Request for proposal from vendor to Fabricate, testing and Screening of Space Qualified 112SS Hybrid Microcircuits.

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1 Introduction

The URSC (U R Rao Satellite Centre) is a key unit of ISRO, responsible for designing and developing communication, navigation, and remote sensing satellites for Indian space programme. URSC is currently seeking proposals from Indian industries with qualified expertise in manufacturing space-qualified hybrid microcircuits. It is intended that an Indian industry who are having manufacturing line of Thick Film Hybrid Microcircuits in India and having experience in delivering space qualified HMCs shall be considered for bid to carry out the tasks described in this document.

2 Scope of Document

This document serves as an invitation for offers related to the **manufacturing** of **Hybrid Microcircuits (HMCs)**. The scope of work includes **fabrication, testing, and screening**.

The document is organized into three parts:

1. **Scope and Description**: This section outlines the work scope, describes the tasks, specifies the mode of operation, and provides precautions to be followed during execution. It also outlines the responsibilities of both vendors and URSC.
2. **Activity and Responsibility Matrix**: The second part includes matrices for activities and responsibilities, screening tests, **Destructive Physical Analysis (DPA)**, and documentation requirements.
3. **Formats for Data Packs**: The third part presents the formats for the fabrication data pack and screening data pack.
4. **Bill of Materials and drawings**

Additionally, the **Process Identification Document** may be periodically updated based on joint working experiences between URSC and the vendor(s) to ensure product quality.

3 Abbreviations

ATC- Active Thermal Cycle
BOM – Bill of Material
DPA- Destructive Physical Analysis
ESD- Electrostatic Discharge
FIM – Free Issue Material
HMC – Hybrid Microcircuits
ISRO-Indian Space Research Organization
LAT -Lot Acceptance Test
NDA- Non-Disclosure Agreement
PID – Process Identification Document
PIND- Particle Impact Noise Detection
PFT- Printing Firing and Trimming
QA- Quality Assurance
SCS – Specification Control Sheet
SIL-Single in-Line
URSC-UR RAO Satellite Centre

Part-I

4 Scope of Work:

The vendor is tasked with manufacturing **112SS HMCs** based on the Engineering drawings supplied by URSC.

These specified types are intended for the **flight** usage.

5 Work progression.

The work progression is depicted in the table below, along with the corresponding completion timeline.

After the award of P.O.	To
Vendor Activity: completion of procurement of mechanical packages and raw materials	T1=To +15 weeks
Vendor Activity: Collection of FIM.	T2=T1+1 weeks
Vendor and URSC Activity: Submission of first batch of 100 no. HMCs along with data pack followed by clearance from URSC-QA	T3=T2 + 8 weeks
Vendor and URSC Activity: Subsequent batches shall be delivered for every 8 weeks till total 700 numbers of HMCs is delivered	T4= T3 +48 weeks

Figure 1. Work progression of manufacturing 112SS and overall delivery schedule

6 Statement of Work

The scope of work encompasses the procurement of packages, and raw materials, followed by the fabrication, testing and screening of HMCs by the vendor. Detailed responsibilities, working methods, and test matrices have been provided to enable vendors to evaluate the scope of work and submit a commercial offer.

The vendor's responsibilities include the following tasks:

- **Procurement of HMC Packages and Raw Materials**
- **Collection of FIM from URSC**
- **Flight HMC realization** as per the **Process Identification Document** approved by URSC/ISRO
- **Fabrication Data pack/Specification Control Sheets (SCS)**
- **Submission of samples** for **testing the quality of manufactured HMCs**
- **Screening of HMCs** as per URSC procedure
- **Screening Data pack/SCS**

It's essential that the vendor has the necessary facilities to carry out all processes. **Outsourcing any process to a third party is not accepted.**

7 Work description

Vendor must manufacture 112SS HMCs and quantity details is given in Table 1

Table 1. Quantity details of 112SS HMC to be fabricated

Sl. No	HMC art no.	Qty
1	112SS	700

7.1 Work 1: Fabrication

- The substrate size and fabrication Type
  - Substrate size is 0.7inch x 0.7inch
  - Single Layer/ Crossover HMCs
- Mechanical Package type
  - Ceramic Flat package (details is given in Part-IV)

7.1.1 Stages of Procurement of Mechanical Packages and Raw Materials

Vendor shall

a. Procure all materials (printing inks, adhesives, wire/ribbons, packages, cleaning agents, SIL clips, solders etc.) from sources approved by URSC.

b. Submit samples for adhesives for out gassing tests to URSC and obtain approval for use.

c. Use shelf-life limited items before date of expiration specified by the manufacturer.

d. Perform LAT tests on packages and submit test data to URSC for approval.

e. Perform Incoming goods inspection for each material and submit data in specified format **(Table 10)**.

