FAIRCHILD
SEMICONDUCTOR™

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74LVT245 • 74LVTH245
Low Voltage Octal Bidirectional Transceiver with 3-STATE Inputs/Outputs

General Description

The LVT245 and LVTH245 contain eight non-inverting bidirectional buffers with 3-STATE outputs and are intended for bus-oriented applications. The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

The LVTH245 data inputs include bushold, eliminating the need for external pull-up resistors to hold unused inputs.

These transceivers are designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVT245 and LVTH245 are fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.
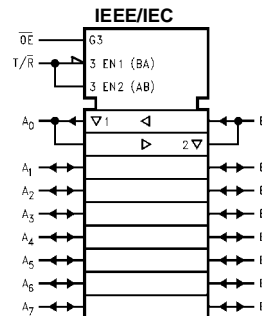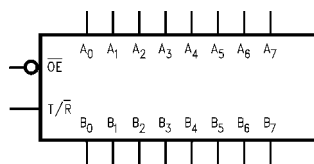
Features

■ Input and output interface capability to systems at 5V V_{CC}

■ Bushold data inputs eliminate the need for external pull-up resistors to hold unused inputs (74LVTH245), also available without bushold feature (74LVT245).

■ Live insertion/extraction permitted

■ Power Up/Down high impedance provides glitch-free bus loading

■ Outputs source/sink, −32 mA/+64 mA
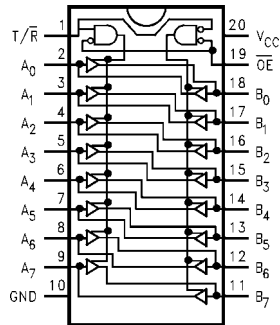
■ Latch-up performance exceeds 500 mA

Ordering Code:

Order Number	Package Number	Package Description
74LVT245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVT245SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II 5.3mm Wide
74LVT245MSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
74LVT245MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74LVTH245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVTH245SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II 5.3mm Wide
74LVTH245MSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
74LVTH245MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

Logic Symbols

Connection Diagram

T/$\overline{R}$	1	20	V_{CC}
A_0	2	19	$\overline{OE}$
A_1	3	18	B_0
A_2	4	17	B_1
A_3	5	16	B_2
A_4	6	15	B_3
A_5	7	14	B_4
A_6	8	13	B_5
A_7	9	12	B_6
GND	10	11	B_7

Pin Descriptions

Pin Names	Description
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A Inputs or 3-STATE Outputs
B_0–B_7	Side B Inputs or 3-STATE Outputs

Truth Table

Inputs		Outputs
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	HIGH-Z State

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

Absolute Maximum Ratings(Note 1)

Symbol	Parameter	Value	Conditions	Units
V_{CC}	Supply Voltage	−0.5 to +4.6		V
V_I	DC Input Voltage	−0.5 to +7.0		V
V_O	Output Voltage	−0.5 to +7.0	Output in 3-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

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units
V_{CC}	Supply Voltage	2.7	3.6	V
V_I	Input Voltage	0	5.5	V
I_{OH}	High-Level Output Current		−32	mA
I_{OL}	Low-Level Output Current		64	mA
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

Note 1: Absolute Maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum rated conditions is not implied.

Note 2: I_O Absolute Maximum Rating must be observed.

