Standard and optional tests can vary between different product families within the same group

Opposite: Reliability testing for components used in space-grade applications can appear limitless

Testing ensures the sky is not the limit

Like space itself, the options for reliability testing components used in space-grade applications can appear to be limitless. Not all components need to be fully approved by the European Space Agency; some may actually be Mil-PRF parts with additional testing to make them reliable enough for space applications.

Ensuring survival

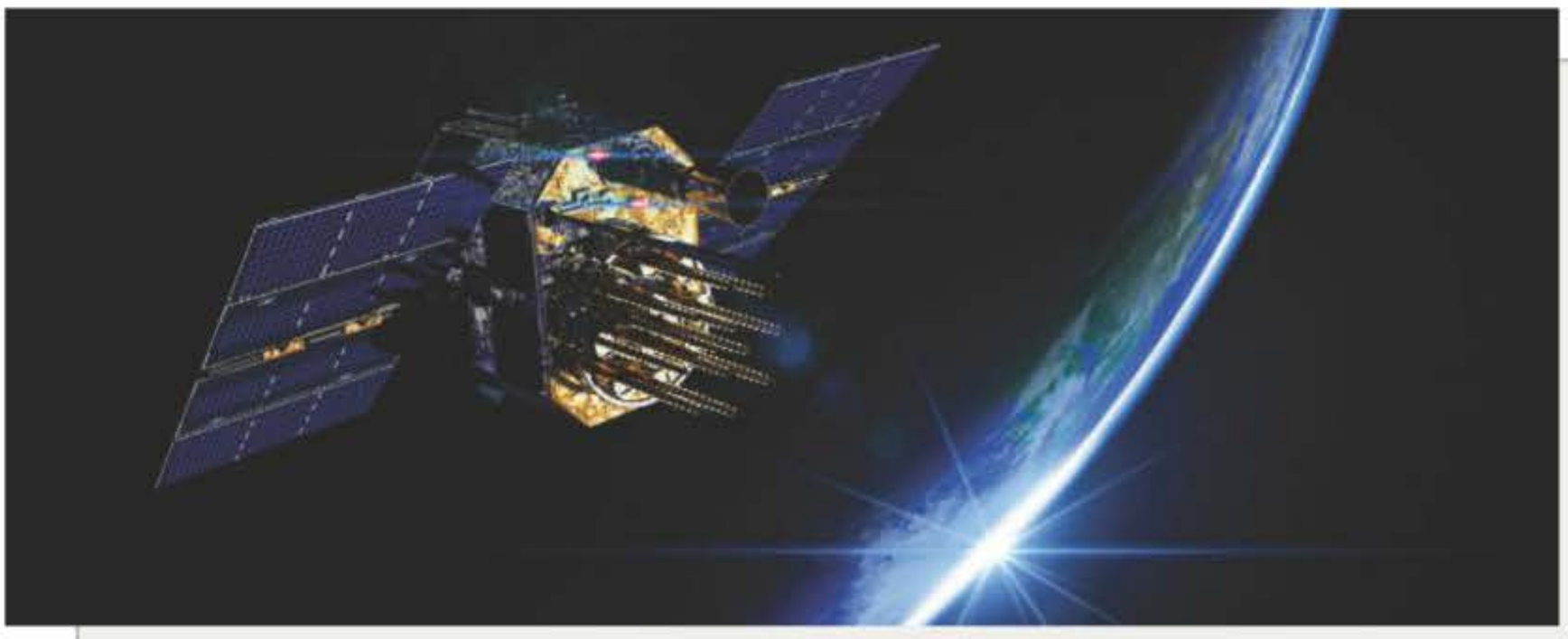
Understanding which tests will be carried out as standard is crucial to ensuring that the components will survive each mission's planned operational lifetime. Typically, this lifetime will be five to 15 years for the low-earth orbit or geo-stationary satellites used for applications such as Earth observations, telecommunications and navigational systems.

There are over 20 individual reliability tests which can be applied to a component and it is the combination of these tests which provides the part with its space-qualified status. The test methodologies offered are a combination of the manufacturer's own in-house tests, standard MIL-PRF tests and MIL-PRF tests with additional destructive physical analysis of five per cent of the parts.

Standard vs optional tests

The complexity for purchasers is that the

Space-grade testing extends lead times and adds cost. Buyers need experience and judgement to decide what is required and manage the testing process, explains Charcroft Electronics' product specalist, Roger Tall



standard and optional tests do not just relate to a particular product type, such as tantalum or ceramic capacitors, but can also vary between different product families within the same product group.

Take ceramic capacitors for example: Kemet's qualified product listing M123/x and GR900 are both space-qualified parts, however, while C-Mode scanning acoustic microscopy is a standard test for the QPL M123 parts, it is optional for the GR900 specification devices.

To simplify matters, Kemet has created three test groups which can be specified using the 18th letter of the part number. This denotes whether the parts are to be tested according to standard test group A, B or C, which include from 10 up to 25 individual tests. Each of these standard test groups also offers additional test options and, sometimes, further tests may be added which do not appear in either the standard or optional tests.

Testing to destruction

Destructive physical analysis is included in all of Kemet's test groups and as a standard test for some, but not all, ceramic capacitors. DPA involves testing to destruction samples from the same lot or batch of components which will be used in the final build of the satellite. The resulting analysis of failure modes and the physical remains of the tested components are then sent to the original equipment manufacturer or contract electronics manufacturer.

For the buyer, any test process not only adds to the lead-time, but also adds to the overall costs. Experience and judgement is needed to balance the risk of component failure, and potentially the mission, against the additional cost of testing.

This trade-off, in addition to the differences in the mandatory tests, means that sourcing components for space applications is the easiest part of the process — managing the relevant test process and documentation can be much harder.

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Product specalist, Charcroft Electronics, Roger Tall