16bit, Single-Channel, 200kSPS, SAR ADC

FEATURES

- No Missing Resolution: 16bit
- INL: ±1LSB (Typ)
- Dynamic Range: 92dB
- SINAD: 92dB(20kHz)
- Analog Input Range: 0 to VREF (VREF up to VDD)
- External Reference
- VDD Single Power Supply: 2.7V to 5.5V
- Serial Interface: Compatible with SPI, MICROWIRE, QSPI and DSP
- Power Dissipation: 7.5mW (5V@100kSPS), 23mW (5V@200kSPS)
- Standby Current: 200nA@5V

PRODUCT DESCRIPTION

The MS5173M is single-channel, 16bit SAR ADC and is powered by single power.

The MS5173M includes a low power dissipation, high-speed data sample and no missing code 16bit SAR ADC and an internal conversion clock.

The MS5173M uses general serial interface to receive the conversion result. The MS5173M also integrates track and hold circuit featured by low noise, wide bandwidth, short aperture delay.

The MS5173M is available in MSOP8 package. The operating temperature is from -40°C to +125°C.

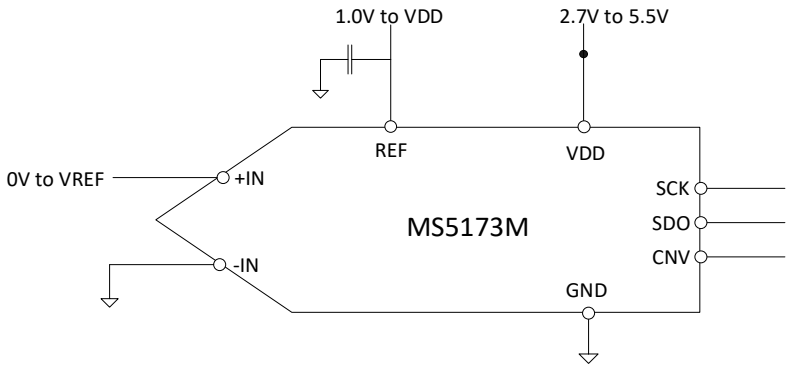
APPLICATIONS

- Battery-powered Equipment
- Medical Device
- Mobile Communication
- PDAs
- Data Acquisition
- Instrumentation
- Process Control

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS5173M	MSOP8	MS5173M

BLOCK DIAGRAM



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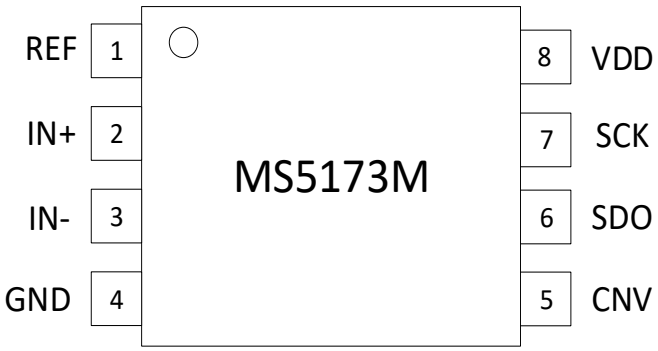
PIN CONFIGURATION



PIN DESCRIPTION

Pin	Name	Type	Description
1	REF	I	Reference Voltage Input. A 10μF decoupling capacitor is required and is placed as close to REF as possible. The range is from 1.0V to VDD.
2	IN+	I	Analog Channel Positive Input Pin
3	IN-	I	Analog Channel Negative Input Pin
4	GND	-	Ground
5	CNV	I	Conversion Input. CNV initiates the conversion on the rising edge. SDO is enabled when CNV is low-level.
6	SDO	O	Serial Data Output
7	SCK	I	Serial Data Clock Input
8	VDD	-	Power Supply

ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

Parameter	Symbol	Range	Unit
Power Supply	V_{DD}	-0.3 ~ +7.0	V
Analog Input Voltage	V_{IN}	-0.3 ~ V_{DD}+0.3	V
Reference Voltage	V_{REFIN}	-0.3 ~ V_{DD}+0.3	V
Digital Input Voltage		-0.3 ~ V_{DD}+0.3	V
Digital Output Voltage		-0.3 ~ V_{DD}+0.3	V
Input Port Current		10	mA
Operating Temperature	T_A	-40 ~ 125	°C
Storage Temperature	T_{STG}	-65 ~ 150	°C
Lead Temperature (10s)		260	°C
ESD(HBM)		±3000	V

ELECTRICAL CHARACTERISTICS

Unless otherwise noted, V_{DD} =2.7V to 5.5 V, V_{REF} = V_{DD}, T_A = -40°C to +85°C.

