

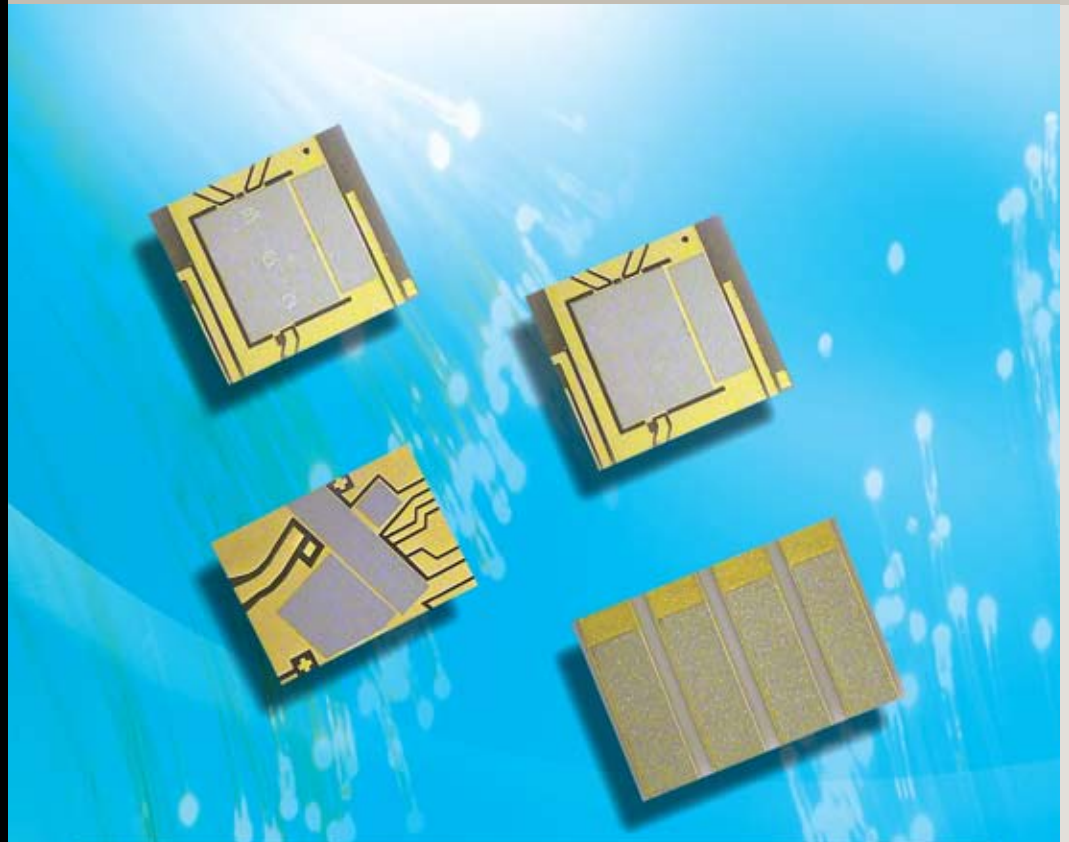


VISHAY INTERTECHNOLOGY, INC.

