



MOTOROLA

OCTAL BUFFER/LINE DRIVER WITH 3-STATE OUTPUTS

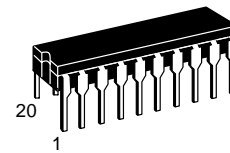
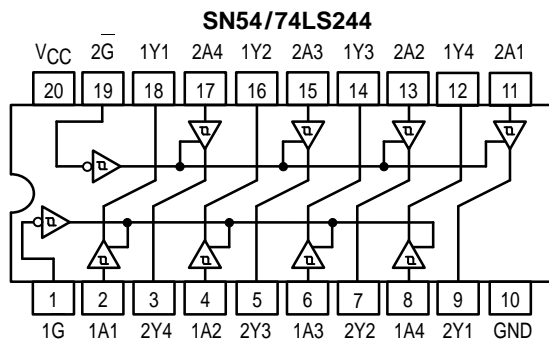
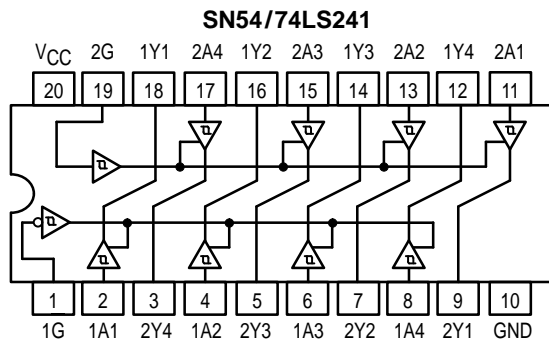
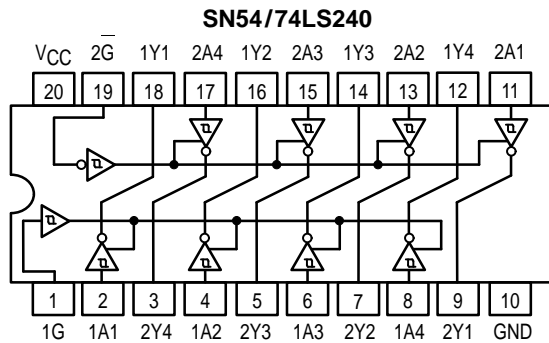
The SN54/74LS240, 241 and 244 are Octal Buffers and Line Drivers designed to be employed as memory address drivers, clock drivers and bus-oriented transmitters/receivers which provide improved PC board density.

- Hysteresis at Inputs to Improve Noise Margins
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- Input Clamp Diodes Limit High-Speed Termination Effects

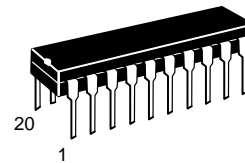
SN54/74LS240
SN54/74LS241
SN54/74LS244

OCTAL BUFFER/LINE DRIVER WITH 3-STATE OUTPUTS
LOW POWER SCHOTTKY

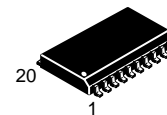
LOGIC AND CONNECTION DIAGRAMS DIP (TOP VIEW)



J SUFFIX
CERAMIC
CASE 732-03



N SUFFIX
PLASTIC
CASE 738-03



DW SUFFIX
SOIC
CASE 751D-03

ORDERING INFORMATION

SN54LSXXXJ Ceramic
 SN74LSXXXN Plastic
 SN74LSXXXDW SOIC

54LS245/DM54LS245/DM74LS245 TRI-STATE® Octal Bus Transceiver

General Description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation minimizes external timing requirements.

