



Electric Vehicle Strategies for million-euro Savings

Short version of the Report

A ready Recipe for
Electrical Vehicle
automakers to unlock
Millions of Euros in
savings

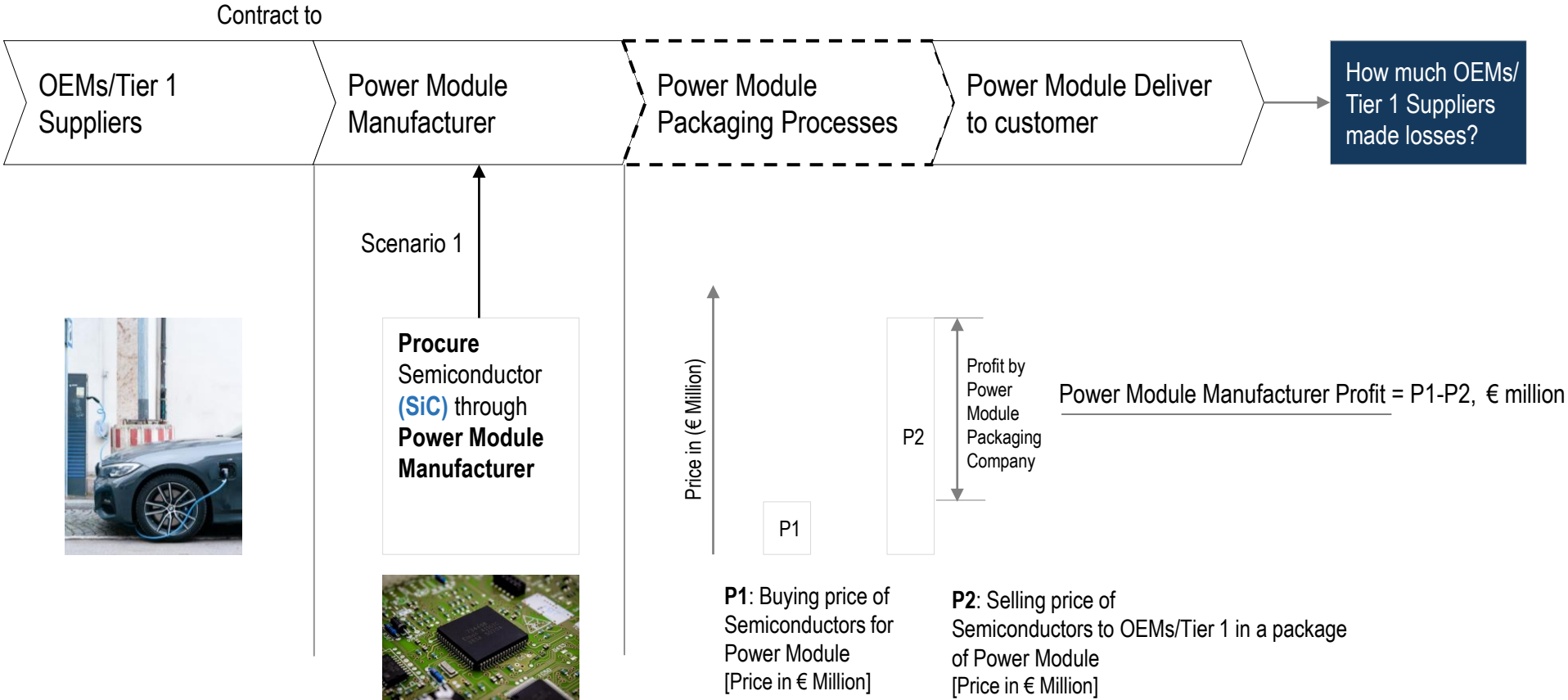
About US:

We are a Global market intelligence and analytics group specializing in the automotive sector. We empower organizations to make informed and strategic decisions at every level, leveraging an integrated suite of market models, essential industry data, and a network of Automotive industry experts.

We work with leading Automotive stakeholders like OEMs, Suppliers, Financial Institutes, Logistics companies, Branding agencies, Research and consulting firms, and Government organizations to help them minimize risk, and improve performance in various areas.

