ENGINEERING PRACTICES STUDY

TITLE: REVIEW RELEVANCE OF DELTA VF TESTING AFTER BURN-IN FOR JANTX/JANTXV RECTIFIER DEVICES FOR MIL-PRF-19500 SPECIFICATION SHEETS /411, /420, /427, AND /429

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FINAL REPORT

Study Conducted by DLA LAND AND MARITIME

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I. OBJECTIVES: The purpose of this Engineering Practice Study was to evaluate a manufacturer submitted proposal to remove post Burn-In (MIL-STD-750, Test Method 1038) delta VF testing for JANTX and JANTXV rectifier devices for MIL-PRF-19500 specification sheets (/411, /420, /427, and /429), and to determine the DoD position regarding these requested changes.

I. BACKGROUND: A manufacturer submitted a proposal to DLA Land and Maritime to remove the delta VF test after burn-in to MIL-STD-750 method 1038 for JANTX and JANTXV rectifier devices for MIL-PRF-19500 specification sheets /411, /420, /427, and /429. Their reasoning is included below in discussion. Actual VF shift data from two manufacturers is attached for review. Some of the data submitted includes increased JANS Burn-In times.

DISCUSSION: Examination of the shift in VF pre-post burn-in for all part types and burn-in durations show typical ΔVF measurement change to be centered at, or just above 0mV. The ΔVF shift distribution is typically contained within ±5mV of the mean. This deviation can be attributed to slight changes in ambient temperature at times of testing, contact resistance if leads have a little oxidation post burn-in, as well as being influenced by tester repeatability.
The ΔVF requirement was added at a time to ensure die-plug bonding remained consistent during the burn-in operation. This has since been replaced in requirement construction guarantee using Thermal Impedance, where each work order is tested to lot norm and design limits. Also wafer fabrication and assembly methods have been vastly improved in the last number of decades. The result of these advances guarantees the construction of the device, the VF characteristic remains constant through AC burn-in for all part types experiencing both JTX and JANS durations.
The important parameter to be monitored for DUT's that have received burn-in is the change in reverse leakage characteristics. This will continue to be monitored as is currently required by MIL-PRF-19500 and relevant slash sheets.

III. RESULTS: The EP study project was opened and an initial draft was posted on the DLA Land and Maritime website and brought up during the JEDEC JC-13.1 and JC-22 meetings. Inputs were solicited from all interested parties using our entire 5961 stock class email distribution list, which included military services, manufacturers, original equipment manufacturers, and user communities. Five comments were received in favor of the proposal. One additional comment received agreed with the proposal, but provided an exception to be aware of. If a manufacturer chooses to use irradiation to reduce the carrier lifetime on the devices, and the burn-in was done improperly and overheated the devices, then the delta VF would drop. The manufacturer would notice this in the delta VF results. Taking this into consideration, the slash sheets where delta VF is being removed, there will be an exception note exempting this allowance if the parts are irradiated to reduce the carrier lifetime.

Example screen 13 note: (1) For JANTX and JANTXV devices, ΔVF may be omitted if thermal impedance is performed, unless irradiation is used to reduce the carrier lifetime.

IV. CONCLUSIONS: The results of this EP study was sufficient to support making the proposed changes and a consensus was reached among the military services, manufacturers, original equipment manufacturer and user communities to remove the delta VF test after burn-in for the listed specification sheets.

V. RECOMMENDATIONS: DLA Land and Maritime recommends that the proposed changes of this EP study be incorporated into the JANTX and JANTXV rectifier specification sheets, /411, /420, /427, and /429.