### OUPONT>

## DuPont<sup>™</sup> GreenTape<sup>™</sup> 95C & 9KC

Low Temperature Co-fired Ceramic Material System

#### **Product Description**

DuPont<sup>™</sup> GreenTape<sup>™</sup> low temperature co-fired ceramic (LTCC) system provides designers with a technology option that aiming to solve upcoming 5G high frequency challenges on material. It combines the benefits of each to provide a high density, high reliability, high performance low-cost interconnect package.

With GreenTape<sup>™</sup> LTCC, the System Integrator/OEM customer will see benefits versus not-in-kind organic laminate technologies in the form of higher circuit routing density, stable dissipation factor with increasing frequency, an approximate 20% reduction in footprint, embedded resistor capability, better hermeticity and approximately 80% better TCE with chips GaAs and Si die.

DuPont provides 2 key GreenTape<sup>™</sup> LTCC material options, 95C and 9KC. Each has its own set of compatible silver conductor systems. The GreenTape<sup>™</sup> 95C material system is designed for general applications up to 40 gigahertz (GHz). GreenTape<sup>™</sup> 9KC is developed for high frequency applications—up to 100GHz and beyond—where low loss characteristics are desired.

#### Table 1 – Electrical Property

Test	GreenTape™ 95C	GreenTape™ 9KC
Dk	7.5 ± 0.1	7.1 ± 0.2
Df	0.006 @ 3GHz	0.0010 @ 3GHz
Shrinkage	x-y 13.0 ± 0.3% z 16.5 ± 1%	x-y 9.1 ± 0.3% z 11.8 ± 0.5%
TCE (100-300°C)	4.7	5.3
Thermal Conductivity (W/m-K)	3.2 ± 0.1	4.9 ± 0.1
Flexural Strength (MPa)	260 ± 40	230 ± 20
Breakdown Voltage	1100 VDC per 25µm	1100 VDC per 25µm

Tables 1 show anticipated typical physical properties for DuPont<sup>™</sup> GreenTape<sup>™</sup> 95C and 9KC based on specific controlled experiments in our labs and are not intended to represent to product specifications, details of which are available upon request.

#### **Paste Selector Guide**

Application	95C	9KC
Tape Thickness Options		
200 µm	95C200	9KC200
165 μm	95C165	
125 μm		9KC125
115 μm	95C115	
50 µm	95C50	9KC50
Co-fired Layers		
Via fill	9C41 Ag	9C601 Ag
Internal Signal line	9C45 Ag 9C42 Ag	9C612 Ag
Internal Ground plane	9C48 Ag	9C602 Ag
External Signal line	9C42 Ag 9C46 Ag/Pd	9C613 Ag 9C617 Ag/Pd
Plateable (Ni/Au)	9C18 Ag	9C613 Ag
Solderable	9C46 Ag/Pd	9C617 Ag/Pd
Buried Resistor	9C0X1	9CBX2
Overglaze	9C15	9C15
Post-Fired Layer		
Solderable Ag/Pd	9C84 Ag/Pd 9C77 Ag/Pd	9C84 Ag/Pd 9C77 Ag/Pd
Overglaze	9C550	9C550
Braze system adhesion Layer	9C81 Ag/Pt	9C81 Ag/Pt
Braze System barrier layer	9C82 Ag	9C82 Ag

### < DUPONT >

# DuPont<sup>™</sup> GreenTape<sup>™</sup> 95C & 9KC

Low Temperature Co-fired Ceramic Material System

#### GreenTape<sup>™</sup> Process Steps

Pre-conditioning



Form via's



- Fill vias
- Print conductor



Collate



Laminate



Burnout/fire



Post fired layers



Singulation

#### **Pre-Conditioning**

Removed from backing film <sup>•</sup>Dry at 80-120°C for 20-30 minutes. On backing film <sup>•</sup>Dry at 100°C for 45 minutes

Via Formation Methods

CNC Punching. PCB Drill. Laser.

#### Via Fill Methods

Off contact screen printing. Extrusion fill.

#### **Conductor Printing**

Off contact screen printing. See product data sheet for specific screen recommendation

#### Collate

Alternate machine and transverse orientations of sheets in stack

#### Lamination

Uniaxial or Isostatic Conditions: 3000-4000 PSI/20-28 MPa • 10 min

•70°C

#### **Burnout and Fire**

One step: - Extended belt furnace - Static kiln

#### **Post-Fired Layers**

Thick film: Conductors Dielectrics Resistors Plating

#### **Singulation Options**

Dicing saw (fired) Blanking (green) Laser scribing (fired/green) Ultrasonic (fired) Cutting (green)

### < DUPONT >

# DuPont<sup>™</sup> GreenTape<sup>™</sup> 95C & 9KC

Low Temperature Co-fired Ceramic Material System

#### **Burnout & Firing Profiles**

- Firing profiles are significantly different for 95C and 9KC
- 3.5 hour profile applies to 95C and the 26.5 hour profile to 9KC
- · Parts must be fired on flat, smooth setter tiles.
- For larger parts and optimum dimensional control, a longer co-fire profile and a programmable box furnace is often recommended.
- All post-fired layers can be processed using standard 850°C/30 or 60 minutes profiles.



850C / 3.5 Hour Co-fire Profile Control Points				
Temperature (°C)	Time (min.)	Ramp Rate (°C / min.)		
Room to 400	28	13.5		
Hold 400	20 - 45	-		
400 to 600	23	4.5		
600 to 850	34	7.2		
Hold 850	20	-		
850 to 50	39	-20.4		



Tape rolls, or boxes of sheeted tape, containers of paste 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 from date of shipment. Some settling of solids may occur and compositions should be thoroughly mixed prior to use.



850C / 26.5 Hour Co-fire Profile Control Points				
Temperature (°C)	Time (min.)	Ramp Rate (°C / min.)		
Room - 195	260	0.7		
Hold 195 - 210	95	-		
210 - 265	80	0.7		
Hold 265 - 275	110	-		
275 - 415	150	0.9		
Hold 415 - 420	115	-		
420 - 530	58	1.9		
Hold 530 - 535	105	-		
535 - 850	125	2.5		
Hold 850	20	-		
850 - 300	420	-1.3		

#### Safety and Handling

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

## OUPONT >

electronics.dupont.com

## For more information on DuPont<sup>™</sup> 95C & 9KC or other DuPont products, please visit our website.

The information provided in this data sheet corresponds to our knowledge on the subject at the date of its publication. It may be subject to revision as new knowledge and experience becomes available. This information is not intended to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. Since we cannot anticipate all variations in end-use and disposal conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. It is intended for use by persons having technical skill, at their own discretion and risk. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right.

DuPont<sup>®</sup>, the DuPont Oval Logo, and all products, unless otherwise noted, denoted with <sup>®</sup>, <sup>w</sup> or <sup>®</sup> are trademarks, service marks or registered trademarks of affiliates of DuPont de Nemours, Inc. Copyright © 2020 DuPont de Nemours Inc. All rights reserved.

95C & 9KC(07/20)

CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102-5 and "DuPont Policy Regarding Medical Applications" H-50103-5..