

# ADS1120-Q1 Automotive, Low-Power, Low-Noise, 16-Bit, Analog-to-Digital Converter for Small-Signal Sensors

Check for Samples: [ADS1120-Q1](#)

## 1 Features

- Qualified for Automotive Applications
- AEC-Q100 Qualified with the Following Results:
  - Temperature Grade 1:  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
  - HBM ESD Classification 2
  - CDM ESD Classification C4B
- Low Current Consumption:  
As Low as  $120\ \mu\text{A}$  (typ) in Duty-Cycle Mode
- Wide Supply Range:  $2.3\ \text{V}$  to  $5.5\ \text{V}$
- Programmable Gain:  $1\ \text{V/V}$  to  $128\ \text{V/V}$
- Programmable Data Rates:  $5\ \text{SPS}$  to  $2\ \text{kSPS}$
- 16-Bit, Noise-Free Resolution at  $20\ \text{SPS}$
- Simultaneous  $50\text{-Hz}$  and  $60\text{-Hz}$  Rejection at  $20\ \text{SPS}$  with Single-Cycle Settling Digital Filter
- Dual-Matched Programmable Current Sources:  $50\ \mu\text{A}$  to  $1500\ \mu\text{A}$
- Internal  $2.048\text{-V}$  Reference:  $5\ \text{ppm}/^{\circ}\text{C}$  (typ) Drift
- Internal  $2\%$  Accurate Oscillator
- Internal Temperature Sensor:  $0.5^{\circ}\text{C}$  (typ) Accuracy
- Two Differential or Four Single-Ended Inputs
- SPI™-Compatible Interface (Mode 1)

## 2 Applications

- Battery Voltage Measurements
- Temperature Sensors:
  - Thermocouples
  - Resistance Temperature Detectors (RTDs):  
2-, 3-, or 4-Wire Types
- Bridge Sensors:
  - Pressure Sensors
  - Strain Gauges

## 3 Description

The ADS1120-Q1 is a precision, 16-bit, analog-to-digital converter (ADC) that offers many integrated features to reduce system cost and component count in applications measuring small sensor signals. The device features two differential or four single-ended inputs through a flexible input multiplexer (MUX), a low-noise, programmable gain amplifier (PGA), two programmable excitation current sources, a voltage reference, an oscillator, a low-side switch, and a precision temperature sensor.

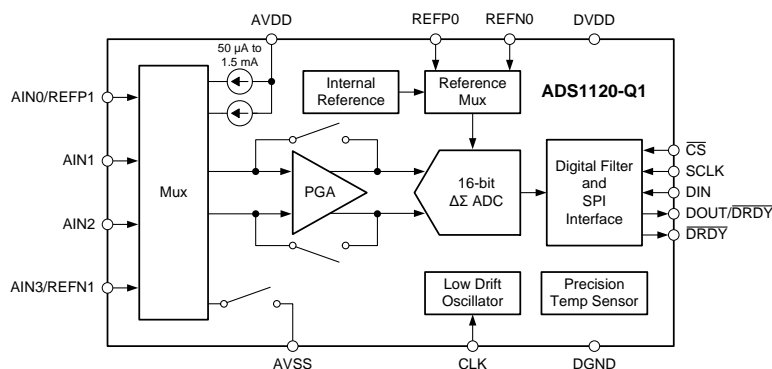
The device can perform conversions at data rates up to  $2000$  samples-per-second (SPS) with single-cycle settling. At  $20\ \text{SPS}$ , the digital filter offers simultaneous  $50\text{-Hz}$  and  $60\text{-Hz}$  rejection for noisy industrial applications. The internal PGA offers gains up to  $128\ \text{V/V}$ . This PGA makes the ADS1120-Q1 ideally-suited for applications measuring small sensor signals, such as resistance temperature detectors (RTDs), thermocouples, thermistors, and bridge sensors. The device supports measurements of pseudo- or fully-differential signals when using the PGA. Alternatively, the device can be configured to bypass the internal PGA while still providing high input impedance and gains up to  $4\ \text{V/V}$ , allowing for single-ended measurements.

Power consumption is as low as  $120\ \mu\text{A}$  when operating in duty-cycle mode with the PGA disabled. Communication to the device is established through a mode 1 SPI-compatible interface. The ADS1120-Q1 is offered in a TSSOP-16 package and is specified over a temperature range of  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### Device Information<sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
ADS1120-Q1	TSSOP (16)	$5.00\ \text{mm} \times 4.40\ \text{mm}$

(1) For all available packages, see the orderable addendum at the end of the datasheet.



