ESA ESCCON 2021 Presentation





Overview of ESA specification ESCC 2567000 - Requirements for process capability approval of Assembly and Test House (ATH) services from an industry perspective



• Micross Company Overview & Space Heritage

• ESA ESCC Basic Specification # 2567000 overview and method route for Process Capability Approval certification from an Industry perspective

Conclusion



Mission Statement : To support customers' system-critical requirements through delivering Hi-Rel microelectronic solutions, assemblies, components and services on-time and to specification

- 40+ Years experience serving Aerospace, Defense, Subsea Oil & Gas, Space, Industrial & Medical Markets
- Unique 'One Source. One Solution' global turnkey solution
- **Broadest** *Single-Source* provider of Hi-Rel post-foundry services
- Quality Accredited across all sites



8 Global Operating Facilities; 2 International Sales Offices







6 Value Streams to Achieve the Hi-Rel Solution

M micross

one source. one solution.



Quality Certifications

AS9100/ISO9001 • ISO14001 • JOSCAR Registered • HM Government - Cyber Essentials • ITAR Registered



M micross

one source, one solution.

Space Heritage & Capabilities

Microelectronics applications present in all of the three main types of satellite activity:







NAVIGATION

Satellite Applications	Programme count
Earth Observation	12
Navigation	6
Science Instrumentation	9
Communications	3
TOTAL	30

* Credit: Satellite Applications Catapult



Space Products & Capabilities

Full TurnKey Flight Model Solution
Comprehensive Test Capability including
Mixed Signal ASIC

In-house Test Hardware And Software
In-house Burn-In Platform Development

High Pin Count CQFP And CGA Packaging

Monolithic & Multi-Chip Modules

· Column Grid Array (CGA) QML Certified Line

CTE enhancement of lead-less carriers (BTCE)

Broad Component Expertise

Highest Level of Quality & Customized Support

Customized Customer SCD's
Radiation Testing Support

radiation rooting capport

ESA ESCC 9000 Component Processing

MIL-PRF-38535 V-Level Assembly

MIL-PRF-38534 Class K

www.micross.com

Support Chip Design & Wafer Fabrication

Wafer Probe

Wafer Saw

Die Inspection

Hermetic Packaging Design & Selection

> Assembly Including CGA

Environmental Screening

Electrical Test & Burn-In

Lot Validation Tests

Fully Qualified Flight Model

Space Heritage & Capabilities



In advanced stages of fulfilling the requirements for Process Capability Approval for Assembly & Test Services pursuant to ESA specification ESCC 2567000 Issue 1:



ESA Contract #: 4000129705/20/NL/KML/ig



Purpose & Scope

The purpose of ESCC specification #: 2567000 is to define the requirements for the Process Capability Approval (PCA) of hermetic assembly, packaging and test services for an assembly and test¹ houses (ATH), for components intended for space applications.

Domain of Certification as per definition in the Capability Abstract

Note 1: Electrical test capabilities certified in accordance with this specification shall be limited to those required to verify the quality of workmanship of the assembly process. The electrical verification (characteristics, performance, parametric, functional, speed, etc.) of any devices manufactured within the certified domain is not part of the domain. Similarly, the verification by test of other device features like thermal dissipation or power handling are also excluded from the certified domain.



Overall requirements, work packages, work breakdown structure and project plan

- Overview of technical requirements (4 Work Packages | 5 Deliverables):
- Work Package 1 (WP1) PCA Domain & Boundaries deliverables:
 - (D1) Capability Abstract
 - (D2) PID
- Work Package 2 (WP2) Evaluation of PCA domain and the ATH deliverables:
 - (D3) Technical note 1: Manufacturing & test data review
- ESA site visit and Audit report
- Work Package 3 (WP3) PCA testing deliverables:
 - (D4) Technical note 2: Test vehicle definition & Test plan
 - Test Readiness Review (TRR)
 - (D5) Technical note 3: Test report
- Work Package 4 (WP4) Data pack & final review deliverables:
 - Abstract (AB), Brochure (BR), Technical Achievement Summary (TAS), Final Presentation (FP), Summary Report (SR), Executive Summary Report (ESR), Final Report (FR), Contract Closure Documentation (CCD)
 - Test Review Board (TRB)