DC Electrical Characteristics

Symbol	Parameter		V_{CC} (V)	T_A = −40°C to +85°C		Units	Conditions
				Min	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 ≤ 0.1V or
V_{IL}	Input LOW Voltage		2.7–3.6		0.8		$V_O ≥ V_{CC}$ − 0.1V
V_{OH}	Output HIGH Voltage		2.7–3.6	V_{CC} - 0.2		V	I_{OH} = −100 μA
			2.7	2.4		V	I_{OH} = − 8 mA
			3.0	2.0		V	I_{OH} = −32 mA
V_{OL}	Output LOW Voltage		2.7		0.2	V	I_{OL} = 100 μA
			2.7		0.5	V	I_{OL} = 24 mA
			3.0		0.4	V	I_{OL} = 16 mA
			3.0		0.5	V	I_{OL} = 32 mA
			3.0		0.55	V	I_{OL} = 64 mA
$I_{I(HOLD)}$ (Note 3)	Bushold Input Minimum Drive		3.0	75		μA	V_I = 0.8V
				−75		μA	V_I = 2.0V
$I_{I(OD)}$ (Note 3)	Bushold 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 ≤ V_I or V_O ≤ 5.5V
$I_{PU/PD}$	Power Up/Down 3-STATE Current		0–1.5V		±100	μA	V_O = 0.5V to V_{CC}; V_I = GND to V_{CC}
I_{OZL}	3-STATE Output Leakage Current		3.6		−5	μA	V_O = 0.5V
I_{OZL} (Note 3)	3-STATE Output Leakage Current		3.6		−5	μA	V_O = 0.0V
I_{OZH}	3-STATE Output Leakage Current		3.6		5	μA	V_O = 3.0V

DC Electrical Characteristics (Continued)

Symbol	Parameter	V$_{CC}$ (V)	T$_A$ = −40°C to +85°C Min	T$_A$ = −40°C to +85°C Max	Units	Conditions
I$_{OZH}$ (Note 3)	3-STATE Output Leakage Current	3.6		5	µA	V$_O$ = 3.6V
I$_{OZH}$+	3-STATE Output Leakage Current	3.6		10	µA	V$_{CC}$ < V$_O$ ≤ 5.5V
I$_{CCH}$	Power Supply Current	3.6		0.19	mA	Outputs HIGH
I$_{CCL}$	Power Supply Current	3.6		5	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$_{CC}$ ≤ V$_O$ ≤ 5.5V, Outputs Disabled
ΔI$_{CC}$	Increase in Power Supply Current (Note 6)	3.6		0.2	mA	One Input at V$_{CC}$ − 0.6V Other Inputs at V$_{CC}$ or GND

Note 3: Applies to Bushold versions only (LVTH245).

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 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 7)

Symbol	Parameter	V$_{CC}$ (V)	T$_A$ = 25°C Min	T$_A$ = 25°C Typ	T$_A$ = 25°C Max	Units	Conditions C$_L$ = 50 pF, R$_L$ = 500Ω
V$_{OLP}$	Quiet Output Maximum Dynamic V$_{OL}$	3.3		0.8		V	(Note 8)
V$_{OLV}$	Quiet Output Minimum Dynamic V$_{OL}$	3.3		−0.8		V	(Note 8)

Note 7: Characterized in SOIC package. Guaranteed parameter, but not tested.

Note 8: Max number of outputs defined as (n). n−1 data inputs are driven 0V to 3V. Output under test held LOW.

