

## DM74LS373 • DM74LS374

### 3-STATE Octal D-Type Transparent Latches and Edge-Triggered Flip-Flops

#### General Description

These 8-bit registers feature totem-pole 3-STATE outputs designed specifically for driving highly-capacitive or relatively low-impedance loads. The high-impedance state and increased high-logic level drive provide these registers with the capability of being connected directly to and driving the bus lines in a bus-organized system without need for interface or pull-up components. They are particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight latches of the DM74LS373 are transparent D-type latches meaning that while the enable (G) is HIGH the Q outputs will follow the data (D) inputs. When the enable is taken LOW the output will be latched at the level of the data that was set up.

The eight flip-flops of the DM74LS374 are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs will be set to the logic states that were set up at the D inputs.

A buffered output control input can be used to place the eight outputs in either a normal logic state (HIGH or LOW logic levels) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

The output control does not affect the internal operation of the latches or flip-flops. That is, the old data can be retained or new data can be entered even while the outputs are OFF.

#### Features

- Choice of 8 latches or 8 D-type flip-flops in a single package
- 3-STATE bus-driving outputs
- Full parallel-access for loading
- Buffered control inputs
- P-N-P inputs reduce D-C loading on data lines

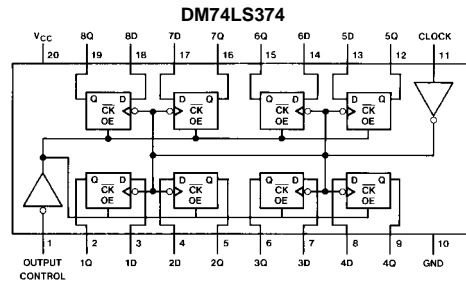
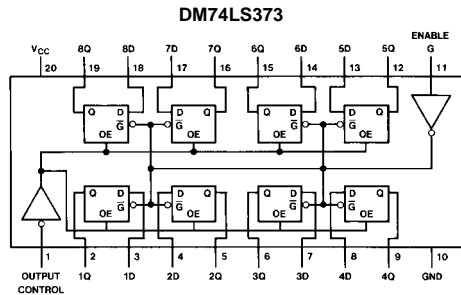
#### Ordering Code:

Order Number	Package Number	Package Description
DM74LS373WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
DM74LS373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS373N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
DM74LS374WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
DM74LS374SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
IDM29901NC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

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

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## Connection Diagrams



## Function Tables

DM74LS373

Output Control	Enable G	D	Output
L	H	H	H
L	H	L	L
L	L	X	Q <sub>0</sub>
H	X	X	Z

DM74LS374

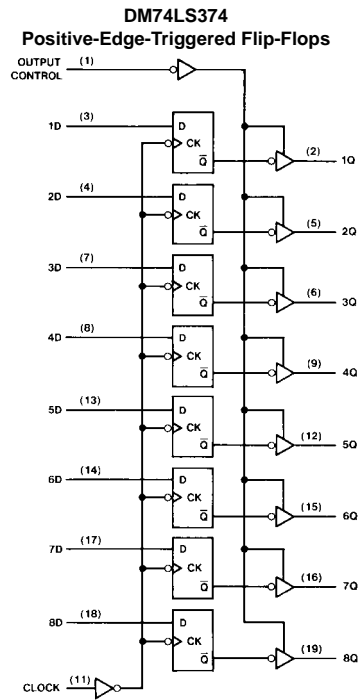
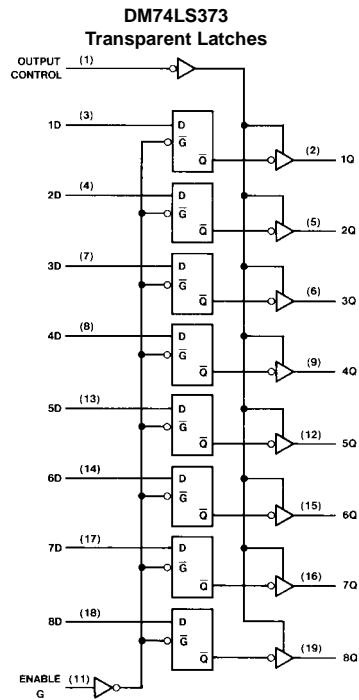
Output Control	Clock	D	Output
L	↑	H	H
L	↑	L	L
L	L	X	Q <sub>0</sub>
H	X	X	Z

