

August 1989

54LS244/DM74LS244 Octal TRI-STATE® Buffers/Line Drivers/Line Receivers

General Description

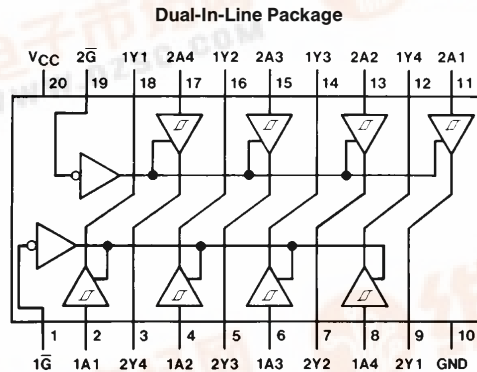
These buffers/line drivers are designed to improve both the performance and PC board density of TRI-STATE buffers/drivers employed as memory-address drivers, clock drivers, and bus-oriented transmitters/receivers. Featuring 400 mV of hysteresis at each low current PNP data line input, they provide improved noise rejection and high fanout outputs and can be used to drive terminated lines down to 133Ω.

Features

- TRI-STATE outputs drive bus lines directly
- PNP inputs reduce DC loading on bus lines
- Hysteresis at data inputs improves noise margins

- Typical I_{OL} (sink current)
 - 54LS 12 mA
 - 74LS 24 mA
- Typical I_{OH} (source current)
 - 54LS -12 mA
 - 74LS -15 mA
- Typical propagation delay times
 - Inverting 10.5 ns
 - Noninverting 12 ns
- Typical enable/disable time 18 ns
- Typical power dissipation (enabled)
 - Inverting 130 mW
 - Noninverting 135 mW

Connection Diagram



TL/F/8442-1

Order Number 54LS244DMQB, 54LS244FMQB, 54LS244LMQB,
DM74LS244WM or DM74LS244N
See NS Package Number E20A, J20A, M20B, N20A or W20A

Function Table

Inputs		Output
\bar{G}	A	Y
L	L	L
L	H	H
H	X	Z

L = Low Logic Level
H = High Logic Level
X = Either Low or High Logic Level
Z = High Impedance

TRI-STATE® is a registered trademark of National Semiconductor Corporation.



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	
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	54LS244			DM74LS244			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
I _{OH}	High Level Output Current			−12			−15	mA
I _{OL}	Low Level Output Current			12			24	mA
T _A	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 _I	Input Clamp Voltage	V _{CC} = Min, I _I = −18 mA			−1.5	V
HYS	Hysteresis (V _{T+} − V _{T−}) Data Inputs Only	V _{CC} = Min	0.2	0.4		V
V _{OH}	High Level Output Voltage	V _{CC} = Min, V _{IH} = Min V _{IL} = Max, I _{OH} = −1 mA	DM74	2.7		V
		V _{CC} = Min, V _{IH} = Min V _{IL} = Max, I _{OH} = −3 mA	54LS/DM74	2.4	3.4	
		V _{CC} = Min, V _{IH} = Min V _{IL} = 0.5V, I _{OH} = Max	54LS/DM74	2		
V _{OL}	Low Level Output Voltage	V _{CC} = Min V _{IL} = Max V _{IH} = Min	I _{OL} = 12 mA	54LS/DM74		0.4
			I _{OL} = Max	DM74		0.5
I _{OZH}	Off-State Output Current, High Level Voltage Applied	V _{CC} = Max V _{IL} = Max V _{IH} = Min	V _O = 2.7V			20
I _{OZL}	Off-State Output Current, Low Level Voltage Applied		V _O = 0.4V			−20
I _I	Input Current at Maximum Input Voltage	V _{CC} = Max	V _I = 7V (DM74) V _I = 10V (54LS)			0.1
I _{IH}	High Level Input Current	V _{CC} = Max	V _I = 2.7V			20
I _{IL}	Low Level Input Current	V _{CC} = Max	V _I = 0.4V	−0.5		−200
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	54LS	−50	−225	mA
			DM74	−40		
I _{CC}	Supply Current	V _{CC} = Max, Outputs Open	Outputs High		13	23
			Outputs Low		27	46
			Outputs Disabled		32	54

