TEXAS INSTRUMENTS

DDC3256
SLASFA0 – JUNE 2023

DDC3256 256-Channel, Current-Input Analog-To-Digital Converter

1 Features

- Single-chip solution to directly measure 256 low-level currents simultaneously
- Adjustable full-scale charge range up to 320 pC
- Input current: 1 µA (maximum)
- Adjustable speed with integration times as low as 50 µs (20 KSPS per channel)
- Resolution: 24 bit
- Low power dissipation: 1.2 mW/channel
- Integral non-linearity: ±0.025% of reading ±1 ppm of full scale range (all channels active)
- Low noise: 0.26 fCrms at 320 pC FSR with 20 pF sensor capacitance
- No charge loss
- On-chip temperature sensor
- Serial LVDS output interface
- Single 1.85-V supply
- In-package bypass capacitors and reference buffer to reduce PCB area and design complexity

2 Applications

- CT Scanner data acquisition system
- Photodiode sensors
- X-ray detection systems
- Optical fiber power monitoring
- Muti-channel current, voltage instrumentation

3 Description

The DDC3256 is a 24-bit, 256-channel, current-input analog-to-digital (A/D) converter. It combines both, current-to-voltage conversion by current integration, and A/D conversion.

Up to 256 individual low-level current output devices, such as photodiodes, can be directly connected to its inputs and digitized in parallel (simultaneously).
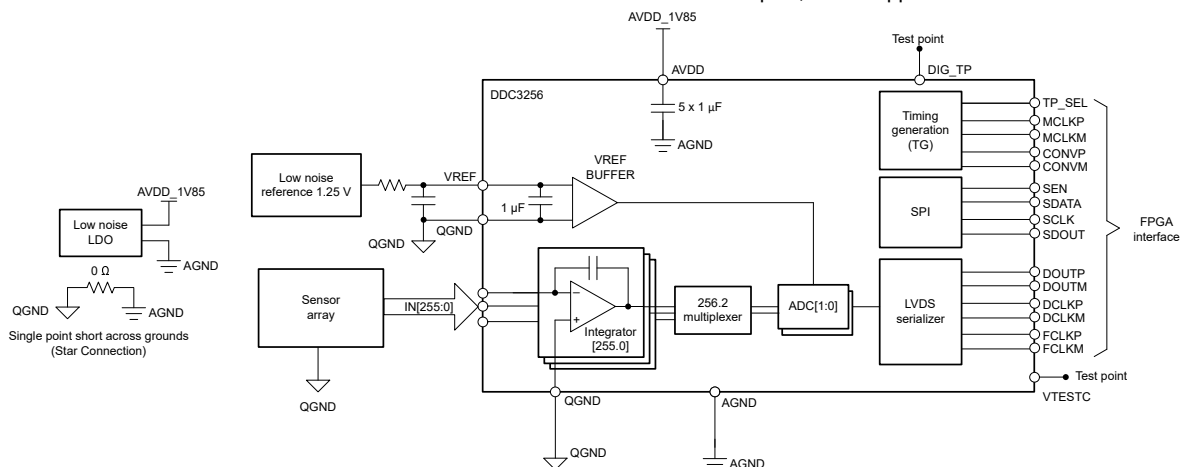
For each of the 256 inputs, the device has one low noise and low power integrator designed to capture all the charge from the sensor. The integration time is adjustable from 50 µs to 1.6 ms, allowing currents in the order of fA to µA to be continuously measured with outstanding precision. The outputs of the integrators are digitized by on-chip low power ADCs and the converted digital codes are transmitted over a single LVDS pair designed to minimize noise coupling in environments with high channel count.

The DDC3256 operates from single 1.85-V supply. The device is specified from 0°C to 70°C operating temperature and available in a 13.2×17.2 mm^2 336-ball 0.8 mm-pitch BGA. The on-chip reference buffer and bypass capacitors (on the BGA) help minimize the external component requirements and further reduce board space.

Package Information

PART NUMBER	PACKAGE[1]	PACKAGE SIZE (NOM)[2]
DDC3256ZWX	ZWX (NFBGA, 336)	17.2 mm × 13.2 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.