Semiconductor Procurement Strategy

Buying through Power Module Manufacturer

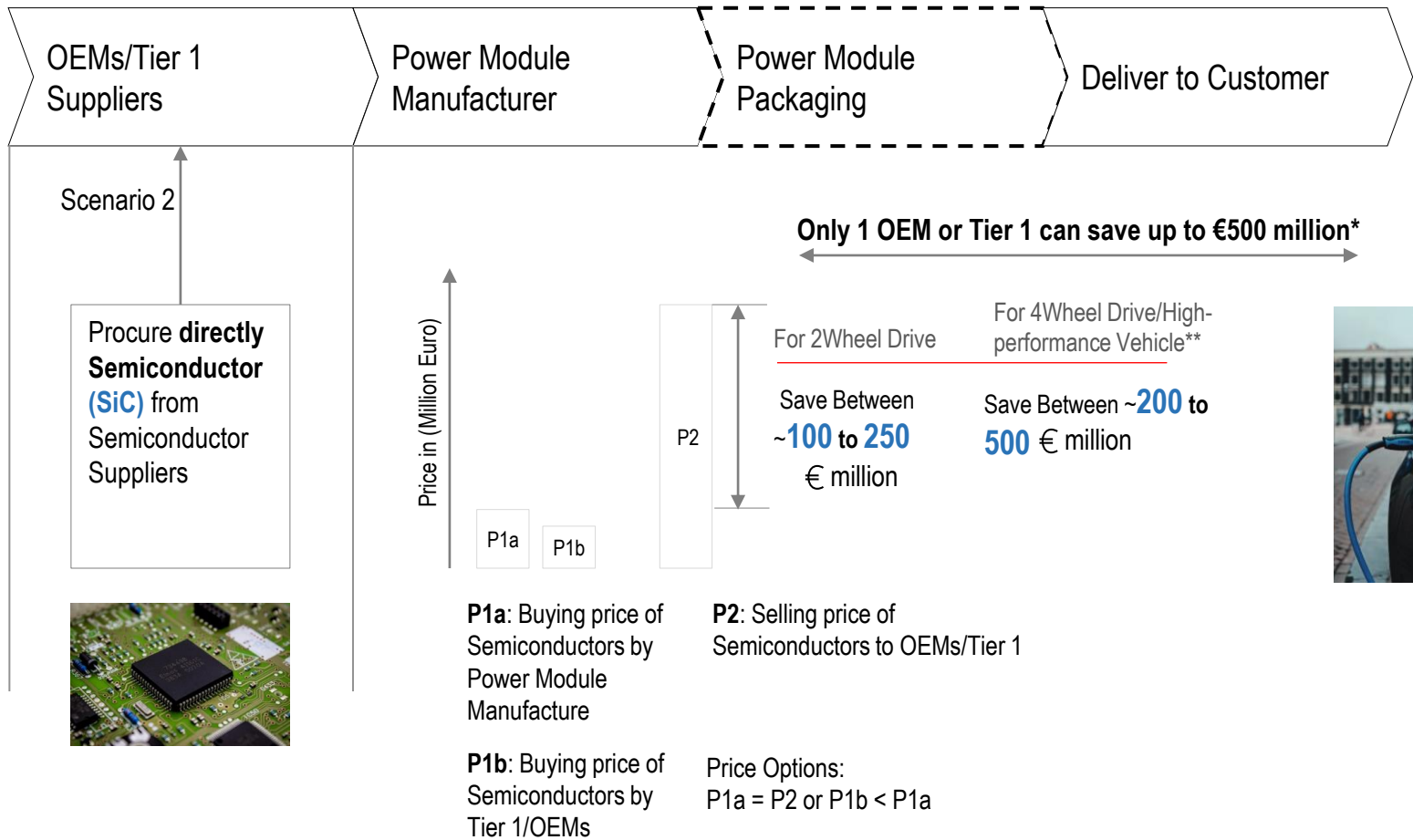


Insights

- OEMs/Tier 1 try to make direct deals with semiconductor suppliers
- The Power Module business is OEM/Tier 1 dependent, this is one of the reasons that OEMs/Tier 1 can dictate their terms and conditions easily
- If Semiconductor suppliers have its own power module, then $P1 = P2 \Rightarrow 0$
- Industry already started to consolidate like ZF is having an alliance with Wolfspeed to manufacture Power Module
- OnSemi, STMicro, Bosch already coming with their own Power Module