H = HIGH Level (Steady State) L = LOW Level (Steady State) X = Don't Care Z = High Impedance State

↑ = Transition from LOW-to-HIGH level

Q<sub>0</sub> = The level of the output before steady-state input conditions were established.

## Logic Diagrams



**Absolute Maximum Ratings**(Note 1)

Supply Voltage	7V
Input Voltage	7V
Storage Temperature Range	-65°C to +150°C
Operating Free Air Temperature Range	0°C to +70°C

**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.

**DM74LS373 Recommended Operating Conditions**

Symbol	Parameter	Min	Nom	Max	Units
$V_{CC}$	Supply Voltage	4.75	5	5.25	V
$V_{IH}$	HIGH Level Input Voltage	2			V
$V_{IL}$	LOW Level Input Voltage			0.8	V
$I_{OH}$	HIGH Level Output Current			-2.6	mA
$I_{OL}$	LOW Level Output Current			24	mA
$t_W$	Pulse Width (Note 3)	Enable HIGH	15		ns
		Enable LOW	15		
$t_{SU}$	Data Setup Time (Note 2) (Note 3)	5↓			ns
$t_H$	Data Hold Time (Note 2) (Note 3)	20↓			ns
$T_A$	Free Air Operating Temperature	0		70	°C

**Note 2:** The symbol (↓) indicates the falling edge of the clock pulse is used for reference.

**Note 3:**  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5\text{V}$ .

**DM74LS373 Electrical Characteristics**

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 4)	Max	Units
$V_I$	Input Clamp Voltage	$V_{CC} = \text{Min}$ , $I_I = -18\text{ mA}$			-1.5	V
$V_{OH}$	HIGH Level Output Voltage	$V_{CC} = \text{Min}$ , $I_{OH} = \text{Max}$	2.4	3.1		V
		$V_{IL} = \text{Max}$ , $V_{IH} = \text{Min}$				
$V_{OL}$	LOW Level Output Voltage	$V_{CC} = \text{Min}$ , $I_{OL} = \text{Max}$		0.35	0.5	V
		$V_{IL} = \text{Max}$ , $V_{IH} = \text{Min}$ $I_{OL} = 12\text{ mA}$ , $V_{CC} = \text{Min}$				
$I_I$	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}$ , $V_I = 7\text{V}$			0.1	mA
$I_{IH}$	HIGH Level Input Current	$V_{CC} = \text{Max}$ , $V_I = 2.7\text{V}$			20	μA
$I_{IL}$	LOW Level Input Current	$V_{CC} = \text{Max}$ , $V_I = 0.4\text{V}$			-0.4	mA
$I_{OZH}$	Off-State Output Current with HIGH Level Output Voltage Applied	$V_{CC} = \text{Max}$ , $V_O = 2.7\text{V}$ $V_{IH} = \text{Min}$ , $V_{IL} = \text{Max}$			20	μA
$I_{OZL}$	Off-State Output Current with LOW Level Output Voltage Applied	$V_{CC} = \text{Max}$ , $V_O = 0.4\text{V}$ $V_{IH} = \text{Min}$ , $V_{IL} = \text{Max}$			-20	μA
$I_{OS}$	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 5)	-50		-225	mA
$I_{CC}$	Supply Current	$V_{CC} = \text{Max}$ , $OC = 4.5\text{V}$ , $D_n$ , Enable = GND		24	40	mA