7.1.2 Collections of Free Issue Materials

The Selected contractor responsible for producing HMCs is required to collect the components from URSC as FIMs in batches, adhering to the delivery schedule outlined in the contract terms. These materials will be issued upon receipt of a guarantee or insurance from the vendor, which will be returned upon contract fulfilment. Any spare components that remain unused must be returned to URSC. Additionally, the vendor is obligated to keep a record of FIM usage, which must be presented as **consumption report** at the end of the final batch delivery or whenever based on the URSC demand.

7.1.2.1 Cost of FIM for Single batch

Table 2. Cost of FIM for single batch

HMCs	Qty	Components Cost per unit HMC in INR	Total cost per batch in INR
112SS	100	161,560	1,61,56,000

The vendor must insure a minimum of three batches worth of costs and can receive FIM in accordance with their production plan. The vendor can collect a maximum of 300 units of FIM at any given time,

up to the insured amount. When FIM is exchanged for 112SS HMC as product delivered, the corresponding number of FIM units will be subtracted as per the list mentioned in Table 3.

Table 3. Cost of FIM for Single 112SS HMC.

DICE as FIM per HMCs				
DICE	**Part No.**	**QTY/HMC**	**Cost/DICE**	**Total**
MOSFET DICE	2N7389	4	37,350	1,49,400
Transistor DICE	2N3019/2N3700	4	1,500	6,000
Diode DICE	IN4148/1N3070/1N6642	4	770	3,080
Zenor Diode DICE	1N759/1N6326	4	770	3,080
			Total Cost/ HMC	1,61,560

7.1.3 Stages of Manufacturing and delivery

The necessary details for manufacturing Space Qualified HMC, including package drawings, package outlines, marking details, component lists, materials, pin configurations, and approved layouts, are provided in **Part-IV**. The various stages involved in the manufacturing and delivery of Space Qualified HMC are explained in the following sections.

7.1.3.1 Applicable standards and process identification document (PID) for reference

a) The standards/ specifications spelt out in the latest ISRO-PAS-206 issue 4 dated November 2012 will form the basis for execution of all tasks.

b) Vendor's PID (Process Identification document) approved by URSC shall form basis for all the activities to be performed by Vendor. HMC fabrication process, materials, operators, equipment, and practices as listed in the PID approved by URSC/ISRO has to be strictly followed during realization of this product.

c) Incremental PID for the new processes, in case of need arises, are to be generated and submitted to URSC for review. Necessary technical support/guidance will be provided by URSC to generate this part of PID.

d) The process steps as listed in approved PID and PID duly approved by URSC/ISRO (for new processes) is to be followed at every stage of product realization.

7.1.3.2 Fabrication

a) Fabricate Products as per Process Identification Document (PID) duly approved by URSC (no deviations from approved process are permitted).

b) Activities and URSC Inspection check points that are to be carried out during fabrication and post fabrication are as given in **Part-II, Table 7**.

c) Document all process details in Specification Control Sheet (SCS) formats. Sample templates are given in **Part-III** of the document.

d) Perform inspection of Products on 100% basis at various stages of fabrication as per approved procedure and document along with SCS.

e) Submit HMCs for Precap Visual Inspection by URSC.

f) Submit Pre and Post-seal electrical test results (100%) along with test certificates.

g) Submit SCS for review/ approval and obtain clearance for Screening.

Return all unused components together with list of appropriate inventory/consumption report.

7.2 Work 2: Screening

Screening of HMCs to be done as per Section 20 in Part –II of the document.

7.2.1 Screening

a) Vendor is responsible for carrying out Screening of HMCs as per the requirements spelt out in **Part-II, Table 8**.

b) Initiate Screening only after receiving Fabrication clearance from URSC.

c) After completion of Screening, samples (as per the requirement provided by URSC) shall be subjected to DPA as per requirements given in **Part-II, Table-9.**

d) Document all test results in the Screening Document formats and deliver them along with the products.

