



Transparent · Flame Retardant
· High Performance

Covestro Innovative Polycarbonate Solution

Agenda

- Company Introduction
- E & E Market Trends and Challenges
- Covestro Innovative Transparent Flame Retardant Solution
- Case Studies
- Q&A

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COMPANY INTRODUCTION

Covestro – global leading polymer manufacturer

~80years Innovation, Pioneer in Circular Economy



Strong and global

- €14.2 bn in sales
- 17,500 employees¹
- 46 production sites

¹calculated as full-time equivalent (FTE)

Game-changing and beneficial

- Polymer materials of superior quality
- Across numerous industry sectors
- Keeping an eye on global challenges



Innovative and sustainable

- 1,340 employees in research and development
- 80 years of ideas and inventions
- Pioneer of the circular economy

Focused around two distinct polymer types:
Polycarbonate and Components for Polyurethanes

Engineering Plastics - Innovative Journey Across Industries



E&E



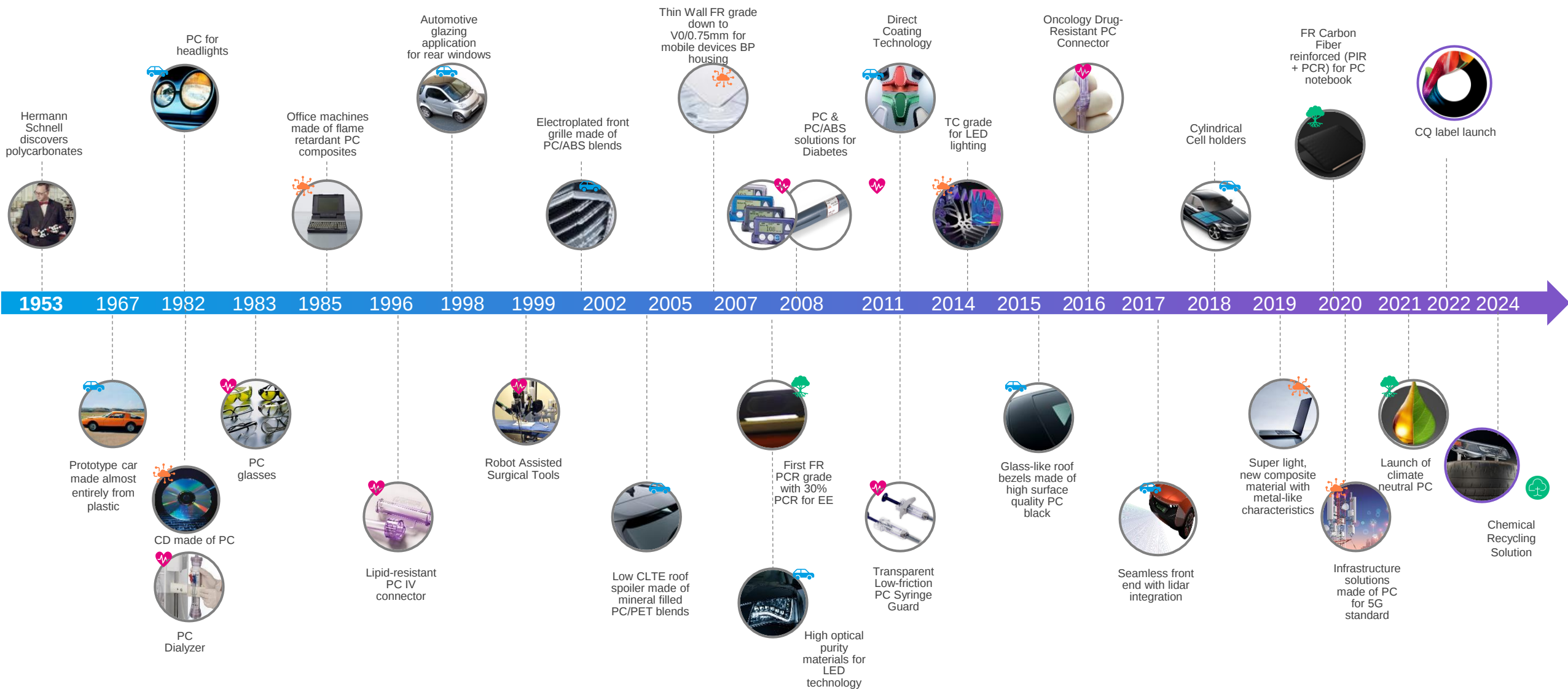
Mobility



