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ScioSense

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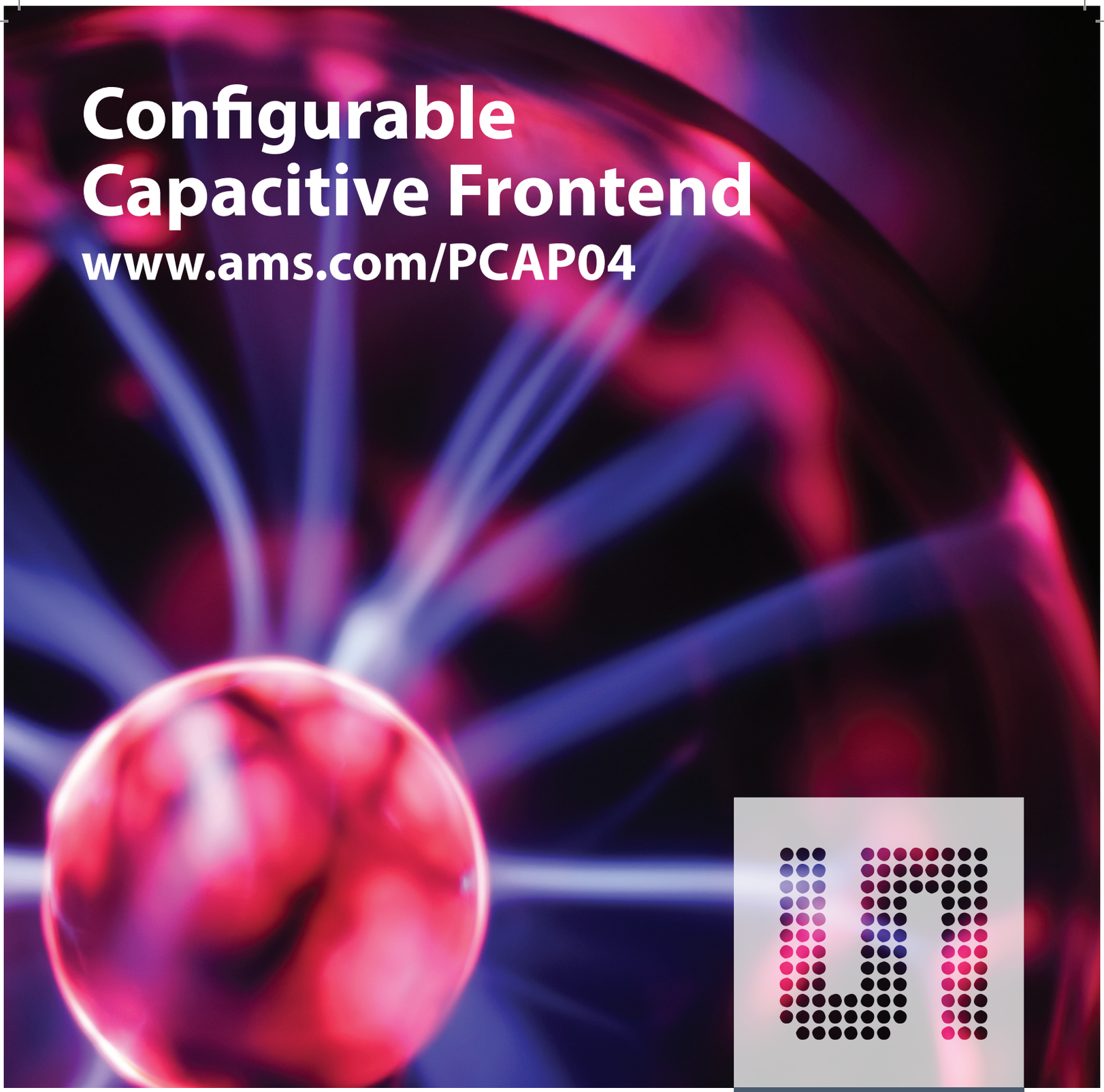
Configurable Capacitive Frontend

www.ams.com/PCAP04



PCAP04 – Analog Frontend for Capacitive Sensor Elements

- Capacitance-to-Digital Converter (CDC) with integrated 32 bit CPU
- Extremely low current consumption down to 2.5 µA possible
- High measurement rate up to 50 kHz
- High resolution up to 8 aF at 2.5 Hz and 10 pF base capacitance

Sensing is life.

General Description

The patented PICOCAP measuring principle is a versatile approach to capacitance measurement. There is practically no limit for the capacitor value since the device covers a capacitance input range from a few fF up to several hundred of nF. It allows for easy configuration for various requirements and can be used with a broad range of sensors. The PCAP04 chips is suited for applications with low current consumption (a few µA) as well as applications that require the highest precision (up to 20 bits) or applications needing high update rates (up to 50,000 measurements per seconds).

The fully-programmable internal 32-bit DSP has the capability of performing high-level processing of the data collected, such as an on-chip sensor linearization.

Measurement principle: PICOCAP transforms the capacitance measurement into a precision time interval measurement. For this purpose, the sense capacitors and a reference capacitor are connected to a resistor, forming a low-pass filter. The capacitors are charged to the supply voltage and then discharged through the resistor alternating between the reference capacitor and the unknown capacitor. The discharge times are measured with a high-precision TDC. The ratio of the capacities is given by the ratio of discharge times. Patented algorithms provide an excellent suppression of parasitic capacities and ensure very good temperature stability.

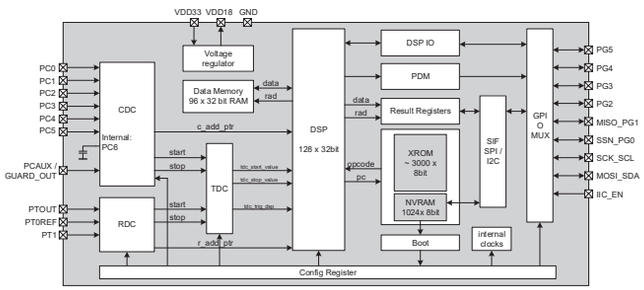
Applications

- Humidity sensors
- Dew-point sensor
- Pressure sensors
- MEMS
- Inertial and motion sensors
- Fill level sensors
- Proximity switches and sensors
- Free-fall sensors
- Bio-medical sensors (disposable senors)

Features

- Up to six capacitors in grounded mode
- Up to three capacitors in floating mode
- Internal reference 1 to 31 pF
- Integrated guarding opamp
- Up to 8 aF at 2.5 Hz and 10 pF base capacitance
- Up to 50 kHz sample rate
- 32-bit DSP
- SPI / IIC interface
- PDM / PWM outputs, GPIO
- Supply voltage 2.1/3.0 to 3.6 V (integrated 1.8 V regulator)
- QFN-24, WLCSP or dice

Block Diagram



Benefits

- Extremely low current consumption possible:
  down to 2.5 µA at 2.5 Hz with 14 bit resolution
- High stability with temperature
- Dedicated ports for precision temperature measurement
- Two-side bonding option for MEMS applications

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