

## 54LS21/DM54LS21/DM74LS21 Dual 4-Input AND Gates

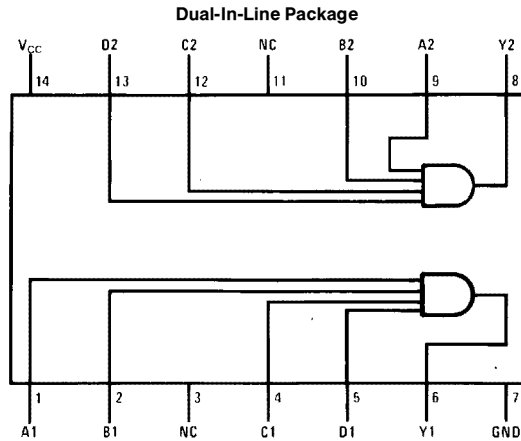
### General Description

This device contains two independent gates each of which performs the logic AND function.

### Features

- Alternate Military/Aerospace device (54LS21) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

### Connection Diagram



TL/F/6356-1

Order Number 54LS21DMQB, 54LS21FMQB, 54LS21LMQB,  
DM54LS21J, DM54LS21W, DM74LS21M or DM74LS21N  
See NS Package Number E20A, J14A, M14A, N14A or W14B

### Function Table

 $Y = ABCD$ 

Inputs				Output
A	B	C	D	Y
X	X	X	L	L
X	X	L	X	L
X	L	X	X	L
L	X	X	X	L
H	H	H	H	H

H = High Logic Level

L = Low Logic Level

X = Either Low or High Logic Level

## Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage 7V

Input Voltage 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

Note: 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.

## Recommended Operating Conditions

Symbol	Parameter	DM54LS21			DM74LS21			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7			0.8	V
I <sub>OH</sub>	High Level Output Current			-0.4			-0.4	mA
I <sub>OL</sub>	Low Level Output Current			4			8	mA
T <sub>A</sub>	Free Air Operating Temperature	-55		125	0		70	°C

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

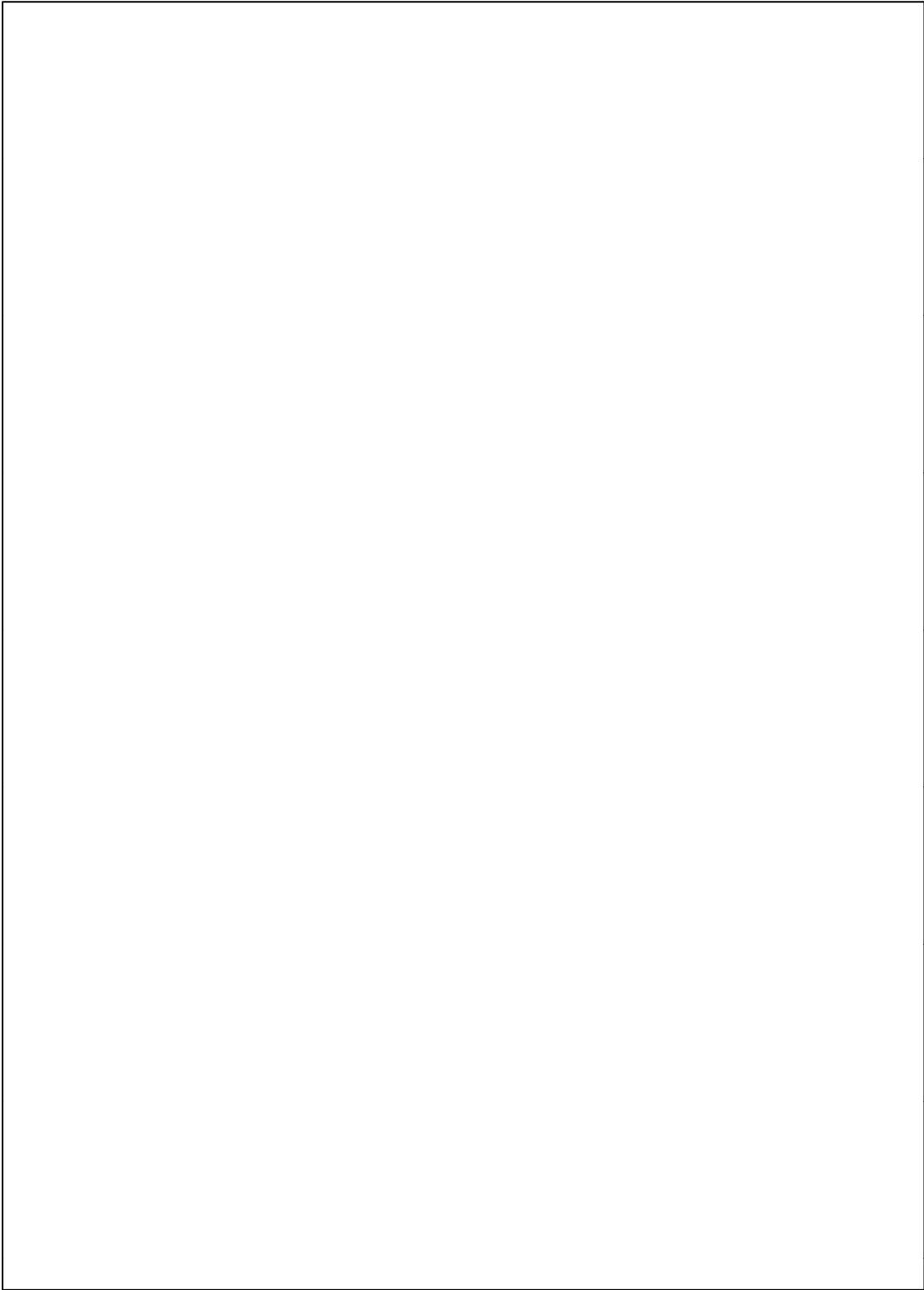
Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units	
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA			-1.5	V	
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IH</sub> = Min	DM54	2.5	3.4	V	
			DM74	2.7	3.4		
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IL</sub> = Max	DM54		0.25	0.4	V
			DM74		0.35	0.5	
			DM74		0.25	0.4	
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 7V			0.1	mA	
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-0.36	mA	
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	DM54	-20		-100	mA
			DM74	-20		-100	
I <sub>CCH</sub>	Supply Current with Outputs High	V <sub>CC</sub> = Max		1.2	2.4	mA	
I <sub>CCL</sub>	Supply Current with Outputs Low	V <sub>CC</sub> = Max		2.2	4.4	mA	

