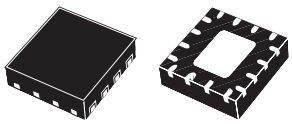
STPMS2

Smart sensor II dual-channel second-order sigma-delta modulator with embedded PGA

Data brief

Features

- V_{CC} supply range 3.2 V - 5.5 V
- Two second-order sigma-delta (ΣΔ) modulators
- Programmable chopper-stabilized low noise and low offset amplifier
- Supports 50-60 Hz, IEC 687/1036 spec for class 1, class 0.5 and class 0.2 AC watt meters
- Less than 0.1% error over 1:2500 range
- Internal low drop regulator at 3 V (typ.)
- Precision voltage reference: 1.23 V and 30 ppm/°C max.



QFN16 (4 x 4)

Applications

- Power metering
- ADC converters

Description

The STPMS2, also called a “smart sensor” device, is an ASSP designed for effective measurement in a power line systems utilizing the Rogowski coil, current transformer or shunt principle.

The STPMS2 is a mixed signal IC consisting of an analog and a digital section. The analog section consists of one preamplifier and two second-order ΣΔ modulator blocks, band-gap voltage reference, a low-drop voltage regulator and DC buffers, while the digital section consists of a clock generator and output multiplexer.

Table 1. Device summary

Order codes	Package	Packaging
STPMS2H-PUR	QFN16 (4 x 4 mm)	4500 parts per reel
STPMS2L-PUR	QFN16 (4 x 4 mm)	4500 parts per reel

Contents

1 General operation description

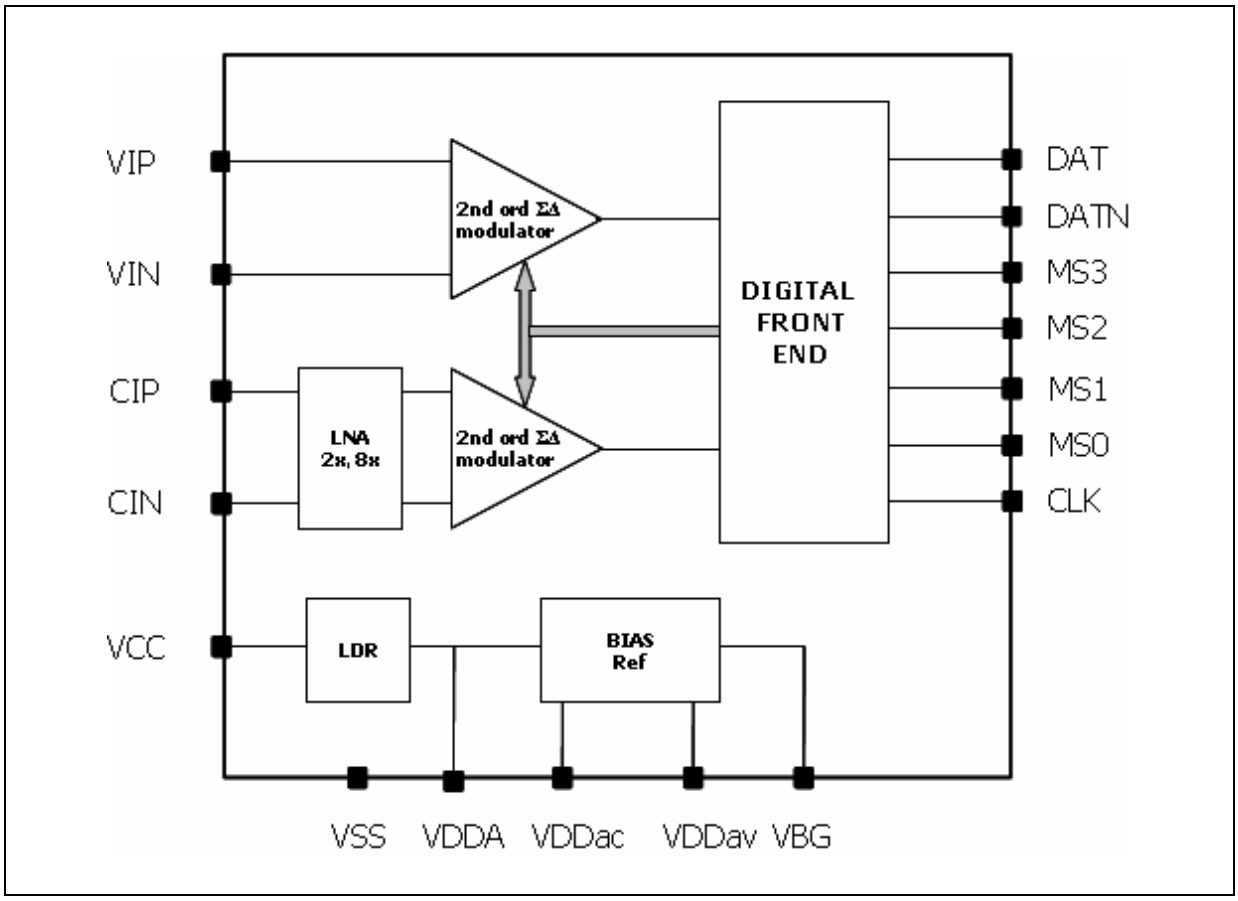
The STPMS2 is a device designed to measure electrical line parameters (voltage and current) via analog signals from voltage sensors (current divider) and current sensors (inductive Rogowski coil, current transformer or shunt resistors). The device is used together with a digital signal processing circuit in order to implement an effective measuring system of a multi-phase power meter.

