

# Low-Voltage CMOS Octal Transparent Latch Flow Through Pinout

With 5 V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

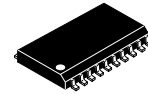
## MC74LCX573

The MC74LCX573 is a high performance, non-inverting octal transparent latch operating from a 1.65 to 5.5 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A  $V_I$  specification of 5.5 V allows MC74LCX573 inputs to be safely driven from 5.0 V devices.

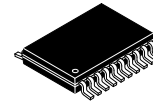
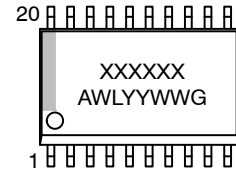
The MC74LCX573 contains 8 D-type latches with 3-state standard outputs. When the Latch Enable (LE) input is HIGH, data on the Dn inputs enters the latches. In this condition, the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is LOW, the latches 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 enabled. When  $\overline{OE}$  is HIGH, the standard outputs are in the high impedance state, but this does not interfere with new data entering into the latches. The LCX573 flow through design facilitates easy PC board layout.

### Features

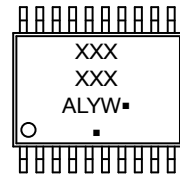
- Designed for 1.65 to 5.5 V  $V_{CC}$  Operation
- 5.0 V Tolerant – Interface Capability With 5.0 V TTL Logic
- Supports Live Insertion and Withdrawal
- $I_{OFF}$  Specification Guarantees High Impedance When  $V_{CC} = 0$  V
- LVTTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability at 3 V
- Near Zero Static Supply Current in All Three Logic States (10  $\mu$ A) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 100 mA
- ESD Performance:
  - ◆ Human Body Model >2000 V
- -Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



SOIC-20 WB  
 DW SUFFIX  
 CASE 751D



TSSOP-20  
 DT SUFFIX  
 CASE 948E



- A = Assembly Location
- L, WL = Wafer Lot
- Y, YY = Year
- W, WW = Work Week
- G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 8.

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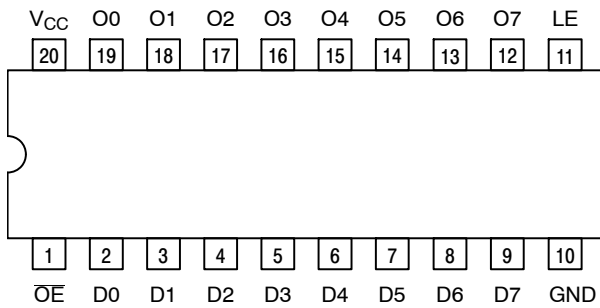


Figure 1. Pinout (Top View)

## PIN NAMES

Pins	Function
OE	Output Enable Input
LE	Latch Enable Input
D0-D7	Data Inputs
O0-O7	3-State Latch Outputs