7.2.2 Data Pack

a) Specification Control Sheet (SCS) detailing the Parts, Materials and Processes used for realization of HMCs shall be submitted to URSC for each batch separately prior to initiation of Screening HMCs.

b) After completion of Screening, HMCs shall be delivered to URSC along with Screening data pack for each batch.

7.3 Test Jig requirement for functional tests and Screening of the HMCs

URSC will supply the functional test and screening jigs, that are available through URSC stores based on the vendor's insured amount (covering all risks for the entire period including transit) against jig's cost. Upon completing full delivery of HMCs, vendor must return the jigs to URSC in working condition. Damaged jigs will not be accepted, and the vendor will be responsible for the cost of any damages incurred.

Table 4. Cost of the Jigs for the HMCs

Item	Total cost in INR
Jig for Functional testing of 112SS (1 No.)	72000.00
Jig for screening and testing of 112SS (1 No.)	371800.00

For Screening and testing at least 13 number of Screening Jigs are required to complete one batch quantity within URSC specified time. Hence insurance should cover the cost of

- One functional test jig and
- Thirteen Screening and testing jigs.

7.4 Rework guidelines and history

Rework on any HMC should be done based as per the approved PID. All rework done on any HMC should be properly documented in SCS.

7.5 Non-Conformance Management

Any Non-conformance during realization/ testing of product is to be presented to URSC before proceeding further with fabrication/ testing. Corrective/ preventive actions suggested by URSC are to be implemented at free of cost.

8 Working Modality

Vendor shall identify one or more focal point/s for interaction with URSC for execution of tasks. The identified focal point should preferably be a senior person who will be able to provide any clarification and take decisions as required. URSC may identify one or more Contract Managers/ Focal Points for day-to-day interaction with the vendor and for execution of the tasks.

Responsibility of vendor focal point shall be as given below for various Tasks.

a. Collection of required HMC design details, fabrication details, FIM and test procedures.
b. Submission of samples along with precap electrical test results to URSC for precap inspection before sealing (will be returned to vendor).
c. Submission of SCS of fabrication (up to precap stage) to URSC for sealing clearance.
d. Delivery of Products after testing along with testing data for the complete batch.
e. Delivery of Products after screening along with screening data for the complete batch.

9 Shipping and storage of bare, semi and finished products

9.1 FIM transit

Vendor shall collect ESD prone FIM from URSC in a safe ESD containers and will shift immediately to desiccators for storage once it reaches at HMC plant site.

9.2 Despatch of Products

Vendor shall supply semi-finished and finished Products in ESD safe containers (as applicable) along with data pack and shall take necessary steps for protection against moisture, contamination and use mechanical damage proof packing during transit.

a. Submission of samples of Products (10% of the batch) to URSC for precap inspection before sealing/ encapsulation (will be returned to vendor).
b. Delivery of all fabricated and Screened HMCs along with the SCS and SD for the complete batch.

9.3 Acceptance of Products

Manufactured products will be accepted by URSC after

- Review of Screening data.
- External visual inspection
- Verification of test results through electrical checks.
- Package drawing is verified as per supplied drawing.

9.4 Handling, Storage, Packing and ESD Protection

Guidelines given below shall be followed as a minimum during handling, storage, and packing.

a) Handle all materials with care while processing and safety precaution followed as per technical manuals/ data sheet supplied by the manufacturer/s.
b) Following precautions shall be taken to prevent failures due to Electro-static discharge (ESD)

- Use of wrist straps while handling assembled substrates & devices and connecting wrist straps to thick grounding lines and proper anti-static mats.
- Use of antistatic wrist strap, tablemats and ground mats during assembly inspection and testing of Products.
- Use of antistatic gloves during sealing of Products &carrying sealed packages in antistatic boxes.
- Use of Teflon tweezers and finger cots while handling metallised substrates.
- Use of metallic trays covered with lids (glass) while transporting products from one work area to another during their assembly.

c) Precap HMCs/ Partially fabricated HMCs supplied to URSC shall be delivered in Nitrogen purged desiccators.
d) Use of Proper sockets to avoid damage to leads during all tests.
e) Caution shall be exercised to avoid damage to Products due to ESD/ EOS during all electrical tests.
f) Storage of all fabrication materials as per the instructions given in the technical manuals/ data sheet supplied by manufacturer/s.
g) Use of Nitrogen purged systems for storing the bare chip components.
h) Use of Nitrogen purged systems for storing half assembled products.
i) Storage of photo-sensitive films in dark room and limiting their exposure to yellow light while handling/ using.
j) Adequate and exclusive storage at vendor facility for Gaganyaan items
k) Random inspection by QA/URSC in addition to the planned periodic inspections.
l) Camera Surveillance of the entire process and storage-footage to be retained for a period as identified by URSC.

