

# Smart Programmable Sensor Interface

## Advance Data Sheet

### Description

For processing signals from a sensor or MEMS device, the Smart Programmable Sensor Interface (MSSPSI) is a monolithic CMOS integrated circuit. Small analog signals from a sensor or MEMS are anti-aliased, filtered and amplified before being converted into a digital signal output by the MSSPSI. These processing functions are controlled by an external uP through the MSSPSI's on-chip serial interface. The MSSPSI also includes offset adjust, low power modes and an on-chip temperature sensor.

The input is fed into a low noise amplifier followed by two 6th order Elliptic switched capacitor anti-aliasing filters. The gain of the filter is controllable via the serial interface up to 18 dB (6 dB) steps. The next stage is a 6 pole Butterworth switched capacitor highpass filter, also with up to 18 dB of controllable gain. Following this is a 7th order Elliptic switched capacitor lowpass filter. These internal filters can be bypassed via the serial interface. The 12 bit, 160 kSps A-to-D converter provides a digital output.

The MSSPSI operates with a supply voltage from 3.3 VDC up to 5.5 VDC. It is available in a 32 pin LQFP Package with an industrial temperature range.

### Features

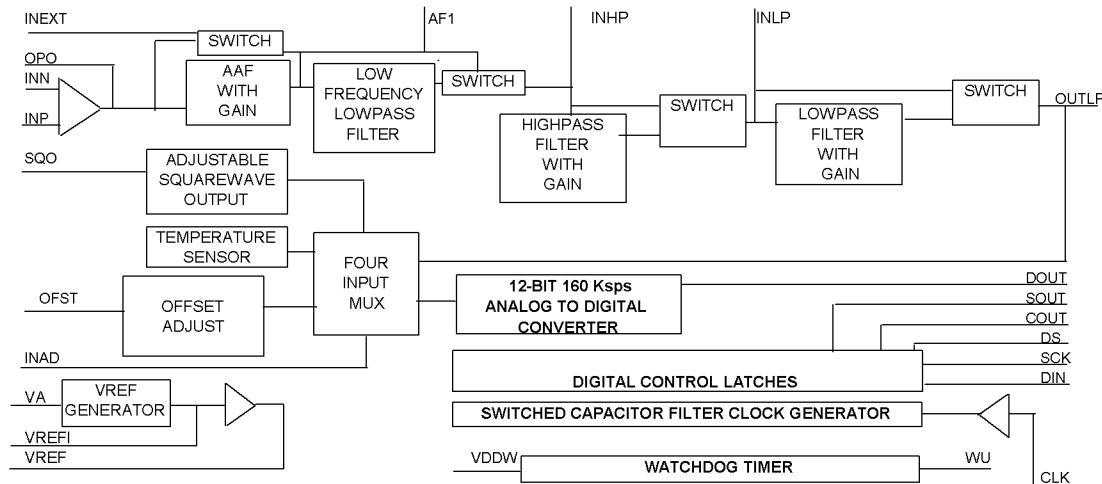
Low Power Modes  
 Low Noise Input:  $<30 \text{ nV}/(\text{Hz})^{1/2}$  at 100 Hz  
 Anti Alias Filter with Adjustable Gain  
 Lowpass Filter with Adjustable Gain Stage  
 Programmable SC Highpass Filter with Gain Adjust  
 Programmable SC Lowpass Filter with Gain Adjust  
 Temperature Sensor  
 Offset Adjust  
 12 bit 160 ksps A-to-D Converter and 4 input Mux

### Applications

Low Noise Sensors  
 MEMS Interface  
 Accelerometer Sensing  
 Pressure Sensing  
 Vibration Sensing  
 Temperature Sensing  
 Test Equipment Cards/Data Acquisition Cards

### Absolute Maximum Ratings

Power Supply Voltage	+6V
Storage Temperature Range	-60 to +150°C
Operating Temperature Range	-45 to +85°C



MSSPSI



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### Electrical Characteristics \_\_\_\_\_

