

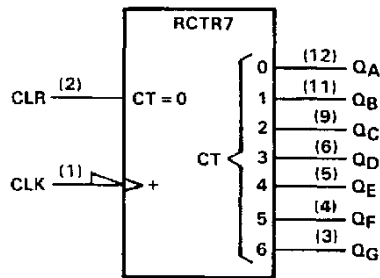
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

**description**

The 'HC4024 is an asynchronous 7-stage binary counter designed with an input pulse-shaping circuit. The outputs of all stages are available externally. A high clear signal asynchronously clears the counter and resets all outputs low. The count is advanced on the high-to-low transition of the clock pulse. Applications include time-delay circuits, counter controls, and frequency-dividing circuits.

The SN54HC4024 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74HC4024 is characterized for operation from -40°C to 85°C.

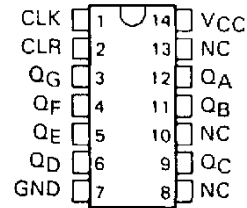
**logic symbol†**



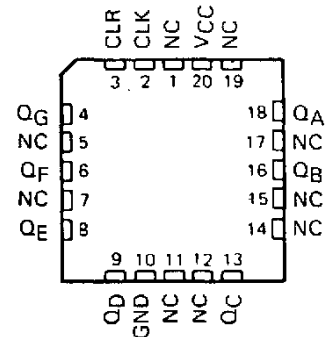
†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

SN54HC4024 . . . J PACKAGE  
SN74HC4024 . . . D OR N PACKAGE  
(TOP VIEW)



SN54HC4024 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

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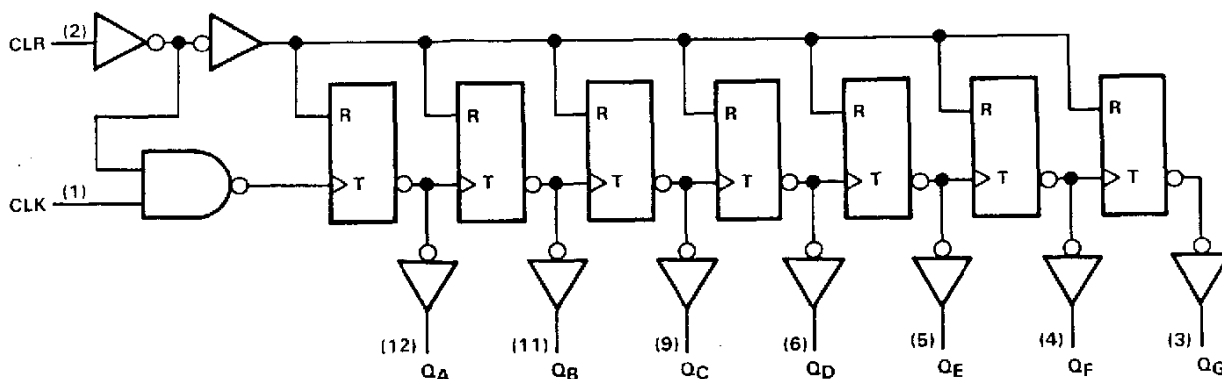


