MOTOROLA

SN54ALS109
SN74ALS109

Advanced Information

DESCRIPTION — The SN54ALS/74ALS109 consists of two high speed completely independent transition clocked $J\overline{K}$ flip-flops. The clocking operation is independent of rise and fall times of the clock waveform. The $J\overline{K}$ design allows operation as a D flip-flop by simply connecting the J and $\overline{K}$ pins together.

DUAL JK POSITIVE EDGE-TRIGGERED FLIP-FLOP

ADVANCED LOW POWER SCHOTTKY

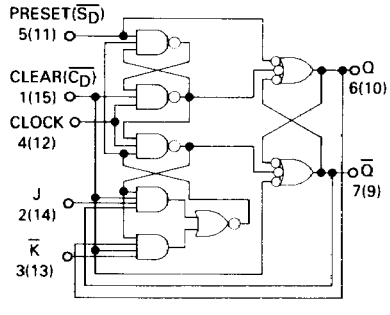
MODE SELECT — TRUTH TABLE

OPERATING MODE	INPUTS				OUTPUTS	
	$\overline{S}_D$	$\overline{C}_D$	J	$\overline{K}$	Q	$\overline{Q}$
Preset	L	H	X	X	H	L
Reset (Clear)	H	L	X	X	L	H
*Underdetermined	L	L	X	X	H	H
Load "1" (Set)	H	H	h	h	H	L
Hold	H	H	l	h	q	$\overline{q}$
Toggle	H	H	h	l	$\overline{q}$	q
Load "0" (Reset)	H	H	l	l	L	H

*Both outputs will be HIGH while both $\overline{S}_D$ and $\overline{C}_D$ are LOW, but the output states are unpredictable if $\overline{S}_D$ and $\overline{C}_D$ go HIGH simultaneously.

H, h = HIGH Voltage Level
L, l = LOW Voltage Level
X = Don't Care
l,h(q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the LOW to HIGH clock transition.

LOGIC DIAGRAM



V_{CC} = Pin 16
GND = Pin 8

J Suffix — Case 620-06
N Suffix — Case 648-05

5

GUARANTEED OPERATING RANGES

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
V_{CC}	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T_A	Operating Ambient Temperature Range	54 74	−55 0	25 25	125 70	°C
I_{OH}	Output Current — High	54,74			−0.4	mA
I_{OL}	Output Current — Low	54 74			4.0 8.0	mA

This document contains information on a new product. Specifications and information herein are subject to change without notice.

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER		LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS	TEST CONDITIONS	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage	54			0.8	V	Guaranteed Input LOW Voltage for All Inputs	
		74			0.8			
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA	
V_{OH}	Output HIGH Voltage	54	2.5	3.4		V	V_{CC} = MIN, I_{OH} = −400 μA, V_{IN} = V_{IH} or V_{IL} per Truth Table	
		74	2.7	3.4		V		
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	V	I_{OL} = 4.0 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = I_{OL} 8.0 mA	
I_{IH}	Input HIGH Current J, $\overline{K}$ Clock, Set, Clear				20	μA	V_{CC} = MAX, V_{IN} = 2.7 V	
	J, $\overline{K}$, Clock, Set, Clear				0.1	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current J, $\overline{K}$, $\overline{Clock}$ $\overline{S_D}$, $\overline{C_D}$				−0.2 −0.4	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Output Short Circuit Current		−60		−150	mA	V_{CC} = MAX, V_{OUT} = 0 V	
I_{CC}	Power Supply Current				4.0	mA	V_{CC} = MAX, V_{CP} = 0 V	

AC CHARACTERISTICS: T_A = 25°C

SYMBOL	PARAMETER		LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS
f_{MAX}	Maximum Clock Frequency		30			MHz
t_{PLH} t_{PHL}	Propagation Delay, Clock to Output				20 30	ns
t_{PLH}	Propagation Delay,				15	ns
t_{PHL}	Preset or Clear to Output	CP = L			25	
t_{PHL}		CP = H			35	

AC SETUP REQUIREMENTS: T_A = 25°C

SYMBOL	PARAMETER	LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS
t_w	Clock Pulse Width (HIGH)	18			ns
t_w	Set or Clear Pulse Width	15			ns
t_s	Setup Time, Data to Clock	20			ns
t_h	Hold Time, Data to Clock	0			ns

Fig. 1