

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 buses. Each device has 4 inverting and 4 noninverting outputs with Active Low output enable which is used to place the I/O ports into High impedance states.

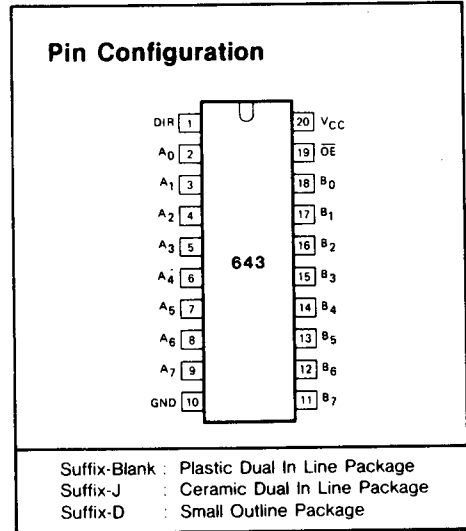
The direction control determines the directions of Data flow. When it is high, Data flow From A to B; When it is low, Data flow from B to A.

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.



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 current: 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 GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage V_I, V_O	0	V_{CC}	V
Operating Temperature T_A : GD74 Types GD54 Types	-40 -55	+85 +125	°C
Input Rise and Fall times t_r, t_f : GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5V		1000 500 400 500	ns

Logic Diagram

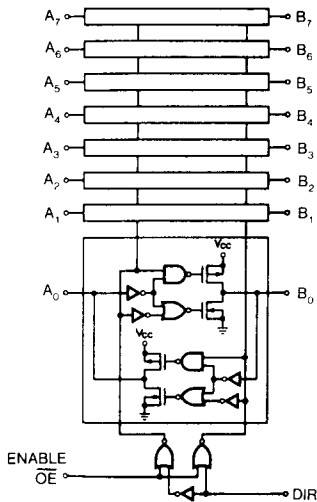


Fig. 1 Logic diagram

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	1.5			1.5		1.5		V	
			4.5	3.15			3.15		3.15			
			6.0	4.2			4.2		4.2			
V _{IL}	LOW level input voltage		2.0			0.3		0.3		0.3	V	
			4.5			0.9		0.9		0.9		
			6.0			1.2		1.2		1.2		
V _{OH}	HIGH level output voltage	V _{IN} = V _{IH}	I _{OH} = -20µA	2.0	1.9	2.0		1.9		1.9	V	
				4.5	4.4	4.5		4.4		4.4		
		or V _{IL}	I _{OH} = -6mA	4.5	3.98	4.3		3.84		3.7		
			I _{OH} = -7.8mA	6.0	5.48	5.2		5.34		5.2		
V _{OL}	LOW level output voltage	V _{IN} = V _{IH}	I _{OL} = 20µA	2.0			0.1		0.1	0.1	V	
				4.5			0.1		0.1	0.1		
		or V _{IL}	I _{OL} = 6mA	4.5		0.17	0.26		0.33			0.4
			I _{OL} = 7.8mA	6.0		0.15	0.26		0.33			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		
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

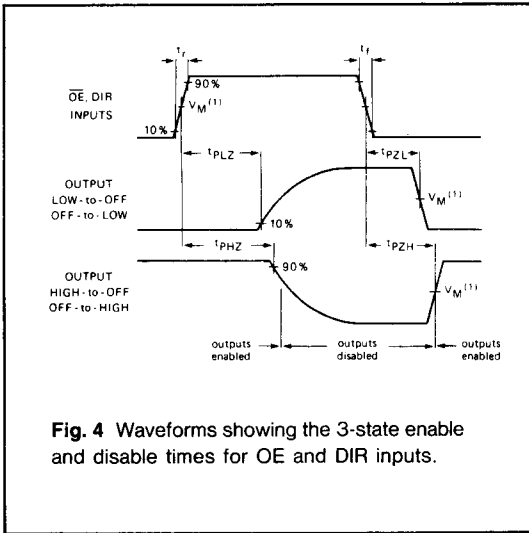
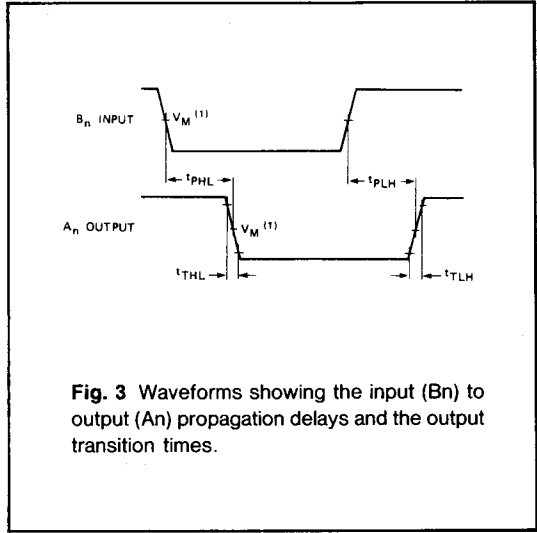
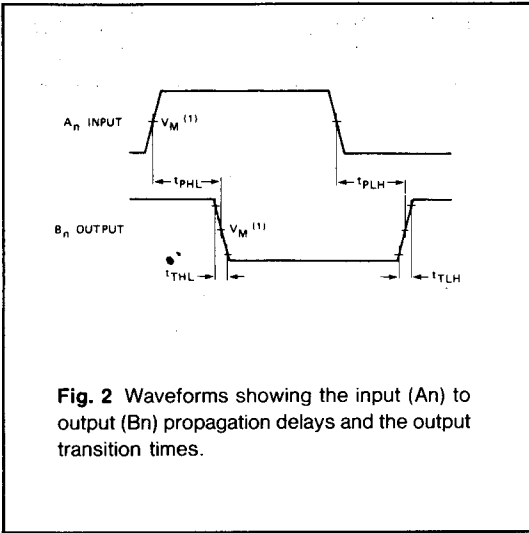
AC Characteristics for HC: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

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: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

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



Note to AC waveforms

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