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“Militarization” of Commercial Semiconductor Devices

There are a myriad of “building block” semiconductor devices that have supported the high reliability market for more than 60 years by virtue of “MIL SPECS” such as MIL PRF 19500, 38510, 38534, 38535, and others. These products are typically fabricated, assembled, screened, and quality conformance tested per these controlled “Mil Specs” and are typically identified with a JAN prefix (for Discrete devices) or a /883B suffix (for Integrated Circuits). The long history and established reliability data make these devices the “go-to” products for new platform designs.

However, the vast majority of semiconductor devices in the market today are only available as commercial or automotive grade devices that do not meet these stringent Mil Spec requirements, particularly regarding the mitigation of “infant mortality” failures, which is accomplished by performing 100% high temperature reverse bias (HTRB) and/or 100% burn-in to the production lot.

The good news is, commercial or automotive semiconductors can up-screened to “equivalent” Military or Space grade on a lot by lot basis by performing Mil Spec assembly, screening, and quality conformance inspection, using established Mil specs as the guide.

Up-screening can be accomplished by one of 3 options:

1. Procure the hermetic commercial part and up-screen as needed.
2. Procure the plastic commercial part and up-screen as needed, omitting all test requirements for hermeticity.
3. Procure the device in die or wafer form, assemble in the appropriate hermetic package, and up-screen as needed.

An issue with options 1 or 2 is that traceability is limited to the established assembly “date code” only, not diffusion lot traceability (required for Military grade) or wafer traceability (required for Space grade). A date code can include any number of diffusion runs, since this is not a requirement for commercial or automotive grade devices. A date code is typically limited to the assembly sealing of a given population of devices over a 1 week period (maybe longer). Another service offered by ES Components is sorting any given production “lot” of commercial / automotive devices by date code and up-screening each sub-lot as needed.

Once the production lot and screening requirements are defined, ES Components utilizes the capabilities of DLA certified assembly, screening, and QCI Sample Test Labs to provide equivalent Military or Space grade devices per applicable Mil specs or whatever custom flow is required by the end user. We fully support “custom” requirements, and provide full logistics support throughout the process. You place one PO and receive finished goods units.

If Radiation Tolerance is an issue in the application we can provide hermetically sealed samples, serialized and with test data, suitable for testing by the user for application specific radiation performance. Note that Radiation Tolerance can vary from wafer to wafer, so traceability becomes a critical factor, and the Customer assumes lot jeopardy for the results. There is no “fail” criteria.