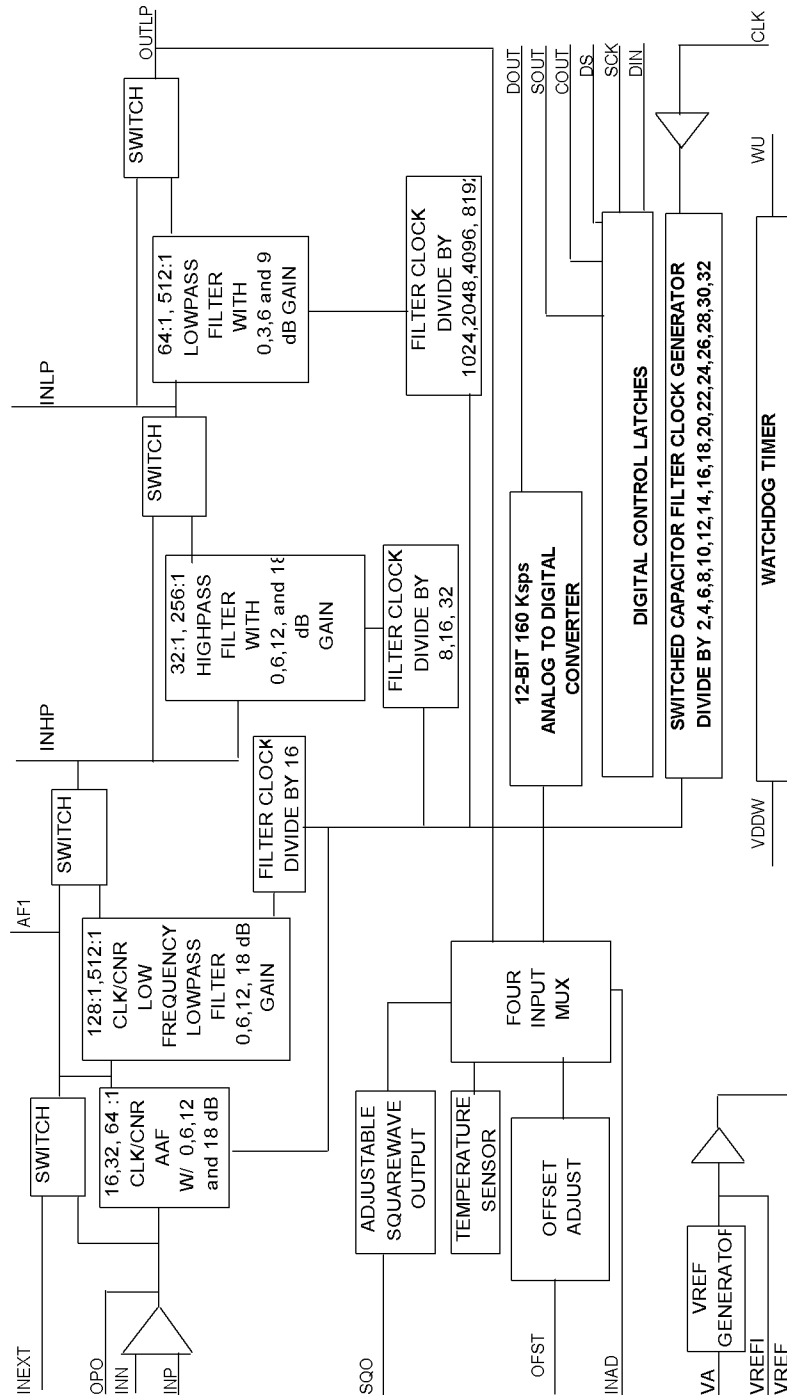
(VDD = +5.0V, T = 25° C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>DC Specifications</b>						
Operating Voltage	VDD		3.3	5.0	5.5	V
Supply Current Regular	IDD	Power Control Bits 1111		5		mA
Supply Current Medium	IDD	Power Control Bits 1010		4		mA
Supply Current Low	IDD	Power Control Bits 0101		2		mA
Input Offset Voltage	IOV			5		mv
Input Bias Current	IBI			50		pA
Switch Input On Resistance	R <sub>IN</sub>			20		kΩ
Temperature Voltage		T= 25°C		2.5		V
Temperature Voltage Slope				+7.5		mV/°C
I/O Interface Voltage	VIO			3	VDD	V
Reference Voltage	VREF			VDD/2		V
<b>AC Specifications</b>						
Amp Unity Gain Bandwidth				2		MHz
Output Voltage Range				4		V <sub>pp</sub>
Output Sink Capability				2		mA
Output Source Capability				0.2		mA
Input Impedance				1		MΩ
Input Referenced Noise Amp	e <sub>n</sub>	f <sub>o</sub> =100 Hz		30		nv/(Hz) <sup>1/2</sup>
Total Harmonic Distortion	THD	f <sub>o</sub> =1 kHz A weighted		-60		dB
Maximum Clock Frequency				20		MHz

