SN54HC4024, SN74HC4024
ASYNCHRONOUS 7-BIT BINARY COUNTERS

D2804, MARCH 1984—REVISED JUNE 1989

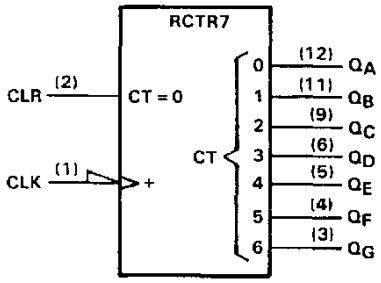
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

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.

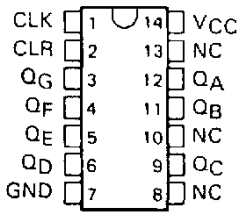
logic symbol†



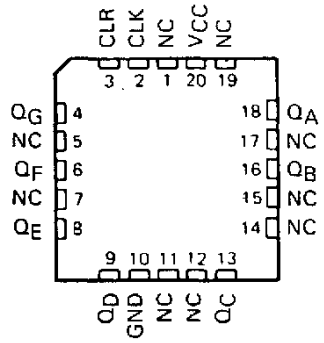
†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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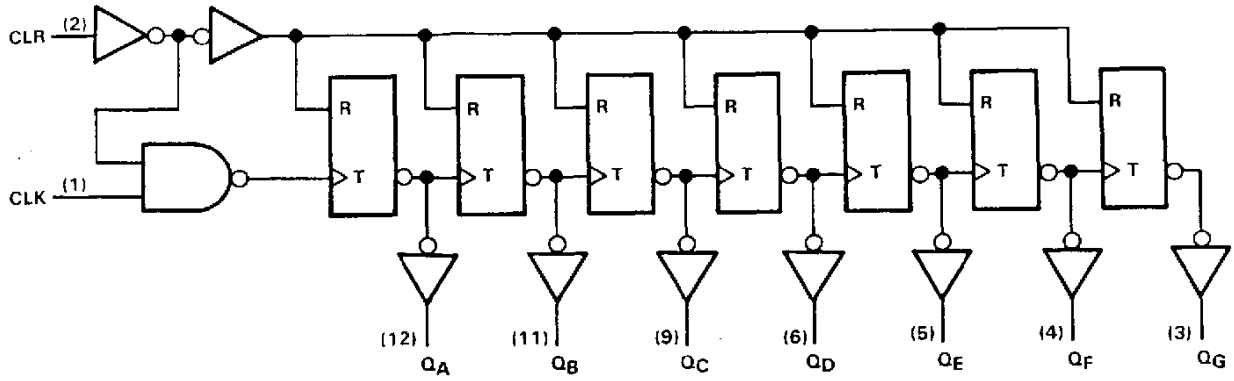
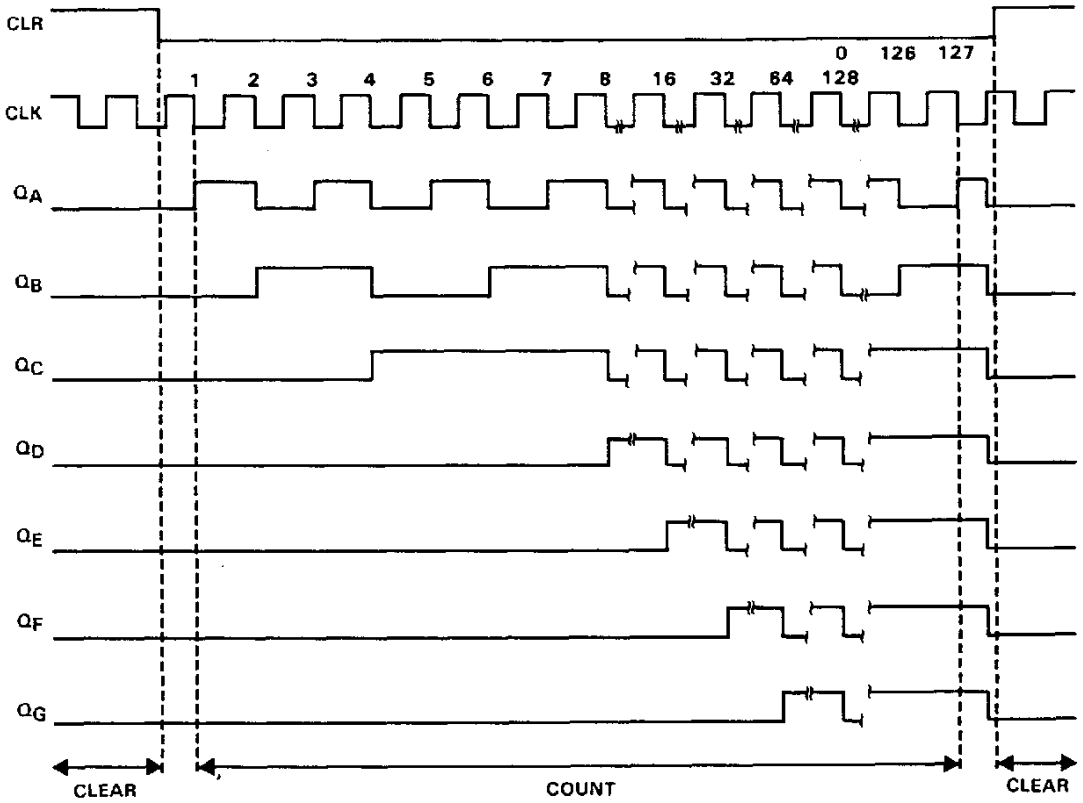
logic diagram (positive logic)



