Panasonic
INDUSTRY

Application Note Reliability of PhotoMOS® Relays

While electromechanical relays suffer wear over their lifetime, PhotoMOS® relays pass accelerated tests without failure – proof of their high reliability and long lifetime.

Minimize failure rate

Panasonic
INDUSTRY

PRODUCT

PhotoMOS® relays

PURPOSE

Reliability has come to rank right alongside cost and efficiency when evaluating the design and application of electrical systems. Semiconductor relays like Panasonic Industry's PhotoMOS® relays offer tangible advantages over electromechanical ones in this regard.

FEATURES

High reliability
Long lifetime
No mechanical wear
Enormous variety, suitable for numerous applications

Minimize failure rate

Panasonic INDUSTRY

FACTS & FIGURES

An electrical system is composed of a collection of electronic components, materials, and manufacturing processes. Each of these elements can fail in some fashion that could influence the system's functionality. Their reliability can be predicted through electronic reliability analyses that assume that failures are independent and random and are statistically distributed with a constant failure rate versus time.

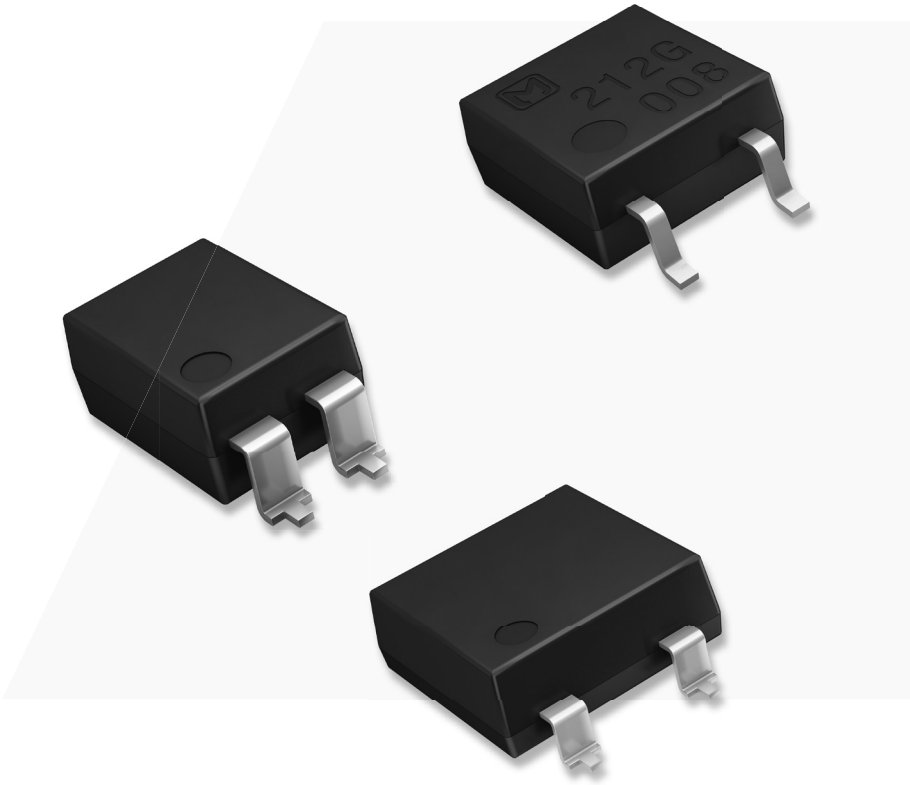
Stress prediction methods attempt to assign a specific baseline failure rate for each component used in electronic design. However, there is an inherent problem in using part stress methods for reliability prediction. Each of the sometimes hundreds of components in a design must be assessed in terms of their specific operating conditions. In addition, the reliability prediction method is rather theoretical and ignores vendor-specific differences, e.g. in construction or quality.

The only true measure of reliability is derived from reliability testing. For electromechanical relays, which suffer wear during their lifetime, reliability data is ideally obtained from Weibull diagrams. All three parts of a bathtub life curve (early failures, random failures, and failures due to wear) can be demonstrated via Weibull distribution. By performing suitable tests under appropriate conditions, results can be entered into a Weibull chart, leading to a failure probability for a certain number of switching operations. However, since semiconductor relays do not suffer wear over the course of their lifetime, Weibull testing is irrelevant for them.

For semiconductor relays, accelerated tests, which reduce time and testing costs, are used to predict reliability. Such tests involve applying temperature cycling and other stress factors, e.g. humidity (85°C and 85% RH is often used as a standard combination). The failure rate is the fundamental variable used to define reliability. Recent cyclic production line quality testing proved the functionality of 960 pieces of PhotoMOS® relays in such a Temperature Humidity Bias Test (THB) under the given circumstances. During the 1000 hours of test time, no failure was observed.

There are many differences between semiconductor relays and electromechanical relays, and reliability testing must take these differences into account. While electromechanical relays suffer wear over their lifetime, PhotoMOS® relays pass accelerated tests without failure, which offers yet additional proof of their high reliability and long lifetime. These and other advantages, including the enormous variety of PhotoMOS® relays, make them suitable for numerous applications, such as telecommunications, measurement, security engineering, sensor technology and the automation sector.

Panasonic
INDUSTRY



Application Note - How to solve various tasks with PhotoMOS® relays

Date: May 2021

Contact: Panasonic Industry Europe GmbH, Caroline-Herschel-Strasse 100, 85521 Ottobrunn/Germany, +49 (0) 89 45 354-1000, info.pieu@eu.panasonic.com