

SN54HC4061, SN74HC4061 ASYNCHRONOUS 14-STAGE BINARY COUNTERS AND OSCILLATORS

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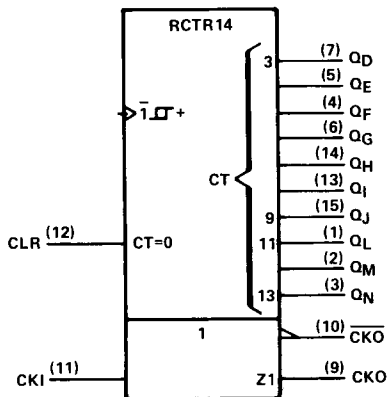
- Allows Design of Either RC or Crystal Oscillator Circuits
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

description

The 'HC4061 consists of an oscillator section and 14 ripple-carry binary counter stages. The oscillator configuration allows design of either RC or crystal oscillator circuits. A high-to-low transition on the clock input increments the counter. A high level at CLR resets the counter to zero (all Q outputs low) but has no effect on the oscillator.

The SN54HC4061 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC4061 is characterized for operation from -40°C to 85°C .

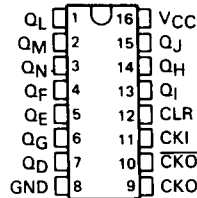
logic symbol†



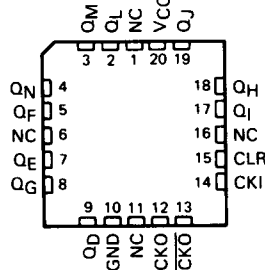
†This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

SN54HC4061 . . . J PACKAGE
SN74HC4061 . . . D† OR N PACKAGE
(TOP VIEW)



SN54HC4061 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

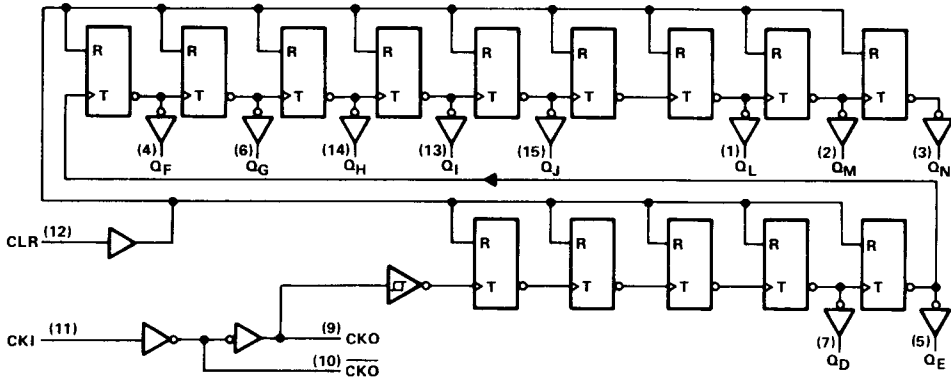
†Contact the factory for D availability

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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.

recommended operating conditions

		SN54HC4061			SN74HC4061			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

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ASYNCHRONOUS 14-STAGE BINARY COUNTERS
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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54HC4061		SN74HC4061		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		V	
		4.5 V		0.001	0.1		0.1			
		6 V		0.001	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		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	

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

		V _{CC}	T _A = 25°C			SN54HC4061		SN74HC4061		UNIT
			MIN	MAX		MIN	MAX	MIN	MAX	
f _{clock}	Clock frequency	2 V			5.5		3.7		4.3	MHz
		4.5 V			28		19		22	
		6 V			33		22		25	
t _w	Pulse duration	CKI high or low	2 V	90			135		115	ns
			4.5 V	18			27		23	
			6 V	15			23		20	
	CLR high	2 V	90			135		115	ns	
		4.5 V	18			27		23		
		6 V	15			23		20		
t _{su}	Setup time, CLR inactive before CKI↓	2 V	160			240		200	ns	
		4.5 V	32			48		40		
		6 V	27			41		34		

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switching characteristics over recommended operating free-air temperature range (unless otherwise noted), $C_L = 50 \text{ pF}$ (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC4061		SN74HC4061		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}	CKI	Q_D	2 V	240	490		735		615	ns	
			4.5 V	58	98		147		123		
			6 V	42	83		125		105		
t_{PHL}	CLR	Any Q	2 V	66	140		210		175	ns	
			4.5 V	18	28		42		35		
			6 V	14	24		36		30		
t_t		Any	2 V	28	75		110		95	ns	
			4.5 V	8	15		22		19		
			6 V	6	13		19		16		

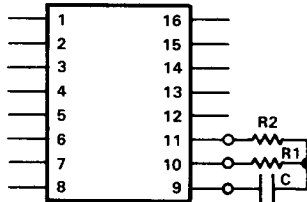
C_{pd}	Power dissipation capacitance	No load, $T_A = 25^\circ\text{C}$	88 pF typ
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Note 1: Load circuits and voltage waveforms are shown in Section 1.

CONNECTING AN RC OSCILLATOR CIRCUIT TO THE 'HC4061

The 'HC4061 consists of an oscillator section and 14 ripple-carry binary counter stages. The oscillator configuration allows design of either RC or crystal oscillator circuits.

When a RC oscillator circuit is implemented, two resistors and a capacitor are required. The components are attached to the chip as follows:



To determine the values of capacitance and resistance necessary to obtain a specific oscillator frequency f , the following formula is used:

$$f = \frac{1}{2(R_1)(C) \left(\frac{0.405 R_2 + 0.693}{R_1 + R_2} \right)}$$

If $R_2 > 10R_1$ (i.e. $R_2 = 10R_1$), then the above formula simplifies to:

$$f = \frac{0.455}{(R_1)(C)}$$