

# SN5472, SN7472

## AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH PRESET AND CLEAR

SDLS117 – DECEMBER 1983 – REVISED MARCH 1988

- Package Options Include Plastic and Ceramic DIPs and Ceramic Flat Packages
- Dependable Texas Instruments Quality and Reliability

### description

These J-K flip-flops are based on the master-slave principle and each has AND gate inputs for entry into the master section which are controlled by the clock pulse. The clock pulse also regulates the state of the coupling transistors which connect the master and slave sections. The sequence of operation is as follows:

1. Isolate slave from master
2. Enter information from AND gate inputs to master
3. Disable AND gate inputs
4. Transfer information from master to slave

The logical states of the J and K inputs must not be allowed to change when the clock pulse is in a high state.

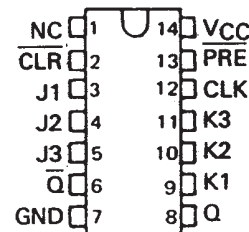
The SN5472, and the SN54H72 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7472 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE

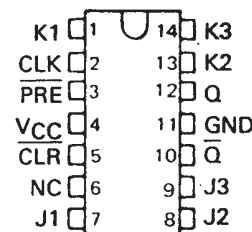
INPUTS					OUTPUTS	
$\overline{\text{PRE}}$	$\overline{\text{CLR}}$	CLK	J	K	Q	$\overline{\text{Q}}$
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	$\text{H}^{\dagger}$	$\text{H}^{\dagger}$
H	H	$\square$	L	L	$\text{Q}_0$	$\overline{\text{Q}}_0$
H	H	$\square$	H	L	H	L
H	H	$\square$	L	H	L	H
H	H	$\square$	H	H	TOGGLE	

$\dagger$  This configuration is nonstable; that is, it will not persist when either preset or clear returns to its inactive (high) level.

SN5472 . . . J PACKAGE  
SN7472 . . . N PACKAGE  
(TOP VIEW)

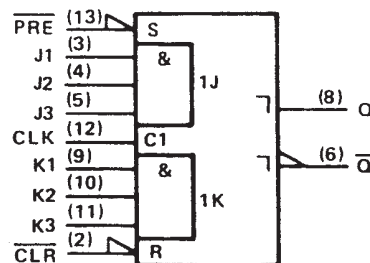


SN5472 . . . W PACKAGE  
(TOP VIEW)



NC - No internal connection

### logic symbol $\ddagger$



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

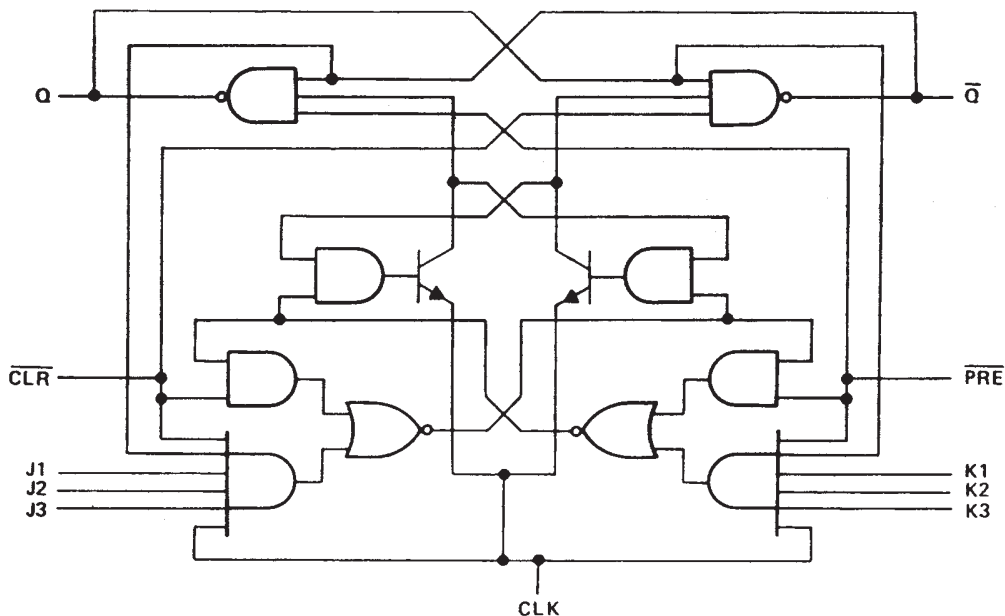
Pin numbers shown are for J and N packages.

