FAIRCHILD SEMICONDUCTOR™

February 1998

DM74ALS09
Quad 2-Input AND Gate with Open Collector Outputs

General Description

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

Pull-Up Resistor Equations

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

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

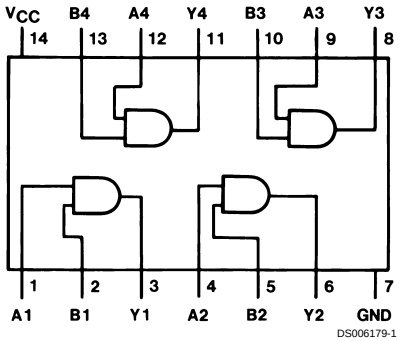
Where: N_1 (I_{OH}) = total maximum output high current for all outputs tied to pull-up resistor
N_2 (I_{IH}) = total maximum input high current for all inputs tied to pull-up resistor
N_3 (I_{IL}) = total maximum input low current for all inputs tied to pull-up resistor

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

Connection Diagram

Dual-In-Line Package



Order Number DM74ALS09M or DM74ALS09N
See Package Number M14A or N14A

Function Table

Y = AB

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

H = High Logic Level
L = Low Logic Level

Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
High Level Output Voltage	7V
Operating Free Air Temperature Range	
DM74ALS	0˚C to +70˚C
Storage Temperature Range	−65˚C to +150˚C
Typical θ_{JA}	
N Package	86.5˚C/W
M Package	116.0˚C/W

Recommended Operating Conditions

Symbol	Parameter	DM74ALS09			Units
		Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	V
V_{IH}	High Level Input Voltage	2			V
V_{IL}	Low Level Input Voltage			0.8	V
V_{OH}	High Level Output Voltage			5.5	V
I_{OL}	Low Level Output Current			8	mA
T_A	Free Air Operating Temperature	0		70	˚C

Note 1: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot 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.*

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	Units
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	I_{OL} =4 mA		0.25	0.4	V
			I_{OL} = 8 mA		0.35	0.5	V
I_I	Input Current @ Max Input Voltage	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		1.3	2.4	mA
			Outputs Low		2.2	4	mA

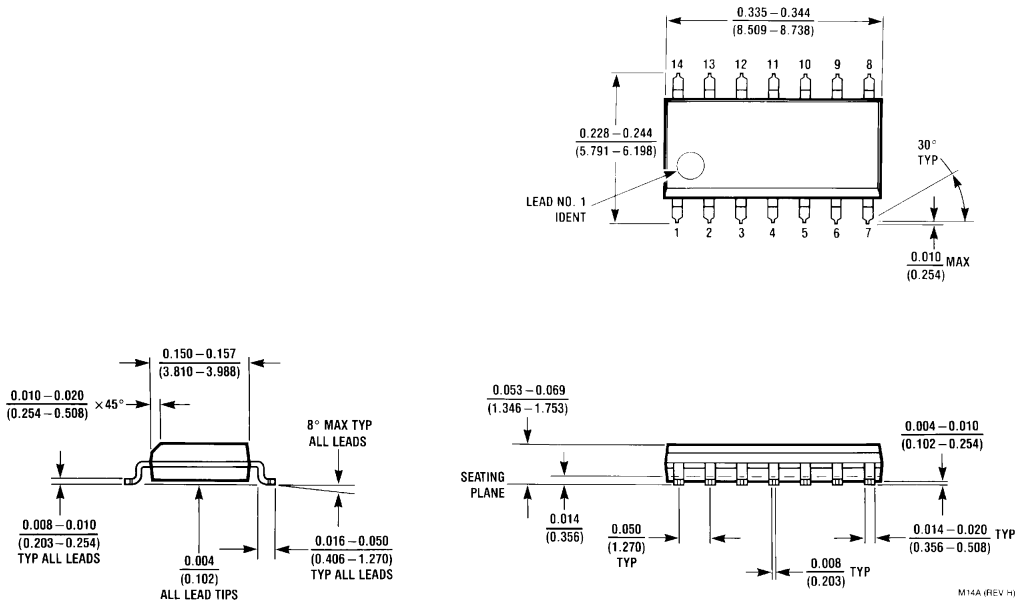
Switching Characteristics

over recommended operating free air temperature range. (Note 2)

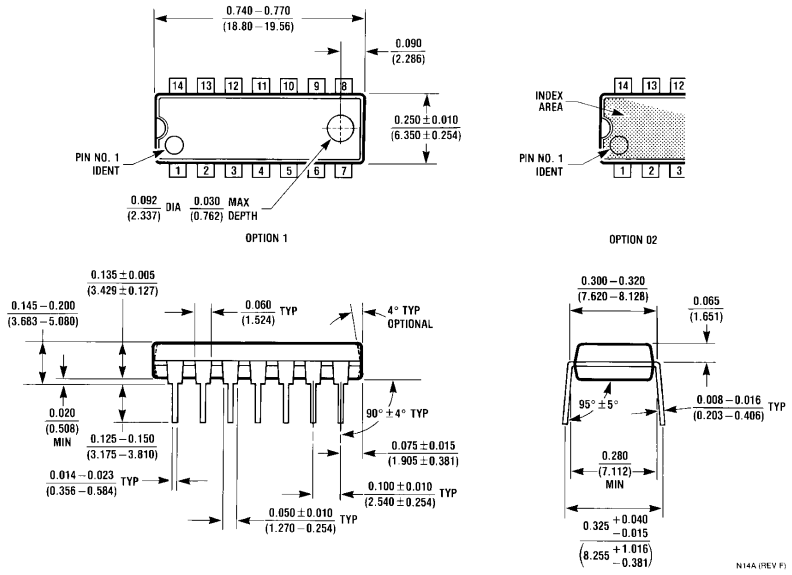
Symbol	Parameter	Conditions	DM74ALS09		Units
			Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	V_{CC} = 4.5V to 5.5V R_L = 2 kΩ, C_L = 50 pF	23	54	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		5	15	ns

Note 2: See Section 1 for test waveforms and output load.

Physical Dimensions inches (millimeters) unless otherwise noted



S.O. Package (M)
Order Number DM74ALS09M
Package Number M14A



Molded Dual-In-Line Package (N)
Order Number DM74ALS09N
Package Number N14A

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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