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

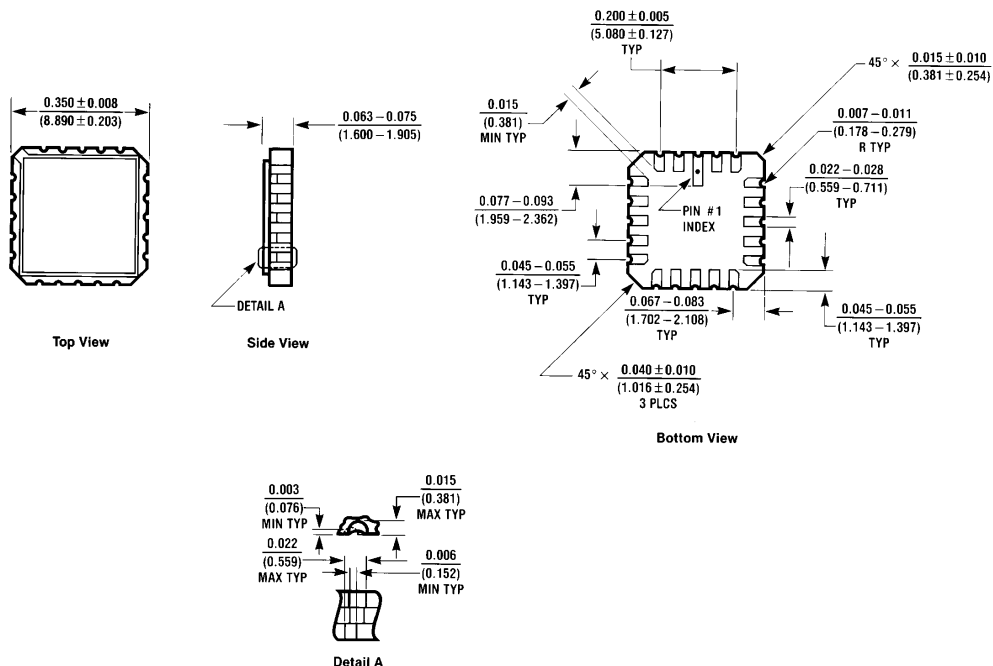
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

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

Symbol	Parameter	Conditions	54LS Max	DM74LS Max	Units
t_{PLH}	Propagation Delay Time Low to High Level Output	$C_L = 45 \text{ pF}$ $R_L = 667\Omega$	18	18	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	$C_L = 45 \text{ pF}$ $R_L = 667\Omega$	18	18	ns
t_{PZL}	Output Enable Time to Low Level	$C_L = 45 \text{ pF}$ $R_L = 667\Omega$	30	30	ns
t_{PZH}	Output Enable Time to High Level	$C_L = 45 \text{ pF}$ $R_L = 667\Omega$	23	23	ns
t_{PLZ}	Output Disable Time from Low Level	$C_L = 5 \text{ pF}$ $R_L = 667\Omega$	25	25	ns
t_{PHZ}	Output Disable Time from High Level	$C_L = 5 \text{ pF}$ $R_L = 667\Omega$	18	18	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	$C_L = 150 \text{ pF}$ $R_L = 667\Omega$		21	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	$C_L = 150 \text{ pF}$ $R_L = 667\Omega$		22	ns
t_{PZL}	Output Enable Time to Low Level	$C_L = 150 \text{ pF}$ $R_L = 667\Omega$		33	ns
t_{PZH}	Output Enable Time to High Level	$C_L = 150 \text{ pF}$ $R_L = 667\Omega$		26	ns

