

# MM74HC373

## 3-STATE Octal D-Type Latch

### General Description

The MM74HC373 high speed octal D-type latches utilize advanced silicon-gate CMOS technology. They possess the high noise immunity and low power consumption of standard CMOS integrated circuits, as well as the ability to drive 15 LS-TTL loads. Due to the large output drive capability and the 3-STATE feature, these devices are ideally suited for interfacing with bus lines in a bus organized system.

When the LATCH ENABLE input is HIGH, the Q outputs will follow the D inputs. When the LATCH ENABLE goes LOW, data at the D inputs will be retained at the outputs until LATCH ENABLE returns HIGH again. When a high logic level is applied to the OUTPUT CONTROL 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 74HC logic family is speed, function, and pin-out compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to  $V_{CC}$  and ground.

### Features

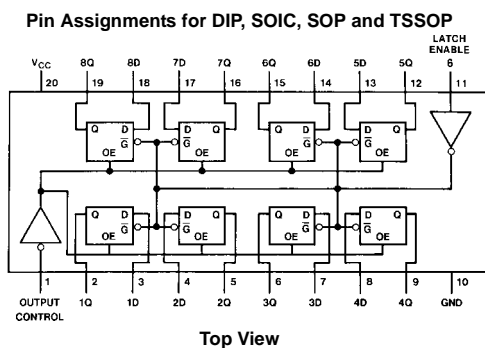
- Typical propagation delay: 18 ns
- Wide operating voltage range: 2 to 6 volts
- Low input current: 1  $\mu$ A maximum
- Low quiescent current: 80  $\mu$ A maximum (74 Series)
- Output drive capability: 15 LS-TTL loads

### Ordering Code:

Order Number	Package Number	Package Description
MM74HC373WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
MM74HC373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HC373MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HC373N	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.

### Connection Diagram



### Truth Table

Output Control	Latch Enable	Data	373 Output
L	H	H	H
L	H	L	L
L	L	X	$Q_0$
H	X	X	Z

H = HIGH Level  
L = LOW Level  
 $Q_0$  = Level of output before steady-state input conditions were established.  
Z = High Impedance

**Absolute Maximum Ratings**(Note 1)

(Note 2)

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC} + 1.5V$
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC} + 0.5V$
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 35$ mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 70$ mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ )	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature ( $T_L$ )	
(Soldering 10 seconds)	260°C

**Recommended Operating Conditions**

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	2	6	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temperature Range ( $T_A$ )	-40	+85	°C
Input Rise or Fall Times ( $t_r, t_f$ )			
$V_{CC} = 2.0V$		1000	ns
$V_{CC} = 4.5V$		500	ns
$V_{CC} = 6.0V$		400	ns

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.

**DC Electrical Characteristics**

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$			$T_A = -40$ to $85^\circ C$	$T_A = -55$ to $125^\circ C$	Units
				Typ	Guaranteed Limits				
$V_{IH}$	Minimum HIGH Level Input Voltage		2.0V		1.5	1.5	1.5	V	
			4.5V		3.15	3.15	3.15	V	
			6.0V		4.2	4.2	4.2	V	
$V_{IL}$	Maximum LOW Level Input Voltage		2.0V		0.5	0.5	0.5	V	
			4.5V		1.35	1.35	1.35	V	
			6.0V		1.8	1.8	1.8	V	
$V_{OH}$	Minimum HIGH Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	2.0	1.9	1.9	1.9	V	
			4.5V	4.5	4.4	4.4	4.4	V	
			6.0V	6.0	5.9	5.9	5.9	V	
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 6.0$ mA $ I_{OUT}  \leq 7.8$ mA	4.5V	4.2	3.98	3.84	3.7	V	
			6.0V	5.7	5.48	5.34	5.2	V	
$V_{OL}$	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	0	0.1	0.1	0.1	V	
			4.5V	0	0.1	0.1	0.1	V	
			6.0V	0	0.1	0.1	0.1	V	
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 6.0$ mA $ I_{OUT}  \leq 7.8$ mA	4.5V	0.2	0.26	0.33	0.4	V	
			6.0V	0.2	0.26	0.33	0.4	V	
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$	
$I_{OZ}$	Maximum 3-STATE Output Leakage Current	$V_{IN} = V_{IH}$ or $V_{IL}$ , $OC = V_{IH}$ $V_{OUT} = V_{CC}$ or GND	6.0V		$\pm 0.5$	$\pm 5$	$\pm 10$	$\mu A$	
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		8.0	80	160	$\mu A$	

**Note 4:** For a power supply of 5V  $\pm 10\%$  the worst case output voltages ( $V_{OH}$  and  $V_{OL}$ ) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case  $V_{IH}$  and  $V_{IL}$  occur at  $V_{CC} = 5.5V$  and 4.5V respectively. (The  $V_{IH}$  value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ ,  $I_{CC}$ , and  $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.

