

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

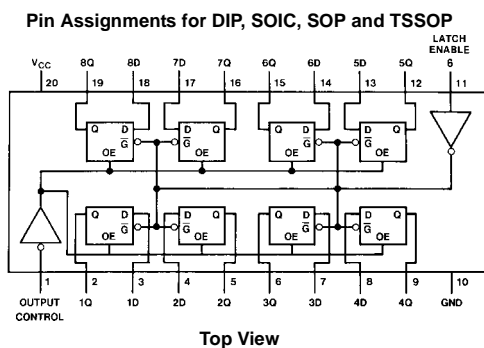
- Typical propagation delay: 18 ns
- Wide operating voltage range: 2 to 6 volts
- Low input current: 1 μ A maximum
- Low quiescent current: 80 μ A maximum (74 Series)
- Output drive capability: 15 LS-TTL loads

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

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}) | ± 20 mA |
| DC Output Current, per pin (I_{OUT}) | ± 35 mA |
| DC V_{CC} or GND Current, per pin (I_{CC}) | ± 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} | $T_A = 25^\circ C$ | | | Units | |
|----------|--|---|----------|--------------------|-------------------|-----------|-----------|---------|
| | | | | Typ | Guaranteed Limits | | | |
| V_{IH} | Minimum HIGH Level Input Voltage | | 2.0V | | 1.5 | 1.5 | V | |
| | | | 4.5V | | 3.15 | 3.15 | V | |
| | | | 6.0V | | 4.2 | 4.2 | V | |
| V_{IL} | Maximum LOW Level Input Voltage | | 2.0V | | 0.5 | 0.5 | V | |
| | | | 4.5V | | 1.35 | 1.35 | V | |
| | | | 6.0V | | 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 | V | |
| | | | 4.5V | 4.5 | 4.4 | 4.4 | V | |
| | | | 6.0V | 6.0 | 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 | V | |
| | | | 4.5V | 0 | 0.1 | 0.1 | V | |
| | | | 6.0V | 0 | 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 | | ± 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 $\pm 10\%$ 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.

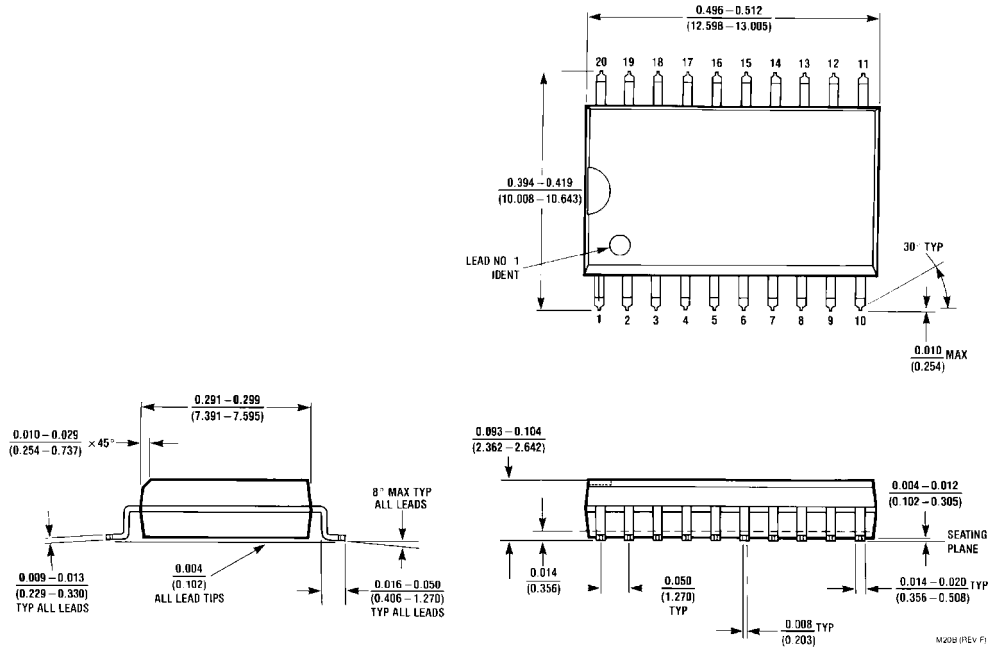
| AC Electrical Characteristics | | | | | | | | | | |
|---|--|------------------------------------|-------------------|--------------------|-------------------|---------------------------|-----|----------------------------|----|-------|
| $V_{CC} = 5V, T_A = 25^\circ C, t_r = t_f = 6 ns$ | | | | | | | | | | |
| 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 | | |
| | | $C_L = 50 pF$ | 4.5V | 21 | 30 | 37 | 45 | ns | | |
| | | $C_L = 150 pF$ | 6.0V | 19 | 26 | 31 | 39 | ns | | |
| | | $C_L = 50 pF$ | 6.0V | 26 | 35 | 44 | 53 | ns | | |
| | | $C_L = 150 pF$ | 6.0V | 28 | 39 | 49 | 59 | 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 50 | | | | pF pF | | |
| C_{IN} | Maximum Input Capacitance | | | 5 | 10 | 10 | 10 | pF | | |