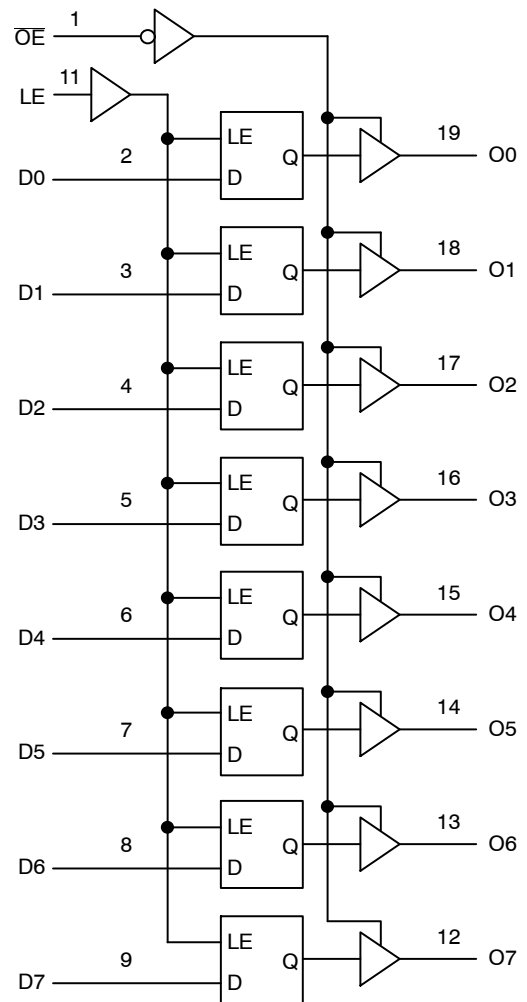


Figure 2. Logic Diagram

## TRUTH TABLE

Inputs			Outputs	Operating Mode
OE	LE	Dn	On	
L	H	H	H	Transparent (Latch Disabled); Read Latch
L	H	L	L	
L	L	h	H	Latched (Latch Enabled) Read Latch
L	L	l	L	
L	L	X	NC	Hold; Read Latch
H	L	X	Z	Hold; Disabled Outputs
H	H	H	Z	Transparent (Latch Disabled); Disabled Outputs
H	H	L	Z	
H	L	h	Z	Latched (Latch Enabled); Disabled Outputs
H	L	l	Z	

H = High Voltage Level;

h = High Voltage Level One Setup Time Prior to the Latch Enable High-to-Low Transition

L = Low Voltage Level

l = Low Voltage Level One Setup Time Prior to the Latch Enable High-to-Low Transition

NC = No Change, State Prior to the Latch Enable High-to-Low Transition

X = High or Low Voltage Level or Transitions are Acceptable

Z = High Impedance State

For I<sub>CC</sub> Reasons DO NOT FLOAT Inputs

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## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit	
$V_{CC}$	DC Supply Voltage	-0.5 to +6.5	V	
$V_I$	DC Input Voltage (Note 1)	-0.5 to +6.5	V	
$V_O$	DC Output Voltage (Note 1) Active-Mode (High or Low State)	-0.5 to $V_{CC} + 0.5$	V	
	Tri-State Mode	-0.5 to +6.5		
	Power-Down Mode ( $V_{CC} = 0$ V)	-0.5 to +6.5		
$I_{IK}$	DC Input Diode Current $V_{IN} < GND$	-50	mA	
$I_{OK}$	DC Output Diode Current $V_{OUT} < GND$	-50	mA	
$I_O$	DC Output Source/Sink Current	$\pm 50$	mA	
$I_{CC}$ or $I_{GND}$	DC Supply Current per Supply Pin or Ground Pin	$\pm 100$	mA	
$T_{STG}$	Storage Temperature Range	-65 to +150	$^{\circ}C$	
$T_L$	Lead Temperature, 1 mm from Case for 10 secs	260	$^{\circ}C$	
$T_J$	Junction Temperature Under Bias	+150	$^{\circ}C$	
$\theta_{JA}$	Thermal Resistance (Note 2)	SOIC-20W	96	$^{\circ}C/W$
		WQFN20	99	
		QFN20	111	
		TSSOP-20	150	
$P_D$	Power Dissipation in Still Air	SOIC-20W	1302	mW
		WQFN20	1256	
		QFN20	1127	
		TSSOP-20	833	
MSL	Moisture Sensitivity	SOIC-20W	Level 3	-
		All Other Packages	Level 1	
$F_R$	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	-
$V_{ESD}$	ESD Withstand Voltage (Note 3)	Human Body Model	> 2000	V
		Charged Device Model	N/A	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- $I_O$  absolute maximum rating must be observed.
- Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
- HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

