MSFB1G, MSFB3G, MSFB5G, MSFB6G
Bandwidth/Gain Selectable Bandpass Filter
Data Sheet

Description

The MSFBxG series of selectable filter ICs can be configured as 6 pole full, third or sixth octave response bandpass filter. The devices utilize low power and high precision Switched-Capacitor Filter (SCF) techniques that require only an external clock to set the corner frequencies for the low-pass filters. No external components (except for decoupling capacitors) are required.

The MSFB1G and MSFB3G are 50:1 clock to corner ratio bandpass filters for corner frequencies of up to 20 kHz and 3 kHz, respectively.

The MSFB5G and MSFB6G are 100:1 clock to corner ratio bandpass filters for corner frequencies of up to 20 kHz and 3 kHz, respectively.

Externally selectable gain setting pin and filter response select pin are included. The devices are packaged in a small 8-lead 4x4x0.9 mm VDFN package, making them very suitable for space constrained designs.

Absolute Maximum Ratings

Power Supply Voltage	+6V
Storage Temperature Range	-60° to +150° C
Operating Temperature Range	-40° to +85° C

Features

Low Voltage Operation down to 2.7V
Three Distinct Filter Types in One Package
Adjustable Gain Settings: 0, 10 or 20 dB
No External Components
High Precision Switched-Capacitor Filters
Low Power Ideal for Battery Operated Applications
Small Package Size
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Applications

Spectrum Analyzers
General Purpose Telecom or Telephony
Portable Systems
Anti-Alias Filters
Reconstruction Filters
Tracking Filters
Harmonic Analysis
Noise Analysis
Sensors and MEMS
Distortion Analysis