The device consists of two analog measuring channels, having second-order sigma-delta modulators with appropriate non-overlap control signal generator. The STPMS2 also includes a temperature compensated band-gap reference voltage generator, low-drop supply voltage stabilizer and minimal digital circuitry that includes BIST (built-in self-test) structures. In a current signal processing channel, a low-noise preamplifier is included in front of the sigma-delta converter. All reference voltages (band-gap, AGND) are internally buffered to eliminate channel crosstalk.

The STPMS2 can operate in fast or low-power mode. In fast mode, a nominal clock frequency of 4.1 or 4.9 MHz is applied to the clock input. In this mode, signal bandwidth is specified between 0 and 4 kHz. In low-power mode, the nominal clock is four times slower in order to lower the power consumption of the circuit. In low-power mode, the quiescent bias currents of the preamplifier and sigma-delta integrators are lowered and the signal bandwidth is narrowed to the frequency bandwidth of 0 to 1 kHz.

2 Schematic diagram

Figure 1. Block diagram



3 Pin configuration

Figure 2. Pin connections

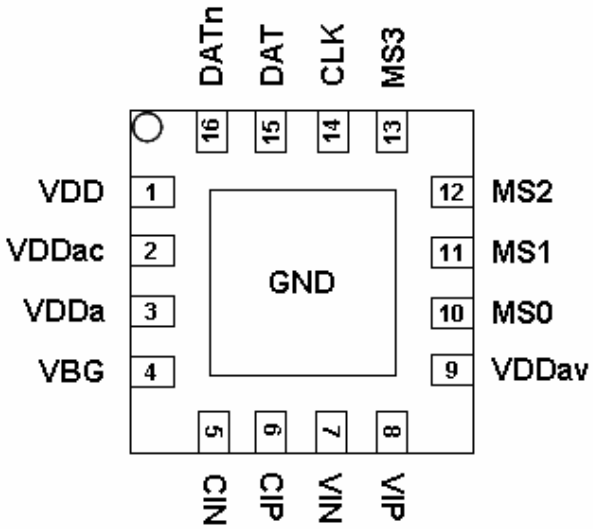


Table 2. Pin description

Pin	Symbol	Description
1	VCC	Unregulated supply voltage for padring, band gap, low drop and level shifters
2	VDDac	Output of internal +3.0 V low drop regulated power supply
3	VDDa	Output of internal +3.0 V low drop regulated power supply
4	VBG	Output of internal +1.23 V bias generator; Input of external precision reference voltage
5	CIN	Current channel -
6	CIP	Current channel +
7	VIN	Voltage channel -
8	VIP	Voltage channel +
9	VDDav	Output of internal +3.0 V low drop regulated power supply
10	MS0	Input for configurator 0
11	MS1	Input for configurator 1
12	MS2	Input for configurator 2
13	MS3	Input for configurator 3
14	CLK	Input for external measurement clock
15	DAT	Output of multiplexed ΣΔ signal
16	DATn	Output of multiplexed ΣΔ signal negated
Exp PAD	GND	Ground level for signals and pin protection

