

DDC1128 128-Channel, Current-Input Analog-to-Digital Converter

1 Features

- Single-Chip Solution to Directly Measure 128 Low-Level Currents
- Proven High-Precision, True Integrating Architecture with 100% Charge Collection
- Easy Upgrade for Existing DDC Family Applications
- Low Power: 3 mW/channel at 3 kSPS
- Extremely Linear:
INL = $\pm 0.025\%$ of Reading ± 1 ppm of FSR
- Low Noise: 6.3 ppm of FSR
- Adjustable Full-Scale Range
- Adjustable Speed
 - Data Rates up to 6 kSPS with 20-bit Performance
 - Integration Times as low as 160 μ s
- Daisy-Chainable Serial Interface
- In-Package Bypass Capacitors Simplify PCB Design Area and Design Complexity

2 Applications

- CT Scanner DAS
- Photodiode Sensors
- X-Ray Detection Systems

3 Description

The DDC1128 is a 20-bit, 128-channel, current-input analog-to-digital (A/D) converter. It combines both current-to-voltage and A/D conversion so that 128 separate low-level current output devices, such as photodiodes, can be directly connected to its inputs and digitized.

For each of the 128 inputs, the DDC1128 uses the proven dual switched integrator front-end. This configuration allows for continuous current integration: while one integrator is being digitized by the onboard A/D converter, the other is integrating the input current. This architecture provides both a stable offset and a loss-less collection of the input current. Adjustable integration times range from 160 μ s to 1s, allowing currents from fAs to μ As to be continuously measured with outstanding precision.

The DDC1128 has a serial interface designed for daisy-chaining in multi-device systems. Simply connect the output of one device to the input of the next to create the chain. Common clocking feeds all the devices in the chain so that the digital overhead in a multi-DDC1128 system is minimal.

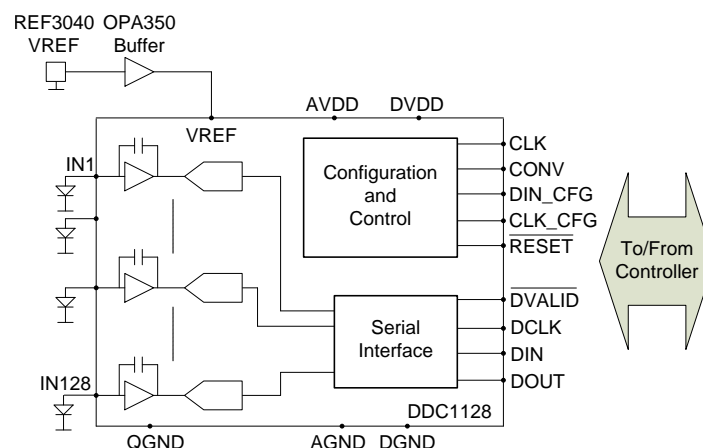
The DDC1128 operates from a +5 V analog supply and a 2.7 V to 3.6 V digital supply, it is specified from 0°C to 70°C operating temperature and it is available in a 9 x 9mm² 192-ball BGA, which includes on board bypass capacitors to help minimize the external component requirements and further reduce board space.

For more information, please contact ddc1128_info@list.ti.com

Device Information

ORDER NUMBER	PACKAGE	BODY SIZE
DDC1128ZKL	NFBGA (192)	9mm x 9mm

Figure 1. Simplified Schematic



4 Device and Documentation Support

4.1 Trademarks

All trademarks are the property of their respective owners.

4.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

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
DDC1128ZKLR	ACTIVE	NFBGA	ZKL	192	1000	Green (RoHS & no Sb/Br)	SNAGCU	Level-3-260C-168 HR	0 to 70	DDC1128	Samples
DDC1128ZKLT	ACTIVE	NFBGA	ZKL	192	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-3-260C-168 HR	0 to 70	DDC1128	Samples

(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.

OBSOLETE: 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.

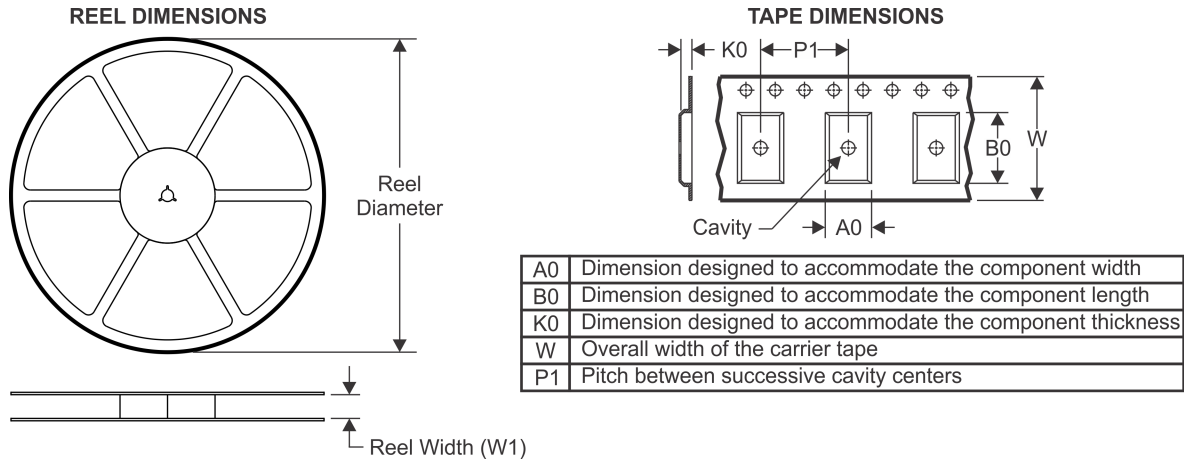
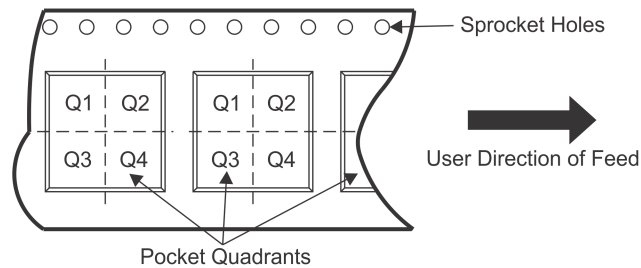
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DDC1128ZKLR	NFBGA	ZKL	192	1000	330.0	16.4	9.3	9.3	2.15	12.0	16.0	Q1
DDC1128ZKLT	NFBGA	ZKL	192	250	180.0	16.4	9.3	9.3	2.15	12.0	16.0	Q1