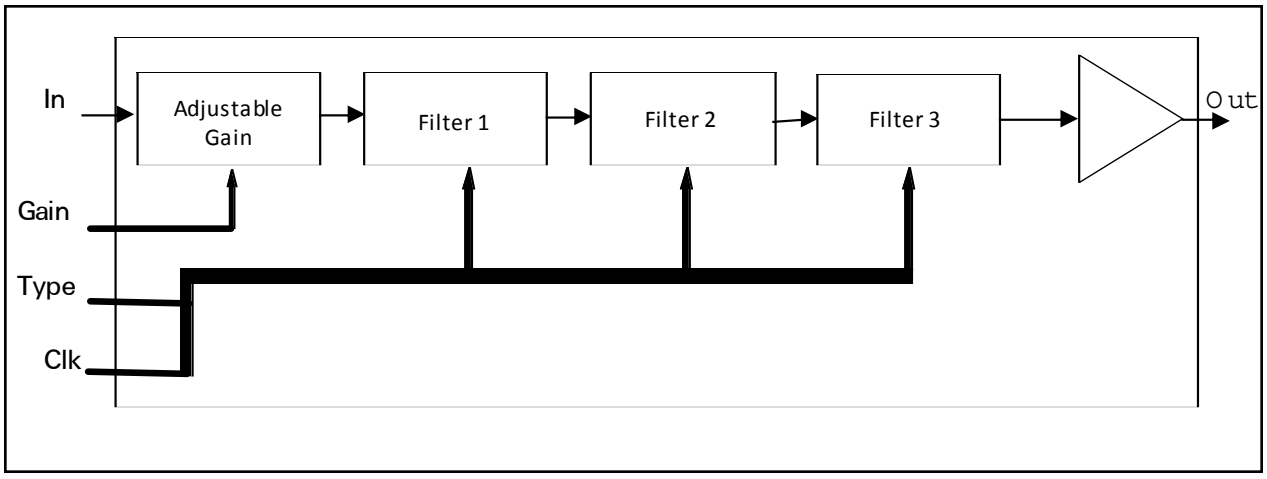


Figure 1 - Block Diagram

Electrical Characteristics

VDD=+3.0V, T=25°C, unless otherwise noted						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
DC Specifications						
Operating Voltage	VDD	2.7	3.0	5.5	V	
Supply Current	IDD		200	300	µA	MSFB3G/6G
			1	1.5	mA	MSFB1G/5G
Reference Voltage Output	VREF		1.5		V	
AC Specifications						
Gain Accuracy	GA	-0.5	0	0.5	dB	From selected value
Noise	e_n		200		µVrms	To ½ sample
Distortion	THD		-72		dB	A weighted
Input Voltage	V_{IN0}			4	Vpp	Gain=0dB; VDD=5V
	V_{IN10}			1.25	Vpp	Gain=10dB;VDD=5V
	V_{IN20}			0.4	Vpp	Gain=20dB;VDD=5V
Input Impedance	Z_{IN}		1		MΩ	f_O=350 kHz
Output Voltage Range	V_{OUT}	0.5		4.5	V	
Output Drive	I_O		300		µA	
Output Impedance	Z_O		500		Ω	
Output Capacitive Load	C_{MAX}			20	pF	
Clock to Center Ratio	CCR		50			MSFB1G/3G
			100			MSFB5G/6G
Center Frequency Range	CFR	0.0001		3	kHz	MSFB3G/6G
		0.0001		20	kHz	MSFB1G/5G
Ripple						
Full Octave	R_{FO}		0.2		dB	
Third Octave	R_{TO}		0.2		dB	
Sixth Octave	R_{SO}		0.2		dB	
40 dB Bandwidth						
Full Octave	BW_{FO}	0.3		3	Hz	Normalized Fo
Third Octave	BW_{TO}	0.6		1.67	Hz	Normalized Fo
Sixth Octave	BW_{SO}	0.76		1.32	Hz	Normalized Fo
Bandpass Q						
Full Octave	Q		1.5			
Third Octave	Q		4.5			
Sixth Octave	Q		9			

Filter Selection

The filter type is selected using the filter select pin, TYPE. TYPE Is a tertiary control pin that selects the filter response. State 0 is GND, state 1 is VREF and state 2 is VDD.

TYPE	Bandpass
0	Full Octave
1	Third Octave
2	Sixth Octave

Gain Selection

The Gain control pin G is a tertiary control pin where state 0 is GND, state 1 is VREF level and state 2 is VDD.

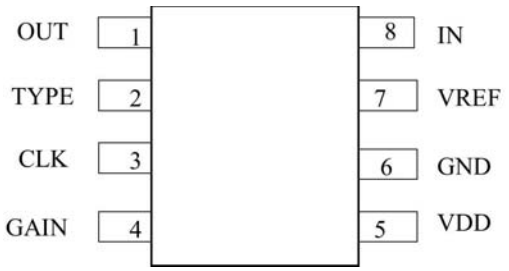
G	Gain
0	OdB
1	10dB
2	20dB

The sample rate ratio is twice the clock to corner ratio (double sampling).

Pin Description

1.	OUT	Filter Output
2	TYPE	Filter Response Select Pin.
3.	CLK	CMOS Level Clock Input
4.	G	Gain Select Pin
5.	VDD	Positive Power Supply,Typically +1.5 Volts for Split Supply, +3.0 Volts for Single Supply
6	GND	Negative Power Supply,Typically -1.5 Volts for Split Supply, 0 Volts for Single Supply
7.	VREF	Reference output, OV for Split Supplies +1.5 Volts Typical for Single Supply. For other VDD: VREF = (VDD-VGND)/2
8` .	IN	Filter Input

Pin Configuration



Note that the large pads on the solder side of the VDFN package is tied internally to VDD. Do not ground this pad.

Ordering Information

Part Number	Package	Clock to Corner Ratio	Max F
MSFB1GD	8 Pin VDFN	50	20 kHz
MSFB3GD	8 Pin VDFN	50	3 kHz
MSFB5GD	8 Pin VDFN	100	20 kHz
MSFB6GD	8 Pin VDFN	100	3 kHz

