

DM74LS09

Quad 2-Input AND Gates 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.

Features

- Alternate Military/Aerospace device (54LS09) is available. Contact a Fairchild Semiconductor Sales Office/Distributor for specifications.

Pull-Up Resistor Equations

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

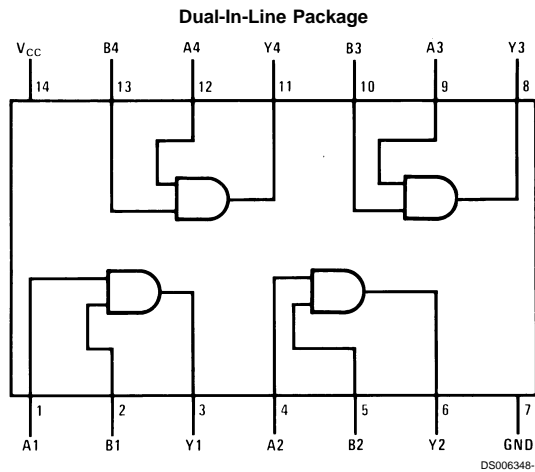
$$R_{MIN} = \frac{V_{CC} (Max) - V_{OL}}{I_{OL} - N_3 (I_{IL})}$$

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

Connection Diagram



Order Number 54LS09DMQB, 54LS09FMQB, DM54LS09J, DM54LS09W, DM74LS09M or DM74LS09N
See Package Number E20A, J14A, M14A, N14A or W14B

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
Input Voltage
Output Voltage

7V
7V
7V

Operating Free Air Temperature Range

DM54LS and 54LS

–55°C to +125°C

DM74LS

0°C to +70°C

Storage Temperature Range

–65°C to +150°C

Recommended Operating Conditions

Symbol	Parameter	DM54LS09			DM74LS09			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

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 (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	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	$V_{CC} = \text{Min}, V_O = 5.5 \text{ V}$ $V_{IH} = \text{Min}$			100	μA
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$	DM54	0.25	0.4	V
		$V_{IL} = \text{Max}$	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_{CCH}	Supply Current With Outputs High	$V_{CC} = \text{Max}$		2.4	4.8	mA
I_{CCL}	Supply Current With Outputs Low	$V_{CC} = \text{Max}$		4.4	8.8	mA

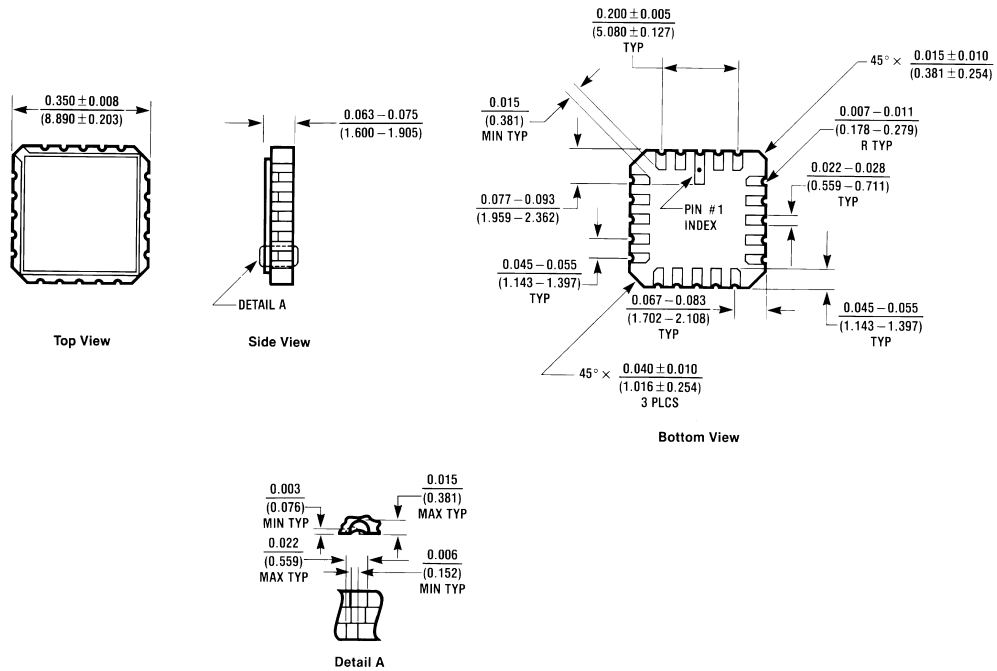
Switching Characteristicsat $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$

Symbol	Parameter	R _L = 2 kΩ				Units
		C _L = 15 pF		C _L = 50 pF		
		Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	5	20	8	45	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	4	15	6	27	ns

Note 2: All typicals are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

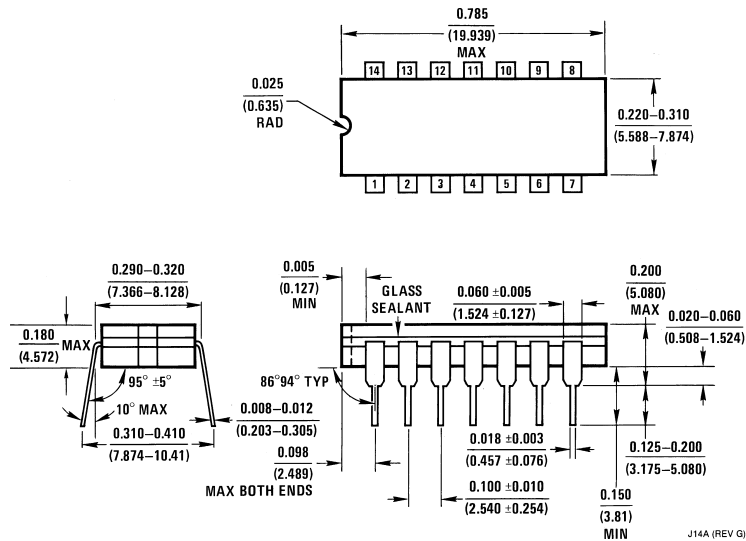


Physical Dimensions inches (millimeters) unless otherwise noted



E20A (REV D)

