

## 74LVQ573

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

#### General Description

The LVQ573 is a high-speed octal latch with buffered common Latch Enable (LE) and buffered common Output Enable ( $\overline{OE}$ ) inputs. The LVQ573 is functionally identical to the LVQ373 but with inputs and outputs on opposite sides of the package.

#### Features

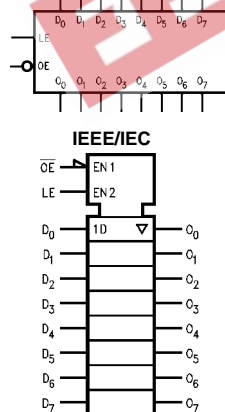
- Ideal for low power/low noise 3.3V applications
- Implements patented EMI reduction circuitry
- Available in SOIC JEDEC, SOIC EIAJ, and QSOP packages
- Guaranteed simultaneous switching noise level and dynamic threshold performance
- Improved latch-up immunity
- Guaranteed incident wave switching into 75Ω
- 4 kV minimum ESD immunity

#### Ordering Code:

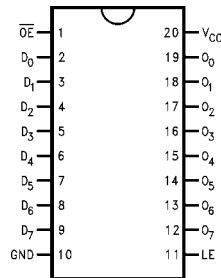
Order Number	Package Number	Package Description
74LVQ573SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74LVQ573SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVQ573QSC	MQA20	20-Lead Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150" 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 <sub>0</sub> -D <sub>7</sub>	Data Inputs
LE	Latch Enable Input
$\overline{OE}$	3-STATE Output Enable Input
O <sub>0</sub> -O <sub>7</sub>	3-STATE Latch Outputs

#### Truth Table

Inputs			Outputs
$\overline{OE}$	LE	D	O <sub>n</sub>
L	H	H	H
L	H	L	L
L	L	X	O <sub>0</sub>
H	X	X	Z

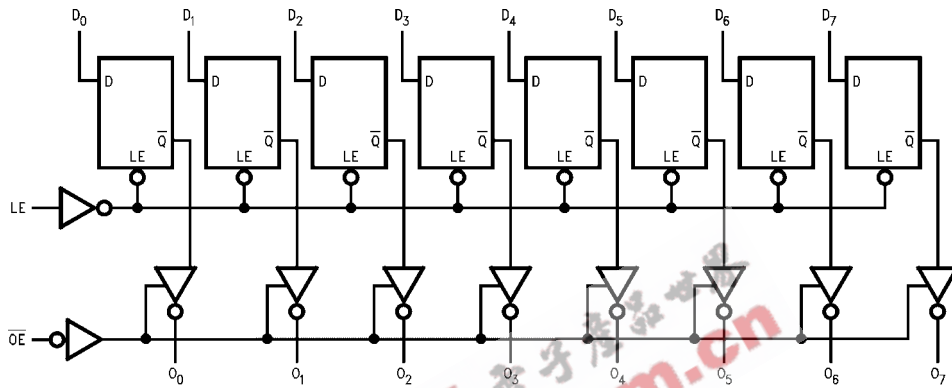
H = HIGH Voltage  
Z = High Impedance  
O<sub>0</sub> = Previous O<sub>0</sub> before HIGH-to-LOW transition of Latch Enable  
L = LOW Voltage  
X = Immaterial

## Functional Description

The LVQ573 contains eight D-type latches with 3-STATE output buffers. 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-type input changes. When LE is LOW the latches store the information that was present on the

D-type inputs a setup time preceding the HIGH-to-LOW transition of LE. The 3-STATE buffers are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is LOW, the buffers are enabled. When  $\overline{OE}$  is HIGH the buffers are in the high impedance mode but this does not interfere with entering new data into the latches.

