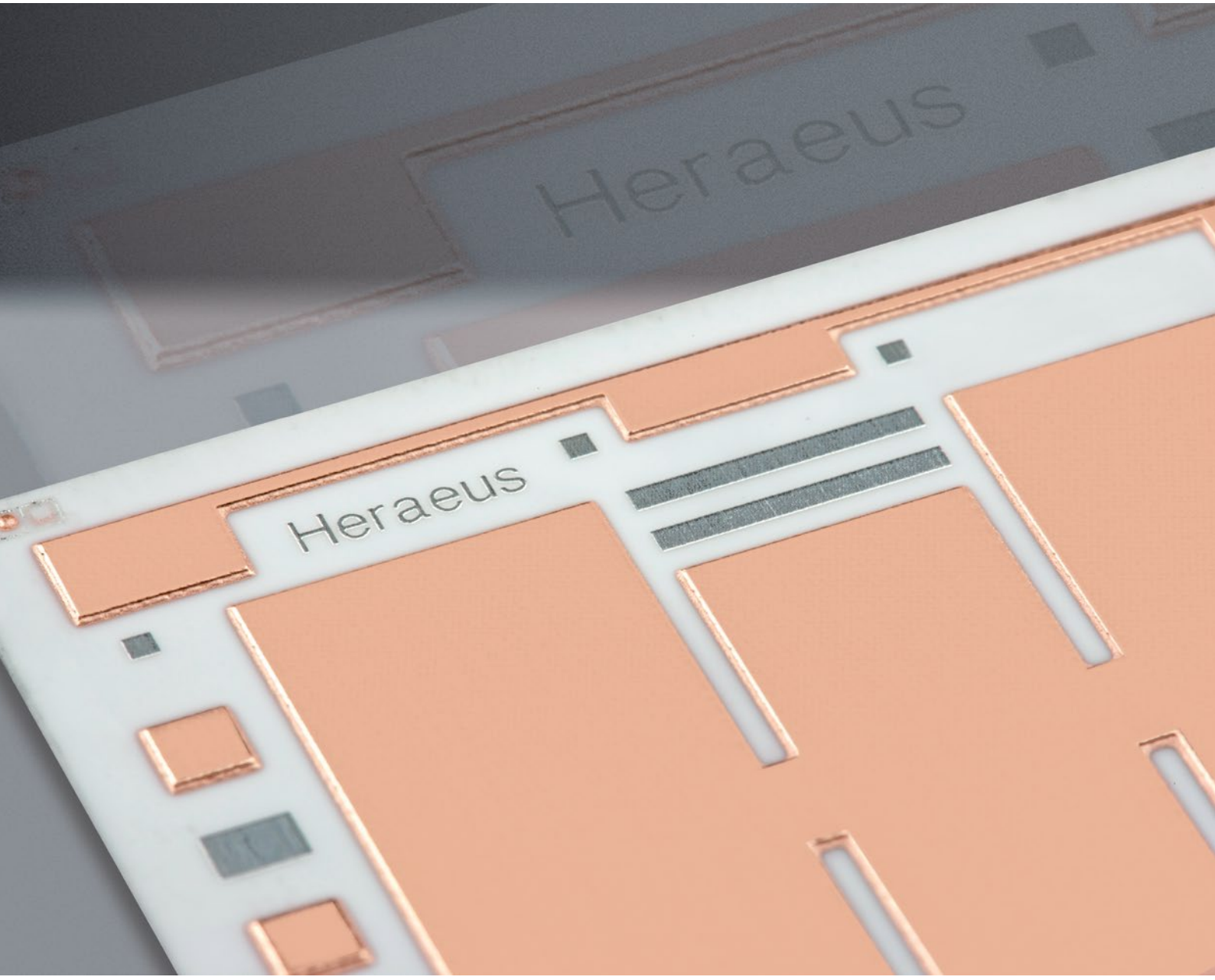
Heraeus



Heraeus Thick Copper Conductor Pastes

Heraeus Thick Copper Conductor Pastes

Heraeus Thick Copper Conductor Pastes are a lead-free material system developed for applying thick layers of copper onto AlN or Al_2O_3 substrates. It is intended for use where high thermal and electrical properties are required.
Heraeus offers the following Copper Conductor Systems as a more reliable alternative to DBC (Direct Bonded Copper) for

- Lapped AlN substrates
- Al_2O_3 substrates

The two paste system C7403 / C7404C is optimized for lapped AlN substrates but also works with some as fired substrates. This system offers excellent adhesion to the AlN substrate.
The low cost two paste system C7403C / C7404C is optimized for application on alumina substrates.

All pastes are applied by screen or stencil printing, dried in air and fired in a Nitrogen atmosphere. High tech stencils such as MTeCK-stencils of Christian Koenen GmbH offer quick build-up of thickness in few layers.

