

GD54/74HC21, GD54/74HCT21

DUAL 4-INPUT AND GATES

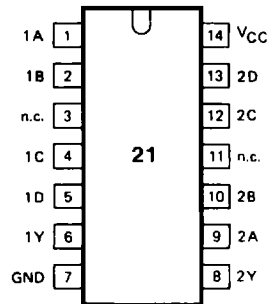
General Description

These devices are identical in pinout to the 54/74LS21. They contain two independent 4-input AND gates. 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: $1\mu\text{A}$ Max.
- Low quiescent current: $20\mu\text{A}$ 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

Function Table

INPUT				OUTPUT
nA	nB	nC	nD	nY
L	X	X	X	L
X	L	X	X	L
X	X	L	X	L
X	X	X	L	L
H	H	H	H	H

H=HIGH Voltage level

L=LOW Voltage level

X=don't care

Logic Symbol and Diagram

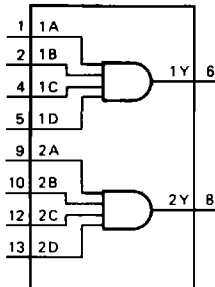


Fig. 1 Logic symbol

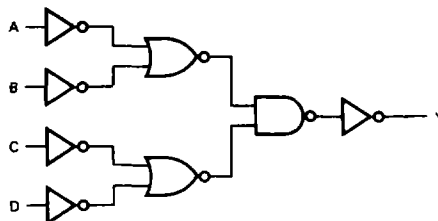


Fig. 2 Logic diagram (one gate)

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 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

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HC21		GD54HC21		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}	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
		or V _{IL}		I _{OH} =-20μA I _{OH} =-4mA I _{OH} =-5.2mA							
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	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
		or V _{IL}		I _{OL} =20μA I _{OL} =4mA I _{OL} =5.2mA							
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

DC Electrical Characteristics for HCT

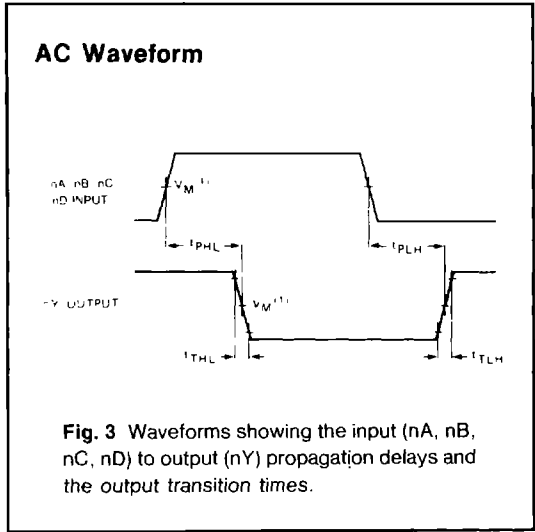
SYMBOL	PARAMETER	TEST CONDITION	V _{CC} (V)	T _A =25°C			GD74HCT21		GD54HCT21		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{IH}	HIGH level input Voltage		4.5 to 5.5	2.0			2.0		2.0		V
V _{IL}	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V
V _{OH}	HIGH level output voltage	V _{IN} =V _{IH}	4.5	4.4	4.5		4.4		4.4		V
		or V _{IL}		I _{OH} =-20μA I _{OH} =-4mA							
V _{OL}	LOW level output voltage	V _{IN} =V _{IH}	4.5			0.1		0.1		0.1	V
		or V _{IL}		I _{OL} =20μA I _{OL} =4mA							
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

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HC21		GD54HC21		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}/$ t_{PHL}	Propagation delay time nA, nB, nC, nD to nY	2.0 4.5 6.0		28 10 8	90 18 15		110 23 20		130 26 23	ns
$t_{TLH}/$ t_{THL}	Output transition time	2.0 4.5 6.0		25 8 7	70 15 13		85 18 16		100 22 19	ns

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

SYMBOL	PARAMETER	V_{CC} (V)	$T_A=25^\circ\text{C}$			GD74HCT21		GD54HCT21		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}/$ t_{PHL}	Propagation delay time nA, nB, nC, nD to nY	4.5		15	25		30		40	ns
$t_{TLH}/$ t_{THL}	Output transition time	4.5		8	15		18		22	ns



Note to AC waveform
(1) HC $V_M=50\%$ $V_L=GND$ to V_{CL}
HCT $V_M=1.3\text{V}$ $V_L=GND$ to 3V