"The Road to Parts Approval and the Role of ESCC"

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The road from a working Mixed-Signal ASIC prototype, hopefully designed and validated according to ECSS-Q-ST-60-02C requirements, into a spaceflight application involves part approval as laid down in the ECSS-Q-ST-60C standard.

This standard defines the requirements for EEE Parts Selection, Control, Procurement and Usage to demonstrate the suitability for on-board applications in accordance with the specific mission requirements. This presentation will provide a brief overview on how this standard applies to components not (yet) space qualified Mixed Signal Monolithic integrated Circuits and how a generic space qualification is achieved under the ESCC system. It will further elaborate on the concept extensions that are presently in preparation for the ESCC system to support the use of patch-work supply chains for the production and procurement of semiconductor devices, including Mixed Signal ICs, which may not yet be foreseen for a full ESCC qualification, in a manner compliant with the ECSS parts approval requirements.

========== End of Short Abstract ==========

The selection of parts is normally based on proven qualification, characterization, and previous space experience and data, and from manufacturers or sources (preferably European) employing effective Product Assurance Programmes in manufacturing and test.

Preference will be given to components which necessitate the least evaluation or qualification effort. Parts chosen from the QPL (Qualified Part List), QML (Qualified Manufacturer List), EPPL (European Preferred Part List) will be preferred because the parts herein have expended this effort to demonstrate their margins and quality.

The ECSS-Q-ST-60C standard does not include the detailed description of requirements related to EEE parts qualification. These Requirements are defined in the ESCC system.

The ESCC System is a self-standing system of component specifications which provides the technical specifications of EEE parts for parts procurement, methodologies for component evaluation and qualification and listing in EPPL, QPL, QML, test methods, quality assurance requirements and operational provision for the overall system and participating organizations.

Different but equivalent and similarly structured approaches to ESCC Qualification are possible: Component Qualification for standards parts (ESCC 20100), Capability Approval for customized or application specific components (ESCC 24300), Technology Flow Qualification for stable and reliable manufacturing technology flows (ESCC 25400).

The ESCC Component Qualification Approval is the ESCC quality assessment technique designed to certify that individual components, ranges of components or structurally similar components are of appropriate performance and reliability for use in space applications. The approach is applicable to components of standard design which are in continuous or repetitive lot by lot production. This method has been widely applied to a family of ICs such as the 54HC or the CMOS SOS PLL Frequency Synthesizers.

The existing ESCC Capability Approval is the ESCC quality assessment technique designed to certify that a manufacturing capability within a specified technology domain is of appropriate performance for use in space applications. The system is applicable to components manufactured in relatively small quantities for use in unique applications where manufacturers technology, materials and processes are used to fabricate components customized to specific user requirements. This approach has been successful in qualifying custom ASICs and GaAs foundries, for example.

The existing Technology Flow Qualification is the ESCC quality assessment technique developed to ensuring the reliability and performance of space components whilst maximizing the benefits of the manufacturers best practices. The Technology Flow Qualification system is designed for component manufacturing technology flows that combine effective quality management techniques with stable and reliable technologies that are supported by quality improvement and Technical Review Board (TRB) principles. Technology Flow Qualification is suitable for both standard continuous lot by lot production components and non-standard components that have design features customized to specific user requirements. It represents the widest range of qualified components defined in a technology domain.

A new concept is currently under discussion at ESA: The ESCC Process Capability Approval certification (PCA). The ESCC PCA will be based on the existing Capability Approval certification approach. However the main difference is that it does not necessarily aim at the ESCC

qualification of the final products. The new ESCC PCA certification is aiming at defining the ESCC quality assessment criteria to certify that “patchwork” supply chains typical of Mixed Signal ASICs and individual manufacturing processes and technologies, to allow the demonstration that the set of entities and practices will provide for appropriate performance and reliability for use in space applications.

With the ESCC PCA Certification in the future we hope to make life easier for fabless manufacturers, Assembly and Test Houses, etc. to be recognized and listed as ESCC certified suppliers.

All ESCC Specifications are in the public domain of the ESCIES web site. The web address is https://escies.org.