

# 3-STATE Octal D-Type Flip-Flop

## MM74HC374

### General Description

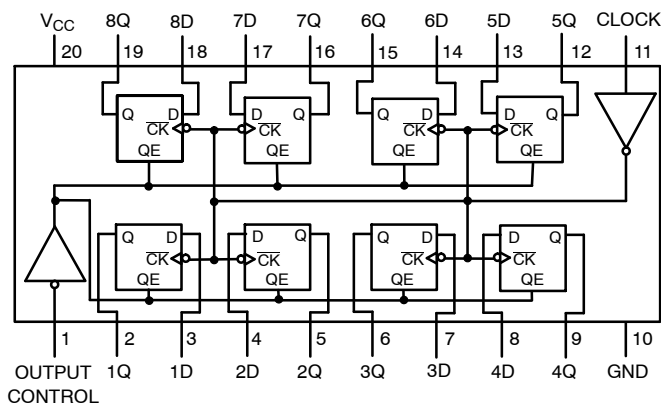
The MM74HC374 high speed Octal D-Type Flip-Flops utilize advanced silicon-gate CMOS technology. They possess the high noise immunity and low power consumption of standard CMOS integrated circuits, as well as the ability to drive 15 LS-TTL loads. Due to the large output drive capability and the 3-STATE feature, these devices are ideally suited for interfacing with bus lines in a bus organized system.

These devices are positive edge triggered flip-flops. Data at the D inputs, meeting the setup and hold time requirements, are transferred to the Q outputs on positive going transitions of the CLOCK (CK) input. When a high logic level is applied to the OUTPUT CONTROL (OC) 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 pinout compatible with the standard 74LS logic family. All inputs are protected from damage due to static discharge by internal diode clamps to VCC and ground.

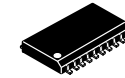
### Features

- Typical Propagation Delay: 20 ns
- Wide Operating Voltage Range: 2–6 V
- Low Input Current: 1  $\mu$ A Maximum
- Low Quiescent Current: 160  $\mu$ A Maximum
- Compatible with Bus-oriented Systems
- Output Drive Capability: 15 LS-TTL Loads
- This is a Pb-Free Device



Pin Assignments for SOIC and TSSOP (Top View)

Figure 1. Connection Diagram



SOIC-20 WB  
CASE 751D-05

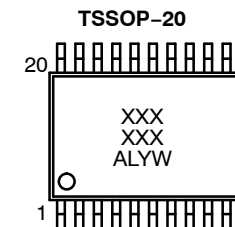
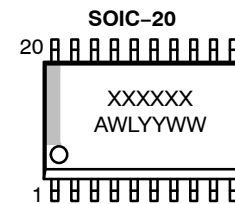


SOIC-20, 300 mils  
CASE 751BJ-01



TSSOP-20 WB  
CASE 948E

### MARKING DIAGRAMS



XXXXXX = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot Number  
Y = Year  
WW, YW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

## TRUTH TABLE

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

## NOTES:

H = HIGH Level  
 L = LOW Level  
 X = Don't Care  
 ↑ = Transition from LOW-to-HIGH  
 Z = High Impedance State  
 Q<sub>0</sub> = The level of the output before steady state input conditions were established.

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Symbol	Rating		Value	Unit
V <sub>CC</sub>	Supply Voltage		−0.5 to +6.5 V	V
V <sub>IN</sub>	DC Input Voltage		−0.5 to V <sub>CC</sub> +0.5 V	V
V <sub>OUT</sub>	DC Output Voltage		−0.5 to V <sub>CC</sub> +0.5 V	V
I <sub>IK</sub> , I <sub>OK</sub>	Clamp Diode Current		±20	mA
I <sub>OUT</sub>	DC Output Current, per pin		±35	mA
I <sub>CC</sub>	DC V <sub>CC</sub> or GND Current, per pin		±70	mA
T <sub>STG</sub>	Storage Temperature Range		−65 to +150	°C
P <sub>D</sub>	Power Dissipation	SOIC	1302	mW
		TSSOP	833	mW
T <sub>L</sub>	Lead Temperature (Soldering 10 seconds)		260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Unless otherwise specified all voltages are referenced to ground.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Supply Voltage		2	6	V
V <sub>IN</sub> , V <sub>OUT</sub>	DC Input or Output Voltage		0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature Range		−55	+125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise or Fall Times	V <sub>CC</sub> = 2.0 V	–	1000	ns
		V <sub>CC</sub> = 4.5 V	–	500	ns
		V <sub>CC</sub> = 6.0 V	–	400	ns

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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## DC ELECTRICAL CHARACTERISTICS (Note 2)

