

## Dielectrics

### IP 9227



#### 2-Layer Lead Free Multilayer Dielectric

#### Description

IP 9227 is a permanent-blue 850°C firing dielectric composition. It withstands harsh conditions such as thermal shock cycling and hot temperature applications to meet requirements of automotive industry. IP 9227 displays the following benefits:

#### Key Benefits

- Expansion coefficient is closely matched with that of alumina, to provide for minimal substrate bowing.
- Extremely dense, hermetic fired film allows for excellent electrical performance in a 2 layer, large area build-up.
- Excellent solderability and adhesion of Ag, Ag/Pd, Ag/Pt, Au and Au/Pt conductors on top of dielectric.
- Excellent wire bondability of Ag and Au based conductors on top of dielectric.
- Resistors can be processed on top of dielectric.
- Absence of the „Battery Effect“ in more than 12 refirings<sup>3</sup>

A separation of dissimilar conductor metallizations such as gold and silver is possible without formation of blisters. This enables the use of more cost-effective, high-conductivity pure silver conductors underneath the dielectric.

- **Compatible with high reliability laser trimming methods**
- Free of lead, cadmium and nickel
- Free of phthalate
- REACH<sup>4</sup> and RoHS<sup>5</sup> compliant

#### Processing

1. Spatulate well prior to processing. When stored in a refrigerator allow paste to come to room temperature prior to opening, to avoid condensation.
2. Printing:  
165 – 230 mesh screen with Direct Coating (no emulsion). To achieve optimum performance two individually fired layers with a total thickness of at least 40µm are recommended. A 230 mesh screen will offer best via resolution.
3. Level at room temperature for 10 – 15 minutes.
4. Dry at 150°C for 10 – 20 minutes.
5. Fire in air, with a 30 – 60 minute cycle to a peak temperature of 850°C. Dwell time: 10 – 12 minutes. All layers of the interconnect structure fired separately. Properties are unaffected by multiple refirings.
6. General: conductor and dielectric film thickness should be controlled carefully, to ensure high yield in production. Conductor thickness under dielectric film should not exceed 12 µm FFT.

**Thinner** HVS 507

#### Typical Properties (Paste)

Form:	Thixotropic paste
Viscosity:	40 – 60 Pas (23°C, D = 33 s <sup>-1</sup> )
Solids:	74.5 ± 1.5%
Coverage:	c. 145 cm <sup>2</sup> / g (35 µm wet film thickness)
Shelf Life:	6 months from date of shipment with correct storage (in a dry, cool (5 – 25 °C) and dark place with container tightly shut)

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#### Typical Properties (Fired) <sup>1</sup>

Fired Thickness <sup>2</sup> : (FFT)	≥ 40 μm (2 separately fired layers)
Dielectric Constant K <sup>2</sup> : (1 kHz, 25°C)	8 – 10
Dissipation Factor <sup>2</sup> : (1 kHz, 25°C)	< 0.2 %
Insulation Resistance <sup>2</sup> : (100 V DC, 25°C)	> 10 <sup>12</sup> Ω cm
Breakdown Voltage:	> 500 V DC per 40 μm FFT
Via Resolution:	300 microns

#### Compatibility

See Application Note IP 9227

- 1 Typical property based on laboratory test methods. For optimum results all materials should be fired in a profiled furnace supplied with dried, hydrocarbon and other contaminant free air (PP-1). Also depends in general on associated conductor materials employed, processing conditions and measurement methods.
- 2 Measured after printing with a 200 mesh steel screen; screen thickness and emulsion thickness combined was c. 110 μm.
- 3 Tested with C 5729 and C 1076 SD
- 4 REACH compliant according to the Commission Regulation (EU) No 143/2011 of 17 February 2011 amending Annex XIV to Regulation (EC) No 1907/2006 of the European Parliament and of the council on the Registration, Evaluation, Authorisation and Restriction of Chemicals ("REACH") by European Chemicals Agency and its subsequent amendments; we define a material as REACH compliant, as long as substances used are not recorded in the Annex XIV.
- 5 RoHS compliant according to the Directives (European Union) No 2011/65/EC of Restriction of Hazardous Substances ("RoHS") and its subsequent amendments (including the exceptions No. 7. c. I. of the EU Directive e.g. related to Pb).

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 (latest versions can always be supplied upon request). 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.

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