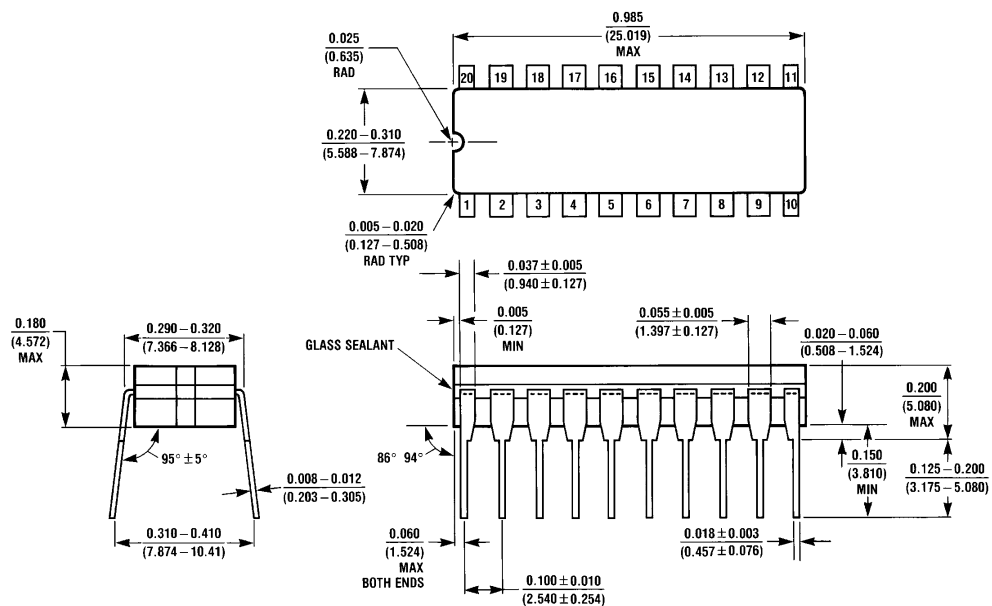
Note: 54LS Output Load is $C_L = 50 \text{ pF}$ for t_{PLH} , t_{PHL} , t_{PZL} and t_{PZH} .

Physical Dimensions inches (millimeters)



E20A (REV D)

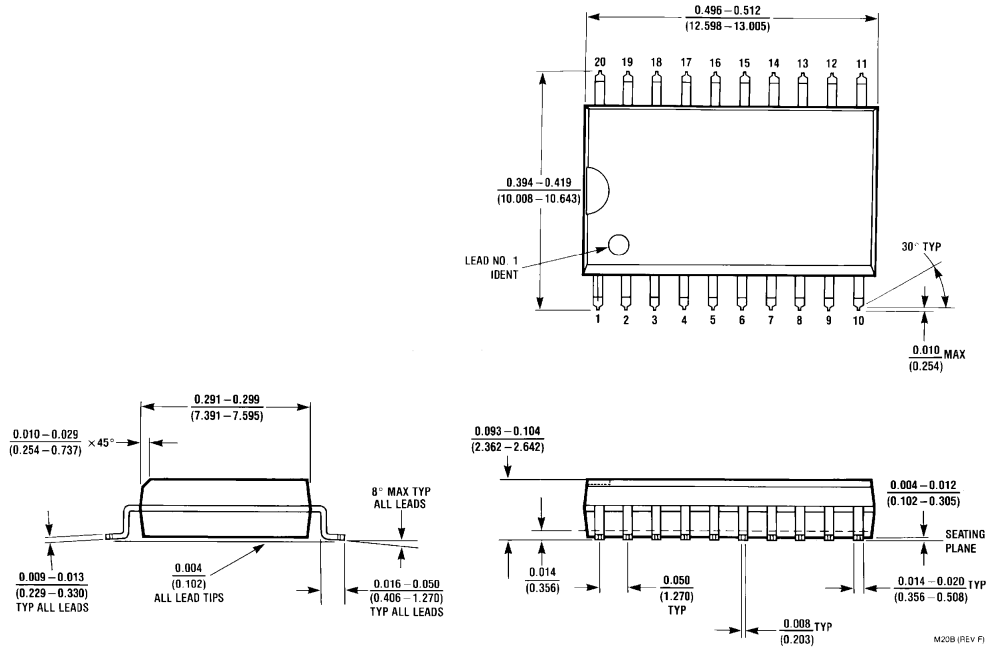
Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS244LMQB
NS Package Number E20A