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## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit	
$V_{CC}$	Supply Voltage	Operating	1.65	3.3	5.5	V
		Data Retention Only	1.5	3.3	5.5	
$V_I$	Digital Input Voltage	0	–	5.5	V	
$V_O$	Output Voltage	Active Mode (High or Low State)	0	–	$V_{CC}$	V
		Tri-State Mode	0	–	5.5	
		Power Down Mode ( $V_{CC} = 0$ V)	0	–	5.5	
$T_A$	Operating Free-Air Temperature	–55	–	+125	°C	
$t_r, t_f$	Input Rise or Fall Rate	$V_{CC} = 1.65$ V to $1.95$ V	0	–	20	nS/V
		$V_{CC} = 2.3$ V to $2.7$ V	0	–	20	
		$V_I$ from $0.8$ V to $2.0$ V, $V_{CC} = 3.0$ V	0	–	10	
		$V_{CC} = 4.5$ V to $5.5$ V	0	–	5	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

4. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). Unused outputs must be left open.

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A = -40$ °C to $+85$ °C		$T_A = -55$ °C to $+125$ °C		Unit
				Min	Max	Min	Max	
$V_{IH}$	High-Level Input Voltage		1.65 to 1.95	$0.65 \times V_{CC}$		$0.65 \times V_{CC}$		V
			2.3 to 2.7	1.7		1.7		
			2.7 to 3.6	2.0		2.0		
			4.5 to 5.5	$0.7 \times V_{CC}$		$0.7 \times V_{CC}$		
$V_{IL}$	Low-Level Input Voltage		1.65 to 1.95		$0.35 \times V_{CC}$		$0.35 \times V_{CC}$	V
			2.3 to 2.7		0.7		0.7	
			2.7 to 3.6		0.8		0.8	
			4.5 to 5.5		$0.3 \times V_{CC}$		$0.3 \times V_{CC}$	
$V_{OH}$	High-Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$						V
		$I_{OH} = -100$ $\mu$ A	1.65 to 5.5	$V_{CC} - 0.1$	–	$V_{CC} - 0.1$	–	
		$I_{OH} = -4$ mA	1.65	1.2	–	1.2	–	
		$I_{OH} = -8$ mA	2.3	1.8	–	1.8	–	
		$I_{OH} = -12$ mA	2.7	2.2	–	2.2	–	
		$I_{OH} = -16$ mA	3.0	2.4	–	2.4	–	
		$I_{OH} = -24$ mA	3.0	2.2	–	2.2	–	
$I_{OH} = -32$ mA	4.5	3.8		3.8				
$V_{OL}$	Low-Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$						V
		$I_{OL} = 100$ $\mu$ A	1.65 to 5.5	–	0.1	–	0.1	
		$I_{OL} = 4$ mA	1.65	–	0.45	–	0.45	
		$I_{OL} = 8$ mA	2.3	–	0.6	–	0.6	
		$I_{OL} = 12$ mA	2.7	–	0.4	–	0.4	
		$I_{OL} = 16$ mA	3.0	–	0.4	–	0.4	
		$I_{OL} = 24$ mA	3.0	–	0.55	–	0.55	
$I_{OL} = 32$ mA	4.5		0.6		0.6			
$I_I$	Input Leakage Current	$V_I = 0$ to $5.5$ V	3.6	–	$\pm 5.0$	–	$\pm 5.0$	$\mu$ A

