1/2011

High Frequency Mixer and Selectable VHF LP/BP Filter
Preliminary Data Sheet

MSMXVHF

Description

The MSMXVHF Mixer with selectable high frequency lowpass/bandpass filter IC Is a CMOS chip that has an independent mixer for IF functions. The output of the mixer can be tied to either a lowpass or a band-pass filter. The lowpass response can be a 6 pole Butterworth, Elliptic or Bessel filter. The band pass response can be a six pole full, 1/3 or 1/6 octave bandpass filter. The device uses switched-capacitor filters and no external components (except for decoupling capacitors) are required, Two external clocks are needed for the mixer and filter functions. Lower current, and lower frequencies are pin selected.

An external selectable gain setting pin, along with a power down and clock to corner ratio select pin are included in the 16 pin version.

Absolute Maximum Ratings

Power Supply Voltage	+3.5V
Storage Temperature Range	-60° to +150° C
Operating Temperature Range	-40° to +85° C

Features

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Low Voltage: 3.0 VDC
Ultrahigh Fequency Mixer (UHF)
Six Filter Types In One Package
No External Components
Switched-Capacitor Filters
High Frequency Filter Operation
Selectable Gain 0, 10 or 20 dB
Small Package Size
On Chip Power Save Pin
ANSI Compatible Bandpass

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Applications

Spectrum Analyzers
General Purpose Systems
Portable Systems
Anti-Alias Filters
Telecommunications
Tracking Filters
Harmonic Analysis
Noise Analysis
Data Communication
Wireless Applications

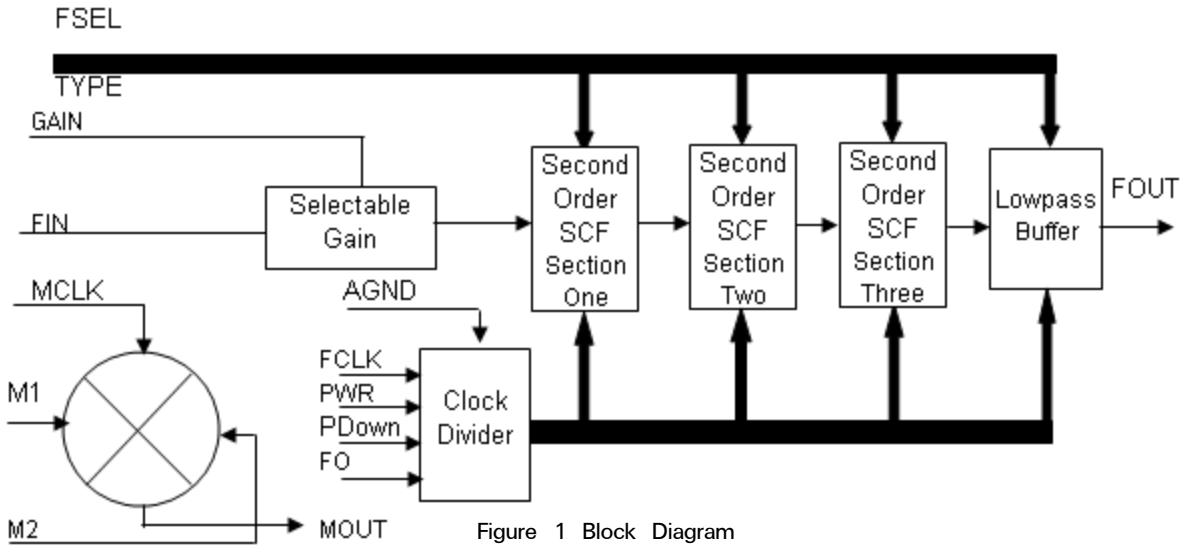

Figure 1 Block Diagram

High Frequency Mixer and Selectable VHF LP/BP Filter

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Electrical Characteristics

(VDD = +3.0V, T = 25 C) Sample rate is 2X clock to corner ratio

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC Specifications						
Operating Voltage	VDD			3.0	3.3	V
Supply Current	IDD	PWR=0		1.0		mA
Supply Current	IDD	PWR=High		15.0		mA
Supply Current in Power Down Mode	IDD_{PD}	PDown=High		200		µA
Filter AC Specifications						
Gain	A_V	G=VSS	-0.5	0	0.5	dB
Gain with 10 dB Selected	A_{V10dB}	G=1/2 VDD		10		dB
Gain with 20 dB Selected	A_{V20dB}	G= VDD		20		dB
Noise	e_n	To 1/2 Sample		200		µVrms
Distortion	THD	5MHz Butterworth with 1 MHz Input		-72		dB
Signal Swing	V_O			2.8		V_{PP}
Input Imedance	Z_{IN}			1.0		MΩ
Output Drive	I_O			300		µA
Output Impedance	Z_O			500		Ω
Output Capacitive Load	C_{OMAX}				20	pF
Clock to Corner		FO=2		12.5		
Clock to Corner		FO=0		6,25		
Center Frequency Range	F_O	FO=0 PWR=High	0.00001	5		MHz
Center Frequency Range	F_O	FO=2 PWR=Low	0.00001	1		MHz
Ripple						
Elliptic Lowpass, Bandpass				0.2		dB
Stop Band Rejection						
Elliptic Lowpass				70		dB
Bessel Lowpass				60		dB
40 dB Bandwidth						
Full Octage		Normalized F_C,	0.3		3	
1/3 Octave		Normalized F_C	0.6		1.67	
1/6 Octave		Normalized F_C	0.76		1.32	