Healthcare

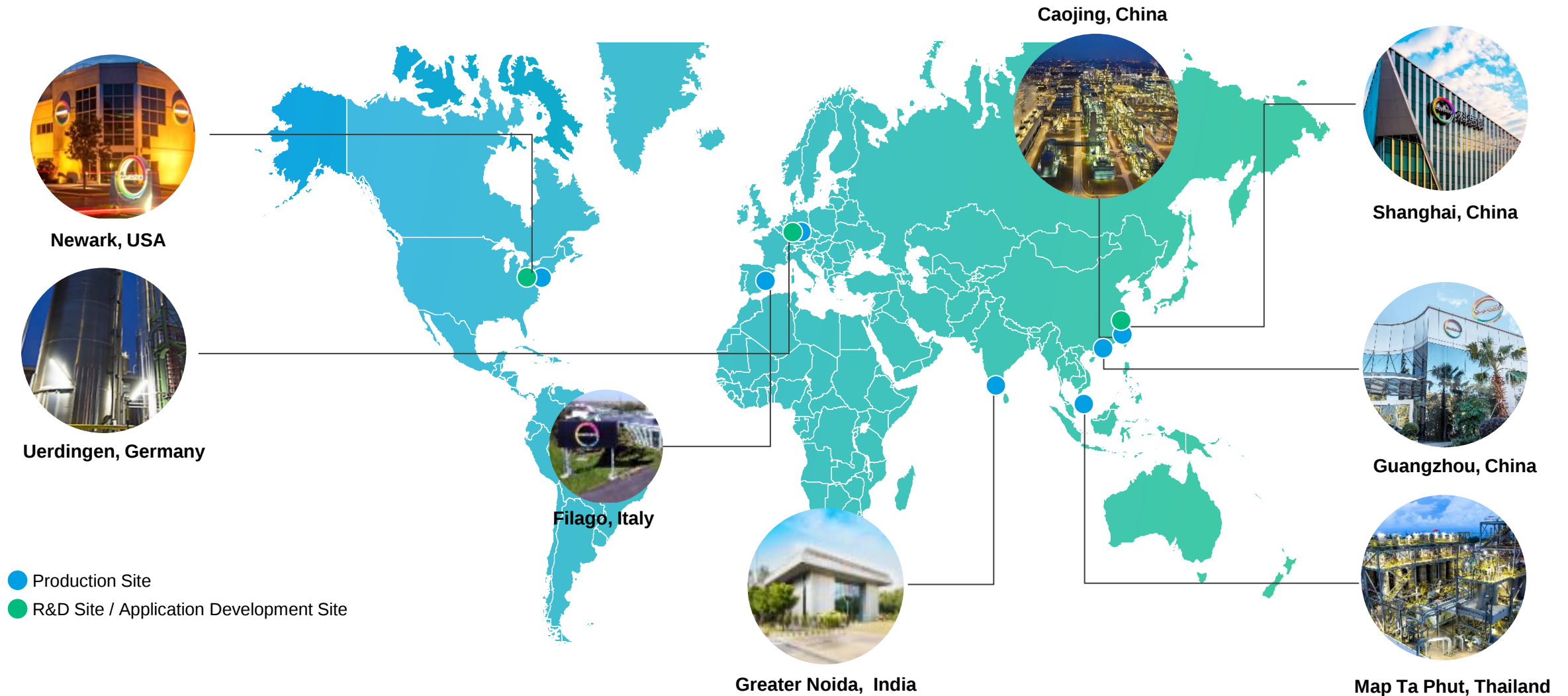


Circular Economy



Global Coverage in Key Markets Close to Customers

Strong supply resilience to tackle volatile market challenges

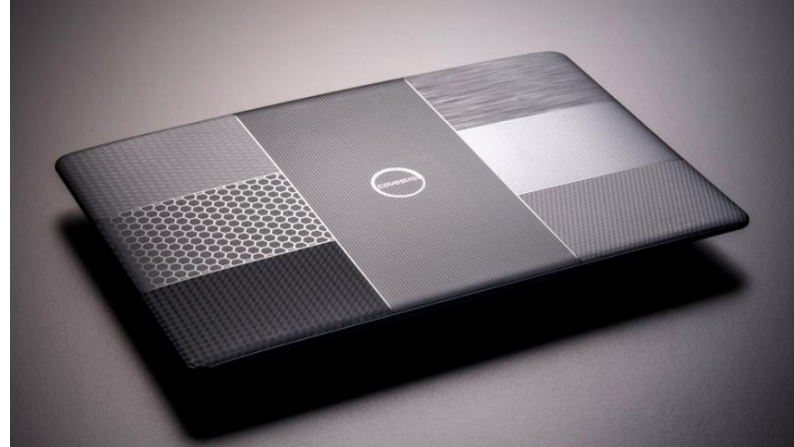


Strong Product Portfolio and Total Solution

Meeting E&E industry's diverse needs



Thermally Conductive



CMF Aesthetics



Thin-Wall Flame Retardant



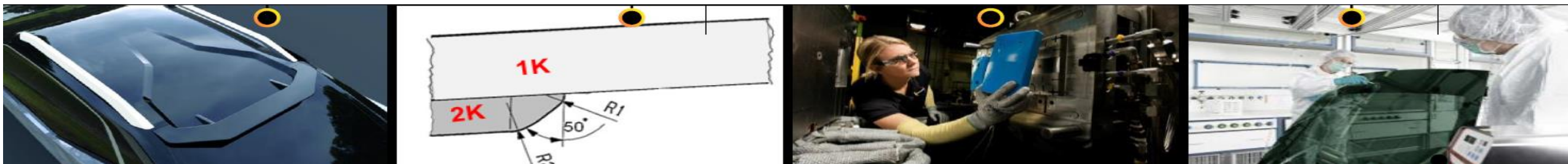
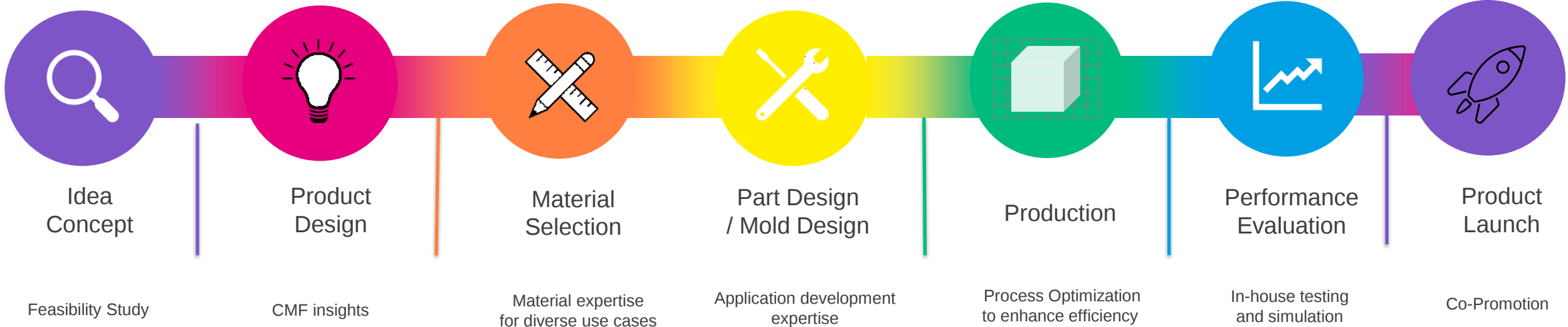
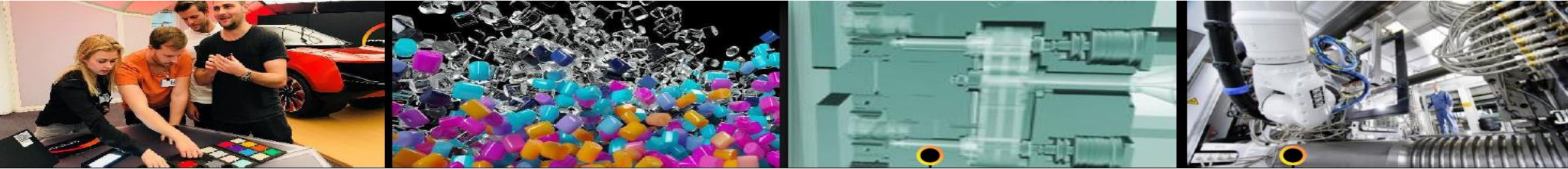
Circular Economy