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 °C to +85 °C		T <sub>A</sub> = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
I <sub>OZ</sub>	3-State Output Leakage Current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>O</sub> = 0 V to 5.5 V	3.6	-	±5.0	-	±5.0	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>I</sub> = 5.5 V or V <sub>O</sub> = 5.5 V	0	-	10	-	10	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>I</sub> = 5.5 V or GND	3.6	-	10	-	10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V	2.3 to 3.6	-	500	-	500	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 °C to +85 °C		T <sub>A</sub> = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, Dn to On	Waveform 1	1.65 to 1.95	-	14.0	-	14.0	ns
			2.3 to 2.7	-	9.6	-	9.6	
			2.7	-	9.0	-	9.0	
			3.0 to 3.6	-	8.0	-	8.0	
			4.5 to 5.5	-	5.5	-	5.5	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, LE to On	Waveform 3	1.65 to 1.95	-	15.0	-	15.0	ns
			2.3 to 2.7	-	10.5	-	10.5	
			2.7	-	9.5	-	9.5	
			3.0 to 3.6	-	8.5	-	8.5	
			4.5 to 5.5	-	6.0	-	6.0	
t <sub>PZH</sub> , t <sub>PZL</sub>	Output Enable Time, to On	Waveform 2	1.65 to 1.95	-	15.0	-	15.0	ns
			2.3 to 2.7	-	10.5	-	10.5	
			2.7	-	9.5	-	9.5	
			3.0 to 3.6	-	8.5	-	8.5	
			4.5 to 5.5	-	6.0	-	6.0	
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Output Enable Time, to On	Waveform 2	1.65 to 1.95	-	10.0	-	10.0	ns
			2.3 to 2.7	-	7.8	-	7.8	
			2.7	-	7.0	-	7.0	
			3.0 to 3.6	-	6.5	-	6.5	
			4.5 to 5.5	-	4.5	-	4.5	
t <sub>s</sub>	Setup Time, HIGH or LOW Dn to LE	Waveform 3	1.65 to 1.95	4.0	-	4.0	-	ns
			2.3 to 2.7	4.0	-	4.0	-	
			2.7	2.5	-	2.5	-	
			3.0 to 3.6	2.5	-	2.5	-	
			4.5 to 5.5	2.5	-	2.5	-	

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## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition	V <sub>CC</sub> (V)	T <sub>A</sub> = -40 °C to +85 °C		T <sub>A</sub> = -55 °C to +125 °C		Unit
				Min	Max	Min	Max	
t <sub>h</sub>	Hold Time, HIGH or LOW Dn to LE	Waveform 3	1.65 to 1.95	2.0	-	2.0	-	ns
			2.3 to 2.7	2.0	-	2.0	-	
			2.7	1.5	-	1.5	-	
			3.0 to 3.6	1.5	-	1.5	-	
			4.5 to 5.5	1.5	-	1.5	-	
t <sub>w</sub>	Pulse Width, LE HIGH	Waveform 3	1.65 to 1.95	4.0	-	4.0	-	ns
			2.3 to 2.7	4.0	-	4.0	-	
			2.7	3.3	-	3.3	-	
			3.0 to 3.6	3.3	-	3.3	-	
			4.5 to 5.5	3.3	-	3.3	-	
t <sub>OSSL</sub> , t <sub>OSLH</sub>	Output to Output Skew		1.65 to 1.95	-	-	-	-	ns
			2.3 to 2.7	-	-	-	-	
			2.7	-	-	-	-	
			3.0 to 3.6	-	1.0	-	1.0	
			4.5 to 5.5	-	-	-	-	

## DYNAMIC SWITCHING CHARACTERISTICS

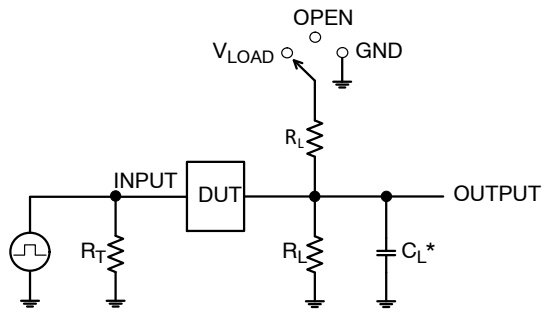
Symbol	Characteristic	Condition	T <sub>A</sub> = +25 °C			Unit
			Min	Typ	Max	
V <sub>OLP</sub>	Dynamic LOW Peak Voltage (Note 6)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V		0.8		V
		V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V		0.6		V
V <sub>OLV</sub>	Dynamic LOW Valley Voltage (Note 6)	V <sub>CC</sub> = 3.3 V, C <sub>L</sub> = 50 pF, V <sub>IH</sub> = 3.3 V, V <sub>IL</sub> = 0 V		-0.8		V
		V <sub>CC</sub> = 2.5 V, C <sub>L</sub> = 30 pF, V <sub>IH</sub> = 2.5 V, V <sub>IL</sub> = 0 V		-0.6		V

6. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typ	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	7	pF
C <sub>I/O</sub>	Input/Output Capacitance	V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	10 MHz, V <sub>CC</sub> = 3.3 V, V <sub>I</sub> = 0 V or V <sub>CC</sub>	25	pF

# MC74LCX573



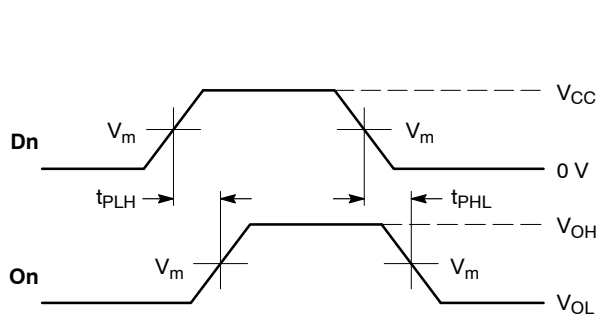
$C_L$  includes probe and jig capacitance  
 $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )  
 $f = 1$  MHz

Test	Switch Position
$t_{PLH} / t_{PHL}$	Open
$t_{PLZ} / t_{PZL}$	$V_{LOAD}$
$t_{PHZ} / t_{PZH}$	GND

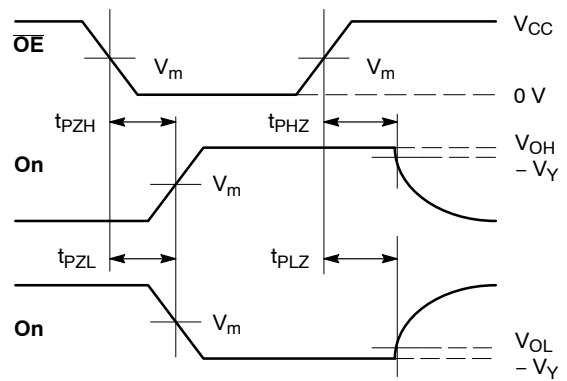
Figure 3. Test Circuit

$V_{CC}, V$	$R_L, \Omega$	$C_L, pF$	$V_{LOAD}$	$V_m, V$	$V_Y, V$
1.65 to 1.95	500	30	$2 \times V_{CC}$	$V_{CC}/2$	0.15
2.3 to 2.7	500	30	$2 \times V_{CC}$	$V_{CC}/2$	0.15
2.7	500	50	6 V	1.5	0.3
3.0 to 3.6	500	50	6 V	1.5	0.3
4.5 to 4.5	500	50	$2 \times V_{CC}$	$V_{CC}/2$	0.3

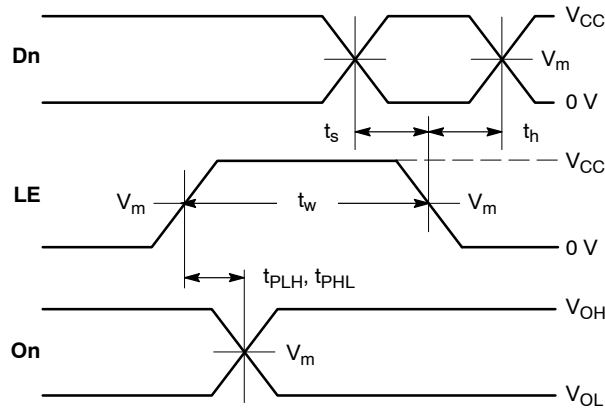
# MC74LCX573



**WAVEFORM 1 – PROPAGATION DELAYS**  
 $t_R = t_F = 2.5 \text{ ns}$ , 10% to 90%;  $f = 1 \text{ MHz}$ ;  $t_W = 500 \text{ ns}$