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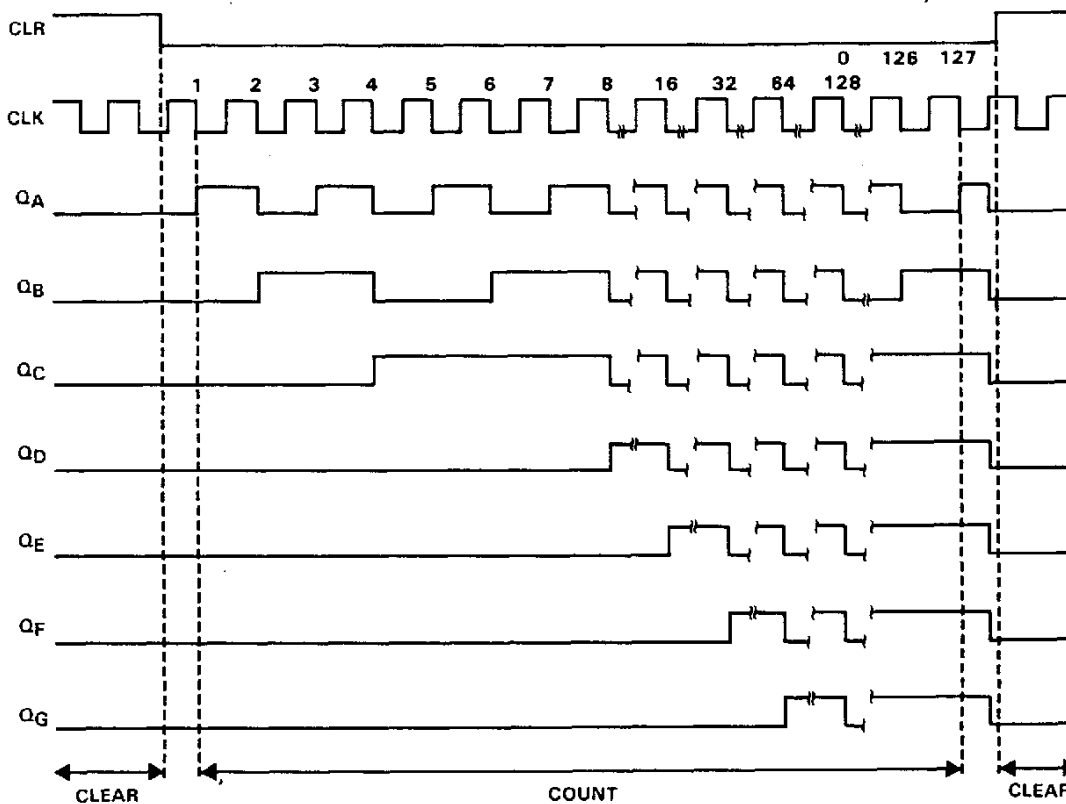
# SN54HC4024, SN74HC4024 ASYNCHRONOUS 7-BIT BINARY COUNTERS

logic diagram (positive logic)



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

typical clear and count sequence



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# SN54HC4024, SN74HC4024 ASYNCHRONOUS 7-BIT BINARY COUNTERS

## absolute maximum ratings over operating free-air temperature range†

Supply voltage, $V_{CC}$ .....	-0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 25$ mA
Continuous current through $V_{CC}$ or GND pins .....	$\pm 50$ mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package .....	300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: D or N package .....	260°C
Storage temperature range .....	-65°C to 150°C

† 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.

## recommended operating conditions

		SN54HC4024			SN74HC4024			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	2	5	6	2	5	6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 2$ V		1.5	$V_{CC} = 2$ V		1.5	V
		$V_{CC} = 4.5$ V		3.15	$V_{CC} = 4.5$ V		3.15	
		$V_{CC} = 6$ V		4.2	$V_{CC} = 6$ V		4.2	
$V_{IL}$	Low-level input voltage	$V_{CC} = 2$ V		0	$V_{CC} = 2$ V		0	V
		$V_{CC} = 4.5$ V		0	$V_{CC} = 4.5$ V		0	
		$V_{CC} = 6$ V		0	$V_{CC} = 6$ V		0	
$V_I$	Input voltage	0			$V_{CC}$			V
$V_O$	Output voltage	0			$V_{CC}$			V
$t_t$	Input transition (rise and fall) times	$V_{CC} = 2$ V		0	$V_{CC} = 2$ V		0	ns
		$V_{CC} = 4.5$ V		0	$V_{CC} = 4.5$ V		0	
		$V_{CC} = 6$ V		0	$V_{CC} = 6$ V		0	
$T_A$	Operating free-air temperature	-55			125			°C