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Electrical Characteristics continued

(VDD = +3.0V, T = 25 C) Sample rate is 2X clock to corner ratio

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Bandpass Q						
Full Octave	Q			1.5		
1/3 Octave	Q			4.5		
1/6 Octave	Q			9		
Mixer AC Specifications						
Gain	A_V			-6		dB
Noise	e_n	To 1/2 Sample		-80		δB
Distortion	THD	500 MHz input LO= 500MHz		-72		dB
Signal Swing	V_O			2.8		V_{PP}
Input Imedance	Z_{IN}	LO=500MHz		1.0		MΩ
Output Drive	I_O			300		µA
Output Impedance	Z_O			500		Ω
Output Capacitive Load	C_{OMAX}				20	pF
Op Amp Summer Corner				1		MHz

Ordering Information

Part Number	Package	Opearting Temperature
MSMXVHFN	16 Pin SOIC	-40 to +85°C

The package is a 150 mil wide (Narrow) SOIC.

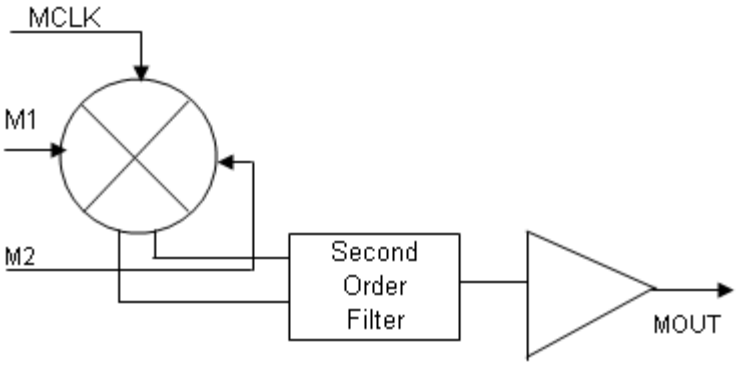

Figure 2 Mixer Detail Block Diagram

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Filter Selection

The filter type is selected using the two filter select pins, TYPE and FSEL, FSEL is a CMOS level pin that selects lowpass or bandpass response (lowpass = 0, bandpass = 2). TYPE Is a tertiary control pin that selects the filter response. State 0 is VSS, state 1 is AGND and state 2 is VDD.

TYPE	Lowpass	Bandpass
0	Butterworth	Full Octave
1	Bessel	Third Octave
2	Elliptic	Sixth Octave

Pin Description

1.	TYPE	Filter Response Select Pin.
2.	FCLK	Filter Clock Input
3.	G	Gain Select Pin
4.	PWR	Power Select Pin; CMOS level High= Regular Power; Low=Low Power
5.	VDD	Positive Power Supply,Typically +1.5 Volts for Split Supply, +3.0 Volts for Single Supply
6.	PDown	Power Down Pin, CMOS level, Hi = Power Down
7,	VSS	Negative Power Supply,Typically -1.5 Volts for Split Supply, 0 Volts for Single Supply
8.	MCLK	Mixer Clock: CMOS Levels
9.	F0	Clock to Corner Select Pin
10.	MO	Mixer Output
11.	AGND	GND Pin, OV for Split Supplies +1.5 Volts Typical for Single Supply
12.	FIN	Filter Input
13.	MIX2	Mixer Input 2
14.	MIX1	Mixer Input 1
15.	FSEL	Filter Select 2 = Banpass; 0= Lowpass
16.	FOUT	Filter Output

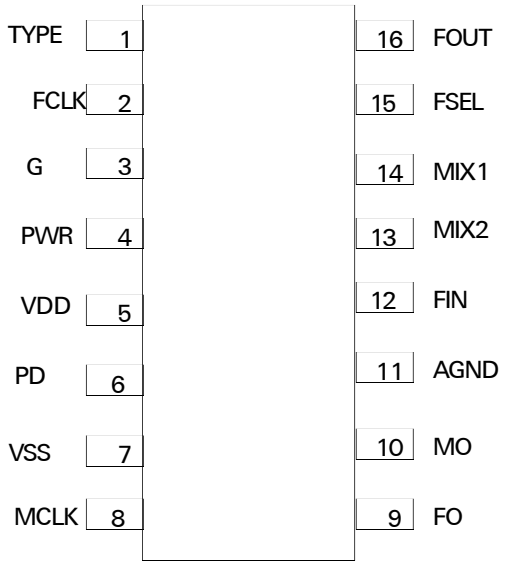
Gain and Frequency Selection

The Gain select pin G is a tertiary control pin where state 0 is VSS, state 1 is AGND level and state 2 is VDD.

