

## SEMICONDUCTORS:

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

## PASSIVE COMPONENTS:

Resistive Products • Magnetics • Capacitors



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.  
37A TAMPINES STREET 92 #07-00  
SINGAPORE 528886  
PH: +65-6788-6668  
FAX: +65-6788-0988

#### P.R. CHINA

VISHAY CHINA 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.  
SHIBUYA PRESTIGE BLDG. 4F  
3-12-22, SHIBUYA  
SHIBUYA-KU  
TOKYO 150-0002  
JAPAN  
PH: +81-3-5466-7150  
FAX: +81-3-5466-7160

### EUROPE

#### GERMANY

VISHAY ELECTRONIC 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: +33-4-9337-2727  
FAX: +33-4-9337-2726

#### UNITED KINGDOM

VISHAY LTD.  
SUITE 6C, TOWER HOUSE  
ST. CATHERINE'S COURT  
SUNDERLAND ENTERPRISE PARK  
SUNDERLAND SR5 3XJ  
UNITED KINGDOM  
PH: +44-191-516-8584  
FAX: +44-191-549-9556

Build **Vishay**  
into your **Design**

[www.vishay.com](http://www.vishay.com)

VMN-PL0433-1007

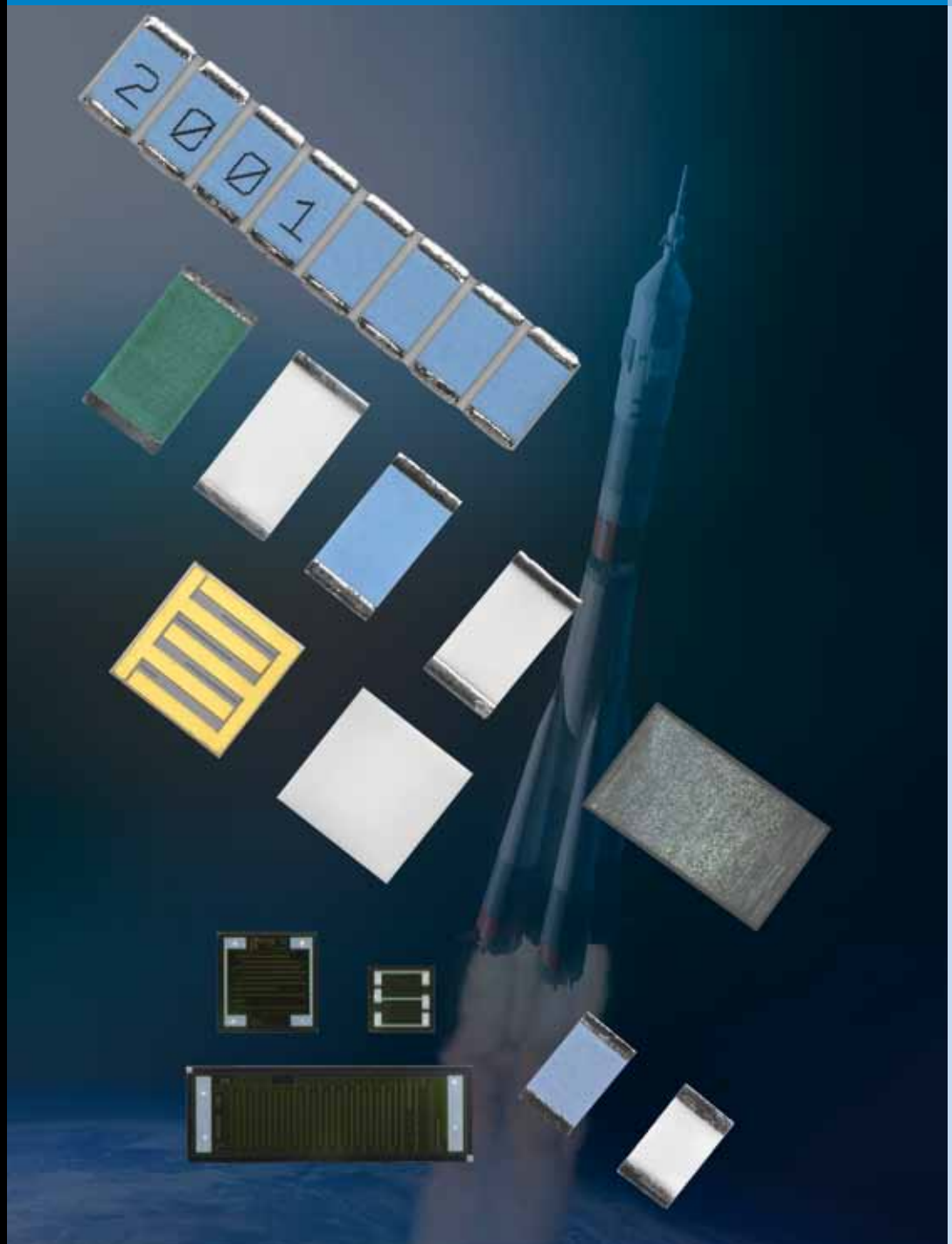


# RESISTIVE PRODUCTS SPACE APPLICATIONS

RESISTIVE PRODUCTS

Vishay Sfernice

CAPABILITIES





Components used in aerospace equipment are designed to function reliably when subjected to extremely hot and cold temperatures, intense vibration, and other environmental stresses. Vishay Sfernice has been involved in this market since the early 1980s, beginning with space-level qualifications for its metal film, wirewound, and SIL products. With the growing demand for miniaturization, Vishay Sfernice SMD products have been qualified for space applications since 2002.

