

## MM74C373 • MM74C374

### 3-STATE Octal D-Type Latch • 3-STATE Octal D-Type Flip-Flop

#### General Description

The MM74C373 and MM74C374 are integrated, complementary MOS (CMOS), 8-bit storage elements with 3-STATE outputs. These outputs have been specially designed to drive high capacitive loads, such as one might find when driving a bus, and to have a fan out of 1 when driving standard TTL. When a high logic level is applied to the OUTPUT DISABLE input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements.

The MM74C373 is an 8-bit latch. When LATCH ENABLE is high, the Q outputs will follow the D inputs. When LATCH ENABLE goes low, data at the D inputs, which meets the set-up and hold time requirements, will be retained at the outputs until LATCH ENABLE returns high again.

The MM74C374 is an 8-bit, D-type, positive-edge triggered flip-flop. Data at the D inputs, meeting the set-up and hold time requirements, is transferred to the Q outputs on positive-going transitions of the CLOCK input.

Both the MM74C373 and the MM74C374 are being assembled in 20-pin dual-in-line packages with 0.300" pin centers.

#### Features

- Wide supply voltage range: 3V to 15V
- High noise immunity: 0.45 V<sub>CC</sub> (typ.)
- Low power consumption
- TTL compatibility:
  - Fan out of 1 driving standard TTL
- Bus driving capability
- 3-STATE outputs
- Eight storage elements in one package
- Single CLOCK/LATCH ENABLE and OUTPUT DISABLE control inputs
- 20-pin dual-in-line package with 0.300" centers takes half the board space of a 24-pin package

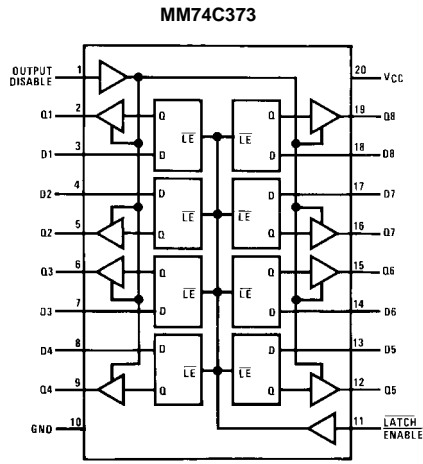
#### Ordering Code:

Order Number	Package Number	Package Description
MM74C373M (Note 1)	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74C373N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
MM74C374N	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

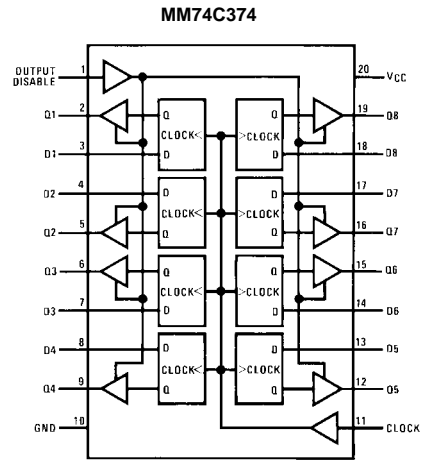
**Note 1:** Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

MM74C373 • MM74C374 3-STATE Octal D-Type Latch • 3-STATE Octal D-Type Flip-Flop

## Connection Diagrams



Top View



Top View

## Truth Tables

MM74C373

Output Disable	$\overline{\text{LATCH}} \text{ ENABLE}$	D	Q
L	H	H	H
L	H	L	L
L	L	X	Q
H	X	X	Hi-Z

