



**Sensors**  
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# Thermal Interface Materials (TIMs) and Their Role in the Automotive Semiconductor Space

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# Agenda

Overview of Automotive Semiconductors



Trends in Sensorization



Why are Thermal Interface Materials Important



Current Solutions and their Shortcomings

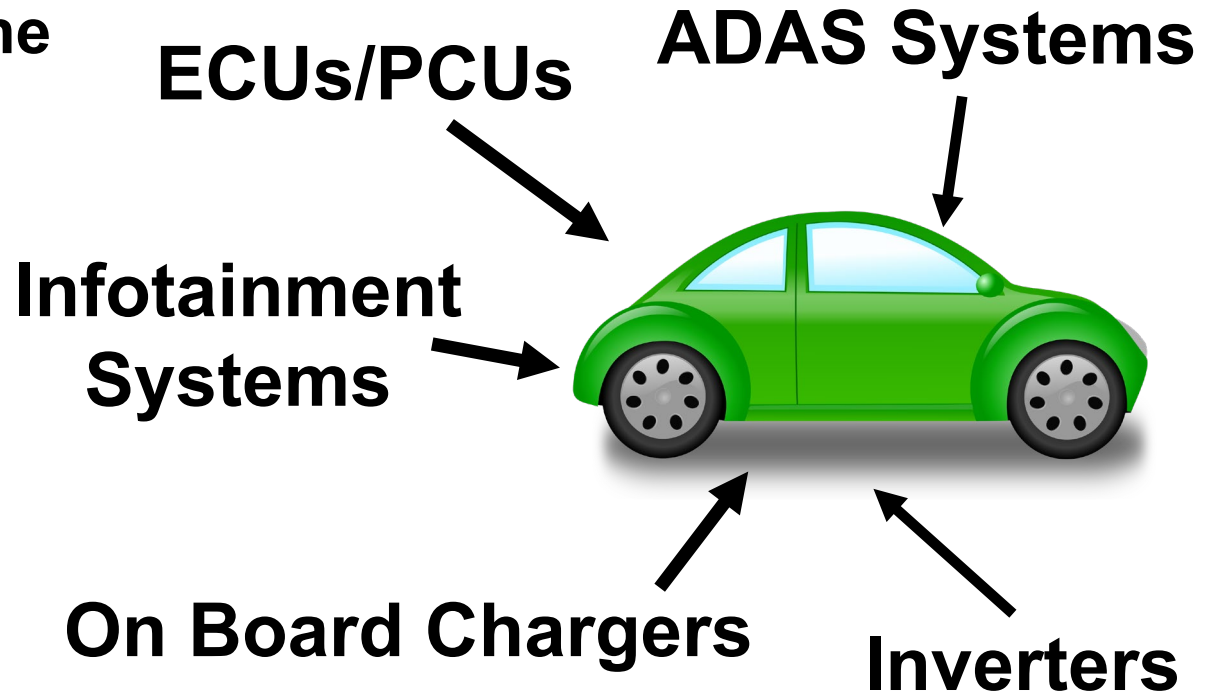