Parameter	Condition	Min	Typ	Max	Unit
Analog Input					
Analog Input Voltage	+IN - (-IN)	0		$+V_{REF}$	V
Analog Absolute Input Voltage	+IN	-0.1		V_{DD}+0.1	V
	-IN	-0.1		+0.1	V
Analog Input CMRR	f_{IN}=200kHz		68		dB
Leakage Current@25°C	Acquisition phase		1		nA
Conversion Rate					
Transmission Rate	V_{DD}=4.5V to 5.5V	0		200	kSPS
Transient Response	Full-scale step		0.4		μs
Accuracy					
No Missing Codes			16		Bits
Integral Non-linearity Error	V_{REF}=2.048V		±1		LSB
Differential Non-linearity Error	V_{REF}=2.048V	-1.5	±0.5	+1.5	LSB
Gain Error		-30	±2	+30	LSB
Gain Error Temperature Drift			±0.3		ppm/°C
Offset Error	V_{DD}=4.5V to 5.5V		±1		mV
	V_{DD}=2.7V to 4.5V		±1		mV
Offset Error Temperature Drift			±0.3		ppm/°C
Power Supply Sensitivity	V_{DD}=5V±5%		±1		LSB
AC Accuracy					
Signal-to-Noise Ratio (SNR)	f_{IN}=20kHz,V_{REF}=2.048V		92		dB
Signal-to- Noise-and-Distortion Ratio (SINAD)	f_{IN}=20kHz,V_{REF}=2.048V		91.5		dB
	f_{IN}=20kHz, -60dB input, V_{REF}=2.048V		33.5		
Total Harmonic Distortion (THD)	f_{IN}=20kHz,V_{REF}=2.048V		-96		dB
Spurious-Free Dynamic Range	f_{IN}=20kHz,V_{REF}=2.048V		110		dB

Parameter	Condition	Min	Typ	Max	Unit
Sampling Dynamics					
-3dB Input Bandwidth	Full bandwidth		12		MHz
Aperture Delay	V_{DD}=5V		2.5		ns
Reference Voltage					
Voltage Range	REF input	1.0		V_{DD}+0.3	V
Leakage Current	200kSPS, V_{REF}=5V		100		µA
Digital Input					
Input Low-level Voltage		-0.3		+0.3×V_{DD}	V
Input High-level Voltage		0.75×V_{DD}		V_{DD}+0.3	V
Input Low-level Current			±1		µA
Input High-level Current			±1		µA
Digital Output					
Output High-level Voltage	I_{SOURCE}=-500µA	V_{DD}-0.3			V
Output Low-level Voltage	I_{SINK}=+500µA			0.4	V
Power Supply					
VDD	Specified performance	2.7		5.5	V
Standby Current	V_{DD}=5V,25°C		200		nA
Power Dissipation	V_{DD}=5V,100kSPS conversion rate		7.5		mW
	V_{DD}=5V, 200kSPS conversion rate		23		mW

Timing

Unless otherwise noted, V_{DD}=2.7V to 5.5V. All specifications are relative to T_{MIN} to T_{MAX}.

Parameter	Symbol	Min	Max	Unit
Conversion Time: CNV Rising Edge to Data Available	t_{CONV}		3.2	µs
Acquisition Time	t_{ACQ}	0.8		µs
Time Interval between Conversions	t_{CYC}	4		µs
SCK Period	t_{SCK}	30		ns

Parameter	Symbol	Min	Max	Unit
SCK Low Time	t_{SCKL}	12		ns
SCK High Time	t_{SCKH}	12		ns
SCK Falling Edge to Data Remaining Valid	t_{HSDO}	5		ns
Delay Time, SCK Falling Edge to Data Valid	t_{DSDO}		30	ns
CNV Low to SDO MSB Valid	t_{EN}		27	ns
CNV High to SDO High-impedance	t_{DIS}		50	ns

