

AFE3256 256-Channel, Analog Front-End for Digital X-Ray, Flat-Panel Detectors

1 Features

- 256 channels
- On-chip, 16-bit ADC
- High performance:
 - Noise: 440 electrons RMS (1.2-pC input charge range)
 - Low correlated noise
 - Full-channel integral nonlinearity: ± 2 LSB at 16 bit
 - Scan time: $< 16 \mu\text{s}$ to $204.8 \mu\text{s}$
- Integration:
 - Programmable full-scale input charge range: 0.3pC to 12.5pC with resolution of 0.3pC
 - Internal timing generator (TG)
 - Built-in correlated double sampler
 - Software programmable electron or hole integration mode
 - Pipelined integrate-and-read for improved throughput—data-read during integration
 - Serial LVDS output
 - On-chip temperature sensor
- Simple power supply scheme:
 - Single 1.85V power supply operation
- Multiple power modes with power consumption ranging from 1mW/ch to 2mW/ch
- Power-down modes: sleep and standby
- Binning mode support
- Custom chip-on-film (COF) packages

2 Applications

- Flat-panel, X-ray detectors
- Charge detectors
- Capacitance measurement

3 Description

The AFE3256 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, correlated double samplers (CDSs) with dual banking, and 256:2 analog multiplexers. The device also features two 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.

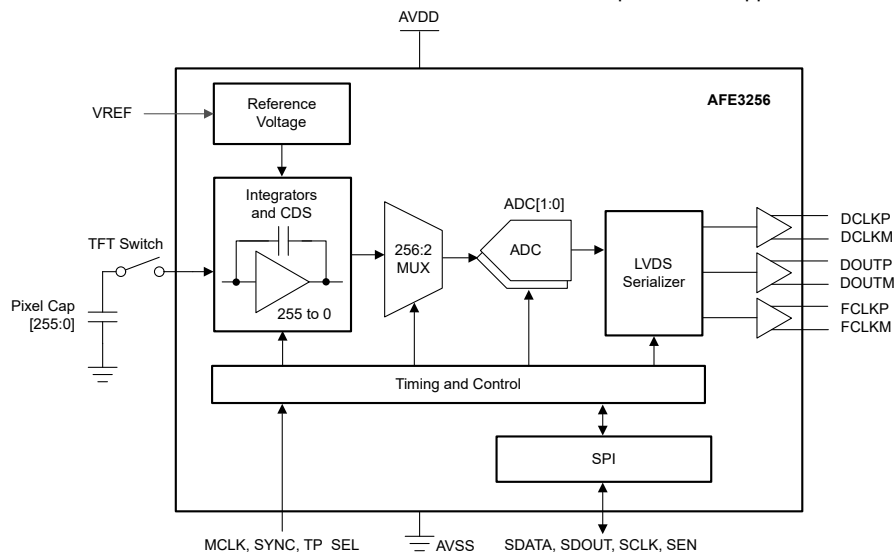
The device, also commonly referred to as a readout integrated circuit (ROIC), optimizes the overall system performance using features such as multiple power modes and in-system debug options.

The sleep and standby modes enable substantial power saving which is critical for battery-powered systems.

Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
AFE3256	TFU (COF, 320)	38mm x 28mm
AFE3256	TFV (COF, 315)	48mm x 17.33mm

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



AFE3256 Block Diagram



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4 Revision History

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

Changes from Revision * (October 2023) to Revision A (April 2024)	Page
• Added AFE3256TFV package details across the document.....	1

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [TPS7A8300 2- \$\mu\$ A, 6- \$\mu\$ VRMS, RF, LDO Voltage Regulator data sheet](#)
- Texas Instruments, [REF70 2 ppm/ \$^{\circ}\$ C Maximum Drift, 0.23 ppm-p 1/f Noise, Precision Voltage Reference data sheet](#)

5.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

5.3 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.

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5.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

5.5 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.

5.6 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.

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)
AFE3256TFU	Active	Production	COF (TFU) 320	30 JEDEC TRAY (10+1)	No	AU	N/A for Pkg Type	0 to 70	AFE3256
AFE3256TFU.A	Active	Production	COF (TFU) 320	30 JEDEC TRAY (10+1)	No	AU	N/A for Pkg Type	0 to 70	AFE3256
AFE3256TFV	Active	Production	COF (TFV) 315	36 JEDEC TRAY (10+1)	No	AU	N/A for Pkg Type	0 to 70	AFE3256
AFE3256TFV.A	Active	Production	COF (TFV) 315	36 JEDEC TRAY (10+1)	No	AU	N/A for Pkg Type	0 to 70	AFE3256

(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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