Simplified Schematic

Table of Contents

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
June 2023	*	Initial Release

Product Folder Links: *DDC3256*

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation, see the following:

1. Texas Instruments, TPS7A84 High-Current (3 A), High-Accuracy (1%), Low-Noise (4.4 µVRMS), LDO Voltage Regulator data sheet
2. Texas Instruments, REF70 2 ppm/°C Maximum Drift, 0.23 ppmp-p 1/f Noise, Precision Voltage Reference data sheet

5.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

5.3 Trademarks

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5.4 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.
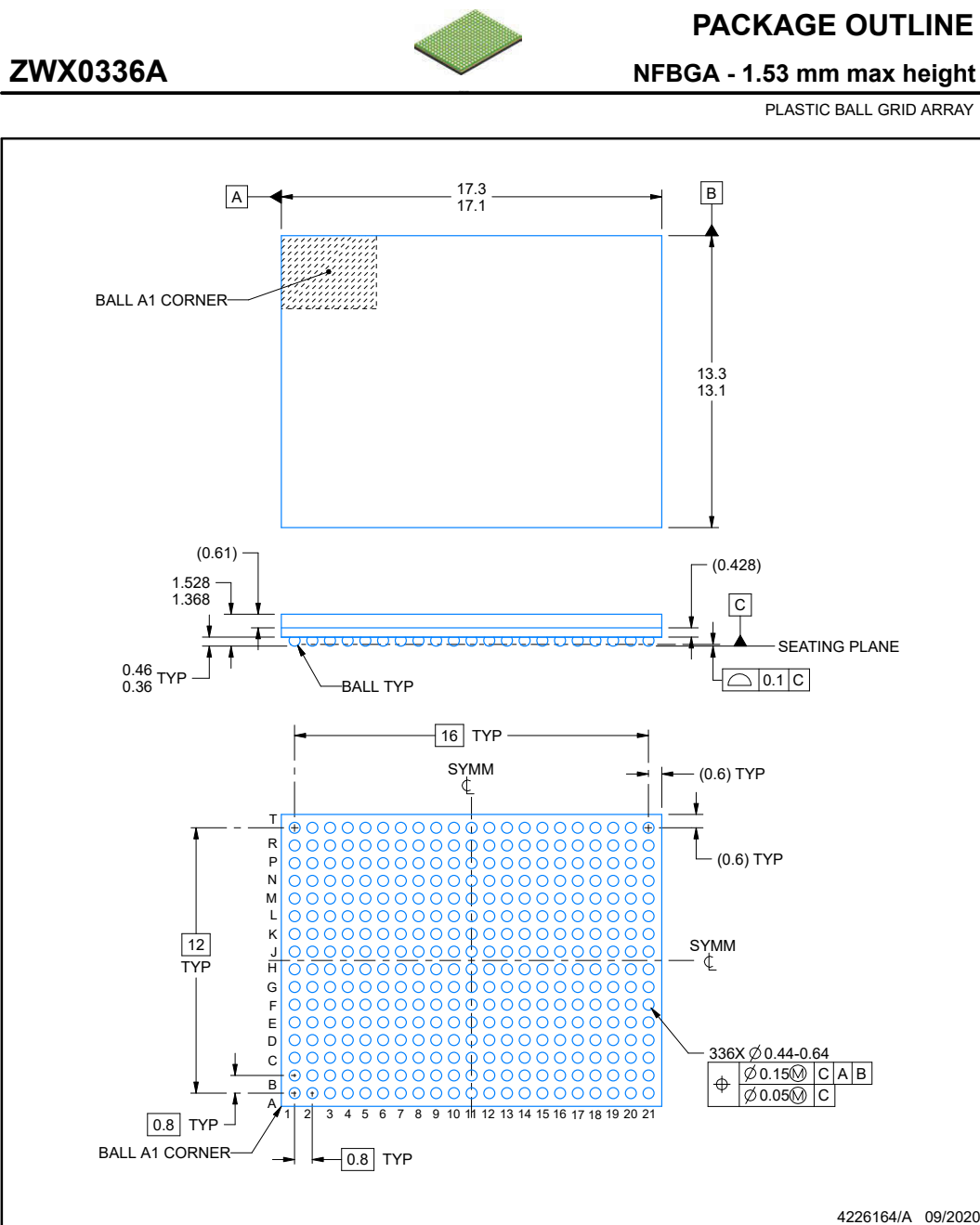
5.5 Glossary

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

6 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.

