

## DM74AS374 Octal D-Type Edge-Triggered Flip-Flop with TRI-STATE® Outputs

### General Description

These 8-bit registers feature totem-pole TRI-STATE outputs designed specifically for driving highly-capacitive or relatively low-impedance loads. The high-impedance state and increased high-logic-level drive provide these registers with the capability of being connected directly to and driving the bus lines in a bus-organized system without need for interface or pull-up components. They are particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the AS374 are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs will be set to the logic states that were set up at the D inputs.

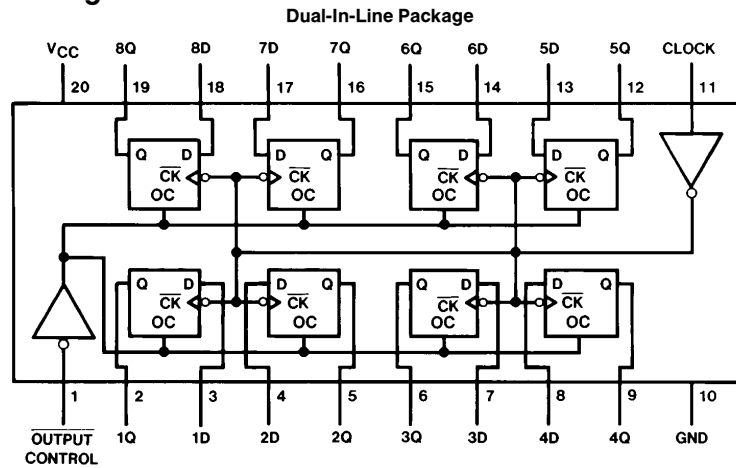
A buffered output control input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

The output control does not affect the internal operation of the flip-flops. That is, the old data can be retained or new data can be entered even while the outputs are off.

### Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and  $V_{CC}$  range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin-for-pin compatible with LS and ALS TTL counterparts
- Improved AC performance over LS and ALS TTL counterparts
- TRI-STATE buffer-type outputs drive bus lines directly

### Connection Diagram



Order Number DM74AS374WM, N  
See NS Package Number M20B or N20A

TL/F/6310-1

DM74AS374 Octal D-Type Edge-Triggered Flip-Flop with TRI-STATE Outputs

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## Absolute Maximum Ratings

Supply Voltage	7V
Input Voltage	7V
Voltage Applied to Disabled Output	5.5V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	-65°C to +150°C
Typical $\theta_{JA}$	
N Package	52.5°C/W
M Package	70.5°C/W

**Note:** This product meets application requirements of 500 temperature cycles from -65°C to +150°C.

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	V
V <sub>IH</sub>	High Level Input Voltage	2			V
V <sub>IL</sub>	Low Level Input Voltage			0.8	V
I <sub>OH</sub>	High Level Output Current			-15	mA
I <sub>OL</sub>	Low Level Output Current			48	mA
f <sub>CLK</sub>	Clock Frequency	0		125	MHz
t <sub>w</sub>	Width of Clock Pulse	High	4		ns
		Low	3		
t <sub>SU</sub>	Data Setup Time	2 ↑	0		ns
t <sub>H</sub>	Data Hold Time	3 ↑	0		ns
T <sub>A</sub>	Operating Free Air Temperature	0		70	°C

The (↑) arrow indicates the positive edge of the Clock is used for reference.

## Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>IK</sub>	Input Clamp Voltage	V <sub>CC</sub> = 4.5V, I <sub>I</sub> = -18 mA			-1.2	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = Max	2.4	3.2		V
		I <sub>OH</sub> = -2 mA, V <sub>CC</sub> = 4.5V to 5.5V	V <sub>CC</sub> - 2			
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = 4.5V, I <sub>OL</sub> = Max		0.35	0.5	V
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 7V			0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IL</sub> = 0.4V			-0.5	mA
I <sub>O</sub>	Output Drive Current	V <sub>CC</sub> = 5.5V, V <sub>O</sub> = 2.25V	-30		-112	mA
I <sub>OZH</sub>	Off-State Output Current, High Level Voltage Applied	V <sub>CC</sub> = 5.5V, V <sub>O</sub> = 2.7V			50	μA
I <sub>OZL</sub>	Off-State Output Current, Low Level Voltage Applied	V <sub>CC</sub> = 5.5V, V <sub>O</sub> = 0.4V			-50	μA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = 5.5V Outputs Open	Outputs High	77	120	mA
			Outputs Low	84	128	
			Outputs Disabled	84	128	

## Switching Characteristics over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From	To	Min	Max	Units
f <sub>MAX</sub>	Maximum Clock Frequency	V <sub>CC</sub> = 4.5V to 5.5V R <sub>L</sub> = 500Ω C <sub>L</sub> = 50 pF			125		MHz
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output		Clock	Any Q	3	8	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output		Clock	Any Q	4	9	ns
t <sub>PZH</sub>	Output Enable Time to High Level Output		Output Control	Any Q	2	6	ns
t <sub>PZL</sub>	Output Enable Time to Low Level Output		Output Control	Any Q	3	10	ns
t <sub>PHZ</sub>	Output Disable Time from High Level Output		Output Control	Any Q	2	6	ns
t <sub>PLZ</sub>	Output Disable Time from Low Level Output		Output Control	Any Q	2	6	ns

