GD54/74HC643, GD54/74HCT643

OCTAL INVERTING & NONINVERTING 3-STATE TRANSCEIVERS

General Description

These devices are Identical in Pinout to the 54/74LS643. They consist of eight transceivers which are designed for Asynchronous two-way communications between Data bses. Each device has 4 inverting and 4 noninverting outputs with-Active Low output enable which is used to place the I/O porte into High impedance states.

The direction control determines the directions of Data flow. When it is high, Data flow From A to B; When it is low, Data flow from B to A.

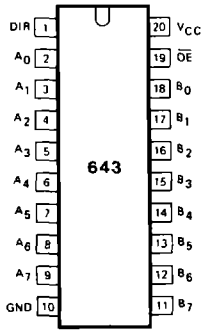
Refer to the other devices for similar functionalities;

The HC/HCT245 All noninverting outputs

The HC/HCT640 All inverting outputs.

These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

Pin Configuration



Suffix-Blank .	Plastic Dual In Line Package
Suffix-J	Ceramic Dual In Line Package
Suffix-D	Small Outline Package

Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 15 LS TTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts
  for HCT 4.5 to 5.5 volts
- Low input curent: 1μA Max.
- Low quiescent current: 80μA Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Function Table

INPUTS		INPUTS/OUTPUTS	
$\overline{OE}$	DIR	A_n	B_n
L	L	A=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

Absolute Maximum Ratings

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX	UNIT
V_{CC}	DC Supply voltage		−0 5	+7	V
I_{IK} I_{OK}	DC input or output diode current	for $V_I<-0.5$ or $V_I>V_{CC}+0$ 5V		|20|	mA
I_O	DC output source or sink current	for -0 5V$<V_O<V_{CC}+0$ 5V		|35|	mA
I_{CC}	DC V_{CC} or GND current			|70|	mA
T_{stg}	Storage temperature range		−65	150	°C
P_D	Power dissipation per package	above +70°C derate linearly with 8mW/K		500	mW
T_L	Lead temperature	At distance 1/16±1/32 in from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		 300 260	°C

Recommended Operating Conditions

CHARACTERISTIC		LIMITS		UNITS
		MIN	MAX	
Supply-Voltage Range V_{CC}	GD54 74HC Types	2	6	V
	GD54 74HCT Types	4 5	5 5	
DC Input or Output Voltage V_I, V_O		0	V_{CC}	V
Operating Temperature T_A	GD74 Types	−40	+85	°C
	GD54 Types	−55	+125	
Input Rise and Fall times t_r, t_f	GD54 74HC Types at 2V		1000	ns
	at 4 5V		500	
	at 6V		400	
	GD54 74HCT Types at 4 5V		500	

Logic Diagram

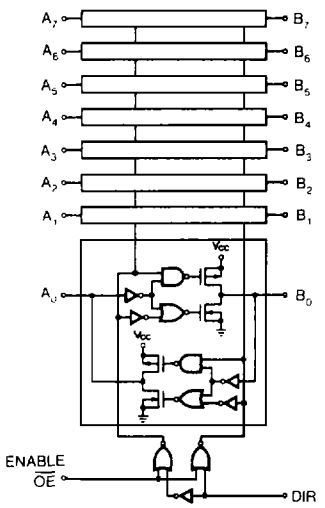


Fig. 1 Logic diagram

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HC643		GD54HC643		UNIT
					MIN	TYP	MAX.	MIN.	MAX	MIN.	MAX	
V_{IH}	HIGH level input Voltage			2 0 4 5 6 0	1 5 3 15 4 2			1 5 3 15 4 2		1 5 3 15 4 2		V
V_{IL}	LOW level input voltage			2 0 4 5 6 0			0 3 0 9 1 2		0.3 0.9 1 2		0 3 0 9 1.2	V
V_{OH}	HIGH level output voltage	V_{IN}=V_{IH} or V_{IL}	I_{OH}=−20μA	2 0 4 5 6 0	1.9 4.4 5 9	2 0 4 5 6 0		1 9 4 4 5.9		1 9 4 4 5 9		V
			I_{OH}=−6mA I_{OH}=−7.8mA	4 5 6 0	3 98 5 48	4 3 5 2		3 84 5.34		3 7 5 2		
V_{OL}	LOW level output voltage	V_{IN}=V_{IH} or V_{IL}	I_{OL}=20μA	2.0 4.5 6.0			0 1 0 1 0 1		0 1 0 1 0 1		0.1 0 1 0.1	V
			I_{OL}=6mA I_{OL}=7 8mA	4 5 6.0		0.17 0 15	0 26 0 26		0 33 0 33		0.4 0.4	
$\|I_{IN}\|$	Input leakage Current	V_{IN}=V_{CC} or GND		6.0			0 1		1 0		1 0	μA
I_{OZ}	Three-State leakage current	V_{IN}=V_{IH} or V_{IL}	V_O=V_{CC} or GND	6.0		0 01	0 5		5 0		10 0	μA
I_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND I_{out}=0μA		6 0			8		80		160	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HCT643		GD54HCT643		UNIT
					MIN.	TYP	MAX	MIN	MAX	MIN	MAX	
V_{IH}	HIGH level input Voltage			4.5 to 5 0	2 0			2 0		2.0		V
V_{IL}	LOW level input voltage			4 5 to 5 5			0 8		0 8		0 8	V
V_{OH}	HIGH level output voltage	V_{IN}=V_{IH} or V_{IL}	I_{OH}=−20μA	4 5	4 4	4 5		4 4		4 4		V
			I_{OH}=−6mA	4 5	3 98	4 3		3 84		3 7		
V_{OL}	LOW level output voltage	V_{IN}=V_{IH} or V_{IL}	I_{OL}=20μA	4 5			0.1		0 1		0 1	V
			I_{OL}=6mA	4 5		0 17	0.26		0 33		0 4	
$\|I_{IN}\|$	Input leakage Current	V_{IN}=V_{CC} or GND		5 5			0 1		1 0		1.0	μA
I_{OZ}	Three-State leakage current	V_{IN}=V_{IH} or V_{IL}	V_O=V_{CC} or GND	5 5		0.01	0 5		5 0		10 0	μA
I_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND I_{out}=0μA		5 5			8		80		160	μA