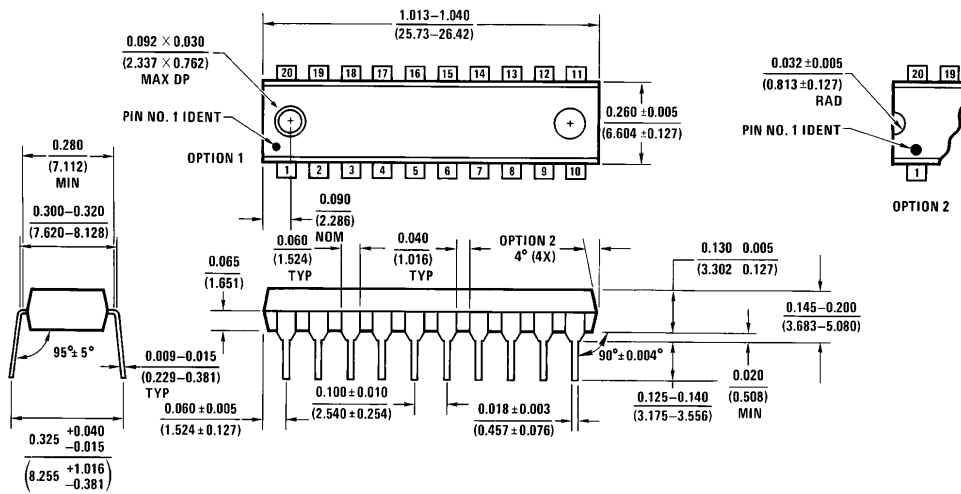
J20A (REV M)

20-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS244DMQB
NS Package Number J20A

Physical Dimensions inches (millimeters) (Continued)

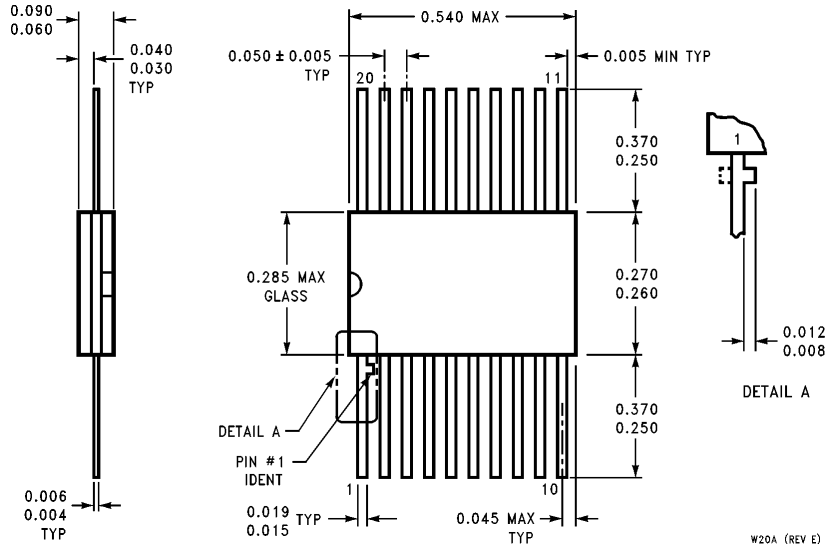


20-Lead Wide Small Outline Molded Package (M)
Order Number DM74LS244WM
NS Package Number M20B



20-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS244N
NS Package Number N20A

Physical Dimensions inches (millimeters) (Continued)



20-Lead Ceramic Flat Package (W)
Order Number 54LS244FMQB
NS Package Number W20A

W20A (REV E)

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