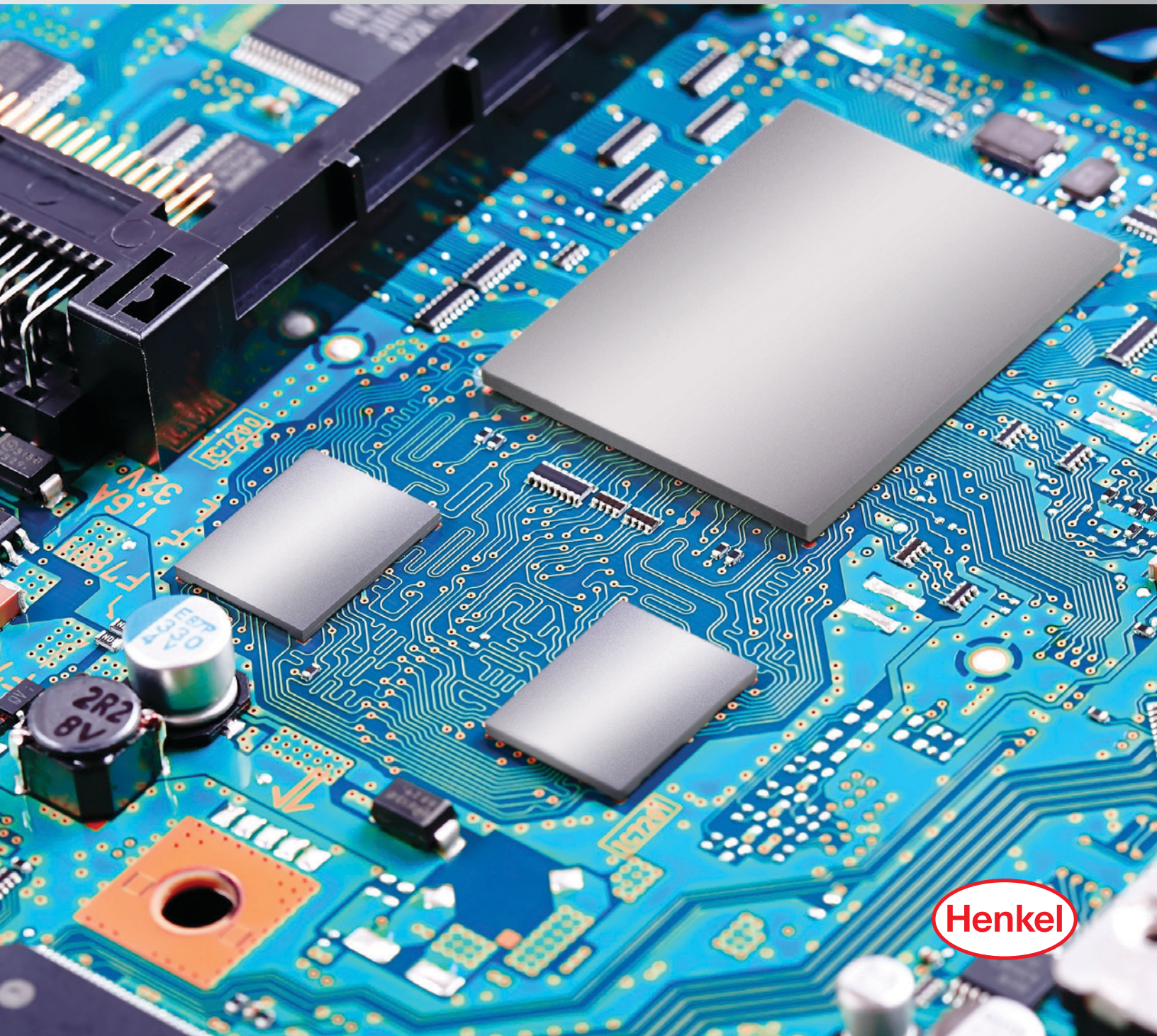




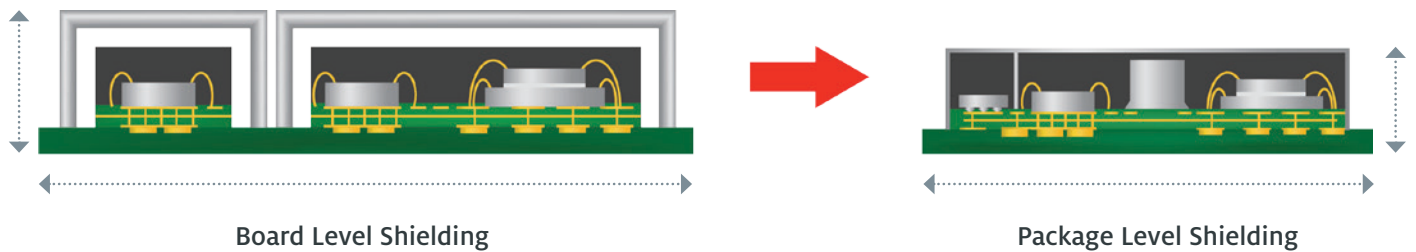
PACKAGE LEVEL EMI SHIELDING SOLUTIONS

CONFORMAL AND COMPARTMENTAL SHIELDING TECHNOLOGIES

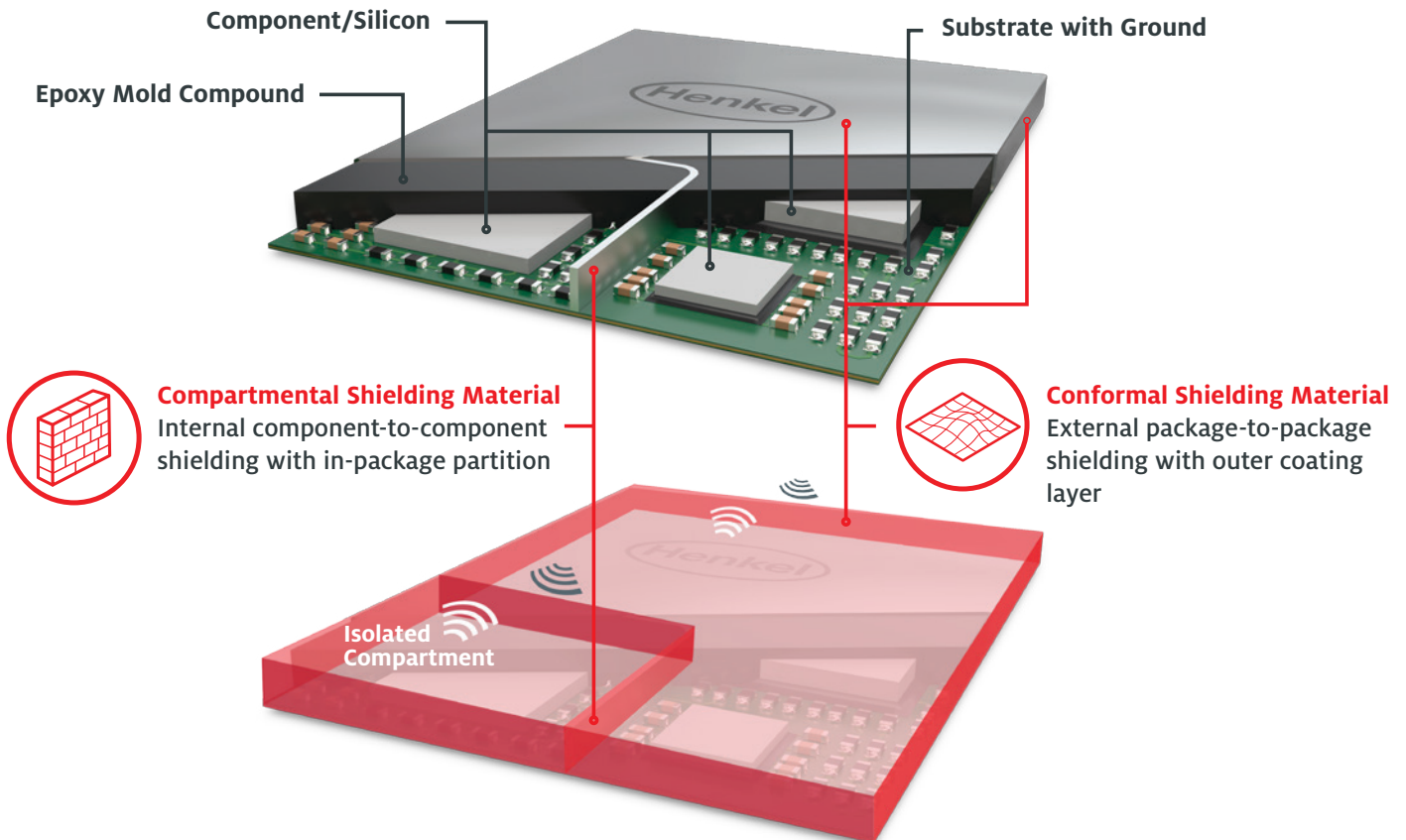


PACKAGE LEVEL EMI SHIELDING SOLUTIONS

With the increasing proliferation of wireless devices, designers are challenged with various electromagnetic waves from multiple sources radiating at the same spectrum of frequencies, resulting in electromagnetic interference (EMI). Radio-frequency (RF) emitting devices require effective isolation to limit the propagation of their interference to neighboring components to protect the end device from performance degradation. As electronics move toward miniaturization, lighter weight and higher speeds, these challenges become more significant as conventional shielding methods present functional and operational limitations. Henkel's specialized materials have optimal properties and characteristics that provide reliable shielding and adhesion performance in stressful electronic conditions and environments.