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6.1 Mechanical Data

PACKAGE OUTLINE

ZWX0336A

NFBGA - 1.53 mm max height
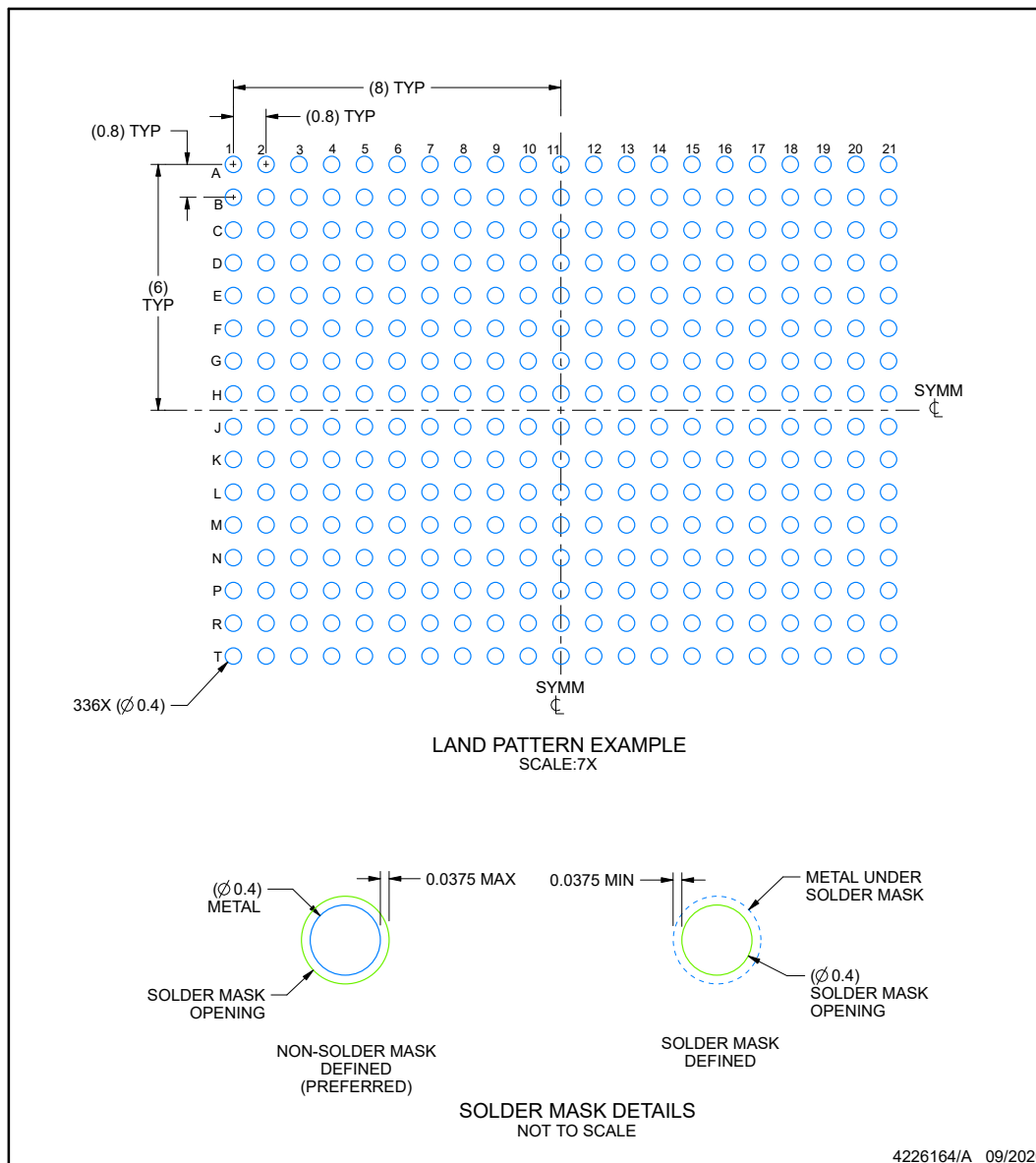
PLASTIC BALL GRID ARRAY

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

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Product Folder Links: *DDC3256*

EXAMPLE BOARD LAYOUT

ZWX0336A

NFBGA - 1.53 mm max height

PLASTIC BALL GRID ARRAY

LAND PATTERN EXAMPLE
SCALE:7X

336X (∅ 0.4)

(8) TYP
(0.8) TYP
(0.8) TYP
(6) TYP

SYMM ℄
SYMM ℄

SOLDER MASK DETAILS
NOT TO SCALE

(∅ 0.4) METAL
SOLDER MASK OPENING
0.0375 MAX
NON-SOLDER MASK DEFINED (PREFERRED)