4 Application information

Figure 3. Application schematic

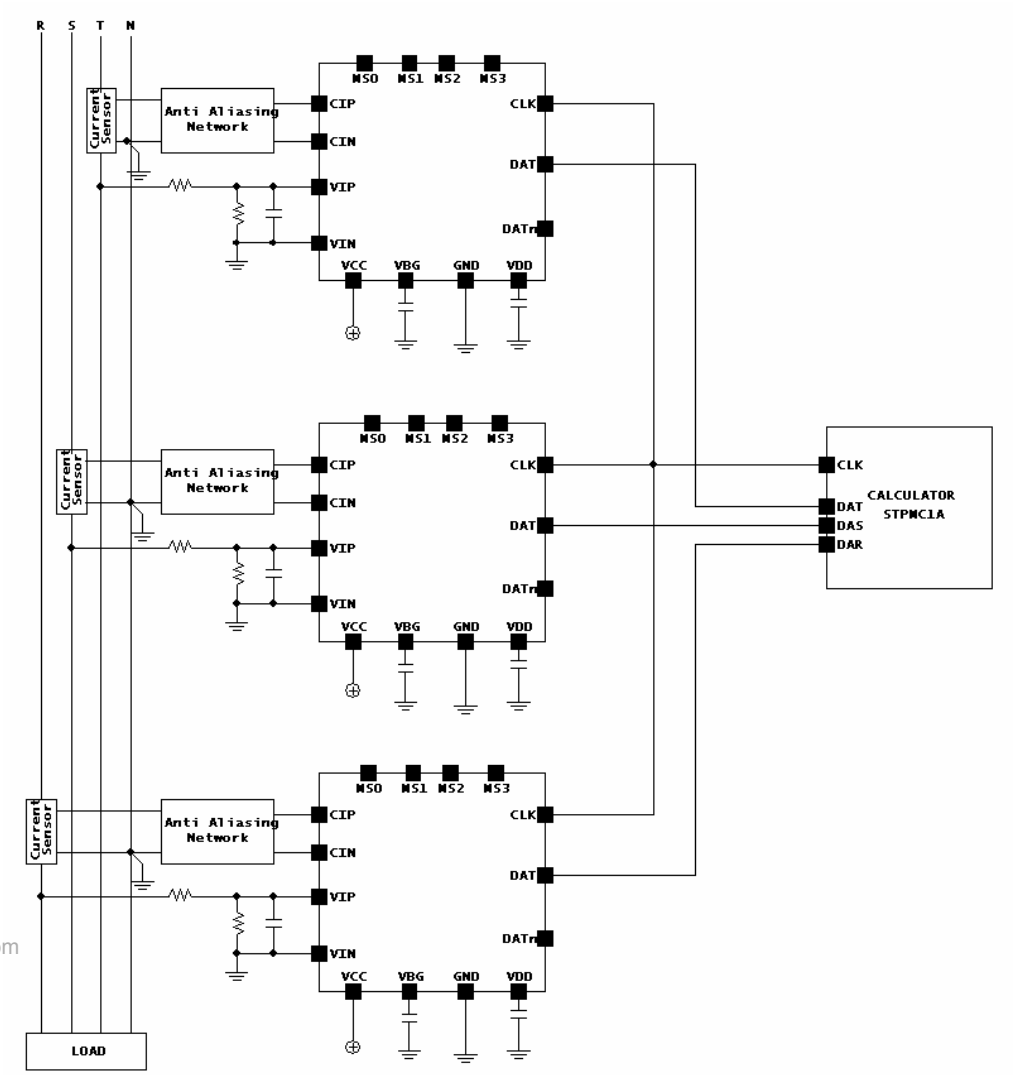


Table 3. List of external components

Component	Description	Value	Tolerance		Unit
Divider	Interfaces the line voltage	1:780	± 1%	50 ppm	V/V
Rogowski coil	Interfaces the line current	0.3	± 12%	-	mV/A
CT	Interfaces the line current	2.4	± 12%	-	mV/A
Shunt	Interfaces the line current	0.2	± 5%	-	mV/A

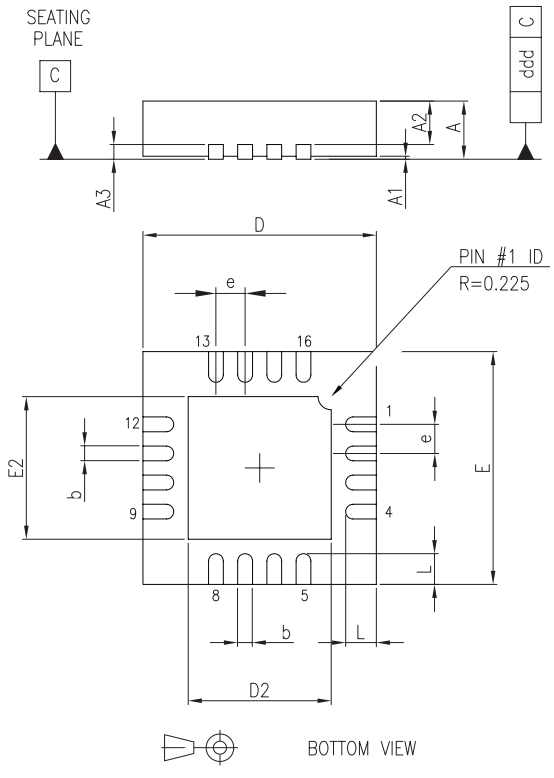
Note: The above-listed components refer to a typical metering application. Operation of the STPMS2 is not limited to the choice of these external components.