MSSPSI

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## Block Diagram



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Pin Number	Pin Name	Description	Pin Number	Pin Name	Description
1	INP	Low Noise Amp Positive Input	16	DOUT	Data Output
2	SQO	Square Wave Output Adjustable to 400 mVpp 255 frequency steps	17	SOUT	Serial Out
3	VREFI	Voltage reference input A 0.1 $\mu$ F cap to AGND is connected to this pin	18	COUT	Serial Data I/O This input becomes an output when reading A/D converter
4	VREF	Voltage Reference Nominally 2.5 VDC	19	WU	Watchdog output
5	TEMP	Temperature Sensor Output	20	AF1	Alias Filter 1 Output Drives $>100\text{kohms}$ $<12$ pF
6	AGND	Analog Ground Typically tied to 0 VDC	21	VA	Positive Supply; Typically 5.0 VDC
7	DGND	Digital Ground Typically tied to 0 VDC	22	INAD	Input to A/D
8	N/C	Do Not Connect	23	OUTLP	Lowpass Filter Output
9	CLK	Master Clock	24	INLP	Lowpass Filter Input)
10	DS	Data Strobe Input	25	INHP	Highpass Filter Input
11	SCK	Serial Data Clock	26	N/C	Do Not Connect
12	DI	Serial Data input	27	INEXT	External Input
13	VIO	IO Interface Voltage Nominally 3.0 VDC	28	BIAS	Bias Input
14	VDDW	Watchdog timer VDD	29	OFST	Offset Adjust Output
15	DVDD	DIGITAL POSITIVE SUPPLY Typically 5.0VDC. Use 0.1 $\mu$ F capacitor to ground	30	OPO	Op Amp Output
			31	N/C	Test Only; Do not connect
			32	INN	Low Noise Op Amp Negative Input

**MSSPSI**

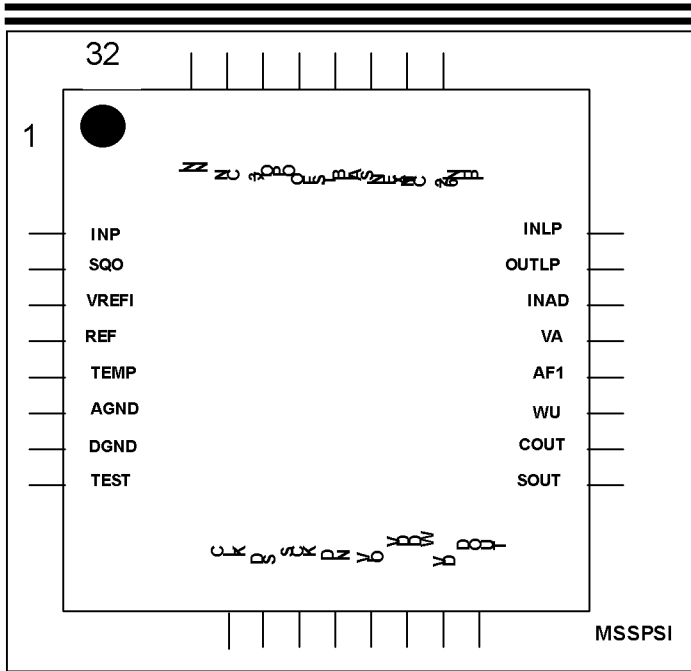

Web Site "[www.mix-sig.com](http://www.mix-sig.com)"

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# Smart Programmable Sensor Interface Advance Data Sheet



PINOUT OF MSSPSI (TOP VIEW)

MSSPSI

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 STANDARD PRODUCTS

MSGEQ5A	Five Band Graphic Equalizer
MSGEQ7	Seven Band Graphic Equalizer
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
MSHN1-6	Selectable High Pass/Notch Filter
MSRAAF	Resistor Programmable Active Audio Filter
MSRAHF	Resistor Programmable Active High Frequency Filter
MS2CAP	Two Channel Audio Processor
MS6CAP	Six Channel Audio Processor

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