

ADS868x 16-Bit, 500-kSPS, 4- and 8-Channel, Single-Supply, SAR ADCs with Bipolar Input Ranges

1 Features

- 16-Bit ADC with Integrated Analog Front-End
- 4-, 8-Channel MUX with Auto and Manual Scan
- Software-Programmable Inputs per Channel:
 - Bipolar: ± 10.24 V, ± 5.12 V, and ± 2.56 V
 - Unipolar: 0 V to 10.24 V and 0 V to 5.12 V
- 5-V Analog Supply: 1.65-V to 5-V I/O Supply
- Constant Resistive Input Impedance: 1 M Ω
- Input Overvoltage Protection: Up to ± 20 V
- On-Chip 4.096-V Reference with Low Drift
- Excellent Performance:
 - 500-kSPS Aggregate Throughput
 - DNL: ± 0.5 LSB
 - INL: ± 0.75 LSB
 - SNR: 92 dB
 - THD: -102 dB
 - Low Power: 65 mW
- AUX Input \rightarrow Direct Connection to ADC Inputs
- ALARM \rightarrow High and Low Thresholds per Channel
- SPI™-Compatible Interface with Daisy-Chain
- -40°C to 125°C Industrial Temperature Range
- TSSOP-38 Package (9.7 mm x 4.4 mm)

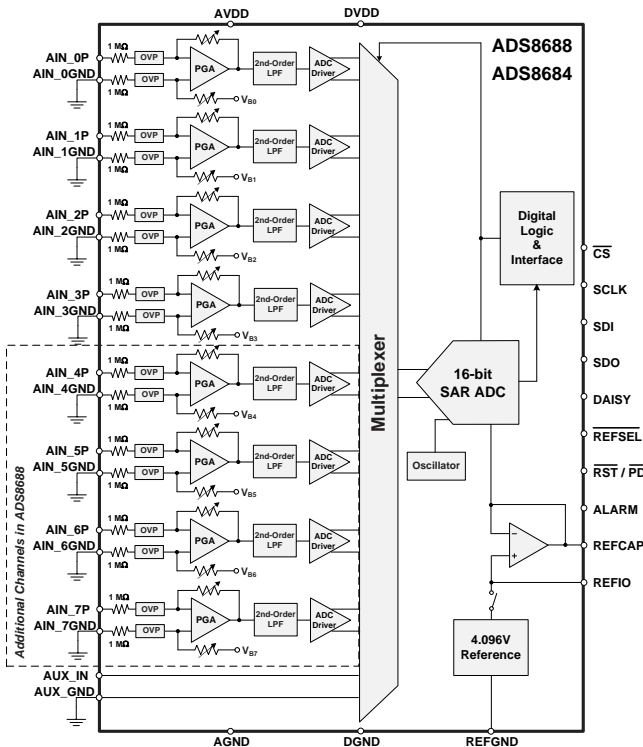
2 Applications

- Power Automation
- Protection Relays
- PLC Analog Input Modules

3 Description

The ADS8684 and ADS8688 are 4- and 8-channel, integrated data acquisition systems based on a 16-bit successive approximation (SAR) analog-to-digital converter (ADC), operating at a throughput of 500 kSPS. The devices feature integrated analog front-end circuitry for each input channel with overvoltage protection up to ± 20 V, a 4- or 8-channel multiplexer with automatic and manual scanning modes, and an on-chip 4.096-V reference with extremely low drift. Operating on a single 5-V analog supply, each input channel on the devices can support true bipolar input ranges of ± 10.24 V, ± 5.12 V, and ± 2.56 V, as well as unipolar input ranges of 0 V to 10.24 V and 0 V to 5.12 V. The input range selection is done by software programming the device internal registers and is independent for each channel. The devices offer a 1-M Ω , constant resistive input impedance irrespective of the selected input range.

The ADS8684 and ADS8688 offer a simple SPI-compatible serial interface to the digital host and also support daisy-chaining of multiple devices. The digital supply can operate from 1.65 V to 5.25 V, enabling direct interface to a wide range of host controllers.



Device Information⁽¹⁾

| PART NUMBER | PACKAGE | BODY SIZE (NOM) |
|-------------|------------|-------------------|
| ADS868x | TSSOP (38) | 9.70 mm x 4.40 mm |

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

PRODUCT PREVIEW



4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

For related documentation see the following:

- OPA320 Data Sheet, [SBOS513](#)

4.2 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 1. Related Links

| PARTS | PRODUCT FOLDER | SAMPLE & BUY | TECHNICAL DOCUMENTS | TOOLS & SOFTWARE | SUPPORT & COMMUNITY |
|---------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| ADS8684 | Click here | Click here | Click here | Click here | Click here |
| ADS8688 | Click here | Click here | Click here | Click here | Click here |

4.3 Trademarks

SPI is a trademark of Motorola.

