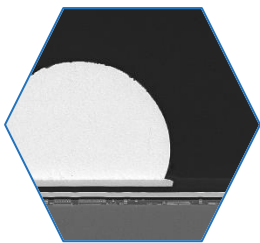
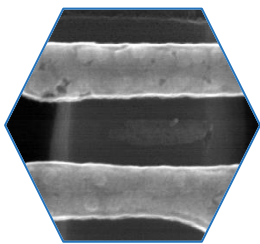
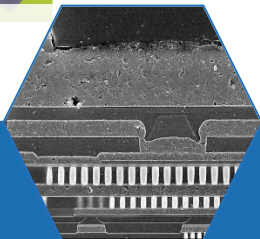


Consumer eCompass Comparison 2021

Physical and cost comparison of 3-axis and 6-axis eCompasses from AKM, MEMSIC, ALPS Alpine, and many more integrated in 225 smartphones over the last five years.



Title: Consumer eCompass Comparison 2021

Pages: 160

Date: December 2021

Format: PDF & Excel file

Reference: SPR21534

Magnetometers embedded in consumer electronics is an ultra-competitive market where the selling prices are already very low. AKM currently holds the lead in the 3-axis magnetometer market aimed at smartphones. The three main players in our sampling are AKM, followed by MEMSIC and ALPS Alpine in second and third place respectively (by design wins). The biggest change compared to our last comparative report, published in 2015, is the replacement of Yamaha by MEMSIC for second place.

This report provides an overview of 3-axis and 6-axis eCompasses integrated into 225 smartphones released since 2016, helping readers to understand which magnetometer's references are used in which smartphones – as well as which manufacturer is integrated in which OEM's smartphone.

System Plus Consulting has also performed a comparative review of the most common 3-axis and 6-axis eCompass references found in our sampling. We examine the dimensions and internal structures of their packages, MEMS arrays, and application-specific integrated circuits (ASICs), as well as their die sizes and cross-sections of the packages, to provide a comprehensive review of eCompass sensors in consumer electronics. Moreover, several

components from other players are analyzed. These players, such as Aichi Steel, MEMSIC, ALPS, YAMAHA, Voltafield, SENODIA, STMicroelectronics, QST, and Bosch, use different technologies.

This report also includes a description of eCompass technologies (Hall sensor, AMR, GMR, TMR, MI, Fluxgate) and a comprehensive supply chain evaluation for the majority of 3-axis & 6-axis eCompasses. Lastly, a comparison of the process evolution per manufacturer and cost overview per component are furnished to provide an overview of the current market.

COMPLETE TEARDOWN WITH:

- Package views and dimensions
- Package cross-sections
- Precise measurements
- Die descriptions
- Technology descriptions
- Physical evolution from the previous reference
- Supply chain evaluation
- Cost analysis
- Cost comparison
- Selling price

TABLE OF CONTENTS

Overview / Introduction

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- 6-axis synthesis

Company Profile

- Company profile Overview
- eCompass Consumer Market
- Design Win
- Ref. Overview
- Supply Chain
- Wearables Market
- Technology Description

Physical, Manufacturing & Cost Analysis

- 3-axis
 - ✓ AKM AK09915C
 - ✓ AKM AK09916C
 - ✓ AKM AK09917D
 - ✓ AKM AK09918C
 - ✓ MEMSIC MMC5603NJ

- ✓ VOLTAFIELD AF8133J
- ✓ VOLTAFIELD AF9133
- ✓ SENODIA ST480M
- ✓ QST QMC7983
- ✓ BOSCH BMM150
- ✓ YAMAHA YAS539
- ✓ MEMSIC MMC3630KJ
- ✓ STMicro LIS2MDL
- ✓ ALPS HSCDTDxxx
- ✓ ALPS HSCDTDxxx (V2)
- ✓ QST QMC6983
- ✓ QST QMC5883L
- ✓ Synthesis
- 6-axis
 - ✓ BOSCH BMC150-4
 - ✓ STMicro LSM303AGR
 - ✓ Kionix KMX63 1055

Technical and Cost comparison

AUTHORS



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Florian Ferre serves as a laboratory Analyst. He oversees the physical analyses of electronic components, chooses the operating mode adapted to the component to analyze, and performs sample preparation and analysis by optical and electronic microscopy. Florian holds a Technological University Diploma (DUT) in Chemistry from the University of Rennes (France).