Robust Properties

Total Solution Beyond Material

Your reliable partner throughout the entire product development process



E&E MARKET TRENDS AND CHALLENGES

E&E Megatrends Open New Opportunities and Challenges



Artificial Intelligence

Heat management
Function Integration

Advanced Connectivity

Higher Band Radio Frequency
Signal Transmittance

Holistic Design

CMF: Color, Material, Finish
Aesthetics

Circular Economy

Low Carbon Emission
High Circularity

Transparent Design

A rising trend to unveil product innovation in the new AI era



Transparent tech is back!
See-through devices are the latest trend



Key Drivers



- **Nostalgia**
Echo to classic transparent devices and evoke fond memories
- **Aesthetic Appeal**
Add a modern, sleek look to devices
- **Innovation**
Showcase cutting-edge technology and engineering
- **Customization**
Personalize devices
- **Brand Differentiation**
Stand out from the crowd



The Transparent Revolution

Achieving Functionality, Aesthetics and Lighting Effect

Functionality

Achieve optical performance and visibility for inner components

Aesthetics

Create sleek and modern look for products with broad colorability.

Lighting Effect

Achieve customized RGB lighting to create immersive user experiences.

Seeing is believing!

Consumers believe transparent design elevates products' "Sense of Technology" and "Sense of Quality"

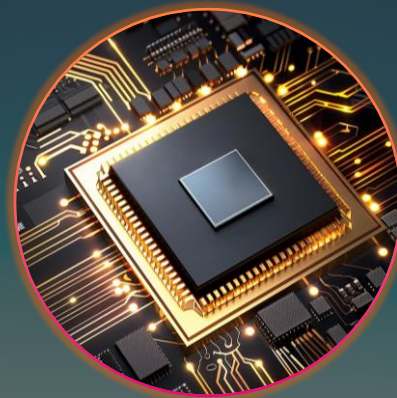
The Evolution of Design Language
Empowering consumer electronics and gaming devices

Smarter Devices Need Smarter Safety

Flame Retardancy is Essential in the Age of AI-Driven Consumer Tech



Smart Devices are getting much faster and packed into smaller, sleeker designs



Smart Devices equipped with modern AI chips, driving up power consumption and heat generation



FR is a must to protect the devices also safeguard users and their surroundings from potential fire risks

Flame Retardancy is a necessity in the AI era



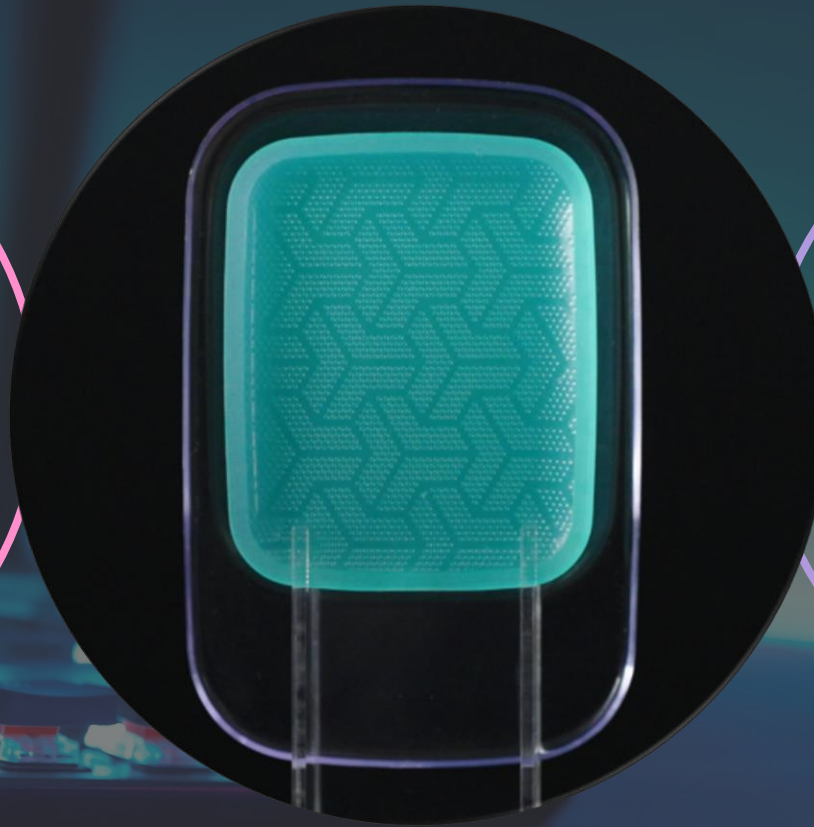
COVESTRO INNOVATIVE SOLUTIONS

Full Range Material Portfolio to Meet Diverse Needs in E&E



Full Transparency

Superior flame retardancy
non brominated / chlorinated FR
V0 1.5 - 2.0mm



High Translucency

High stiffness
Superior flame retardancy
non brominated / chlorinated FR
V0 1.0 - 1.5mm

