

SN54ALS113A, SN74ALS113A DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS WITH PRESET

SDAS200 – D2661, APRIL 1982 – REVISED MAY 1986

- Fully Buffered to Offer Maximum isolation from External Disturbance
- Package Options Include Plastic Small Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

TYPE	TYPICAL MAXIMUM CLOCK FREQUENCY	TYPICAL POWER DISSIPATION PER FLIP-FLOP
'ALS113A	40 MHz ($C_L=15$ pF)	6 mW

description

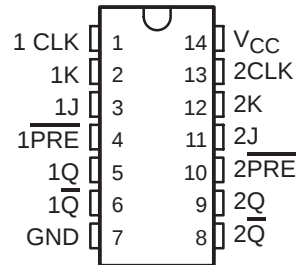
These devices contain two independent J-K negative-edge-triggered flip-flops. A low level at the Preset input sets the outputs regardless of the levels of the other inputs. When Preset $\overline{PRE}$ is inactive (high), data at the J and K inputs meeting the setup time requirements are transferred to the outputs on the negative-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the fall time of the clock pulse. Following the hold time interval, data at the J and K inputs may be changed without affecting the levels at the outputs. These versatile flip-flops can perform as toggle flip-flops by tying J and K high.

The SN54ALS113A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS113A is characterized for operation from 0°C to 70°C .

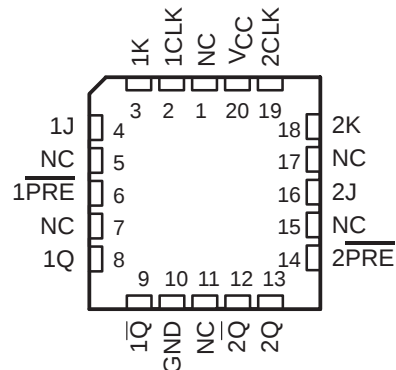
FUNCTION TABLE

INPUTS				OUTPUTS	
PRE	CLK	J	K	Q	$\overline{Q}$
L	X	X	X	H	L
H	$\downarrow$	L	L	Q_0	$\overline{Q}_0$
H	$\downarrow$	H	L	H	L
H	$\downarrow$	L	H	L	H
H	$\downarrow$	H	H	TOGGLE	TOGGLE
H	H	X	X	Q_0	$\overline{Q}_0$

SN54ALS113A . . . J PACKAGE
SN74ALS113A . . . D OR N PACKAGE
(TOP VIEW)

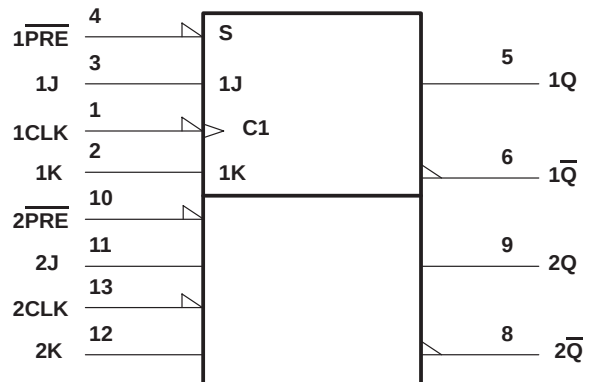


SN54ALS113A . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

logic symbol†



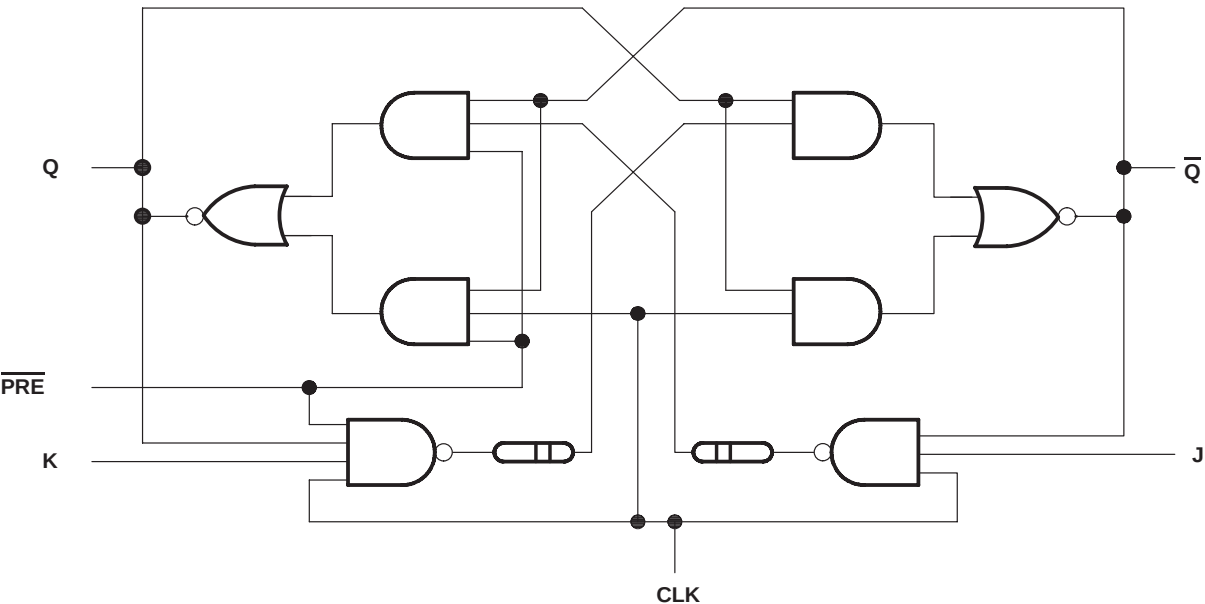
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

