National Semiconductor

ADVANCE INFORMATION
December 1996

74LVT2244
3.3V ABT Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

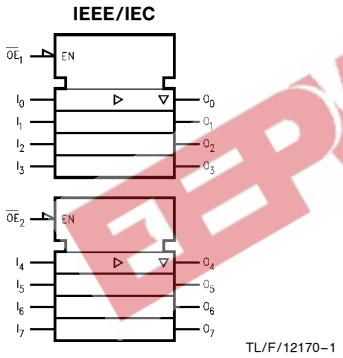
The LVT2244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density. The equivalent 25Ω-Series resistor helps reduce output overshoot and undershoot.

These octal buffers and line drivers are designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVT2244 is fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.

Features

- Input and output interface capability to systems at 5V V_{CC}
- Bus-Hold data inputs eliminate the need for external pull-up resistors to hold unused inputs
- Equivalent 25Ω-Series resistor on outputs
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink −12 mA/+12 mA
- Available in SOIC JEDEC, SOIC EIAJ, TSSOP and SSOPII
- Latch-up performance exceeds 500 mA

Logic Symbol



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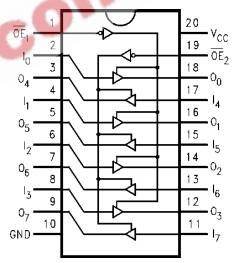
Connection Diagram

Pin Assignment for SOIC, TSSOP and SSOPII



TL/F/12170–2

Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
$\overline{OE}_1$	I_n	
L	L	L
L	H	H
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
$\overline{OE}_2$	I_n	
L	L	L
L	H	H
H	X	Z

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

Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	TRI-STATE Output Enable Inputs
I_0–I_7	Inputs
O_0–O_7	Outputs

	SOIC JEDEC	SOIC EIAJ	TSSOP JEDEC	SSOPII
Order Number	74LVT2244WM 74LVT2244WMX	74LVT2244SJ 74LVT2244SJX	74LVT2244MTC 74LVT2244MTCX	74LVT2244MSA 74LVT2244MSAX
See NS Package Number	M20B	M20D	MTC20	MSA20

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Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Value	Conditions	Units
V_{CC}	Supply Voltage	−0.5 to +7.0		V
V_I	DC Input Voltage	−0.5 to +7.0		V
V_O	DC Output Voltage	−0.5 to +7.0	Output in TRI-STATE	V
		−0.5 to +7.0	Output in High or Low State (Note 2)	V
I_{IK}	DC Input Diode Current	−50	V_I < GND	mA
I_{OK}	DC Output Diode Current	−50	V_O < GND	mA
I_O	DC Output Current	64	V_O > V_{CC} Output at High State	mA
		128	V_O > V_{CC} Output at Low State	
I_{CC}	DC Supply Current per Supply Pin	±64		mA
I_{GND}	DC Ground Current per Ground Pin	±128		mA
T_{STG}	Storage Temperature	−65 to +150		°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'' table are not guaranteed at the Absolute Maximum Ratings. The ''Recommended Operating Conditions'' table will define the conditions for actual device operation.

Note 2: I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Units
V_{CC}	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
V_I	Input Voltage		0	3.6	V
V_O	Output Voltage	HIGH or LOW State	0	V_{CC}	V
		TRI-STATE	0	5.5	
I_{OH}	High-Level Output Current			−12	mA
I_{OL}	Low-Level Output Current			12	
T_A	Free-Air Operating Temperature		−40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, V_{IN} = 0.8V–2.0V, V_{CC} = 3.0V		0	10	ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = −40°C to +85°C			Units	Conditions
			Min	Typ (Note 3)	Max		
V_{IK}	Input Clamp Diode Voltage	2.7			−1.2	V	I_I = −18 mA
V_{IH}	Input HIGH Voltage	2.7–3.6	2.0			V	$V_O \le 0.1V$ or $V_O \ge V_{CC} - 0.1V$
V_{IL}	Input LOW Voltage	2.7–3.6			0.8		
V_{OH}	Output HIGH Voltage	2.7–3.6	V_{CC} − 0.2			V	I_{OH} = −100 μA
		3.0	2.0			V	I_{OH} = −12 mA
V_{OL}	Output LOW Voltage	2.7			0.2	V	I_{OL} = 100 μA
		3.0			0.8	V	I_{OL} = 12 mA

