

# DUAL J-K EDGE-TRIGGERED FLIP-FLOP

# S54H103 N74H103

S54H103-A,F,W • N74H103-A,F

DIGITAL 54/74 TTL SERIES

## DESCRIPTION

These dual monolithic J-K flip-flops are negative-edge-triggered. They feature individual J, K, clock, and asynchronous clear inputs to each flip-flop. When the clock goes high, the inputs are enabled and data will be accepted. Logical state of J and K inputs may be allowed to change when the clock pulse is in a high state and bistable will perform according to the truth table as long as minimum setup times are observed. Input data are transferred to the outputs on the negative edge of the clock pulse.

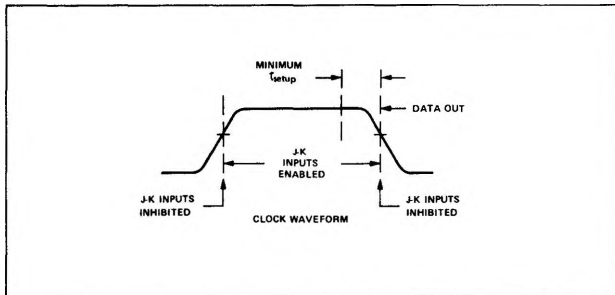
## TRUTH TABLE

J	K	$t_n$	$t_{n+1}$	Q
0	0			$Q_n$
0	1			0
1	0			1
1	1			$\bar{Q}_n$

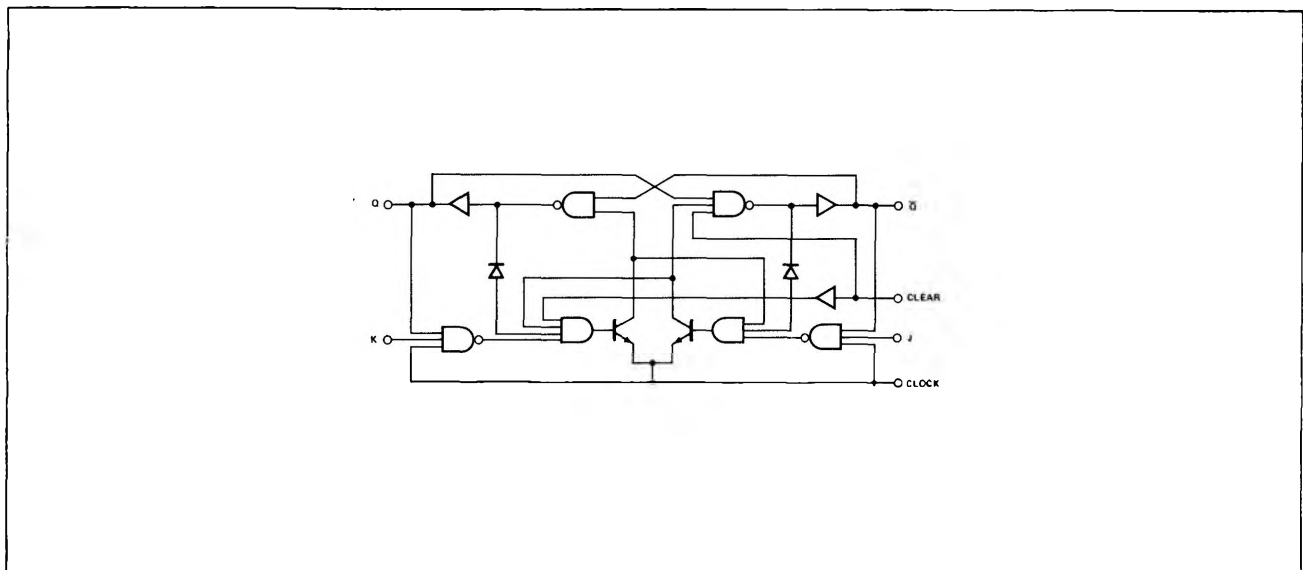
### NOTES:

1.  $t_n$  = Bit time before clock pulse
2.  $t_{n+1}$  = Bit time after clock pulse