AC Characteristics for HC: $t_r=t_f=6ns$ $C_L=50$ pF

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HC643		GD54HC643		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{PLH}/ t_{PHL}	Propagation Delay Time An to Bn; Inverting	2.0		300	100		120		140	ns
		4.5		10	20		25		30	
		6.0		9	18		22		26	
t_{PLH}/ t_{PHL}	Propagation Delay Time Bn to An; Non-Inverting	2.0		34	110		130		160	ns
		4.5		12	22		28		32	
		6.0		11	20		24		28	
t_{PZH}/ t_{PZL}	3-state Output Enable Time $\overline{OE}$, DIR to An; $\overline{OE}$, DIR to Bn	2.0		45	140		180		210	ns
		4.5		18	30		38		45	
		6.0		16	26		32		38	
t_{PLZ}/ t_{PHZ}	3-State Output Disable Time $\overline{OE}$, DIR to An; $\overline{OE}$, DIR to Bn	2.0		45	140		180		210	ns
		4.5		18	30		38		45	
		6.0		16	26		32		38	
t_{TLH}/ t_{THL}	Output Transition Time	2.0		15	60		75		90	ns
		4.5		6	12		15		18	
		6.0		5	10		13		15	

AC Characteristics for HCT: $t_r=t_f=6ns$ $C_L=50$ pF

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HCT643		GD54HCT643		UNIT
			MIN.	TYP	MAX.	MIN.	MAX.	MIN.	MAX	
t_{PLH}/ t_{PHL}	Propagation Delay Time An to Bn; Inverting	4.5		13	26		28		32	ns
t_{PLH}/ t_{PHL}	Propagation Delay Time Bn to An; Non-Inverting	4.5		15	28		32		38	ns
t_{PZH}/ t_{PZL}	3-state Output Enable Time $\overline{OE}$, DIR to An; $\overline{OE}$, DIR to Bn	4.5		19	35		45		52	ns
t_{PLZ}/ t_{PHZ}	3-State Output Disable Time $\overline{OE}$, DIR to An; $\overline{OE}$, DIR to Bn	4.5		19	35		45		52	ns
t_{TLH}/ t_{THL}	Output Transition Time	4.5		7	12		15		18	ns

AC Waveforms

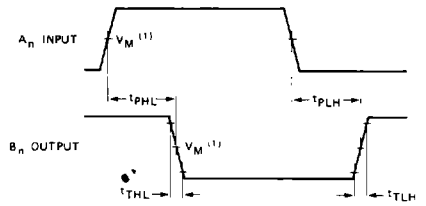


Fig. 2 Waveforms showing the input (An) to output (Bn) propagation delays and the output transition times.

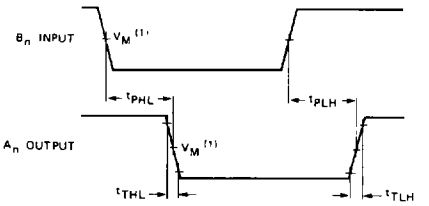


Fig. 3 Waveforms showing the input (Bn) to output (An) propagation delays and the output transition times.

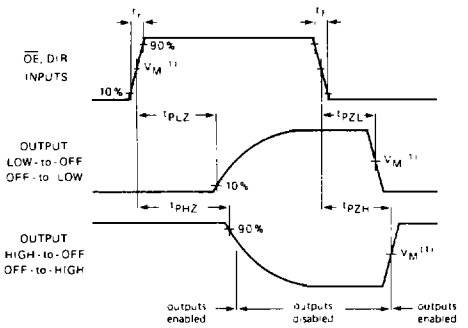


Fig. 4 Waveforms showing the 3-state enable and disable times for OE and DIR inputs.

Note to AC waveforms

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