



Standard Testing and Additional Screening for Improved Performance

STANDARD RNR/RNN TESTING (OPTIONAL FOR GSR)

- **Thermal Shock:** (Temperature Cycling): This environmental exposure testing was designed and is imposed by the Mil Spec to detect a variety of design and manufacturing deficiencies resulting from materials with incompatible temperature coefficients of expansion, inadequately bonded materials, and materials with improper chemical compositions. MIL-R-55182 requires 5 cycles from - 65°C to + 150°C with a maximum ΔR of $\pm 0.2\%$ for thermal shock and overload tests combined.
- **Overload:** The Overload Test is used to screen out those resistors that could catastrophically fail due to an open, short or excessive resistance shift, if subjected to a transient overvoltage. This test consists of applying voltage in excess of the rated voltage for a short time interval and recording DC Resistance change. The overvoltage varies by model between 2 1/4 to 5 times the rated power per MIL-R-55182. The application time is one hour.
- **Visual Examination:** Visual examination (under 10X magnification) of hermetically-sealed resistors is used to inspect the film for contamination or damage from handling, cap to core alignment, positioning of the resistor in the enclosure, quality of the helix, quality of the hermetic seal, and workmanship. This test would be performed at the end of the manufacturing process.

ADDITIONAL SCREENING FOR IMPROVED PERFORMANCE

- **Power Conditioning (Burn-in):** Burn-in typically consists of the application of full rated power (not to exceed maximum rated voltage) at 100% rated-wattage and temperature for a period of time associated with the resistor type and resistance material. The purpose is to stress the resistor type electrically and thermally to the maximum of its designed operating capability. Experience has indicated that this type of stress is extremely effective in detecting latent failures and in improving long term stability characteristics by reducing ΔR . The number of hours that a part is burned-in has evolved as a result of experience.

IMPROVED PERFORMANCE - CONTINUED

Typical recommended burn-in tests for metal film resistors are:

Standard High-Reliability 100 hours at 125°C with full rated power applied. ΔR not to exceed $\pm 0.15\%$ and a Percent Defective Allowable (PDA) of 5% per lot per item.

Spacecraft Flight High-Reliability 168 hours at 125°C with full rated power applied. ΔR not to exceed $\pm 0.15\%$ and a PDA of 5% per lot per item.

- **Thermal Shock:** Additional thermal shock cycles are available (10 to 15 cycles recommended).
- **Radiographic Inspection (X-ray):** Radiographic inspection, normally limited to resistors with opaque cases, is used to detect internal fractures of leads and substrates, location of anomalies, separation of connections and particulate contaminant. The commonly used procedure to X-ray in two or more orthogonal planes as required to screen the entire resistor body. X-ray is normally not needed with the Angstrom clear glass construction.
- **Electrical Measurements (DWV, DCR, IR):** Electrical measurements (including Dielectric Withstanding Voltage, DC Resistance and Insulation Resistance) are used to check electrical characteristics and parametric drift resulting from screening and exposure to the various environmental test conditions.
- **Visual Examination (5x and 10x):** Visual examination as described above is available at any point in the manufacturing process (for example: after helixing, prior to making, etc).
- **Customized Improved Performance Testing:** Contact Vishay Angstrom for Improved Performance Testing that meets your most demanding specifications.