DC Electrical Characteristics (Continued)

Symbol	Parameter		V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions
				Min	Typ (Note 3)	Max		
$I_{I(HOLD)}$	Bus-Hold Input Minimum Drive		3.0	75			μA	$V_I = 0.8V$
				−75			μA	$V_I = 2.0V$
$I_{I(OD)}$	Bus-Hold Input Over-Drive Current to Change State		3.0	500			μA	(Note 4)
				−500			μA	(Note 5)
I_I	Input Current		3.6			10	μA	$V_I = 5.5V$
		Control Pins	3.6			±1	μA	$V_I = 0V$ or V_{CC}
		Data Pins	3.6			−5	μA	$V_I = 0V$
						1	μA	$V_I = V_{CC}$
I_{OFF}	Power Off Leakage Current		0			±100	μA	$0V \le V_I$ or $V_O \le 5.5V$
$I_{PU/PD}$ (Note 6)	Power up/down TRI-STATE Output Current		0–1.2V			±100	μA	$V_O = 0.5V$ to V_{CC} V_I = GND or V_{CC}
I_{OZL}	TRI-STATE Output Leakage Current		3.6			−5	μA	$V_O = 0.5V$
I_{OZH}	TRI-STATE Output Leakage Current		3.6			5	μA	$V_O = 3.0V$
$I_{OZH}+$	TRI-STATE Output Leakage Current		3.6			10	μA	$V_{CC} < V_O \le 5.5V$
I_{CCH}	Power Supply Current		3.6			0.19	mA	Outputs High
I_{CCL}	Power Supply Current		3.6			12	mA	Outputs Low
I_{CCZ}	Power Supply Current		3.6			0.19	mA	Outputs Disabled
$I_{CCZ}+$	Power Supply Current		3.6			0.19	mA	$V_{CC} \le V_O \le 5.5V$, Outputs Disabled
ΔI_{CC}	Increase in Power Supply Current (Note 7)		3.6			0.2	mA	One Input at $V_{CC} - 0.6V$ Other Inputs at V_{CC} or GND

Note 3: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

Note 4: An external driver must source at least the specified current to switch from LOW to HIGH.

Note 5: An external driver must sink at least the specified current to switch from HIGH to LOW.

Note 6: This parameter is valid for any V_{CC} between 0V and 1.2V at 25°C only.

Note 7: This is the increase in supply current for each input that is at the specified voltage level rather than V_{CC} or GND.

Dynamic Switching Characteristics (Note 8)

Symbol	Parameter	V_{CC} (V)	$T_A = 25°C$			Units	Conditions $C_L = 50$ pF, $R_L = 500\Omega$
			Min	Typ	Max		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3		0.8		V	(Note 9)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3		−0.8		V	(Note 9)

Note 8: Characterized in SOIC package. Guaranteed parameter, but not tested.

Note 9: Max number of outputs defined as (n). n−1 data inputs are driven 0V to 3V. Output under test held LOW.

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF, $R_L = 500\Omega$					Units
		$V_{CC} = 3.3V \pm 0.3V$			$V_{CC} = 2.7V$		
		Min	Typ (Note 3)	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.0 1.0		4.1 4.1	1.0 1.0	5.0 5.2	ns
t_{PZH} t_{PZL}	Output Enable Time	1.0 1.0		5.2 5.2	1.0 1.0	6.3 6.7	ns
t_{PHZ} t_{PLZ}	Output Disable Time	1.8 1.8		5.6 5.1	1.8 1.8	6.3 5.6	ns
t_{OSHL} t_{OSLH}	Output to Output Skew (Note 10)			1.0			ns

Note 3: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

Note 10: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}). Parameter guaranteed by design.

