



September 1983
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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

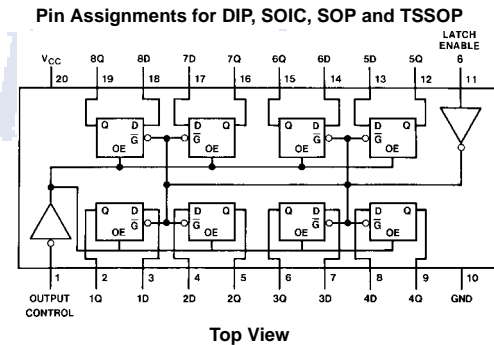
- Typical propagation delay: 18 ns
- Wide operating voltage range: 2 to 6 volts
- Low input current: 1 μ A maximum
- Low quiescent current: 80 μ A maximum (74 Series)
- Output drive capability: 15 LS-TTL loads

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

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Absolute Maximum Ratings (Note 1)		Recommended Operating Conditions						
(Note 2)			Min	Max	Units			
Supply Voltage (V_{CC})	-0.5 to +7.0V	Supply Voltage (V_{CC})	2	6	V			
DC Input Voltage (V_{IN})	-1.5 to $V_{CC}+1.5V$	DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V			
DC Output Voltage (V_{OUT})	-0.5 to $V_{CC}+0.5V$	Operating Temperature Range (T_A)	-40	+85	°C			
Clamp Diode Current (I_{IK}, I_{OK})	±20 mA	Input Rise or Fall Times (t_r, t_f) $V_{CC} = 2.0V$		1000	ns			
DC Output Current, per pin (I_{OUT})	±35 mA	$V_{CC} = 4.5V$		500	ns			
DC V_{CC} or GND Current, per pin (I_{CC})	±70 mA	$V_{CC} = 6.0V$		400	ns			
Storage Temperature Range (T_{STG})	-65°C to +150°C	Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur.						
Power Dissipation (P_D)		Note 2: Unless otherwise specified all voltages are referenced to ground.						
(Note 3)	600 mW	Note 3: Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.						
S.O. Package only	500 mW							
Lead Temperature (T_L)								
(Soldering 10 seconds)	260°C							
DC Electrical Characteristics								
Symbol	Parameter	Conditions	V_{CC}	$T_A = 25^\circ C$			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 \text{ mA}$ $ I_{OUT} \leq 7.8 \text{ 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 \text{ mA}$ $ I_{OUT} \leq 7.8 \text{ 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		±0.1	±1.0	±1.0	µA
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		±0.5	±5	±10	µA
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		8.0	80	160	µA
Note 4: For a power supply of 5V ±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 Ω $C_L = 45$ pF	20	28	ns
t_{PHZ} , t_{PLZ}	Maximum Output Disable Time	$R_L = 1$ k Ω $C_L = 5$ 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
			2.0V	80	200	250	300	ns
		$C_L = 150$ pF	4.5V	22	30	37	45	ns
			4.5V	30	40	50	60	ns
			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
			2.0V	110	225	280	338	ns
		$C_L = 150$ pF	4.5V	25	35	44	52	ns
			4.5V	35	45	56	68	ns
			6.0V	21	30	37	45	ns
t_{PZH} , t_{PZL}	Maximum Output Enable Time	$R_L = 1$ k Ω	2.0V	50	150	188	225	ns
			2.0V	80	200	250	300	ns
		$C_L = 50$ pF	4.5V	21	30	37	45	ns
			4.5V	30	40	50	60	ns
			6.0V	19	26	31	39	ns
			6.0V	26	35	44	53	ns
t_{PHZ} , t_{PLZ}	Maximum Output Disable Time	$R_L = 1$ k Ω	2.0V	50	150	188	225	ns
			4.5V	21	30	37	45	ns
		6.0V	19	26	31	39	ns	
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

