

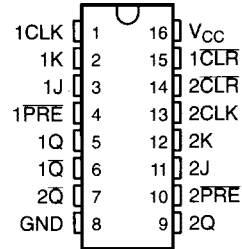
# SN74LVC112

## DUAL NEGATIVE-EDGE-TRIGGERED J-K FLIP-FLOP WITH CLEAR AND PRESET

JANUARY 1993

- **Space-Saving Package Option:**  
Shrink Small-Outline Package (DB)  
Features EIAJ 0.65-mm Lead Pitch
- **EPIC™ (Enhanced-Performance Implanted CMOS) Submicron Process**
- **Designed to Facilitate Incident Wave Switching for Line Impedances of 50 Ω or Greater**
- **Typical  $V_{OLP}$  (Output Ground Bounce) < 0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$**
- **Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot) > 2 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Latch-Up Performance Exceeds 250 mA Per JEDEC Standard JESD-17**
- **Package Options Include Plastic Small-Outline and Thin Shrink Small-Outline Packages**

DB, DW, OR PW PACKAGE  
(TOP VIEW)



### description

This dual negative-edge-triggered J-K flip-flop is designed for 2.7-V to 3.6-V  $V_{CC}$  operation.

A low level at the preset ( $\overline{\text{PRE}}$ ) or clear ( $\overline{\text{CLR}}$ ) inputs sets or resets the outputs regardless of the levels of the other inputs. When  $\overline{\text{PRE}}$  and  $\overline{\text{CLR}}$  are inactive (high), data at the J and K inputs meeting the setup time requirements is 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 rise 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. The SN74LVC112 can perform as a toggle flip-flop by tying J and K high.

The SN74LVC112 is packaged in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN74LVC112 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

FUNCTION TABLE

INPUTS					OUTPUTS	
PRE	CLR	CLK	J	K	Q	$\overline{Q}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H <sup>†</sup>	H <sup>†</sup>
H	H	↓	L	L	Q <sub>0</sub>	$\overline{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	Toggle	
H	H	H	X	X	Q <sub>0</sub>	$\overline{Q}_0$

<sup>†</sup> This configuration is nonstable; that is, it will not persist when PRE or CLR returns to its inactive (high) level.

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PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

  
**TEXAS  
INSTRUMENTS**

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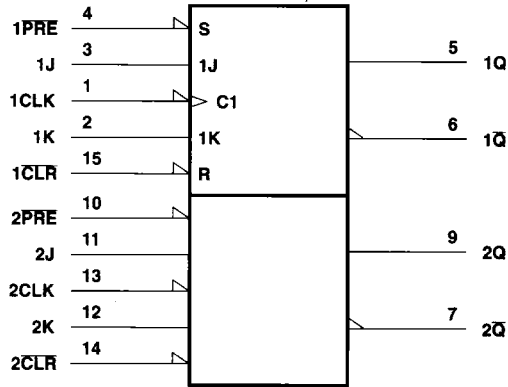
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PRODUCT PREVIEW

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**DUAL NEGATIVE-EDGE-TRIGGERED J-K FLIP-FLOP**  
**WITH CLEAR AND PRESET**

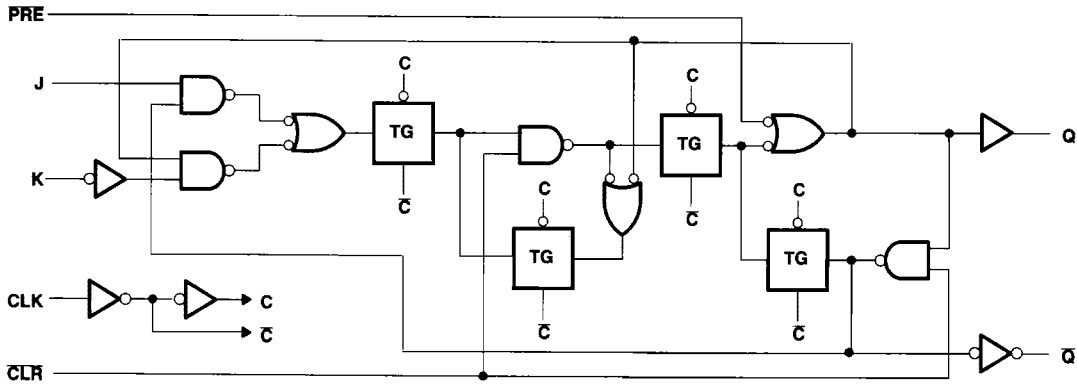
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**logic symbol†**



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

**logic diagram, each flip-flop (positive logic)**



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### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage range, $V_{CC}$ .....	-0.5 V to 4.6 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to 4.6 V
Output voltage range, $V_O$ (see Notes 1 and 2) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	±50 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	±50 mA
Continuous current through $V_{CC}$ or GND pins .....	±100 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air):	
DB package .....	0.4 W
DW package .....	0.85 W
PW package .....	0.4 W
Storage temperature range .....	-65°C to 150°C

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
2. This value is limited to 4.6 V maximum.

### recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	2.7	3.6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2.7$ V to 3.6 V		V
$V_{IL}$	Low-level input voltage	$V_{CC} = 2.7$ V to 3.6 V		V
$V_I$	Input voltage	0	$V_{CC}$	V
$V_O$	Output voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 2.7$ V		mA
		$V_{CC} = 3$ V		
$I_{OL}$	Low-level output current	$V_{CC} = 2.7$ V		mA
		$V_{CC} = 3$ V		
$\Delta t/\Delta v$	Input transition rise or fall rate	0	10	ns/V
$T_A$	Operating free-air temperature	-40	85	°C

NOTE 3: Unused or floating inputs must be held high or low.

<sup>‡</sup> Current duty cycle ≤ 50%,  $f \geq 1$  kHz

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub> <sup>†</sup>	MIN	TYP	MAX	UNIT
V <sub>IK</sub>	I <sub>I</sub> = -18 mA	2.7 V			-1.2	V
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA	MIN to MAX	V <sub>CC</sub> -0.2			V
	I <sub>OH</sub> = -12 mA	2.7 V	2.2			
		3 V	2.4			
	I <sub>OH</sub> = -24 mA	3 V	2			
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA	MIN to MAX			0.2	V
	I <sub>OL</sub> = 12 mA	2.7 V			0.4	
	I <sub>OL</sub> = 24 mA	3 V			0.55	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V			±5	μA
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V			±10	μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6 V			20	μA
ΔI <sub>CC</sub>	V <sub>CC</sub> = 3 V to 3.6 V, Other inputs at V <sub>CC</sub> or GND One input at V <sub>CC</sub> - 0.6 V,				500	μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	TBD			pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V	TBD			pF

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate values under recommended operating conditions.

PRODUCT PREVIEW