# MOTOROLA

OCTAL BUFFER/LINE DRIVER WITH 3-STATE OUTPUTS

The SN54/74LS540 and SN54/74LS541 are octal buffers and line drivers with the same functions as the LS240 and LS241, but with pinouts on the opposite side of the package.

These device types are designed to be used as memory address drivers, clock drivers and bus-oriented transmitters/receivers. These devices are especially useful as output ports for the microprocessors, allowing ease of layout and greater PC board density.

- Hysteresis at Inputs to Improve Noise Margin
- PNP Inputs Reduce Loading
- 3-State Outputs Drive Bus Lines
- Inputs and Outputs Opposite Side of Package, Allowing Easier Interface to Microprocessors
- Input Clamp Diodes Limit High-Speed Termination Effects

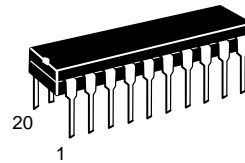## LOGIC AND CONNECTION DIAGRAMS DIP (TOP VIEW)

SN54/74LS540
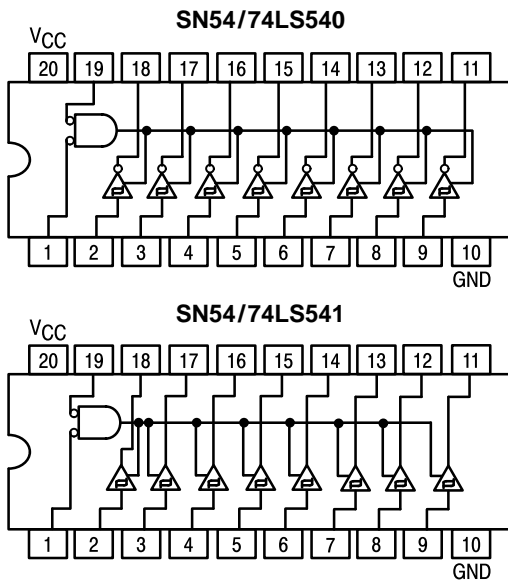
SN54/74LS541

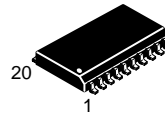## SN54/74LS540
SN54/74LS541

OCTAL BUFFER/LINE DRIVER WITH 3-STATE OUTPUTS

LOW POWER SCHOTTKY
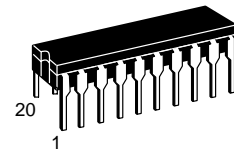
J SUFFIX
CERAMIC
CASE 732-03

N SUFFIX
PLASTIC
CASE 738-03

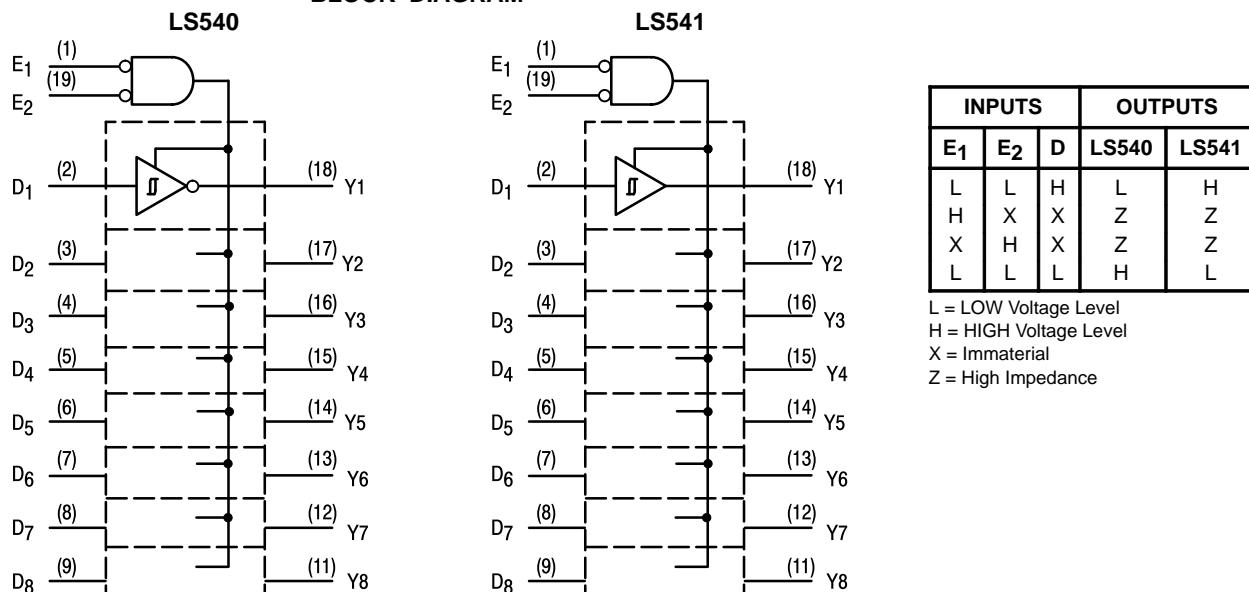**DW SUFFIX**
SOIC
CASE 751D-03

ORDERING INFORMATION

SN54LSXXXJ   Ceramic
SN74LSXXXN   Plastic
SN74LSXXXDW SOIC

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			−12	mA
		74			−15	
I_{OL}	Output Current — Low	54			12	mA
		74			24	