G	Gain
0	OdB
1	10dB
2	20dB

The clock to corner select pin F0 is a CMOS level pin where HIGH is clock to corner of 12.5 to 1 (25 to 1 for Bessel) and LOW is clock to corner of 6.25 to 1 (12.5 to 1 for Bessel). The sample rate ratio is twice the clock to corner ratio (double sampling).

Pin Configuration



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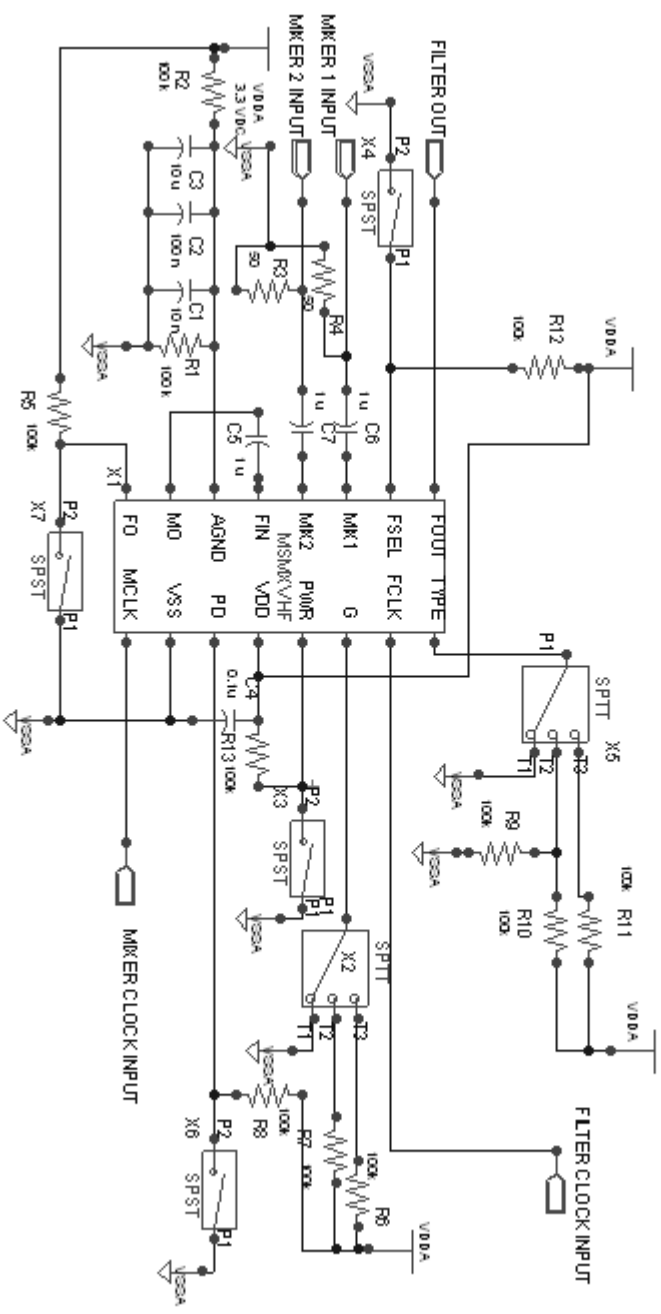

Figure 4 Typical Application Schematic

STANDARD PRODUCTS

MSGEQ5A	Five Band Graphic Equalizer Display Filter
MSGEQ7	Seven Band Graphic Equalizer Display Filter
MSHFS1-6	Selectable High Frequency LP/BP Filter
MSFS1-6	Selectable Lowpass/Bandpass Filter
MSCAHF	Selectable High Frequency Active Lowpass/Bandpass Filter
MSU1F1-4, MSU2F1	Resistor Programmable Universal Active Filter
MSU1HF1-4, MSU2HF1	High Frequency Resistor Programmable Universal Active Filter
MSELP	Switched Capacitor Elliptic Lowpass Filter with Op Amps
MSNBLP	Switched Capacitor Butterworth Lowpass Filter
MSLE/B/C5L/M	Switched Capacitor General Purpose Lowpass Filter
MS2LFS	Dual Selectable Low Voltage Lowpass/Bandpass Filter
MSLFS	Selectable Low Voltage Lowpass/Bandpass Filter
MSHN1-6	Selectable High Pass/Notch Filter
MSRAAF	Resistor Programmable Active Audio Filter
MSRAHF	Resistor Programmable Active High Frequency Filter
MSDET	Tone Detector
MSEPAF	Electrically Programmable Active Filter
MSCBT	Communications Baseband Transceiver
MSVL14	14 MHz Video Lowpass Filter
MSSPSI	Smart Programmable Sensor Interface
MSCPSI	Computer Programmable Sensor Interface
MSLOSC	15 Hz to 64 kHz All Silicon Sine Source
MSTHDA	Total Harmonic Distortion Analyzer
MSSCSA	Single Chip Spectrum Analyzer
MSFIPS	FIP-140 Level 4+ Security Supervisor
MSLSA	Low Power Single Chip Spectrum Analyzer
MSRFIF	Radio Frequency Interface Front-End
MSVHFS1-6	Selectable Very High Frequency LP/BP Filter
MSMXVHF	High Frequency Mixer and Selectable VHF LP/BP Filter

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