Full Transparent Solution for Superior Flame Retardancy and Mechanical Performance



Transparent FR Portfolio - Unfilled

New!

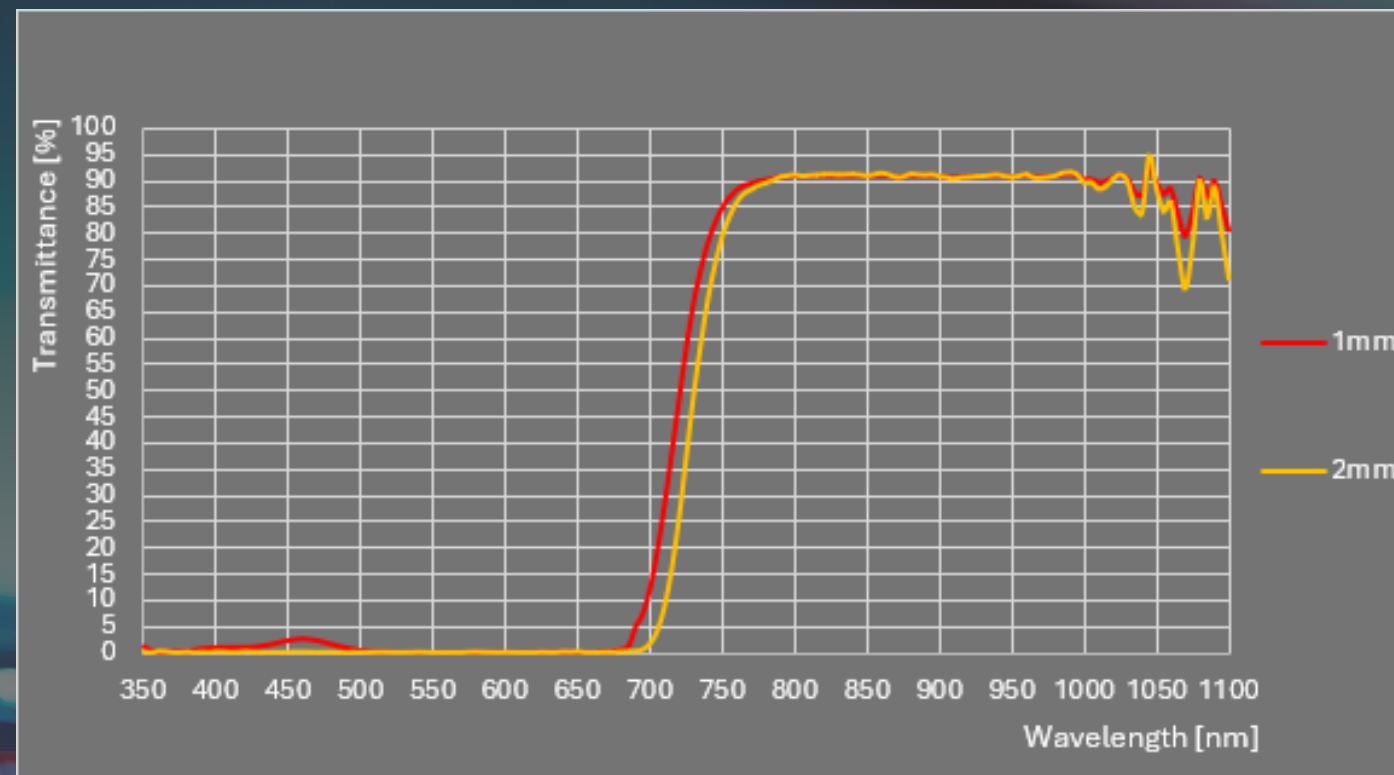
New!