ESA ATH PCA Approval & Certification

Overall requirements, work packages, work breakdown structure and project plan



			•	
Task	Task-ID	WBS ID	Task Name	Duration
1		1	RC1710 - PCA of ATH Services Project	256 days
2	WP1-0	1.1	WP1: PCA Domain and Boundaries	30 days
3	WP1-1	1.1.1	Task 1: Compilation of Capability Abstract and PID	30 days
4	WP1-2	1.1.1.1	Data collation and document editing	20 days
5	WP1-3	1.1.1.2	Deliverable 1 (D1): Capability Abstract	10 days
6	WP1-4	1.1.1.3	Deliverable 2 (D2): PID	10 days
7	WP2-0	1.2	WP2: Evaluation of PCA Domain and the ATH	50 days
8	WP2-1	1.2.1	Task 2: Review of existing test results	40 days
9	WP2-2	1.2.1.1	Data collation and document editing	25 days
10	WP2-3	1.2.1.2	Deliverable 3 (D3): Technical note 1 (TN1) Manufacturing & test data review	15 days
11	WP2-4	1.2.2	Task 3: ATH Audit and Manufacturer Data Review	10 days
12	WP2-5	1.2.2.1	ESA Audit	2 days
13	WP2-6	1.2.2.2	If applicable: Completion of relevant sections of ESCC basic specification No. 2026000	10 days
14	WP3-0	1.3	WP3: PCA Testing	151 days
15	WP3-1	1.3.1	Task 4: Definition of Test Vehicles and Test Plan	21 days
16	WP3-2	1.3.1.1	Deliverable 4 (D4): Technical Note 2 (TN2) Test vehicle definition and test plan	20 days
17	WP3-3	1.3.1.2	Test Readiness Review (TRR) 1	
18	WP3-4	1.3.2	Task 5: Process Capability Approval Testing	130 days
19	WP3-5	1.3.2.1	Test Vehicle Production (assembly & test)	55 days
20	WP3-6	1.3.2.2	Test Vehicle - Chart I of ESCC basic specification No. 2567000	55 days
21	WP3-7	1.3.2.3	Deliverable 5 (D5): Technical Note 2 (TN3) Test report	20 days
22	WP4-0	1.4	WP4: Data Pack and Final Review	25 days
23	WP4-1	1.4.1	Final Documentation: Data Collation & Editing	25 days
			Abstract (AB), Brochure (BR), Technical Achievement Summary (TAS), Final Presentation (FP),	
24	WP4-2	1.4.1.1	Summary Report (SR), Executive Summary Report (ESR), Final Report (FR), Contract Closure	25 days
			Documentation (CCD)	
25	WP4-3	1.4.1.2	TRB	1 day

M micross

one source, one solution.

ESA ATH PCA Approval & Certification (WP1)

PCA Domain & Boundaries

Capability Abstract



Process Identification Document (PID)

Production of flight model ASICs qualified for Space applications encapsulated in hermetically sealed Ceramic Quad Flat Packages (CQFP)



micross

one source, one solution.

.

ESA ATH PCA Approval & Certification (WP1)

PCA Domain & Boundaries

Capability Abstract



Process Identification Document (PID)

Production of flight model ASICs qualified for Space applications encapsulated in hermetically sealed Ceramic Quad Flat Packages (CQFP)

- Dice technologies: Silicon based processes from a single foundry
- Package types: CQFP's (High Temperature Co-fired Ceramic (HTCC) cavity packages)
- Assembly processes, materials inspection, testing capabilities and traceability in accordance with the PID.

	Step	Operation	Process Spec
	1.	Die Visual	
		Inspection	
	2.	Crop Ty Bar	
	3	Package	
		Inspection	
		Serialize Base of	
	4.	Package	
		(Optional)	
	5.	Die attach	P018
	6	Die attach	0020
	0.	inspection	Q029
	7.	Wire bond	P021
	8.	Bond pull test	O027 / P032
			2
	0	Wire bond	0020
	9.	inspection	Q029
		Internal	
	10.	inspection	Q029
		Independent	
	11.	precap inspection	
	10	Independent Die	0020
	12.	chear	Q039

Step	Operation	Process Spec
13.	Independent Bond pull test	Q027 / P032
14.	Pre seal bake	P025
15.	Lid seal	P034
16.	Lid seal inspection	Q030
17.	Part Marking	P109
18.	Stabilisation Bake	P025
19.	PIND	P086
20.	Fine Leak	P024
21.	Gross Leak	P023
22.	Crop Ty Bar	
23.	Pre Burn-In Electrical test	P115
24.	External visual	Q032

Evaluation of PCA Domain

Set of documentation on the basis of previously manufactured "test vehicles" as defined within the Domain of Certification as defined in the Capability Abstract. This included but where not limited to:

- PID
- Micross assembly & test instruction pack
- Completed travellers (batch cards)
- Wafer level processing, Assembly & Test reports containing production process control test results as well as Lot Acceptance Testing qualification reports
- Independent Pre-encapsulation inspection report

NCross

one source, one solution

.

ESA ATH PCA Approval & Certification (WP3)



Test vehicle definition, manufacturing and reports

Test vehicle definition in accordance with capability abstract for certification domain







ESA ATH PCA Approval & Certification (WP3)



15

INTEGRATED CIRCUITS:

MONOLITHIC AND MULTICHIP MICROCIRCUITS,

WIRE-BONDED, HERMETICALLY SEALED

AND

FLIP-CHIP MONOLITHIC MICROCIRCUITS.

SOLDER BALL BONDED, HERMETICALLY AND NON-HERMETICALLY SEALED

AND

DIE

ESCC Generic Specification No. 9000

Chart F4

Target completion date:

Q2-2021

Test vehicle definition, manufacturing and reports

Chart I of ESCC basic specification No. 2567000





Conclusions

 Work Package 4 to complete by the end of H1-2021 with TRB tentatively scheduled for end of July 2021

 ATH PCA specification & accreditation process provides an opportunity for the Space community to have a mechanism for qualifying Space level workmanship for Space grade components with a higher degree of confidence

 Micross has found the accreditation process as an excellent auditable vehicle to review established processes and as an opportunity to strengthen the organisational disciplines in support of manufacturing the highest quality of Space qualified flight components