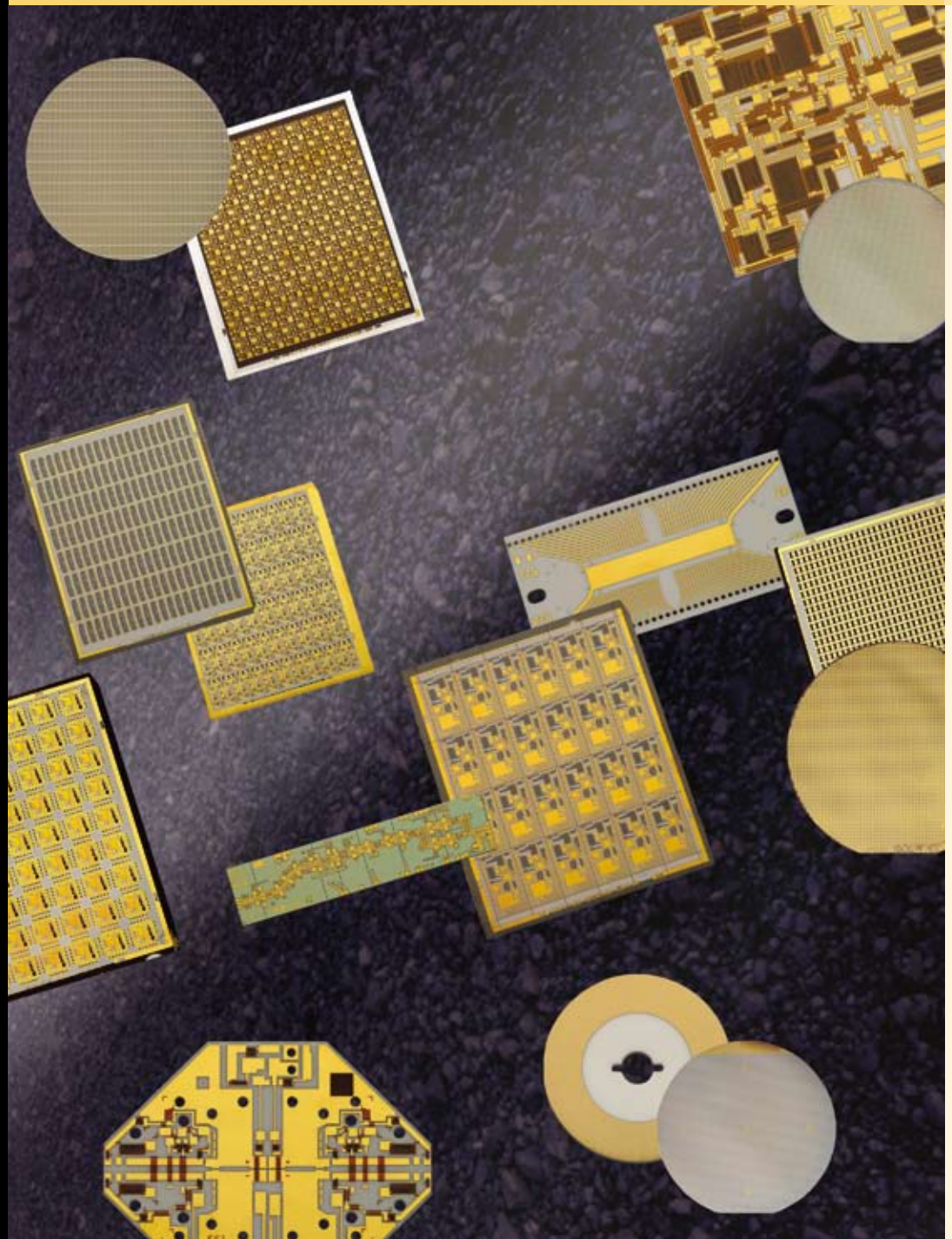




VISHAY INTERTECHNOLOGY, INC.