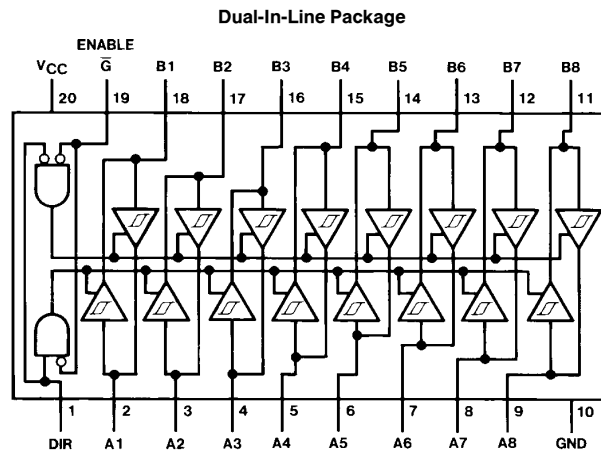
The device allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the direction control (DIR) input. The enable input (\bar{G}) can be used to disable the device so that the buses are effectively isolated.

Features

- Bi-Directional bus transceiver in a high-density 20-pin package
- TRI-STATE outputs drive bus lines directly

- PNP inputs reduce DC loading on bus lines
- Hysteresis at bus inputs improve noise margins
- Typical propagation delay times, port-to-port 8 ns
- Typical enable/disable times 17 ns
- I_{OL} (sink current)
 - 54LS 12 mA
 - 74LS 24 mA
- I_{OH} (source current)
 - 54LS -12 mA
 - 74LS -15 mA
- Alternate Military/Aerospace device (54LS245) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram



TL/F/6413-1

Order Number 54LS245DMQB, 54LS245FMQB, 54LS245LMQB,
DM54LS245J, DM54LS245W, DM74LS245WM or DM74LS245N
See NS Package Number E20A, J20A, M20B, N20A or W20A

Function Table

Enable \bar{G}	Direction Control DIR	Operation
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H = High Level, L = Low Level, X = Irrelevant

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	
DIR or \bar{G}	7V
A or B	5.5V
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	DM54LS245			DM74LS245			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-})	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 _{IL} = Min V _{IL} = Max, I _{OH} = -3 mA	DM54/DM74	2.4	3.4			
		V _{CC} = Min, V _{IH} = Min V _{IL} = 0.5V, I _{OH} = Max	DM54/DM74	2				
V _{OL}	Low Level Output Voltage	V _{CC} = Min V _{IL} = Max V _{IH} = Min	I _{OL} = 12 mA	DM74		0.4	V	
			I _{OL} = Max	DM54		0.4		
				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	μA	
I _{OZL}	Off-State Output Current, Low Level Voltage Applied		V _O = 0.4V			-200	μA	
I _I	Input Current at Maximum Input Voltage	V _{CC} = Max	A or B	V _I = 5.5V		0.1	mA	
			DIR or \bar{G}	V _I = 7V		0.1		
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V				20	μA	
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V				-0.2	mA	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)		-40		-225	mA	
I _{CC}	Supply Current	Outputs High		V _{CC} = Max		48	70	mA
		Outputs Low				62	90	
		Outputs at Hi-Z				64	95	

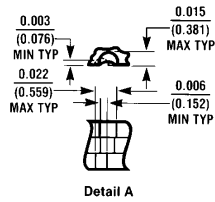
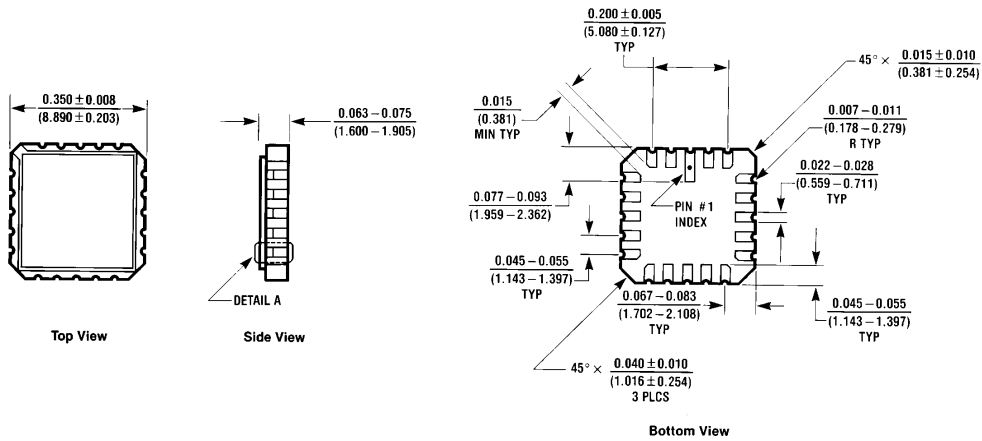
Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

