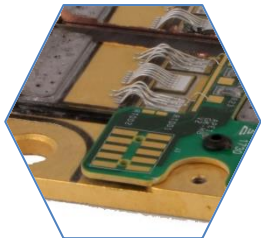
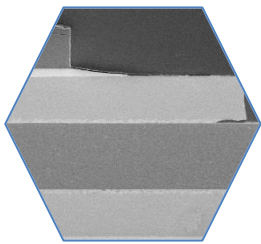


## Industrial Power Module Packaging Comparison 2020

*Compare the packaging technology and cost of 10 Industrial power modules from Infineon, Mitsubishi, IXYS/Littelfuse, Vincotech, ABB, and Wolfspeed.*



The market for power modules will be worth \$6B by 2024 with a 2018-2024 compound annual growth rate (CAGR) of 6.6%. The power module market plays a key role in several industrial applications, such as motor drives and traction. In 2018, the biggest power module market segment is motor drives at \$1.4B.

Module packaging currently faces several challenges, from housings to die attach and connections. To remain competitive, power module makers must deliver high reliability while remaining cost efficient.

In this dynamic context of the power module packaging market, System Plus Consulting provides a deep comparative review of packaging technology and cost, of 10 Industrial Power Modules from the main suppliers on the market: Infineon, Mitsubishi, IXYS, Vincotech, ABB, and Wolfspeed.

System Plus Consulting analyzes several packaging technologies to provide an insight into their structures, processes and costs. We look at their external parts, including cases, covers and baseplates, and their internal structure, including substrates, assembly of the substrates and modules, die and substrate attach and connections.

The cost of each power module packaging is detailed including external part costs, assembly cost per process step, and yield losses cost.

The ten Industrial Power Module packaging have been compared in terms of packaging structure, assembly, and electrical performance. Finally, they have been compared in terms of packaging cost, including package cost breakdown, cost per commutation cell, cost per power in \$/kVA, cost per module package surface and per package volume.

### COMPLETE TEARDOWN WITH

- Detailed optical and SEM photos
- Precise measurements
- Packaging assembly process flow
- Packaging cost analysis
- Technology comparisons of packaging structure, assembly, and electrical performance
- Packaging cost comparisons per commutation cell, power, package surface, package volume
- Examples of system integration of Industrial Power Modules

**Title:** Industrial Power Module Packaging Comparison 2020

**Pages:** 165

**Date:** May 2020

**Format:** PDF & Excel file

**Price:** EUR 6,490

**Reference:** SP20474

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    - ✓ EconoPACK™ 4 FS100R12PT4
    - ✓ PrimePACK™ 2 FF1200R12IE5
  - Mitsubishi
    - ✓ Std Type CM450DY-24S
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  - Vincotech
    - ✓ flow90PIM 1 V23990-P632-A-PM
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    - ✓ LinPak 5SNG 1000X170300

- Wolfspeed
  - ✓ High Performance 62mm CAS325M12HM2
  - ✓ XM3 CAB450M12XM3

### Physical Comparison

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- Package Cost Comparison: Breakdown, Cost Comparison per Commutation Cell, Cost Comparison per kVA, Cost Comparison per Surface, Cost Comparison per Volume

### System Plus Consulting Services

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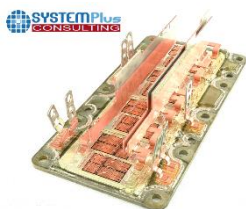


*Amine Allouche is part of System Plus Consulting's Power Electronics and Compound Semiconductors team. Amine holds a Master's degree focused on Micro and Nanotechnologies for integrated Systems.*

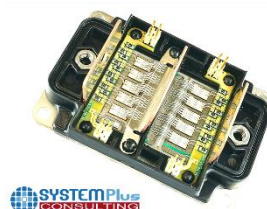


*Véronique Le Troadec has joined System Plus Consulting as a laboratory engineer. Coming from Atmel Nantes, she has extensive knowledge in failure analysis of components and in deprocessing of integrated circuits.*

## RELATED REPORTS



**Infineon PrimePACK™ 2 1200V Power Module with IGBT5 and EC5 Diode**  
*The 1st PrimePACK™ 2 product from Infineon implementing IGBT5 and .XT joining technology with copper wire bonding and sintered silver die attach.*  
 October 2019 - EUR 3,990\*

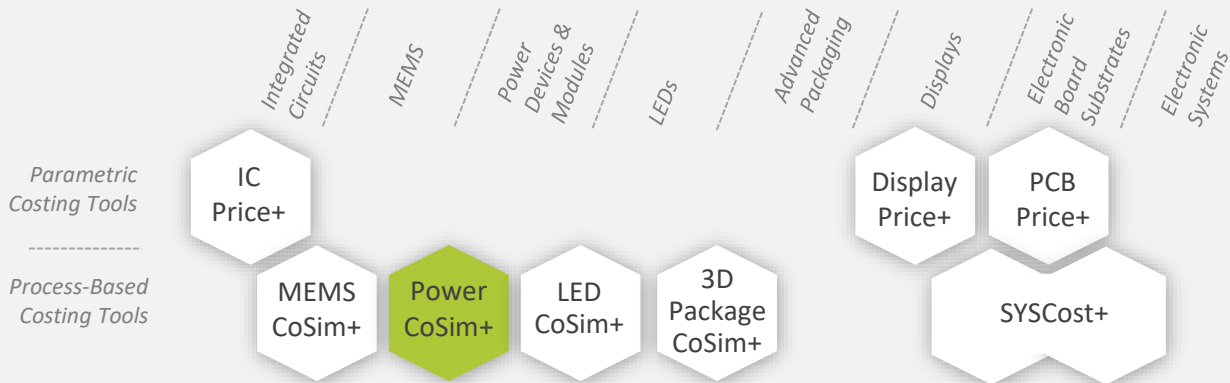


**Wolfspeed All-SiC Module CAB450M12XM3**  
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## COSTING TOOLS



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

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

### Power CoSim+

Cost simulation tool to evaluate the cost of any Power Electronics process or device: from single chip to complex structures.

## 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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# TERMS AND CONDITIONS OF SALES

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## 1. INTRODUCTION

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

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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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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.

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

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## 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?

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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.

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

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