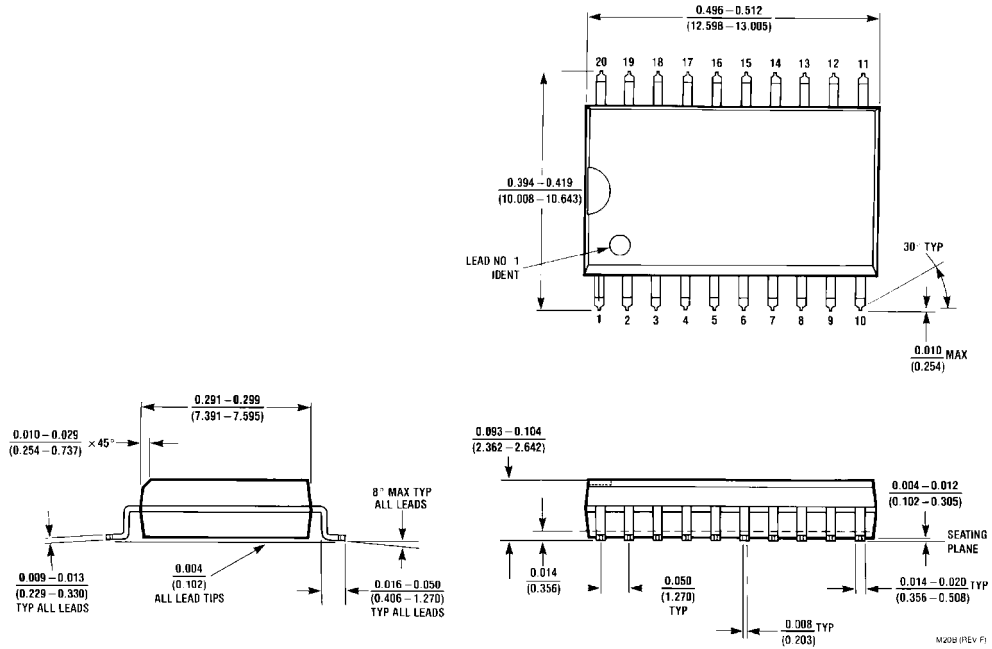
AC Electrical Characteristics										
$V_{CC} = 5V, T_A = 25^\circ C, t_r = t_f = 6 ns$										
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units					
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Data to Q	$C_L = 45 pF$	18	25	ns					
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, LE to Q	$C_L = 45 pF$	21	30	ns					
$t_{PZH}, t_{PZL}$	Maximum Output Enable Time	$R_L = 1 k\Omega$ $C_L = 45 pF$	20	28	ns					
$t_{PHZ}, t_{PLZ}$	Maximum Output Disable Time	$R_L = 1 k\Omega$ $C_L = 5 pF$	18	25	ns					
$t_S$	Minimum Set Up Time			5	ns					
$t_H$	Minimum Hold Time			10	ns					
$t_W$	Minimum Pulse Width		9	16	ns					
AC Electrical Characteristics										
$V_{CC} = 2.0-6.0V, C_L = 50 pF, t_r = t_f = 6 ns$ (unless otherwise specified)										
Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$		$T_A = -40 to 85^\circ C$		$T_A = -55 to 125^\circ C$		Units
				Typ	Guaranteed Limits					
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, Data to Q	$C_L = 50 pF$	2.0V	50	150	188	225	ns		
		$C_L = 150 pF$	2.0V	80	200	250	300	ns		
		$C_L = 50 pF$	4.5V	22	30	37	45	ns		
		$C_L = 150 pF$	4.5V	30	40	50	60	ns		
		$C_L = 50 pF$	6.0V	19	26	31	39	ns		
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay, LE to Q	$C_L = 50 pF$	2.0V	63	175	220	263	ns		
		$C_L = 150 pF$	2.0V	110	225	280	338	ns		
		$C_L = 50 pF$	4.5V	25	35	44	52	ns		
		$C_L = 150 pF$	4.5V	35	45	56	68	ns		
		$C_L = 50 pF$	6.0V	21	30	37	45	ns		
$t_{PHL}, t_{PLH}$	$C_L = 150 pF$	$C_L = 50 pF$	6.0V	26	35	44	53	ns		
		Maximum Output Enable Time	$R_L = 1 k\Omega$	2.0V	50	150	188	225	ns	
			$C_L = 50 pF$							
			$C_L = 150 pF$							
			$C_L = 50 pF$							
$C_L = 150 pF$										
$t_{PHZ}, t_{PLZ}$	Maximum Output Disable Time	$R_L = 1 k\Omega$	2.0V	50	150	188	225	ns		
		$C_L = 50 pF$								
		$C_L = 150 pF$								
		$C_L = 50 pF$								
		$C_L = 150 pF$								
$t_S$	Minimum Set Up Time		2.0V	50	60	75	ns			
			4.5V	9	13	15	ns			
			6.0V	9	11	13	ns			
$t_H$	Minimum Hold Time		2.0V	5	5	5	ns			
			4.5V	5	5	5	ns			
			6.0V	5	5	5	ns			
$t_W$	Minimum Pulse Width		2.0V	30	80	100	120	ns		
			4.5V	10	16	20	24	ns		
			6.0V	9	14	18	20	ns		
$t_{THL}, t_{TLH}$	Maximum Output Rise and Fall Time	$C_L = 50 pF$	2.0V	25	60	75	90	ns		
			4.5V	7	12	15	18	ns		
			6.0V	6	10	13	15	ns		
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per latch) OC = $V_{CC}$ OC = GND		30				pF		
				50				pF		
$C_{IN}$	Maximum Input Capacitance			5	10	10	10	pF		