SN54/74LS540 • SN54/74LS541

BLOCK DIAGRAM

LS540   **LS541**

INPUTS			OUTPUTS	
E_1	E_2	D	LS540	LS541
L	L	H	L	H
H	X	X	Z	Z
X	H	X	Z	Z
L	L	L	H	L

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

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits			Unit	Test Conditions	
			Min	Typ	Max			
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs	
		74			0.8			
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA	
V_{OH}	Output HIGH Voltage	54, 74	2.4	3.4		V	V_{CC} = MIN, I_{OH} = −3.0 mA	
		54, 74	2.0			V	V_{CC} = MIN, I_{OH} = MAX, V_{IL} = 0.5 V	
V_{OL}	Output LOW Voltage	54, 74		0.25	0.4	V	I_{OL} = 12 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = 24 mA	
V_{T+}−$V_{T−}$	Hysteresis		0.2	0.4		V	V_{CC} = MIN	
I_{OZH}	Output Off Current HIGH				20	µA	V_{CC} = MAX, V_{OUT} = 2.7 V	
I_{OZL}	Output Off Current LOW				−20	µA	V_{CC} = MAX, V_{OUT} = 0.4 V	
I_{IH}	Input HIGH Current				20	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
					0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current				−0.2	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Short Circuit Current (Note 1)		−40		−225	mA	V_{CC} = MAX	
I_{CC}	Power Supply Current Total, Output HIGH	LS540			25	mA	V_{CC} = MAX	
		LS541			32	mA		
	Total, Output LOW	LS540			45	mA		
		LS541			52	mA		
	Total Output 3-State	LS540			52	mA		
		LS541			55	mA		

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

FAST AND LS TTL DATA

SN54/74LS540 • SN54/74LS541

AC CHARACTERISTICS (T$_A$ = 25°C)

Symbol	Parameter		Min	Typ	Max	Unit	Test Conditions
t$_{PLH}$	Propagation Delay, Data to Output	LS540		9.0	15	ns	V$_{CC}$ = 5.0 V C$_L$ = 45 pF R$_L$ = 667 Ω
t$_{PLH}$		LS541		12	15		
t$_{PHL}$		LS540		12	15		
t$_{PHL}$		LS541		12	18		
t$_{PZH}$	Output Enable Time to HIGH Level	LS540		15	25	ns	
		LS541		15	32		
t$_{PZL}$	Output Enable Time to LOW Level	LS540		20	38	ns	
		LS541		20	38		
t$_{PHZ}$	Output Disable Time to HIGH Level	LS540		10	18	ns	C$_L$ = 5.0 pF
		LS541		10	18		
t$_{PLZ}$	Output Disable Time to LOW Level	LS540		15	25	ns	
		LS541		15	29		

AC WAVEFORMS
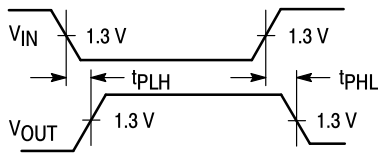
Figure 1
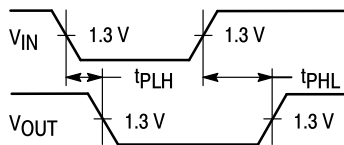
Figure 2
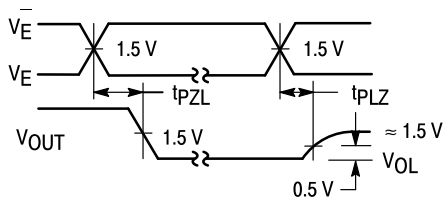
Figure 3
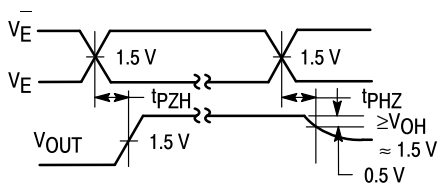
Figure 4
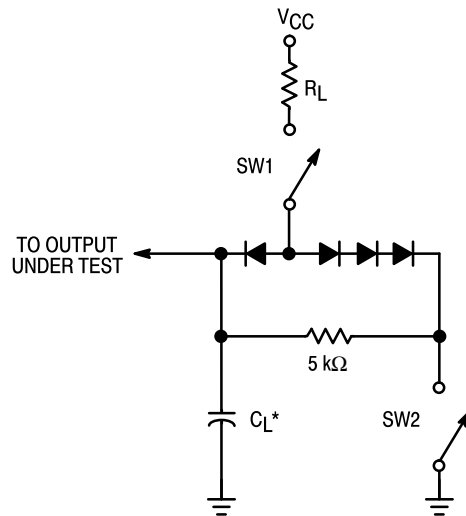
Figure 5

