

Component Shelf Life and Storage Conditions

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One of the concerns users of electronic components face is that of their shelf life. The answer to the question of how long a lot of resistors will be usable is simply that it depends. Aside from considerations of differences in resistor technologies, the conditions under which components are kept is the major factor that affects their storage life. First and foremost, it is recommended that the product be kept in its original packaging until just prior to use. This prevents damage from dust and other potential contaminants and helps reduce the possibility of physical damage due to handling.

The Stackpole Electronics Inc. recommendations for storage environment are:

- ✧ **Temperature:** 40 to 90 degrees Fahrenheit;
- ✧ **Humidity:** 25% to 65% Relative Humidity;
- ✧ **Parts are not exposed to direct sunlight, chemical fumes or sulfur-containing materials and gases.**

Temperature

Temperatures outside a reasonable range can adversely affect the product as well as the packaging. It's recommended that the ambient temperature of the storage area be kept between 40 and 90 degrees Fahrenheit (between 4.4 and 32.2 degrees Celsius). Temperature control is important to provide protection from material decomposition. It is also important to prevent rapid temperature changes that could cause moisture condensation which may affect solderability or the basic electrical functioning of the component. Moisture enhances corrosion mechanisms that can lead to opens, shorts, dendrites, and discoloration. This is true of all resistor types, but thin film SMD resistors are especially sensitive to the effects of moisture.



Fig. 1 Taping issues due to improper storage conditions

Humidity

To protect the product and the packaging, the recommended humidity range is from 25% to 65%. If the storage atmosphere is too dry, the packaging can degrade such that adhesives that hold carrier tapes together for axial products and that maintain the seal of the cover tape on the carrier tape for SMD components becomes ineffective. This obviously results in components coming loose, making it difficult to impossible to properly remove and place them precisely in their intended locations on PCBs. If the ambient humidity is consistently high, there is increased risk of oxidation of the terminations, resulting in poor solderability due to lack of adequate wetting of the terminations, examples are shown in Fig. 2 below.



Fig. 2 Examples of poor solderability, poor wetting, and moisture damaged terminations



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One resistor technology requires extra attention regarding humidity: Carbon Composition resistors are very hygroscopic (moisture absorbent). Exposure to humidity causes them to drift in value, usually on the positive side and potentially by a large percentage above the upper tolerance limit. For this reason Stackpole ships all Carbon Comp resistors in sealed plastic bags containing desiccant. It is strongly recommended that the product be stored in the sealed bags until just before use.

ESD

Most resistors are not particularly sensitive to electrostatic discharges, so special ESD packaging is generally not required. As such they are not generally packaged in anti-static bags or protected from ESD in any other way. However, it is possible to damage any resistor if it experiences a sufficient discharge. Reasonable care in handling and storage will often provide all the protection needed from ESD.

Packaging

The packaging in which the components are shipped is designed and fabricated to protect them in transit and in storage. This includes reels, sleeves, bags, boxes, and trays. The product should be stored as it has been shipped to maximize shelf life. The labels on the inner packaging contain important information including part number, lot number, date code, quantity, and other reference info. Handling and storage procedures should assure that labels are not defaced, damaged, or destroyed. This is key information to retain for traceability in the event of a question or concern about a product.

Inventory Control

It is not surprising that proper controls of inventory age are important in maintaining fresh stock that does not exhibit any degradation. Use of FIFO (first in, first out) inventory rotation should be followed. This will help ensure that product gets used in a timely manner and avoid any product issues that may occur due to aging packaging or product.

Conclusion

An inventory of electronic components may represent a considerable financial investment. It makes sense to take the simple steps necessary to assure that this inventory is stored and maintained in a way that will maximize its shelf life and reduce usage risks associated with aging.