AC Electrical Characteristics

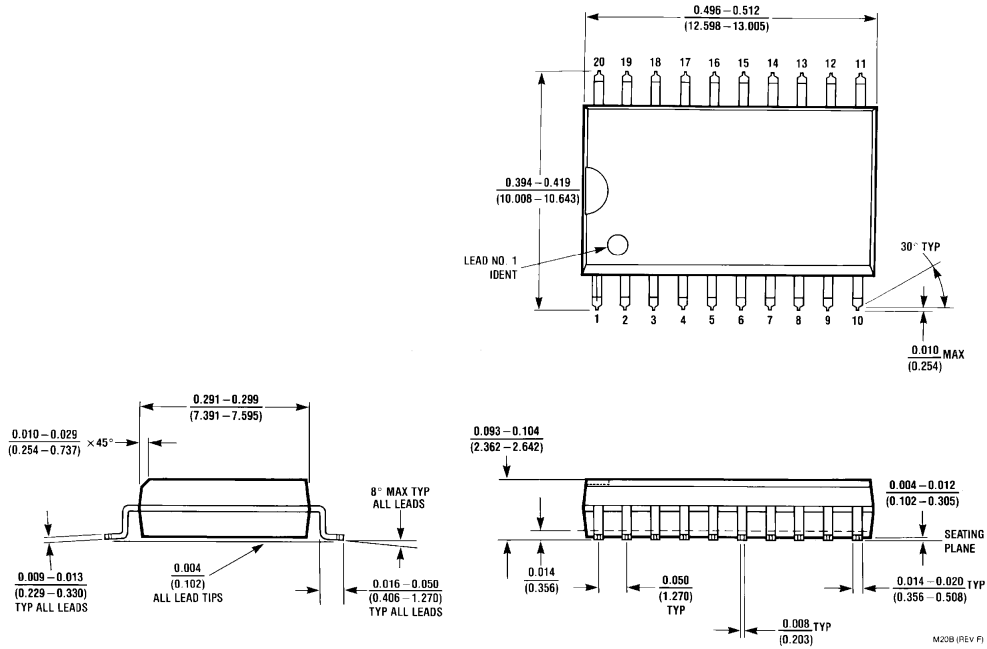| Symbol	Parameter	T$_A$ = −40°C to +85°C, C$_L$ = 50 pF, R$_L$ = 500Ω V$_{CC}$ = 3.3V ± 0.3V Min	V$_{CC}$ = 3.3V ± 0.3V Max	V$_{CC}$ = 2.7V Min	V$_{CC}$ = 2.7V Max	Units
t$_{PLH}$	Propagation Delay	1.2	3.6	1.2	4.0	ns
t$_{PHL}$		1.2	3.5	1.2	4.0	
t$_{PZH}$	Output Enable Time	1.3	5.5	1.3	7.1	ns
t$_{PZL}$		1.7	5.7	1.7	6.7	
t$_{PHZ}$	Output Disable	2.0	5.9	2.0	6.5	ns
t$_{PLZ}$		2.0	5.0	2.0	5.1	
t$_{OSHL}$	Output to Output Skew (Note 9)		1.0		1.0	ns
t$_{OSLH}$						

Note 9: 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$_{OSLH}$).
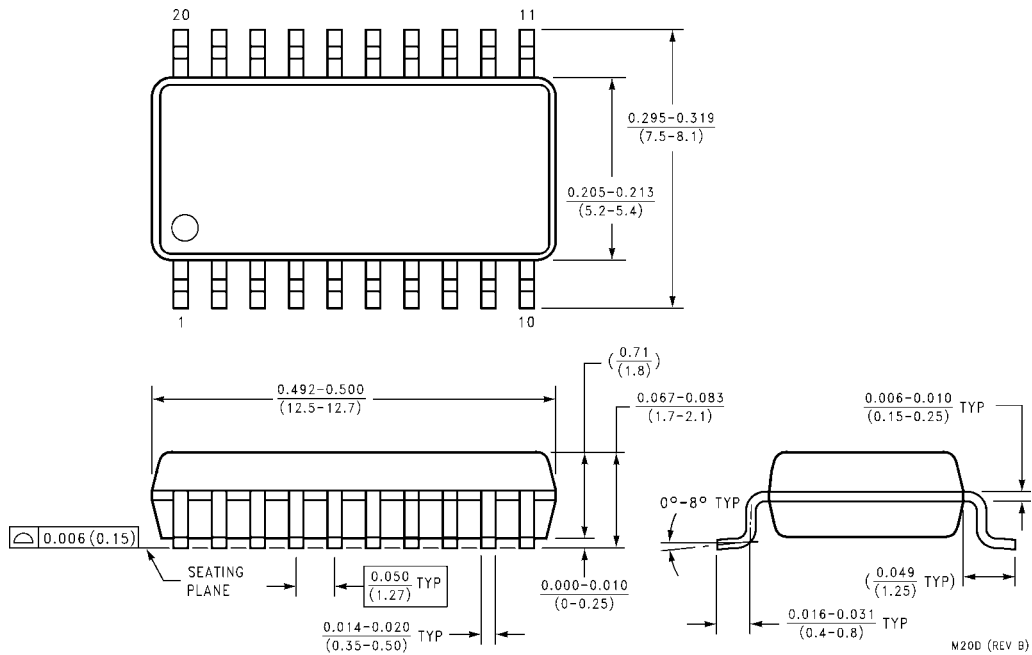
Capacitance (Note 10)

