

SN54HC4040, SN74HC4040 ASYNCHRONOUS 12-BIT BINARY COUNTERS

D2684, DECEMBER 1982—REVISED JUNE 1989

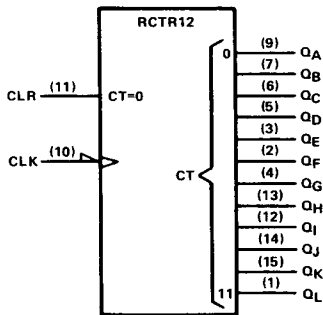
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

This device is an asynchronous 12-stage binary counter with the outputs of all stages available externally. A high level at CLR asynchronously clears the counter and resets all outputs low. The count is advanced on a high-to-low transition at CLK. Applications include time delay circuits, counter controls, and frequency-dividing circuits.

The SN54HC4040 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC4040 is characterized for operation from -40°C to 85°C .

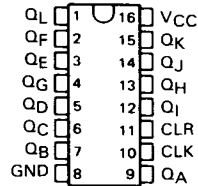
logic symbol†



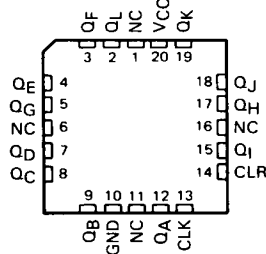
†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

SN54HC4040 . . . J PACKAGE
SN74HC4040 . . . D† OR N PACKAGE
(TOP VIEW)



SN54HC4040 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

†Contact the factory for D availability

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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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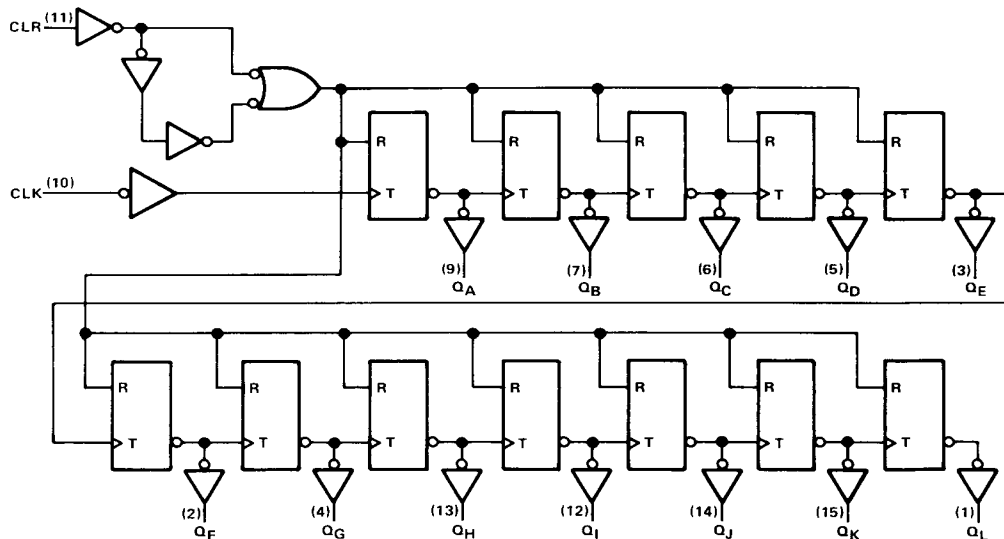
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SN54HC4040, SN74HC4040

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logic diagram (positive logic)



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

absolute maximum ratings over operating free-air temperature†

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.

SN54HC4040, SN74HC4040 **ASYNCHRONOUS 12-BIT BINARY COUNTERS**

recommended operating conditions

		SN54HC4040			SN74HC4040			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	2	5	6	2	5	6	V
V_{IH}	High-level input voltage	$V_{CC} = 2\text{ V}$ 1.5 $V_{CC} = 4.5\text{ V}$ 3.15 $V_{CC} = 6\text{ V}$ 4.2			$V_{CC} = 2\text{ V}$ 1.5 $V_{CC} = 4.5\text{ V}$ 3.15 $V_{CC} = 6\text{ V}$ 4.2			V
V_{IL}	Low-level input voltage	$V_{CC} = 2\text{ V}$ 0 $V_{CC} = 4.5\text{ V}$ 0 $V_{CC} = 6\text{ V}$ 0			$V_{CC} = 2\text{ V}$ 0 $V_{CC} = 4.5\text{ V}$ 0 $V_{CC} = 6\text{ V}$ 0			V
V_I	Input voltage	0			0			V
V_O	Output voltage	0			0			V
t_t	Input transition (rise and fall) times	$V_{CC} = 2\text{ V}$ 0 $V_{CC} = 4.5\text{ V}$ 0 $V_{CC} = 6\text{ V}$ 0			$V_{CC} = 2\text{ V}$ 0 $V_{CC} = 4.5\text{ V}$ 0 $V_{CC} = 6\text{ V}$ 0			ns
T_A	Operating free-air temperature	-55			-40			°C

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC4040		SN74HC4040		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -20\text{ }\mu\text{A}$	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} , $I_{OH} = -4\text{ mA}$	4.5 V	3.98	4.30		3.7		3.84		
V_{OL}	$V_I = V_{IH}$ or V_{IL} , $I_{OH} = -5.2\text{ mA}$	6 V	5.48	5.80		5.2		5.34		V
	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 20\text{ }\mu\text{A}$	2 V		0.002	0.1		0.1		0.1	
		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} , $I_{OL} = 4\text{ mA}$	4.5 V		0.17	0.26		0.4		0.33	
	$V_I = V_{IH}$ or V_{IL} , $I_{OL} = 5.2\text{ mA}$	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		pF

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

		V _{CC}	T _A = 25 °C			SN54HC4040		SN74HC4040		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{clock}	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 _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	70		105		90		ns
			4.5 V	14		21		18		
			6 V	12		18		15		
t _{su}	Setup time, CLR inactive before CLK†	2 V	60			90		75		ns
		4.5 V	12			18		15		
		6 V	10			15		13		

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			SN54HC4040		SN74HC4040		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
f _{max}			2 V	5.5	10		3.7		4.3		MHz
			4.5 V	28	45		19		22		
			6 V	33	53		22		25		
t _{pd}	CLK	Q _A	2 V		62	150		225		190	ns
			4.5 V		16	30		45		38	
			6 V		12	26		38		32	
t _{PHL}	CLR	Any	2 V		63	140		210		175	ns
			4.5 V		17	28		42		35	
			6 V		13	24		36		30	
t _t		Any	2 V		28	75		110		95	ns
			4.5 V		8	15		22		19	
			6 V		6	30		19		16	

C _{pd}	Power dissipation capacitance	No load, T _A = 25 °C	88 pF typ
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Note 1: Load circuits and voltage waveforms are shown in Section 1.