L = LOW logic level  
 H = HIGH logic level  
 X = Irrelevant

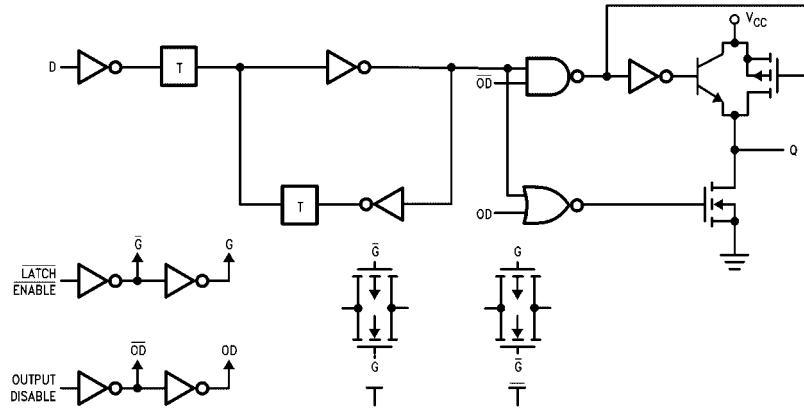
MM74C374

Output Disable	Clock	D	Q
L	↗	H	H
L	↗	L	L
L	L	X	Q
L	H	X	Q
H	X	X	Hi-Z

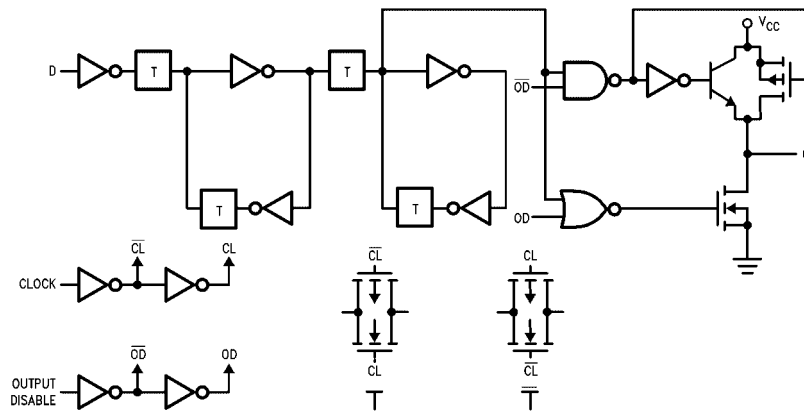
↗ = LOW-to-HIGH logic level transition  
 Q = Preexisting output level  
 Hi-Z = High impedance output state

Block Diagrams

MM74C373 (1 of 8 Latches)



MM74C374 (1 of 8 Flip-Flops)



**Absolute Maximum Ratings**(Note 2)

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$
Operating Temperature Range ( $T_A$ )	
MM74C373	-55°C to +125°C
Storage Temperature Range ( $T_S$ )	-65°C to +150°C
Power Dissipation	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating $V_{CC}$ Range	3V to 15V
Absolute Maximum $V_{CC}$	18V
Lead Temperature ( $T_L$ )	
(Soldering, 10 seconds)	260°C

**Note 2:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**DC Electrical Characteristics**

Min/Max limits apply across temperature range unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$	3.5 8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$			1.5 2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5V, I_O = -10 \mu A$ $V_{CC} = 10V, I_O = -10 \mu A$	4.5 9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5V, I_O = 10 \mu A$ $V_{CC} = 10V, I_O = 10 \mu A$			0.5 1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V, V_{IN} = 15V$		0.005	1.0	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = 0V$	-1.0	-0.005		$\mu A$
$I_{OZ}$	3-STATE Leakage Current	$V_{CC} = 15V, V_O = 15V$ $V_{CC} = 15V, V_O = 0V$		0.005 -1.0	1.0	$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.05	300	$\mu A$
<b>CMOS/LPTTL INTERFACE</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 4.75V, I_O = -360 \mu A$ $V_{CC} = 4.75V, I_O = -1.6 mA$	$V_{CC} - 0.4$ 2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 4.75V, I_O = 1.6 mA$			0.4	V
<b>OUTPUT DRIVE (Short Circuit Current)</b>						
$I_{SOURCE}$	Output Source Current	$V_{CC} = 5V, V_{OUT} = 0V$ $T_A = 25^\circ C$ (Note 3)	-12	-24		mA
$I_{SOURCE}$	Output Source Current	$V_{CC} = 10V, V_{OUT} = 0V$ $T_A = 25^\circ C$ (Note 3)	-24	-48		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$ (Note 3)	6	12		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$ (Note 3)	24	48		mA