**WAVEFORM 2 – OUTPUT ENABLE AND DISABLE TIMES**  
 $t_R = t_F = 2.5 \text{ ns}$ , 10% to 90%;  $f = 1 \text{ MHz}$ ;  $t_W = 500 \text{ ns}$



**WAVEFORM 3 – LE to On PROPAGATION DELAYS, LE MINIMUM PULSE WIDTH, Dn to LE SETUP AND HOLD TIMES**  
 $t_R = t_F = 2.5 \text{ ns}$ , 10% to 90%;  $f = 1 \text{ MHz}$ ;  $t_W = 500 \text{ ns}$  except when noted

**Figure 4. AC Waveforms**

## ORDERING INFORMATION

Device	Marking	Package	Shipping†
MC74LCX573DWG	LCX573	SOIC-20 (Pb-Free)	38 Units / Rail
MC74LCX573DWR2G	LCX573	SOIC-20 (Pb-Free)	1000 Tape & Reel
MC74LCX573DTG	LCX 573	TSSOP-20 (Pb-Free)	75 Units / Rail
MC74LCX573DTR2G	LCX573	TSSOP-20 (Pb-Free)	2500 Tape & Reel
MC74LCX573DTR2G-Q*	LCX573	TSSOP-20 (Pb-Free)	2500 Tape & Reel

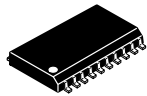
## DISCONTINUED (Note 7)

NLV74LCX573DTR2G*		TSSOP-20 (Pb-Free)	2500 Tape & Reel
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†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*-Q Suffix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

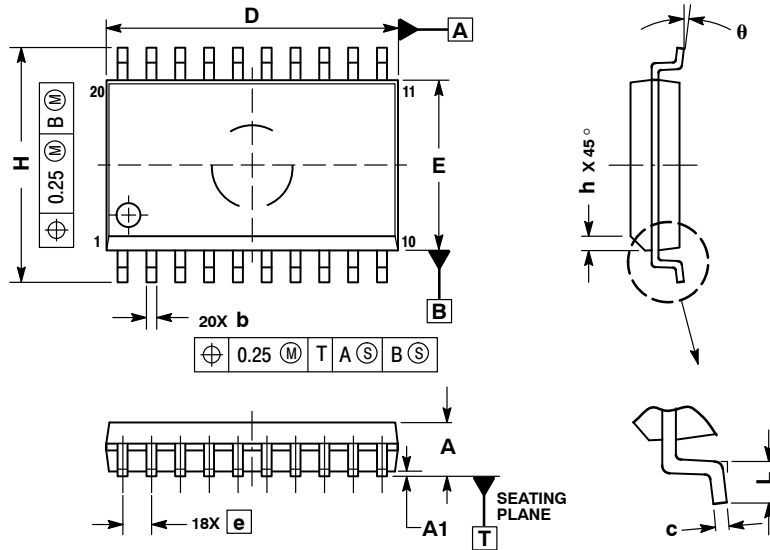
7. **DISCONTINUED:** This device is not recommended for new design. Please contact your onsemi representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).



SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015

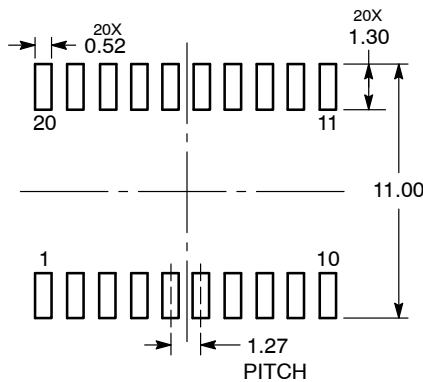


NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
b	0.35	0.49
c	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

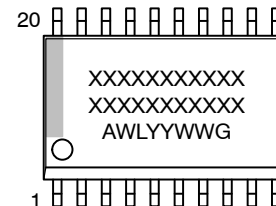
RECOMMENDED  
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC  
MARKING DIAGRAM\*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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