**Note 4:** All typicals are at  $V_{CC} = 5\text{V}$ ,  $T_A = 25^\circ\text{C}$ .

**Note 5:** Not more than one output should be shorted at a time, and the duration should not exceed one second.

## DM74LS373 Switching Characteristics

at  $V_{CC} = 5V$  and  $T_A = 25^\circ C$

Symbol	Parameter	From (Input) To (Output)	$R_L = 667\Omega$				Units
			$C_L = 45\text{ pF}$		$C_L = 150\text{ pF}$		
			Min	Max	Min	Max	
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	Data to Q		18		26	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	Data to Q		18		27	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	Enable to Q		30		38	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	Enable to Q		30		36	ns
$t_{PZH}$	Output Enable Time to HIGH Level Output	Output Control to Any Q		28		36	ns
$t_{PZL}$	Output Enable Time to LOW Level Output	Output Control to Any Q		36		50	ns
$t_{PHZ}$	Output Disable Time from HIGH Level Output (Note 6)	Output Control to Any Q		20			ns
$t_{PLZ}$	Output Disable Time from LOW Level Output (Note 6)	Output Control to Any Q		25			ns

Note 6:  $C_L = 5\text{ pF}$ .

## DM74LS374 Recommended Operating Conditions

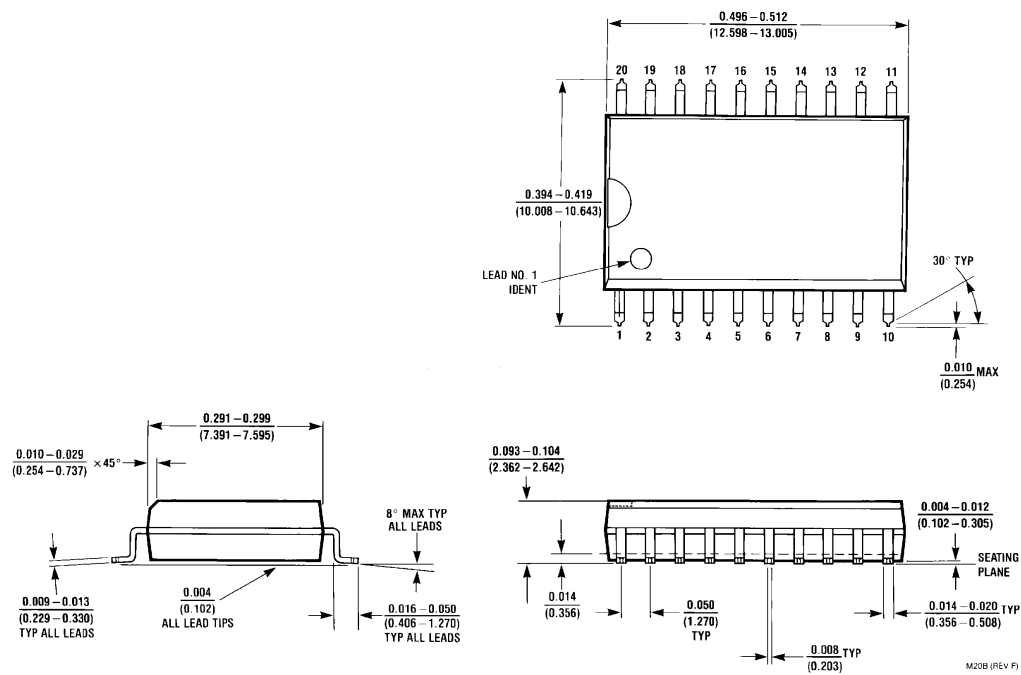
Symbol	Parameter	Min	Nom	Max	Units
$V_{CC}$	Supply Voltage	4.75	5	5.25	V
$V_{IH}$	HIGH Level Input Voltage	2			V
$V_{IL}$	LOW Level Input Voltage			0.8	V
$I_{OH}$	HIGH Level Output Current			-2.6	mA
$I_{OL}$	LOW Level Output Current			24	mA
$t_W$	Pulse Width (Note 8)	Clock HIGH	15		ns
		Clock LOW	15		
$t_{SU}$	Data Setup Time (Note 7) (Note 8)	$20\uparrow$			ns
$t_H$	Data Hold Time (Note 7) (Note 8)	$1\uparrow$			ns
$T_A$	Free Air Operating Temperature	0		70	$^\circ C$

Note 7: The symbol ( $\uparrow$ ) indicates the rising edge of the clock pulse is used for reference.