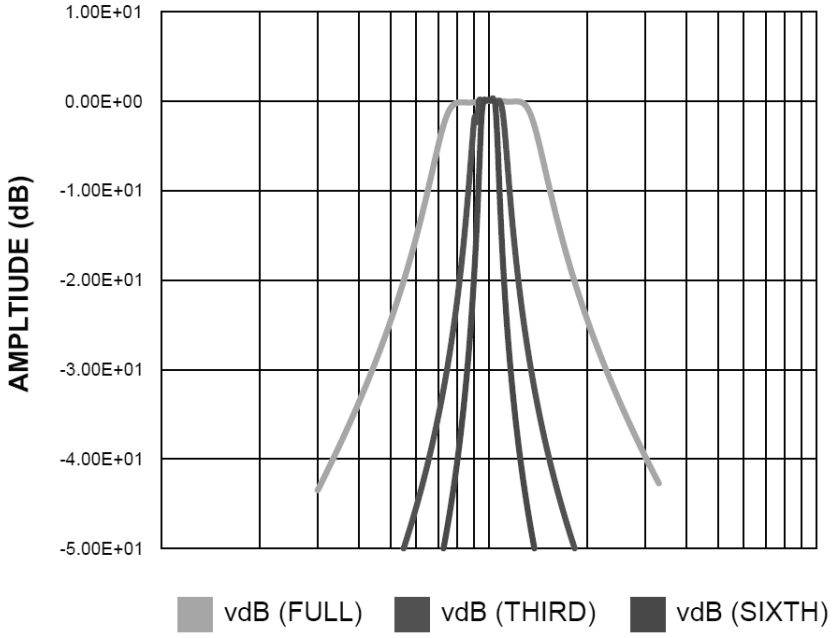


Figure 2 - Normalized Filter Responses

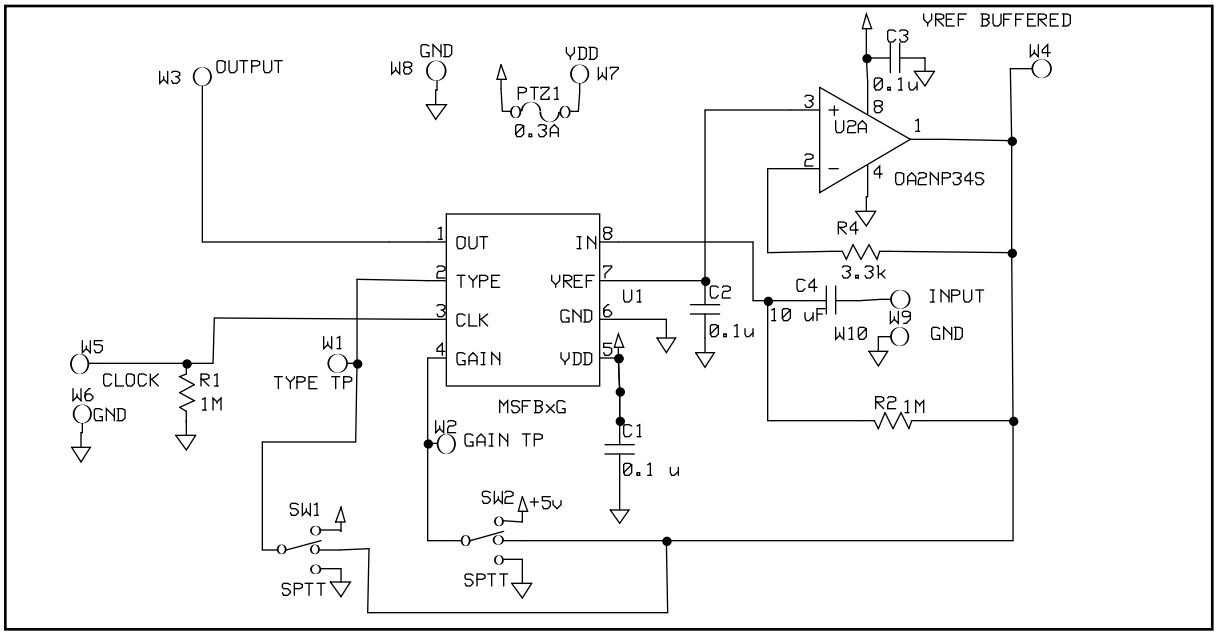


Figure 3 - Application Schematic