ASSESSMENT OF ECSS-Q-ST-60-13 FOR COTS PASSIVE COMPONENTS

M.SÁNCHEZ, SPCD 2022

ALTER TECHNOLOGY

TABLE OF CONTENTS

TASK INTRODUCTION

OBJECTIVES OVERVIEW

TASK 1

TASK 2

TASK 3

TASK 4

ALTER TECHNOLOGY

TABLE OF CONTENTS

CONCLUSION

ACKNOWLEDGEMENTS

ALTER TECHNOLOGY

TASK INTRODUCTION

- ✓ Task 1: Inventory & Test Reports Collection: this consists of the collection of test reports of previously procured commercial EEE parts in the frame of ESA projects.
- ✓ Task 2: Parts Procurement Selection & Test Plan Definition: consists of the selection of passive components' technologies, types and related part numbers. In addition, Task 2 consists of the definition of the test plan according to the proposed one in ECSS-Q-ST-60-13C rev1.
- ✓ Task 3: Parts Procurement & Testing in accordance with the test plans defined during task 2.
- ✓ Task 4: Parts Selection: this task will consist of selecting the most interesting components to be stored as per centralized storage.

OBJECTIVES OVERVIEW

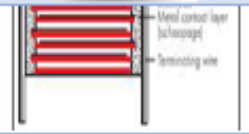
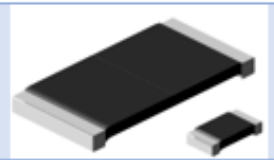
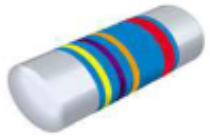
With the performance on these four tasks, we aim to reach the following objectives:

- Collect the information available for passive COTS components in the recent ESA programs.
- Selection of commercial passive parts considered interesting from the technological or performance point of view and to apply the existing test flow defined in ECSS-Q-ST-60-13 Rev.1.
- Proceed with the test.
- Deep review of the test results and discussion about how the test performed in accordance to forthcoming ECSS document have been able to evaluate/screen/qualify commercial components. Pros and cons of the new approach will be gathered as well as proposal for improvement for the ECSS-Q-ST-60-13C Rev1 in case is needed

TASK 1

Project	Status
Lisa Pathfinder	No commercial parts used. Not all parts in space grade "High-rel" but upscreening from commercial parts philosophy was not already used
Solar Orbiter	Included. Few commercial parts + upscrenning used (pioneer). Additional testing performed over high-rel/space parts but out of COTS approach for this reporting contract
Sentinel-3	No (Commercial parts + upscreening) performed by ALTER procurement
BepiColombo	Only two commercial parts + upscreening. Performance was not available in Space parts
MTG	No (Commercial parts + upscreening) performed by ALTER procurement
Euclid	No (Commercial parts + upscreening) considered for ALTER procurement. Additional test performed but for delta characterization over space parts (mostly Cryogenic). Commercial parts+upscreening were accepted but out of CPPA framework and therefore these data can't be shared as part of this study
JUICE	Included, important consideration for COTS+upscreening, mainly on active devices

TASK 2

Family		Part Number	Part Type	Manufacturer
Capacitors		06035C104K4T2A	0603 Type II (X7R) 100nF 10% 50V	AVX
Capacitors		MKS4F051506I00KSSD	MKS4 15uF 10% 250V 2-pin	WIMA
Capacitors		T541X337K010AT6730	T541 330uF ±10% 10V Case X	Kemet
Capacitors		C0603C105K8RACAUTO	0603 10VDC 1uF 10% X7R AEC-Q200	Kemet
Capacitors		A798D477M2R5ATE009	A798 470uF 2.5V 9mOhm AEC-Q200	Kemet
Resistors		CRCW080510K0FKTA	CRCW0805 10K 1% 100ppm/°C 1/8W	Vishay
Resistors		WSL2512R1000FTA	WSL2512 0.1 Ohm 1% 1W	Vishay
Resistors		CMB02070X1002FB200	CMB0207 10K 1% 0,4W 500V MELF	Vishay Beyschlag