Note 8:  $T_A = 25^\circ C$  and  $V_{CC} = 5V$ .

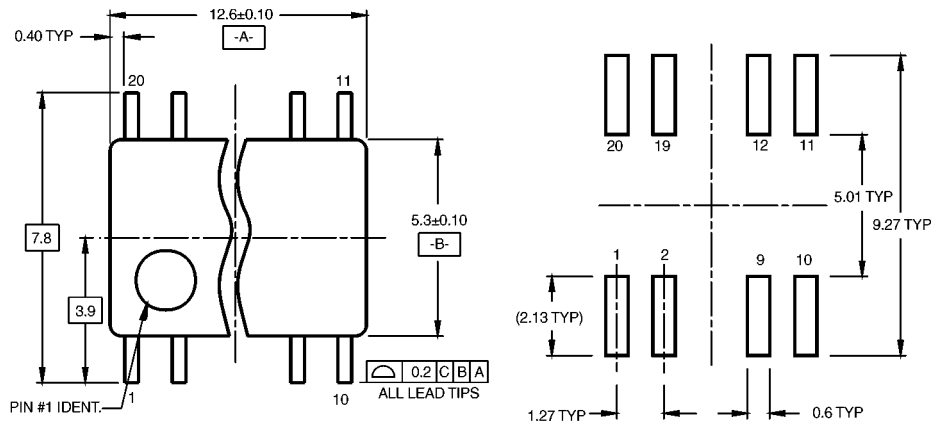
<b>DM74LS374 Electrical Characteristics</b>						
over recommended operating free air temperature range (unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ (Note 9)	Max	Units
$V_I$	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18 \text{ mA}$			-1.5	V
$V_{OH}$	HIGH Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	2.4	3.1		V
$V_{OL}$	LOW Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$ $I_{OL} = 12 \text{ mA}, V_{CC} = \text{Min}$		0.35 0.25	0.5 0.4	V
$I_I$	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}, V_I = 7\text{V}$			0.1	mA
$I_{IH}$	HIGH Level Input Current	$V_{CC} = \text{Max}, V_I = 2.7\text{V}$			20	$\mu\text{A}$
$I_{IL}$	LOW Level Input Current	$V_{CC} = \text{Max}, V_I = 0.4\text{V}$			-0.4	mA
$I_{OZH}$	Off-State Output Current with HIGH Level Output Voltage Applied	$V_{CC} = \text{Max}, V_O = 2.7\text{V}$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			20	$\mu\text{A}$
$I_{OZL}$	Off-State Output Current with LOW Level Output Voltage Applied	$V_{CC} = \text{Max}, V_O = 0.4\text{V}$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			-20	$\mu\text{A}$
$I_{OS}$	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 10)	-50		-225	mA
$I_{CC}$	Supply Current	$V_{CC} = \text{Max}, D_n = \text{GND}, \text{OC} = 4.5\text{V}$		27	45	mA
<b>Note 9:</b> All typicals are at $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$ .						
<b>Note 10:</b> Not more than one output should be shorted at a time, and the duration should not exceed one second.						
<b>DM74LS374 Switching Characteristics</b>						
at $V_{CC} = 5\text{V}$ and $T_A = 25^\circ\text{C}$						
Symbol	Parameter	$R_L = 667\Omega$				Units
		$C_L = 45 \text{ pF}$		$C_L = 150 \text{ pF}$		
		Min	Max	Min	Max	
$f_{MAX}$	Maximum Clock Frequency	35		20		MHz
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output		28		32	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output		28		38	ns
$t_{PZH}$	Output Enable Time to HIGH Level Output		28		44	ns
$t_{PZL}$	Output Enable Time to LOW Level Output		28		44	ns
$t_{PHZ}$	Output Disable Time from HIGH Level Output (Note 11)		20			ns
$t_{PLZ}$	Output Disable Time from LOW Level Output (Note 11)		25			ns
<b>Note 11:</b> $C_L = 5 \text{ pF}$ .						