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

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

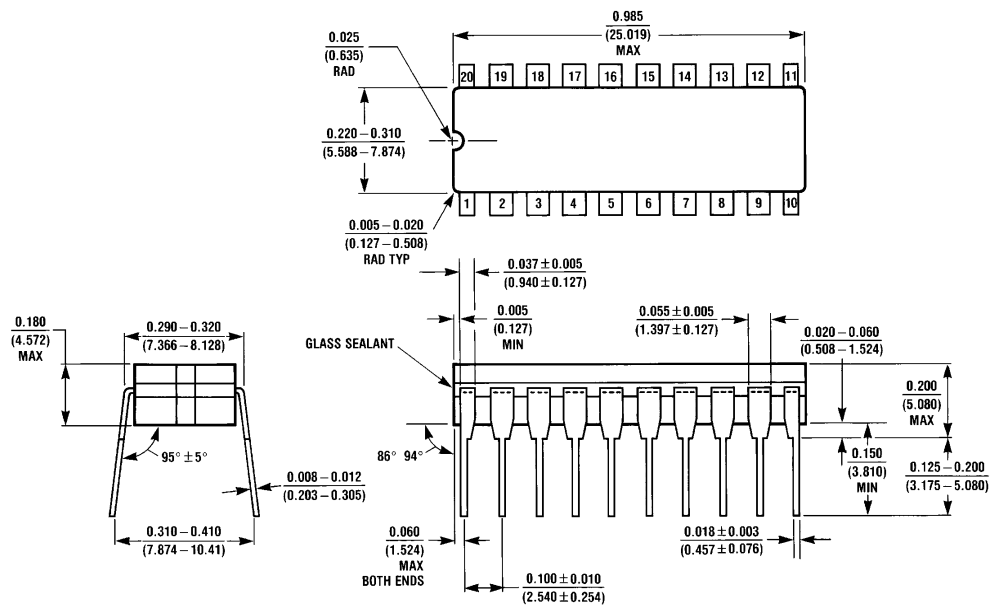
Symbol	Parameter	Conditions	DM54/74		Units
			LS245		
			Min	Max	
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output	$C_L = 45 \text{ pF}$ $R_L = 667 \Omega$		12	ns
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output			12	ns
t_{PZL}	Output Enable Time to Low Level			40	ns
t_{PZH}	Output Enable Time to High Level			40	ns
t_{PLZ}	Output Disable Time from Low Level	$C_L = 5 \text{ pF}$ $R_L = 667 \Omega$		25	ns
t_{PHZ}	Output Disable Time from High Level			25	ns
t_{PLH}	Propagation Delay Time, Low-to-High-Level Output	$C_L = 150 \text{ pF}$ $R_L = 667 \Omega$		16	ns
t_{PHL}	Propagation Delay Time, High-to-Low-Level Output			17	ns
t_{PZL}	Output Enable Time to Low Level			45	ns
t_{PZH}	Output Enable Time to High Level			45	ns

Physical Dimensions inches (millimeters)



Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS245LMQB
NS Package Number E20A