Source: ACG Study on Semiconductor and Power Module Procurement Strategy Report 2023

Elevating the savings of the Electric Vehicle Manufacturers by incorporating a Systematic Approach in Semiconductor Procurement



Insights

- There are several direct and indirect advantages for OEMs/Tier if they directly deal with Semiconductor Suppliers
- The OEMs/Tier 1 can save up to € 500 million in 5 year's time frame
- In case of a Direct deal with a Semiconductor supplier, the equation of the price will be either Pa1 will be equal to P2 or even P1b less than P1a



Source: ACG Study on Semiconductor and Power Module Procurement Strategy Report 2023

* The saving amount is based on the Average SiC chip as per the May 2023 price, the number of chips used in one Power Module, the Number of power Module in a 2W drive, Power Module Procurement for 5 years and for a specific number of vehicles

** The number of power modules used in a 2-wheel drive (2WD) or 4-wheel drive (4WD) vehicle can vary depending on the specific design of the electric powertrain and the vehicle's power requirements.

OEMs/Tier 1 Suppliers Benefits of Directly dealing with Semiconductor Suppliers

Power Module

Attributes		Benefits	Strategic Fit
I	Supply	Secure supply is the biggest concern about semiconductors. Dealing directly with semiconductor suppliers could improve the secure supply of chips.	
II	Price	Directly Deal gives the opportunity to get the best price. OEMs/Tier 1 have a better negotiate better pricing terms and enjoy cost advantages, especially when purchasing in bulk.	
III	Technical benefits	It is crucial in semiconductors to have technical support. OEMs can receive assistance with integration, troubleshooting, and product optimization.	
IV	Knowledge Transfer	Working closely may help to new development & and joint research projects, resulting in better productivity.	
V	Qualification	Qualification is an important step in the Power Module and Semiconductor Industry. Easy to work on the qualification process with the next Generation chip.	
VI	Customization and Collaboration	OEMs can work closely with suppliers to customize semiconductor components to meet their specific requirements.	
VI	Access to Cutting-Edge Technology	OEMs that work directly with semiconductor suppliers may have early access to the latest technological advancements and product offerings, giving them a competitive edge.	
VII	Product Roadmap Alignment	OEMs can work their product development strategies more closely with the semiconductor supplier's product roadmap. This ensures Product compatibility and access to the future.	



Highly relevant



Partly relevant



Not relevant

Source: ACG Power Module, Semiconductor and Electric Vehicle OMEs and Tier 1 Suppliers Study 2023

Is SiC MOSFET a better choice than Si IGBT

Using SiC and Si depends on the driving cycle of the vehicle, Uses of the vehicle like application and price target

