

Product Line PTS – Focus Portfolio for Mass Market¹

1) Concrete parts listed in respective pitch capsule

Non-Automotive

Consumer, Industrial, Medical, Mobility

1



Magnetic Position Sensor

2



**IVT Sensor
(current / voltage)**

3



Temperature Sensor

4



Capacitive Sensor

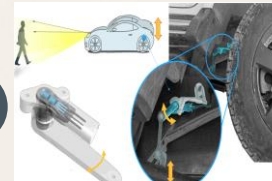
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Inductive Position Sensor

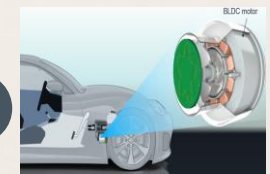
Automotive / Transportation

1



Magnetic Position Sensor

2



Inductive Position Sensor

3



Capacitive Sensor

4



**IVT Sensor
(current / voltage)**

Sensing is life

ams OSRAM

ams Osram – Temperature Sensors for industrial , medical & consumer applications

Focus product : AS62xx

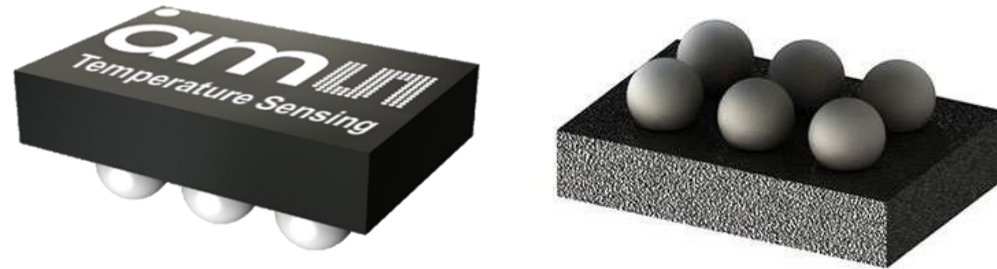
Content

1. **Focus products** → Which products are we talking about?
2. **Applications** → What can they be used for?
3. **Market size** → What is the revenue potential?
4. **USPs and competitive comparison** → Why should customers use ams Osram?
5. **Success stories** → Proof points for what we claim
6. **Product order information and design resources** → How can you get the product? How can you easily design-in the product?

AS62xx product family offers compelling temperature sensing solutions

Temperature sensing for industrial, medical & consumer applications

AS62xx



AS62xx family comprises of wide variety of temperature sensors operating in a wide temperature range (-40°C to +125°C) with very low power consumption of 0.1µA (standby, 25°C) , small form factor (1.5 x 1.1 mm) and 8 I²C addresses

Offers : Different temperature accuracy options (0.2°C ; 0.4°C ; 0.8°C) ; easy to use solution for fast implementation ; alert functionality ; I²C interface

Suitable for : Thermostat control, PCB temperature sensing monitoring, Home automation, Smoke detectors, Cameras, HVAC, Cold chain monitoring, Industrial automation, Diabetes care product, Thermometer patches etc.

AS6212 Product Overview

Additional product variants AS6221, AS6214, AS6218 available, see details in backup