Symbol	Parameter	Conditions	Typical	Units
C$_{IN}$	Input Capacitance	V$_{CC}$ = 0V, V$_I$ = 0V or V$_{CC}$	4	pF
C$_{I/O}$	Input/Output Capacitance	V$_{CC}$ = 3.0V, V$_O$ = 0V or V$_{CC}$	8	pF

Note 10: Capacitance is measured at frequency f = 1 MHz, per MIL-STD-883, Method 3012.

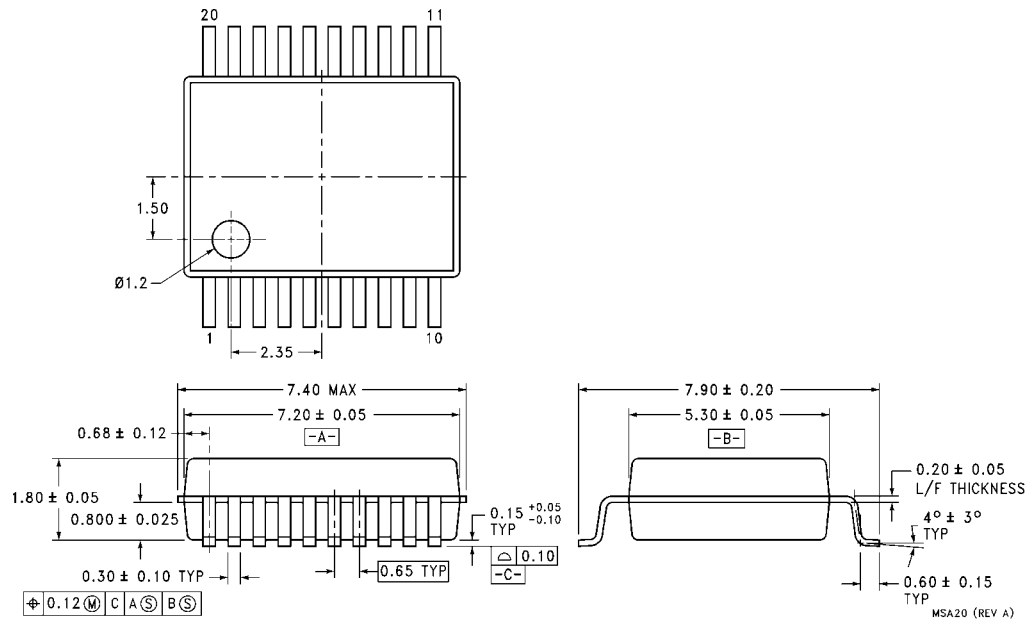**Physical Dimensions** inches (millimeters) unless otherwise noted

0.496 – 0.512
(12.598 – 13.005)

20 19 18 17 16 15 14 13 12 11

0.394 – 0.419
(10.008 – 10.643)

LEAD NO. 1
IDENT

1 2 3 4 5 6 7 8 9 10

30° TYP

0.010 MAX
(0.254)

0.291 – 0.299
(7.391 – 7.595)

0.010 – 0.029
(0.254 – 0.737) × 45°

8° MAX TYP
ALL LEADS

0.009 – 0.013
(0.229 – 0.330)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 – 0.050
(0.406 – 1.270)
TYP ALL LEADS

0.093 – 0.104
(2.362 – 2.642)

0.004 – 0.012
(0.102 – 0.305)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.014 – 0.020 TYP
(0.356 – 0.508)

