OCTAL BUS TRANSCEIVER; 3-STATE; INVERTING

FEATURES

- Octal bidirectional bus interface
- Inverting 3-state outputs
- Output capability: bus driver
- I_{CC} category: MSI

GENERAL DESCRIPTION

The 74HC/HCT640 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC/HCT640 are octal transceivers featuring inverting 3-state bus compatible outputs in both send and receive directions.

The "640" features an output enable ($\overline{OE}$) input for easy cascading and a send/receive (DIR) for direction control. $\overline{OE}$ controls the outputs so that the buses are effectively isolated.

The "640" is similar to the "245" but has inverting outputs.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL		UNIT
			HC	HCT	
t_{PHL}/t_{PLH}	propagation delay A_n to B_n; B_n to A_n	C_L = 15 pF; V_{CC} = 5 V	9	9	ns
C_I	input capacitance		3.5	3.5	pF
$C_{I/O}$	input/output capacitance		10	10	pF
C_{PD}	power dissipation capacitance per transceiver	notes 1 and 2	35	35	pF

GND = 0 V; T_{amb} = 25 °C; $t_r = t_f$ = 6 ns

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz
   f_o = output frequency in MHz
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs
   C_L = output load capacitance in pF
   V_{CC} = supply voltage in V
2. For HC the condition is V_I = GND to V_{CC}
   For HCT the condition is V_I = GND to V_{CC} − 1.5 V

ORDERING INFORMATION/PACKAGE OUTLINES

20-lead DIL; plastic (SOT146).

20-lead mini-pack; plastic (SO20; SOT163A).

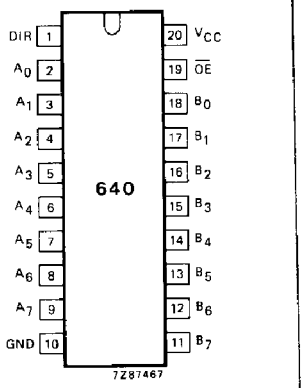

Fig. 1 Pin configuration.

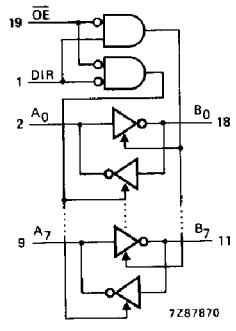

Fig. 2 Logic symbol.

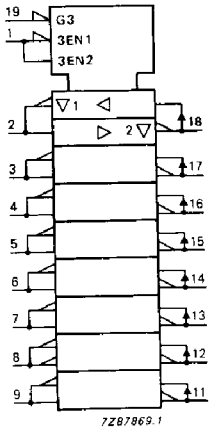

Fig. 3 IEC logic symbol.

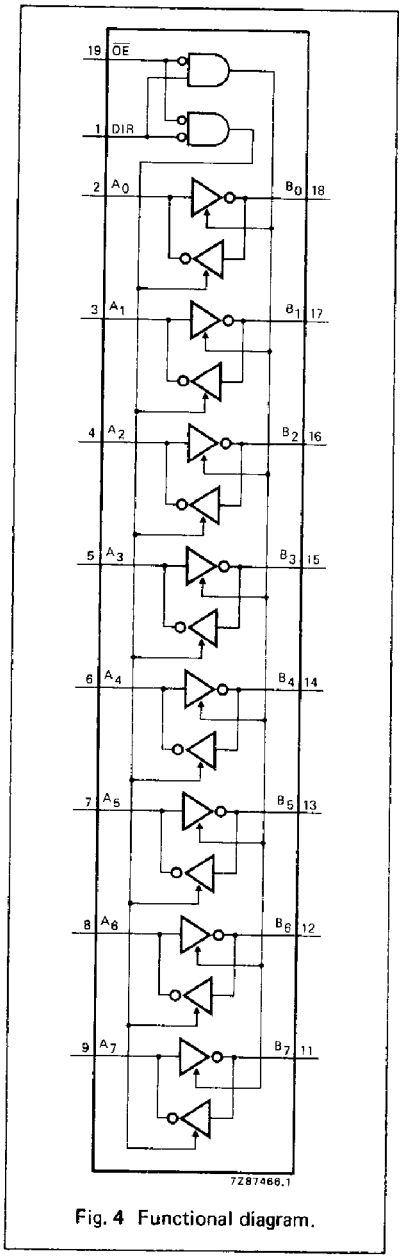

Fig. 4 Functional diagram.