Best fit for HVAC solutions requiring very small form factor and low price

Key Features

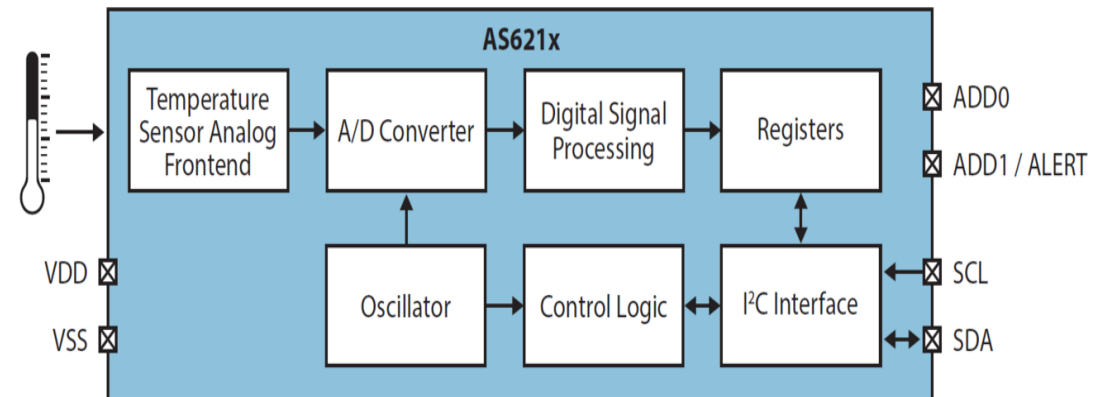
- Ultra low power consumption
- High temperature accuracy
- Small integration size (WLCSP)
- Complete sensor system with serial bus connection
- Alert functionality for exact temperature control

Benefits

- Long battery life and low self heating
- “Easy to Use” solution, i.e. no calibration or linearization needed
- Minimal board space and fast reaction time
- Available to be attached both by direct contact or by contact through thermal vias and contact spring

Applications

- Thermostat control
- PCB temperature monitoring
- Home automation
- Smoke detectors
- Cameras
- HVAC
- Cold chain monitoring
- Industrial automation



Some example applications

Temperature Sensors covers a wide field of applications in various market segments

Industrial



Thermostat



Smart Home



Motor heating Control



Robots & AGVs



PCB temperature monitor

Consumer



Earbuds



Smartwatch



Camera



Fitness Monitor



SSD and hard disks

Medical



Diabetes Care Product



Thermometer patches

Application Example

Constant Glucose Monitoring (CGM)



CGM systems are devices that measure the glucose content in the tissue fluid of the subcutaneous fatty tissue every five minutes around the clock and transfer it to a receiving device.

Challenges

ams-OSRAM solution

Precise temperature sensing on human skin

High accuracy up to 0.09°C (@35°C) *

Limited space

Small form factor by WLCSP-6 package (1.5 x 1.0 mm)

Low battery capacity

Best in class power consumption with 6µA (typ – 4con / s) and 0.1µA (typ.) enable very long battery life

Easy & fast integration

No calibration or linearization required.
Up to 8 I²C addresses to be used by single bus

Mechanical stress exposure

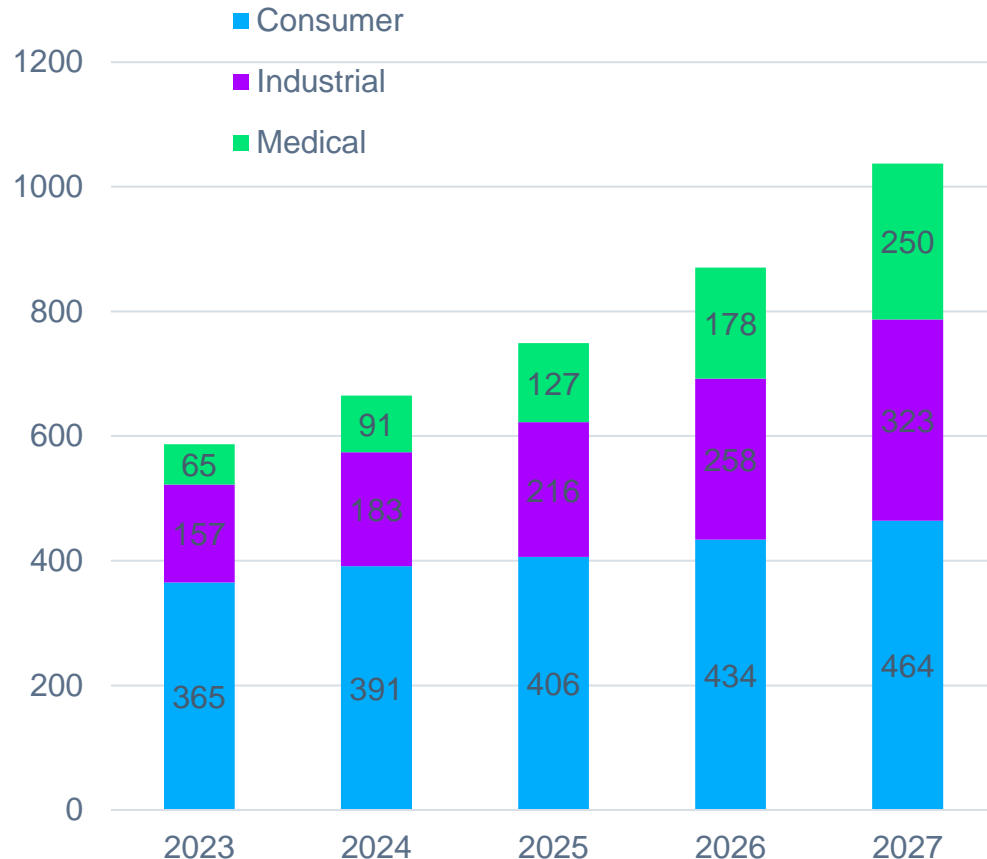
Very stable temperature information under mechanical stress like bending

