

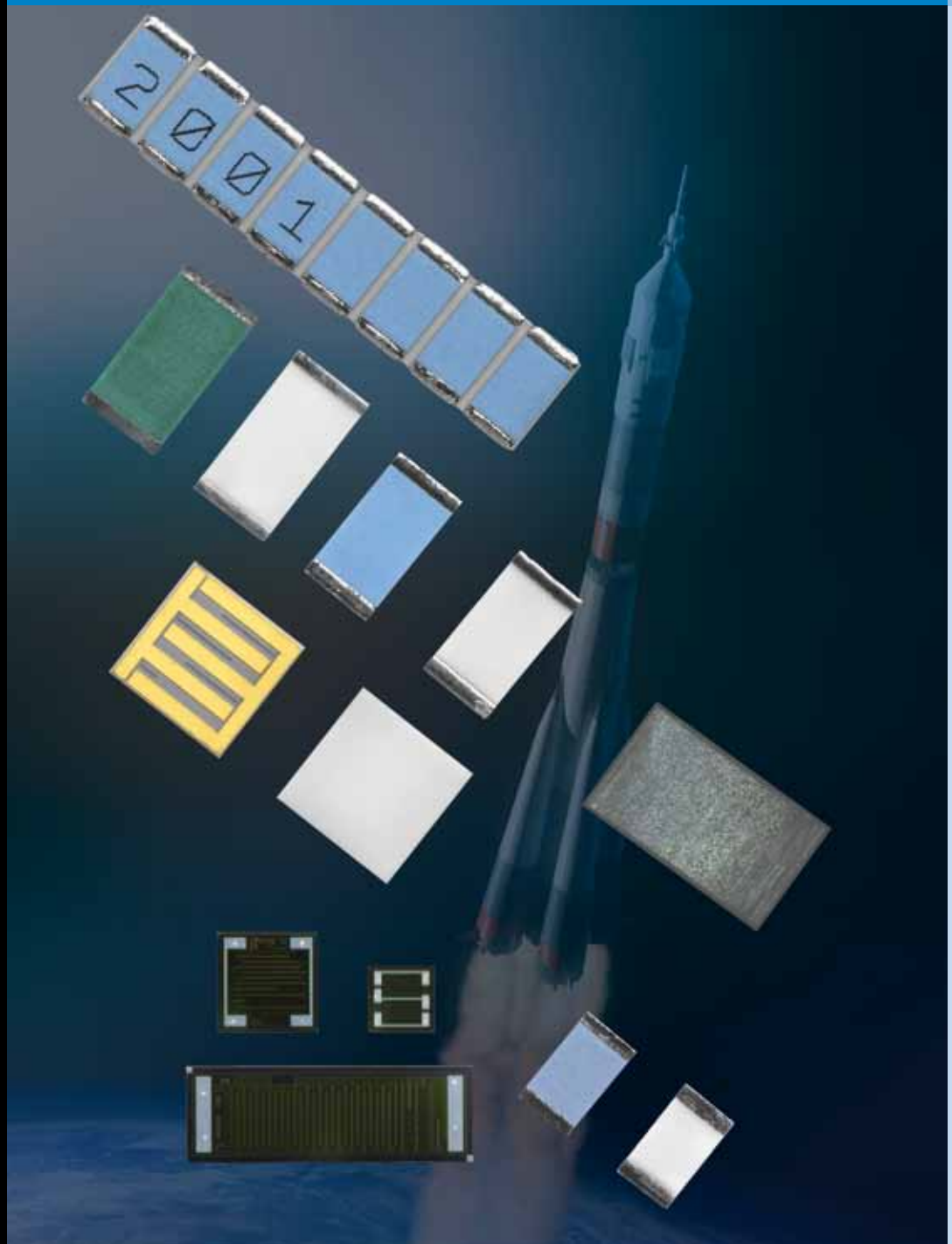


RESISTIVE PRODUCTS SPACE APPLICATIONS

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.

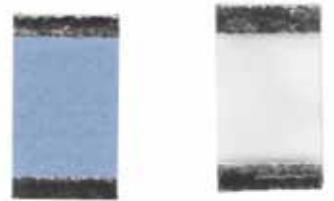
In 2009, Vishay Sfernice became the first manufacturer of passive components to hold the ESCC/QML qualification (ESCC Technology Flow Qualified Manufacturer) granted by the European Space Agency (ESA). At Vishay Sfernice, our goal is to offer the widest range of qualified or SCD (customer source control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

QUALIFIED PRODUCTS

PHR

Key Features and Benefits:

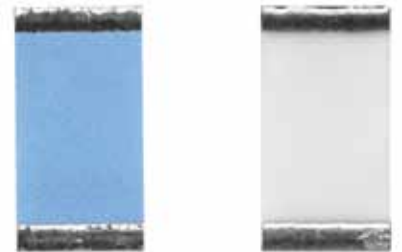
- Space level ESA qualified: ESCC4001/023
- Thin film technology
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2010 (0402 qualification ongoing)
- Wide ohmic range: 10 Ω to 3 MΩ (depending on size)
- Tight tolerance: down to 0.01 %
- Tight temperature coefficient: down to 5 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 Ω to 10 MΩ
- 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 Ω to 9.99 Ω
- 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 Ω
- Operating temperature range – 55 °C; + 155 °C
- Various sizes: 0603 to 2512
- Conform to MIL-PRF-32159

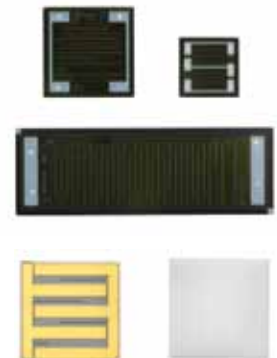


PRODUCTS AVAILABLE UNDER CUSTOMER SPECIFICATION

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 Ω to 5 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: 0.05 % after 2000 h at 70 °C typical



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