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January 2008

74LVT2245, 74LVTH2245 Low Voltage Octal Bidirectional Transceiver with 3-STATE Inputs/Outputs and 25 Ω Series Resistors in the B Port Outputs

Features

- Input and output interface capability to systems at 5V V_{CC}
- Equivalent 25Ω series resistor on B Port outputs
- Bushold data inputs eliminate the need for external pull-up resistors to hold unused inputs (74LVTH2245), also available without bushold feature (74LVT2245)
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink –12mA/+12mA on B Port, –32mA/+64mA on A Port
- Latch-up performance exceeds 500mA
- ESD performance:
 - Human-body model > 2000V
 - Machine model > 200V
 - Charged-device model > 1000V

General Description

The LVT2245 and LVTH2245 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 impedance state. The equivalent 25 Ω -series resistor in the B Port helps reduce output overshoot and undershoot.

The LVTH2245 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 LVT2245 and LVTH2245 are fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining low power dissipation.

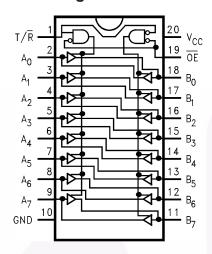
Ordering Information

Order Number	Package Number	Package Description
74LVT2245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVT2245SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVT2245MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74LVTH2245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVTH2245SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVTH2245MTC	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 number.

All packages are lead free per JEDEC: J-STD-020B standard.

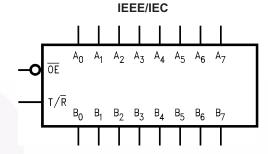
Connection Diagram

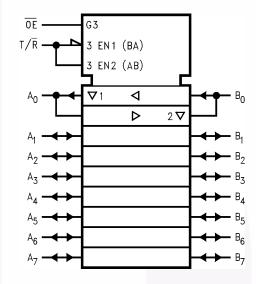


Pin Description

Pin Names	Description			
ŌĒ	Output Enable Input			
T/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			

Logic Symbols





Truth Table

Inp	uts	
ŌĒ	T/R	Outputs
L	L	Bus B Data to Bus A
L	Н	Bus A Data to Bus B
Н	Х	HIGH-Z State

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V _{CC}	Supply Voltage	-0.5V to +4.6V
V _I	DC Input Voltage	-0.5V to +7.0V
Vo	DC Output Voltage	
	Output in 3-STATE	-0.5V to +7.0V
	Output in HIGH or LOW State ⁽¹⁾	-0.5V to +7.0V
I _{IK}	DC Input Diode Current, V _I < GND	–50mA
I _{OK}	DC Output Diode Current, V _O < GND	-50mA
I _O	DC Output Current, V _O > V _{CC}	
	Output at HIGH State	64mA
	Output at LOW State	128mA
I _{CC}	DC Supply Current per Supply Pin	±64mA
I _{GND}	DC Ground Current per Ground Pin	±128mA
T _{STG}	Storage Temperature	−65°C to +150°C

Note:

1. IO Absolute Maximum Rating must be observed.

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min	Max	Units	
V _{CC}	Supply Voltage		2.7	3.6	V
VI	Input Voltage		0	5.5	V
I _{OH}	HIGH-Level Output Current	A Port	//	-32	mA
		B Port		-12	
I _{OL}	LOW-Level Output Current	A Port		64	mA
		B Port		12	
T _A	Free Air Operating Temperature	-40	+85	°C	
Δt/ΔV	Input Edge Rate, $V_{IN} = 0.8V-2.0V$, V_{CC}	; = 3.0V	0	10	ns/V