RELATED ANALYSES



Mobile Inertial Sensors Comparison 2021

Focus on IMU in 114 smartphones released since 2019 from the three main manufacturers: STMicroelectronics, InvenSense, and Bosch. September 2021



Consumer Teardown Track – Phone Module

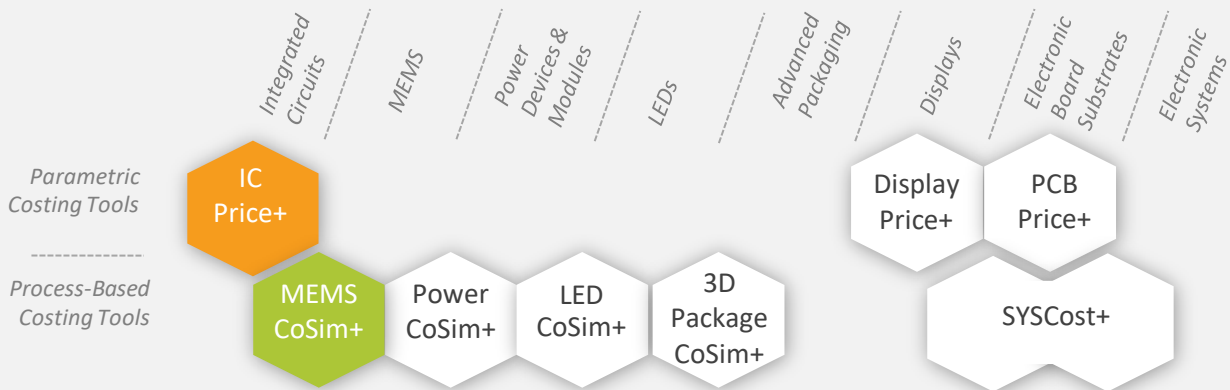
More than 530 products already available.



Status of the MEMS Industry 2021

The MEMS market will grow due to new opportunities in audio for microphones, microspeakers and inertial MEMS, AR/VR for optical MEMS, and other emerging applications. July 2021

COSTING TOOLS



Our analysis is performed with our costing tools IC Price+ and MEMS CoSim+.

System Plus Consulting offers powerful costing tools to evaluate the production cost and selling price from single chip to complex structures.

IC Price+

The tool performs the necessary cost simulation of any Integrated Circuit: ASICs, microcontrollers, DSP, memories, smartpower...

MEMS CoSim+

The costing tool is process-based to evaluate the manufacturing cost per wafer using your own inputs or using the pre-defined parameters included in the tool.

ABOUT SYSTEM PLUS CONSULTING

WHAT IS A REVERSE COSTING®?

Reverse Costing® is the process of disassembling a device (or a system) in order to identify its technology and calculate its manufacturing cost, using in-house models and tools.



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System Plus Consulting is specialized in the cost analysis of electronics from semiconductor devices to electronic systems.

A complete range of services and costing tools to provide in-depth production cost studies and to estimate the objective selling price of a product is available.

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- **COSTING SERVICES**
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The present terms and conditions apply to the offers, sales and deliveries of services managed by System Plus Consulting except in the case of a particular written agreement.

Buyer must note that placing an order means an agreement without any restriction with these terms and conditions.

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Prices of the purchased services are those which are in force on the date the order is placed. Prices are in Euros and worked out without taxes. Consequently, the taxes and possible added costs agreed when the order is placed will be charged on these initial prices.

System Plus Consulting may change its prices whenever the company thinks it necessary. However, the company commits itself in invoicing at the prices in force on the date the order is placed.

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System Plus Consulting delivered services are to be paid within 30 days end of month by bank transfer except in the case of a particular written agreement.

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System Plus Consulting remains sole owner of the delivered services until total payment of the invoice.

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The delivery schedule on the purchase order is given for information only and cannot be strictly guaranteed. Consequently any reasonable delay in the delivery of services will not allow the buyer to claim for damages or to cancel the order.

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The transport costs and risks are fully born by the Buyer. Should the customer wish to ensure the goods against lost or damage on the base of their real value, he must imperatively point it out to System Plus Consulting when the shipment takes place. Without any specific requirement, insurance terms for the return of goods will be the carrier current ones (reimbursement based on good weight instead of the real value).

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