Market growth and potential

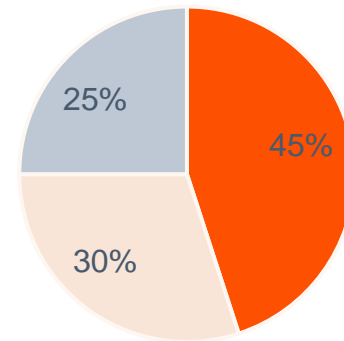
Temperature Sensors market expects to grow with 15% CAGR [23-27]

Temperature sensors market development (global)

*Market size (SAM) in M€ [2023 to 2027]



Regional Split



■ Asia ■ Europe ■ US

Market dynamic

Main reasons of growth

- Factors leading to growth of semiconductor -based temperature sensors
 - Higher thermal management demand in digital circuits, longer battery life demand, higher temperature sensitivity and accuracy demand
- **Industrial** as main growth driver due to emerging applications
 - EV charging station, professional drones, smart meters, smart buildings, home controls
- **Consumer** sector has notebook PCs, desktops, data servers and SSDs driving growth
- **Medical** sector has pulse oximeters, blood glucose meters, and ventilators which drive growth

*Data derived from Omdia and ams Osram intelligence

Features: Why to choose ams OSRAM for Temperature Sensors

ams OSRAM is shaped to lead Temperature Sensors market and generate fast revenue growth

Low current consumption

- Power consumption in operation mode is 6 μ A (@ 4 Hz) while in standby mode is 0.1 μ A

High Temperature accuracy and robustness under mechanical stress

- Provides high accuracy of up to $\pm 0.09^{\circ}\text{C}$ over full supply range (1.71V to 3.6V) and 16-bit resolution
- Can be used to measure human body temperature ($\pm 0.09^{\circ}\text{C}$ / $\pm 0.2^{\circ}\text{C}$ / $\pm 0.4^{\circ}\text{C}$ / $\pm 0.8^{\circ}\text{C}$ accuracy).

Guaranteed Supply chain

- Flexible in-house Supply chain, 0.45ppm in past years
- 0 line downs in the last 4 years

Competitive advantage (USP)

Easy integration

- Standard I²C interface
- Pre-calibrated (no in-system calibration is needed)
- Pin to pin compatible with industry standard devices

Small form factor

- Ultra small package size : WLCSP (1.5 x 1.0 mm)

Alert functionality

- Alert functionality, triggers an interrupt to protect devices from excessive temperatures
- The alarm gets set (and cleared) at user selectable thresholds. No need to constantly poll the temp sensor






