

Summary of activities

New SMD fuse up to 15A for telecom satellite application

Schurter is a Swiss based manufacturer of fuses, connectors, circuit breakers, input systems and EMC products. Founded in 1933 and privately owned Schurter is a leading fuse manufacturer in Europe.

The ESA project for new Fuses up to 15A evaluation and qualification was awarded to Schurter in December and will last for the next 30 months.

Overview

Based on ESA ECI phase I that ended with the qualification of MGA-S thin film fuses Schurter AG shall work on phase II for fuses up to 15A evaluation and qualification.

These fuses shall be used as over-current protection mainly in telecom satellite applications.

These satellites have the tendency to use higher voltage and amperage that needs to be securely disconnected from the on board power supply.

As already stipulated in phase I the fuse shall not be of wire design so the preferred technology is a solid-body style SMD fuse.

Basic Idea

In general there are two ways to come up with a solution to this request. First solution is to use the existing MGA-S fuse in parallel.

The second solution is a new fuse. This would require a new housing as the higher voltage and amperage require larger dimensions for physical reasons.

Both solutions should bear in mind easy accomplishment in terms of feasibility and fast availability. On the other hand a new product shall have a high compatibility to competitor products. The ESCC through its different working groups has already identified that the market for European fuses pin-to-pin compatible and with similar performances as those of AEM is expected to be high. Pin-to-pin compatibility and similarity in performance are therefore considered as top requirements.

The parallel solution involves elaborating kits with a set of fuses. These kits should have a number of fuses that need to be defined and have their own part designation.

Testing for the behaviour regarding impulses and how they split the current to the fuses will have to lead to the best solution whether to use two, three, four or five fuses in parallel. The influence of the set up of these fuses along with the creeping distances and the size of the soldering pads have to be verified.

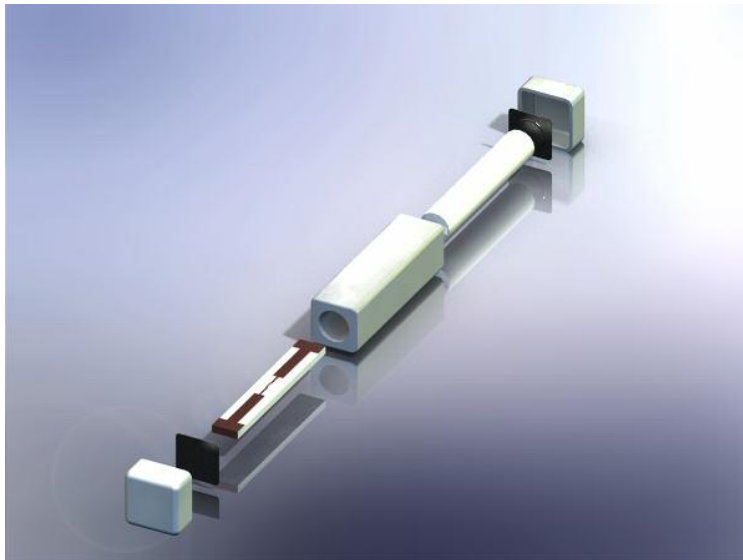
Design

The design of an ESCC/ESA qualified quick acting SMD-fuse for higher amperage requires more basic work.

This basic work involves the decision whether to use the sputter technology used for the actual MGA-S fuse or another fuse element technology. Possible candidates are the surface micromachining based LIGA (Lithography, Electroplating, Molding) and the established PCB technology. The fuse element will be integrated in a ceramic housing. All solutions shall allow currents from 4 to 15A and voltages up to 135VAC together with a rather high breaking capacity of 1000A.

All advantages or disadvantages of the various technologies shall be shown and tested accordingly. A prototype will have to be tested according to all fuse specifications in general and specific requirements for space applications.

A special effort has to be taken to show the risks of the new technology in order to prove feasibility and reliability for a long period.



Design study of a SMD-fuse for higher amperage

Technical feasibility and testing

For both variants the cold resistance, voltage drop and time current characteristic will have to be elaborated and tested. Furthermore the breaking capacity has to be set in various tests. Moreover the temperature influence along with the derating factor needs to be verified.

After the basic work and basic elaboration a test plan with all test condition that make sense will be defined. Testing for the new fuse design will have to be more stringent as a new technology needs to be tested thoroughly. The parallel fuse testing can be based on the initial MGA-S testing made in phase I as the technology is in use for a long time and some conditions may not vary regardless of the quantity of fuses used.

In a later stage the selected fuse will have to be manufactured according to the previously defined PID (Process Identification Document) in sufficient quantity for performing the qualification testing according to ESCC4008 and detail specification.

Qualification

The final work will include preparation of the final reporting and organize the final presentation. In parallel the document necessary for the listing in the EQPL (European Qualified Parts List) shall be prepared.

This entire project should help providing a European solution for a space fuse where higher amperage is requested. Although the demand for higher current fuses will not outnumber the demand for middle current fuses it is beneficial to have a single product line. The proven collaboration between ESTEC/ESA and Schurter will help to come up with a solution that helps the industry to have competitive product out of Europe.