## AC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V <sub>CC</sub>	T <sub>A</sub> = 25°C		T <sub>A</sub> = -40 to 85°C	T <sub>A</sub> = -55 to 125°C	Units
				Typ	Guaranteed Limits			
C <sub>OUT</sub>	Maximum Output Capacitance			15	20	20	20	pF

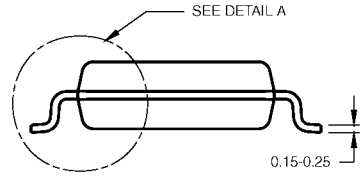
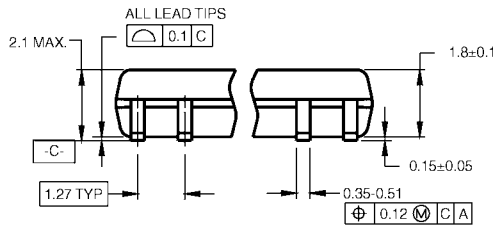
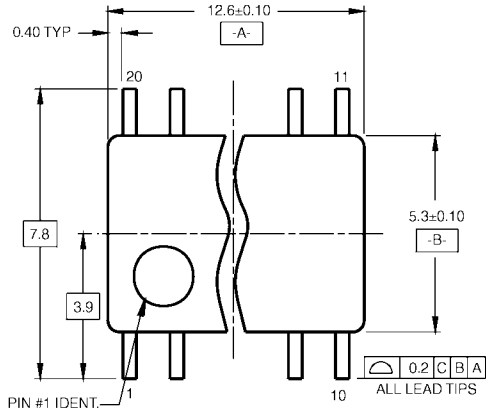
**Note 5:** C<sub>PD</sub> determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

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



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

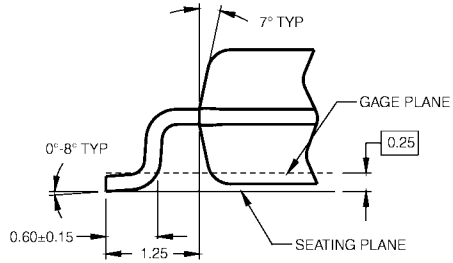
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



DIMENSIONS ARE IN MILLIMETERS

- 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



DETAIL A

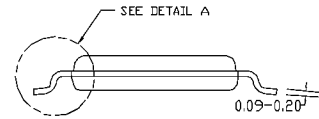
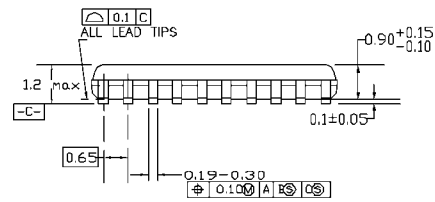
**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**

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

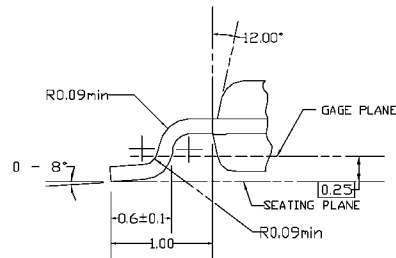


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

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.

MTC20REVD1

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

**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

N20A (REV G)

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