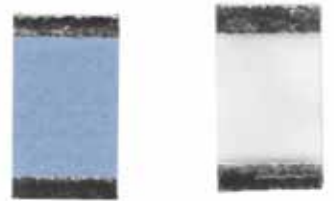
In 2009, Vishay Sfernice became the first manufacturer of passive components to hold the ESCC/QML qualification (ESCC Technology Flow Qualified Manufacturer) granted by the European Space Agency (ESA). At Vishay Sfernice, our goal is to offer the widest range of qualified or SCD (customer source control drawing) products and thus to serve as a one-stop-shop for our space customers.

## QUALIFIED PRODUCTS

### PHR

#### Key Features and Benefits:

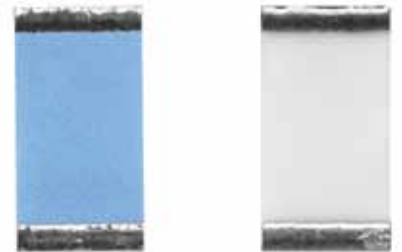
- Space level ESA qualified: ESCC4001/023
- Thin film technology
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2010 (0402 qualification ongoing)
- Wide ohmic range: 10 Ω to 3 MΩ (depending on size)
- Tight tolerance: down to 0.01 %
- Tight temperature coefficient: down to 5 ppm/°C (- 55 °C; + 155 °C)
- Load life stability: 0.15 % after 2000 h at 70 °C at nominal power (0.02 % typical)



### PFRR

#### Key Features and Benefits:

- Established reliability: R failure rate (0.01 %/1000 h)
- Thin film technology
- Operating temperature range – 55 °C; + 155 °C
- ESA qualified: ESCC4001/023
- Various sizes: 0603 to 2010 (0402 qualification ongoing)
- Wide ohmic range: 100 Ω to 3.01 MΩ (depending on size)
- Tight tolerance: down to 0.05 %
- Tight temperature coefficient: down to 10 ppm/°C (- 55 °C; + 155 °C)
- Load life stability: 0.25 % after 8000 h at 70 °C at nominal power (0.05 % typical)
- The industry's only SMD product with an official space qualification and performance as tight as 0.05 % / 10 ppm



### PRAHR / CNWHR

#### Key Features and Benefits

- Space level ESA qualified: ESCC4001/025
- Thin film technology
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: PRAHR100, PARHR135, PRAHR182 (PRAHR070 ongoing)
- Wide ohmic range 100 Ω to 1 MΩ (depending on size)
- Tight tolerances: 0.1 % absolute, 0.05 % ratio (tighter on request)
- Tight temperature coefficient: 10 ppm/°C (- 55 °C; + 155 °C) absolute, 3 ppm/°C ratio
- Same ohmic value (any value) or different ohmic values in same network: CNWHR
- Load life stability: 0.1 % after 1000 h at 70 °C at nominal power, 0.02 % on the ratio



## CHPHR

### Key Features and Benefits:

- Space level ESA qualified: ESCC4001/026
- Thick film technology
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2512
- Wide ohmic range: 1  $\Omega$  to 10 M $\Omega$
- Load life stability: 1 % after 1000 h at 70 °C at nominal power
- Tin/lead or gold terminations



## PRODUCTS WITH ONGOING QUALIFICATION

### LHR

#### Key Features and Benefits:

- Space level ESA qualification ongoing
- Thin film technology
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2010 (2512 under development)
- Ohmic range 0.1  $\Omega$  to 9.99  $\Omega$
- Load life stability: 0.5 % after 2000 h at 70 °C at nominal power
- Temperature coefficient: 50 ppm/°C to 300 ppm/°C (depending on ohmic value)



### PZHR

#### Key Features and Benefits:

- Space level ESA qualification ongoing
- Strap: 0  $\Omega$
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2512
- Conform to MIL-PRF-32159

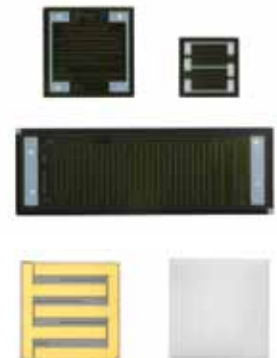


## PRODUCTS AVAILABLE UNDER CUSTOMER SPECIFICATION

### DIE CHIPS, CURRENT SENSORS and NETWORKS

#### Key Features and Benefits:

- Thin film technology
- Nickel chromium, tantalum nitride or chromium silicium depending on performance needed
- Custom networks available
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 20 mil x 20 mil to 67 mil x 134 mil
- Wide ohmic range 0.05  $\Omega$  to 5 M $\Omega$  (depending on size)
- Tight tolerance: down to 0.01 %
- Tight temperature coefficient: down to 5 ppm/°C (-55 °C; +155 °C)
- Load life stability: 0.05 % after 2000 h at 70 °C typical



**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.