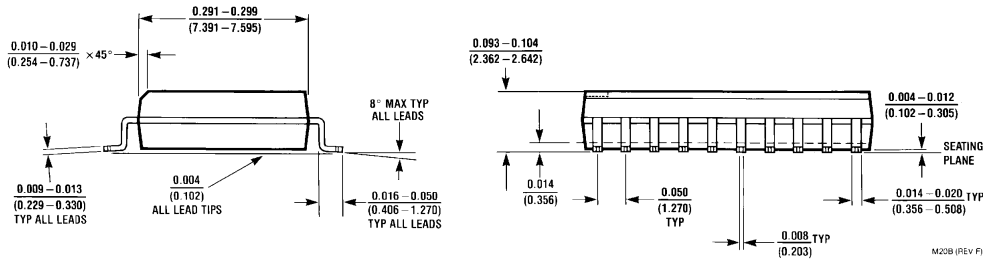
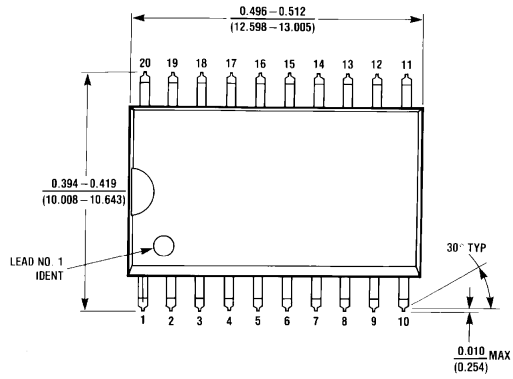
E20A (REV D)



20-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS245DMQB or DM54LS245J
NS Package Number J20A

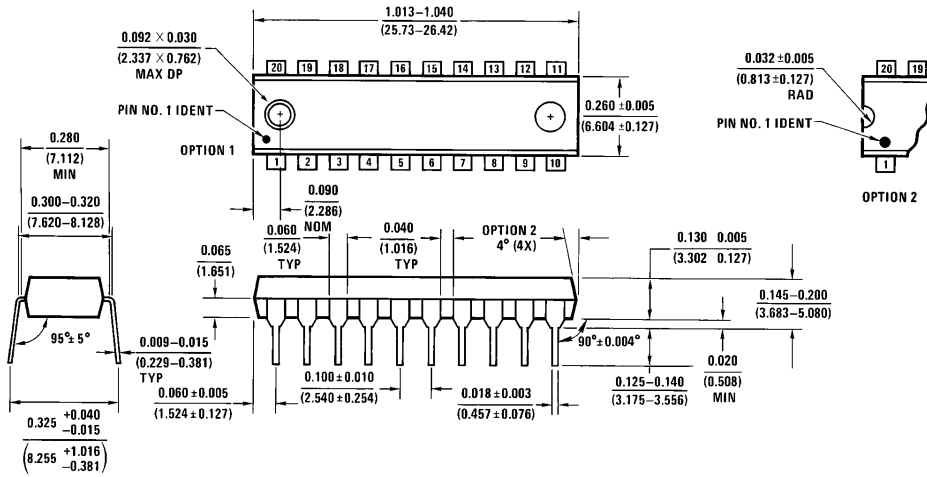
J20A (REV M)

Physical Dimensions inches (millimeters) (Continued)



M20B (REV F)

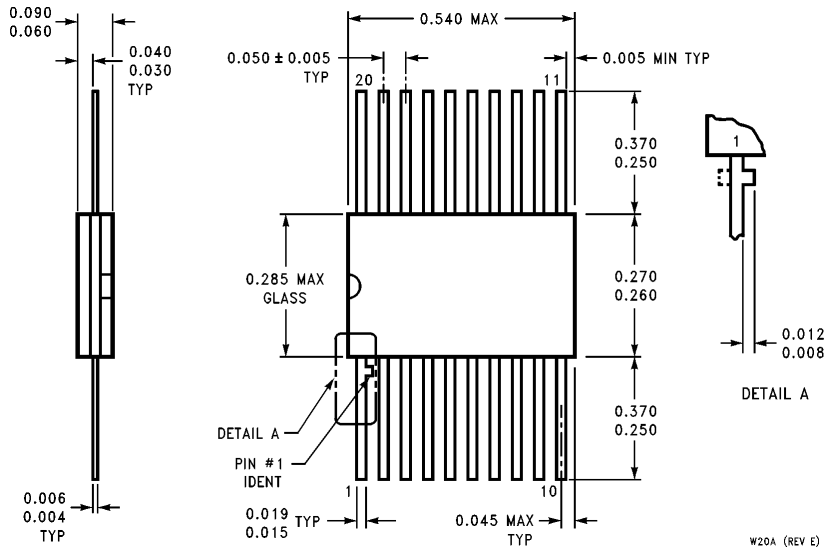
20-Lead Small Outline Molded Package (M)
Order Number DM74LS245WM
NS Package Number M20B