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logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Operating free-air temperature range: SN54ALS113A	-55°C to 125°C
SN74ALS113A	0°C to 70°C
Storage temperature range	-65°C to 150°C

recommended operating conditions

			SN54ALS113A			SN74ALS113A			UNIT		
			MIN	NOM	MAX	MIN	NOM	MAX			
V _{CC}	Supply voltage		4.5	5	5.5	4.5	5	5.5	V		
V _{IH}	High-level input voltage		2			2			V		
V _{IL}	Low-level input voltage				0.7			0.8	V		
I _{OH}	High-level output current				−0.4			−0.4	mA		
I _{OL}	Low-level output current				4			8	mA		
f _{clock}	Clock frequency		0		25	0		30	mHz		
t _w	Pulse duration	PRE low	20			10			ns		
		CLK high	20			16.5					
		CLK low	20			16.5					
t _{su}	Setup time before CLK↓	Data	25			22			ns		
		PRE inactive	20			20					
t _h	Hold time, data after CLK↓		0			0			ns		
T _A	Operating free-air temperature		−55			125			0	70	°C

SN54ALS113A, SN74ALS113A

DUAL J-K NEGATIVE-EDGE-TRIGGERED FLIP-FLOPS

WITH PRESET

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

PARAMETER		TEST CONDITIONS	SN54ALS113A			SN74ALS113A			UNIT
			MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
V_{IK}		$V_{CC} = 4.5 \text{ V}$, $I_I = -18 \text{ mA}$			-1.5			-1.5	V
V_{OH}		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$, $I_{OH} = -0.4 \text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
V_{OL}		$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	V
		$V_{CC} = 4.5 \text{ V}$, $I_{OL} = 8 \text{ mA}$					0.35	0.5	
I_I	J, K, or CLK	$V_{CC} = 5.5 \text{ V}$, $V_I = 7 \text{ V}$		0.1			0.1		mA
	$\overline{\text{PRE}}$			0.2			0.2		
I_{IH}	J, K, or CLK	$V_{CC} = 5.5 \text{ V}$, $V_I = 2.7 \text{ V}$		20			20		μA
	$\overline{\text{PRE}}$			40			40		
I_{IL}	J, K, or CLK	$V_{CC} = 5.5 \text{ V}$, $V_I = 0.4 \text{ V}$		-0.2			-0.2		mA
	$\overline{\text{PRE}}$			-0.4			-0.4		
$I_{O\ddagger}$		$V_{CC} = 5.5 \text{ V}$, $V_O = 2.25 \text{ V}$	-30		-112	-30		-112	mA
I_{CC}		$V_{CC} = 5.5 \text{ V}$, See Note 1		2.5	4.5		2.5	4.5	mA

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

[‡] The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

NOTE 1: I_{CC} is measured with J, K, CLK, and $\overline{\text{PRE}}$ grounded, then with J, K, CLK, and $\overline{\text{CLR}}$ grounded.

switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 500 Ω, T _A = MIN to MAX				UNIT
			SN54ALS113A		SN74ALS113A		
			MIN	MAX	MIN	MAX	
f _{max}			25		30		MHz
t _{PLH}	$\overline{\text{PRE}}$	Q or $\overline{\text{Q}}$	3	23	3	14	ns
t _{PHL}			4	26	4	18	
t _{PLH}	CLK	Q or $\overline{\text{Q}}$	3	22	3	15	ns
t _{PHL}			5	23	5	19	

NOTE 2: Load circuit and voltage waveforms are shown in Section 1.



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