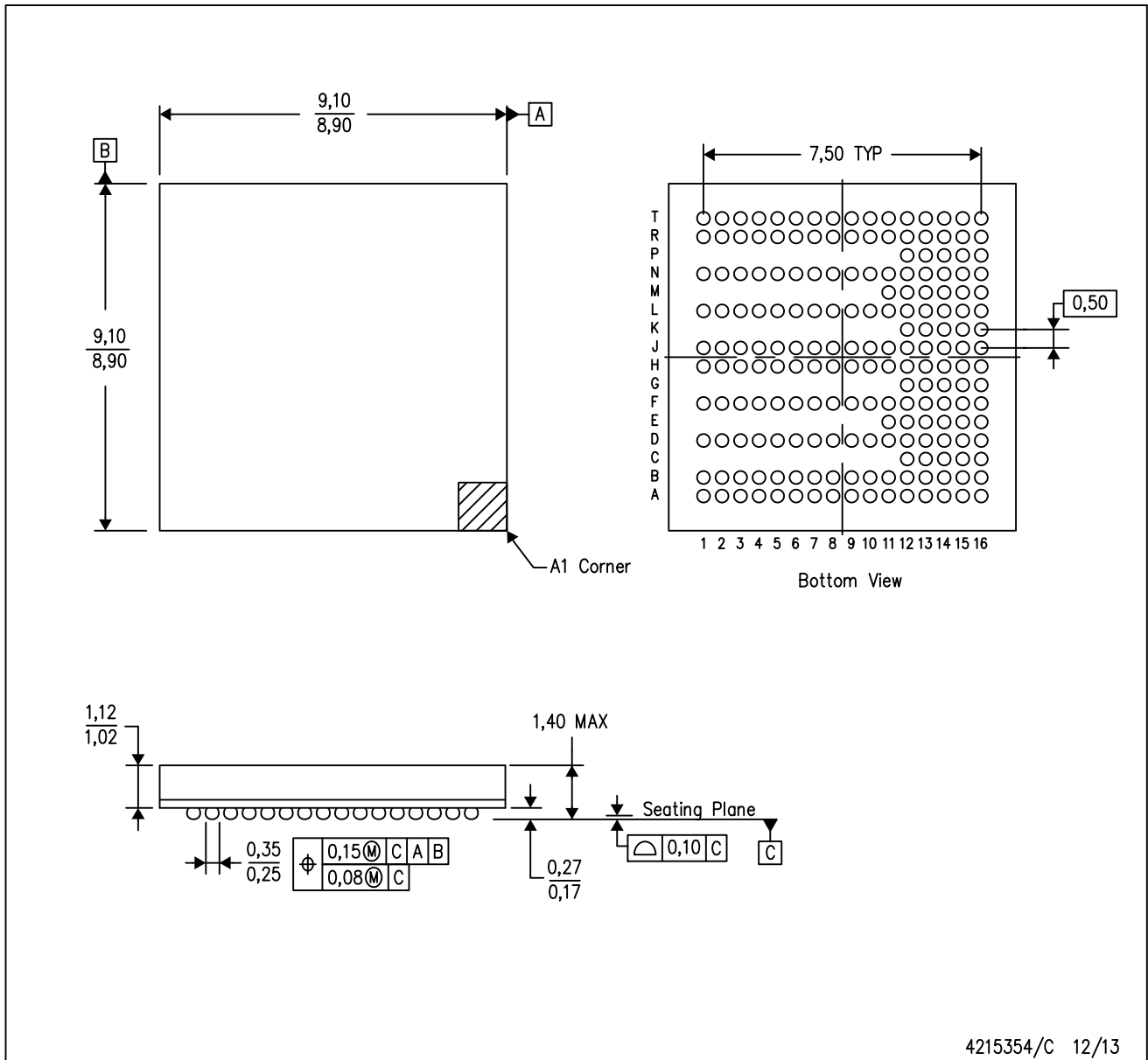
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DDC1128ZKLR	NFBGA	ZKL	192	1000	336.6	336.6	28.6
DDC1128ZKLT	NFBGA	ZKL	192	250	213.0	191.0	55.0

ZKL (S-PBGA-N192)

PLASTIC BALL GRID ARRAY



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y1.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. This is a Pb-free solder ball design.

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