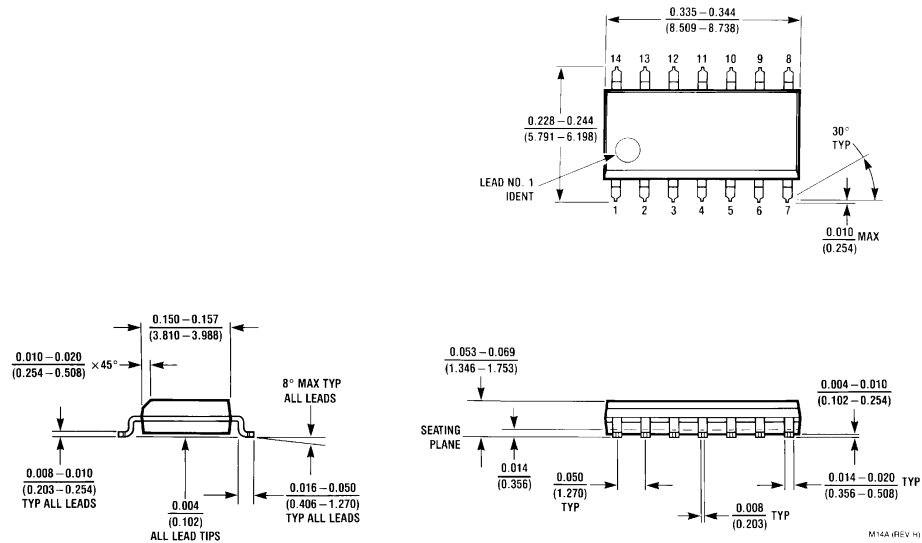
Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS09LMQB
Package Number E20A



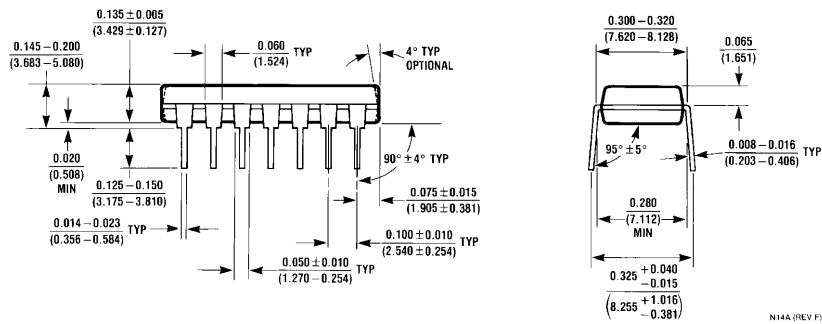
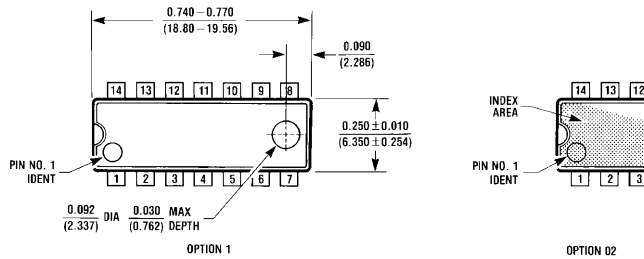
J14A (REV G)

14-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS09DMQB or DM54LS09J
Package Number J14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

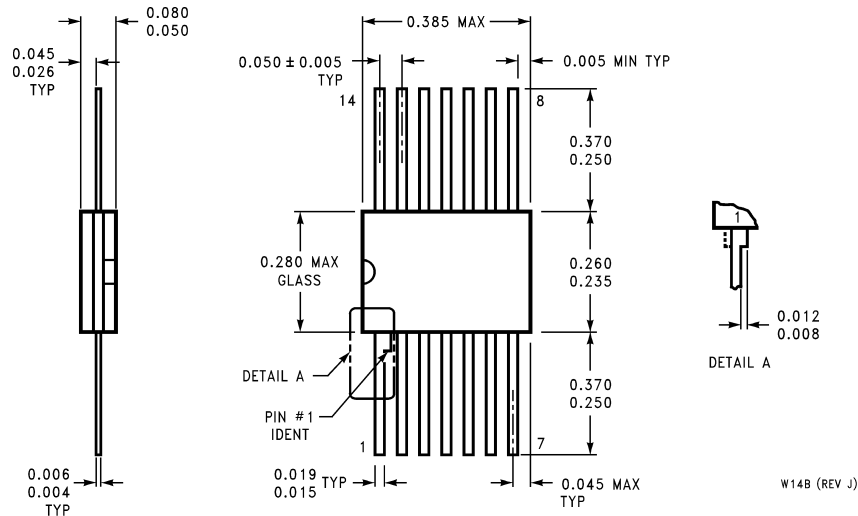


14-Lead Small Outline Molded Package (M)
Order Number DM74LS09M
Package Number M14A



14-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS09N
Package Number N14A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Ceramic Flat Package (W)
Order Number 54LS09FMQB or DM54LS09W
Package Number W14B

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