

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

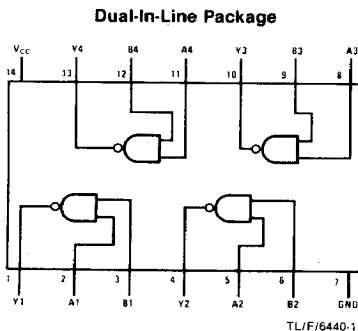
Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
Output Voltage	7V
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.

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Connection Diagram



DM54LS01 (J) DM74LS01 (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

Symbol	Parameter	DM54LS01			DM74LS01			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.7			0.8	V
V_{OH}	High Level Output Voltage			5.5			5.5	V
I_{OL}	Low Level Output Current			4			8	mA
T_A	Free Air Operating Temperature	-55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18 \text{ mA}$			-1.5	V
I_{CEX}	High Level Output Current	$V_{CC} = \text{Min}, V_O = 5.5 \text{ V}$ $V_{IL} = \text{Max}$			100	μA
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}$ $I_{OL} = \text{Max}$ $V_{IH} = \text{Min}$	DM54	0.25	0.4	V
			DM74	0.35	0.5	
		$I_{OL} = 4 \text{ mA}$ $V_{CC} = \text{Min}$	DM74	0.25	0.4	
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}, V_I = 7 \text{ V}$			0.1	mA
I_{IH}	High Level Input Current	$V_{CC} = \text{Max}, V_I = 2.7 \text{ V}$			20	μA
I_{IL}	Low Level Input Current	$V_{CC} = \text{Max}, V_I = 0.4 \text{ V}$			-0.36	mA
I_{OCH}	Supply Current With Outputs High	$V_{CC} = \text{Max}$		0.8	1.6	mA
I_{OCL}	Supply Current With Outputs Low	$V_{CC} = \text{Max}$		2.4	4.4	mA

Switching Characteristics at $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$ (See Section 1 for Test Waveforms and Output Load)

Parameter	R _L = 2 kΩ						Units
	C _L = 15 pF			C _L = 50 pF			
	Min	Typ	Max	Min	Typ	Max	
t _{PLH} Propagation Delay Time Low to High Level Output	6	12	20	20	32	45	ns
t _{PHL} Propagation Delay Time High to Low Level Output	3	7	15	4	10	20	ns

Note 1: All typicals are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.