Properties	Test Condition	Unit	Conventional FR PC	Innovative FR PC - M.6355	Innovative FR PC - M.6957
Flame Retardancy /UL 94	V0	mm	+++ V0 3.0	++++ V0 2.0	+++++ V0 1.5
Flow / Processability	300 °C/ 1.2 kg	cm³/10 min	++++	++++	++++
Impact Resistance	23 °C; 3 mm	kJ/m²	+++++	+++++	++++
Heat Resistance	50 N; 50 °C/h	°C	+++++	+++++	+++++
Luminous transmittance	1.0 mm	%	+++++	+++++	+++++
Luminous transmittance	2.0 mm	%	+++++	+++++	+++++



Full Transparency to Make the Invisible Visible

Achieving Unique Optical Infrared Transmission in High-Gloss Black



Material Innovation to Overcome Safety Challenges



Challenges :



- Thinner materials can burn more easily
 - Requires innovative FR solution to meet UL94 flame test



- Thermal resistance can be affected by FR additives
 - Judicious choice of flame chemistry



- Ensure transparency for critical applications

Burning Test Comparison – based on UL Flammability Standard



Conventional Transparent FR material
V0 3.0mm



Innovative Transparent FR material
M.6957 - V0 1.5mm

Glass Fiber Reinforced Translucent Solution – Thin-wall Flame Retardancy and High Rigidity



Translucent FR Portfolio – Glass Fiber Reinforced

Properties	Test Condition	Unit	New! M.GF9024	New! M.GF Upgrade
Flame Retardancy / UL 94	V0	mm	++++- V0 1.5	+++++ V0 1.0
Flow	260 °C/ 5 kg	cm ³ /10 min	++++	++++
Impact Resistance	23 °C; 3 mm	kJ/m ²	++++	++++
Heat Resistance	50 N; 50 °C/h	°C	+++++	+++++
Rigidity	1 mm/min	GPa	++++	+++++
Luminous transmittance	1.0 mm	%	+++++	++++
Luminous transmittance	2.0 mm	%	++++	+++
No-Intentionally Added PFAS	UL746G			Available

High Translucent GF Reinforced vs. Conventional GF Reinforced Solution



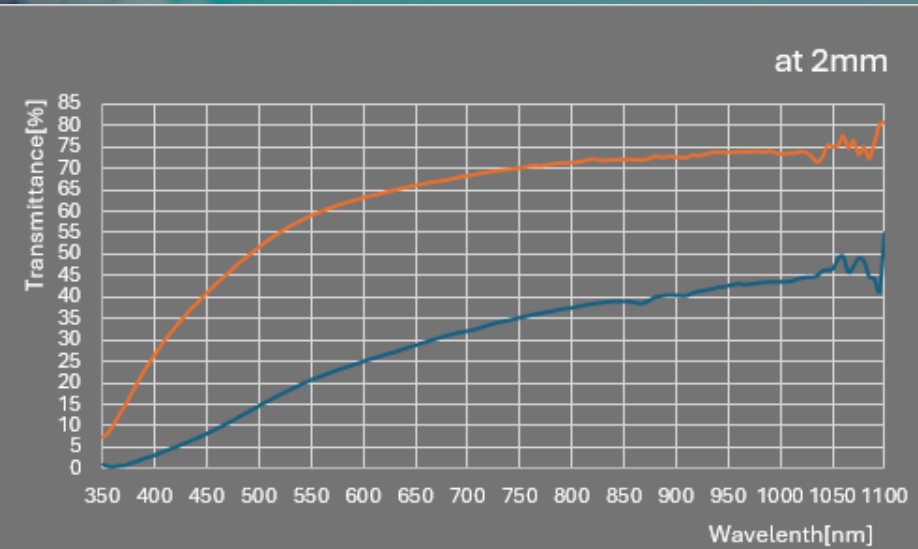
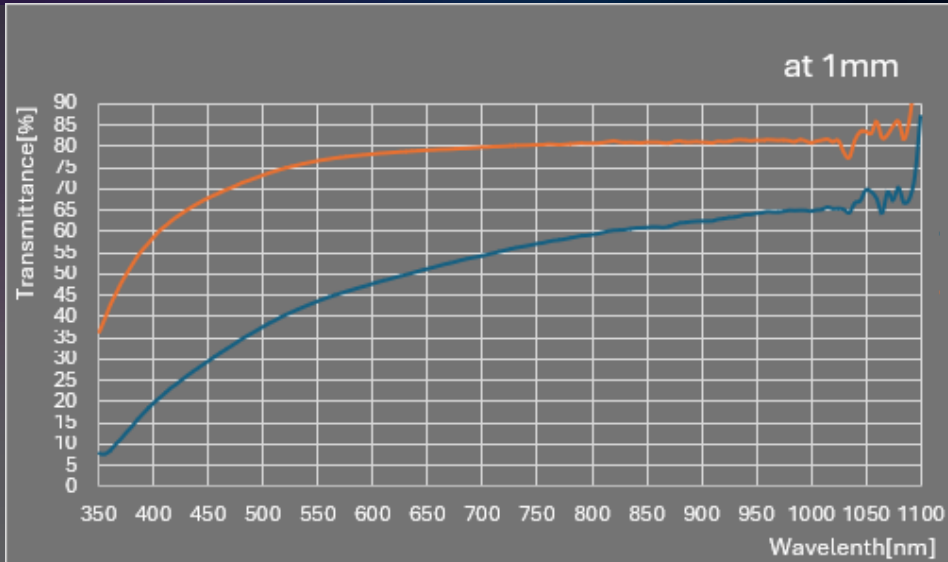
High Translucent GF Reinforced