5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

QFN16 (4 x 4) mechanical data

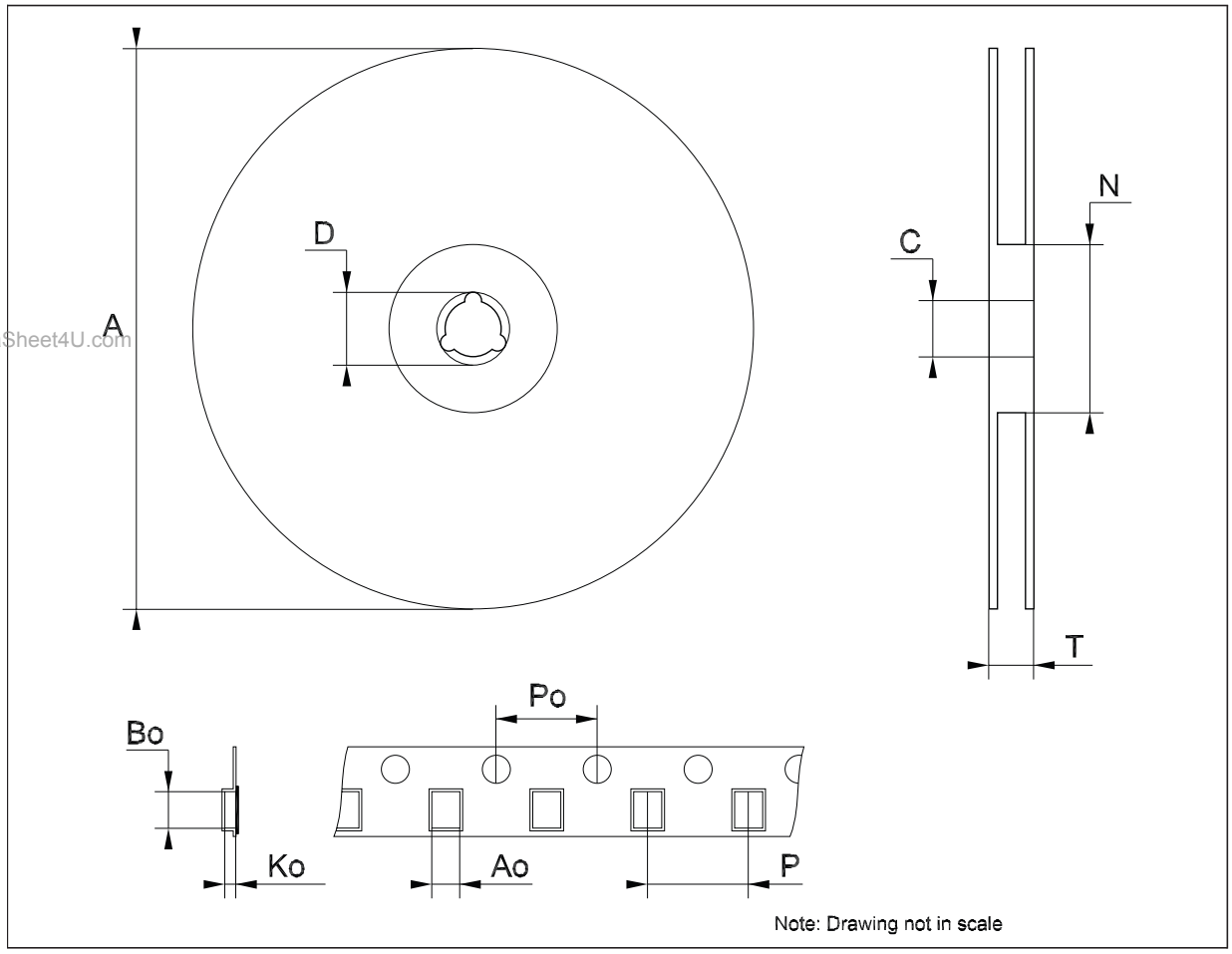
Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.80	0.90	1.00	31.5	35.4	39.4
A1		0.02	0.05		0.8	2.0
A2		0.65	1.00		25.6	39.4
A3		0.20			7.9	
b	0.18	0.25	0.30	7.1	9.8	11.8
D	3.85	4.00	4.15	151.6	157.5	163.4
D2	2.10		2.60	82.7		102.4
E	3.85	4.00	4.15	151.6	157.5	163.4
E2	2.10		2.60	82.7		102.4
e		0.50			19.7	
L	0.30	0.40	0.50	11.8	15.7	19.7
ddd			0.08			3.1



7653321A

Tape & reel QFNxx/DFNxx (4x4) mechanical data

Dim.	mm.			inch.		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	99		101	3.898		3.976
T			14.4			0.567
Ao		4.35			0.171	
Bo		4.35			0.171	
Ko		1.1			0.043	
Po		4			0.157	
P		8			0.315	



Note: Drawing not in scale

6 Revision history

Table 4. Document revision history

Date	Revision	Changes
23-Oct-2009	1	Initial release.

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