

August 1986 Revised March 2000

# DM74LS244 Octal 3-STATE Buffer/Line Driver/Line Receiver

## **General Description**

These buffers/line drivers are designed to improve both the performance and PC board density of 3-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  $133\Omega.$ 

#### **Features**

- 3-STATE outputs drive bus lines directly
- PNP inputs reduce DC loading on bus lines
- Hysteresis at data inputs improves noise margins
- Typical I<sub>OL</sub> (sink current) 24 mA
- Typical I<sub>OH</sub> (source current) -15 mA
- Typical propagation delay times

Inverting 10.5 ns
Noninverting 12 ns

- Typical enable/disable time 18 ns
- Typical power dissipation (enabled)

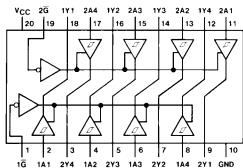
Inverting 130 mW Noninverting 135 mW

# **Ordering Code:**

	Order Number Package Number		Package Description		
DM74LS244WM M20B		M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide		
	DM74LS244SJ M20D		20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide		
	DM74LS244N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide		

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

# **Connection Diagram**



### **Function Table**

Inp	Output		
G	Α	Υ	
L	L	L	
L	Н	Н	
Н	Х	Z	

- L = LOW Logic Level
- H = HIGH Logic Level
- X = Either LOW or HIGH Logic Level
- Z = High Impedance

# **Absolute Maximum Ratings**(Note 1)

Supply Voltage 7V Input Voltage 7V Operating Free Air Temperature Range  $0^{\circ}\text{C to } +70^{\circ}\text{C}$  Storage Temperature Range  $-65^{\circ}\text{C to } +150^{\circ}\text{C}$ 

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 tables 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	Min	Nom	Max	Units
V <sub>CC</sub>	Supply Voltage	4.75	5	5.25	V
V <sub>IH</sub>	HIGH Level Input Voltage	2			V
V <sub>IL</sub>	LOW Level Input Voltage			0.8	V
I <sub>OH</sub>	HIGH Level Output Current			-15	mA
I <sub>OL</sub>	LOW Level Output Current			24	mA
T <sub>A</sub>	Free Air Operating Temperature	0		70	°C

#### **Electrical Characteristics**

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

Symbol	Parameter	Conditi	ons	Min	Typ (Note 2)	Max	Units
VI	Input Clamp Voltage	$V_{CC} = Min, I_I = -18 \text{ mA}$				-1.5	V
HYS	Hysteresis (V <sub>T+</sub> – V <sub>T-</sub> )	V <sub>CC</sub> = Min		0.2	0.4		V
	Data Inputs Only						
V <sub>OH</sub>	HIGH Level Output Voltage	$V_{CC} = Min, V_{IH} = Min$		2.7			
		$V_{IL} = Max$ , $I_{OH} = -1 \text{ mA}$	$V_{IL} = Max$ , $I_{OH} = -1$ mA				
		V <sub>CC</sub> = Min, V <sub>IH</sub> = Min		2.4	3.4		V
		$V_{IL} = Max$ , $I_{OH} = -3 \text{ mA}$		2.4			· ·
		V <sub>CC</sub> = Min, V <sub>IH</sub> = Min		2			
		$V_{IL} = 0.5V$ , $I_{OH} = Max$	2				
V <sub>OL</sub>	LOW Level Output Voltage	V <sub>CC</sub> = Min	I <sub>OL</sub> = 12 mA			0.4	
		V <sub>IL</sub> = Max	I <sub>OL</sub> = Max			0.5	V
		$V_{IH} = Min$					
I <sub>OZH</sub>	Off-State Output Current,	V <sub>CC</sub> = Max	V <sub>O</sub> = 2.7V			20	μΑ
	HIGH Level Voltage Applied	V <sub>IL</sub> = Max					
I <sub>OZL</sub>	Off-State Output Current,	V <sub>IH</sub> = Min	$V_0 = 0.4V$			-20	μΑ
	LOW Level Voltage Applied						
I <sub>I</sub>	Input Current at Maximum	V <sub>CC</sub> = Max	V <sub>I</sub> = 7V			0.1	mA
	Input Voltage						
I <sub>IH</sub>	HIGH Level Input Current	V <sub>CC</sub> = Max	V <sub>I</sub> = 2.7V			20	μΑ
I <sub>IL</sub>	LOW Level Input Current	V <sub>CC</sub> = Max	V <sub>I</sub> = 0.4V	-0.5		-200	μΑ
Ios	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 3)	•	-40		-225	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max,	Outputs HIGH		13	23	
		Outputs Open	Outputs LOW		27	46	mA
			Outputs Disabled		32	54	1

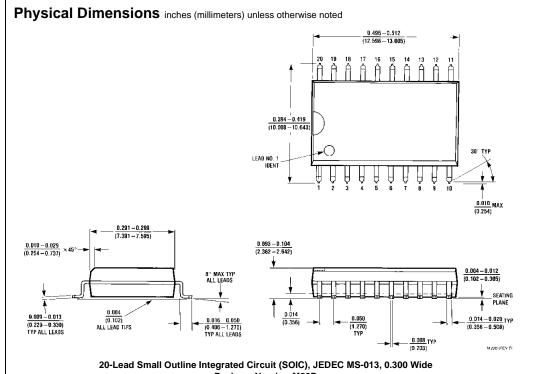
Note 2: All typicals are at  $V_{CC} = 5V$ ,  $T_A = 25$ °C.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

