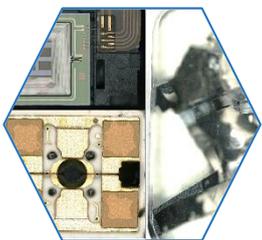
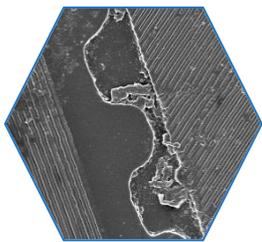


## Microsoft – Holographic Lens from HoloLens 2

*See-through holographic display for mixed reality smartglasses.*



This reverse costing study has been conducted to provide insights into technology data and manufacturing cost of the holographic lens from the Microsoft HoloLens 2. The HoloLens 2 is the latest generation of augmented/mixed reality from Microsoft. The system allows an immersive experience.

The see-through display module includes:

- a red/green/blue (RGB) laser module to generate the pictures
- two MEMS micromirrors from STMicroelectronics to project the picture onto the display
- four mirrors and one lens
- the holographic lens

The frame with the mirrors and lens, the two MEMS micromirrors and the RGB laser modules are disassembled and analyzed in this report to understand the light path.

This report is focused on the holographic lens. The display is an assembly of two waveguides. Each waveguide is manufactured with a grating on the two sides of the glass substrate. The gratings are made with nano-imprint lithography. For the more complex slanted grating, additional plasma etching is performed.

This report is an exhaustive analysis of the see-through display, including a partial technical analysis of the laser module, the

two MEMS micromirrors, the lens and the mirrors. A complete physical analysis with scanning electron microscope (SEM) pictures, cross-sections, energy dispersive X-ray (EDX) analysis to identify the material shows all the technical characteristics of the main component of the holographic display lens. Along with the complete technical analysis of the waveguide display lens, this report analyses the cost for the holographic display lens. The other electronic, optic and housing parts are detailed in the [teardown of the HoloLens 2](#). Other details on the optical parts and the assembly are described in this complementary analysis. The cost estimation of assembly of the electronic and the optic are also performed in the teardown.

### COMPLETE TEARDOWN WITH

- Detailed photos
- Precise measurements
- Materials analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Explanation of device operation
- Estimated sales price

**Title:** Microsoft – Holographic Lens from HoloLens 2

**Pages:** 99

**Date:**  
January 2021

**Format:**  
PDF & Excel file

**Price:**  
EUR 3,990

**Reference:**  
SPR21578

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## AUTHORS

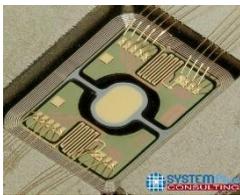


*Sylvain Hallereau has been Project Manager at System Plus Consulting since 2000. He is in charge of costing analyses for Integrated Circuits, Power semiconductors and LEDs. He has significant experience in the modeling of manufacturing costs for electronics components.*



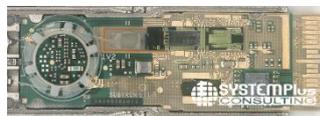
*Guillaume Chevalier has joined System Plus Consulting in early 2018 to perform physical analyses. He holds a two-year university degree in technology of physical measurements and instrumentation technics, and previously worked for four years for chemistry, mechanical and mass-metrology laboratories.*

## RELATED REPORTS



### Intel Realsense L515 MEMS-Based Solid-State LiDAR Camera

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### Intel Silicon Photonic 100G CWDM4 QFSP28 Transceiver

*A deep analysis of the world's first 100G CWDM silicon photonic transceiver, covering new technologies and the main differences from the Intel 100G PSM4.*

March 2020 - EUR 3,990\*

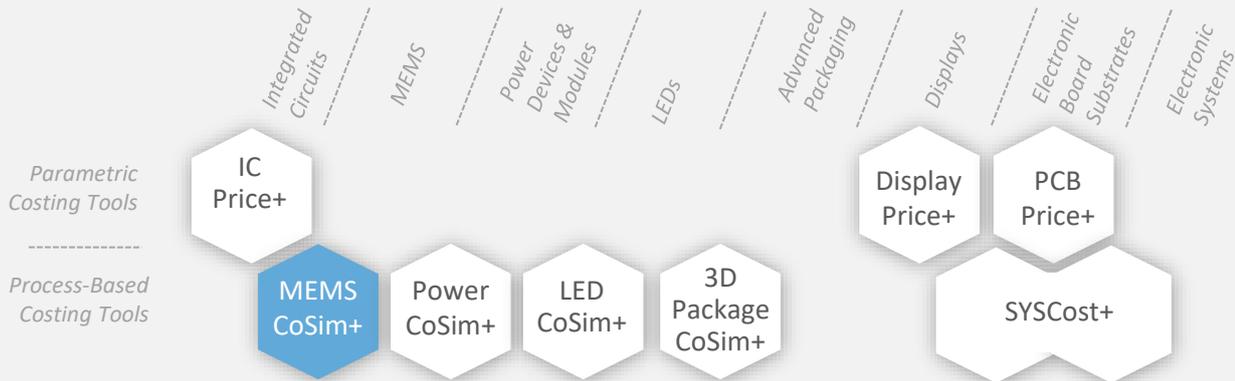


### Intel Silicon Photonic 100G PSM4 QFSP28 Transceiver

*First silicon photonic die with Intel's unique approach for laser integration, the outcome of 15 years of development, along with the main optoelectronic components in the connector.*

March 2019 - EUR 3,990\*

## COSTING TOOLS



Our analysis is performed with our costing tool MEMS CoSim+.

System Plus Consulting offers powerful costing tools to evaluate any process or device, the production cost and selling price, from single chip to complex structures. All these tools are on sale under corporate license.

### MEMS CoSim+

Cost simulation tool to evaluate the cost of any MEMS process or device.

## 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.



### CONTACTS

**Headquarters**  
22, bd Benoni Goullin  
Nantes Biotech  
44200 Nantes  
France  
+33 2 40 18 09 16  
sales@systemplus.fr

**Europe Sales Office**  
Lizzie LEVENEZ  
Frankfurt am Main  
Germany  
+49 151 23 54 41 82  
llevenez@systemplus.fr

**America Sales Office**  
Steven LAFERRIERE  
Western USA & Canada  
+1 310-600-8267  
laferriere@yole.fr

Chris YOUMAN  
Eastern USA & Canada  
+1 919-607-9839  
chris.youman@yole.fr

**Asia Sales Office**  
Takashi ONOZAWA  
Japan & Rest of Asia  
+81 80 4371 4887  
onozawa@yole.fr

Mavis WANG  
Greater China  
TW +886 979 336 809  
CN +8613661566824  
wang@yole.fr

Peter OK  
Korea  
+82 10 4089 0233  
peter.ok@yole.fr

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.

Our services:

- **STRUCTURE & PROCESS ANALYSES**
- **TEARDOWNS**
- **CUSTOM ANALYSES**
- **COSTING SERVICES**
- **COSTING TOOLS**
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www.systemplus.fr  
sales@systemplus.fr

# 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 three times the 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, 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.