

# Epson Toyocom X3500W – QMEMS Gyro

## Reverse Costing Analysis

by System Plus Consulting

### 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 of the yaw rate sensor X3500W supplied by Epson Toyocom.

This Z-axis gyroscope use an hermetically sealed multi-chip Ceramic LCC package with two dies: : a Quartz crystal sensor die processed with MEMS technology (QMEMS) and an ASIC die for signal conditioning.

The X3500W is integrated in the Nintendo Wii Motion Plus accessory. It is a variation of the standard XV-3500CB from Epson Toyocom which is mainly used for image stabilization of DVC and DSC or for the detection of moving with human machine interface.

This report provides a complete teardown of the QMEMS Gyroscope with:

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



## TABLE OF CONTENTS

Glossary			
Overview / Introduction	P4	Cost Analysis	P49
Epson Toyocom Company Profile	P8	•Synthesis of the Cost Analysis	
Physical Analysis	P14	•Main Steps of Economic Analysis	
•Synthesis of the Physical Analysis		•Supply Chain Analysis	
•Physical Analysis Methodology		•Manufacturers financial ratios	
•Package Characteristics & Markings		•Yields Explanation	
•Package Opening		•ASIC Front-End Cost	
•Device Structure		•ASIC Back-End 0 : Probe Test and Dicing	
•ASIC Markings		•Die per wafer & Probe Test	
•ASIC Dimensions		•ASIC Total Wafer Cost (Front-End + Back-End 0)	
•ASIC Poly & Metal Layers		•ASIC Die Cost	
•ASIC Main Blocks		•QMEMS Front-End Cost	
•ASIC Process Characteristics		•QMEMS Front-End Cost per Process Steps	
•QMEMS Dimensions		•QMEMS Front-End : Equipment Cost per Family	
•QMEMS Structure		•QMEMS Front-End : Material Cost per Family	
•Gyro Principle : Double-T Structure		•QMEMS Back-End 0 : Test/Trimming	
•QMEMS Details		•QMEMS Back-End 0 : Bumping & Dicing	
•Component Cross-Section		•QMEMS Total Wafer Cost (Front-End + Back-End 0)	
•MEMS process characteristics		•QMEMS Die Cost	
4. Manufacturing Process Flow	P44	•X3500W Packaging Process Flow	
•Overview		•X3500W Packaging Cost	
•ASIC Process Flow		•X3500W Final Test Cost	
•MEMS Process Flow		•X3500W Component Manufacturing Cost	
		•Yield Synthesis	
		Estimated Manufacturer Price Analysis	P78
		Conclusion	

Distributed by

Analysis performed by

# ORDER FORM

PLEASE ENTER MY ORDER FOR "Epson Toyocom X3500W" IN:

- Single user license price: EURO 2,490\*
- Multi-user, single site license price: EURO 2,890\*
- Multi-user, multi-site license price: EURO 3,690\*

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

\*For French customer, add 19,6 % 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 bank transfer:

BANK INFO: TARNEAUD, 27 rue du calvaire, F-44000 Nantes, France,  
Bank code : 10558, Branch code : 02250  
Account No : 2133 9700 200,  
SWIFT or BIC code : TARNFR2L,  
IBAN : FR76 1055 8022 5021 3397 0020 096

#### Return order by:

FAX: +33 (0)253 55 10 59  
MAIL: SYSTEM PLUS CONSULTING,  
9 rue Alfred Kastler – BP 10748,  
F-44307 Nantes Cedex 3, France

#### Contact:

Christiane BERGER, cberger@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](http://www.systemplus.fr)  
The present document is valid 6 months after its publishing date: 1<sup>st</sup> February 2010.

## 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 Purchaser to calculate to cost of any integrated circuit
- ✓ SYS.Cost which is a powerful costing tool for electronic boards and systems

#### Costing Models

- ✓ Easy to use Excel-based models
- ✓ **Available now:** 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



Analysis performed by

