

## 74LVX373

### Low Voltage Octal Transparent Latch with 3-STATE Outputs

#### General Description

The LVX373 consists of eight latches with 3-STATE outputs for bus organized system applications. The latches appear transparent to the data when Latch Enable (LE) is HIGH. When LE is LOW, the data satisfying the input timing requirements is latched. Data appears on the bus when the Output Enable ( $\overline{OE}$ ) is LOW. When  $\overline{OE}$  is HIGH, the bus

output is in the high impedance state. The inputs tolerate up to 7V allowing interface of 5V systems to 3V systems.

#### Features

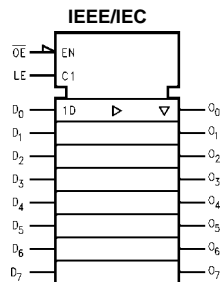
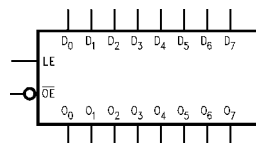
- Input voltage translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications

#### Ordering Code:

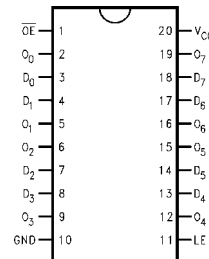
Order Number	Package Number	Package Description
74LVX373M	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVX373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVX373MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

#### Logic Symbols



#### Connection Diagram



#### Pin Descriptions

Pin Names	Description
$D_0$ - $D_7$	Data Inputs
LE	Latch Enable Input
$\overline{OE}$	Output Enable Input
$O_0$ - $O_7$	3-STATE Latch Outputs

## Functional Description

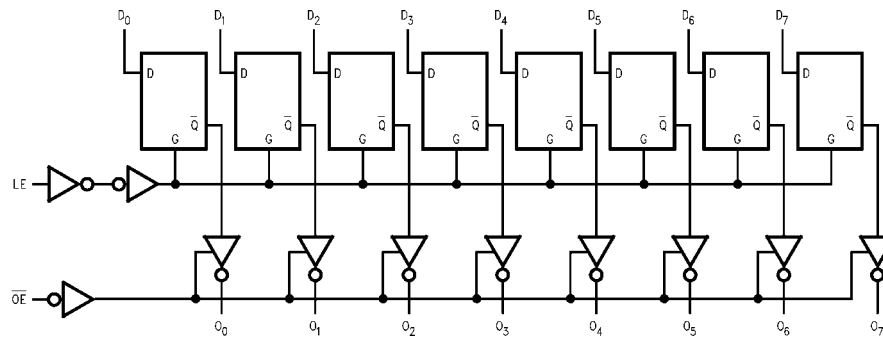
The LVX373 contains eight D-type latches with 3-STATE standard outputs. When the Latch Enable (LE) input is HIGH, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is LOW, the latches store the information that was present on the D inputs a setup time preceding the HIGH-to-LOW transition of LE. The 3-STATE standard outputs are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is LOW, the standard outputs are in the 2-state mode. When  $\overline{OE}$  is HIGH, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the latches.

## Truth Table

Inputs			Outputs
LE	$\overline{OE}$	$D_n$	$O_n$
X	H	X	Z
H	L	L	L
H	L	H	H
L	L	X	$O_0$

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 Z = High Impedance  
 X = Immaterial  
 $O_0$  = Previous  $O_0$  before HIGH-to-LOW transition of Latch Enable

## Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Absolute Maximum Ratings** (Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ )	
$V_I = -0.5V$	-20 mA
DC Input Voltage ( $V_I$ )	-0.5V to 7V
DC Output Diode Current ( $I_{OK}$ )	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Source	
or Sink Current ( $I_O$ )	$\pm 25$ mA
DC $V_{CC}$ or Ground Current	
( $I_{CC}$ or $I_{GND}$ )	$\pm 75$ mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation	180 mW