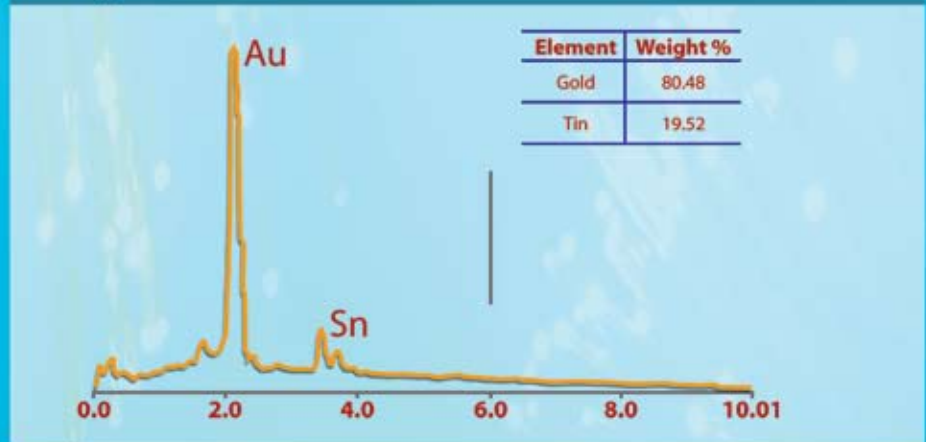
THIN FILM RESISTORS

DIODE SUBMOUNT CAPABILITIES USING THIN FILM SUBSTRATES

CAPABILITIES



Integrated Au/Sn Eutectic





DIODE SUBMOUNT CAPABILITIES

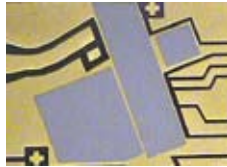
Vishay Electro-Films, with its complete in-house capability, offers a wide variety of solutions for matching the best substrate materials and metal schemes to achieve optimum thermal and mechanical performance.

Vishay Electro-Films, an RoHS-compliant facility and ISO 9001/2000-registered company, provides thermal management submount solutions for all optoelectronics applications.

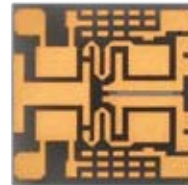
Typical Applications Using Vishay Electro-Films Substrate Submounts



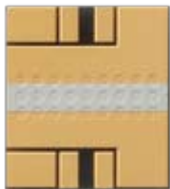
25-Gbps to 40-Gbps TOSA
and ROSA transceiver /
receiver optical sub submount



Tunable laser submount



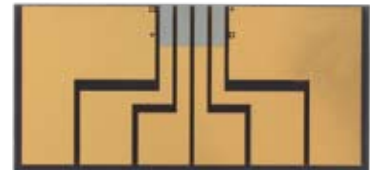
CATV submount



Semiconductor laser
diode submount



Single-emitter
semiconductor laser



High Power Laser Bar

Applications

- Laser diode submounts
- Fiber optic pump lasers
- Optical transmitters
- Optical receivers
- Optical transceivers
- Optical TOSA/ROSA packages

Vishay Electro-Films, Inc
111 Gilbane Street
Warwick, RI 02886
USA
Ph: +1-401-738-9150
Fax: +1-401-738-4389
Email: EFI@Vishay.com



Materials

Vishay offers a variety of material choices for submounts with a wide range of thicknesses to help designers meet their specific application requirements.

Material	Surface finish (u" CLA)	Std. thickness mils (mm)	Available thickness mils (mm)	Diel. constant ϵ @ 1 MHz	Thermal conductivity (W/m°C) 25 °C / 100 °C	Coeff. thermal expansion (ppm)	Tan δ 1 MHz / 10 GHz
Quartz	60/40 optical	10, 20 (0.25, 0.5)	10 to 40 (0.25 - 1.0)	3.82	5 / 2	0.55	0.00002 / 0.0001
Al ₂ O ₃	< 1 pol. < 3 asf	10, 15, 25 (0.25, 0.38, 0.63)	5 to 90 (0.12 - 2.3)	9.9	35 / 27	7.4	0.0001 / 0.0003
AlN	< 2 pol. < 24 asf	20, 25, 51 (0.5, 0.63, 1.3)	10 to 90 (0.25 - 2.3)	8.6	170 / 130 / 200 / 230	4.6	0.001 / 0.002
BeO	< 4 pol. < 15 asf	15, 25 (0.38, 0.63)	10 to 60 (0.25 - 1.5)	6.5	300 / 240	9	0.0004
Zirconia	< 4 pol.	Special order	10 to 25 (0.25 - 0.63)	20 - 33	2 - 3	10 - 11	~



METALIZATION GUIDELINES

For applications incorporating resistors, or for conductors only, Vishay provides designers with a wide range of metal combinations to meet their needs.