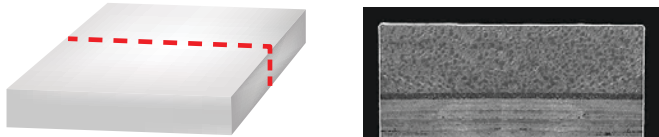
TYPICAL PACKAGING STRUCTURE AND SOLUTIONS



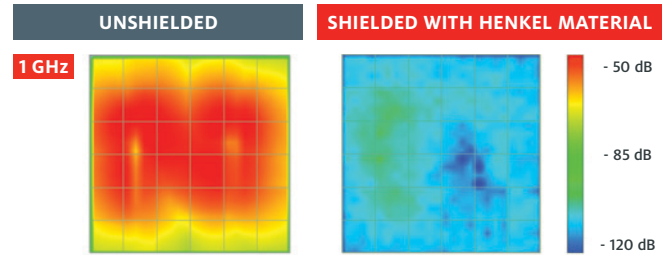
CONFORMAL SHIELDING

The thinly spray-coated material provides uniform coverage on top and sidewalls, clean edges without backside contamination, and excellent adhesion to mold compound with outstanding Shielding Effectiveness (SE). This technology is simple, allowing easy production scalability and design flexibility with minimal cost of ownership using spray-coating, compared to other costly methods such as PVD/sputtering.

Cross Section of Conformal Shielding



Unshielded and Shielded with Henkel Technology



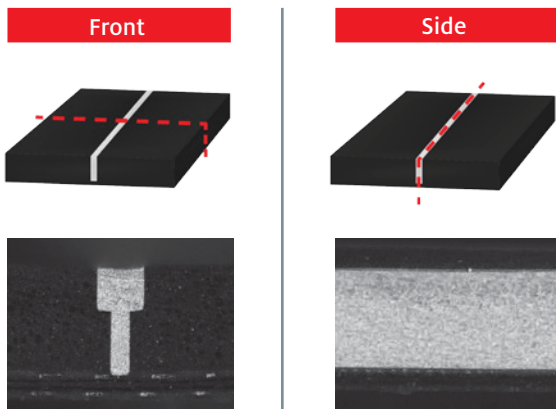
Conformal EMI Shielding Material Properties

GENERAL PROPERTIES	LOCTITE ABLESTIK EMI 8660S	LOCTITE ABLESTIK EMI 8880S
Application Method	Spray	Spray
Viscosity, 5 rpm (cP)	250	550
Thixotropic Index (0.5 rpm/5 rpm)	1.2	1.4
Conductive Filler Type	Proprietary Ag	Proprietary Ag
Volume Resistivity ($\Omega \cdot \text{cm}$)	1.5×10^{-5}	7.9×10^{-6}
Curing Condition	175°C, 1 hour in air	175°C, 1 hour in air
Optimal Coating Thickness (μm)	3~5	3~5
Adhesion to EMC (ASTM Cross Hatch Test)	5B (0% peel)	5B (0% peel)
Shielding Effectiveness (dB)	90 (Excellent)	90 (Excellent)
Target Frequency Range	500 MHz ~ 10 GHz	10 MHz ~ 10 GHz

COMPARTMENTAL SHIELDING

The jet-dispensed, highly flowable, conductive material is capable of filling a narrow trench with high aspect ratios to create shielded partitioning within a package. This material technology offers high adhesion to the inner sidewalls and the bottom of the trench.

Cross Section of Compartmental Shielding



Typical Compartment EMI Shielding Material Properties

GENERAL PROPERTIES	TYPICAL HENKEL MATERIAL
Application Method	Jet-Dispense
Viscosity, 5 rpm (cP)	5000
Thixotropic Index (0.5 rpm/5 rpm)	< 1.5
Conductive Filler Type	Ag or Ag-coated Cu
Volume Resistivity ($\Omega \cdot \text{cm}$)	7.0×10^{-5}
Adhesion Interfaces	EMC, Copper, Solder
Supported Trench Width (μm)	60 and above
Trench Aspect Ratio (Depth: Width)	Up to 10:1
Cure Shrinkage	Low
Stress Management	Good

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