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	Unit
				Typ	Guaranteed Limits			
V <sub>IH</sub>	Minimum HIGH Level Input Voltage		2.0 V		1.5	1.5	1.5	V
			4.5 V		3.15	3.15	3.15	V
			6.0 V		4.2	4.2	4.2	V
V <sub>IL</sub>	Maximum LOW Level Input Voltage		2.0 V		0.5	0.5	0.5	V
			4.5 V		1.35	1.35	1.35	V
			6.0 V		1.8	1.8	1.8	V
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0 V	2.0	1.9	1.9	1.9	V
			4.5 V	4.5	4.4	4.4	4.4	V
			6.0 V	6.0	5.9	5.9	5.9	V
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 6.0 mA  I <sub>OUT</sub>   ≤ 7.8 mA	4.5 V	4.2	3.98	3.84	3.7	V
			6.0 V	5.7	5.48	5.34	5.2	V
V <sub>OL</sub>	Maximum LOW Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 20 μA	2.0 V	0	0.1	0.1	0.1	V
			4.5 V	0	0.1	0.1	0.1	V
			6.0 V	0	0.1	0.1	0.1	V
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OUT</sub>   ≤ 6.0 mA  I <sub>OUT</sub>   ≤ 7.8 mA	4.5 V	0.2	0.26	0.33	0.4	V
			6.0 V	0.2	0.26	0.33	0.4	V
I <sub>IN</sub>	Maximum Input Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0 V		±0.1	±1.0	±1.0	μA
I <sub>OZ</sub>	Maximum 3-STATE Output Leakage Current	V <sub>IN</sub> = V <sub>IH</sub> , OC = V <sub>IH</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	6.0 V		±0.5	±5	±10	μA
I <sub>CC</sub>	Maximum Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0 μA	6.0 V		8.0	80	160	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. For a power supply of 5 V ±10% the worst case output voltages (V<sub>OH</sub>, and V<sub>OL</sub>) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case V<sub>IH</sub> and V<sub>IL</sub> occur at V<sub>CC</sub> = 5.5 V and 4.5 V respectively. (The V<sub>IH</sub> value at 5.5 V is 3.85 V.) The worst case leakage current (I<sub>IN</sub>, I<sub>CC</sub>, and I<sub>OZ</sub>) occur for CMOS at the higher voltage and so the 6.0 V values should be used.

## AC ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Unit
f <sub>MAX</sub>	Maximum Operating Frequency		50	35	MHz
t <sub>PHL</sub> , t <sub>PLH</sub>	Maximum Propagation Delay Clock to Q	C <sub>L</sub> = 45 pF	20	32	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	Maximum Output Enable Time	R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 45 pF	19	28	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Maximum Output Disable Time	R <sub>L</sub> = 1 kΩ, C <sub>L</sub> = 5 pF	17	25	ns
t <sub>S</sub>	Minimum Setup Time		–	20	ns
t <sub>H</sub>	Minimum Hold Time		–	5	ns
t <sub>W</sub>	Minimum Pulse Width		9	16	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# MM74HC374

## AC ELECTRICAL CHARACTERISTICS

(VCC = 2.0–6.0 V, CL = 50 pF, tr = tf = 6 ns, unless otherwise specified)