## PATTERN SUBSTRATES USING THIN FILM TECHNOLOGY

Vishay Electro-Films  
Application-Specific Pattern Substrates



PRECISION RESISTORS

CAPABILITIES



# Pattern Substrates Using Thin Film Technology



## Vishay Electro-Films: Substrates and Pattern Substrates

Vishay Electro-Films is a leading-edge manufacturer of thin film passive components and custom substrates. Vishay Electro-Films offers a wide variety of substrate choices – alumina, aluminum nitride, beryllium oxide, quartz, silicon, ferrites, titanates, and many metallization alternatives such as nichrome, tantalum nitride, titanium tungsten, copper, nickel, gold, and aluminum to meet application-specific demands.

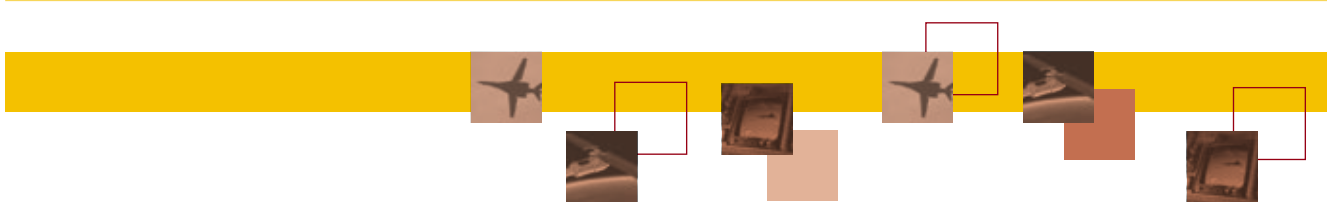
With its ability to integrate fine line patterns and multilayer structures into its manufacturing processes, Vishay Electro-Films is able to produce simple to complex designs in a timely manner. Vishay Electro-Films has one of the industry's broadest line of thin film products, as well as a rapid prototyping service.

## About Vishay Electro-Films

Electro-Films, founded in 1974, became the industry leader in custom thin film substrate production for the hybrid circuit and microwave industries. Vishay Intertechnology, a leading global manufacturer of electronic components, acquired Electro-Films in 2000. Since that time, Vishay has invested over \$50 million to refurbish the physical plant and purchase state-of-the-art processing equipment. The 57,000-square-foot facility contains 11,400 square feet of clean rooms, including class 100 and class 1000 clean rooms. Vishay Electro-Films is an ISO 9001:2000-certified facility serving commercial, medical, microwave, telecommunications, and defense industry manufacturers worldwide.

## Features

- Rapid prototyping / full in-house capabilities
- Large-volume production
- Multiple substrate material options
- Complete thin film services



Substrate Characteristics			
Material	Uses	Benefits	Standard Thickness* MILS (mm)
Alumina (Al <sub>2</sub> O <sub>3</sub> )	Standard hybrid Medium-power microwave	Most cost-effective choice	10, 15, 25 (0.25, 0.38, 0.63)
Silicon (Si)	DC circuit-medium/high power	Best choice for high-density fine-line interconnects	15 (0.38)
Quartz (SiO <sub>2</sub> )	Microwave/millimeter-wave low power/low shunt capacitance	Good for high-density patterns Low loss tangent/low CTE	10, 20, 25 (0.25, 0.5, 0.63)
Aluminum Nitride (AlN)	High-power microwave	Deal CTE match to silicon devices High thermal conductivity	20, 25, 50 (0.5, 0.63, 1.3)
Beryllium Oxide (BeO)	High-power DC/RF microwave	Highest thermal conductivity	15, 25 (0.38, 0.63)
Sapphire	Millimeter-wave/optical circuits with special electrical or mechanical requirements	Low loss tangent Optical surface finish	Special
Titanates	RF/microwave with high Q	Dielectric properties	Special
Ferrites	Circulators/isolators	Magnetic sensitivity	Special