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$		SN54HC4024		SN74HC4024		UNIT	
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -20 \mu\text{A}$	2 V	1.9	1.998		1.9		1.9	V	
		4.5 V	4.4	4.499		4.4		4.4		
		6 V	5.9	5.999		5.9		5.9		
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -4$ mA	4.5 V	3.98	4.30		3.7		3.84		
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OH} = -5.2$ mA	6 V	5.48	5.80		5.2		5.34		
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 20 \mu\text{A}$	2 V		0.002	0.1		0.1		V	
		4.5 V		0.001	0.1		0.1			0.1
		6 V		0.001	0.1		0.1			0.1
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 4$ mA	4.5 V		0.17	0.26		0.4			0.33
	$V_I = V_{IH}$ or $V_{IL}$ , $I_{OL} = 5.2$ mA	6 V		0.15	0.26		0.4		0.33	
$I_I$	$V_I = V_{CC}$ or 0	6 V		$\pm 0.1$	$\pm 100$		$\pm 1000$		nA	
$I_{CC}$	$V_I = V_{CC}$ or 0, $I_O = 0$	6 V			8		160		$\mu\text{A}$	
$C_i$		2 to 6 V		3	10		10		pF	



**SN54HC4024, SN74HC4024**  
**ASYNCHRONOUS 7-BIT BINARY COUNTERS**

timing requirements over recommended operating free-air temperature range (unless otherwise noted)

		V <sub>CC</sub>	T <sub>A</sub> = 25 °C		SN54HC4024		SN74HC4024		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>clock</sub>	Clock frequency	2 V	0	5.5	0	3.7	0	4.3	MHz
		4.5 V	0	28	0	19	0	22	
		6 V	0	33	0	22	0	25	
t <sub>w</sub>	Pulse duration	CLK high or low	2 V	90		135		115	ns
			4.5 V	18		27		23	
			6 V	15		23		20	
	CLR high	2 V	80		120		100	ns	
		4.5 V	16		24		20		
		6 V	14		20		17		
t <sub>su</sub>	Setup time, CLR low before CLK↓	2 V	80		120		100	ns	
		4.5 V	16		24		20		
		6 V	14		20		17		

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C<sub>L</sub> = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	T <sub>A</sub> = 25 °C			SN54HC4024		SN74HC4024		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>		Q <sub>A</sub>	2 V	5.5	10		3.7		4.3	MHz	
			4.5 V	28	50		19		22		
			6 V	33	60		22		26		
t <sub>pd</sub>	CLK	Q <sub>A</sub>	2 V		56	120		180		150	ns
			4.5 V		16	24		36		30	
			6 V		12	20		31		26	
t <sub>PHL</sub>	CLR	Any	2 V		61	130		195		165	ns
			4.5 V		17	26		39		32	
			6 V		13	22		33		28	
t <sub>t</sub>		Q <sub>A</sub>	2 V		28	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

C <sub>pd</sub>	Power dissipation capacitance	No load, T <sub>A</sub> = 25 °C	40 pF typ
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Note 1: Load circuits and voltage waveforms are shown in Section 1.



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**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
86012012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	86012012A SNJ54HC 4024FK	<a href="#">Samples</a>
8601201CA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	8601201CA SNJ54HC4024J	<a href="#">Samples</a>
SN54HC4024J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54HC4024J	<a href="#">Samples</a>
SNJ54HC4024FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	86012012A SNJ54HC 4024FK	<a href="#">Samples</a>
SNJ54HC4024J	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	8601201CA SNJ54HC4024J	<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.

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

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(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.

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

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FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

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



4214771/A 05/2017

### 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

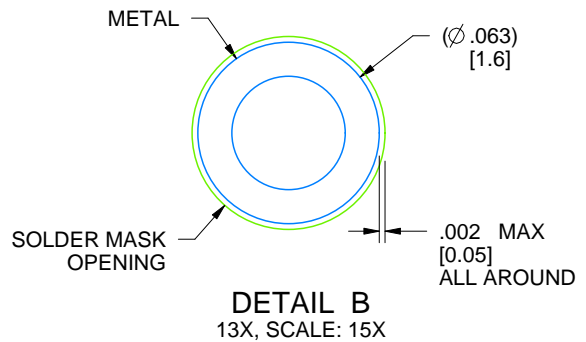
J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



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



4214771/A 05/2017

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