## Switching Characteristics at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C (See Section 1 for Test Waveforms and Output Load)

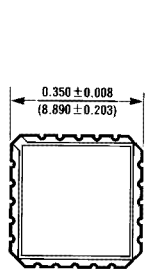
Symbol	Parameter	R <sub>L</sub> = 2 kΩ				Units
		C <sub>L</sub> = 15 pF		C <sub>L</sub> = 50 pF		
		Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output	4	13	6	18	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output	3	11	5	18	ns

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

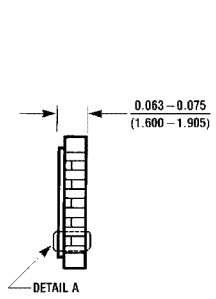
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.



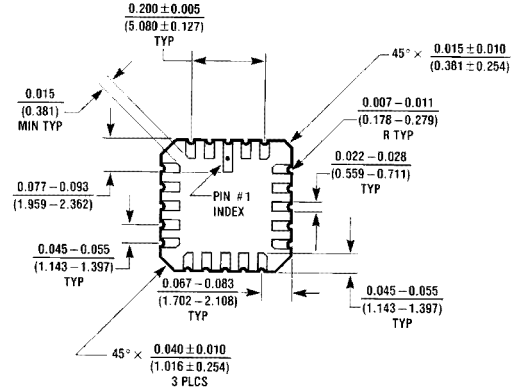
**Physical Dimensions** inches (millimeters)



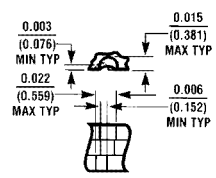
Top View



Side View



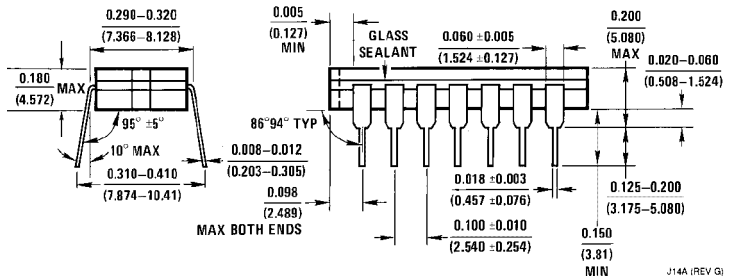
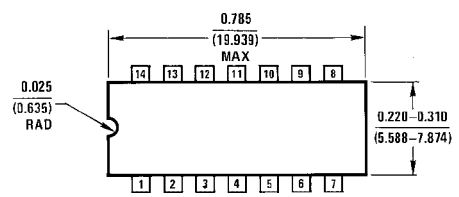
Bottom View