Metal stack resistor	EFI STD	Wire bondable	Solderable		EFI STD
			Gold	Solder	
Ta ₂ N/TiW/Au	Yes	Yes	~	~	TiW (500 – 1 kA)
Ta ₂ N/TiW/Au/Ni/Au	Yes	Yes	Yes	Yes	TiW (500 – 1 kA)
Ta ₂ N/TiW/Pd/Au	Yes	Yes	Yes	Yes	TiW (500 – 1 kA)
Ta ₂ N/TiW/Au/Cu/Au		Yes	~	~	TiW (500 – 1 kA)
Ta ₂ N/TiW/Au/Cu/Ni/Au		Yes	Yes	Yes	TiW (500 – 1 kA)
NiCr/TiW/Au	Yes	Yes	~	~	TiW (500 – 1 kA)
NiCr/Au/Ni/Au		Yes	Yes	Yes	
Conductor only					
TiW/Au	Yes	Yes	~	~	TiW (500 – 1 kA)
TiW/Pt/Au		Yes	Yes	Yes	TiW (500 – 1 kA)
TiW/Au/Ni/Au		Yes	Yes	Yes	TiW (500 – 1 kA)
TiW/Pd/Au	Yes	Yes	Yes	Yes	TiW (500 – 1 kA)
Ti/Pd/Au		Yes	Yes	Yes	Ti (500 – 1 kA)
Conductor only- high power					
TiW/Cu/Ni/Au	Yes	Yes	Yes	Yes	TiW (500 – 1 kA)
NiCr/Cu/Ni/Au		Yes	Yes	Yes	NiCr (500 – 1 kA)
AuSn 80/20	Yes		Yes	Yes	4, 6, 8 micron

Refer to technical note for recommended standard metal thickness <http://www.vishay.com/doc?49387>



THERMAL MANAGEMENT - SOLID FILLED VIAS

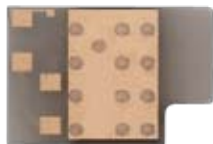
Vishay EFI products feature unique capabilities for improved thermal performance

- Solid-filled vias — Gold or copper vias are available in AlN, BeO, Al₂O₃, and quartz.
- Key benefits:
 - High-reliability, low-resistance paths to ground (less than 10 mΩ)
 - Enhanced thermal conductivity
 - Low thermal paths to rear of the substrate

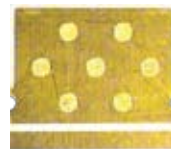
Design Parameters	
Material thickness	Min via diameter (Max = 2x min)
0.010 in (0.245 mm)	0.006 in (0.152 mm)
0.015 in (0.381 mm)	0.008 in (0.203 mm)
0.020 in (0.51 mm)	0.010 in (0.254 mm)
0.025 in (0.635 mm)	0.012 in (0.305 mm)
0.050 in (1.27 mm)	0.020 in (0.51 mm)

Min via centers	Min via center to die edge
2x via diameter Al ₂ O ₃ 3x via diameter AlN	1.5x via diameter

See technical note 61084, “Application & Design of Plated & Filled Via Circuits” at <http://www.vishay.com/doc?61084>.



Cu filled 8 mil (0.2 mm) diameter vias on a 15 mil thick (0.38 mm) aluminum nitride substrate



Custom gold filled 10 mil (0.25 mm) diameter vias on a 20 mil (0.51 mm) thick alumina substrate

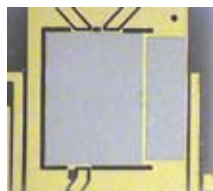


THERMAL MANAGEMENT - AuSn

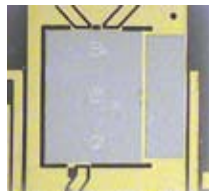
- Gold/tin pre-deposited pads — Vishay Electro-Films offers a robust selective-patterned 80/20 gold/tin for solder applications.
- Key benefits:
 - 2- μm to 8- μm thickness available at $\pm 1\text{-}\mu\text{m}$ tolerance
 - Eliminates need for soldering preforms — AuSn is pre-deposited onto submount
 - Available on simple to complex designs
 - AuSn pad placement accuracy to 0.0005 in. (0.0127 mm)
 - Allows accurate laser alignment to ± 0.005 in. (0.127 mm)
 - Pad tolerance to ± 0.0002 in. (.005 mm)
 - Freeze time: 120 seconds at 320 °C
 - Excellent reflow stability — does not migrate outside borders of defined area