**Recommended Operating Conditions** (Note 2)

Supply Voltage ( $V_{CC}$ )	2.0V to 3.6V
Input Voltage ( $V_I$ )	0V to 5.5V
Output Voltage ( $V_O$ )	0V to $V_{CC}$
Operating Temperature ( $T_A$ )	-40°C to +85°C
Input Rise and Fall Time ( $\Delta t/\Delta V$ )	0 ns/V to 100 ns/V

**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.

**Note 2:** Unused inputs must be held HIGH or LOW. They may not float.

**DC Electrical Characteristics**

Symbol	Parameter	$V_{CC}$	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			Min	Typ	Max	Min	Max		
$V_{IH}$	HIGH Level Input Voltage	2.0	1.5			1.5		V	
		3.0	2.0			2.0			
		3.6	2.4			2.4			
$V_{IL}$	LOW Level Input Voltage	2.0			0.5		0.5	V	
		3.0			0.8		0.8		
		3.6			0.8		0.8		
$V_{OH}$	HIGH Level Output Voltage	2.0	1.9	2.0		1.9		V	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -4 \text{mA}$
		3.0	2.9	3.0		2.9			
		3.0	2.58			2.48			
$V_{OL}$	LOW Level Output Voltage	2.0		0.0	0.1		0.1	V	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 4 \text{mA}$
		3.0		0.0	0.1		0.1		
		3.0			0.36		0.44		
$I_{OZ}$	3-STATE Output Off-State Current	3.6			$\pm 0.25$		$\pm 2.5$	$\mu\text{A}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND
$I_{IN}$	Input Leakage Current	3.6			$\pm 0.1$		$\pm 1.0$	$\mu\text{A}$	$V_{IN} = 5.5V$ or GND
$I_{CC}$	Quiescent Supply Current	3.6			4.0		40.0	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND

**Noise Characteristics** (Note 3)

Symbol	Parameter	$V_{CC}$ (V)	$T_A = 25^\circ\text{C}$		Units	$C_L$ (pF)
			Typ	Limit		
$V_{OLP}$	Quiet Output Maximum Dynamic $V_{OL}$	3.3	0.5	0.8	V	50
$V_{OLV}$	Quiet Output Minimum Dynamic $V_{OL}$	3.3	-0.5	-0.8	V	50
$V_{IHD}$	Minimum HIGH Level Dynamic Input Voltage	3.3		2.0	V	50
$V_{ILD}$	Maximum LOW Level Dynamic Input Voltage	3.3		0.8	V	50

**Note 3:** Input  $t_r = t_f = 3$  ns.

AC Electrical Characteristics									
Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units	Conditions
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Time D <sub>n</sub> to O <sub>n</sub>	2.7	7.7	15.0	1.0	18.5	ns	C <sub>L</sub> = 15 pF	
t <sub>PHL</sub>			10.2	18.5	1.0	22.0		C <sub>L</sub> = 50 pF	
		3.3 ± 0.3	6.0	9.7	1.0	11.5		C <sub>L</sub> = 15 pF	
			8.5	13.2	1.0	15.0		C <sub>L</sub> = 50 pF	
t <sub>PLH</sub>	Propagation Delay Time LE to O <sub>n</sub>	2.7	7.5	14.5	1.0	17.5	ns	C <sub>L</sub> = 15 pF	
t <sub>PHL</sub>			10.0	18.0	1.0	21.0		C <sub>L</sub> = 50 pF	
		3.3 ± 0.3	5.8	9.3	1.0	11.0		C <sub>L</sub> = 15 pF	
			8.3	12.8	1.0	14.5		C <sub>L</sub> = 50 pF	
t <sub>PZL</sub>	3-STATE Output Enable Time	2.7	7.7	15.0	1.0	18.5	ns	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PZH</sub>			10.2	18.5	1.0	22.0		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
		3.3 ± 0.3	6.0	9.7	1.0	11.5		C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ	
			8.5	13.2	1.0	15.0		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PLZ</sub>	3-STATE Output Disable Time	2.7	9.8	18.0	1.0	21.0	ns	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PHZ</sub>		3.3 ± 0.3	8.2	12.8	1.0	14.5		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>W</sub>	LE Pulse Width, HIGH	2.7	6.5		7.5		ns		
		3.3 ± 0.3	5.0		5.0				
t <sub>S</sub>	Setup Time, D <sub>n</sub> to LE	2.7	6.0		6.0		ns		
		3.3 ± 0.3	4.0		4.0				
t <sub>H</sub>	Hold Time, D <sub>n</sub> to LE	2.7	1.0		1.0		ns		
		3.3 ± 0.3	1.0		1.0				
t <sub>OSLH</sub>	Output to Output Skew (Note 4)	2.7		1.5		1.5	ns	C <sub>L</sub> = 50 pF	
t <sub>OSHL</sub>		3.3		1.5		1.5			