## 4 Device and Documentation Support

### 4.1 Trademarks

SPI is a trademark of Motorola, Inc.

All other trademarks are the property of their respective owners.

### 4.2 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 4.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
ADS1120QPWRQ1	PREVIEW	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU   Call TI	Level-3-260C-168 HR	-40 to 125	A1120Q	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSELETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF ADS1120-Q1 :**

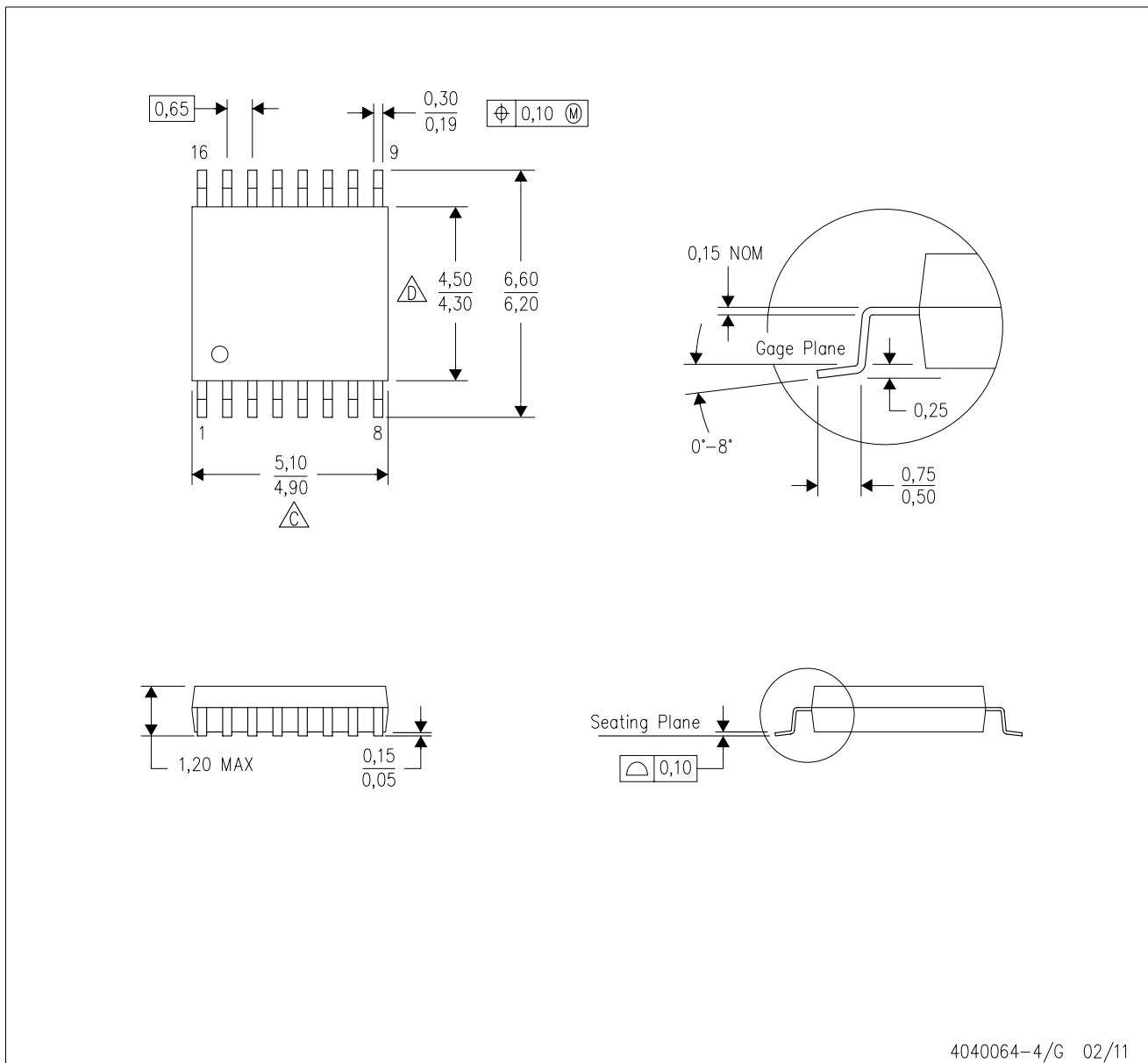
- Catalog: [ADS1120](#)

## NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

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