Universal Dual Filter Building Block

FEATURES

- Operates from ±2.5V supply up to ±8V
- Operates up to 30kHz
- Low Power and 88dB Dynamic Range at ±2.5V Supply
- Center Frequency Q Product up to 1.6MHz
- *Guaranteed* Offset Voltages
- *Guaranteed* Clock to Center Frequency Accuracy over Temperature, 0.8% or Better
- *Guaranteed* Q Accuracy over Temperature
- Low Temperature Coefficient of Q and Center Frequency
- Low Crosstalk, 70dB
- Clock Inputs TTL and CMOS Compatible

APPLICATIONS

- Single 5V Supply Medium Frequency Filters
- Very High Q and High Dynamic Range Bandpass, Notch Filters
- Tracking Filters
- Telecom Filters

DESCRIPTION

The LTC1060 consists of two high performance, switched capacitor filters. Each filter, together with 2 to 5 resistors, can produce various 2nd order filter functions such as low-pass, bandpass, highpass notch and allpass. The center frequency of these functions can be tuned by an external clock, or by an external clock and resistor ratio. Up to 4th order full biquadratic functions can be achieved by cascading the two filter blocks. Any of the classical filter configurations (like Butterworth, Chebyshev, Bessel, Cauer) can be formed.

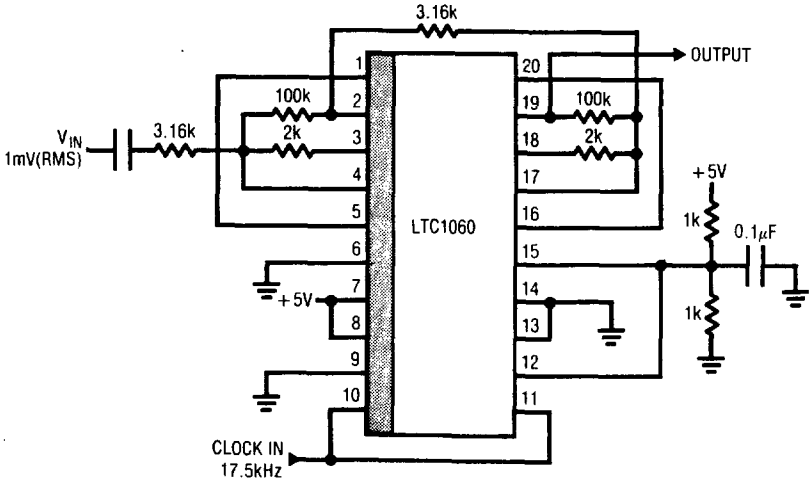
The LTC1060 operates with either a single or dual supply from ±2.37V to ±8V. When used with low supply (i.e., single 5V supply), the filter typically consumes 12mW and can operate with center frequencies up to 10kHz. With ±5V supply, the frequency range extends to 30kHz and very high Q values can also be obtained.

The LTC1060 is manufactured by using Linear Technology's enhanced LTCMOS™ silicon gate process. Because of this, low offsets, high dynamic range, high center frequency Q product and excellent temperature stability are obtained.

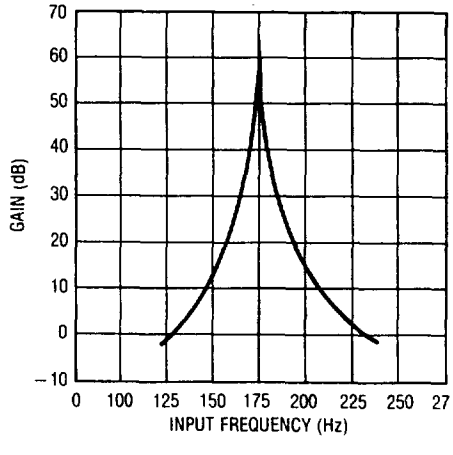
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Single 5V, Gain of 1000 4th Order Bandpass Filter



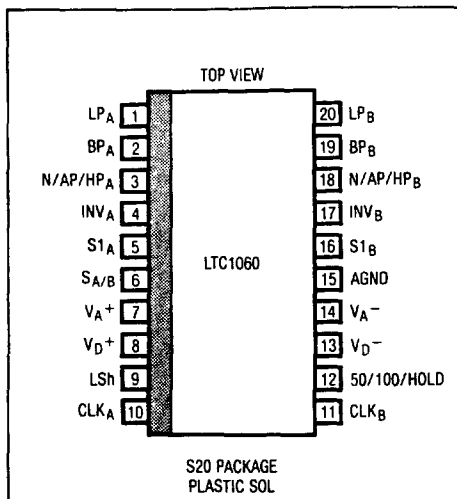
Amplitude Response



ABSOLUTE MAXIMUM RATINGS

Supply Voltage 18V
Operating Temperature Range ..... $-40°C \le T_A \le 85°C$
Storage Temperature Range..... $-65°C$ to $150°C$
Lead Temperature (Soldering, 10 sec.)..... $300°C$

PACKAGE/ORDER INFORMATION



ORDER PART NUMBER
LTC1060S
PART MARKING
LTC1060S

ELECTRICAL CHARACTERISTICS

(Complete Filter) $V_S = \pm 5V$, $T_A = 25°C$ unless otherwise specified.