In order to achieve ever thicker layers in one firing step it is also possible to print/dry the copper paste up to three times and then co-fire this build-up

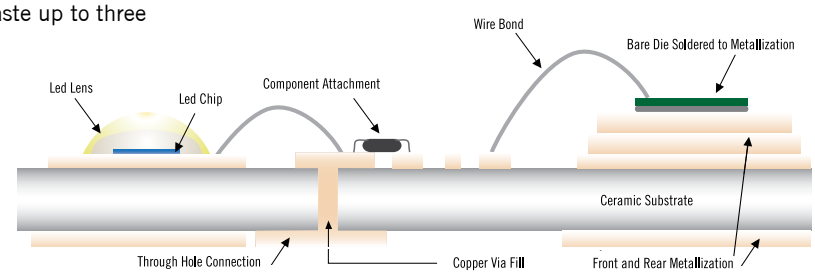
KEY BENEFITS

- High fired film thickness (up to 300 µm)
- Excellent electrical and thermal properties
- Excellent fired film densi
- Wire bondable
  - C7403 / C7404C: Thick aluminum and thick copper wire bondable
- Free of lead, cadmium, phthalate and nickel
- REACH and RoHS compliant
- C7404C is ENIG and ENIPIG plateable on AlN and alumina

APPLICATIONS

- Power electronics
- High Brightness LEDs
- Battery charge control devices for electro and hybrid cars

Cross-Section of a Device with Copper



Design Guideline for Thick Copper Conductor Pastes

Description	Thick Copper Conductor	DBC on Alumina/AlN
Min. width of Cu pattern	0.40 mm / 300 µ	0.50 mm / 300 µ
Min. spacing between Cu patterns	0.25 mm / 300 µ	0.50 mm / 300 µ
Min. spacing between Cu pattern and ceramic edge	0.20 mm / 300 µ	0.35 mm / 300 µ

General Recommendation of an ENIG Plating Process

Process Step	Technic Product	Immersion Time (minutes)	Temperature (° C)	pH
Cleaner	Techniclean AT1000	3	38	< 0.50
Catalyst	TechniCatalyst AT 000	2	27	< 0.50
Electroless Ni	Technic EN AT5600	15	82	4.5 – 5.3
Immersion Au	Technic IM gold AT6000	15	82	5.0 – 5.8

For detailed information please contact your local Heraeus office

Product Overview Thick Copper Conductor Pastes

Product number	**C7403C** (Adhesion layer) **C7404C** (Build-up layer)	**C7403** (Adhesion layer) **C7404C** (Build-up layer)	**C7463*** (Plug Hole)
Substrates recommended	96 % Al_2O_3 ZTA	AlN BeO	AlN 96 % Al_2O_3
Fired film thickness (FFT)	**Screen printing:** 1 x Print Dry Fire: 20 – 60 µm 5 x Print Dry Fire: 200 – 300 µm **Advanced stencil printing:** 1 x Print Dry Fire: ≥ 100 µm 3 x Print Dry Fire: ≥ 300 µm	C7403: 3 x Print Dry Fire: 20 – 60 µm C7404C: 3 x Print Dry Fire: 200 – 300 µm	Up to 750 µm diameter
Sheet Resistance	≤ 0.7 mΩ/□ (FFT: 50 µm)	≤ 0.7 mΩ/□ (FFT: 50 µm)	N/A
Solderability	> 95 % coverage with SAC 305 at 245°C, 5 sec dip, RMA flux	> 95 % coverage with SAC 305 at 245°C, 5 sec dip, RMA flux after ENIG plating	N/A
Adhesion [N] **(SAC 305)**	> 20 / 4 mm^2 48 h / 150°C	> 20 / 4 mm^2 48 h / 150°C	N/A
300 µm Al-wire bonding **onto 300 µm FFT**	Initial: 100 % wire break 1000 TS Cycles: 100 % wire break	Initial: 100 % wire break 1000 h 85°C / 85 % r. h. 100 % wire break 500 cycles 100 % wire break	N/A
Shear strength [N/mm^2] **mAgic® silver sintering** (sinter pressure 5 MPa, 250°C, IFX-Resistorchip)	> 40	> 40	
ENIG (Ni/Au plating)	Yes	Yes	N/A
Suitable for Cu-galvanic reinforcement	Yes	Yes	N/A
Coverage **[cm^2/g, 30 µm FFT]**	45	42	N/A

SAC 305: Sn96.5 Ag3 Cu0.5

** compatible with C7403 only N/A = not applicable*

The descriptions and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to date on the date this document was printed. Although the data is considered accurate, we cannot guarantee accuracy, the results obtained from its use, or any patent infringement resulting from its use (unless this is contractually and explicitly agreed in writing, in advance). The data is supplied on the condition that the user shall conduct tests to determine materials suitability for a particular application.

Thick Copper Conductor Advantages

Thermal shock (– 40 to +150°C): > 1000 cycles with zero failures on Al_2O_3 and lapped AlN

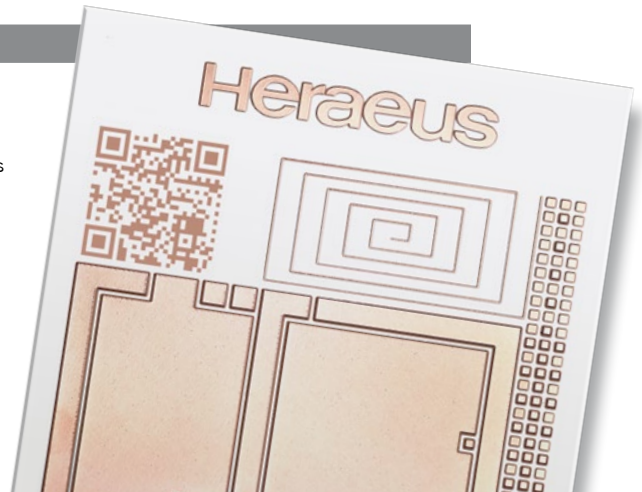
Improved versatility

- Additive screen or stencil printing offers material savings because varied layer thicknesses are possible within the same design

Ability to print over 100 microns fired thickness, with one print-dry-fire cycle

Wire bondable, solderable, plateable

Handle multiple circuits on one panel and singulate afterwards



E 04.2016/VN. Layout: www.lunis.de_HET-MarCom

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