DuPont 2100 Series

RESISTOR COMPOSITIONS FOR HYBRID CIRCUITES

Technical Data Sheet

Product Description

2100 Series resistor compositions are designed to provide excellent electrical properties, lower overall process sensitivity, for Hybrid circuits with new resistor materials technology.

Electrical Performance Features

- HTCR's of less than 50 ppm/°C @0 – 70°C
- Low noise
- Excellent electrostatics
- Discharge (ESD)
- Excellent short term
- Overload (STOL)

Processing Features

- Low sensitivity to peak firing temperature
- No blend break from 1Ω to 10MΩ/sq.
- Small shifts of resistivity and TCR on re-firing
- Designed to give high power performance at low thickness (18μm dry thickness)
- Compatible with Hi-Ag termination 5164N (Pt/Ag), or Pd/Ag.
- Excellent printability
- Small length and thickness effects on resistivity and TCR
- Cadmium free

Processing

Substrates

Reported properties are based on tests with 96% alumina substrates. Substrates of other compositions may yield variation in performance properties.

Terminations

2100 Series are designed for use with high silver terminations. Reported properties are obtained on DuPont 5164N Pt/Ag terminations.

Printing

Properties are based on resistors printed to 18±2μm dried thickness. This is achieved by using 325 mesh stainless steel screen with emulsion thickness of 5 to 10μm. Resistors smaller than 0.3mm x 0.3mm are best printed using a 400 mesh stainless steel screen.

Thinner

2100 Series is optimized for screen printing and thinning is not normally required. For minor adjustment, DuPont thinner 8250 is recommended.

Drying

Prints should be allowed to level at room temperature for 5 – 10 minutes, then dried for 10 minutes at 150°C.

Firing

Properties are based on a 30 minutes firing cycle with 10 minutes at a peak of 850°C.

Blendability

Adjacent members of 2100 Series are totally blendable. Electrical performance between members approaches linear behavior. Log resistance versus blind ratio is nearly linear.

Encapsulation

2100 Series is compatible with glass encapsulant fired at 500-560°C.

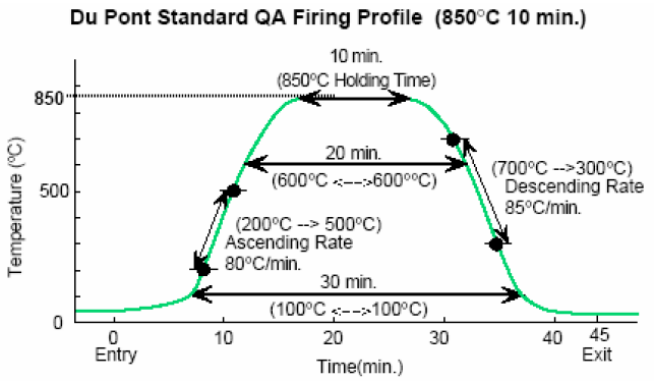
Laser Trimming

2100 Series is designed to allow fast laser trimming to achieve tight resistor tolerances. Table gives suggested laser trimming parameters. Laser trimming may be optimized by the user.

Laser Trimming Parameter

Speed Mm/sec.	Q-Rate KHz	Power W
30	5 – 6	1.5 – 2.5
40	5 – 8	2.0 – 3.0
50	6 – 10	2.5 – 3.5
60	8 – 12	2.5 – 4.0
70	8 – 12	3.0 – 4.0
80	10 – 12	3.0 – 4.5
90	10 – 12	3.5 – 5.0
100	12 – 15	4.0 – 6.0

Should be clean of debris for best performance. Minimum width of more than 40μm.



2100 Series Properties

	Resistivity Ω/sq. (1)	TCR ppm/°C (2)	ESD 5kV (3)	ESD 25kV (3)	Quan-Tech Noise (4)	TCR Length Effect 0.3/0.8mm (5)	TCR Firing Sensitivity 825 – 875°C (6)
2101	1 ± 20%	0 ± 50	< 0.1%	< 1%	< -35	< 40ppm	< 1.0
2104	4 ± 20%	0 ± 50	< 0.1%	< 1%	< -35	< 40ppm	< 1.0
2110	10 ± 20%	0 ± 50	< 0.1%	< 1%	< -35	< 40ppm	< 1.0
2120	100 ± 20%	0 ± 50	< 0.1%	< 3%	< -35	< 40ppm	< 1.0
2130	1K ± 20%	0 ± 50	< 0.1%	< 8%	< -18	< 40ppm	< 0.5
2140	10K ± 20%	0 ± 50	< 0.1%	< 8%	< -11	< 40ppm	< 0.5
2150	100K ± 20%	0 ± 50	< 0.1%	< 2%	< -6	< 40ppm	< 0.5
2160	1M ± 20%	0 ± 50	< 0.1%	< 1%	< +6	< 40ppm	< 0.5
2170	10M ± 20%	0 ± 150	< 0.1%	< 2%	N/A	< 40ppm	< 0.5

(1) Unless otherwise noted, resistors were printed on DuPont 5164N terminations at 18μm dried thickness. Then fired in 30 minute cycle with 850°C peak for 10 minutes. Resistor geometry is 1.0mm x 1.0mm. Shipping specifications for resistivity are as shown.

(2) Temperature coefficient of resistance from +25 to +70 for hot TCR and +25 to 0°C for cold TCR.

(3) Electrostatic discharge using 100pF/1500 Ω R/C network. Untrimmed resistors, 0.8mm x 0.8mm @ 5kV or 0.5mm x 0.5mm @ 25kV.

(4) Quan-Tech model 315C, Untrimmed resistors, 0.8mm x 0.8mm.

(5) Difference in TCR between 0.3mm and 0.8mm resistor length.

(6) The effect of firing temperature on TCRs between 825 and 875°C, ppm/°C/°C.

Storage and Shelf Life

Containers 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.

Safety and Handling

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

Caution: Do not use in medical applications involving implantation in the human body or contact with internal body fluids or tissue unless the product is provided by DuPont under a formal written contract consistent with the DuPont Policy Regarding Medical Applications of DuPont Materials H-50103-2 ("Medical Applications Policy") and which expressly acknowledges the contemplated use. For additional information, please request a copy of DuPont Medical Caution Statement H-50102-2 and the DuPont Medical Applications Policy.

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