**Note 4:** Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHm</sub> - t<sub>PLHn</sub>|, t<sub>OSHL</sub> = |t<sub>PHLm</sub> - t<sub>PHLn</sub>|

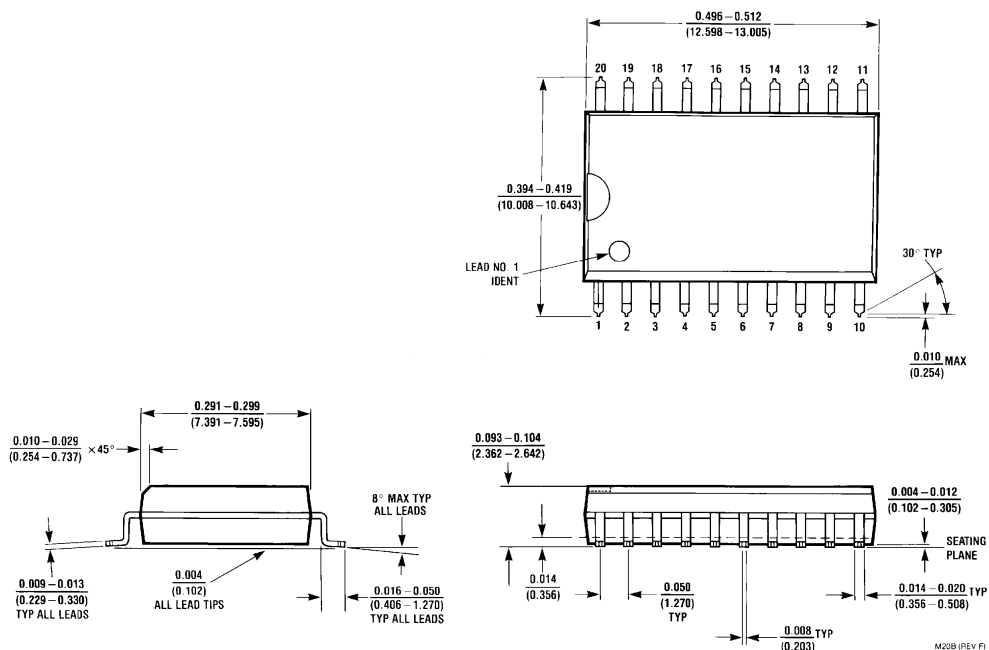
### Capacitance

Symbol	Parameter	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units
		Min	Typ	Max	Min	Max	
C <sub>IN</sub>	Input Capacitance		4	10		10	pF
C <sub>OUT</sub>	Output Capacitance		6				pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)		27				pF