AuSn pad custom designs

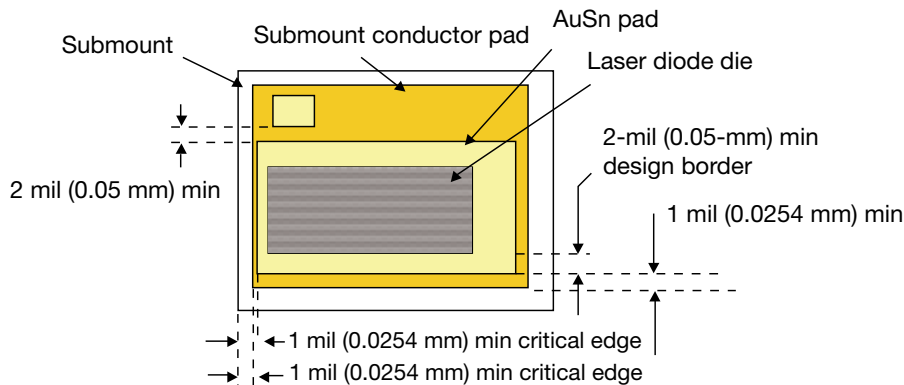


AuSn pad with no vias



AuSn pad with vias

Layout Guidelines



Minimum requirements for gold/tin pre-deposited pads

See data sheet 61081 at <http://www.vishay.com/doc?61081>.

DISCLAIMER All product specifications and data are subject to change without notice. Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product. Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications. Product names and markings noted herein may be trademarks of their respective owners.

Machined Shapes

Vishay EFI's in-house CO₂ laser machining of ceramics provides the ability to offer custom-shaped substrates, cut outs, and holes for special applications. CO₂ machining can be applied to Al₂O₃, AlN and BeO substrates.



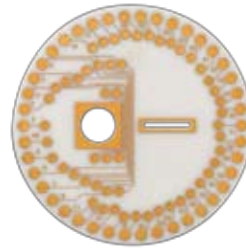
Cut out Tosa Rosa



10 G Submount



Custom Submounts



Custom Round with Filled Vias

High-Power Conductor Lines

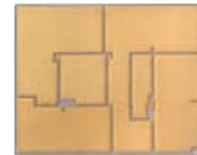
Special process capabilities allow Vishay EFI to provide power lines with up to 0.006-in. thick copper. A copper conductor to 0.002-in. (0.05-mm) thickness can be integrated on one substrate in relatively close proximity to the fine-line patterns without degradation of the patterning capability. The copper lines are isolated with nickel barrier layers to prevent copper oxidation and intermetallic diffusion during high-temperature processing and operation.



Copper/gold



Thick copper



Thick copper / Nickel / Gold

See data sheet 61053 at <http://www.vishay.com/doc?61053>.

General Product Tech Notes:

HDI Design Guidelines: <http://www.vishay.com/doc?TN002>.

Integrated Microelectronic Interconnect Circuitry: <http://www.vishay.com/doc?61082>.

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

Vishay Electro-Films, Inc
111 Gilbane Street
Warwick, RI 02886
USA
Ph: +1-401-738-9150
Fax: +1-401-738-4389
Email: EFI@Vishay.com

SEMICONDUCTORS:

Rectifiers • High-Power Diodes and Thyristors • Small-Signal Diodes • Zener and Suppressor Diodes
• FETs • RF Transistors • Optoelectronics • ICs • Modules

PASSIVE COMPONENTS:

Resistive Products • Magnetics • Capacitors • Strain Gage Transducers and Stress Analysis Systems



One of the World's Largest Manufacturers of
Discrete Semiconductors and Passive Components

WORLDWIDE SALES CONTACTS

THE AMERICAS

UNITED STATES

VISHAY AMERICAS
ONE GREENWICH PLACE
SHELTON, CT 06484
UNITED STATES
PH: +1-402-563-6866
FAX: +1-402-563-6296

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. CHINA

VISHAY TRADING (SHANGHAI) CO., LTD.
15D, SUN TONG INFOPORT PLAZA
55 HUAI HAI WEST ROAD
SHANGHAI 200030
P.R. CHINA
PH: +86-21-5258 5000
FAX: +86-21-5258 7979

JAPAN

VISHAY JAPAN CO., LTD.
MG IKENOHATA BLDG. 4F
1-2-18, IKENOHATA
TAITO-KU
TOKYO 110-0008
JAPAN
PH: +81-3-5832-6210
FAX: +81-3-5832-6260

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

UNITED KINGDOM

VISHAY LTD.
PALLION INDUSTRIAL ESTATE
SUNDERLAND SR4 6SU
UNITED KINGDOM
PH: +44-191-514-4155
FAX: +44-191-567-8262