SYSTEMPlus CONSULTING

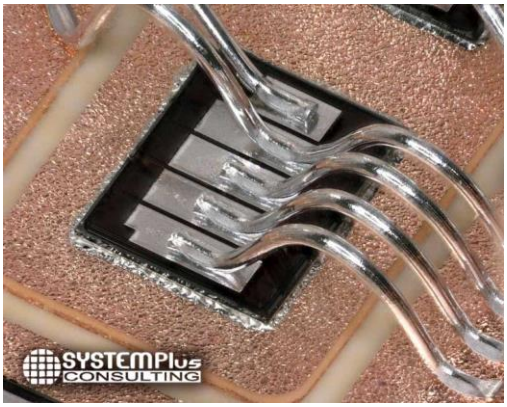
Reverse Costing® REPORT

LED | IC & RF | MEMS | IMAGING | PACKAGING | SYSTEM | POWER | DISPLAY

Structure, Process & Cost Analysis

1200V CoolSiC™ MOSFET Module DF11MR12W1M1_B11, from Infineon

Infineon expands its presence in the SiC market with a new 1200V SiC MOSFET-based boost converter for solar applications



The market outlook for SiC devices is promising, with a compound annual growth rate (CAGR) of 28% from 2016 - 2020. This will increase to 40% from 2020 - 2022 due to growth in industrial applications. In total, the SiC market will exceed $1B in 2022. In the photovoltaic sector, SiC devices have an actual value of $71M, which will increase by around 28% in 2022. The reason for this relates to market forces pushing for loss reduction, not only for the sake of improved efficiency but also for smaller packages.

Capitalizing on Infineon's years of experience and know-how, the CoolSiC™ MOSFET product line enables drastically new system designs compared to the usual silicon-based converters. Infineon's new boost converter targets the entire photovoltaic conversion chain (inverter, battery charging, and energy storage). Based on a 1200V 23mΩ SiC Trench MOSFET, this product's best-in-class performance enables highly efficient energy harvesting.

Supported by a full teardown of the module's components and housing, this report reveals Infineon's innovative assets, such as its unique shifted doping implantation design, which brings several advantages to the 1200V SiC MOSFET: superior gate-oxide reliability, switching performance and conduction losses, the highest transconductance level (gain), a threshold voltage of Vth = 4 V, and short-circuit robustness.

Another of this module's assets is the use of cutting-edge SiC Schottky Diodes from Infineon's thinQ!™ product line. This component is based on an MPS (merged-pin-Schottky) structure that combines the shielding of the electric field from the Schottky barrier and an increased surge current capability via hole injection.

Title: Infineon DF11MR12W1M1_B11 1200V CoolSiC MOSFET Module

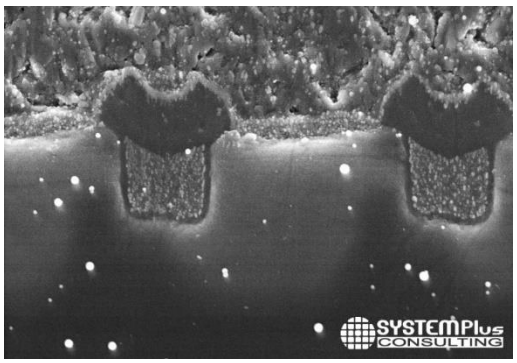
Pages: 140

Date: March 2018

Format: PDF & Excel file

COMPLETE TEARDOWN WITH:

- Detailed photos
- Precise measurements
- Materials analysis
- Manufacturing process flow
- Supply chain evaluation
- Manufacturing cost analysis
- Estimated sales price
- Comparison with Infineon's Si IGBT module packaging
- Comparison with Rohm's SiC module packaging
- Comparison with competitors' 1200V SiC MOSFETs



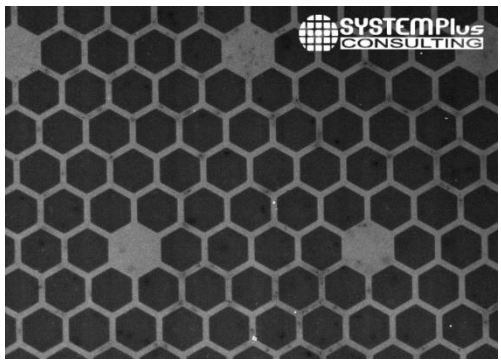


TABLE OF CONTENTS

AUTHORS:

Elena Barbarini

Elena is in charge of costing analyses for Power Electronics and Compound Semiconductors. She has a deep knowledge of Electronics R&D and Manu-facturing environment.

