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TP1112M10

16-Bit Analog-to-Digital Converter with Input Multiplexer and Onboard Reference

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Features

- COMPLETE DATA ACQUISITION SYSTEM IN THE MSOP-10 PACKAGES
- MEASUREMENTS FROM TWO DIFFERENTIAL CHANNELS OR THREE SINGLE-ENDED CHANNELS
- I^2C™INTERFACE—EIGHT ADDRESSES PIN-SELECTABLE
- ONBOARD REFERENCE:
  Accuracy: 2.048V ±0.05%
  Drift: 5ppm/°C
- ONBOARD PGA
- ONBOARD OSCILLATOR
- 16 BITS, NO MISSING CODES
- INL: 0.01% of FSR max
- CONTINUOUS SELF-CALIBRATION
- SINGLE-CYCLE CONVERSION
- PROGRAMMABLE DATA RATE: 15SPS to 240SPS
- POWER SUPPLY: 2.7V to 5.5V
- LOW CURRENT CONSUMPTION: 240μA

Applications

- PORTABLE INSTRUMENTATION
- INDUSTRIAL PROCESS CONTROL
- SMART TRANSMITTERS
- CONSUMER GOODS
- FACTORY AUTOMATION
- TEMPERATURE MEASUREMENT

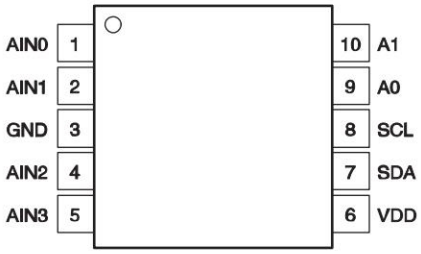
General Description

The TP1112M is a precision, continuously self-calibrating Analog-to-Digital (A/D) converter with two differential or three single-ended channels and up to 16 bits of resolution in the small MSOP-10 no-lead) packages. The onboard 2.048V reference provides an input range of ±2.048V differentially. The TP1112M uses an I^2C-compatible serial interface and has two address pins that allow a user to select one of the eight I^2C Slave addresses. The TP1112M operates from a single power supply ranging from 2.7V to 5.5V.

The TP1112M can perform conversions at rates of 15, 30, 60, or 240 samples per second (SPS). The onboard programmable gain amplifier (PGA), which offers gains of up to eight, allows smaller signals to be measured with high resolution. In single-conversion mode, the TP1112M automatically powers down after a conversion, greatly reducing current consumption during idle periods.

The TP1112M is designed for applications requiring high-resolution measurement, where space and power consumption are major considerations. Typical applications include portable instrumentation, industrial process control, and smart transmitters.

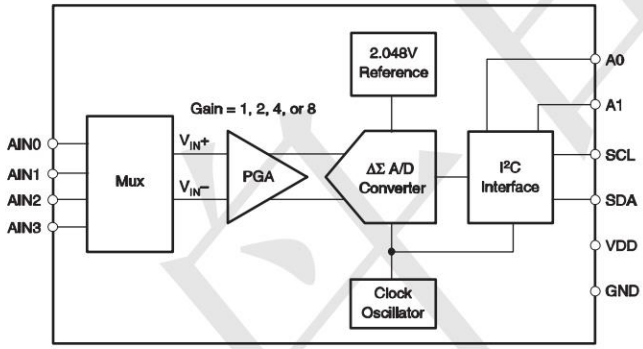
PIN CONFIGURATION



MSOP10

TERMINAL NAME	NO.	DESCRIPTION
AIN0	1	Differential Channel 1; Positive Input Single-ended Channel 1 Input
AIN1	2	Differential Channel 1; Negative Input Single-ended Channel 2 Input
GND	3	Ground
AIN2	4	Differential Channel 2; Positive Input Single-ended Channel 3 Input
AIN3	5	Differential Channel 2; Negative Input Single-ended Common Input
VDD	6	Power Supply: 2.7V to 5.5V
SDA	7	Serial Data: Transmits and receives data
SCL	8	Serial Clock Input: Clocks output data on SDA
A0	9	I^2C Slave Address Select
A1	10	I^2C Slave Address Select

BLOCK DIAGRAM



Absolute Maximum Rating (T_A=25°C unless otherwise noted)

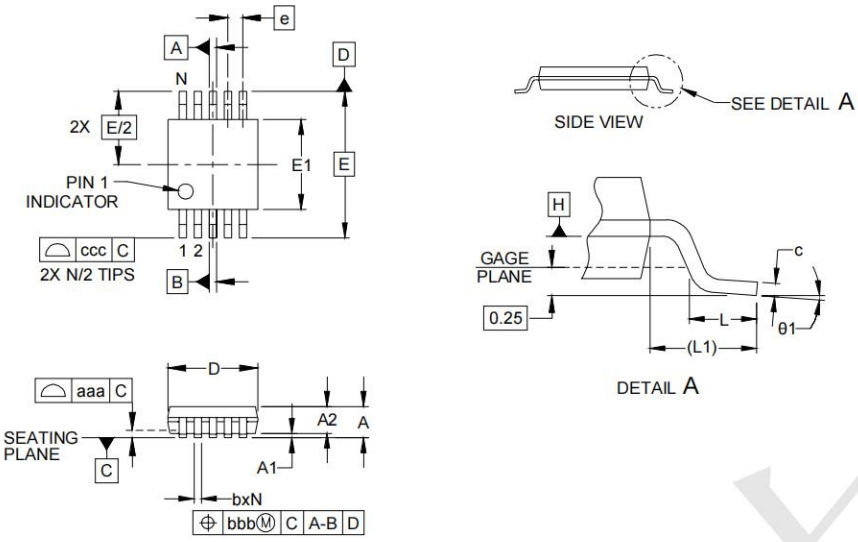
VDD to GND	−0.3V to +6V
Input Current	100mA, Momentary
Input Current	10mA, Continuous
Analog Inputs, A0, A1, Voltage to GND	−0.3V to VDD + 0.3V
SDA, SCL Voltage to GND	−0.5V to 6V
Maximum Junction Temperature	+150°C
Operating Temperature Range	−40°C to +125°C
Storage Temperature Range	−60°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

