TDC7200 Time-to-Digital Converter for Water, Gas, Heat Flow Metering Applications

1 Features

- Resolution: 55 ps
- Standard Deviation: 35 ps
- Measurement Range:
  - Mode 1: 12 ns to 500 ns
  - Mode 2: 250 ns to 8 ms
- Low Power Consumption: 0.5 uA (2 SPS)
- Supports up to 5 STOP Signals
- Autonomous Multi-Cycle Averaging Mode for Low Power Consumption
- Supply Voltage: 2.0 V to 3.6 V
- Operating Temperature –40°C to 85°C
- SPI Host Interface for Configuration and Register Access

2 Applications

- Flow Meter: Water Meter, Gas Meter, Heat Meter
- Heat Cost Allocators

3 Description

The TDC7200 is a Time to Digital Converter (TDC) for ultrasonic sensing measurements such as water flow meter, gas flow meter, and heat flow meter. When paired with the TDC1000 (ultrasonic analog-front-end), the TDC7200 can be a part of a complete TI ultrasonic sensing solution that includes the MSP430, power, wireless, and source code.

The Time to Digital Converter (TDC) performs the function of a stopwatch and measures the elapsed time (time-of-flight or TOF) between a START pulse and up to five STOP pulses. The ability to measure from START to multiple STOPs gives users the flexibility to select which STOP pulse yields the best echo performance.

The device has an internal self-calibrated time base which compensates for drift over time and temperature. Self-calibration enables time-to-digital conversion accuracy in the order of picoseconds. This accuracy makes the TDC7200 ideal for flow meter applications, where zero and low flow measurements require high accuracy.

When placed in the Autonomous Multi-Cycle Averaging Mode, the TDC7200 can be optimized for low system power consumption, making it ideal for battery powered flow meters. In this mode, the host can go to sleep to save power, and it can wake up when interrupted by the TDC upon completion of the measurement sequence.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
TDC7200	TSSOP (14)	5.00 mm × 4.40 mm

Companion Device

PART NO.	TITLE
TDC1000	Ultrasonic Sensing Analog Front End for Level, Concentration, Flow & Proximity Sensing

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

PRODUCT PREVIEW

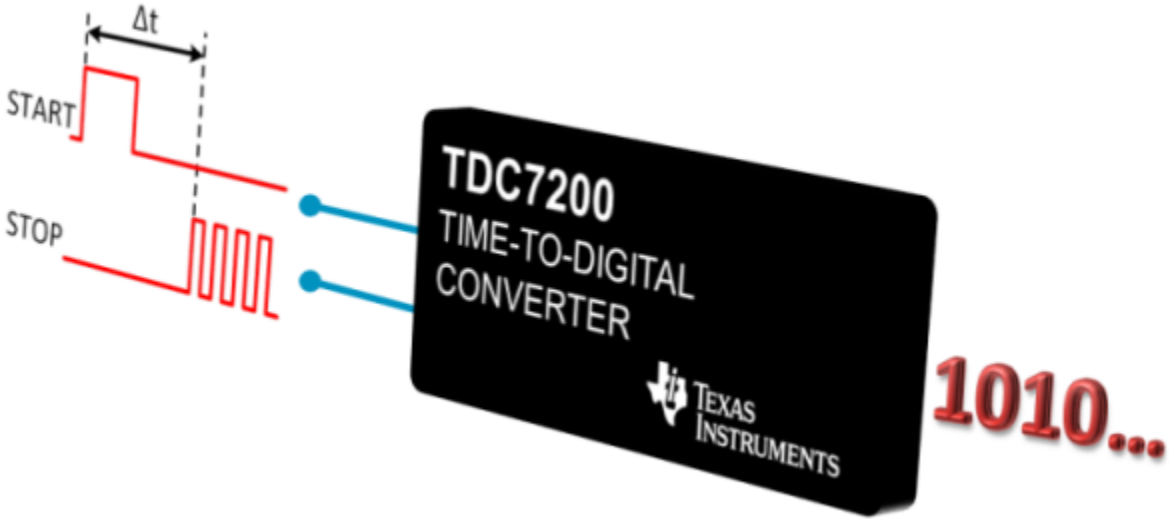


Table of Contents

4 Revision History

DATE	REVISION	NOTES
February 2015	*	Initial release.

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

- TDC1000: Ultrasonic Sensing Analog Front End for Level, Concentration, Flow & Proximity Sensing Applications

5.2 Trademarks

All trademarks are the property of their respective owners.

5.3 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.

5.4 Glossary

SLYZ022 — *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.

PRODUCT PREVIEW

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
TDC7200PW	PREVIEW	TSSOP	PW	14	90	TBD	Call TI	Call TI	-40 to 85		
TDC7200PWR	PREVIEW	TSSOP	PW	14	2000	TBD	Call TI	Call TI	-40 to 85		

(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)

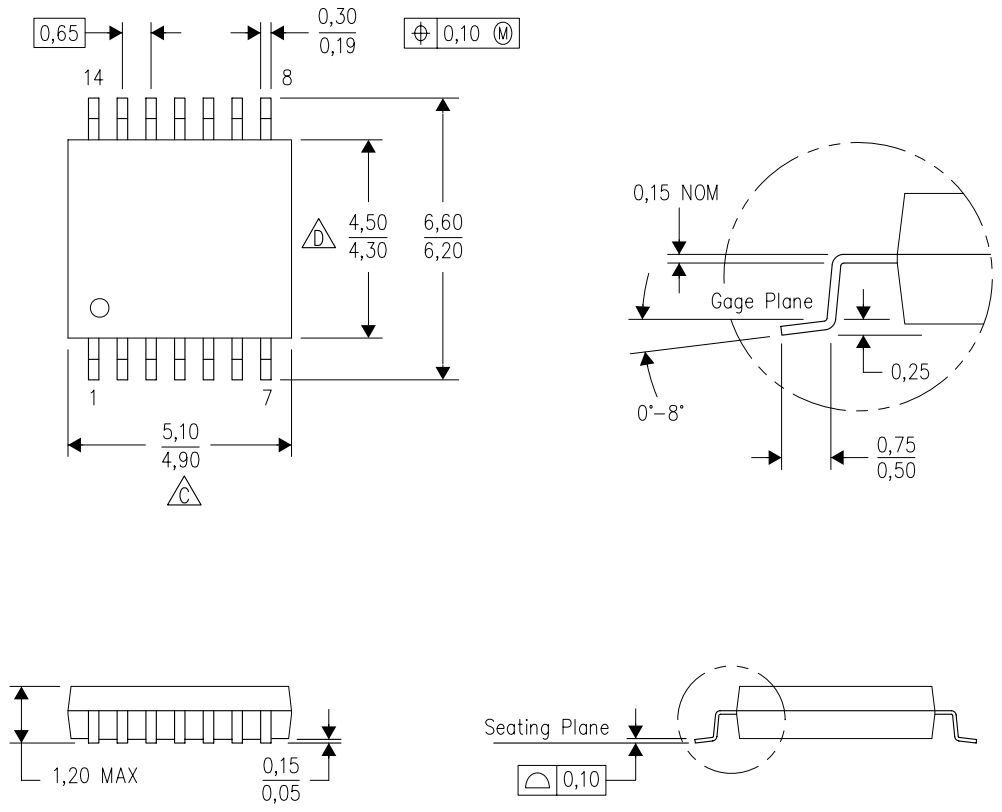
(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(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.

PW (R–PDSO–G14) PLASTIC SMALL OUTLINE



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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 length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO–153

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