All other trademarks are the property of their respective owners.

4.4 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.

4.5 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 |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|---------|
| ADS8684IDBT | PREVIEW | TSSOP | DBT | 38 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | -40 to 125 | ADS8684 | |
| ADS8684IDBTR | PREVIEW | TSSOP | DBT | 38 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | -40 to 125 | ADS8684 | |
| ADS8688IDBT | PREVIEW | TSSOP | DBT | 38 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | -40 to 125 | ADS8688 | |
| ADS8688IDBTR | PREVIEW | TSSOP | DBT | 38 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-2-260C-1 YEAR | -40 to 125 | ADS8688 | |

(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.

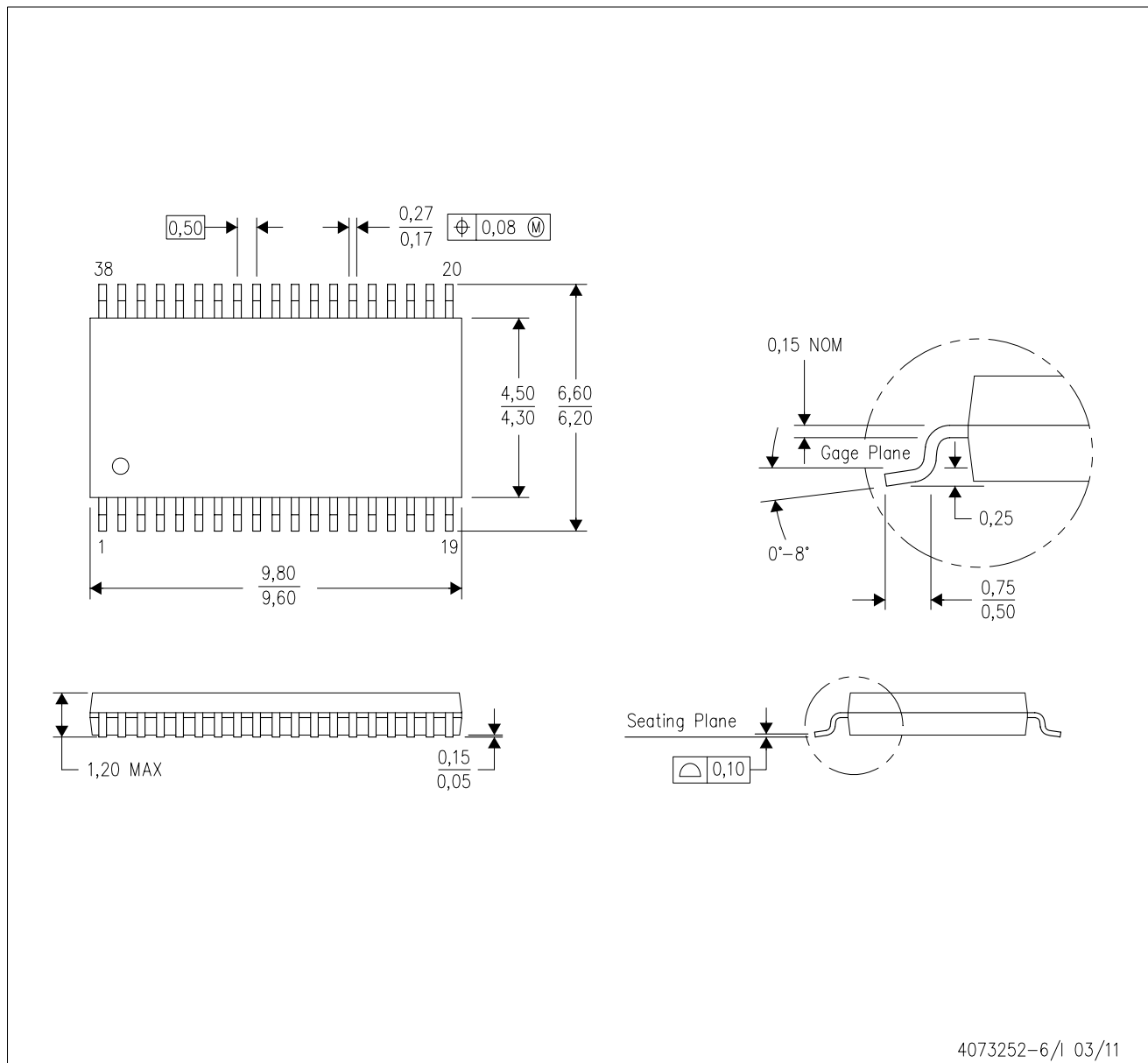
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MECHANICAL DATA

DBT (R-PDSO-G38)

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 dimensions do not include mold flash or protrusion.
 - D. Falls within JEDEC MO-153.

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