

74A



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## DM54ALS74A/DM74ALS74A Dual D Positive-Edge-Triggered Flip-Flop with Preset and Clear

### General Description

The 'ALS74A contains two independent positive edge-triggered flip-flops. Each flip-flop has individual D, clock, clear and preset inputs, and also complementary Q and  $\bar{Q}$  outputs.

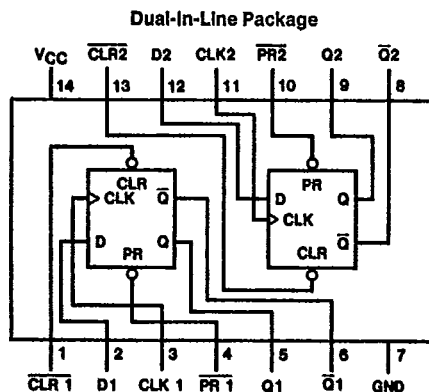
Information at input D is transferred to the Q output on the positive going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive going pulse. When the clock input is at either the high or low level, the D input signal has no effect.

Asynchronous preset and clear inputs will set or clear Q output respectively upon the application of low level signal.

### 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 Schottky and LS TTL counterpart
- Improved AC performance over LS74 at approximately half the power

### Connection Diagram



Order Number DM54ALS74AJ, DM74ALS74AM, DM74ALS74AN or DM74ALS74ASJ  
See NS Package Number J14A, M14A, M14D or N14A

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### Function Table

Inputs				Outputs	
PR	$\bar{CLR}$	CLK	D	Q	$\bar{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q <sub>0</sub>	$\bar{Q}$ <sub>0</sub>

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

↑ = Positive Edge Transition

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

\* = This condition is nonstable; it will not persist when preset and clear inputs return to their inactive (high) level. The output levels in this condition are not guaranteed to meet the  $V_{OH}$  specification.

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**Absolute Maximum Ratings**

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54ALS	-55°C to +125°C
DM74ALS	0°C to +70°C
Storage Temperature Range	-65°C to +150°C
Typical $\theta_{JA}$	
N Package	87.0°C/W
M Package	117.0°C/W

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	DM54ALS74A			DM74ALS74A			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7			0.8	V
I <sub>OH</sub>	High Level Output Current			-0.4			-0.4	mA
I <sub>OL</sub>	Low Level Output Current			4			8	mA
f <sub>CLK</sub>	Clock Frequency	0		30	0		34	MHz
t <sub>w</sub> (CLK)	Width of Clock Pulse	High	17.5		14.5			ns
		Low	17.5		14.5			ns
t <sub>w</sub>	Pulse Width Preset & Clear	Low	15		14.5			ns
t <sub>SU</sub>	Data Setup Time	Data	16 ↑		15 ↑			ns
		PRE or CLR Inactive	10 ↑		10 ↑			ns
t <sub>H</sub>	Data Hold Time		2 ↑		0 ↑			ns
T <sub>A</sub>	Free Air Operating Temperature	-55		125	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			-1.5	V
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -0.4 mA V <sub>CC</sub> = 4.5V to 5.5V	V <sub>CC</sub> - 2			V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = 4.5V V <sub>IH</sub> = 2V	54/74ALS I <sub>OL</sub> = 4 mA	0.25	0.4	V
			74ALS I <sub>OL</sub> = 8 mA	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	Clock, D		0.1	mA
			Preset, Clear		0.2	
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 2.7V	Clock, D		20	μA
			Preset, Clear		40	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IL</sub> = 0.4V	Clock, D		-0.2	mA
			Preset, Clear		-0.4	
I <sub>O</sub>	Output Drive Current	V <sub>CC</sub> = 5.5V, V <sub>O</sub> = 2.25V	-30		-112	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = 5.5V (Note 1)		2.4	4	mA

Note 1: I<sub>CC</sub> is measured with D, CLK and PRESET grounded, then with D, CLK and CLEAR grounded.

Note 2: I<sub>IL</sub> PRE and CLR pins not guaranteed to meet specifications with both PRE and CLK low.

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**Switching Characteristics**

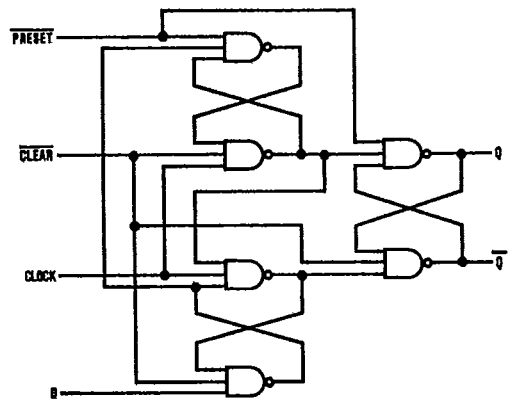
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over recommended operating free air temperature range (Note 1).

Parameter	Conditions	From	To	DM54ALS74A		DM74ALS74A		Units
				Min	Max	Min	Max	
$f_{MAX}$	$V_{CC} = 4.5V$ to $5.5V$			30		34		MHz
$t_{PLH}$	$R_L = 500\Omega$ $C_L = 50 pF$	Preset or Clear	Q or $\bar{Q}$	3	13.5	3	13	ns
$t_{PHL}$				5	17	5	15	ns
$t_{PLH}$		Clock	Q or $\bar{Q}$	5	17	5	16	ns
$t_{PHL}$				5	18	5	18	ns

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

**Logic Diagram**



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