National Semiconductor

DM54LS01/DM74LS01 Quad 2-Input NAND Gates with Open-Collector Outputs

General Description

This device contains four independent gates each of which performs the logic NAND function. The open-collector outputs require external pull-up resistors for proper logical operation.

Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC}\,(Min) - V_{OH}}{N_1\,(I_{OH}) + N_2\,(I_{IH})}$$

$$R_{MIN} = \frac{V_{CC}\,(Max) - V_{OL}}{I_{OL} - N_3\,(I_{IL})}$$

Where: $N_1\,(I_{OH})$ = total maximum output high current for all outputs tied to pull-up resistor

$N_2\,(I_{IH})$ = total maximum input high current for all inputs tied to pull-up resistor

$N_3\,(I_{IL})$ = total maximum input low current for all inputs tied to pull-up resistor

Features

- Switching Specifications at 50 pF.
- Switching Specifications Guaranteed Over Full Temperature and V_{CC} Range.
- Advanced Oxide-Isolated, Ion-Implanted Schottky TTL Process.
- Functionally and Pin For Pin Compatible with Schottky and Low Power Schottky TTL Counterpart.
- Improved AC Performance Over Schottky and Low Power Schottky Counterparts.

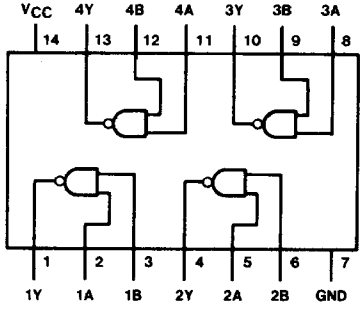
Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
Off State (High Level) Output Voltage	7V
Operating Free Air Temperature Range	
DM54ALS	−55°C to 125°C
DM74ALS	0°C to 70°C
Storage Temperature Range	−65°C to 150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device can not be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Connection Diagram

Dual-In-Line Package



TL/F/6174-1

54ALS01 (J) **74ALS01 (J,N)**

Function Table

$Y = \overline{AB}$

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = High Logic Level

L = Low Logic Level

Recommended Operating Conditions

Parameter	DM54ALS01			DM74ALS01			Unit
	Min	Nom	Max	Min	Nom	Max	
Supply Voltage, V_{CC}	4.5	5	5.5	4.5	5	5.5	V
High Level Input Voltage, V_{IH}	2			2			V
Low Level Input Voltage, V_{IL}			0.8			0.8	V
High Level Output Voltage, V_{OH}			5.5			5.5	V
Low Level Output Current, I_{OL}			4			8	mA

Electrical Characteristics over recommended operating free air temperature range.

All typical values are measured at $V_{CC} = 5V$, $T_A = 25°C$.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{IK}	Input Clamp Voltage	$V_{CC} = 4.5V$, $I_I = -18$ mA				−1.5	V
I_{OH}	High Level Output Current	$V_{CC} = 4.5V$ $V_{OH} = 5.5V$				100	μA
V_{OL}	Low Level Output Voltage	$V_{CC} = 4.5V$	54/74ALS $I_{OL} = 4$ mA		0.25	0.4	V
			74ALS $I_{OL} = 8$ mA		0.35	0.5	V
I_I	Max High Input Current	$V_{CC} = 5.5V$, $V_{IH} = 7V$				0.1	mA
I_{IH}	High Level Input Current	$V_{CC} = 5.5V$, $V_{IH} = 2.7V$				20	μA
I_{IL}	Low Level Input Current	$V_{CC} = 5.5V$, $V_{IL} = 0.4V$				−0.1	mA
I_{CC}	Supply Current	$V_{CC} = 5.5V$	Outputs High		0.43	0.85	mA
			Outputs Low		1.62	3.0	mA

Switching Characteristics over recommended operating free air temperature range (Note 1).

All typical values are measured at $V_{CC} = 5V$, $T_A = 25°C$.

Parameter	Conditions	DM54ALS01			DM74ALS01			Unit
		Min	Typ	Max	Min	Typ	Max	
T_{PLH}, Propagation delay time. Low to high level output	$V_{CC} = 4.5$ to $5.5V$ $R_L = 2K\ \Omega$, $C_L = 50$ pF.	23		59	23		54	ns
T_{PHL}, Propagation delay time. High to low level output		4		29	4		28	ns

Note 1: See Section 1 for test waveforms and output load.