Detail A

**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS20LMQB**  
**NS Package Number E20A**

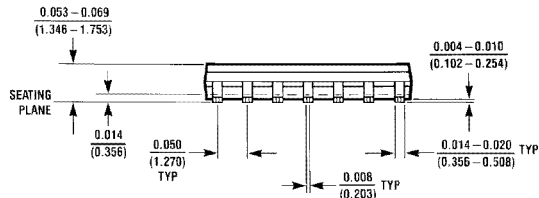
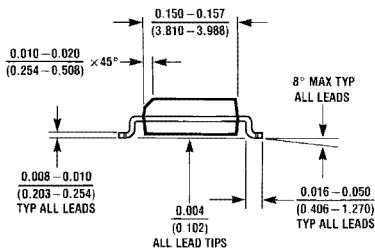
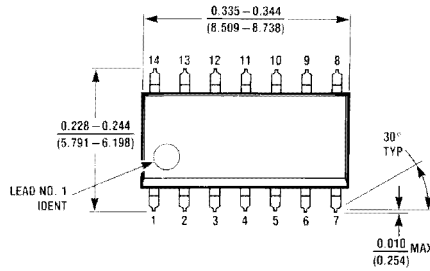
E20A (REV D)



**14-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS20DMQB or DM54LS21J**  
**NS Package Number J14A**

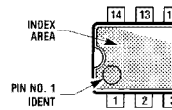
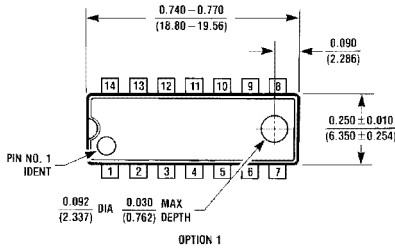
J14A (REV G)

**Physical Dimensions** inches (millimeters) (Continued)



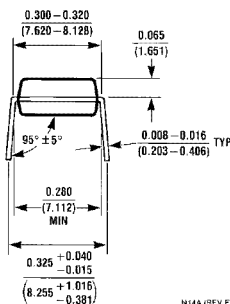
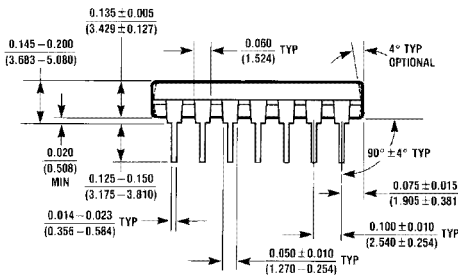
M14A (REV. H)

**14-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS21M**  
**NS Package Number M14A**



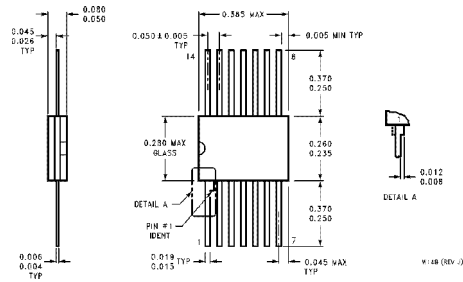
OPTION 1

OPTION 02



N14A (REV. F)

**14-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS21N**  
**NS Package Number N14A**

**Physical Dimensions** inches (millimeters) (Continued)

**14-Lead Ceramic Flat Package (W)**  
**Order Number 54LS21FMQB or DM54LS21W**  
**NS Package Number W14B**

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is 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.



**National Semiconductor Corporation**  
 1111 West Bardin Road  
 Arlington, TX 76017  
 Tel: 1(800) 272-9959  
 Fax: 1(800) 737-7018

**National Semiconductor Europe**  
 Fax: (+49) 0-180-530 85 86  
 Email: cnjwge@tevm2.nsc.com  
 Deutsch Tel: (+49) 0-180-530 85 85  
 English Tel: (+49) 0-180-532 78 32  
 Français Tel: (+49) 0-180-532 93 58  
 Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**  
 13th Floor, Straight Block,  
 Ocean Centre, 5 Canton Rd.  
 Tsimshatsui, Kowloon  
 Hong Kong  
 Tel: (852) 2737-1600  
 Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**  
 Tel: 81-043-299-2309  
 Fax: 81-043-299-2408