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 |

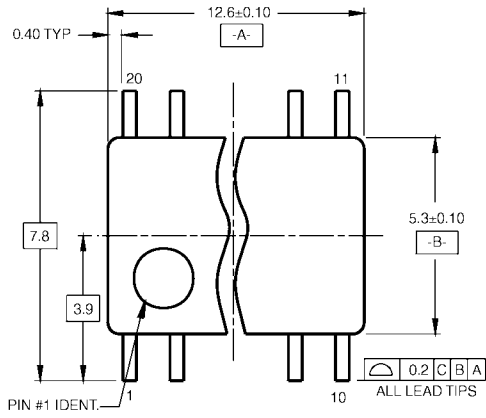
Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Physical Dimensions inches (millimeters) unless otherwise noted

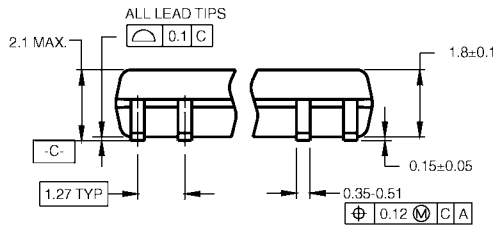


20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Package Number M20B

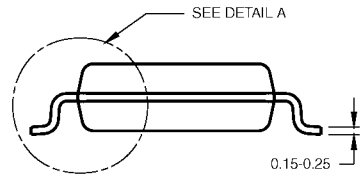
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

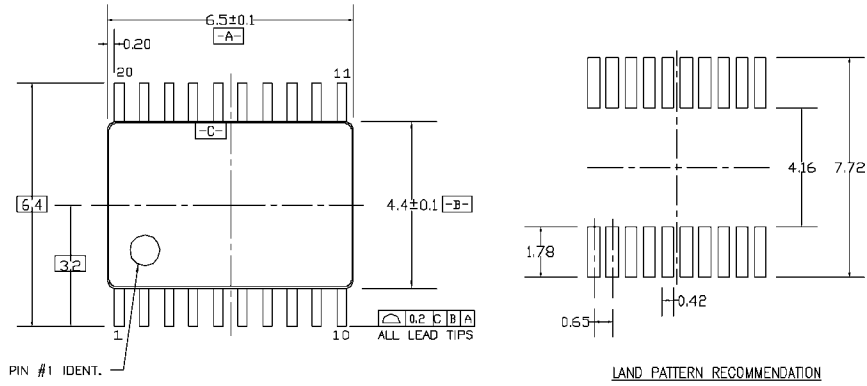
NOTES:

- 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

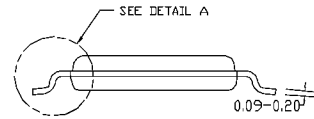
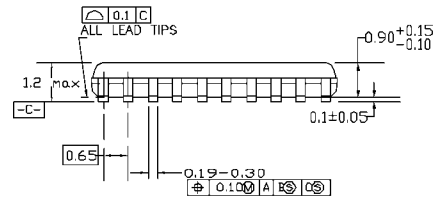
20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M20D

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

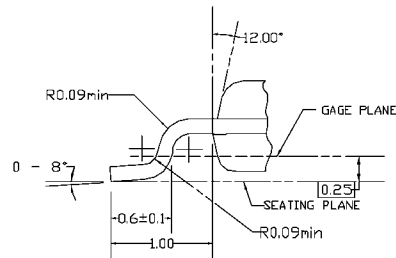


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

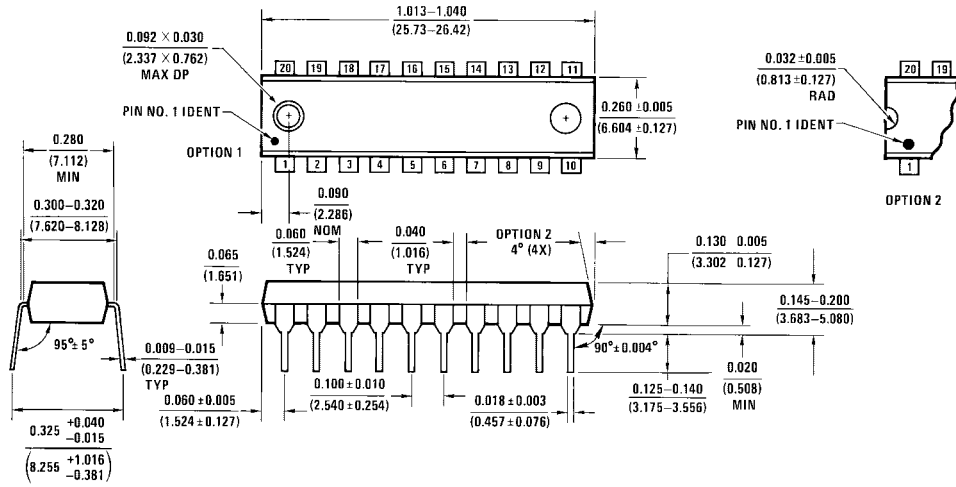
NOTES:

- 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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