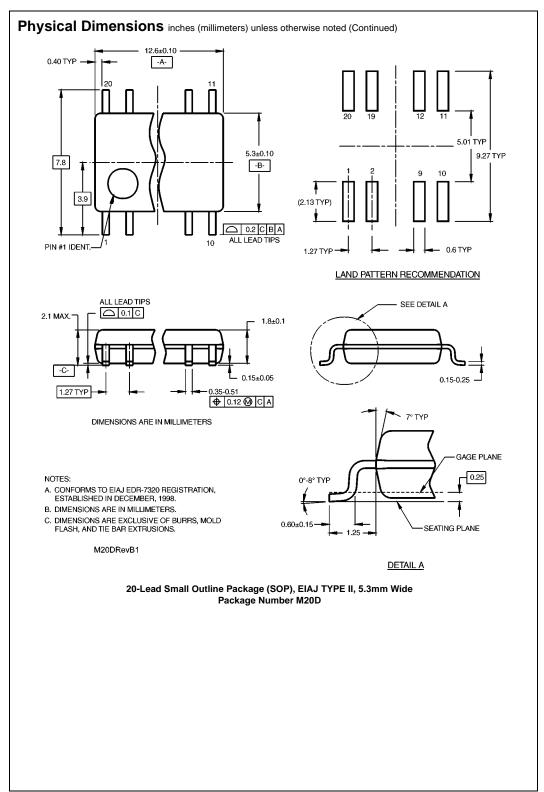
# **Switching Characteristics**

at  $V_{CC} = 5V$ ,  $T_A = 25^{\circ}C$ 

Symbol	Parameter	Conditions	Max	Units	
t <sub>PLH</sub>	Propagation Delay Time	C <sub>L</sub> = 45 pF	18	ns	
	LOW-to-HIGH Level Output	$R_L = 667\Omega$	10	115	
t <sub>PHL</sub>	Propagation Delay Time	C <sub>L</sub> = 45 pF	18	ns	
	HIGH-to-LOW Level Output	$R_L = 667\Omega$	10	115	
t <sub>PZL</sub>	Output Enable Time to	C <sub>L</sub> = 45 pF	30		
	LOW Level	$R_L = 667\Omega$	30	ns	
t <sub>PZH</sub>	Output Enable Time to	C <sub>L</sub> = 45 pF	23	ns	
	HIGH Level	$R_L = 667\Omega$	23		
t <sub>PLZ</sub>	Output Disable Time	$C_L = 5 pF$	25	ns	
	from LOW Level	$R_L = 667\Omega$	25		
t <sub>PHZ</sub>	Output Disable Time	$C_L = 5 pF$	18	ns	
	from HIGH Level	$R_L = 667\Omega$	10		
t <sub>PLH</sub>	Propagation Delay Time	C <sub>L</sub> = 150 pF	21	ns	
	LOW-to-HIGH Level Output	$R_L = 667\Omega$	21		
t <sub>PHL</sub>	Propagation Delay Time	C <sub>L</sub> = 150 pF	22	ns	
	HIGH-to-LOW Level Output	$R_L = 667\Omega$	22		
t <sub>PZL</sub>	Output Enable Time to	C <sub>L</sub> = 150 pF	33	no	
	LOW Level	$R_L = 667\Omega$	33	ns	
t <sub>PZH</sub>	Output Enable Time to	C <sub>L</sub> = 150 pF	26	ns	
	HIGH Level	$R_L = 667\Omega$	26		



20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide Package Number M20B



(8.255 +1.016) -0.381

#### Physical Dimensions inches (millimeters) unless otherwise noted (Continued) 1.013-1.040 (25.73-26.42) $\textbf{0.092} \times \textbf{0.030}$ (2.337 × 0.762) MAX DP 0.032 ±0.005 20 19 18 17 16 15 14 13 12 11 20 19 (0.813±0.127) RAD 0.260 ±0.005 PIN NO. 1 IDENT PIN NO. 1 IDENT (6.604 ±0.127) 0.280 **DPTION 1** (7.112) MIN 1 2 3 4 5 6 7 8 9 10 0.090 OPTION 2 0.300-0.320 (2.286) (7.620-8.128) D.060 NOM 0.040 OPTION 2 4° (4X) 0.130 0.005 (1.524) TYP (1.016) TYP 0.065 (3.302 0.127) (1.651) 0.145-0.200 (3.683-5.080) 0.009-0.015 (0.229-0.381) TYP 0.060 ±0.005 0.020 $0.100 \pm 0.010$ 0.125-0.140 (0.508)(2.540 ± 0.254) (3.175-3.556) 0.325 +0.040 -0.015 (1.524 ± 0.127) (0.457 ± 0.076)

20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N20A

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