**Note 3:** These are peak output current capabilities. Continuous output current is rated at 12 mA max.

<b>AC Electrical Characteristics</b> (Note 4)						
MM74C373, $T_A = 25^\circ\text{C}$ , $C_L = 50\text{ pF}$ , $t_r = t_f = 20\text{ ns}$ , unless otherwise noted						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd0}, t_{pd1}$	Propagation Delay, LATCH ENABLE to Output	$V_{CC} = 5\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}, C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 150\text{ pF}$		165 70 195 85	330 140 390 170	ns
$t_{pd0}, t_{pd1}$	Propagation Delay Data In to Output	LATCH ENABLE = $V_{CC}$ $V_{CC} = 5\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}, C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 150\text{ pF}$		155 70 185 85	310 140 370 170	ns
$t_{SET-UP}$	Minimum Set-Up Time Data In to CLOCK/LATCH ENABLE	$t_{HOLD} = 0\text{ ns}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		70 35	140 70	ns
$f_{MAX}$	Maximum LATCH ENABLE Frequency	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	3.5 4.5	6.7 9.0		MHz
$t_{PWH}$	Minimum LATCH ENABLE Pulse Width	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		75 55	150 110	ns
$t_r, t_f$	Maximum LATCH ENABLE Rise and Fall Time	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		NA NA		$\mu\text{s}$
$t_{1H}, t_{0H}$	Propagation Delay OUTPUT DISABLE to High Impedance State (from a Logic Level)	$R_L = 10\text{k}, C_L = 5\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		105 60	210 120	ns
$t_{H1}, t_{H0}$	Propagation Delay OUTPUT DISABLE to Logic Level (from High Impedance State)	$R_L = 10\text{k}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		105 45	210 90	ns
$t_{THL}, t_{TLH}$	Transition Time	$V_{CC} = 5\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}, C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 150\text{ pF}$		65 35 110 70	130 70 220 140	ns
$C_{LE}$	Input Capacitance	$\overline{LE}$ Input (Note 5)		7.5	10	pF
$C_{OD}$	Input Capacitance	OUTPUT DISABLE Input (Note 5)		7.5	10	pF
$C_{IN}$	Input Capacitance	Any Other Input (Note 5)		5	7.5	pF
$C_{OUT}$	Output Capacitance	High Impedance State (Note 5)		10	15	pF
$C_{PD}$	Power Dissipation Capacitance	Per Package (Note 6)		200		pF
<p><b>Note 4:</b> AC Parameters are guaranteed by DC correlated testing.</p> <p><b>Note 5:</b> Capacitance is guaranteed by periodic testing.</p> <p><b>Note 6:</b> <math>C_{PD}</math> determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note AN-90.</p>						