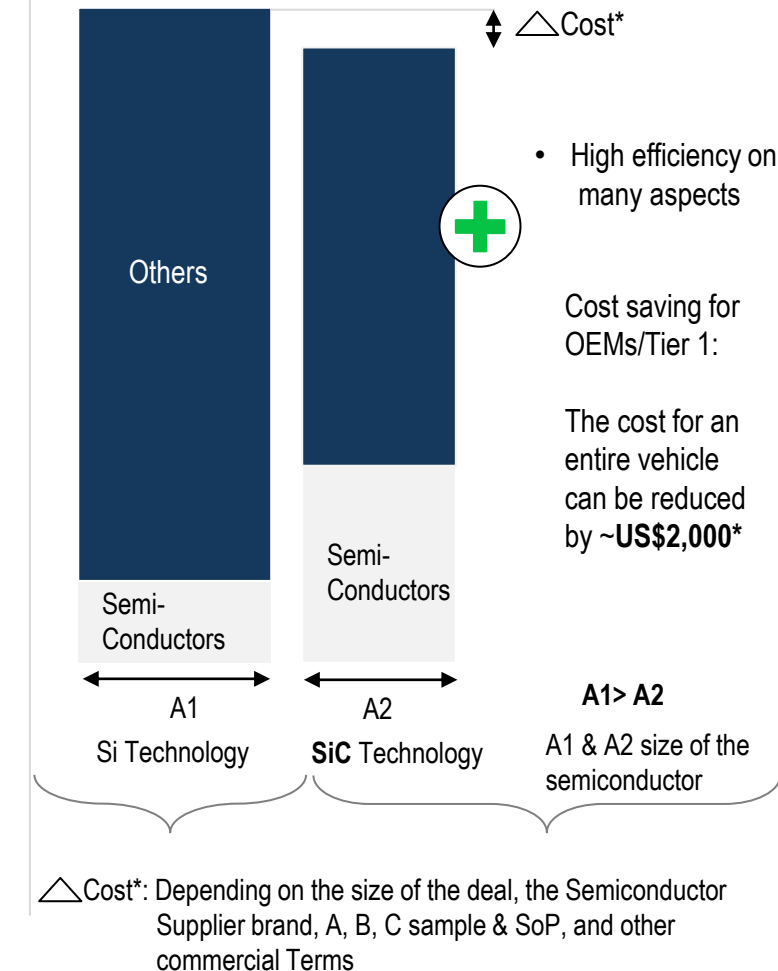
Attributes	Impact	Comment
I Efficiency	↑	SiC inverter is ~3.6% more efficient Vs. IGBT inverter at average EV operating condition. ~60 - 70% lower loss compared to Si-based
II Weight	↓	- Thermal Conductivity rate is ~ 3 times that of Si - Operation at high temperature – band gap is ~ 3 times that of Si - Low Power loss – reduction in conduction & and switching loss
III Battery cost/Heat dissipation costs/ Space cost	↓	Compared to IGBT based EV with an 88kWh battery, the SiC version requires only 85.1kWh for the same range. If 1kWh = USD 90, then it saves USD 2700 for 85kWh battery capacity.
IV Range	↑	By using SiC, the efficiency of the vehicle will be increased by 5 to 10%.
V Other advantages	↑	SiC based inverter will only need to dissipate 61% of the heat compared to IGBT version

 Increasing
  Decreasing

Source: ACG Study on SiC and Si Semiconductor Effect on EV Industry

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SiC – OEMs/Tier 1 Cost Analysis



Electric Vehicle Energy Efficiency Analysis

The combined energy efficiency can be significantly enhanced, equivalent to the benefits of using SiC chips

Different factors	Condition	Value of Factors	Energy Consumption	Possibility of Increasing Efficiency			Insights
Negative Temperature	 	-7°C	~6% - 14%		~1 to 2%		- The SiC semiconductor is a great semiconductor but there are some Electric Vehicle Segment in which Si semiconductors can be used - The mapping of Semiconductor applications is an important deciding factor - There are several areas of Electric Vehicle where the energy can be saved, or the efficiency of the vehicle can be increased up to 10% - There is an impact on Battery attributes like SoC and Regenerative braking - By Using SiC vehicle efficiency can be increased by 10%  Highly relevant  Partly relevant  Not relevant  Increasing  Decreasing
High Temperatures	 	45°C	~2%		~ 0%		
HVAC Heating (in winter)	 	Depend on Passenger	~52 – 94%		~2%		
HVAC Cooling (in summer)	 	Depend on Passenger	~11– 17%		~1%		
Wind	 	18km/h	~5– 14%		~1-3%		
	 	50km/h	~15– 31%		~2-3%		
Inclination	 	3%	~50%		~1%		
	 	-3%	~80%		~0%		
Route length	 	4-16km	~15 - 29%		~1 – 2%		
Traffic conditions	 	12-18% to 24 to 34%	~20%		~2-3%		
Load	 	Q = 250kg	~7%		~1%		
Driving Style	 	Aggressive	~17%		~3-4%		

~ 5 to 10% Energy saving

Source: ACG Analysis, The 13th International Conference on Automotive Safety (Automotive Safety 2022)

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Our Clients: OEMs, Consulting, Venture Capital, Auto Components Manufactures, Service provider and Others





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Our Expertise:

Our key expertise is in the Global Automotive Industry and currently, our key focus is on the E-mobility segment. Product Management & Strategy, Sales Analytics and strategy, Market Assessment and Forecast, Insurance providers, Software Development, Digital technology, Semiconductor and Power Module, Battery Technology, Customer Analytics, Go-To-Market, Branding Strategy, Autonomous vehicle technology and Market Forecasts.

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Thank you

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