SWITCH POSITIONS

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

Case 751D-03 DW Suffix
20-Pin Plastic
SO-20 (WIDE)
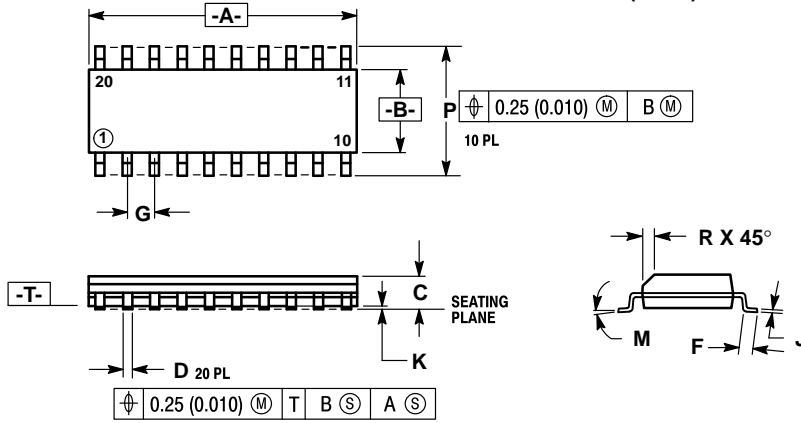
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.65	12.95	0.499	0.510
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

Case 732-03 J Suffix
20-Pin Ceramic Dual In-Line
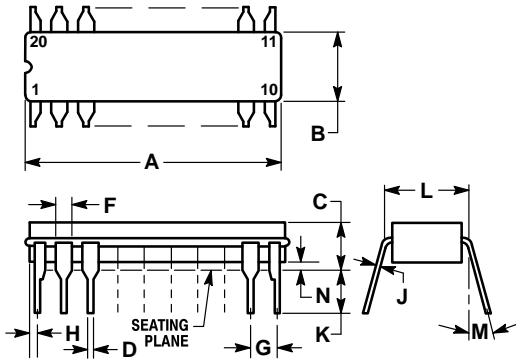
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	23.88	25.15	0.940	0.990
B	6.60	7.49	0.260	0.295
C	3.81	5.08	0.150	0.200
D	0.38	0.56	0.015	0.022
F	1.40	1.65	0.055	0.065
G	2.54 BSC		0.100 BSC	
H	0.51	1.27	0.020	0.050
J	0.20	0.30	0.008	0.012
K	3.18	4.06	0.125	0.160
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.25	1.02	0.010	0.040

Case 738-03 N Suffix
20-Pin Plastic
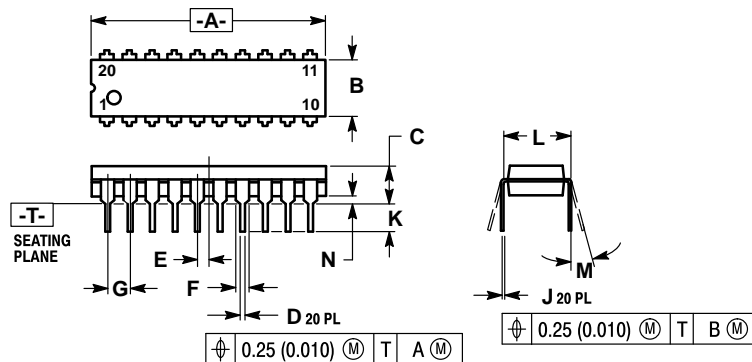
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	25.66	27.17	1.010	1.070
B	6.10	6.60	0.240	0.260
C	3.81	4.57	0.150	0.180
D	0.39	0.55	0.015	0.022
E	1.27 BSC		0.050 BSC	
F	1.27	1.77	0.050	0.070
G	2.54 BSC		0.100 BSC	
J	0.21	0.38	0.008	0.015
K	2.80	3.55	0.110	0.140
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.51	1.01	0.020	0.040

SYMBOL	SW1	SW2
t_{PZH}	Open	Closed
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed

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