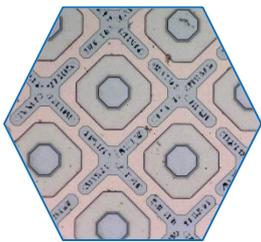
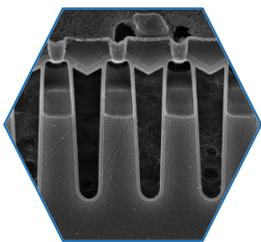


Silicon IGBT Comparison 2021

Exhaustive technology and cost comparisons of 31 Silicon IGBTs from Infineon, ON Semiconductor, STMicroelectronics, Mitsubishi, Rohm, Toshiba, Fuji Electric, Littelfuse, ABB, Microsemi, and the IGBT in StarPower's module.



Silicon (Si) devices represent the majority of the power electronics market. In 2019, the power semiconductor device market segment was worth US\$17.5 billion, with a Compound Annual Growth Rate (CAGR) for 2019-2025 of 4.3% according to Yole Développement.

Silicon devices such as IGBTs are benefiting from mature infrastructure and processes. New device generations are coming to the market. In addition to performance improvements, Si IGBT costs will further be reduced thanks to a 12-inch Si wafer transition that will make the competition with WBG materials even tougher.

Si IGBT players offer different approaches for device design, depending on the targeted electrical performance and applications. Most of them have adopted the Field-Stop (FS) trench structure.

In this report, System Plus Consulting presents an overview of the state of the art of 31 Si IGBT transistors of eight voltage classes from 11 main IGBT market players. The report highlights differences in device design and manufacturing processes, and their impact on device size

and production cost.

Detailed physical analysis is performed for 17 IGBTs. For devices previously analyzed by System Plus Consulting, please refer to the corresponding reports for the full technology analysis. Cost simulations are detailed for all 31 IGBTs. It includes their estimated manufacturing cost with breakdowns, and their selling price.

Finally, this report provides exhaustive physical, technological and manufacturing cost comparisons of the analyzed Si IGBTs, and a current density and die Ampere cost comparisons with SiC Transistors.

COMPLETE TEARDOWN WITH

- Detailed optical and SEM photos
- Precise measurements
- Manufacturing process flow of selected technologies
- Supply chain evaluation
- Manufacturing cost analysis
- Estimated selling price
- Comparisons of technology design parameters and performance
- Comparisons of costs

Title: Silicon IGBT Comparison 2021

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SPR21540

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Physical Analysis

- 650V IGBTs
 - ✓ Infineon, ON Semiconductor, STMicroelectronics, Mitsubishi, Rohm
- 750V IGBT
 - ✓ StarPower
- 900V IGBT
 - ✓ Microsemi
- 1200V IGBT
 - ✓ Infineon, ON Semiconductor, STMicroelectronics, Mitsubishi, Toshiba, Fuji Electric, Littelfuse
- 1700V IGBT
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- For Each of the 31 IGBTs:
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 - ✓ Die cost
 - ✓ Packaging cost, only for discrete packaging
 - ✓ Component cost
 - ✓ Component price

Cost Comparison

- Comparisons Include Wafer, Die Costs, Die Ampere Costs for Each Voltage Class
- SiC Transistor vs Si IGBT Die Ampere Cost Comparison

AUTHORS

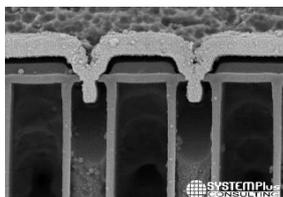


Amine Allouche is part of System Plus Consulting's Power Electronics and Compound Semiconductors team. Amine holds a Master's degree focused on Micro and Nanotechnologies for integrated Systems.



Peggy Gallois joined System Plus Consulting's laboratory of microelectronics team in July 2019. She has a deep knowledge of metallic materials. She previously worked in the laboratory of metallographic expertise for Dassault Aviation near Paris.

RELATED REPORTS



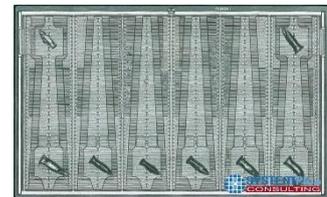
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Industrial Power Module Packaging Comparison 2020

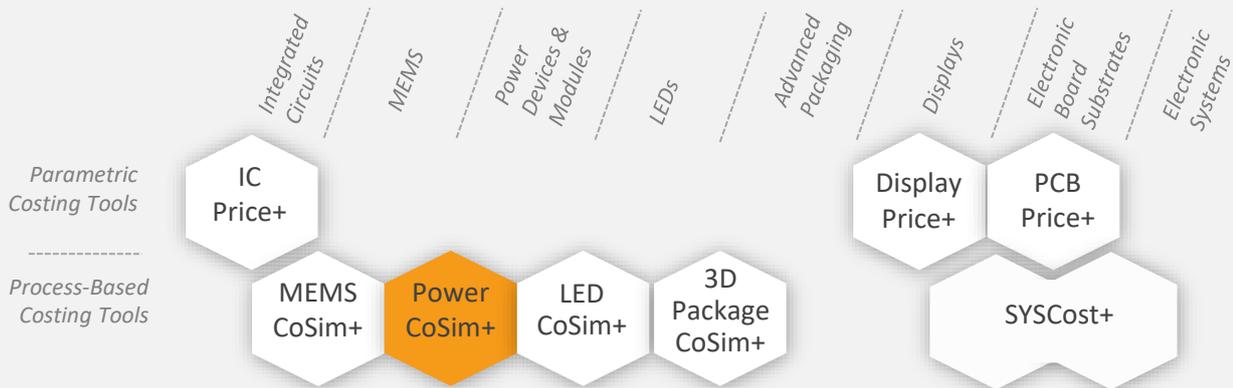
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StarPower GD820HTX75P6H Tri-Pack IGBT Module

Tri-Pack power module from StarPower with direct liquid cooling pin-fin structure. March 2020 - EUR 3,990*

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

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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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