DuPont™ Green Tape™ 951

LOW TEMPERATURE CERAMIC SYSTEM

Technical Data Sheet

Product Description

DuPont™ GreenTape™ 951 is a low-temperature cofired ceramic tape. Green Tape™ 951 system comprises a complete cofireable family of gold and silver metallizations, buried passives, and encapsulants. GreenTape™ 951 is available in multiple thicknesses and is designed for use as an insulating layer in:

- Multichip modules
- Single chip packages
- Ceramic printed wiring boards
- RF modules

The GreenTape™ 951C2, GreenTape™ 951PT, GreenTape™ 951P2 and GreenTape™ 951PX products are provided on a base film with improved punching characteristics.

Product Benefits

When used with compatible metallizations, GreenTape™ 951 offer the following benefits:

- Component integration – buried resistors, capacitors, and inductors
- Hermetic packaging
- Low temperature brazing
- Cavities
- High density interconnections
- Cofire processing and refire stability

Processing

Design

For detailed recommendations on use of GreenTape™ 951, see the GreenTape™ Design and Layout Guidelines (GreenTape™ 951 section). For compatible metallizations and their recommended use see the GreenTape™ 951 Product Selector Guide.

System Capability

The GreenTape™ 951 system is designed to deliver line and space resolution of 100 µm, via diameters of 100 µm, and maximum layer counts in excess of 100.

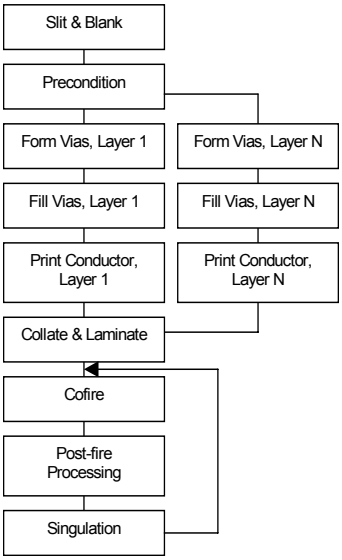
Printing

Following blanking and preconditioning of GreenTape™ 951 green sheets, print compatible compositions directly onto unfired GreenTape™ 951 using thick film printing methods and a vacuum stone or other support structure that uniformly distributes vacuum. Follow specific printing and drying recommendations described on individual composition product data sheets.

Inspection

Inspect via, conductor and other prints prior to collation and lamination.

Typical Process Flow



Lamination and Firing

Laminate multiple sheets of DuPont™ GreenTape™ 951 low-temperature cofired ceramic tape according to processing parameters detailed in the GreenTape™ Design and Layout Guidelines (GreenTape™ 951 section). Recommended parameters for lamination are 3000 psi at 70°C for 10 minutes. Cofire laminates of 951 using the recommended firing profile and a belt or box furnace.

Post-fire Processing

Print compatible compositions onto cofired substrate surface and refire.

Singulation

Singulate multi-up substrates either in the green state using a hot-knife or after cofire using either a diamond saw (preferred) or laser scribe.

Storage and Shelf Life

Tape rolls, or boxes of sheeted tape, should be stored tightly sealed in a clean, stable environment at room temperature (<25° C). Shelf life of material in unopened containers is six months.

Safety and Handling

For Safety and Handling information pertaining to this product, read the Material Safety Data Sheet (MSDS).

Typical Tape Properties

Test	Properties
Physical	
Unfired Thickness (µm)	50 ± 3 (951C2) 114 ± 8 (951PT) 165 ± 11 (951P2) 254 ± 13 (951PX)
X, Y Shrinkage (%) Z Shrinkage (%)	12.7 ± 0.3 (951 PT, P2, PX) 13.0 ± 0.2 (951C2) 15 ± 0.5
TCE(25 to 300°C), ppm/ºC	5.8
Density (g/cm³)	3.1
Camber, inch/inch	Conforms to setter
Surface Roughness , µm	<0.34
Thermal Conductivity, W/m·K	3.3
Flexural Strength, MPa (1)	230
Young's Modulus, GPa	120
Electrical	
Dielectric constant @ 3 GHz (2)	7.8 ± 0.2
Dielectric constant @ 10 GHz (3)	7.5 ± 0.2
Loss Tangent @ 3 GHz	0.006
Insulation resistance at 100VDC,Ω	$>10^{12}$
Breakdown voltage, V/µm	> 1000/25
Notes: (1) Four point bend (2) T-resonator with gold conductor (3) Split cavity measurement method	

This table shows anticipated typical physical properties for GreenTape™ 951 based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.

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