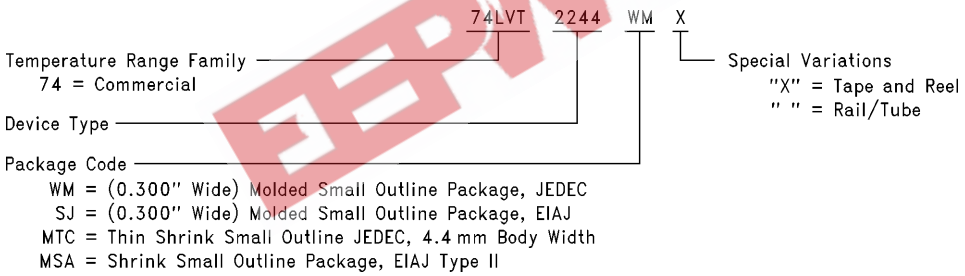
Capacitance (Note 11)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
C_{IN}	Input Capacitance		4		pF	$V_{CC} = 0V$, $V_I = 0V$ or V_{CC}
C_{OUT}	Output Capacitance		8		pF	$V_{CC} = 3.0V$, $V_O = 0V$ or V_{CC}

Note 11: Capacitance is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.

74LVT2244 Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



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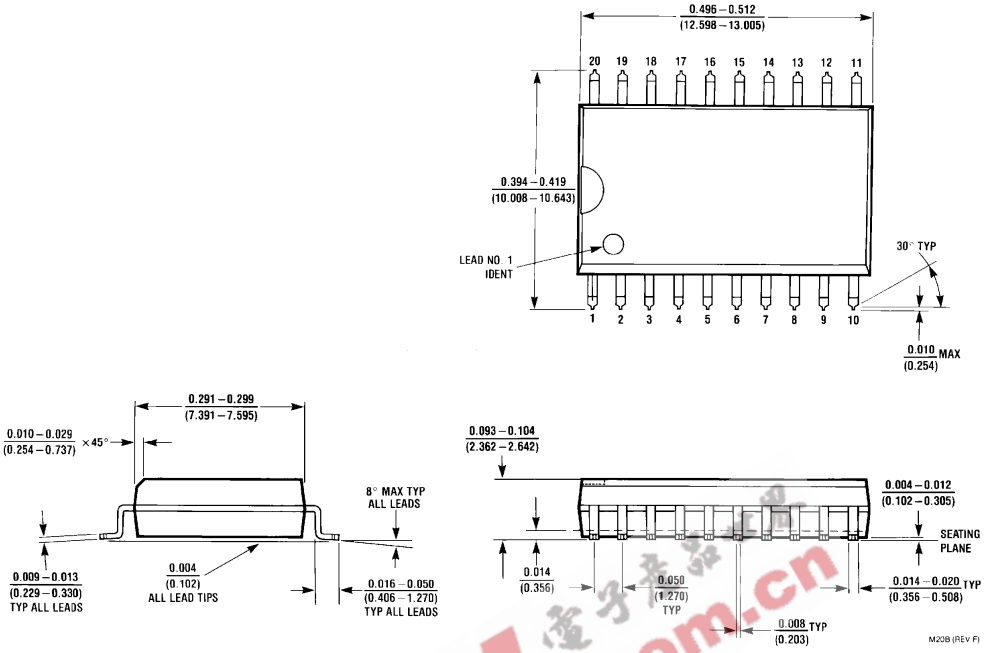
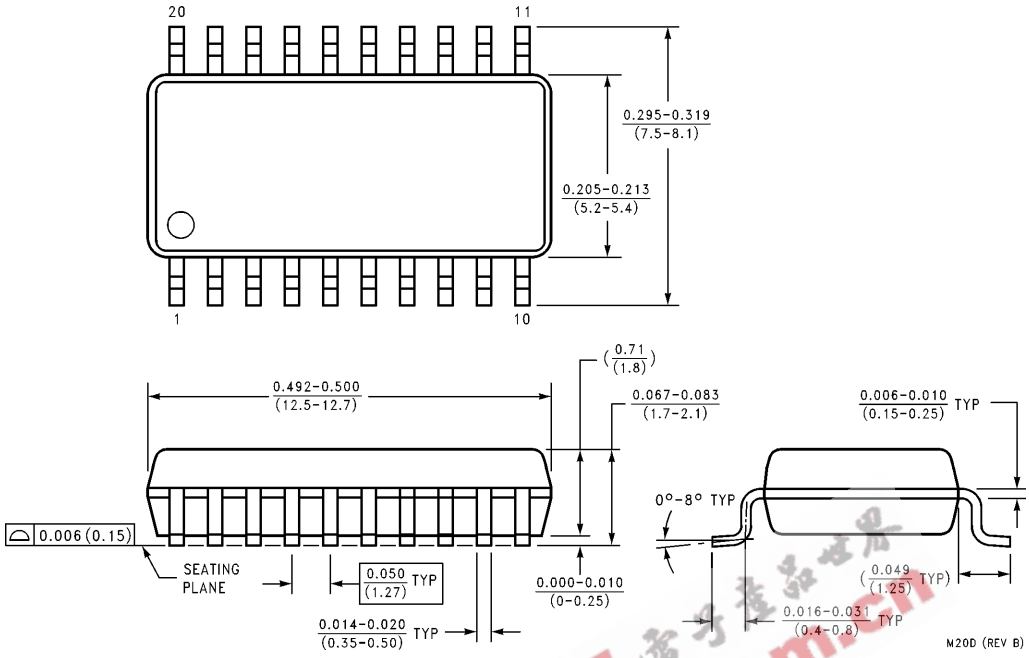
Physical Dimensions inches (millimeters) unless otherwise noted