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	Unit
				Typ	Guaranteed Limits			
f <sub>MAX</sub>	Maximum Operating Frequency	C <sub>L</sub> = 50 pF	2.0 V 4.5 V 6.0 V		6 30 35	5 24 28	4 20 23	MHz MHz MHz
t <sub>PHL</sub> , t <sub>PLH</sub>	Maximum Propagation Delay, Clock to Q	C <sub>L</sub> = 50 pF	2.0 V	68	180	225	270	ns
		C <sub>L</sub> = 150 pF	2.0 V	110	230	288	345	ns
		C <sub>L</sub> = 50 pF	4.5 V	22	36	45	48	ns
		C <sub>L</sub> = 150 pF	4.5 V	30	46	57	69	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	Maximum Output Enable Time	C <sub>L</sub> = 50 pF	6.0 V	20	31	39	46	ns
		C <sub>L</sub> = 150 pF	6.0 V	28	40	50	60	ns
		C <sub>L</sub> = 50 pF	2.0 V	50	150	189	225	ns
		C <sub>L</sub> = 150 pF	2.0 V	80	200	250	300	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Maximum Output Disable Time	C <sub>L</sub> = 50 pF	4.5 V	21	30	37	45	ns
		C <sub>L</sub> = 150 pF	4.5 V	30	40	50	60	ns
		C <sub>L</sub> = 50 pF	6.0 V	19	26	31	39	ns
		C <sub>L</sub> = 150 pF	6.0 V	26	35	44	53	ns
t <sub>s</sub>	Minimum Setup Time		2.0 V 4.5 V 6.0 V		50 9 9	60 13 11	75 15 13	ns ns ns
t <sub>H</sub>	Minimum Hold Time		2.0 V 4.5 V 6.0 V		5 5 5	30 5 5	5 5 5	ns ns ns
t <sub>w</sub>	Minimum Pulse Width		2.0 V 4.5 V 6.0 V	30 9 8	80 16 14	100 20 18	120 24 20	ns ns ns
t <sub>THL</sub> , t <sub>TLH</sub>	Maximum Output Rise and Fall Time	C <sub>L</sub> = 50 pF	2.0 V	25	60	75	90	ns
			4.5 V	7	12	15	18	ns
			6.0 V	6	10	13	15	ns
t <sub>r</sub> , t <sub>f</sub>	Maximum Input Rise and Fall Time, Clock		2.0 V		1000	1000	1000	ns
			4.5 V		500	500	500	ns
			6.0 V		400	400	400	ns
C <sub>PD</sub>	Power Dissipation Capacitance (Note 3)	(per flip–flop) OC = V <sub>CC</sub> OC = GND		30 50				pF pF
C <sub>IN</sub>	Maximum Input Capacitance			5	10	10	10	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. CPD determines the no load dynamic power consumption, PD = CPD VCC<sup>2</sup>f + ICC VCC, and the no load dynamic current consumption, IS = CPD VCC f + ICC.

## MM74HC374

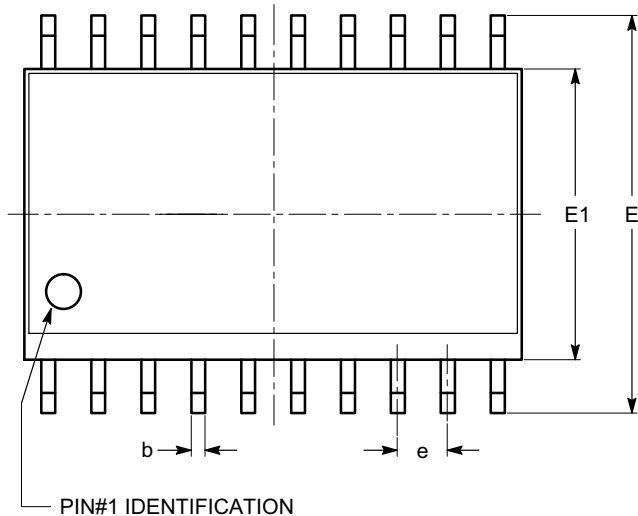
### ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
MM74HC374WM	HC374A	SOIC-20 WB (Pb-Free and Halide Free)	38 Units / Tube
MM74HC374WMX	HC374A	SOIC-20, 300 mils (Pb-Free and Halide Free)	1000 / Tape & Reel
MM74HC374MTCX	HC 374A	TSSOP-20 WB (Pb-Free)	2500 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

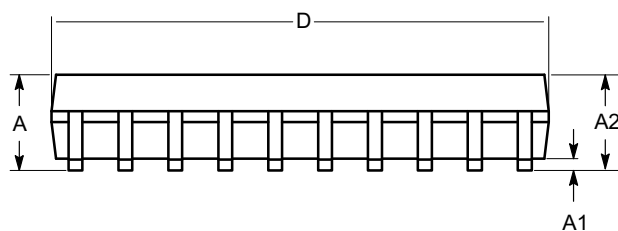
**SOIC-20, 300 mils**  
CASE 751BJ  
ISSUE O

DATE 19 DEC 2008

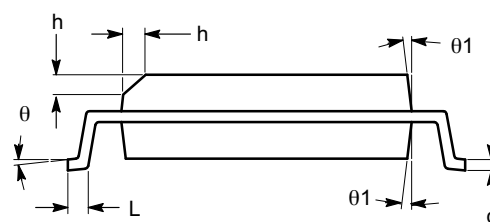


**TOP VIEW**

SYMBOL	MIN	NOM	MAX
A	2.36	2.49	2.64
A1	0.10		0.30
A2	2.05		2.55
b	0.31	0.41	0.51
c	0.20	0.27	0.33
D	12.60	12.80	13.00
E	10.01	10.30	10.64
E1	7.40	7.50	7.60
e	1.27 BSC		
h	0.25		0.75
L	0.40	0.81	1.27
$\theta$	0°		8°
$\theta 1$	5°		15°



**SIDE VIEW**



**END VIEW**

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-013.

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SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
b	0.35	0.49
c	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0°	7°

RECOMMENDED  
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC  
MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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