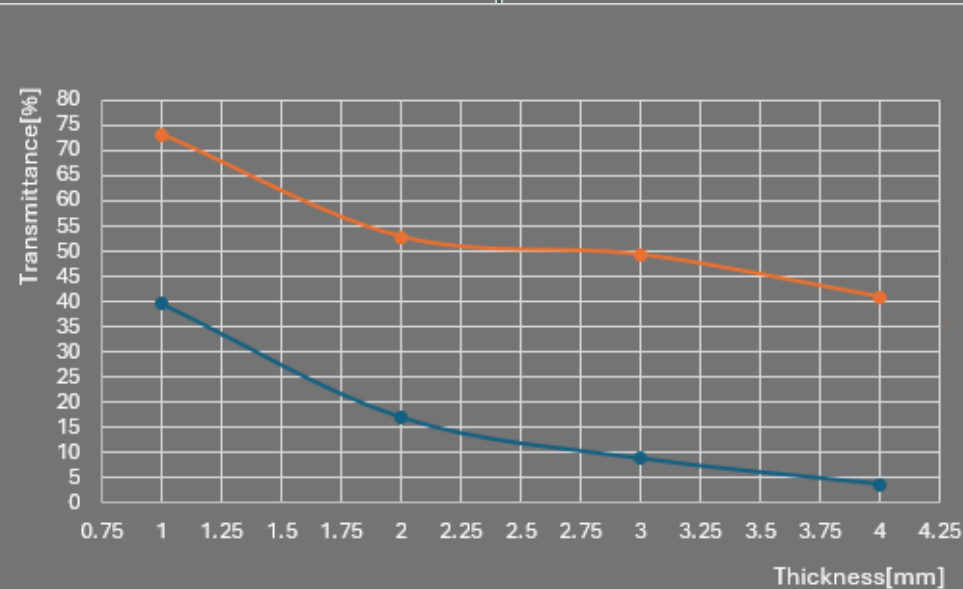
Conventional GF Reinforced

Higher Light Transmission At a Given Thickness

Translucent GF solution vs. Conventional GF solution



— Translucent GF
— Conventional GF



Makrolon® GF9024 and Upgraded Offering

Glass fiber reinforced with good translucency and thin-wall flame retardancy



Asus ROG gaming laptop

Use Case example

- Gaming laptop housing
Achieve See-through, Back-light effect and slim design, without compromising on flame retardancy and impact resistance.

Benefits

- High translucency : 70% light transmittance @2mm
- Thin-wall flame retardancy: UL94 V-0@1.5mm
- Good rigidity and mechanical performance
- Bio-circular RE version available with significant low CO₂

Upgraded offering

- High translucency : 75% light transmittance @1mm
- Enhanced flame retardancy : UL94 V-0@1.0mm
- Higher rigidity and toughness
- No-Intentionally Added PFAS Solution available