0.0375 MIN
METAL UNDER SOLDER MASK
(∅ 0.4) SOLDER MASK OPENING
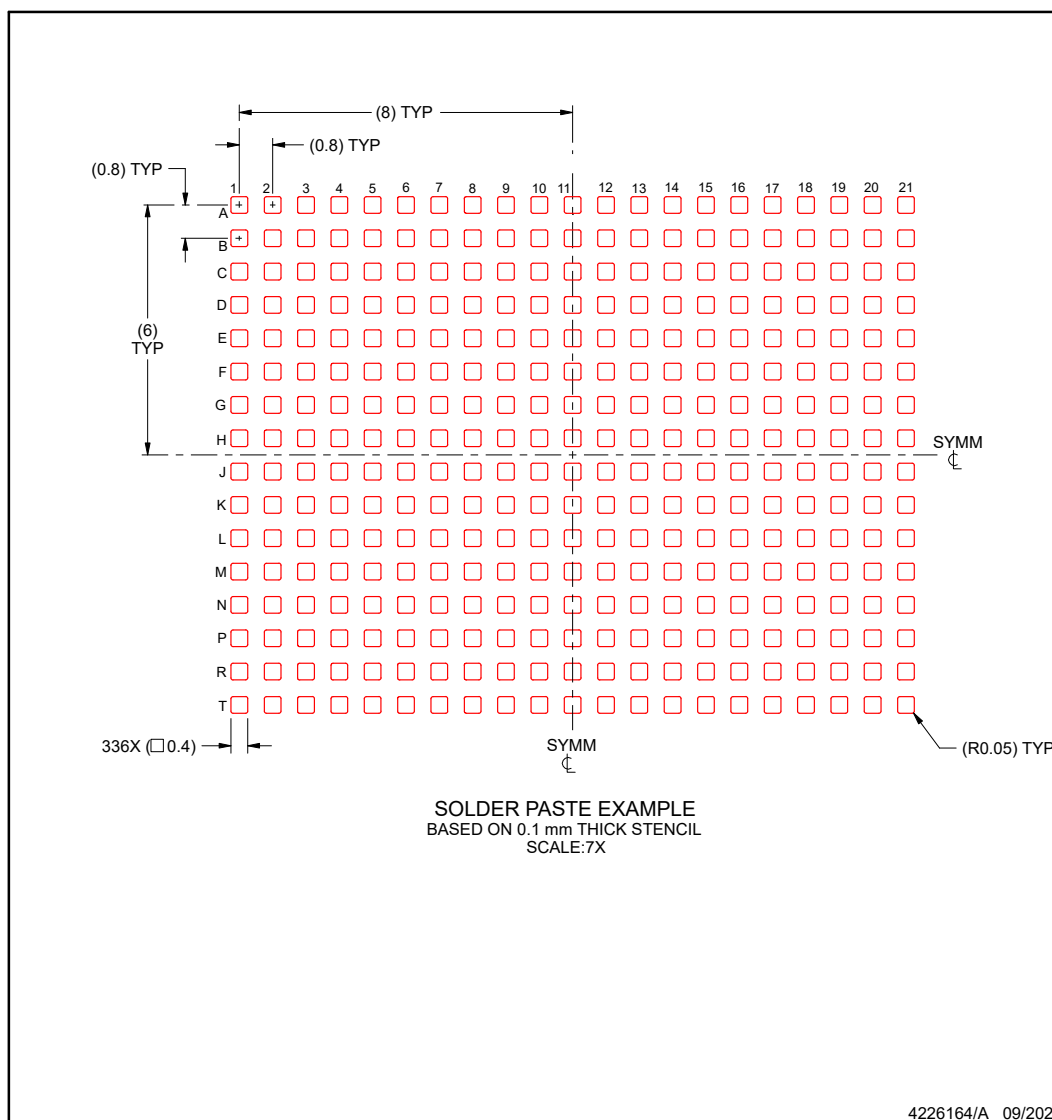SOLDER MASK DEFINED

4226164/A   09/2020

NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints.
   For information, see Texas Instruments literature number SPRAA99 (www.ti.com/lit/spraa99).

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Product Folder Links: *DDC3256*

EXAMPLE STENCIL DESIGN

ZWX0336A

NFBGA - 1.53 mm max height

PLASTIC BALL GRID ARRAY

SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:7X

4226164/A   09/2020

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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Product Folder Links: *DDC3256*

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
DDC3256ZWX	Active	Production	NFBGA (ZWX) | 336	108 | EIAJ TRAY (10+1)	Yes	SNAGCU	Level-3-260C-168 HR	0 to 70	DDC3256
DDC3256ZWX.A	Active	Production	NFBGA (ZWX) | 336	108 | EIAJ TRAY (10+1)	Yes	SNAGCU	Level-3-260C-168 HR	0 to 70	DDC3256

(1) Status: For more details on status, see our product life cycle.

(2) Material type: When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) RoHS values: Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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PACKAGE MATERIALS INFORMATION

TRAY

Chamfer on Tray corner indicates Pin 1 orientation of packed units.

*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
DDC3256ZWX	ZWX	NFBGA	336	108	06X18	150	315	135.9	7620	17	13	14.45
DDC3256ZWX.A	ZWX	NFBGA	336	108	06X18	150	315	135.9	7620	17	13	14.45

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Last updated 10/2025