

August 1986 Revised April 2000

DM74S74

Dual Positive-Edge-Triggered D Flip-Flops with Preset, Clear, and Complementary Outputs

General Description

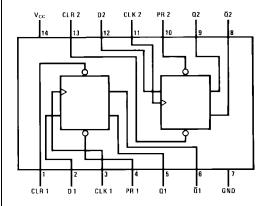
This device contains two independent positive-edge-triggered D flip-flops with complementary outputs. The information on the D input is accepted by the flip-flops on the positive going edge of the clock pulse. The triggering occurs at a voltage level and is not directly related to the transition time of the rising edge of the clock. The data on the D input may be changed while the clock is LOW or HIGH without affecting the outputs as long as setup and hold times are not violated. A low logic level on the preset or clear inputs will set or reset the outputs regardless of the logic levels of the other inputs.

Ordering Code:

Order Number	Package Number	Package Description
DM74S74M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74S74N	N14A	14-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



Function Table

	Inpu	ıts		Out	puts
PR	CLR	CLK	D	Q	Q
L	Н	Х	Х	Н	L
Н	L	Х	Χ	L	Н
L	L	Х	Χ	H*	H*
Н	Н	1	Н	Н	L
Н	Н	1	L	L	Н
Н	Н	L	Х	Q_0	\overline{Q}_0

- H = HIGH Logic Level X = Either LOW or HIGH Logic Level
- L = LOW Logic Level
- ↑ = Positive-going Transition
 * = This configuration is nonstable; that is, it will not persist when either the preset and/or clear inputs return to its inactive (HIGH) level.
- $\mathbf{Q}_0 = \mathsf{The}$ output logic level of \mathbf{Q} before the indicated input conditions were

Absolute Maximum Ratings(Note 1)

Supply Voltage 7V Input Voltage 5.5V Operating Free Air Temperature Range $0^{\circ}\text{C to } +70^{\circ}\text{C}$ Storage Temperature Range $-65^{\circ}\text{C to } +150^{\circ}\text{C}$

Note 1: 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 tables 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 _{CC}	Supply Voltage		4.75	5	5.25	V	
V _{IH}	HIGH Level Input V	HIGH Level Input Voltage				V	
V _{IL}	LOW Level Input V	oltage			0.8	V	
I _{OH}	HIGH Level Output	Current			-1	mA	
I _{OL}	LOW Level Output	Current			20	mA	
f _{CLK}	Clock Frequency (Note 2)		0	110	75	MHz	
f _{CLK}	Clock Frequency (N	Note 3)	0	95	65	MHz	
t _W	Pulse Width	Clock HIGH	6				
	(Note 2)	Clock LOW	7.3			ns	
		Clear LOW	7			115	
		Preset LOW	7				
t _W	Pulse Width	Clock HIGH	8				
	(Note 3)	Clock LOW	9				
		Clear LOW	9			ns	
		Preset LOW	9				
t _{SU}	Setup Time (Note 2)(Note 4)		3↑			ns	
t _{SU}	Setup Time (Note 3)(Note 4)		3↑			ns	
t _H	Input Hold Time (Note 2)(Note 4)		2↑			ns	
t _H	Input Hold Time (Note 3)(Note 4)		2↑			ns	
T _A	Free Air Operating Temperature		0		70	°C	

Note 2: $C_L = 15$ pF, $R_L = 280\Omega$, $T_A = 25$ °C and $V_{CC} = 5V$.

Note 3: $C_L = 50$ pF, $R_L = 280\Omega$, $T_A = 25$ °C and $V_{CC} = 5V$.

Note 4: The symbol $(\hat{1})$ indicates the rising edge at the clock pulse is used for reference.

Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 5)	Max	Units
VI	Input Clamp Voltage	$V_{CC} = Min, I_I = -18 \text{ mA}$				-1.2	V
V _{OH}	HIGH Level	V _{CC} = Min, I _{OH} = Max		2.7	3.4		V
	Output Voltage	$V_{IL} = Max, V_{IH} = Min$		2.1	5.4		V
V _{OL}	LOW Level	V _{CC} = Min, I _{OL} = Max				0.5	V
	Output Voltage	$V_{IH} = Min, V_{IL} = Max$				0.5	V
I _I	Input Current @ Max Input Voltage	$V_{CC} = Max, V_I = 5.5V$				1	mA
I _{IH}	HIGH Level	V _{CC} = Max	D			50	
	Input Current	$V_I = 2.7V$	Clear			150	μА
			Preset			100	μΛ
			Clock			100	
I _{IL}	LOW Level	V _{CC} = Max	D			-2	
	Input Current	$V_I = 0.5V$	Clear			-6	mA
		(Note 6)	Preset			-4	IIIA
			Clock			-4	
Ios	Short Circuit Output Current	V _{CC} = Max (Note 7)		-40		-100	mA
I _{CC}	Supply Current	V _{CC} = Max, (Note 8)	•		30	50	mA

Note 5: All typicals are at $V_{CC} = 5V$, $T_A = 25^{\circ}C$.

Note 6: Clear is tested with preset HIGH and preset is tested with clear HIGH.

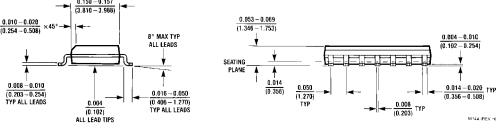
Note 7: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 8: With all outputs OPEN, I_{CC} is measured with the Q and \overline{Q} outputs HIGH in turn. At the time of measurement, the clock is grounded.

Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25^{\circ}C$

	Parameter			$R_L = 280\Omega$			
Symbol		From (Input) To (Output)	C _L = 15 pF		C _L = 50 pF		Units
			Min	Max	Min	Max	1
f _{MAX}	Maximum Clock Frequency		75		65		MHz
t _{PLH}	Propagation Delay Time	Preset to Q		6		9	ns
	LOW-to-HIGH Level Output	Flesel to Q					
t _{PLH}	Propagation Delay Time	Clear to Q		6		9	ns
	LOW-to-HIGH Level Output	Clear to Q		0			
t _{PHL}	Propagation Delay Time					17	ns
	HIGH-to-LOW Level Output	Preset to Q		13.5			
	(Clock HIGH)						
t _{PHL}	Propagation Delay Time	Preset to Q		8		14	ns
	HIGH-to-LOW Level Output						
	(Clock LOW)						
t _{PHL}	Propagation Delay Time						
	HIGH-to-LOW Level Output	Clear to Q		13.5		16	ns
	(Clock HIGH)						
t _{PHL}	Propagation Delay Time	Clear to Q		8		13	ns
	HIGH-to-LOW Level Output						
	(Clock LOW)						
t _{PLH}	Propagation Delay Time	Clock to Q or Q		9		12	ns
	LOW-to-HIGH Level Output			3		12	115
t _{PHL}	Propagation Delay Time	Clock to Q or Q		9		14	ns
	HIGH-to-LOW Level Output	CIUCK IU Q UI Q		3		1,4	113



14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow Package Number M14A

N144 (REV.E)

Physical Dimensions inches (millimeters) unless otherwise noted (Continued) 0.740 - 0.770(18.80 - 19.56)0.090 (2.286) 14 13 12 11 10 9 8 14 13 12 0.250 ± 0.010 PIN NO. 1 IDENT PIN NO. 1 IDENT 1 2 3 4 5 6 7 1 2 3 $\frac{0.092}{(2.337)}$ DIA 0.030 MAX (0.762) DEPTH OPTION 1 OPTION 02 $\frac{0.135 \pm 0.005}{(3.429 \pm 0.127)}$ 0.300 - 0.320 $\overline{(7.620 - 8.128)}$ 0.065 $\frac{0.145 - 0.200}{(3.683 - 5.080)}$ 0.060 4° TYP Optional (1.524) (1.651) 0.008-0.016 TYP 0.020 (0.203 - 0.406)(0.508) 0.125 - 0.150 0.075 ± 0.015 $\overline{(3.175 - 3.810)}$ 0.280 (1.905 ± 0.381) (7.112) MIN 0.014 - 0.0230.100 ± 0.010 (2.540 ± 0.254) TYP (0.356 - 0.584) $\frac{0.050\pm0.010}{(1.270-0.254)}$ TYP 0.325 ^{+0.040} -0.015 $8.255 + 1.016 \\ -0.381$

14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N14A

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- 2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com