Ideal TIM for Automotive Applications

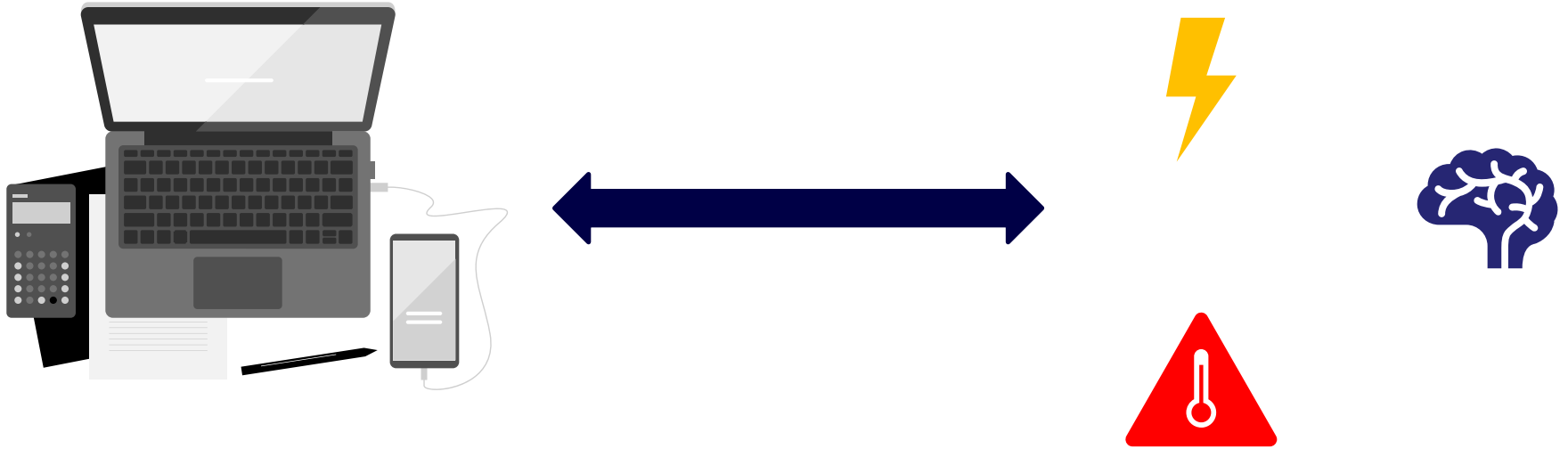
# Overview of Automotive Semiconductors

## Requirements from the Automotive Industry

- High reliability requirements
- Wide temperature operating range
- Smaller packages
- Quick on/off cycling
- Cost



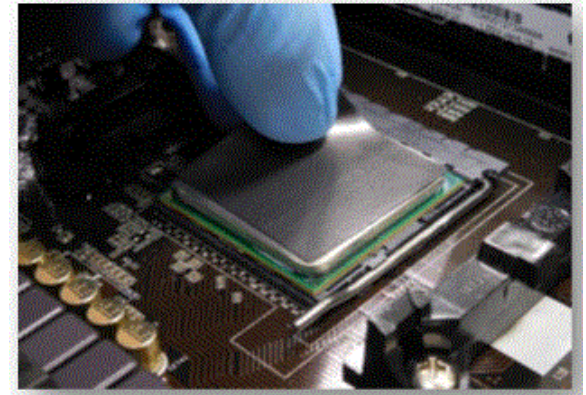
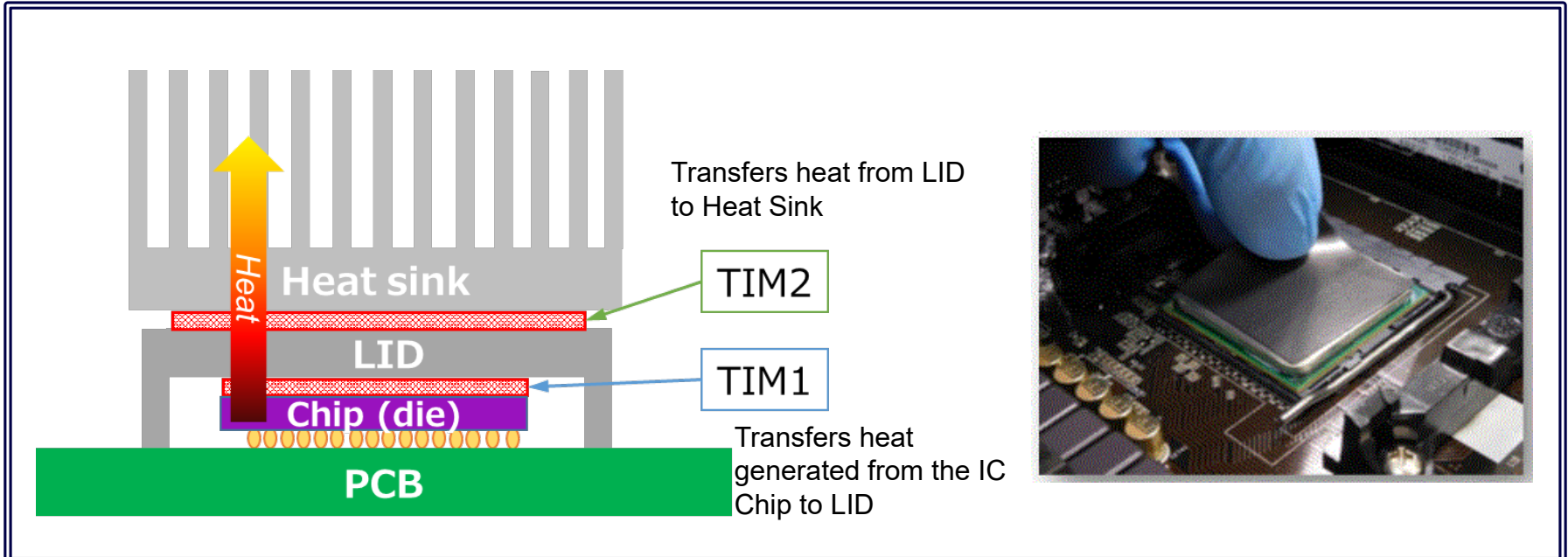
# Trends in Sensorization