Key features

AS6221 versus competitors










ams Osram key strength

Fighting guide

Parameter	AS6221	COMP 1	COMP 2	COMP 3	COMP 4	COMP 5	COMP 6
Highest accuracy in °C	± 0,09 	± 0,75	± 0,1	± 0,1	± 0,1	± 0,08	± 0,5
Accuracy -40 125°C in °C	± 0,3 	± 1	± 0,3	± 0,5	± 0,6	± 0,3	± 1
Package-size in mm ²	1,52	1,0004	1,53	9	6,25	1,53	0,64
Configurable I ² C Bus (Max. number of bus devices)	8	3	8	32	2	8	4
Conversion Current (max, 1 meas/sec) in µA	1,75 	6	5	925	2,5	5	10
Conversion Current (typ, 1 meas/sec) in µA	1,5 	4	3,5	600	1,7	3,5	3,2
Standby Current (max) in µA	0,4 	3,1	3,1	3,5	2	3,1	1
Standby Current (typ @ 25°C) in µA	0,1	2,5	1,25	1,65	0,2	0,15	0,5
Supply Voltage (min) in V	1,71	1,4	1,7	2,7	2,15	1,8	1,4
Supply Voltage (max) in V	3,6	3,6	5,5	3,3	5,5	5,5	3,6
Conversion Time (typ) in ms	36	30	15,5	44	12,5	15,5	15,5
Resolution in Bit	16	12	16	16	14	16	12
Min Temperature in °C	-40	-40	-40	0	-40	-55	-40
Max Temperature in °C	125	125	125	50	125	150	125

Success stories

Few Design-Win examples

Part number	AS6221	AS6221	AS6214	AS6212	AS6221	AS6214	AS6218
Market segment	Medical	Consumer	Consumer	Industrial	Industrial	Industrial, Medical	Industrial
Application details	CGM	Smartwatch	Fitness Band	Industrial IoT (Thermostat HVAC)	Animal HealthCare Monitoring	Cool Chain Monitoring	Safety Light Barrier
							
Win Factors	Outstanding accuracy, low current consumption, small form factor	Outstanding accuracy, mechanical stress resilience, low current consumption, small form factor	Outstanding accuracy, mechanical stress resilience, low current consumption, small form factor	Price competitiveness, Outstanding accuracy	Low current consumption, high accuracy, small form factor	Low power consumption and small form factor	Easy integration, price competitiveness, Low power consumption and small form factor

Product order information

Overview of the available products

Product Name	Part Number (Order Code)	Package Type	Accuracy	Temperature Range	Supply	Focus Market Segment	Design Resources
AS6221	AS6221-AWLT-S (Q65114A1149) AS6221-AWLT-L (Q65114A1150)	WLCSP (600µm)	± 0.09°C @ 20..42°C ± 0.3°C @ -40..125°C	-40°C to +125°C	1.71 - 3.6V (0°C to 125°C) 2.00 - 3.6V (-40°C to 125°C)	<ul style="list-style-type: none"> Medical Consumer Industrial 	Evaluation Kit (Q65114A1537), Demo Kit (Q65114A1536)
AS6212	AS6212-AWLT-S (Q65114A1143) AS6212-AWLT-L (Q65114A1144)	WLCSP (600µm)	±0.3°C @ -40..-10°C ± 0.2°C @ -10... 65°C ±0.3°C @ 65... 85°C ±0.5°C @ 85...125°C	-40°C to +125°C	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)	<ul style="list-style-type: none"> Medical Consumer Industrial 	Evaluation Kit (Q65114A1511), Demo Kit (Q65114A1510)
AS6214	AS6214-AWLT-S (Q65114A1145) AS6214-AWLT-L (Q65114A1146)	WLCSP (600µm)	±1.0°C @ -40...0°C ± 0.4°C @ 0... 65°C ±1.0°C @ 65...125°C	-40°C to +125°C	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)	<ul style="list-style-type: none"> Medical Consumer Industrial 	Evaluation Kit (Q65114A1511), Demo Kit (Q65114A1510)
AS6218	AS6218-AWLT-S (Q65114A1147) AS6218-AWLT-L (Q65114A1148)	WLCSP (600µm)	±1.0°C @ -40...0°C ± 0.8°C @ 0... 65°C ±1.0°C @ 65...125°C	-40°C to +125°C	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)	<ul style="list-style-type: none"> Medical Consumer Industrial 	Evaluation Kit (Q65114A1513), Demo Kit (Q65114A1510)

Y- AWLT-S : 500 pcs/reel; Y- AWLT-L : 5000 pcs/reel; AS6221T-AWLM : 500 pcs/reel ; AS6221T-AWLT: 12000 pcs/reel
 Y: AS6221 / AS6212/ AS6214/ AS6218

Design Resources

Support Tools

Application Notes



How to implement the sensor for good thermal characteristics into your design.