M20A (REV G)

20-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS245N
NS Package Number N20A

Physical Dimensions inches (millimeters) (Continued)



20-Lead Ceramic Flat Package (W)
Order Number 54LS245FMQB or DM54LS245W
NS Package Number W20A

W20A (REV E)

LIFE SUPPORT POLICY

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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.



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SN54/74LS240 • SN54/74LS241 • SN54/74LS244

TRUTH TABLES

SN54/74LS240

INPUTS		OUTPUT
1G, 2G	D	
L	L	H
L	H	L
H	X	(Z)

SN54/74LS244

INPUTS		OUTPUT
1G, 2G	D	
L	L	L
L	H	H
H	X	(Z)

SN54/74LS241

INPUTS		OUTPUT	INPUTS		OUTPUT
1G	D		2G	D	
L	L	L	H	L	L
L	H	H	H	H	H
H	X	(Z)	L	X	(Z)

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 Z = HIGH Impedance

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V _{CC}	Supply Voltage	54	4.5	5.0	5.5	V
		74	4.75	5.0	5.25	
T _A	Operating Ambient Temperature Range	54	-55	25	125	°C
		74	0	25	70	
I _{OH}	Output Current — High	54, 74			-3.0	mA
		54 74			-12 -15	mA
I _{OL}	Output Current — Low	54			12	mA
		74			24	

SN54/74LS240 • SN54/74LS241 • SN54/74LS244

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		

SN54/74LS240 • SN54/74LS241 • SN54/74LS244

AC WAVEFORMS

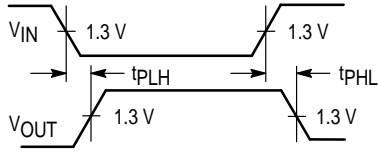


Figure 1

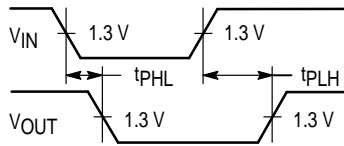


Figure 2

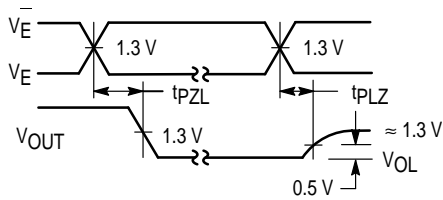


Figure 3

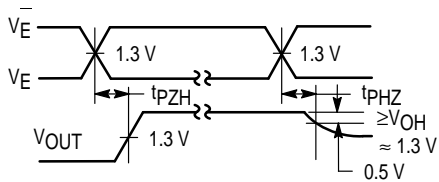
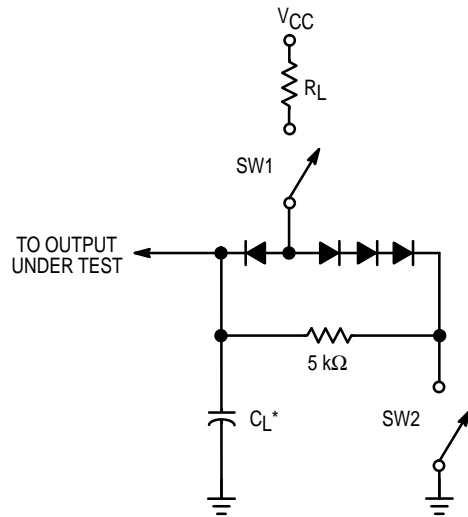


Figure 4



SWITCH POSITIONS

SYMBOL	SW1	SW2
t _{PZH}	Open	Closed
t _{PZL}	Closed	Open
t _{PLZ}	Closed	Closed
t _{PHZ}	Closed	Closed

Figure 5