**Note 1:** See Section 5 for test waveforms and output load.

## Function Table

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

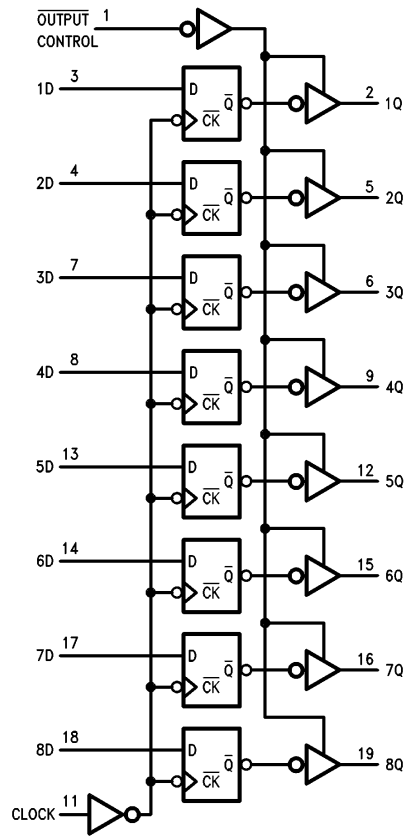
L = Low State, H = High State, X = Don't Care

↑ = Positive Edge Transition

Z = High Impedance State

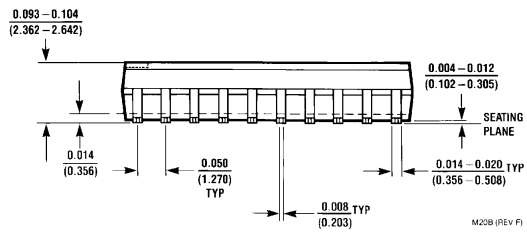
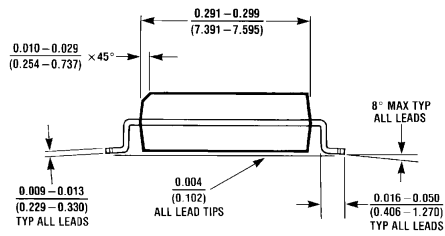
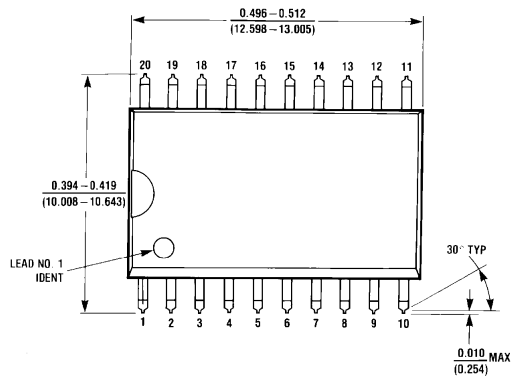
Q<sub>0</sub> = Previous Condition of Q

# Logic Diagram



TL/F/6310-2

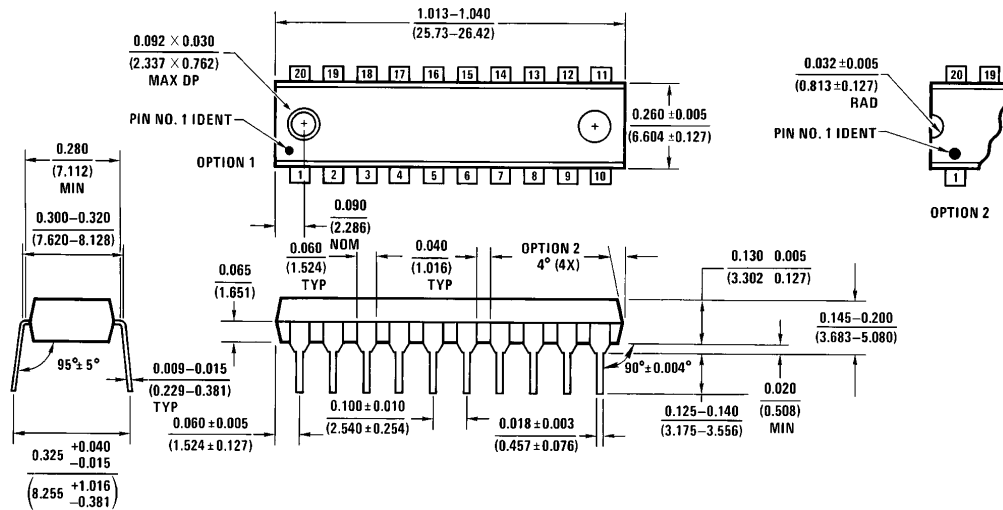
**Physical Dimensions** inches (millimeters)



**S.O. Package (M)**  
**Order Number DM74AS374WM**  
**NS Package Number M20B**

M20B (REV F)

**Physical Dimensions** inches (millimeters) (Continued)



**Molded Dual-In-Line Package (N)**  
**Order Number DM74AS374N**  
**NS Package Number N20A**

N20A (REV G)

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