

AFE2256 256-Channel, Analog Front-End for Digital X-Ray, Flat-Panel Detectors

1 Features

- 256 Channels
- On-Chip, 16-Bit ADC
- Photodiode Short Immunity
- High Performance:
 - Noise: 750 Electrons RMS (1.2-pC Input Charge Range)
 - Low Correlated Noise
 - Integral Nonlinearity: ± 2 LSB with Internal 16-Bit ADC
 - Scan Time: < 20 μ s to 204.8 μ s
- Integration:
 - Six Selectable, Full-Scale Input Ranges: 0.6 pC (Minimum) to 9.6 pC (Maximum)
 - Internal Timing Generator (TG)
 - Built-In Correlated Double Sampler
 - Pipelined Integrate-and-Read for Improved Throughput—Data-Read During Integration
 - Serial LVDS Output
- Simple Power-Supply Scheme:
 - AVDD1 = 1.85 V
 - AVDD2 = 3.3 V
- Low Power Consumption
- Nap and Total Power-Down Modes
- Custom Chip-On-Film (COF) Packages

2 Applications

- Flat-Panel, X-Ray Detectors
- Charge Detectors
- Capacitance Measurement

3 Description

The AFE2256 is a 256-channel, analog front-end (AFE) designed to suit the requirements of flat-panel detector (FPD) based digital x-ray systems. The device includes 256 integrators, a programmable gain amplifier (PGA) for full-scale charge level selection, a correlated double sampler with dual banking, and 256:4 analog multiplexers.

The device also features four 16-bit successive-approximation register (SAR) analog-to-digital converters (ADCs). Serial data from the ADCs are available in low-voltage differential signaling (LVDS) format.

The nap and power-down modes enable substantial power savings, and are especially useful in battery-powered systems.

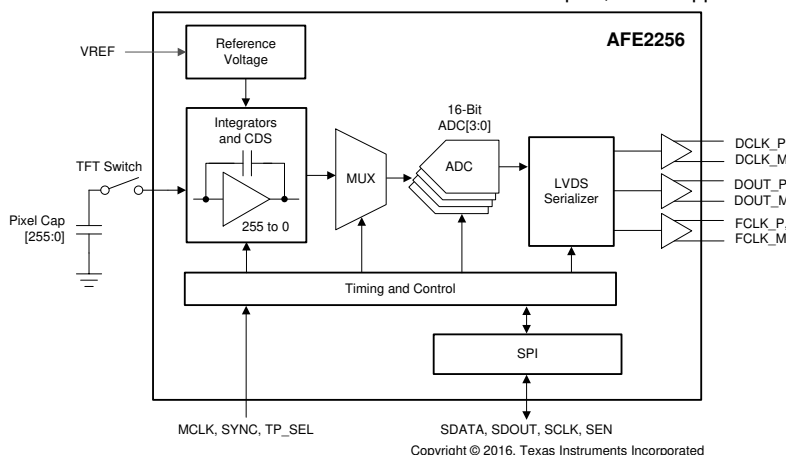
To request a full datasheet or other design resources: [request AFE2256](#)

Package Information

| PART NUMBER | PACKAGE ⁽¹⁾ | PACKAGE SIZE ⁽²⁾ |
|-------------|------------------------|-----------------------------|
| AFE2256 | TDU (COF, 320) | 38.00 mm × 28.00 mm |
| | TDR (COF, 325) | 48.35 mm × 21.5 mm |
| | TBN (COF, 325) | 48.35 mm × 21.5 mm |

(1) For all available packages, see [Section 6](#).

(2) The package size (length × width) is a nominal value and includes pins, where applicable.



AFE2256 Block Diagram



Table of Contents

| | | | |
|---|----------|--|----------|
| 1 Features | 1 | 4.2 Trademarks..... | 3 |
| 2 Applications | 1 | 4.3 Electrostatic Discharge Caution..... | 3 |
| 3 Description | 1 | 4.4 Glossary..... | 3 |
| 4 Device and Documentation Support | 3 | 5 Revision History | 3 |
| 4.1 Documentation Support..... | 3 | 6 Mechanical, Packaging, and Orderable Information | 3 |

4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

For related documentation, see the following:

Texas Instruments, [TPS7A8300 2- \$\mu\$ A, 6- \$\mu\$ VRMS, RF, LDO Voltage Regulator data sheet](#)

4.2 Trademarks

All trademarks are the property of their respective owners.

4.3 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.

4.4 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

5 Revision History

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

| Changes from Revision B (May 2016) to Revision C (December 2023) | Page |
|--|------|
| • Added <i>AFE2256TBN</i> package specifications across the document | 1 |
| • Changed front page schematic diagram for clarity..... | 1 |
| Changes from Revision A (July 2015) to Revision B (May 2016) | Page |
| • Added link to request full data sheet..... | 1 |
| Changes from Revision * (March 2015) to Revision A (July 2015) | Page |
| • Released to production..... | 1 |

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.

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) |
|-----------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| AFE2256TBN | Active | Production | COF (TBN) 325 | 32 JEDEC TRAY (5+1) | Yes | AU | N/A for Pkg Type | 0 to 70 | AFE2256TBN |
| AFE2256TBN.A | Active | Production | COF (TBN) 325 | 32 JEDEC TRAY (5+1) | Yes | AU | N/A for Pkg Type | 0 to 70 | AFE2256TBN |
| AFE2256TDR | Active | Production | COF (TDR) 325 | 32 JEDEC TRAY (5+1) | Yes | AU | Level-1-260C-UNLIM | 0 to 85 | AFE2256TDR |
| AFE2256TDR.A | Active | Production | COF (TDR) 325 | 32 JEDEC TRAY (5+1) | Yes | AU | Level-1-260C-UNLIM | 0 to 85 | AFE2256TDR |
| AFE2256TDU | Active | Production | COF (TDU) 320 | 35 EIAJ TRAY (10+1) | Yes | AU | Level-1-260C-UNLIM | 0 to 85 | AFE2256TDU |
| AFE2256TDU.A | Active | Production | COF (TDU) 320 | 35 EIAJ TRAY (10+1) | Yes | AU | Level-1-260C-UNLIM | 0 to 85 | AFE2256TDU |

⁽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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative

and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](#) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2025, Texas Instruments Incorporated