## 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
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage ( $V_I$ )	-0.5V to $V_{CC} + 0.5V$
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 ( $I_O$ )	$\pm 50$ mA
DC $V_{CC}$ or Ground Current ( $I_{CC}$ or $I_{GND}$ )	$\pm 400$ mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
DC Latch-Up Source or Sink Current	$\pm 300$ mA

**Recommended Operating Conditions** (Note 2)

Supply Voltage ( $V_{CC}$ )	2.0V to 3.6V
Input Voltage ( $V_I$ )	0V to $V_{CC}$
Output Voltage ( $V_O$ )	0V to $V_{CC}$
Operating Temperature ( $T_A$ )	-40°C to +85°C
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
$V_{IN}$ from 0.8V to 2.0V	
$V_{CC}$ @ 3.0V	125 mV/ns

**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	$V_{CC}$ (V)	$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			Typ	Guaranteed Limits	Typ	Guaranteed Limits		
$V_{IH}$	Minimum High Level Input Voltage	3.0	1.5	2.0	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
$V_{IL}$	Maximum Low Level Input Voltage	3.0	1.5	0.8	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
$V_{OH}$	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	$I_{OUT} = -50 \mu\text{A}$	
		3.0		2.58	2.48	V	$V_{IN} = V_{IL}$ or $V_{IH}$ (Note 3) $I_{OH} = -12 \text{ mA}$	
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	$I_{OUT} = 50 \mu\text{A}$	
		3.0		0.36	0.44	V	$V_{IN} = V_{IL}$ or $V_{IH}$ (Note 3) $I_{OL} = 12 \text{ mA}$	
$I_{IN}$	Maximum Input Leakage Current	3.6		$\pm 0.1$	$\pm 1.0$	$\mu\text{A}$	$V_I = V_{CC}, \text{ GND}$	
$I_{OLD}$	Minimum Dynamic	3.6			36	mA	$V_{OLD} = 0.8 V_{Max}$ (Note 5)	
$I_{OHD}$	Output Current (Note 4)	3.6			-25	mA	$V_{OHD} = 2.0V V_{Min}$ (Note 5)	
$I_{CC}$	Maximum Quiescent Supply Current	3.6		4.0	40.0	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND	
$I_{OZ}$	3-STATE Leakage Current	3.6		$\pm 0.25$	$\pm 2.5$	$\mu\text{A}$	$V_I (\text{OE}) = V_{IL}, V_{IH}$ $V_I = V_{CC}, \text{ GND}$ $V_O = V_{CC}, \text{ GND}$	
$V_{OLP}$	Quiet Output Maximum Dynamic $V_{OL}$	3.3	0.4	0.8		V	(Note 6)(Note 7)	
$V_{OLV}$	Quiet Output Minimum Dynamic $V_{OL}$	3.3	-0.4	-0.8		V	(Note 6)(Note 7)	
$V_{IHD}$	Maximum High Level Dynamic Input Voltage	3.3	1.6	2.0		V	(Note 6)(Note 8)	
$V_{ILD}$	Maximum Low Level Dynamic Input Voltage	3.3	1.6	0.8		V	(Note 6)(Note 8)	

**Note 3:** All outputs loaded; thresholds on input associated with output under test.

**Note 4:** Maximum test duration 2.0 ms, one output loaded at a time.

**Note 5:** Incident wave switching on transmission lines with impedances as low as 75 $\Omega$  for commercial temperature range is guaranteed for.

**Note 6:** Worst case package.

**Note 7:** Max number of outputs defined as (n). Data inputs are driven 0V to 3.3V; one output at GND.

**Note 8:** Max number of Data Inputs (n) switching. (n - 1) inputs switching 0V to 3.3V. Input-under-test switching: 3.3V to threshold ( $V_{ILD}$ ), 0V to threshold ( $V_{IHD}$ ),  $f = 1 \text{ MHz}$ .