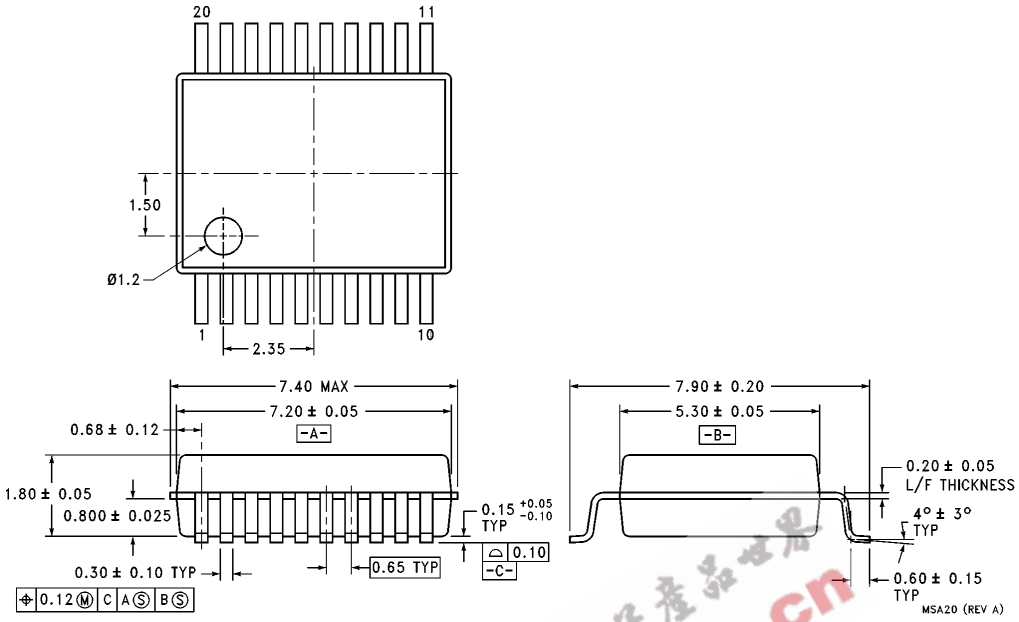
20-Lead (0.300″ Wide) Molded Small Outline Package, JEDEC
Order Number 74LVT2244WM or 74LVT2244WMX
NS Package Number M20B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



