

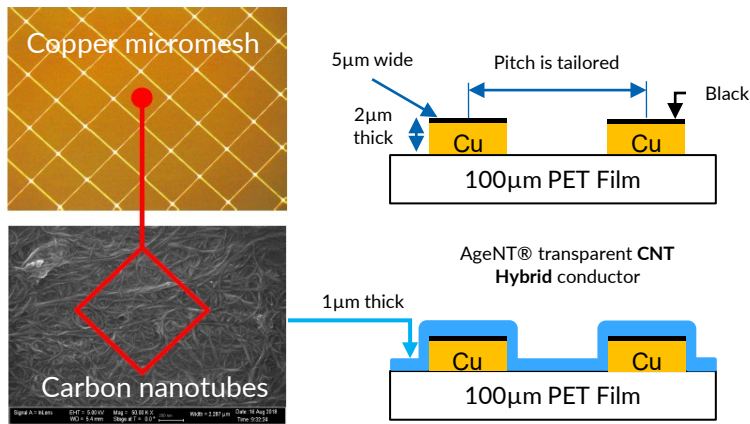
Summary

AgeNT-12 transparent heater foils enable the world's first Universal Transparent ADAS Heater solution, for rapid, uniform defogging & de-icing of radomes, lidomes and camera lenses at 12V or less – with high transmission of Radar, LiDAR and Camera signals.

Benefits

- ✔ Compatible with Camera, LiDAR & Radar Sensors
- ✔ Delivers Rapid, Uniform Heating at 12V or less
- ✔ Highly Transparent and No Visible Microwires
- ✔ Highly Robust – Flexible, Formable, Environmentally Stable
- ✔ Can be Mass-produced at Low-cost

Patented CNT Hybrid TCF Technology



Superior Heater Foil Performance

Heater Foil Solution		De-Icing Time	Total Transmittance (%)			Loss (dB)
	R _s (Ω/□)		Camera 550 nm	LiDAR 905 nm	LiDAR 1,550 nm	
★ AgeNT-12	11.7	5-10 min or less at 12V	90.6	89.1	91.0	0.1
AgeNT-3*	2.6	✓	89.9	88.0	88.3	0.6
AgeNT-1-G3 (Banded)*	2.2	✓	89.4	N/A	N/A	0.4

* AgeNT-3 and AgeNT-1-G3 (Banded) transparent heater foil solutions are also available, if even lower resistance heaters are desired.

Universal ADAS Heater Solution



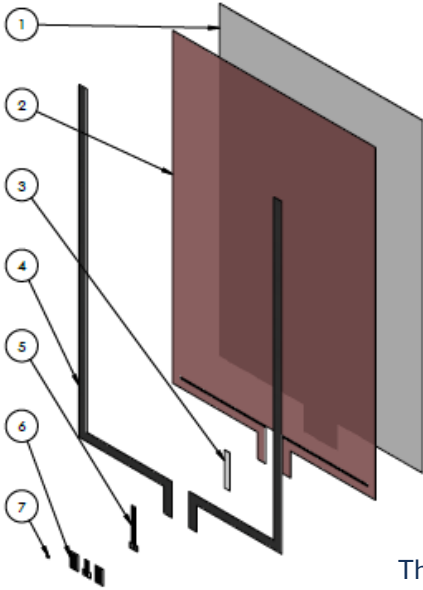
AgeNT-12 Transparent CNT Hybrid vs. competitive transparent heater technologies

	AgeNT-12	Microwire	Peripheral	CNT
Power Density @ 12V	😊	😊	😞	😊
Aesthetics	😊	😞	😊	😊
ADAS perf (Camera)*	😊	😊	😊	😊
ADAS perf (LiDAR)*	😊	😞	😞	😊
ADAS perf (Radar)*	😊	😊	😞	😞

* ADAS sensor performance when Heaters are designed for 12V systems



Example of Heater Foil Stack-up



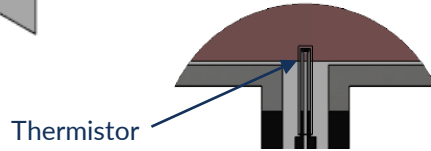
ITEM	PART NUMBER	DESCRIPTION	QTY.
1	RAD230504_Substrate	AgeNT-12 (MM) on 100 μm PET	1
2	RAD230504_CNT_Flood	AgeNT VC201 CNT Ink Layer	1
3	RAD230504_Dielectric	Henkel 9001 Dielectric Ink	1
4	RAD230504_Ag Busbar	Henkel ECI 1010 Silver Ink	1
5	RAD230504_Thermistor Traces	Henkel ECI 1010 Silver Ink	1
6	RAD230504_Carbon	DuPont 7102 Carbon Ink	1
7	RAD230504_Substrate	Thermistor	1



Heater Control



Integration



AgeNT Transparent Heater Foils can be integrated with lens assemblies via OCA lamination, overmolding & film insert molding (FIM)



Prototypes to Mass Production



Custom Prototypes



Mass Production

CHASM offers custom prototypes, early-stage production, and also works closely with Tier 1 & 2 Suppliers to ensure rapid and smooth transition from initial conceptual design to mass production.

Collaborate with us on your transparent heater design!



Prototype Capabilities

- ✔ CAD Design
- ✔ Screen Printing
- ✔ OCA Lamination
- ✔ Adhesion Promotors
- ✔ TCF Patterning
- ✔ Heater Testing
- ✔ Singulation
- ✔ Tail Stiffeners
- ✔ Thermistors
- ✔ Wire attach
- ✔ Thru Hole Vias
- ✔ Custom Packaging



Supply Chain Design