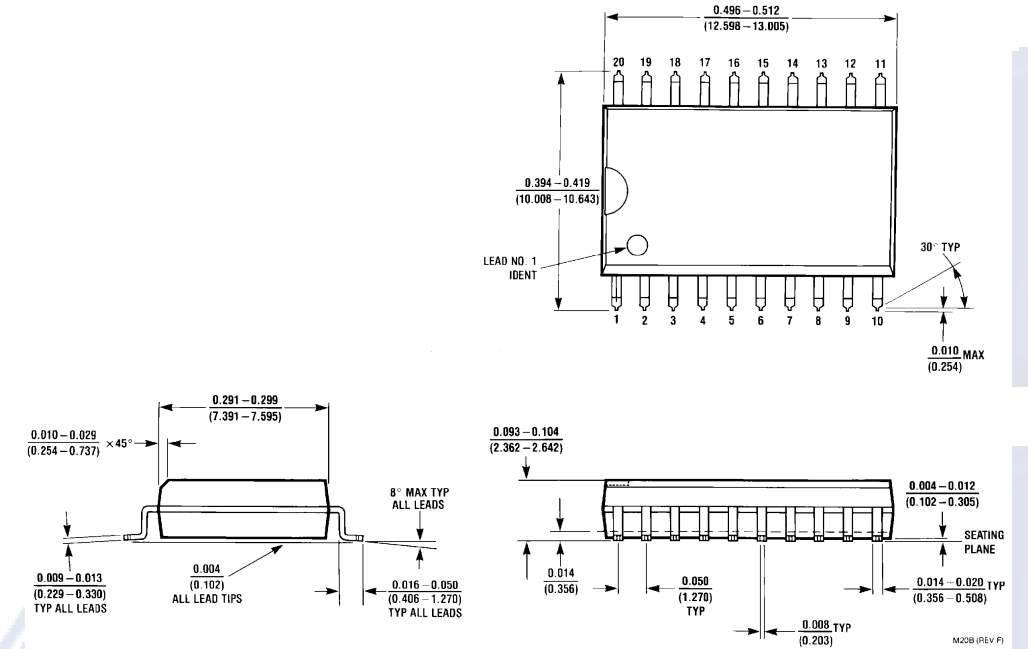
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AC Electrical Characteristics (Continued)								
Symbol	Parameter	Conditions	V _{CC}	T _A = 25°C		T _A = -40 to 85°C	T _A = -55 to 125°C	Units
				Typ	Guaranteed Limits			
C _{OUT}	Maximum Output Capacitance			15	20	20	20	pF
<p>Note 5: C_{PD} determines 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}.</p>								

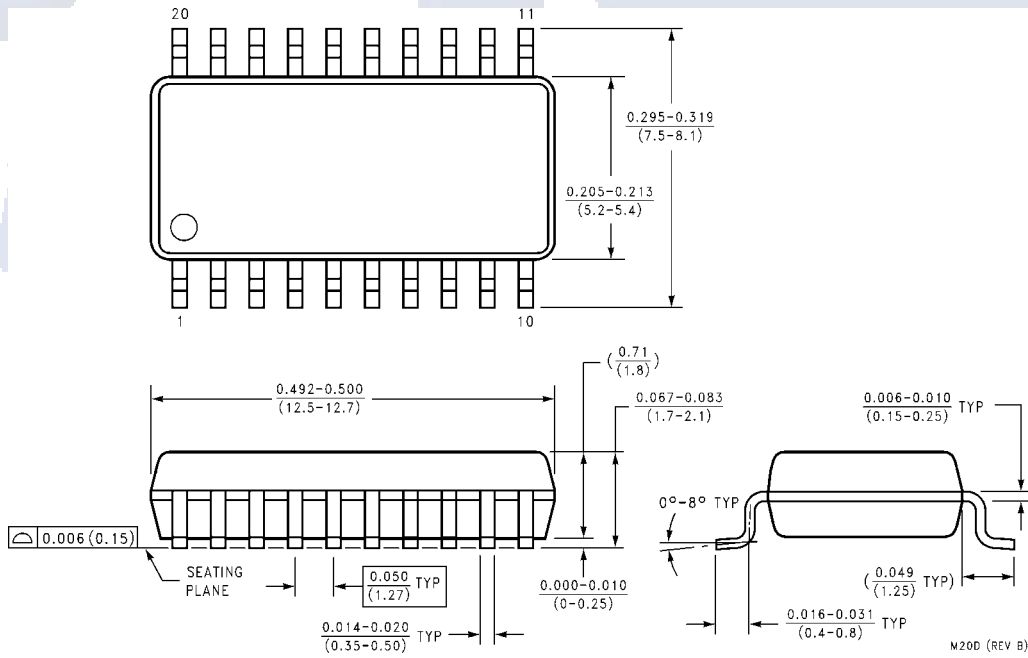
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Physical Dimensions inches (millimeters) unless otherwise noted



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



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

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

Top View Dimensions:
 - Overall width: 6.5 ± 0.1 [-A]
 - Lead pitch: 0.20
 - Pin 1 location: 3.2
 - Body width: 6.4
 - Lead height: 4.4 ± 0.1 [-B-]
 - Pin 10 location: 1.0
 - Lead tip width: 0.2 [-B-A]
 - Pin #1 IDENT. circle diameter: 0.2

Side View Dimensions:
 - Lead height: 1.78
 - Lead thickness: 0.42
 - Lead tip thickness: 0.65