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Min	Typ	Max	Min	Max	
t <sub>PHL</sub>	Propagation Delay	2.7	2.5	10.2	14.8	2.5	16.0	ns
t <sub>PLH</sub>	D <sub>n</sub> to O <sub>n</sub>	3.3 ± 0.3	2.5	8.5	10.5	2.5	11.0	
t <sub>PLH</sub>	Propagation Delay	2.7	2.5	10.2	16.9	2.5	18.0	ns
t <sub>PHL</sub>	LE to O <sub>n</sub>	3.3 ± 0.3	2.5	8.5	12.0	2.5	12.5	
t <sub>PZL</sub>	Output Enable Time	2.7	2.5	10.2	18.3	2.5	19.0	ns
t <sub>PZH</sub>		3.3 ± 0.3	2.5	8.5	13.0	2.5	13.5	
t <sub>PHZ</sub>	Output Disable Time	2.7	1.0	10.8	20.4	1.0	21.0	ns
t <sub>PLZ</sub>		3.3 ± 0.3	1.0	9.0	14.5	1.0	15.0	
t <sub>OSSL</sub>	Output to Output Skew (Note 9)	2.7		1.0	1.5		1.5	ns
t <sub>OSLH</sub>	D <sub>n</sub> to O <sub>n</sub>	3.3 ± 0.3		1.0	1.5		1.5	

**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<sub>OSSL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>). Parameter guaranteed by design.

## AC Operating Requirements

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Typ	Guaranteed Minimum	Typ	Guaranteed Minimum	
t <sub>S</sub>	Setup Time, HIGH or LOW D <sub>n</sub> to LE	2.7 3.3 ± 0.3	0 0	4.0 3.0	4.5 3.0		ns
t <sub>H</sub>	Hold Time, HIGH or LOW D <sub>n</sub> to LE	2.7 3.3 ± 0.3	0 0	1.5 1.5	1.5 1.5		
t <sub>W</sub>	LE Pulse Width, HIGH	2.7 3.3 ± 0.3	2.4 2.0	5.0 4.0	6.0 4.0		ns

## Capacitance

Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = Open
C <sub>PD</sub> (Note 10)	Power Dissipation Capacitance	37	pF	V <sub>CC</sub> = 3.3V

**Note 10:** C<sub>PD</sub> is measured at 10 MHz.

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



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

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



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS

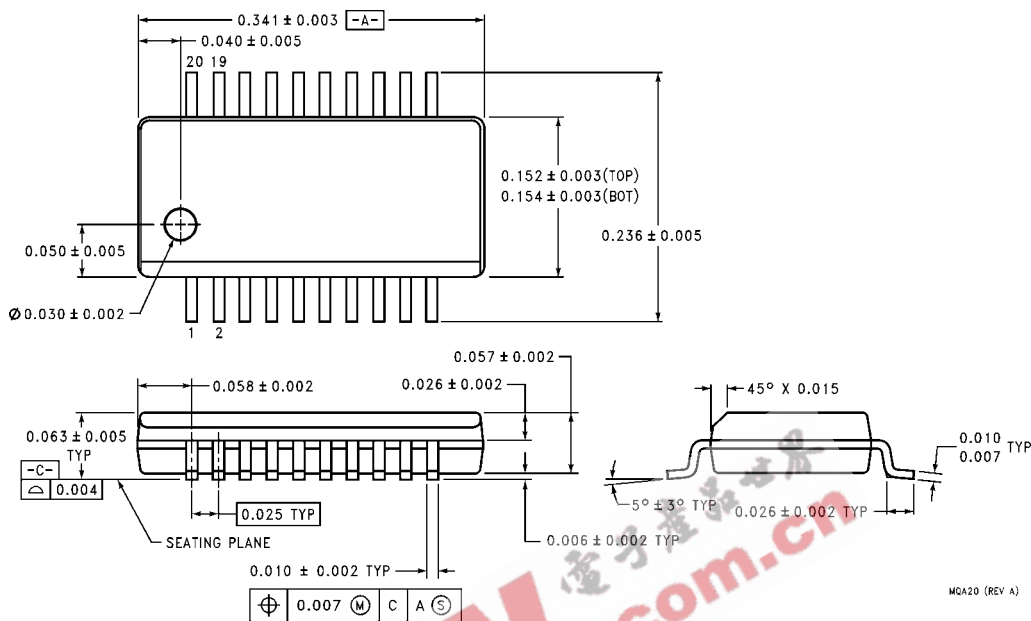
- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1996.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

DETAIL A

**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 Quarter Size Outline Package (QSOP), JEDEC MO-137, 0.150" Wide  
 Package Number MQA20

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