ENGINEERING PRACTICE STUDY

TITLE: Proposed Changes to MIL-PRF-38535 Concerning Determination of New Technology Requirements in the Appendix H

March 2, 2010

STUDY PROJECT 5962-2009-002

FINAL REPORT

Study Conducted by DSCC

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I. OBJECTIVE: The purpose of this Engineering Practice (EP) Study was to evaluate the requested changes concerning determination of New Technology requirements in the appendix H of MIL-PRF-38535, and to determine the DoD position regarding these requested changes.

II. BACKGROUND: The technological revolution in the integrated microcircuits areas are growing faster than ever, wherein everyday microcircuit manufacturers, original equipment manufacturer and user communities are facing new challenges to fabricate and use high reliable parts and devices in modern military weapon systems and space applications. In early 2008, DSCC received numerous requests from the military services, original equipment manufacturers and user communities for modification of current practices for certification, validation, and qualification requirements for new technologies under Appendix H of MIL-PRF-38535. In response, DSCC brought this issue to the joint JC-13.2 and G-12 committees of JEDEC. The committee members requested DSCC to perform an engineering practice study and formed a JC-13.2 task group to work with DSCC. Accordingly, DSCC conducted an engineering practice study concerning rewrite of Appendix H wherein outlined is a proven baseline that includes details of the certification, validation, and qualification process with emphasis on necessary product characterization, screening, and qualification testing applicable to new technologies. During the MIL-PRF-38535 appendix H rewrite phase numerous co-ordinations were made via teleconferences, surveying questionnaire and meetings among the military services, microcircuit manufacturers, microcircuit distributors, original equipment manufacturers, and user communities.

III. RESULTS: The EP Study project was opened by DSCC-VAC, and an initial draft and working draft revisions posted on the web and distributed to JC-13, G-12, G-11, and Space community's members on May 29, 2009, August 15, 2009 and November 12, 2009 for review and comments. Inputs were solicited from all interested parties, including the military services, microcircuit manufacturers, microcircuit distributors, original equipment manufacturers, and user communities concerning the requested changes in Appendix H of MIL-PRF-38535. Received comments were compiled for review at the JC-13.2 task group meeting on January 13, 2010 of the JEDEC conference in San Antonio, TX.

All received comments were discussed at the JC-13.2 meeting. The major changes of Appendix H are includes:

a) Scope of the new technology under QML program;
b) Characterization requirements: Wherein manufacturers should evaluate their processes to determine the long term reliability of the product and perform detailed characterization plan indentifying critical parameters, test conditions, and analysis physics of failures;
c) Definition of new technology: New technology is defined as a part or product family, material, or process that has never been previously characterized and qualified by the manufacturer for a military or space level application;
d) New technology requirements of class level B and class of level S product;
e) General QML process flows: The general QML process flows for new suppliers, and existing certified suppliers for class level B products (figure H-1), and for class level S products (figure H-2);
f) Overview of QML approval process: This was the most important section wherein many issues were discussed including:
    1) Design, wafer fabrication, assembly and test certification;
    2) Physics of failures/TCV reliability assessment;
    3) Process technology validation/SEC qualifications: Detailed discussed on this issue, and considering applications to class level B product and class level S product, the meeting members reached consensus that life test for class level B product will follow current practices of MIL-PRF-38535, and for class level S, devices shall meet the requirements of current paragraph B.3.4 in appendix B, or shall meet the long term life test of 4000 hrs minimum, or equivalent, on 1 wafer lot.
g) Performance verification: Computer aided design (CAD) simulations performance limits should be deleted;

h) Wafer fabrication: As part of certification, the manufacturer should identify a specific technology or technologies for the wafer fabrication. A technology consists of the fabrication sequence, design rules, and electrical characteristics. Demonstration of wafer fabrication capability consists of the fabrication sequence, design rules, and electrical characteristics, and process information. All supporting documentation and data shall be made available to the qualifying activity before or during technology validation. A plan shall also be presented that provides for an on-going reliability monitor and failure rate calculations;
i) Wafer fabrication checklist for class level S: The meeting members discussed all comments and decided to accept all comments;
j) SPC and in-process monitoring program;
k) TCV verification;
l) Transitional certification and qualification;
m) Assembly process technology testing for plastic packages (table H-IB) wherein ultrasonic c-mode scanning acoustic microscopy (C-SAM) test is added for die attach interconnect and molding.

All concerns and comments regarding the proposed changes, modifications, and additions in Appendix H of MIL-PRF-38535, were unanimously approved and Appendix H changes will be incorporated into the next draft revision J of MIL-PRF-38535.

IV. CONCLUSIONS: The results of this EP Study was adequate to support making the proposed changes and a consensus reached among the military services, manufacturers, original equipment manufacturers, and user communities to add the proposed changes, modifications, and additions for new technology requirements in Appendix H of MIL-PRF-38535.

V. RECOMMENDATION: DSCC recommends that the accepted proposed changes, modifications and new additions for new technology requirements will be incorporated in the Appendix H of MIL-PRF-38535, and the modified Appendix H will be included in MIL-PRF-38535 revision J.