

RESISTORS

FACILITY ASSESSMENT AND QUALITY

Resistors can be purchased with known quality and failure rate levels. These are determined by the resistor vendor through testing. Resistors manufactured to the Military performance specifications are identified by a failure rate letter designator, shown in Table 1. The failure rates of Military standard resistors carry a statistical confidence level of 60% based on life test at full rated power and temperature, usually with a 10% producer's risk. Commercial resistors can also be purchased with given quality/failure rating, although testing methods and statistical confidence levels will vary between part vendors.

Quality assurance requirements imposed on the resistor vendor depend on the quality level of the resistor. Resistors conforming to the Established Reliability (ER) requirements of Military performance requirements are required to undergo Group A, B, and C testing on a periodic basis. A comparison of some of the more common conformance tests for the MIL-PRF standards is given in Table 2 for Group A testing, Table 3 for Group B, and Table 4 for Group C. As the tables show, tests are different for different resistor styles. Note these are not comprehensive tables of all Group A, B, and C tests. In addition, the procedures covering the detailed implementation of the tests may differ between specifications. For more detailed information, consult the data sheet, resistor manufacturer, and military performance specification. Military performance and specification requirements are given under the "Military Considerations" paragraph for each resistor style (Resistor Derating section). Some resistor styles have no governing Military performance specifications, and therefore the Military considerations are marked as not applicable.

Table 1. Failure Rate Designators for Military Resistor Styles

| Failure-Rate Letter Designator | Failure Rate |
|--------------------------------|------------------|
| C | Not Demonstrated |
| M | 1.0% |
| P | 0.1% |
| R | 0.01% |
| S | 0.001% |

Table 2. Sample of Group A Inspection-Test Requirements for Resistors

| Inspection-Test | Military Performance Requirement, MIL-PRF- | | | | | |
|-------------------------------------|--|--------|--------|--------|--------|--------|
| | 39007H | 55182G | 39015D | 55342G | 39017F | 39009D |
| Visual Examination | X | X | X | X | X | X |
| Resistance | X | X | X | X | X | X |
| Thermal Shock | | X | X | X | | |
| Solderability | X | X | X | | X | X |
| Dielectric Withstanding Voltage | X | | X | | | |
| Resistance to Solvents | | | | X | | |
| Noise | | X | X | | | |
| Insulation Resistance | | | X | | | |
| Torque | | | X | | | |
| Marking Legibility | X | | | X | | |
| Power Conditioning | | | | | X | X |
| Hermetic Seal | | X | | | | |
| Destructive Physical Analysis (DPA) | X | X | | | | |
| Short Term Overload | X | | | | | |
| Radiographic | X | | | | | |

Table 3. Sample of Group B Inspection-Test Requirements for Resistors

| Test/Inspection | Military Performance Requirement, MIL-PRF- | | | | | |
|------------------------|--|--------|--------|--------|--------|--------|
| | 39007H | 55182G | 39015D | 55342G | 39017F | 39009D |
| Visual Inspection | X | X | | | X | X |
| Life | | | X | | | |
| Moisture Resistance | | | X | | | |
| Temperature Resistance | | X | | X | X | X |
| Noise | | | X | | | |
| Resistance to Solvents | X | X | X | | X | |
| Shock | | | X | | | |
| Vibration | | | X | | | |
| Wire Bond Integrity | | | | X | | |
| Short Term Overload | | | | X | X | |

Table 4. Sample of Group C Inspection-Test Requirements for Resistors

| Inspection-Test | Military Performance Requirement, MIL-PRF- | | | | | |
|---------------------------------|--|--------|--------|--------|--------|--------|
| | 39007H | 55182G | 39015D | 55342G | 39017F | 39009D |
| Life Testing | X | X | | X | X | X |
| Thermal Shock | | | | X | X | X |
| Moisture Resistance | X | X | | X | X | X |
| Shock | X | X | | X | X | X |
| Vibration | X | X | | | X | X |
| Dielectric Withstanding Voltage | X | | | | X | X |
| Low Temp Storage | X | X | | | X | X |
| Low Temp Exposure | | | | | X | |
| High Temp Exposure | X | X | | X | X | X |
| Short Term Overload | X | | | | | X |
| Hermetic Seal | | X | | | | |