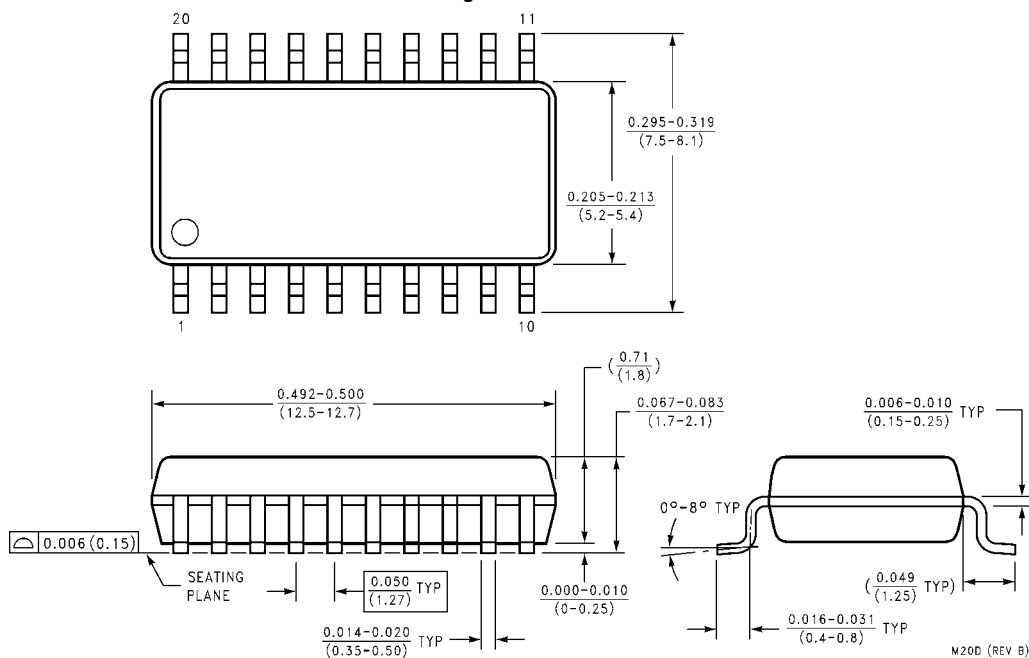
**Note 5:** C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:  $I_{CC(opr)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{8}$  (per Latch)

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

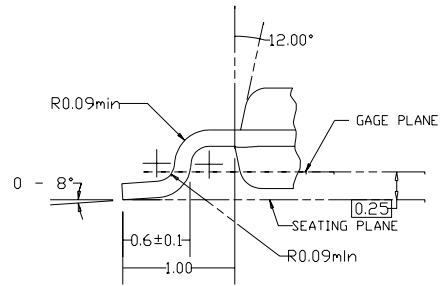
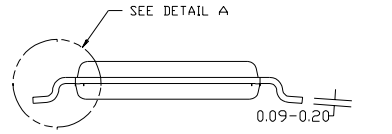
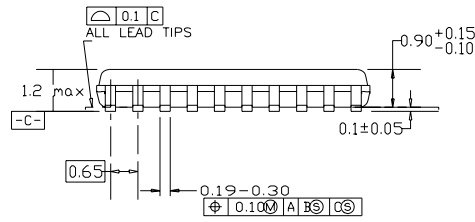
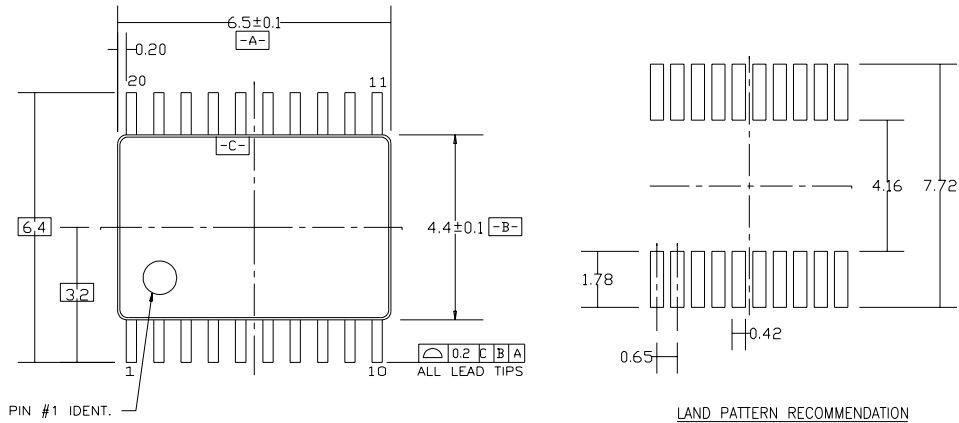


**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B**



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

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



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, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

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

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