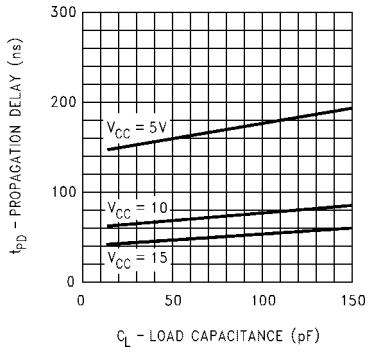
**AC Electrical Characteristics** (Note 7)MM74C374,  $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $t_r = t_f = 20\text{ ns}$ , unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd0}, t_{pd1}$	Propagation Delay, CLOCK to Output	$V_{CC} = 5\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}, C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 150\text{ pF}$		150 65 180 80	300 130 360 160	ns
$t_{SET-UP}$	Minimum Set-Up Time Data In to CLOCK/LATCH ENABLE	$t_{HOLD} = 0\text{ ns}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		70 35	140 70	ns
$t_{PWH}, t_{PWL}$	Minimum CLOCK Pulse Width	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		70 50	140 100	ns
$f_{MAX}$	Maximum CLOCK Frequency	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	3.5 5	7.0 10		MHz
$t_{1H}, t_{0H}$	Propagation Delay OUTPUT DISABLE to High Impedance State (from a Logic Level)	$R_L = 10\text{k}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		105 60	210 120	ns
$t_{1H}, t_{H0}$	Propagation Delay OUTPUT DISABLE to Logic Level (from High Impedance State)	$R_L = 10\text{k}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$		105 45	210 90	ns
$t_{THL}, t_{TLH}$	Transition Time	$V_{CC} = 5\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 50\text{ pF}$ $V_{CC} = 5\text{V}, C_L = 150\text{ pF}$ $V_{CC} = 10\text{V}, C_L = 150\text{ pF}$		65 35 110 70	130 70 220 140	ns
$t_r, t_f$	Maximum CLOCK Rise and Fall Time	$V_{CC} = 5\text{V}$ $V_{CC} = 10\text{V}$	15 5	>2000 >2000		$\mu\text{s}$
$C_{CLK}$	Input Capacitance	CLOCK Input (Note 8)		7.5	10	pF
$C_{OD}$	Input Capacitance	OUTPUT DISABLE Input (Note 8)		7.5	10	pF
$C_{IN}$	Input Capacitance	Any Other Input (Note 8)		5	7.5	pF
$C_{OUT}$	Output Capacitance	High Impedance State (Note 8)		10	15	pF
$C_{PD}$	Power Dissipation Capacitance	Per Package (Note 9)		250		pF

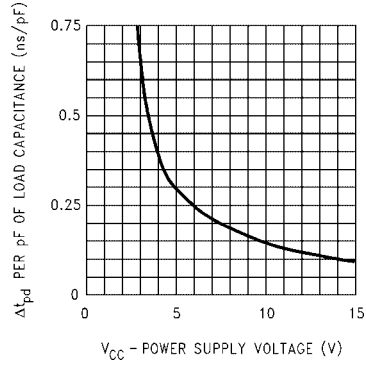
**Note 7:** AC Parameters are guaranteed by DC correlated testing.**Note 8:** Capacitance is guaranteed by periodic testing.**Note 9:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics Application Note AN-90.

**Typical Performance Characteristics**

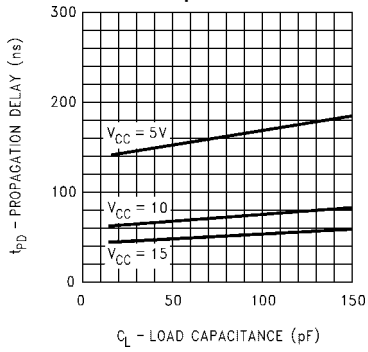
**MM74C373**  
**Propagation Delay, LATCH ENABLE to Output vs Load Capacitance**



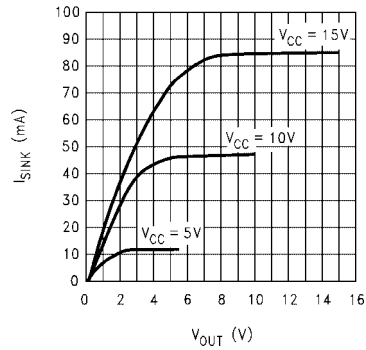
**MM74C373, MM74C374**  
**Change in Propagation Delay per pF of Load Capacitance ( $\Delta t_{pd}/pF$ ) vs Power Supply Voltage**



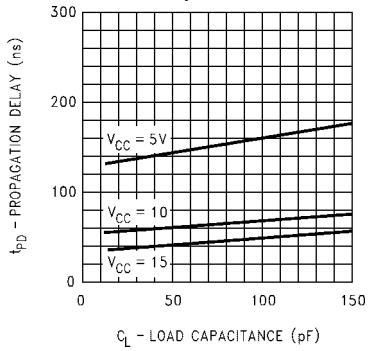
**MM74C373**  
**Propagation Delay, Data In to Output vs Load Capacitance**