**The demands of the general market are requiring electronics to shrink while also demanding higher processing requirement**

# Importance of Thermal Interface Materials

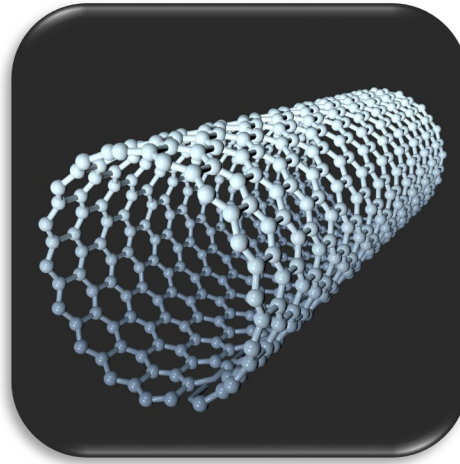
TIM is a material used to fill the gap between parts that generate heat (i.e. IC chips) and parts that dissipate them (i.e. heat sinks) in order to let the heat transfer and dissipate efficiently.



# Current Solutions

TIM	Pros	Cons	Acceptable in the Automotive Industry
Thermal Grease	<ul style="list-style-type: none"> <li>• Low bond line thickness</li> <li>• Low cost</li> <li>• Easy application</li> </ul>	<ul style="list-style-type: none"> <li>• Low thermal performance</li> <li>• Risk of physical and thermal degradation during cycling</li> <li>• Risk of pump out</li> </ul>	
Phase Change Material	<ul style="list-style-type: none"> <li>• High thermal conductivity</li> <li>• High cycling reliability</li> <li>• Good conformability</li> </ul>	<ul style="list-style-type: none"> <li>• Limited thermal operating range (roughly 50 C per material type)</li> <li>• Expensive</li> </ul>	
Metal TIMs (Solders)	<ul style="list-style-type: none"> <li>• High thermal conductivity</li> <li>• Easy application</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive</li> <li>• Risk of cracking due to CTE mismatch during cycling</li> </ul>	
Gap Pad	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Good mechanical properties</li> <li>• Good adhesion</li> </ul>	<ul style="list-style-type: none"> <li>• High bond line thicknesses</li> <li>• Low thermal performance</li> <li>• Low thermal operating range</li> </ul>	

# What is the Ideal TIM?



- High temperature polymer
- Good mechanical properties
- Easy application
- Low cost

- High thermal conductivity
- High cycling reliability
- Wide temperature operating range

# Questions?

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