DC Electrical Characteristics

					$T_A = -40^{\circ}C$	to +85°C	
Symbol	Parame	ter	V _{CC} (V)	Conditions	Min.	Max.	Units
V _{IK}	Input Clamp Diode Vo	oltage	2.7	I _I = -18mA		-1.2	V
V_{IH}	Input HIGH Voltage		2.7–3.6	$V_0 \le 0.1V$ or	2.0		V
V _{IL}	Input LOW Voltage		2.7–3.6	$V_O \ge V_{CC} - 0.1V$		0.8	V
V _{OH}	Output HIGH Voltage	A Port	2.7	$I_{OH} = -8mA$	2.4		V
			3.0	$I_{OH} = -32mA$	2.0		
		B Port	3.0	$I_{OH} = -12mA$	2.0		
			2.7–3.6	$I_{OH} = -100\mu A$	V _{CC} -0.2		
V_{OL}	Output LOW Voltage	A Port	2.7	$I_{OL} = 24mA$		0.5	V
			3.0	$I_{OL} = 16mA$		0.4	
			3.0	$I_{OL} = 32mA$		0.5	
			3.0	$I_{OL} = 64 \text{mA}$		0.55	
		B Port	3.0	$I_{OL} = 12mA$		0.8	
			2.7	$I_{OL} = 100 \mu A$		0.2	
I _{I(HOLD)} ⁽²⁾	Bushold Input Minimu	ım Drive	3.0	$V_1 = 0.8V$	75		μA
				$V_1 = 2.0V$	– 75		
I _{I(OD)} ⁽²⁾	Bushold Input Over-D	rive Current to	3.0	(3)	500		μA
	Change State			(4)	-500		
I _I	Input Current		3.6	$V_1 = 5.5V$		10	μA
		Control Pins	3.6	$V_I = 0V \text{ or } V_{CC}$		±1	
		Data Pins	3.6	$V_I = 0V$		- 5	
				$V_I = V_{CC}$		1	
I _{OFF}	Power Off Leakage C	urrent	0	$0V \le V_I \text{ or } V_O \le 5.5V$		±100	μA
I _{PU/PD}	Power Up/Down, 3-S	TATE Current	0–1.5	$V_O = 0.5V$ to 3.0V, $V_I = GND$ or V_{CC}		±100	μA
I _{OZL}	3-STATE Output Leak	rage Current	3.6	$V_O = 0.5V$		- 5	μA
I _{OZL} ⁽²⁾	3-STATE Output Leak		3.6	$V_O = 0.0V$			μA
I _{OZH}	3-STATE Output Leak		3.6	$V_0 = 3.0V$		5	μA
I _{OZH} ⁽²⁾	3-STATE Output Leak	age Current	3.6	V _O = 3.6V		5	μA
I _{OZH} +	3-STATE Output Leak	age Current	3.6	$V_{CC} < V_O \le 5.5V$		10	μA
I _{CCH}	Power Supply Curren	t	3.6	Outputs High		0.19	mA
I _{CCL}	Power Supply Current		3.6	Outputs Low		5	mA
I _{CCZ}	Power Supply Current		3.6	Outputs Disabled		0.19	mA
I _{CCZ} +	Power Supply Curren	t	3.6	$V_{CC} \le V_O \le 5.5V$, Outputs Disabled		0.19	mA
Δl _{CC}	Increase in Power Su	pply Current ⁽⁵⁾	3.6	One Input at V _{CC} – 0.6V, Other Inputs at V _{CC} or GND		0.2	mA

Notes:

- 2. Applies to Bushold versions only (74LVTH2245).
- 3. An external driver must source at least the specified current to switch from LOW-to-HIGH.
- 4. An external driver must sink at least the specified current to switch from HIGH-to-LOW.
- 5. 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⁽⁶⁾

			Conditions	T,	_A = 25°	С	
Symbol	Parameter	V _{CC} (V)	$C_L = 50 pF, R_L = 500 \Omega$	Min.	Тур.	Max.	Units
V _{OLP}	Quiet Output Maximum Dynamic V _{OL}	3.3	(7)		0.8		V
V _{OLV}	Quiet Output Minimum Dynamic V _{OL}	3.3	(7)		-0.8		V

Notes:

- 6. Characterized in SOIC package. Guaranteed parameter, but not tested.
- 7. Max number of outputs defined as (n). n-1 data inputs are driven 0V to 3V. Output under test held LOW.

AC Electrical Characteristics

	$T_A = -40$ °C to +85°C, $C_L = 50$ pF, $R_L = 500$ Ω					
		$V_{CC}=3.3$	3V ± 0.3V	V _{CC} =	= 2.7V	
Symbol	Parameter	Min.	Max.	Min.	Max.	Units
t _{PLH}	Propagation Delay Data to B Port Output	1.2	4.4	1.2	5.1	ns
t _{PHL}		1.2	4.4	1.2	5.1	
t _{PLH}	Propagation Delay Data to A Port Output	1.2	3.6	1.2	4.0	ns
t _{PHL}		1.2	3.5	1.2	4.0	
t _{PZH}	Output Enable Time for B Port Output	1.3	6.2	1.3	7.3	ns
t _{PZL}		1.7	6.2	1.7	7.3	
t _{PZH}	Output Enable Time for A Port Output	1.3	5.5	1.3	7.1	ns
t _{PZL}		1.7	5.7	1.7	6.7	
t _{PHZ}	Output Disable Time for B Port Output	2.0	5.9	2.0	6.5	ns
t _{PLZ}		2.0	5.4	2.0	5.7	
t _{PHZ}	Output Disable Time for A Port Output	2.0	5.9	2.0	6.5	ns
t _{PLZ}		2.0	5.0	2.0	5.1	
toshl, toshh	A Port Output to Output Skew ⁽⁸⁾		1.0		1.0	ns
toshl, toslh	B Port Output to Output Skew ⁽⁸⁾		1.0		1.0	ns