TASK 3

Description	Part Number procured	Mnfr	Test @ ALTER
Automotive MLCC, multiple chip size 0402, 0603, 0805, 1206, 1210, 1812	06035C104K4T2A (0603 Type II (X7R) 100nF 10% 50V)	AVX	Constructional Analysis Life test + temperature characterization
Metallized Polyester (PET) Capacitors 0.01 µF to 10 µF, 50 to 630Vdc	MKS4F051506I00KSSD (MKS4 15uF 10% 250V 2-pin)	Wima	Constructional Analysis Life test
Polymer Electrolytic High Reliability series (HRA) 2.5 to 63Vdc	T541X337K010AT6730 (T541 330uF ±10% 10V Case X)	Kemet	Constructional Analysis Life test already performed as part of EPPL documentation
MLCC Automotive grade X7R dielectic, 6.3 to250Vdc	C0603C105K8RACAUTO (0603 10VDC 1uF 10% X7R AEC-Q200)	Kemet	Constructional Analysis

TASK 3

Description	Part Number procured	Mnfr	Test @ ALTER
Surface Mount Aluminum Organic Capacitor 2-25V	A798D477M2R5ATE009 (A798 470uF 2.5V 9mOhm AEC-Q200)	Kemet	Constructional Analysis
Lead (Pb)-Bearing Thick Film, Rectangular Chip Resistors 1R to 10M, 100 and 200ppm/K	CRCW080510K0FKTA (CRCW0805 10K 1% 100ppm/ºC 1/8W)	Vishay	Constructional Analysis Life test
Power Metal Strip® Resistors, Low Value (Down to 0.0005R), Surface-Mount	WSL2512R1000FTA (WSL2512 0.1 Ohm 1% 1W)	Vishay Dale	Constructional Analysis
High Pulse Load Carbon Film MELF Resistors	CMB02070X1002FB200 (CMB0207 10K 1% 0,4W 500V MELF)	Vishay Beyschlag	Constructional Analysis

TASK 4

Part Number	Part Type	Manufacturer	Supplier	ATN storage
06035C104K4T2A	0603 Type II (X7R) 100nF 10% 50V	AVX	Mouser	142
MKS4F051506I00KSSD	MKS4 15uF 10% 250V 2-pin	WIMA	Mouser	47
T541X337K010AT6730	T541 330uF ±10% 10V Case X	Kemet	Kemet (FoC)	93
C0603C105K8RACAUTO	0603 10VDC 1uF 10% X7R AEC-Q200	Kemet	Mouser	193
A798D477M2R5ATE009	A798 470uF 2.5V 9mOhm AEC-Q200	Kemet	Kemet (FoC)	93
CRCW080510K0FKTA	CRCW0805 10K 1% 100ppm/ºC 1/8W	Vishay	Mouser	95
WSL2512R1000FTA	WSL2512 0.1 Ohm 1% 1W	Vishay	Mouser	193
CMB02070X1002FB200	CMB0207 10K 1% 0,4W 500V MELF	Vishay Beyschlag	Mouser	193

CONCLUSION

- Most devices selected AEC-Q200. The especial consideration of these parts in of ECSS-Q-60-13C Rev1 is a natural step. Constructional analysis performed reinforces the maturity and robustness of these components, making them especially suitable as potential candidates for New Space missions.

- Samples from MLCC capacitors and Thick film resistors were submitted to 2000 hours duration life test over 40 and 54 pieces respectively. The reason behind performing this demanding test over these particular families is linked to their massive introduction for New Space projects. In both cases, the results showed no anomalies and confirming the suitability of these parts for certain missions.

- CSAM has not been performed on the parts. The potential ingress of humidity on tested plastic parts and its link with delamination degradation has not been studied in this case.

- Two types from WIMA and Vishay Beyschlag have been submitted to CA. In the case of WIMA capacitors, life test has been performed to the same conditions of Space parts showing no significant degradation.

ACKNOWLEDGEMENTS

- Manufacturers: All manufacturers involved, especially Kemet and Wima

- ESA TECHNICAL OFFICE: Mr. Léo Farhat & Mr. Joaquín Fernández

THANK YOU!

Manuel Sánchez
manuel.sanchez@altertechnology.com
+34 664 703 203

www.altertechnology-group.com
info@altertechnology.com
+34 95 446 70 50

ALTER TECHNOLOGY