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

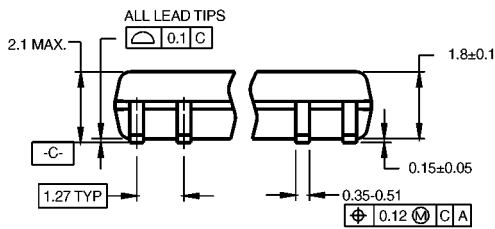


**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M20B**

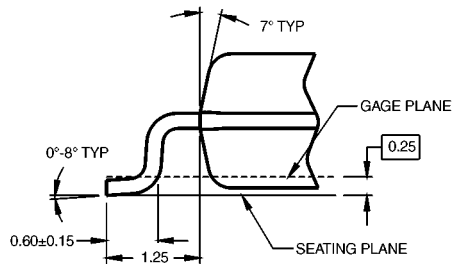
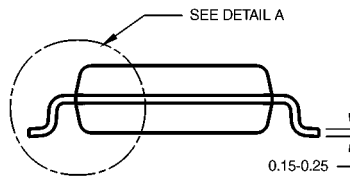
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**LAND PATTERN RECOMMENDATION**



DIMENSIONS ARE IN MILLIMETERS

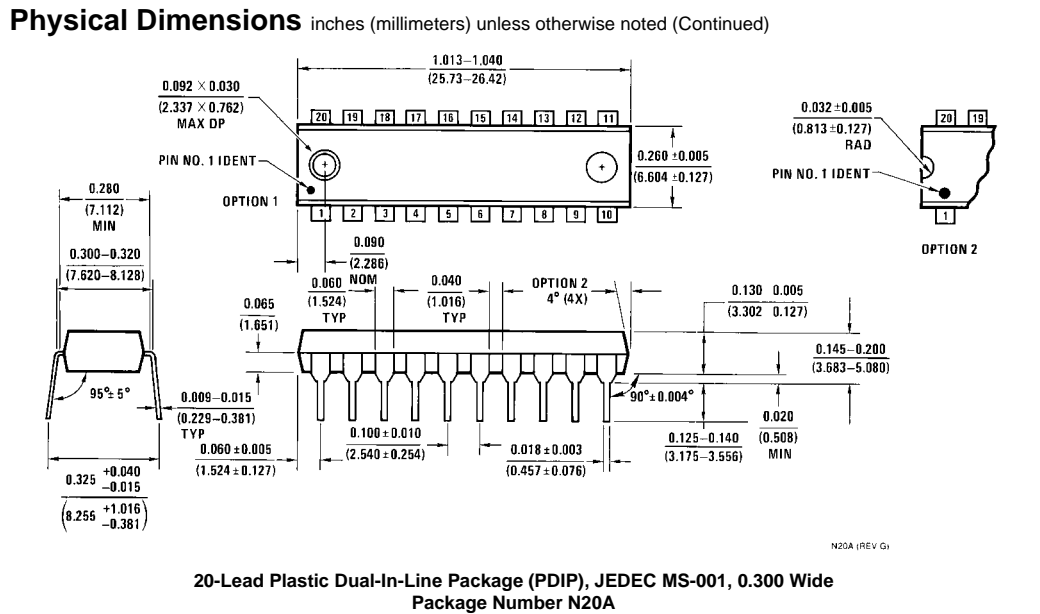


**DETAIL A**

- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

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



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