Electrical Characteristics

All specifications at −40°C to +85°C, VDD = 5V, and all PGAs, unless otherwise noted.

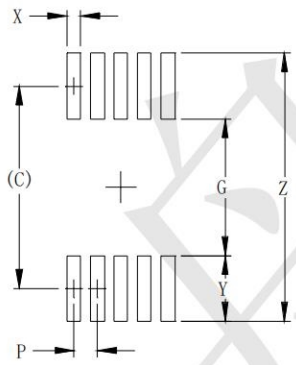
PARAMETER	CONDITIONS	ADS1112 MIN	ADS1112 TYP	ADS1112 MAX	UNIT
ANALOG INPUT					
Full-Scale Input Voltage	$(V_{IN+}) - (V_{IN-})$		±2.048/PGA		V
Analog Input Voltage	V_{IN+} to GND or V_{IN-} to GND	GND − 0.2		VDD + 0.2	V
Differential Input Impedance			2.8/PGA		MΩ
Common-Mode Input Impedance	PGA = 1		3.5		MΩ
	PGA = 2		3.5		MΩ
	PGA = 4		1.8		MΩ
	PGA = 8		0.9		MΩ
SYSTEM PERFORMANCE					
Resolution and No Missing Codes	DR = 00	12		12	Bits
	DR = 01	14		14	Bits
	DR = 10	15		15	Bits
	DR = 11	16		16	Bits
Data Rate	DR = 00	180	240	308	SPS
	DR = 01	45	60	77	SPS
	DR = 10	22	30	39	SPS
	DR = 11	11	15	20	SPS
Output Noise		See Typical Characteristic Curves			
Integral Nonlinearity	DR = 11, PGA = 1, End Point Fit(1)		±0.004	±0.010	% of FSR(2)
Offset Error	PGA = 1		1.2	8	mV
	PGA = 2		0.7	4	mV
	PGA = 4		0.5	2.5	mV
	PGA = 8		0.4	1.5	mV
Offset Drift	PGA = 1		1.2		µV/°C
	PGA = 2		0.6		µV/°C
	PGA = 4		0.3		µV/°C
	PGA = 8		0.3		µV/°C
Offset vs VDD	PGA = 1		800		µV/V
	PGA = 2		400		µV/V
	PGA = 4		200		µV/V
	PGA = 8		150		µV/V
Channel Offset Match	Match between any two channels		30		µV
Gain Error(3)			0.05	0.40	%
PGA Gain Error Match(3)	Match between any two PGA gains		0.02	0.10	%
Gain Error Drift(3)			5	40	ppm/°C
Gain vs VDD			80		ppm/V
Channel Gain Match	Match between any two channels		0.01		%
Common-Mode Rejection	At DC and PGA = 8	95	105		dB
	At DC and PGA = 1		100		dB
DIGITAL INPUT/OUTPUT					
Logic Level					
V_{IH}		0.7 • VDD		6	V
V_{IL}		GND − 0.5		0.3 • VDD	V
V_{OL}	I_{OL} = 3mA	GND		0.4	V
Input Leakage					
I_H	V_{IH} = 5.5V			10	µA
I_L	V_{IL} = GND	−10			µA
POWER-SUPPLY REQUIREMENTS					
Power-Supply Voltage	VDD	2.7		5.5	V
Supply Current	Power-Down		0.05	2	µA
	Active Mode		240	350	µA
Power Dissipation	VDD = 5.0V		1.2	1.75	mW
	VDD = 3.0V		0.675		mW

Outline Drawing -MSOP10



DIM	DIMENSIONS					
	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	-	-	.043	-	-	1.10
A1	.000	-	.006	0.00	-	0.15
A2	.030	-	.037	0.75	-	0.95
b	.007	-	.011	0.17	-	0.27
c	.003	-	.009	0.08	-	0.23
D	.114	.118	.122	2.90	3.00	3.10
E1	.114	.118	.122	2.90	3.00	3.10
E	.193 BSC			4.90 BSC		
e	.020 BSC			0.50 BSC		
L	.016	.024	.032	0.40	0.60	0.80
L1	(.037)			(.95)		
N	10			10		
θ1	0°	-	8°	0°	-	8°
aaa	.004			0.10		
bbb	.003			0.08		
ccc	.010			0.25		

Land Pattern -MSOP-10



DIMENSIONS		
DIM	INCHES	MILLIMETERS
C	(.161)	(4.10)
G	.098	2.50
P	.020	0.50
X	.011	0.30
Y	.063	1.60
Z	.224	5.70

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