### positive logic

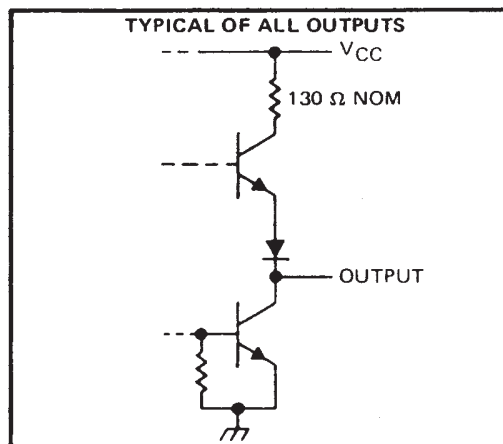
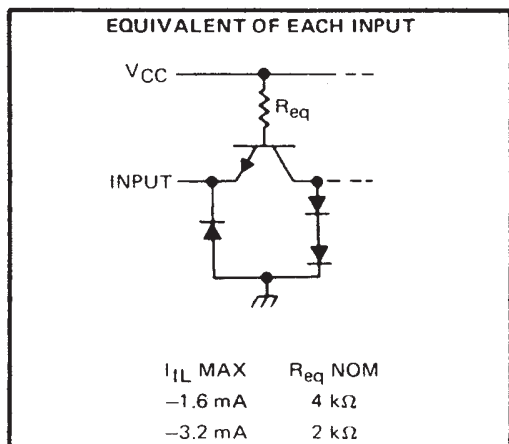
$$J = J1 \cdot J2 \cdot J3$$

$$K = K1 \cdot K2 \cdot K3$$

logic diagram (positive logic)



schematics of inputs and outputs



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

Supply voltage, $V_{CC}$ (see Note 1) .....	7 V
Input voltage .....	5.5 V
Operating free-air temperature: SN54' .....	-55°C to 125°C
SN74' .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

# SN5472, SN7472 AND-GATED J-K MASTER-SLAVE FLIP-FLOPS WITH PRESET AND CLEAR

SDLS117 – DECEMBER 1983 – REVISED MARCH 1988

## recommended operating conditions

		SN5472			SN7472			UNIT	
		MIN	NOM	MAX	MIN	NOM	MAX		
$V_{CC}$	Supply voltage	4.5	5	5.5	4.75	5	5.25	V	
$V_{IH}$	High-level input voltage	2			2			V	
$V_{IL}$	Low-level input voltage	0.8			0.8			V	
$I_{OH}$	High-level output current	-0.4			-0.4			mA	
$I_{OL}$	Low-level output current	16			16			mA	
$t_w$	Pulse duration	CLK high	20		20		ns		
		CLK low	47		47				
		PRE or CLR	25		25				
$t_{su}$	Input setup time before CLK ↑	0			0			ns	
$t_h$	Input hold time-data after CLK ↓	0			0			ns	
$T_A$	Operating free-air temperature	-55		125		0		70	°C

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

PARAMETER		TEST CONDITIONS †	SN5472			SN7472			UNIT	
			MIN	TYP‡	MAX	MIN	TYP‡	MAX		
$V_{IK}$		$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-1.5			-1.5			V	
$V_{OH}$		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -0.4 \text{ mA}$	2.4	3.4		2.4	3.4		V	
$V_{OL}$		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V	
$I_I$		$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$	1			1			mA	
$I_{IH}$	J or K	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$	40			40			$\mu\text{A}$	
	All other		80			80				
$I_{IL}$	J or K	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1.6			-1.6			mA	
	All other		-3.2			-3.2				
$I_{OS}\S$		$V_{CC} = \text{MAX}$	-20		-57	-18		-57	mA	
$I_{CC}$		$V_{CC} = \text{MAX},$ See Note 2	10		20		10		20	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

§ Not more than one output should be shorted at a time.

NOTE 2: With all outputs open,  $I_{CC}$  is measured with the Q and  $\bar{Q}$  outputs high in turn. At the time of measurement, the clock input is grounded.

## switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT	
$f_{\text{max}}$			$R_L = 400 \Omega, C_L = 15 \text{ pF}$		15	20		MHz	
$t_{PLH}$	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q or $\bar{Q}$				16	25		ns
$t_{PHL}$						25	40		ns
$t_{PLH}$	CLK	Q or $\bar{Q}$				16	25		ns
$t_{PHL}$						25	40		ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN5472J	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN5472J	<a href="#">Samples</a>
SNJ5472J	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ5472J	<a href="#">Samples</a>
SNJ5472J	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ5472J	<a href="#">Samples</a>
SNJ5472W	ACTIVE	CFP	W	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ5472W	<a href="#">Samples</a>
SNJ5472W	ACTIVE	CFP	W	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ5472W	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SNJ5472W	W	CFP	14	25	506.98	26.16	6220	NA

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP1-F14

J 14

**GENERIC PACKAGE VIEW**  
**CDIP - 5.08 mm max height**  
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4040083-5/G



J0014A



# PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

# EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE: 5X



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