PIN DESCRIPTION

PIN NO.	SYMBOL	NAME AND FUNCTION
1	DIR	direction control
2, 3, 4, 5, 6, 7, 8, 9	A_0 to A_7	data inputs/outputs
10	GND	ground (0 V)
18, 17, 16, 15, 14, 13, 12, 11	B_0 to B_7	data inputs/outputs
19	$\overline{OE}$	output enable input (active LOW)
20	V_{CC}	positive supply voltage

FUNCTION TABLE

inputs		inputs/outputs	
$\overline{OE}$	DIR	A_n	B_n
L	L	A=$\overline{B}$	inputs
L	H	inputs	B=$\overline{A}$
H	X	Z	Z

H = HIGH voltage level
L = LOW voltage level
X = don't care
Z = high impedance OFF-state

DC CHARACTERISTICS FOR 74HC

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: bus driver
I_{CC} category: MSI

AC CHARACTERISTICS FOR 74HC

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HC								V_{CC} V	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/ t_{PLH}	propagation delay A_n to B_n; B_n to A_n		30 11 9	90 18 15		115 23 20		135 27 23	ns	2.0 4.5 6.0	Fig. 5
t_{PZH}/ t_{PZL}	3-state output enable time $\overline{OE}$, DIR to A_n; $\overline{OE}$, DIR to B_n		44 16 13	150 30 26		190 38 33		225 45 38	ns	2.0 4.5 6.0	Fig. 6
t_{PHZ}/ t_{PLZ}	3-state output disable time $\overline{OE}$, DIR to A_n; $\overline{OE}$, DIR to B_n		50 18 14	150 30 26		190 38 33		225 45 38	ns	2.0 4.5 6.0	Fig. 6
t_{THL}/ t_{TLH}	output transition time		14 5 4	60 12 10		75 15 13		90 18 15	ns	2.0 4.5 6.0	Fig. 5

DC CHARACTERISTICS FOR 74HCT

For the DC characteristics see chapter "HCMOS family characteristics", section "Family specifications".

Output capability: bus driver
I_{CC} category: MSI

Note to HCT types

The value of additional quiescent supply current (ΔI_{CC}) for a unit load of 1 is given in the family specifications. To determine ΔI_{CC} per input, multiply this value by the unit load coefficient shown in the table below.

INPUT	UNIT LOAD COEFFICIENT
A_n	1.50
B_n	1.50
$\overline{OE}$	1.50
DIR	0.90

AC CHARACTERISTICS FOR 74HCT

GND = 0 V; $t_r = t_f$ = 6 ns; C_L = 50 pF

SYMBOL	PARAMETER	T_{amb} (°C)							UNIT	TEST CONDITIONS	
		74HCT								V_{CC} V	WAVEFORMS
		+25			−40 to +85		−40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
t_{PHL}/t_{PLH}	propagation delay A_n to B_n; B_n to A_n		11	22		28		33	ns	4.5	Fig. 5
t_{PZH}/t_{PZL}	3-state output enable time $\overline{OE}$, DIR to A_n; $\overline{OE}$, DIR to B_n		18	30		38		45	ns	4.5	Fig. 6
t_{PHZ}/t_{PLZ}	3-state output disable time $\overline{OE}$, DIR to A_n; $\overline{OE}$, DIR to B_n		19	30		38		45	ns	4.5	Fig. 6
t_{THL}/t_{TLH}	output transition time		5	12		15		18	ns	4.5	Fig. 5

AC WAVEFORMS

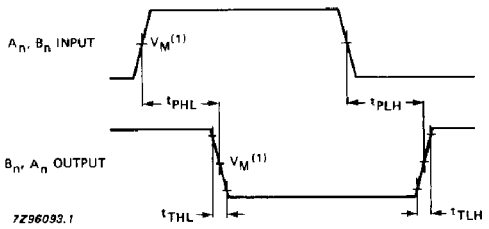

Fig. 5 Waveforms showing the input (A_n, B_n) to output (B_n, A_n) propagation delays and the output transition times.

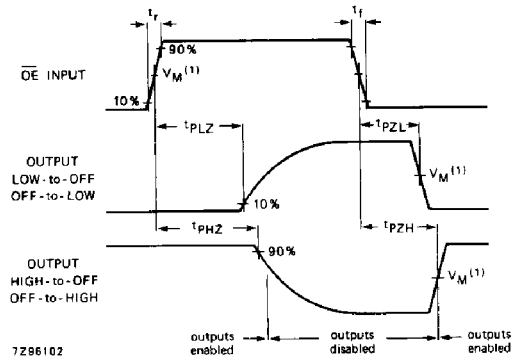

Fig. 6 Waveforms showing the 3-state enable and disable times.

Note to AC waveforms

(1) HC : V_M = 50%; V_I = GND to V_{CC}.
HCT: V_M = 1.3 V; V_I = GND to 3 V.