LAND PATTERN RECOMMENDATION

Detail A Dimensions:
 - Lead tip thickness: 0.1 [-C]
 - Lead tip width: 0.1 ± 0.05
 - Lead length: 1.2 max
 - Lead angle: 12.00°
 - Lead tip radius: $R0.09$ min
 - Seating plane offset: 0.25
 - Lead thickness: 0.6 ± 0.1
 - Lead width: 1.00
 - Lead angle: $0 - 8^\circ$
 - Lead tip radius: $R0.09$ min
 - GAGE PLANE
 - SEATING PLANE

Other Dimensions:
 - Lead tip radius: $0.19 - 0.30$
 - Lead tip diameter: $\phi 0.10$ [-C]

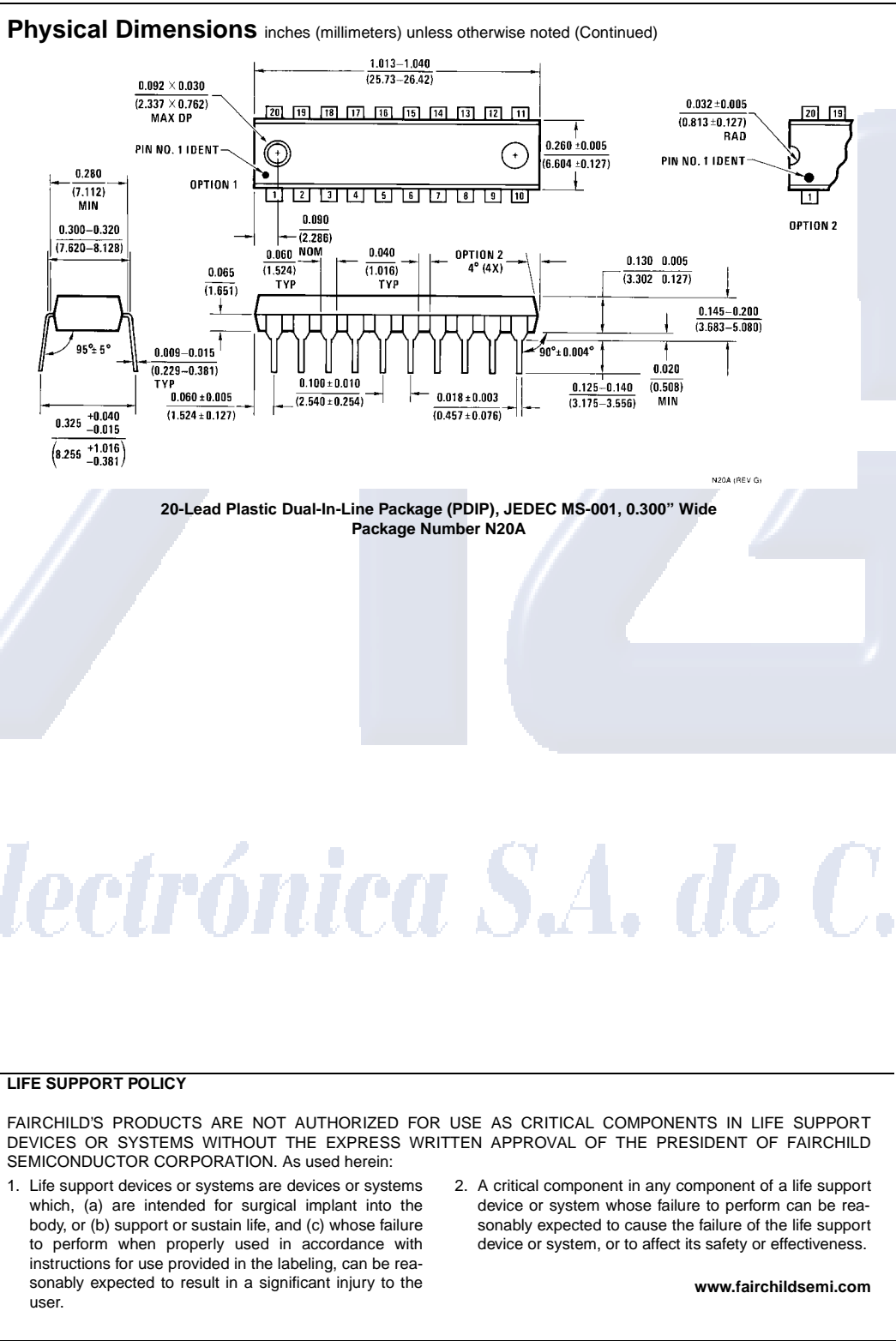
ALL LEAD TIPS

DIMENSIONS ARE IN MILLIMETERS

NOTES:

- CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

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



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