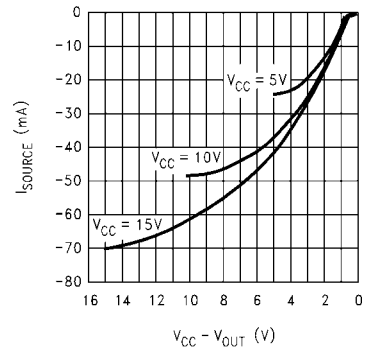
**MM74C373, MM74C374**  
**Output Sink Current vs VOUT**



**MM74C373**  
**Propagation Delay, CLOCK to Output vs Load Capacitance**

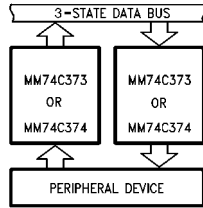


**MM74C373, MM74C374**  
**Source Current vs VCC - VOUT**

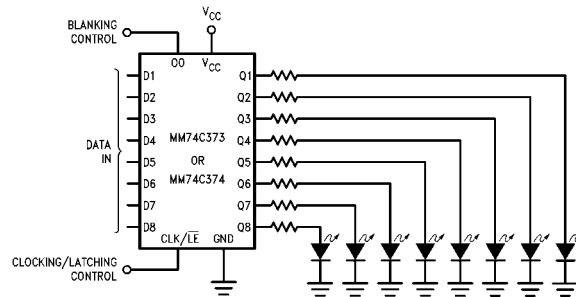


## Typical Applications

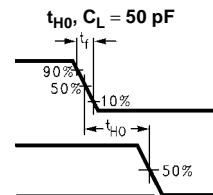
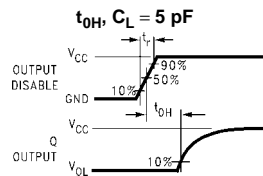
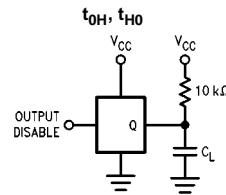
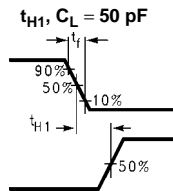
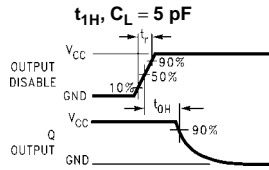
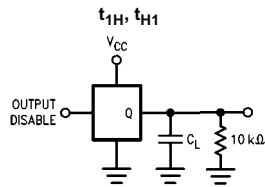
### Data Bus Interfacing Element



Simple, Latching, Octal, LED Indicator Driver with Blanking for Use as Data Display, Bus Monitor,  $\mu$ P Front Panel Display, Etc.



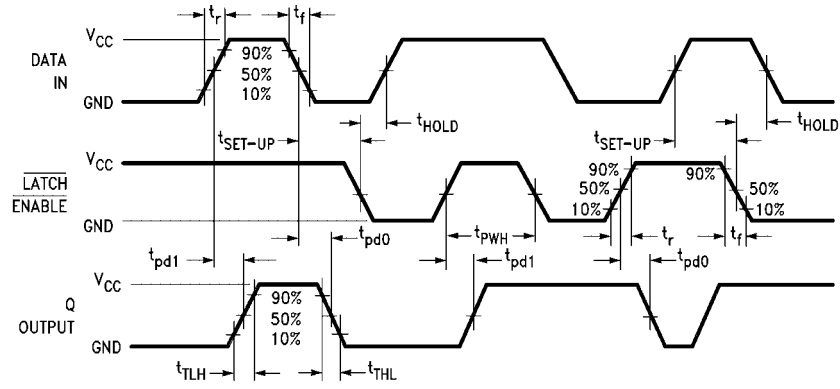
## 3-STATE Test Circuits and Switching Time Waveforms