\* Additional thicknesses available upon request

Metallization Capabilities		
Sputtered Materials		
Material	Uses	Notes
Tantalum Nitride (Ta <sub>2</sub> N)	Resistor	10-250 ohms/square
Nichrome (NiCr)	Resistor	10-250 ohms/square
Chromium Oxide (Cermet)	Resistor	Up to 500 ohms/square
Chromium Silicon (CrSi)	Resistor	Up to 500 ohms/square
Titanium Tungsten (TiW)	Barrier/adhesion	500-1000 Angstrom typical thickness
Gold (Au)	Adhesion	4-12 micro-inches typical thickness
Palladium (Pd)	Adhesion	Solderable
Platinum (Pt)	Adhesion	Solderable
Nickel (Ni)	Adhesion	Solderable
Gold/Tin (Au/Sn) (80/20)	Contact metallization	Eutectic die attach
Aluminum (Al)	Contact metallization	12,000 Angstrom typical thickness
Copper (Cu)	Contact metallization	500-1000 Angstrom typical thickness
Plated Materials		
Material	Uses	Notes
Gold (Au)	Contact metallization	100 micro-inches typical thickness
Nickel (Ni)	Solderable	20-60 micro-inches typical thickness
Copper (Cu)	Thermal management	Thickness up to 0.005 inches



<b>Dimensional Capabilities</b>	
Conductor line width	0.001 inches
Conductor line thickness	50 to 300 micro-inches standard, up to 5 mils custom
Line width tolerance	0.0001 inches at 150 micro-inches thickness
Through-hole minimum diameter	0.005 inches, dependent on substrate thickness
Metallized hole diameter to substrate thickness ratio	0.8 minimum
Through-hole tolerance: diameter and position	+/-0.002 inches
Front-to-back alignment	+/-0.002 inches

<b>Process Capabilities</b>
Custom CO <sub>2</sub> laser shaping
Au or Cu filled vias (0.007 to 0.020 inches diameter)
Large couples with polyimide or air bridges
Multilayer metal crossovers
Wraparound edge metallization
Two-sided metallization
Solder balls
High aspect ratio structures

## Design

If your design is complete and you would like to send us your files, or if you would like us to help you finalize your application design, please contact:

VISHAY ELECTRO-FILMS, INC.  
111 GILBANE STREET  
WARWICK, RI 02886  
United States  
Ph: +1-401-738-9150  
Fax: +1-401-738-4389





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**THE AMERICAS**

**UNITED STATES**

VISHAY ELECTRO-FILMS, INC.  
111 GILBANE STREET  
WARWICK, RI 02886  
UNITED STATES  
PH: +1-401-738-9150  
FAX: +1-401-738-4389

**ASIA**

**SINGAPORE**

VISHAY INTERTECHNOLOGY  
ASIA PTE LTD.  
25 TAMPINES STREET 92  
KEPPEL BUILDING #02-00  
SINGAPORE 528877  
PH: +65-6788-6668  
FAX: +65-6788-0988

**P.R.C.**

VISHAY INTERTECHNOLOGY  
ASIA PTE. LTD.  
(SHANGHAI REPRESENTATIVE OFFICE)  
ROOM D,15F, SUN TONG INFOPORT PLAZA  
55 HUAI HAI WEST ROAD  
200030 SHANGHAI  
P.R.C.  
PH: +86-21-6283-1036  
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**JAPAN**

VISHAY JAPAN CO., LTD.  
SHIBUYA 3-CHOME SQUARE BUILDING 3F  
3-5-16 SHIBUYA  
SHIBUYA-KU  
TOKYO 150-0002  
JAPAN  
PH: +81-3-5464-6411  
FAX: +81-3-5464-6433

**EUROPE**

**GERMANY**

VISHAY EUROPE SALES GMBH  
GEHEIMRAT-ROSENTHAL-STR. 100  
95100 SELB  
GERMANY  
PH: +49-9287-71-0  
FAX: +49-9287-70435

**FRANCE**

VISHAY S.A.  
199, BLVD DE LA MADELEINE  
06003 NICE, CEDEX 1  
FRANCE  
PH: +33-4-9337-2920  
FAX: +33-4-9337-2997

**NETHERLANDS**

VISHAY BCCOMPONENTS B.V.  
HURKESTRAAT 31  
P.O. BOX 8766  
5652 AH EINDHOVEN  
NETHERLANDS  
PH: +31-40-2590-700  
FAX: +31-40-2590-777