0.008 TYP
(0.203)

M20B (REV F)

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

20   11

0.295 – 0.319
(7.5 – 8.1)

0.205 – 0.213
(5.2 – 5.4)

1   10

$\left(\frac{0.71}{1.8}\right)$

0.492 – 0.500
(12.5 – 12.7)

0.067 – 0.083
(1.7 – 2.1)

0.006 – 0.010 TYP
(0.15 – 0.25)

0.006 (0.15)

0° – 8° TYP

SEATING
PLANE

0.050 TYP
(1.27)

0.000 – 0.010
(0 – 0.25)

$\left(\frac{0.049}{1.25}\text{ TYP}\right)$

0.014 – 0.020 TYP
(0.35 – 0.50)

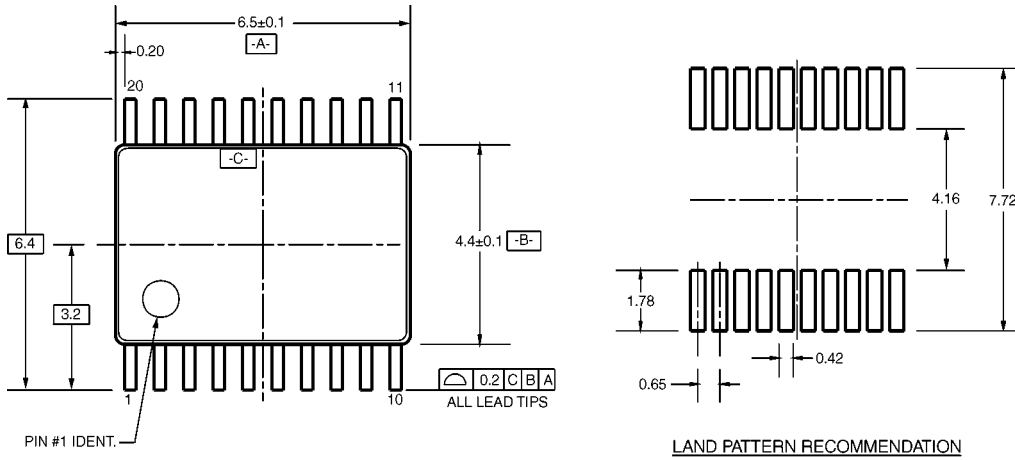0.016 – 0.031 TYP
(0.4 – 0.8)

M20D (REV B)

20-Lead Small Outline Package (SOP), EIAJ TYPE II 5.3mm Wide
Package Number M20D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)
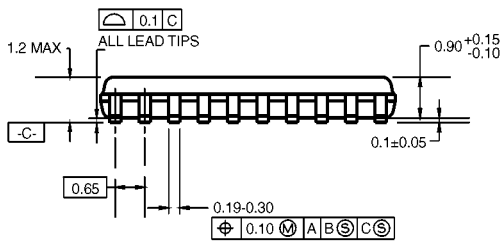
20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
Package Number MSA20

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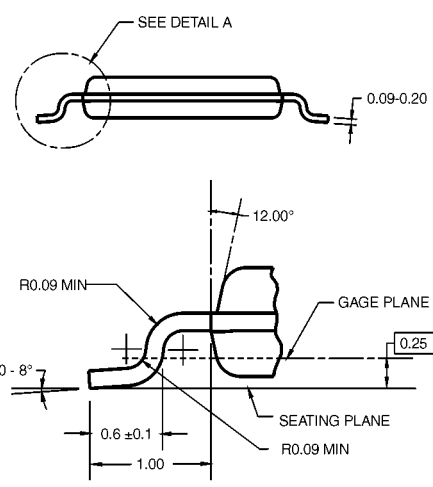

LAND PATTERN RECOMMENDATION

DIMENSIONS ARE IN MILLIMETERS

NOTES:
A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20RevD1

DETAIL A

20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC20

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2. A critical component in 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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