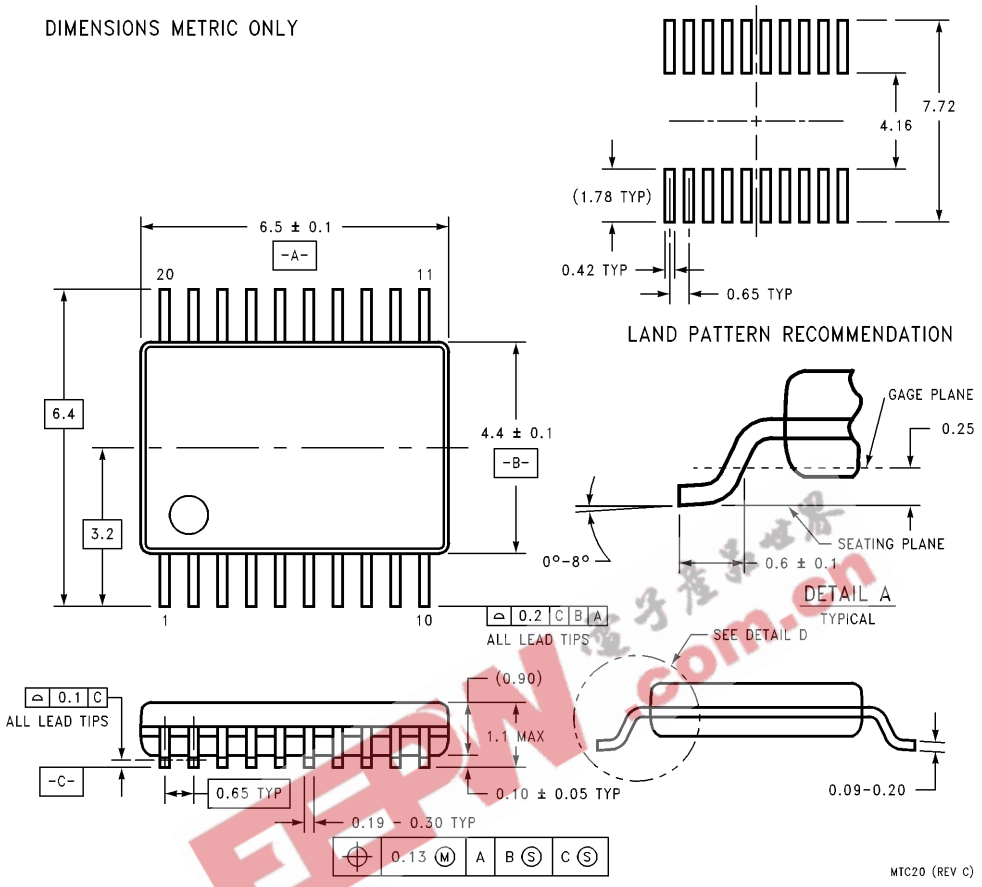
20-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ
Order Number 74LVT2244SJ or 74LVT2244SJX
NS Package Number M20D

Physical Dimensions millimeters (Continued)



20-Lead Molded Shrink Small Outline Package, EIAJ Type II
Order Number 74LVT2244MSA or 74LVT2244MSAX
NS Package Number MSA20

Physical Dimensions millimeters (Continued)



20-Lead Molded Thin Shrink Small Outline Package, JEDEC
Order Number 74LVT2244MTC or 74LVT2244MTCX
NS Package Number MTC20

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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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