

Invensense MPU-6000/6050

Motion Processing Unit : 3D accelerometer + 3D gyroscope

Reverse Costing Analysis – October 2011

Physical Analysis of the Device Step by Step Reconstruction of the Process Flow Cost of Manufacturing and Estimation of Selling Price

System Plus Consulting is proud to publish the reverse costing report on the MPU-6000/6050 MEMS from InvenSense.

The MPU-6000/6050 is the first inertial MEMS that combines a 3D accelerometer and a 3D gyroscope in the same silicon substrate together with a signal conditioning circuitry in a 4x4x0.9mm³ QFN package.

The MPU-6000/6050 is targeted for mobile phones, gaming devices, Portable Navigation Devices and remote controllers.

This report provides complete teardown of the inertial MEMS with:

- Detailed photos
- Material analysis
- Schematic assembly description
- Manufacturing Process Flow
- In-depth economical analysis
- Manufacturing cost breakdown
- Selling price estimation



TABLE OF CONTENTS

1. Introduction

- Executive Summary
- Reverse Costing Methodology

2. Company Profiles

3. Physical Analysis

- Physical Analysis Methodology
- Package Characteristics & Markings
- Package X-Ray
- Package Opening
- Package Cross-Section
- Device Structure
- Die Dimensions
- MEMS Sensor
- MEMS Sensor -3-Axis Gyroscope
- MEMS Sensor -3-Axis Accelerometer
- ASIC Marking
- ASIC Bond Pad
- ASIC Cavities
- Component Cross-Section
- Physical Data Summary

4. Manufacturing Process Flow

- Global Overview
- ASIC Process Flow
- MEMS Process Flow
- Description of the Wafer Fabrication Units

5. Cost Analysis

- Synthesis of the Cost Analysis
- Yields Explanation
- ASIC Front-End Cost (CMOS+ Cavities)
- MEMS Front-End Cost
- MEMS Wafer : Equipment Cost per Family
- MEMS Wafer : Consumable Cost per Family
- Total Wafer Cost
- MEMS Die cost
- Component Packaging Cost
- Component Final Test Cost

6. Estimated Price Analysis

- Manufacturers financial ratios
- Estimated manufacturer Price
- Estimated Selling Price

Distributed by

Performed by

ORDER FORM

Please enter my order for "MPU-6000/6050" Teardown & Reverse Costing Analysis:

SP11072

Corporate license price: EURO 1,990*

*For price in dollars please use the day's exchange rate

*All reports are delivered electronically in pdf format

*For French customer, add 20 % for VAT

SHIP TO

Name (Mr/Ms/Dr/Pr):
.....
Job Title:
.....
Company:
.....
Address:
.....
City: State:
.....
Postcode/Zip:
.....
Country*:
.....
*VAT ID Number for EU members:
.....
Tel:
.....
Email:
.....
Date:
.....
Signature :
.....

PAYMENT

DELIVERY on receipt of payment:

By credit card:

Number: _____ Expiration date: __/__/____
Card Verification Value: _____



By bank transfer:

HSBC – CAE- Le Terminal -2 rue du Charron- 44800 St Herblain France
BIC code : CCFRFRPP

In EUR

Bank code : 30056 - Branch code : 00955 - Account : 09550003234
IBAN : FR76 3005 6009 5509 5500 0323 439

In USD

Bank code : 30056 - Branch code : 00955 - Account : 09550003247
IBAN : FR76 3005 6009 5509 5500 0324 797

Return order by:

FAX: +33 (0)253 55 10 59
MAIL: SYSTEM PLUS CONSULTING
21 rue La Noue Bras de Fer
44200 Nantes – France

Contact: sales@systemplus.fr - Tel: +33 (0)240 18 09 16

BILLING CONTACT

First Name:
Email:.....
Last Name:
Phone:.....

Our prices are subject to change. Please check our new releases and price changes on www.systemplus.fr

ABOUT SYSTEM PLUS CONSULTING

System Plus Consulting is specialized in the **cost analysis** of electronics from **semiconductor devices** to **electronic systems**. Around this main line System Plus Consulting developed a complete range of services and costing tools to provide **in-depth production cost studies** and estimation of the **objective selling price** of the product.

COSTING SERVICES

- ✓ **On demand Reverse Costing studies** are performed on ICs, ASICs, MEMs, Power Devices, ECUs, electronic boards and full electronic systems
- ✓ **The catalog of available reports** includes cost analyzes on MEMS, Electronic components and Electronic systems (Telecom terminals, Power systems, Consumer products)

All these studies are performed using in-house developed costing tools and their technological databases.

COSTING TOOLS Software

- ✓ IC Price+ to calculate the cost of any integrated circuit
- ✓ Power Price+ to calculate the cost of any power component or module
- ✓ SYS.Cost which is a costing tool for electronic boards and systems

Costing Models

- ✓ Board Assembly – System in Package – System on Chip – Memory Chip – Smart Card – Plastic Part
- ✓ Other costing models can be developed according to customer specification

Cost Simulation Tools

- ✓ Powerful flow builders including exhaustive databases to simulate a device processing cost
- ✓ Available now: MEMS CoSim+ • IGBT CoSim+ • SiC CoSim+ • LED CoSim+ • TSV CoSim+ • PV CoSim+ (photovoltaic)

Distributed by



Performed by



TERMS AND CONDITIONS OF SALES

1. INTRODUCTION

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.

2. PRICES

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.

3. REBATES and DISCOUNTS

The quoted prices already include the rebates and discounts that System Plus Consulting could have granted according to the number of orders placed by the Buyer, or other specific conditions. No discount is granted in case of early payment.

4. TERMS OF PAYMENT

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.

If the payment does not reach System Plus Consulting on the deadline, the Buyer has to pay System Plus Consulting a penalty for late payment the amount of which is 3 times the French legal interest rate. The legal interest rate is the current one on the delivery date. This penalty is worked out on the unpaid invoice amount without taxes, starting from the invoice deadline. This penalty is sent without previous notice.

When payment terms are over 30 days end of month, the Buyer has to pay a deposit which amount is 10% of the total invoice amount when placing his order.

5. OWNERSHIP

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

6. DELIVERIES

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.

7. ENTRUSTED GOODS SHIPMENT

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).

8. FORCE MAJEURE

System Plus Consulting responsibility will not be involved in non execution or late delivery of one of its duties described in the current terms and conditions if these are the result of a force majeure case. Therefore, the force majeure includes all external event unpredictable and irresistible as defined by the article 1148 of the French Code Civil?

9. CONFIDENTIALITY

As a rule, all information handed by customers to system Plus Consulting are considered as strictly confidential.

A non-disclosure agreement can be signed on demand.

10. RESPONSABILITY LIMITATION

The Buyer is responsible for the use and interpretations he makes of the reports delivered by System Plus Consulting. Consequently, System Plus Consulting responsibility can in no case be called into question for any direct or indirect damage, financial or otherwise, that may result from the use of the results of our analysis or results obtained using one of our costing tools.

11. APPLICABLE LAW

Any dispute that may arise about the interpretation or execution of the current terms and conditions shall be resolved applying the French law.

If the dispute cannot be settled out-of-court, the competent Court will be the Tribunal de Commerce de Nantes.