FUNCTION DESCRIPTION

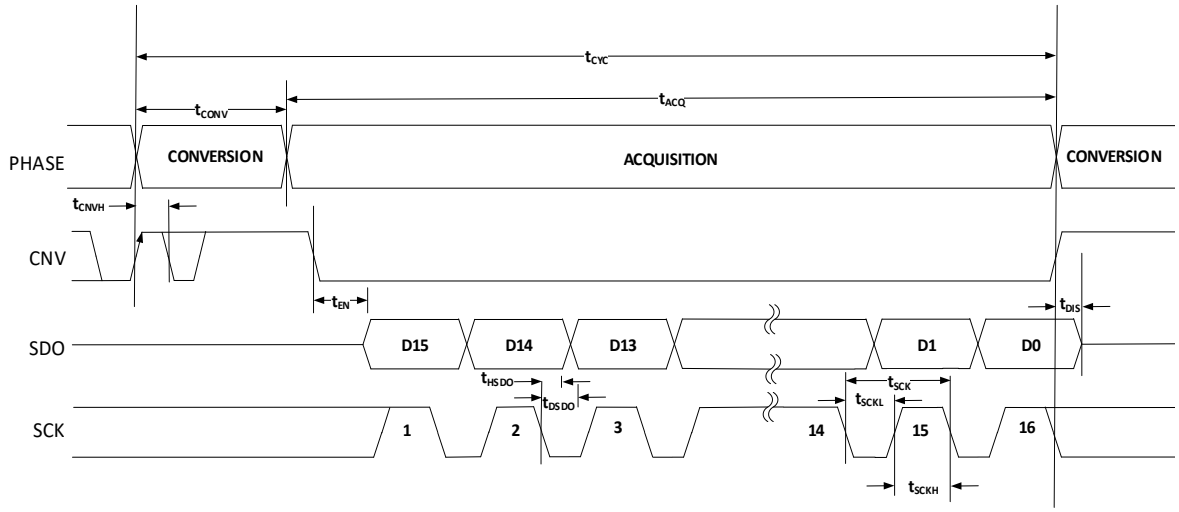
Overview

The MS5173M is a high-speed, low power dissipation, 16bit, approaching ADC and its conversation rate is 200kSPS. The device is in shutdown state between two conversions. The operating voltage of the MS5173M is 2.7V to 5.5V.

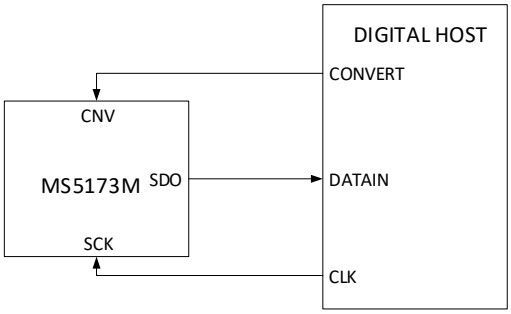
Digital Interface

The MS5173M uses 3-wire interface for CNV, SCK and SDO signals. And it is compatible with SPI, MICROWIRE, QSPI, digital host and DSP.

The rising edge of CNV initiates conversion. CNV is invalid during conversion and CNV must be set to high before the minimum conversion time. After the conversion is completed, the MS5173M enters the acquisition phase. SDO becomes MSB from high-impedance and remaining data bits are output at the falling edge of SCK. Data is valid on SCK edges. SDO would return to high-impedance state at the falling edge of 16th SCK or after CNV is set to high.



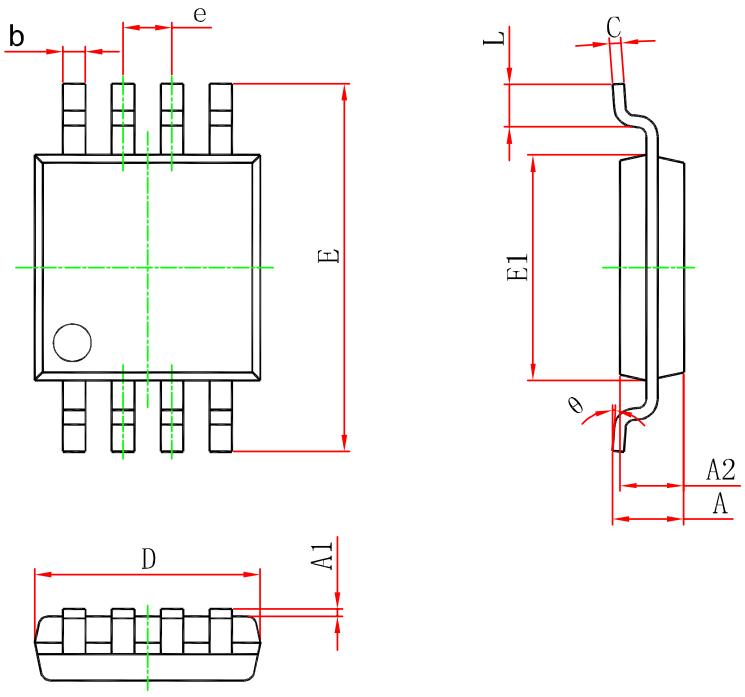
Timing Diagram



Connection Diagram

PACKAGE OUTLINE DIMENSIONS

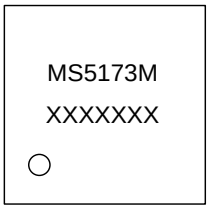
MSOP8



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	-	1.100	-	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	4.750	5.050	0.187	0.199
E1	2.900	3.100	0.114	0.122
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

MARKING and PACKAGING SPECIFICATION

1. Marking Drawing Description



Product Name: MS5173M

Product Code: XXXXXXX

2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

3. Packaging Specification

Device	Package	Piece/Reel	Reel/Box	Piece/Box	Box/Carton	Piece/Carton
MS5173M	MSOP8	3000	1	3000	8	24000

STATEMENT

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- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

MOS CIRCUIT OPERATION PRECAUTIONS

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.

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