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Center Frequency Range	$f_o \times Q \le 400kHz$, Mode 1			0.1-20k		Hz
	$f_o \times Q \le 1.6MHz$, Mode 1			0.1-16k		Hz
Clock to Center Frequency Ratio (Note 1)	Mode 1, 50:1, $f_{CLK} = 250kHz$, $Q = 10$	●			50 ± 0.8%	
	Mode 1, 100:1, $f_{CLK} = 500kHz$, $Q = 10$	●			100 ± 0.8%	
Q Accuracy (Note 1)	Mode 1, 50:1 or 100:1, $f_o = 5kHz$ $Q = 10$	●		±0.5	5	%
f_o Temperature Coefficient	Mode 1, $f_{CLK} < 500kHz$			−10		ppm/°C
Q Temperature Coefficient	Mode 1, $f_{CLK} < 500kHz$, $Q = 10$			+20		ppm/°C
DC Offset V_{OS1} (Note 2)		●		2	15	mV
V_{OS2}	$f_{CLK} = 250kHz$, 50:1, $S_{A/B}$ High	●		3	40	mV
V_{OS2}	$f_{CLK} = 500kHz$, 100:1, $S_{A/B}$ High	●		6	80	mV
V_{OS2}	$f_{CLK} = 250kHz$, 50:1, $S_{A/B}$ Low	●		2	30	mV
V_{OS2}	$f_{CLK} = 500kHz$, 100:1, $S_{A/B}$ Low	●		4	60	mV
V_{OS3}	$f_{CLK} = 250kHz$, 50:1, $S_{A/B}$ Low	●		2	30	mV
V_{OS3}	$f_{CLK} = 500kHz$, 100:1, $S_{A/B}$ Low	●		4	60	mV
DC Low Pass Gain Accuracy	Mode 1, R1 = R2 = 50k			±0.1	2	%
BP Gain Accuracy at f_o	Mode 1, $Q = 10$, $f_o = 5kHz$			±0.1		%
Clock Feedthrough	$f_{CLK} \le 1MHz$			10		mV(p-p)
Max. Clock Frequency				1.5		MHz
Power Supply Current			3	5	8	mA
		●			12	mA
Crosstalk				70		dB

Note 1: An LTC1060S with improved Q and clock to center frequency ratio accuracy can be made available upon special request.

Note 2: For definition of the DC offset voltages refer to the LTC1060 data sheet. An LTC1060S with improved DC offset specifications can be made available upon special request.

ELECTRICAL CHARACTERISTICS (Complete Filter) $V_S = \pm 2.37V$, $T_A = 25°C$

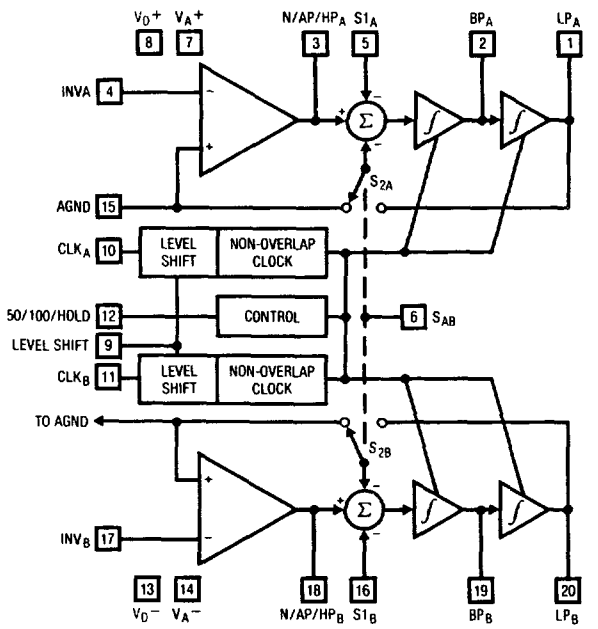
PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Center Frequency Range	$f_0 \times Q \leq 100kHz$			0.1-10k		Hz
Clock to Center Frequency Ratio	Mode 1, 50:1, $f_{CLK} = 250kHz$, $Q = 10$ Mode 1, 100:1, $f_{CLK} = 250kHz$, $Q = 10$			$50 \pm 0.8\%$ $100 \pm 0.8\%$		
Q Accuracy	Mode 1, $f_0 = 2.5kHz$, $Q = 10$ 50:1 and 100:1			± 2		%
Max Clock Frequency				500		kHz
Power Supply Current				2.5	4	mA

ELECTRICAL CHARACTERISTICS (Internal Op Amps) $T_A = 25°C$

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage Range			± 2.37		± 8	V
Voltage Swings	$V_S = \pm 5V$, $R_L = 5k$ (Pins 1, 2, 19, 20)		± 3.8	± 4		V
	$R_L = 3.5k$ (Pins 3, 18)	●	± 3.6	± 4		V
Output Short Circuit Current	$V_S = \pm 5V$					
Source				25		mA
Sink				3		mA
Op Amp GBW Product	$V_S = \pm 5V$			2		MHz
Op Amp Slew Rate	$V_S = \pm 5V$			7		V/μs
Op Amp DC Open Loop Gain	$R_L = 10k$, $V_S = \pm 5V$			85		dB

The ● denotes the specifications which apply over the full operating temperature range.

BLOCK DIAGRAM



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