GD54/74HC05, GD54/74HCT05

HEX INVERTERS WITH OPEN-DRAIN OUTPUTS

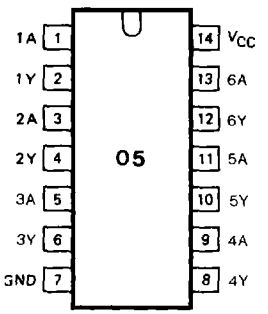
General Description

These devices are identical in pinout to the 54/74LS05. They contain six independent INVERTERS. The open-drain outputs require pull-up resistors to perform correctly. With suitable pull-up resistors, these devices can be used in active-low wired-OR or active-high wired-AND applications. 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: 10 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: 20μA Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

Pin Configuration



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

Logic Diagram Typical Application

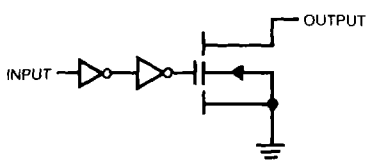


Fig. 1 Logic diagram (one gate)

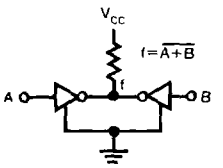


Fig. 2 Typical application

Function Table

INPUT	OUTPUT
nA	nY
H	L
L	Z

H= HIGH voltage level
L= LOW voltage level
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 $-0.5V<V_O<V_{CC}+0.5V$		|25|	mA
I_{CC}	DC V_{CC} or GND current			|50|	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	

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HC05		GD54HC05		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}=−4mA I_{OH}=−5.2mA	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}=4mA I_{OL}=5.2mA	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_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND I_{out}=0μA		6.0			2		20		40	μA
I_{OH}	HIGH level output current	V_{IN}=V_{IH} or V_{IL} V_{out}=V_{CC}		6.0		0.01	0.5		5		10	μA

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION		V_{CC} (V)	T_A=25°C			GD74HCT05		GD54HCT05		UNIT
					MIN	TYP.	MAX.	MIN	MAX.	MIN	MAX.	
V_{IH}	HIGH level input Voltage			4 5 to 5 5	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}=−4mA	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}=4mA	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_{CC}	Quiescent Supply Current	V_{IN}=V_{CC} or GND I_{out}=0μA		5.5			2		20		40	μA
I_{OH}	HIGH level output current	V_{IN}=V_{IH} or V_{IL} V_{out}=V_{CC}		4.5 to 5 5		0 01	0.5		5		10	μA

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HC05		GD54HC05		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{PZL}/ t_{PLZ}	Propagation delay time nA to nY	2.0		25	80		105		125	ns
		4.5		8	16		21		26	
		6.0		7	14		18		23	
t_{THL}	Output transition time	2.0		25	70		85		100	ns
		4.5		8	15		18		22	
		6.0		7	13		16		19	

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25°C$			GD74HCT05		GD54HCT05		UNIT
			MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{PZL}/ t_{PLZ}	Propagation delay time nA to nY	4.5		10	20		24		29	ns
t_{THL}	Output transition time	4.5		8	15		19		22	ns

AC Waveform

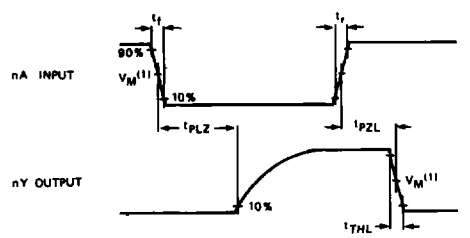


Fig. 3 Waveofrms showing the input (nA) to output (nY) propagation delays and the output transition times.

Note to AC waveform

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