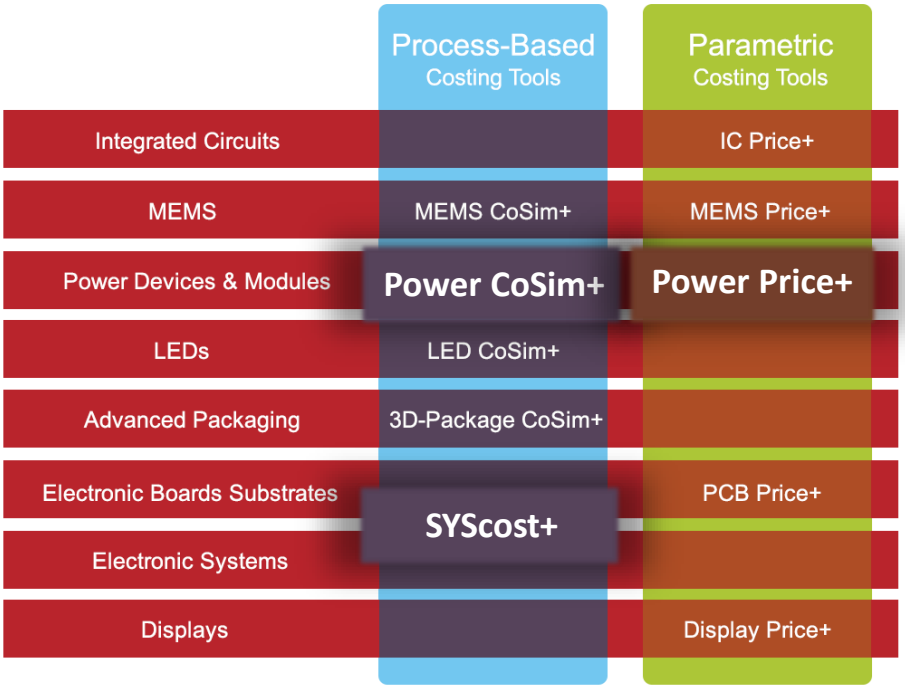
Farid Hamrani

Farid is focused on system reverse costing analysis. He has worked for Tronico in the field of high temperature electronic assembly and qualification.

Yvon Le Goff (Lab)

Yvon has joined System Plus Consulting in to setup its laboratory. He previously worked for 25 years at Atmel Nantes Technological Analysis Laboratory, and for three years at Hirex Engineering in Toulouse.

ANALYSIS PERFORMED WITH OUR COSTING TOOLS POWER COSIM+, POWER PRICE+ AND SYSCOST+



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

POWER CoSim+ is a process based costing tool used to evaluate the manufacturing cost per wafer using your own inputs or using the pre-defined parameters included in the tool.

POWER Price+ is a parametric costing tool used to evaluate the manufacturing cost of devices using few process related inputs.

SYScost+ gives accurate calculations through estimations of all components costs and cost simulations of assembly and test process.

Performed by

SYSTEMPlus CONSULTING

RELATED REPORTS

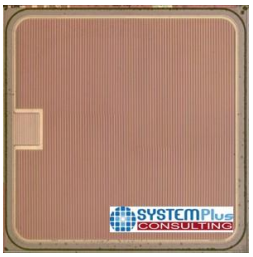
1200V SiC MOSFET vs Silicon IGBT: Technology and Cost comparison

New SiC MOSFET technologies are trying to compete with well - established silicon IGBTs, but will they succeed?

Pages: 195
Date: December 2016

STMicroelectronics 1200V SiC MOSFET STC30N120

The 1st generation 1200V SiC MOSFET device from STMicroelectronics has good current density at a very competitive cost.



Pages: 66
Date: January 2017

ROHM 1700V SiC MOSFET SCT2H12NZGC11 Discrete

In its new series of SiC MOSFETs, Rohm uses trench structures for 650V and 1200V products, while 1700V products use planar structures.

Pages: 65
Date: April 2017

ANNUAL SUBSCRIPTION OFFER

Each year System Plus Consulting releases a comprehensive collection of new reverse engineering & costing analyses in various domains.

You can choose to buy over 12 months a set of 3, 4, 5, 7, 10 or 15 Reverse Costing® reports.

Up to 47% discount!

More than 60 reports released each year on the following topics (considered for 2018):

- MEMS & Sensors:
  Accelerometer - Environment - Fingerprint - Gas - Gyroscope - IMU/Combo - Microphone - Optics - Oscillator - Pressure
- Power:
  GaN - IGBT - MOSFET - Si Diode - SiC
- Imaging: *Camera - Spectrometer*
- LED & Laser:
  UV LED - VCSEL - White/blue LED
- Packaging:
  3D Packaging - Embedded - SIP - WLP
- Integrated Circuits :
  IPD - Memories - PMIC - SoC
- RF:
  FEM - Duplexer
- Systems:
  Automotive - Consumer - Energy - Telecom

Performed by
SYSTEMPlus CONSULTING

ORDER FORM

Please process my order for "Infineon DF11MR12W1M1_B11 1200V CoolSiC MOSFET Module" Report

Ref.: SP18366

***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**
***Our prices are subject to change. Please check our new releases and price changes on www.systemplus.fr. The present document is valid 6 months after its publishing date: March 2018**

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:
.....

BILLING CONTACT

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

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 2 53 55 10 59
MAIL: SYSTEM PLUS CONSULTING
21 rue La Nouë Bras de Fer
44200 Nantes – France

Contact:

EMAIL: sales@systemplus.fr
TEL: +33 2 40 18 09 16

ABOUT SYSTEM PLUS CONSULTING

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:

TECHNOLOGY ANALYSIS - COSTING SERVICES - COSTING TOOLS - TRAININGS

www.systemplus.fr - sales@systemplus.fr

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 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.

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