Makrolon® 6957

High transparency with thin-wall flame retardancy



Asus ROG gaming mobile dock

Use Case Example

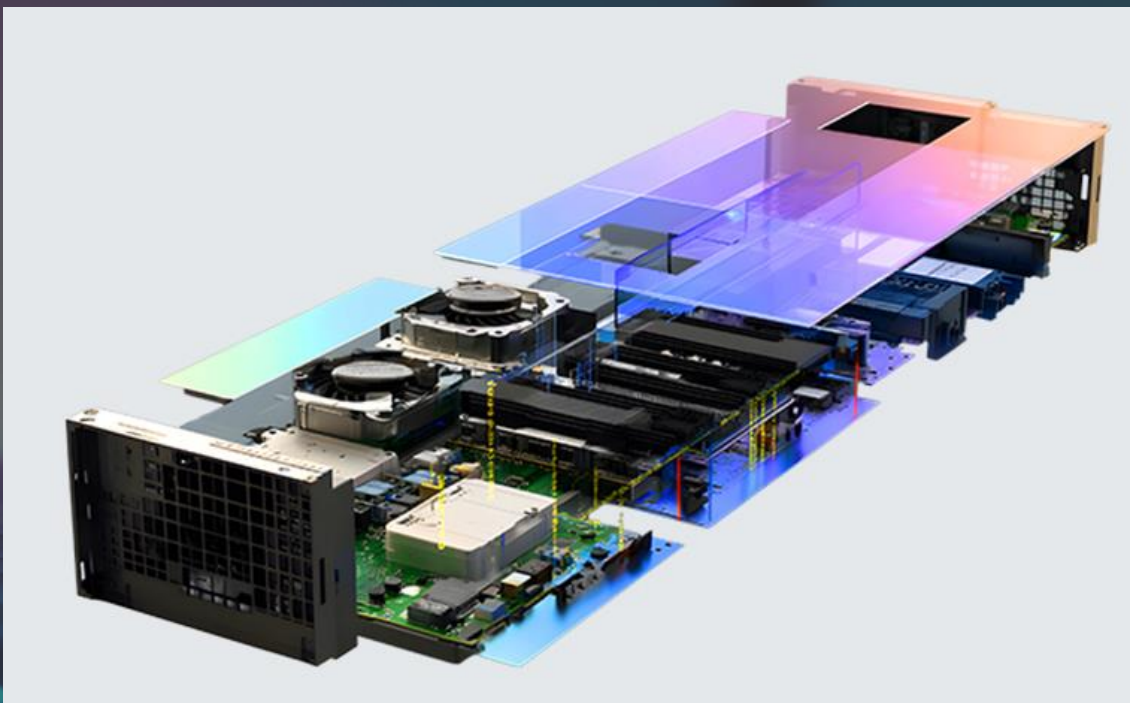
- Gaming device housing
Transparent material compatibility with ASUS AURA SYNC RGB LEDs enables customize lighting effects to enhance case design and supports Asus’s vision for cutting-edge, aesthetic gaming hardware

Benefits

- High transparency: 89% light transmittance @2mm
- Thin-wall flame-retardancy: UL94 V-0@1.5mm Design freedom for thin-wall devices
- Good impact resistance to protect the electronics components inside

Makrolon® 6355

High transparency with good flame retardancy



Leading server brand's next generation product

Use Case Example

- Server Air Duct
High visibility of the inner components enables the components to be evaluated easily from the outside

Benefits

- High transparency: 89% light transmittance @2mm
- Good flame-retardancy: UL94 V0 @2mm
- Good mechanical properties to ensure durability and reliability
- Good heat resistance to ensure stable performance under high temperature environment

Covestro Innovative High Transparent and Translucent FR Solution

Empowering Diverse Use Cases in Electronics and Electrical



Unleash the design possibilities and inspire your next idea!

From gaming laptop to broad Electronics and Electrical applications e.g., wearables, IoT, mobile devices, robotics, etc., Flame retardant transparent and translucent solution open the door for new possible aesthetic designs, while maintaining excellent mechanical performance and flame retardancy to meet high functionality and safety requirements.

Covestro:

Your global go-to partner to achieve high performance, exceptional design and reduced carbon footprint



- **Global Leadership**

Pioneer in circular economy with strategic focus and strong material portfolio

- **Total Solution for Today and Tomorrow**

Future-oriented solution to enable you stay ahead of the curve of innovations and regulations

- **Resilient Supply**

Global coverage across countries close to local market with high reliability and agility

- **Strong Value Chain Partnership**

Deep engagement and collaboration with the leading players in Electronics and Electrical Industry



Thank you!



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