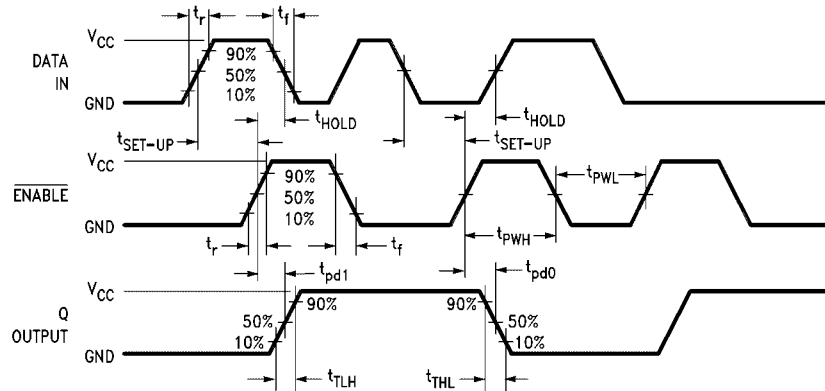
### Switching Time Waveforms

MM74C373



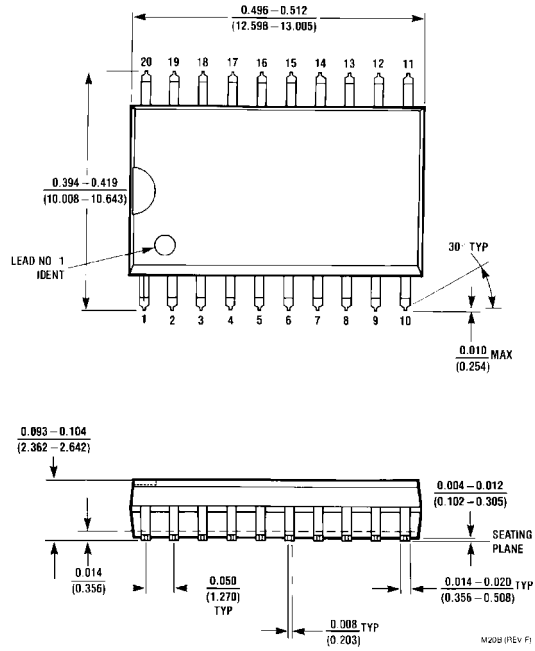
Output Disable = GND

MM74C374



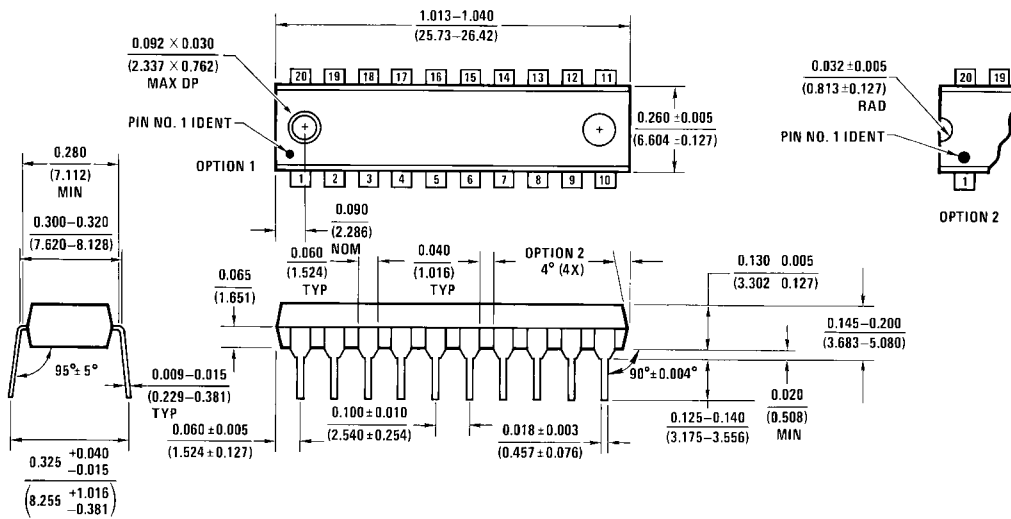
Output Disable = GND

**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)



**20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide  
Package Number N20A**

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