Check out the application notes:

[Thermal design guideline for Wearables](#)

[Thermal design guideline for PCB reference design](#)

Videos



[Video presentation of the AS621x evaluation kit](#)

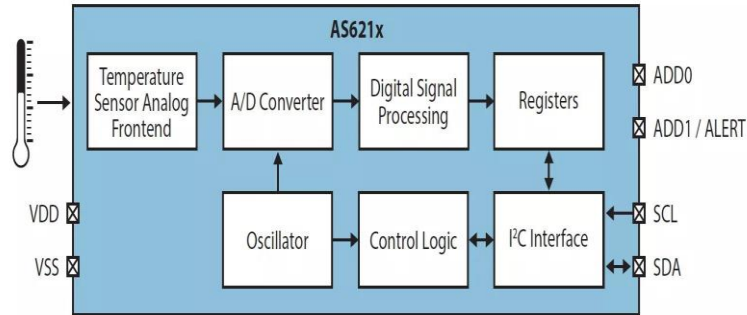
[High accuracy AS6221](#)

BACKUP



Variants Overview

Digital temperature sensors for various applications

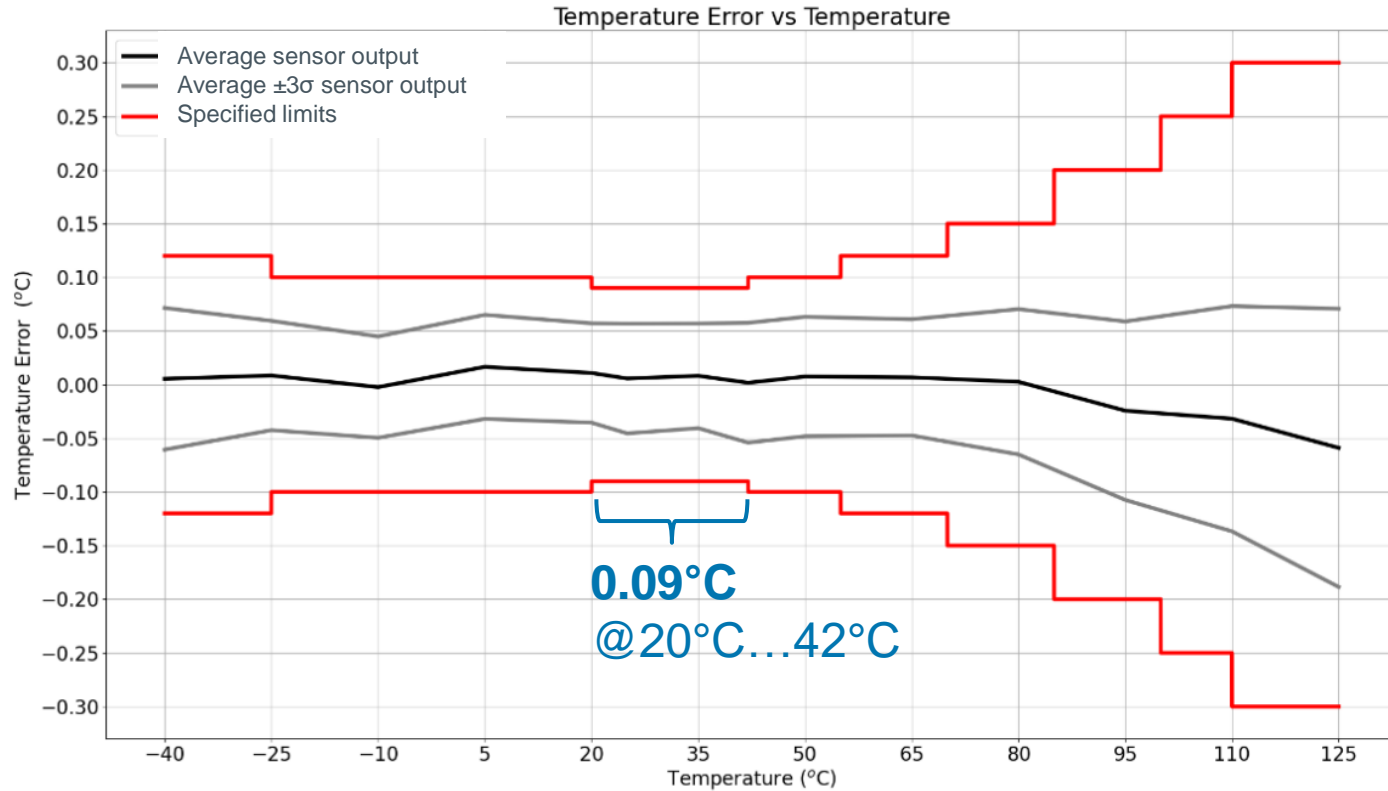


	AS6221	AS6212	AS6214	AS6218
Accuracy	± 0.09°C @ 20..42°C ± 0.3°C @ -40..125°C	±0.3°C @ -40..-10°C ± 0.2°C @ -10... 65°C ±0.3°C @ 65... 85°C ±0.5°C @ 85...125°C	±1.0°C @ -40...0°C ± 0.4°C @ 0... 65°C ±1.0°C @ 65...125°C	±1.0°C @ -40...0°C ± 0.8°C @ 0... 65°C ±1.0°C @ 65...125°C
Supply	1.71 - 3.6V (0°C to 125°C) 2.00 - 3.6V (-40°C to 125°C)	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)	1.71 - 3.6V (0°C to 125°C) 2.0 - 3.6V (-40°C to 125°C)
Package	6pin WLCSP 600µm height	6pin WLCSP 600µm height	6pin WLCSP 600µm height	6pin WLCSP 600µm height
Resolution	16 bit	16 bit	16 bit	16 bit