Note:

8. 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⁽⁹⁾

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:

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

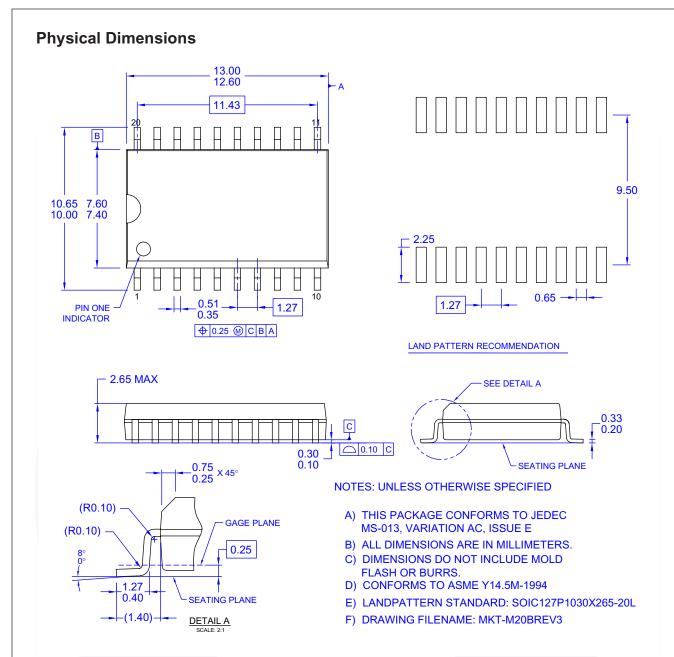


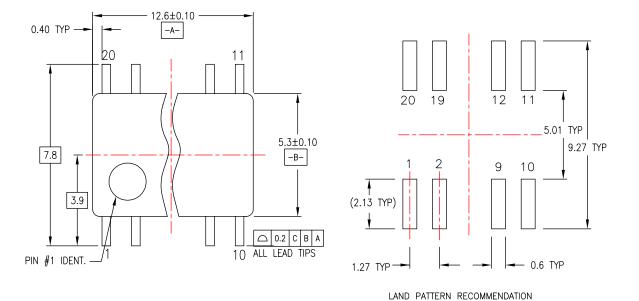
Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

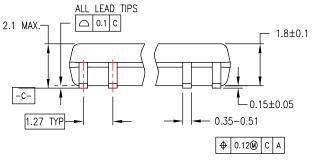
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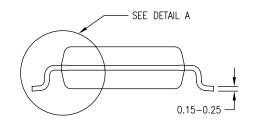
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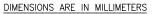
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Physical Dimensions (Continued)



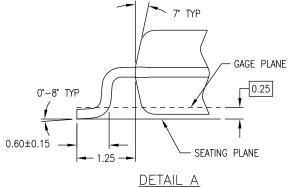






NOTES:

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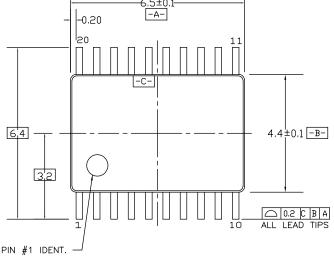
M20DREVC

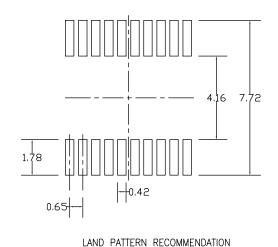
Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

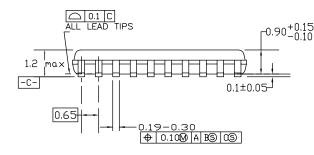
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SEE DETAIL A



DETAIL A

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- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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