Bosch LRR4
Long and Short Range 77GHz Radar
System report by David Le Gac
April 2017
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**Company Services**
Reverse Costing Methodology

The reverse costing analysis is conducted in several phases:

• **The initialization of the analysis**
  - Pictures of the elements to be studied.
  - Identification of the components.

• **Description of the material in the “SYScost+” software**
  - Creation of an “estimation project” of the studied board with SYScost+ software.
  - Construction of the Bill of Material (BOM).

• **Assessing the material**
  - Searching for the price of each reference among distributors and manufacturers.
  - Assessing the cost of the PCB and of the unaccounted references (unknown by distributors).
  - The BOM is valued with SYScost+ : price simulation according to the requested quantities.

• **Assessing the assembling and test phases**
  - Assembly and test lines are modeled with the SYScost+ software.
  - The assembly and tests costs are estimated.

• **Production cost & selling price**
  - Estimation of the production cost & selling price.

• **Report**
  - A report is edited.

SYS.cost+©, is a software tool developed by SYSTEM PLUS CONSULTING to calculate the cost of electronic boards. More information on the software can be found at www.systemplus.fr.
Global View of the Radar

Global view of the LRR4 Radar.

Total Weight: 218g
Part Collection

Overview / Introduction

Company Profile & Main Features

Physical Analysis
- Views & Dimensions
- Radar Opening
- Electronic Boards
- RF Chipset
- Comparison

Cost Analysis

Manufacturing Price

About System Plus
### MCU Board – Top Side – Global View

<table>
<thead>
<tr>
<th>Physical Analysis:</th>
<th>Company Profile &amp; Main Features:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Views &amp; Dimensions</td>
<td>MCU Board – Top Side – Global View</td>
</tr>
<tr>
<td>Radar Opening</td>
<td>MCU Board – Top Side – Global View</td>
</tr>
<tr>
<td>Electronic Boards</td>
<td>MCU Board – Top Side – Global View</td>
</tr>
<tr>
<td>RF Chipset</td>
<td>MCU Board – Top Side – Global View</td>
</tr>
<tr>
<td>Comparison</td>
<td>MCU Board – Top Side – Global View</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PCB Characteristics:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Material: FR4:</td>
<td></td>
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<tr>
<td>Total Thickness:</td>
<td></td>
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<tr>
<td>Finishing:</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Layers number:</th>
<th>Dimensions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>External copper thickness:</td>
<td></td>
</tr>
<tr>
<td>Drilling holes number:</td>
<td></td>
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<tr>
<td>Internal copper thickness:</td>
<td></td>
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<tr>
<td>Diameter:</td>
<td></td>
</tr>
</tbody>
</table>

**Cross section of MCU Board| Layers**
MCU Board – Top Side – Main Components Identification

- Diode Switching Ultrafast
- Capacitor Electrolytic
- ON Semiconductor
RF Board – Bottom Side – Main Components Markings
Receiver Package

The Radar Receiver die is packaged

- The package is a
- Pin pitch:
- The package marking includes the logo of

Top view

Die

Back view
Receiver Die

- The die marking includes the logo of "" and:

- Silicon die in ""
### Comparison with Continental ARS4-A and Bosch MMR1Plus

<table>
<thead>
<tr>
<th></th>
<th>Bosch LRR4</th>
<th>Continental ARS4-A</th>
<th>Bosch MMR1Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The LRR4 (Bosch)</strong></td>
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<tr>
<td>In the LRR4, the transmitter has one</td>
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<tr>
<td>The LRR4 configuration offers wider range of</td>
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</tbody>
</table>

|                  |            |                    |                |
| The ARS4-A (Continental) contains two |            |                    |                |
| In the ARS4-A, the transmitter has |            |                    |                |
| The ARS4-A configuration thanks to the array of |            |                    |                |

|                  |            |                    |                |
| The MRR1Plus (BOSCH) contain one |            |                    |                |
| In the MRR1Plus, the transmitter has |            |                    |                |
| The MRR1Plus configuration seems to |            |                    |                |
BOM Cost – MCU Board (1/2)

<table>
<thead>
<tr>
<th>Part Reference</th>
<th>Article Qty</th>
<th>Description</th>
<th>Package</th>
<th>Pin Nb</th>
<th>Manufacturer</th>
<th>Side Unit Cost</th>
<th>Total Cost</th>
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</thead>
<tbody>
<tr>
<td>PCB of MCU Board</td>
<td>1 Unit FR4</td>
<td>unit Radar ASIC QFP100</td>
<td>QFP100</td>
<td>100</td>
<td></td>
<td>$1</td>
<td>$1</td>
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Note: The table continues with more entries.
## Manufacturing Cost Breakdown

<table>
<thead>
<tr>
<th>Bosch LLR4 77GHz Radar</th>
<th>ASSEMBLY COST</th>
<th>MATERIAL COST</th>
<th>MANUFACTURING COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADDED VALUE</td>
<td>Manufacturing Duration (s)</td>
<td></td>
</tr>
<tr>
<td>Housing</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>MCU Board</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>RF Board</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$</td>
<td>$</td>
<td>$</td>
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</tbody>
</table>

### Cost Analysis
- Accessing the BOM
- PCB Costs
- BOM Cost – Electronics
- Housing Parts Estimation
- BOM Cost - Housing
- Material Cost Breakdown
- Added-Value Cost
- Manufacturing Cost

### Manufacturing Price

### About System Plus

The Total Manufacturing Cost is estimated to $ including $ for Material Cost (%) and $ for Added Value Cost (%).
# Estimation of the Manufacturing Price

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Quantity</th>
<th>Manufacturing Location</th>
<th>Material Cost</th>
<th>Scrap</th>
<th>Supplying</th>
<th>Total Material Cost</th>
<th>Assembly Cost</th>
<th>Manufacturing Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>1234</td>
<td>Germany</td>
<td>$1234</td>
<td>$1234</td>
<td>$1234</td>
<td>$1234</td>
<td>$1234</td>
<td>$1234</td>
</tr>
</tbody>
</table>

The bill of material (BOM) cost is estimated to $1234 for the Radar.

To this, we must add some scrap costs and component supplying costs to obtain the total material cost of $1234.

The assembly cost is estimated to $1234, so the manufacturing cost is $1234.

With estimated costs of R&D, G&A and Profit, the average manufacturing price of Bosch can be estimated at $1234 when using the estimated economic parameters of Bosch.
Overview / Introduction

Company Profile & Main Features

Physical Analysis

Cost Analysis

Manufacturing Price

About System Plus

Related Reports

- Continental ARS4-A 77GHz Radar
- Autoliv 77GHz Multi Mode Radar
- Infineon RRN7745P & RTN7735P eWLB Fan-Out Package – 77GHz Radar Dies

MARKET AND TECHNOLOGY REPORTS - YOLE DÉVELOPPEMENT

- Imaging Technologies for Automotive 2016
- Sensors and Data Management for Autonomous Vehicles report 2015
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Custom Analyses
(>130 analyses per year)

Reports
(>40 reports per year)

Costing Tools

Trainings

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LED
IC & RF
MEMS & Sensor
PCB
Imaging
Packaging
System

Company services
Feedbacks
Contact
Legal