



POLYMER THICK FILM DESIGN GUIDELINES

MATERIALS

Substrate Material	
Standard Available	0.003", 0.004" or 0.005" Polyester (PET), translucent and white 0.002" through >0.010" PET; Other substrates include Polycarbonate, PEN, Polyimide

Conductive Inks	Description/Applications	Resistivity (mΩ/sq/mil)
Standard Silver Ink	Hard Ink for standard apps	10-15
High Conductivity Silver Ink	High Conductivity ink for antenna	5-10
Silver/Silver Chloride Ink	Medical Electrode Ink	15-30
Carbon Ink	High resistance, no migration, cover	<150

Dielectric Inks	Description
Standard Dielectric	Flexible, moisture resistant, UV cure dielectric suitable for use as a printed spacer, cover-coat, and as insulation between conductive layers
Flame Retardant Dielectric	White dielectric for reflectivity and flame retardancy, used for automotive

Ink Flexibility:

Trace / conductor may be flexed around a .125"(3.125mm) minimum radius under both compression and tension. Circuits may be flexed in the component area around a 4" (100mm) radius under both compression and tension.

Trace Resistance of Silver Ink at 10 mOhm/sq/0.001":

- ◆ A 1.7 Ohm/inch resistance is typical for a 0.020" wide trace at nominal ink thickness of 0.0003"
 - Resistance change as a function of line width is inversely proportional when ink thickness is constant (i.e.: resistance of a 0.040" wide trace at 0.0003" thickness = 0.83 Ohms/inch
 - The formula to calculate resistance is: $Ohms = Ink\ Resistivity \times (length/width) \times (1/thickness)$

Component and Circuit Attach Inks

Poly-Solder®	Isotropic adhesive, Attaching leaded components, junction encapsulated, Junction resistance <30mOhm, Typical shear strength on chip components > 5 lbs
Z-axis attach	Anisotropic adhesive, Attaching Flip Chip and bonding circuit to circuit Ability to bond tails after circuit processing to save costs.



PRINT CAPABILITY

Sheet Sizes:

The print area maximum is a 24" X 36" sheet on high-speed cylinder press.

Trace Pitch Capabilities	
Standard:	.010" lines and .010" space
Available:	.008" lines and .008" space within limited areas and substrates

Circuit Construction	
Double Sided	Double sided circuits available using a printed thru hole. Holes may be punched or drilled to 0.030" or laser cut to 0.005".
Multi Layer	Up to 4 conductive layers including a shield layer have been printed on one side of a circuit using our printed crossover design. Dielectric strength of between traces will withstand 1500VDC.

Print Registration Tolerance	
Standard	±0.010" print to print on same side and front to back
Available	±0.006" same side print to print in limited areas of sheet

DIECUT CAPABILITY

Diecut Type	Die Cut to Print Tolerance	Max Cut Size	Description
Hard Tool	+/-0.008"	12" x 20"	High volume, long life, high accuracy, highest cost
Laser Cut	±0.008"	26" x 38"	High accuracy, complex cuts, micro-via, lowest tooling cost
Etched Die	±0.010"	12" x 20"	High accuracy, lower cost, lower volume
Steel rule die	±0.015"	20" x 36"	Lower accuracy, lower cost, lower volume
Optical Punch	±0.002"	One feature	High Tolerance, typical for punching registration holes

SMT ASSEMBLY CAPABILITY

Component Type	Examples	Package Size/Pitch
Chip Components	Resistors, capacitors, LEDs	0603 minimum package size
Leaded Components	QFP, SOIC, and PLCC packages	>/= .020" pitch
Bare die	Low IO count	>/= .016 " pitch
Odd Form components	Buzzers, Seven Segment Displays, Connectors, Switches	



MECHANICAL LIMITS

Sheet Size: 18" x 36" Component Placement Area: 17" x 22"

ENVIRONMENTAL SPECIFICATIONS

<i>Operating Temperature</i>	-40°C to +85°C
<i>Humidity</i>	5% to 90% RH , non-condensing
<i>Storage / Shipping</i>	-40°C to +85°C 5% to 90% RH non-condensing
<i>Shock</i>	Thermal: -40°C to +85°C, 25 cycles Mechanical: 30G, 11msec., half sine wave Vibration: 5.35 G rms, 50-2000 Hz

* These parameters may change based on customer design criteria

Flammability w/ PTF printed circuits:

- ◆ Polyester UL 94 HB
- ◆ Polyimide UL 94 V1
- ◆ Polyetherimide UL 94 V1

INTERFACES

Connectors	
FFC Connector, ZIF or other type	0.039" to 0.100" pitch typical
Crimp connectors	>/= 0.100" pitch
Z-axis or pressure fit	>/= 0.020" pitch

Operator Interfaces	Force (typical)	Tactile ratio (typical)
Tactile Poly-Dome	200 – 300 grams	30 – 60
Tactile Metal Dome	200 – 400 grams	30 – 60
Non-tactile membrane switch	100 – 300 grams	