Power Consumption	6µA @ 4Hz 1.6µA typ. @1Hz 2.1 µA (max) @1Hz	6µA @ 4Hz 1.6µA typ. @1Hz 2.1 µA (max) @1Hz	6µA @ 4Hz 1.6µA typ. @1Hz 2.1 µA (max) @1Hz	6µA @ 4Hz 1.6µA typ. @1Hz 2.1 µA (max) @1Hz
Interface	I²C	I²C	I²C	I²C

- Variants mainly differ in temperature accuracy providing customers best option for their needs

Accuracy – AS6221 & AS6221T

Outstanding accuracy out of the box



Circuit Design
 Sensing element based on delta VBE of bipolar transistors in ams CMOS process

Lab Evaluation
 High number of devices measured in oil bath

Calibration
 Devices are calibrated

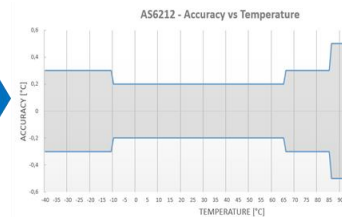
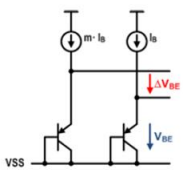
Final performance
 Performance is guaranteed to 3.0σ including soldering effects

Circuit Design

Lab Evaluation

Test Calibration

Final Performance

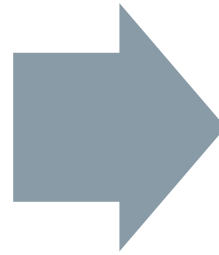


Recommendations to replace older Products

Push Focus Products for new Design Ins

Old Products

AS6200
AS6200C
AS6204



Replacement Products

AS6212
AS6214

Sensing is life

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