## CLOCK WAVEFORM

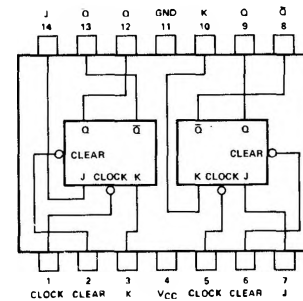


## LOGIC DIAGRAM (each flip-flop)

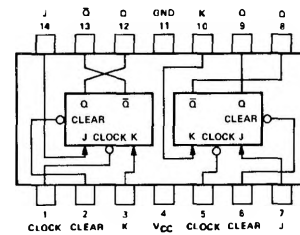


## PIN CONFIGURATIONS

### W PACKAGE



### A,F PACKAGE



SIGNETICS DIGITAL 54/74 TTL SERIES – S54H103 • N74H103

RECOMMENDED OPERATING CONDITIONS

	MIN	NOM	MAX	UNIT
Supply Voltage $V_{CC}$ : S54H103 Circuits	4.5	5	5.5	V
N74H103 Circuits	4.75	5	5.25	V
Operating Free-Air Temperature Range, $T_A$ : S54H103 Circuits	-55	25	125	$^{\circ}$ C
N74H103 Circuits	0	25	70	$^{\circ}$ C
Normalized Fan-Out from each Output, N			10	
Width of Clock Pulse, $t_{p(\text{clock})}$	10			ns
Width of Clear Pulse, $t_{p(\text{clear})}$	16			ns
Input Setup Time, $t_{\text{setup}}$ : Logical 1	10			ns
Logical 0	13			ns
Input Hold Time, $t_{\text{hold}}$	0			ns
Clock Pulse Transition Time, $t_0$			150	ns

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

PARAMETER	TEST CONDITIONS *	MIN	TYP <sup>†</sup>	MAX	UNIT
$V_{in(1)}$ Input voltage required to ensure logical 1 at any input terminal		2			V
$V_{in(0)}$ Input voltage required to ensure logical 0 at any input terminal				0.8	V
$V_{out(1)}$ Logical 1 output voltage	$V_{CC} = \text{MIN}, I_{\text{load}} = -500\mu\text{A}$	2.4	3.2		V
$V_{out(0)}$ Logical 0 output voltage	$V_{CC} = \text{MIN}, I_{\text{sink}} = 20\text{mA}$		0.25	0.4	V
$I_{in(0)}$ Logical 0 level input current at J, K, or clear	$V_{CC} = \text{MAX}, V_{in} = 0.4\text{V}$		-1	-2	mA
$I_{in(0)}$ Logical 0 level input current at clock	$V_{CC} = \text{MAX}, V_{in} = 0.4\text{V}$		-3	-4.8	mA
$I_{in(1)}$ Logical 1 level input current at J or K	$V_{CC} = \text{MAX}, V_{in} = 2.4\text{V}$			50	$\mu\text{A}$
	$V_{CC} = \text{MAX}, V_{in} = 5.5\text{V}$			1	mA
$I_{in(1)}$ Logical 1 level input current at clock	$V_{CC} = \text{MAX}, V_{in} = 2.4\text{V}$	0		-1	mA
	$V_{CC} = \text{MAX}, V_{in} = 5.5\text{V}$			1	mA
$I_{in(1)}$ Logical 1 level input current at clear	$V_{CC} = \text{MAX}, V_{in} = 2.4\text{V}$			100	$\mu\text{A}$
	$V_{CC} = \text{MAX}, V_{in} = 5.5\text{V}$			1	mA
$I_{OS}$ Short-circuit output current **	$V_{CC} = \text{MAX}, V_{in} = 0$	-40		-100	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$		40	76	mA

SWITCHING CHARACTERISTICS,  $V_{CC} = 5\text{V}, T_A = 25^{\circ}\text{C}, N = 10$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{\text{clock}}$ Maximum input clock frequency	$C_L = 25\text{pF}, R_L = 280\Omega$	40	50		MHz
$t_{pd1}$ Propagation delay time to logical 1 level from clear to output	$C_L = 25\text{pF}, R_L = 280\Omega$		8	12	ns
$t_{pd0}$ Propagation delay time to logical 0 level from clear to output (clock low)	$C_L = 25\text{pF}, R_L = 280\Omega$		23	35	ns
$t_{pd0}$ Propagation delay time to logical 0 level from clear to output (clock high)	$C_L = 25\text{pF}, R_L = 280\Omega$		15	20	ns
$t_{pd1}$ Propagation delay time to logical 1 level from clock to output	$C_L = 25\text{pF}, R_L = 280\Omega$	5	10	15	ns
$t_{pd0}$ Propagation delay time to logical 0 level from clock to output	$C_L = 25\text{pF}, R_L = 280\Omega$	8	16	20	ns

\* For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.

\*\* Not more than one output should be shorted at a time, and duration of short-circuit test should not exceed one second.

† All typical values are at  $V_{CC} = 5\text{V}, T_A = 25^{\circ}\text{C}$ .