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

typical clear and count sequence



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 $V_I > V_{CC}$) . . . . . ±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$ . . . . . ±20 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±25 mA
Continuous current through V_{CC} or GND pins . . . . . ±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			1.5			V
		V_{CC} = 4.5 V	3.15			3.15			
		V_{CC} = 6 V	4.2			4.2			
V_{IL}	Low-level input voltage	V_{CC} = 2 V	0		0.3	0		0.3	V
		V_{CC} = 4.5 V	0		0.9	0		0.9	
		V_{CC} = 6 V	0		1.2	0		1.2	
V_I	Input voltage		0		V_{CC}	0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	0		V_{CC}	V
t_t	Input transition (rise and fall) times	V_{CC} = 2 V	0		1000	0		1000	ns
		V_{CC} = 4.5 V	0		500	0		500	
		V_{CC} = 6 V	0		400	0		400	
T_A	Operating free-air temperature		−55		125	−40		85	°C

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

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			SN54HC4024		SN74HC4024		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	V_I = V_{IH} or V_{IL}, I_{OH} = −20 μA	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 μA	2 V		0.002	0.1		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		±0.1	±100		±1000		±1000	nA
I_{CC}	V_I = V_{CC} or 0, I_O = 0	6 V			8		160		80	μA
C_i		2 to 6 V		3	10		10		10	pF

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

		V_{CC}	T_A = 25°C		SN54HC4024		SN74HC4024		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
f_{clock} Clock frequency		2V	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_w 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_{su} 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_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC4024		SN74HC4024		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f_{max}		Q_A	2 V	5.5	10		3.7		4.3		MHz
			4.5 V	28	50		19		22		
			6 V	33	60		22		26		
t_{pd}	CLK	Q_A	2 V		56	120		180		150	ns
			4.5 V		16	24		36		30	
			6 V		12	20		31		26	
t_{PHL}	CLR	Any	2 V		61	130		195		165	ns
			4.5 V		17	26		39		32	
			6 V		13	22		33		28	
t_t		Q_A	2 V		28	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	13		19		16	

C_{pd}	Power dissipation capacitance	No load, T_A = 25°C	40 pF typ

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

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