\text{CC}} = 5.0\text{V} \pm 10\%$$

$$V_{\text{LC}} = 0.2\text{V}$$

$$V_{\text{HC}} = V_{\text{CC}} - 0.2\text{V}$$

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)	$V_{\text{CC}} = \text{Max.}, V_{\text{IN}} = V_{\text{CC}}$	—	—	5	μA
I_{IL}	Input LOW Current (Except I/O Pins)	$V_{\text{CC}} = \text{Max.}, V_{\text{IN}} = \text{GND}$	—	—	-5	μA
I_{IH}	Input HIGH Current (I/O Pins)	$V_{\text{CC}} = \text{Max.}, V_i = V_{\text{CC}}$	—	—	15	μA
I_{IL}	Input LOW Current (I/O Pins)	$V_{\text{CC}} = \text{Max.}, V_i = \text{GND}$	—	—	-15	μA
I_{SC}	Short Circuit Current	$V_{\text{CC}} = \text{Max.}^{(3)}$	-60	-100	—	mA
V_{OH}	Output HIGH Voltage	$V_{\text{CC}} = 3\text{V}, V_{\text{IN}} = V_{\text{LC}} \text{ or } V_{\text{HC}}, I_{\text{OH}} = -32\mu\text{A}$	V_{HC}	V_{CC}	—	V
		$V_{\text{CC}} = \text{Min.}, V_{\text{IN}} = V_{\text{IH}} \text{ or } V_{\text{IL}}, I_{\text{OH}} = -150\mu\text{A}$	V_{HC}	V_{CC}	—	
		$V_{\text{CC}} = \text{Min.}, V_{\text{IN}} = V_{\text{IH}} \text{ or } V_{\text{IL}}, I_{\text{OH}} = -12\text{mA}$	2.4	4.3	—	
V_{OL}	Output LOW Voltage	$V_{\text{CC}} = 3\text{V}, V_{\text{IN}} = V_{\text{LC}} \text{ or } V_{\text{HC}}, I_{\text{OL}} = 300\mu\text{A}$	—	GND	V_{LC}	V
		$V_{\text{CC}} = \text{Min.}, V_{\text{IN}} = V_{\text{IH}} \text{ or } V_{\text{IL}}, I_{\text{OL}} = 300\mu\text{A}$	—	GND	V_{LC}	
		$V_{\text{CC}} = \text{Min.}, V_{\text{IN}} = V_{\text{IH}} \text{ or } V_{\text{IL}}, I_{\text{OL}} = 14\text{mA}$	—	—	0.4	

NOTES:

- For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{\text{CC}} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient and maximum loading.
- 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	$V_{CC} = \text{Max.}$ $V_{IN} \geq V_{HC} : V_{IN} \leq V_{LC}$ $f_I = 0$		—	0.001	1.5	mA
I_{CCT}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current ⁽⁵⁾	$V_{CC} = \text{Max.}$ Outputs Open $OE = GND$ $T/\bar{R} = GND$ 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⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_I = 1.0\text{MHz}$ 50% Duty Cycle $OE = GND$ 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	
		$V_{CC} = \text{Max.}$ Outputs Open $f_I = 250\text{kHz}$ 50% Duty Cycle $OE = GND$ Eight Bits Toggling	$V_{IN} \geq V_{HC}^{(6)}$ $V_{IN} \leq V_{LC}$ (AHCT)	—	0.3	2.0	
			$V_{IN} = 3.4V$ or ⁽⁶⁾ $V_{IN} = GND$	—	2.3	10.0	

NOTES:

- For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0V$, $+25^{\circ}C$ ambient and maximum loading.
- Per TTL driven input ($V_{IN} = 3.4V$); all other inputs at V_{CC} or GND.
- $I_{CC} = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_{CC} = I_{CCQ} + I_{CCT} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
 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} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
 f_I = Input Frequency
 N_I = Number of inputs at f_I
All currents are in milliamperes and all frequencies are in megahertz.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.

10

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

TRUTH 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	$C_L = 50\text{pF}$ $R_L = 500\Omega$	10.0	1.5	14.0	ns
t_{ZH} t_{ZL}	Output Enable Time		15.0	1.5	27.0	ns
t_{HZ} t_{LZ}	Output Disable Time		12.0	1.5	20.0	ns

- NOTES:
- See test circuit and waveform.
 - Minimum limits are guaranteed but not tested on Propagation Delays.

ORDERING INFORMATION