10 Responsibility Definition

The responsibilities of URSC and the vendor during various technical activities given below are to be read along with Annexures 2 & 3.

10.1 URSC will be responsible for the following:

a. Placing of Purchase orders along with providing HMC design details (Circuit Schematic, Approved Layout, Bill of Materials etc.) and other fabrication details.
b. Providing FIM against insurance.
c. Mandatory Inspection Checkpoints (QA activities) like Precap Visual Inspection, Fabrication data pack review and clearances as per **Table-7**.
d. Providing all test procedures including Functional and Burn-in test procedures
e. Providing training for Functional & Burn-in testing of HMCs
f. Providing Test and Burn-in Jigs necessary for Screening against insurance.
g. Audit the vendor facility and advice on improvements if necessary.

10.2 The vendor shall be responsible for the following:

a. Raw Materials/ Packages with details such as lot number, manufacturer etc. The materials imported against submission of specific assurances to the foreign Governments while their import will be highlighted.
b. Fabrication of HMCs as per approved PID.
c. Inform URSC about schedule for pre-cap inspection at least one week in advance (URSC may depute its representative for performing pre-cap).
d. Submit SCS for review/ approval and obtain clearance for Screening.
e. Screening of HMCs and Destructive Physical Analysis (DPA) on samples as per requirements of URSC.

f. Proper Storage and maintenance of jigs as supplied by URSC and return the same to URSC after execution of the work.
g. Document all process details and test results in the specified formats and deliver them along with the products.
h. Packing of HMCs in ESD safe boxes as mentioned in **Section 9**.
i. Vendor shall
   - *Set up an internal system (through NC board) whereby all non-conformances noticed during execution of the tasks are properly recorded and reported within their own system as well as to URSC. The system will specifically address the procedures and responsibilities of personnel/ teams for disposal of 'minor' non-conformances. The failure analysis along with NC board recommendation to be provided to URSC for consideration*
   - *Use all technical data supplied by URSC only for the intended purpose for which it is given. In no case the technical data shall be discussed or shared to any third party.*
   - *Participate in reviews related to failure of Products and carry out failure analysis based on deliberations and implement identified corrective actions.*
   - *Submit all documents as 'hard copy' as well as the 'soft copy (scanned) in Compact Disc' along with the Products as per Table 6.*

11 Vendor Liability

If any products fail during testing, whether performed at the vendor's location or elsewhere before acceptance by URSC, the vendor is responsible for replacing or reworking them at no cost. If the failures are due to reasons other than defective components, the vendor must cover the cost of all necessary components for re-fabrication. Additionally, in the case of batch rejection for reasons other than defective components, the vendor is liable for re-fabricating and screening all products in the batch. Alternatively, the vendor may accept order cancellation as per URSC's decision, in which case they must refund the cost of components to URSC. Furthermore, if products fail during re-screening due to testing or related reasons, the vendor must refund the cost of rejected HMC products, including both manufacturing and component costs, as determined by URSC.

12 Status Reports and Plans

The vendor shall provide status report on various activities related to fabrication and testing of products. This report shall be submitted fortnightly. It shall also include the projections on activities planned and targeted during the following month.

13 Delivery Schedules

Vendors are required to provide clear delivery schedules for various tasks, considering the quantities to be delivered. The quotation should include the following details.

1. **Procurement Schedule**: This covers raw materials, and HMC packages.
2. **Fabrication and Testing Schedule:** This includes components inspection, fabrication process, testing, screening and final delivery.
3. **Batch Fabrication Details:** Vendors must indicate the batch size and provide a complete delivery schedule from the first to last batch. Additionally, the delivery schedule must align with one provided by URSC in Section 17.2

14 Vendor selection criteria

The vendor must comply with URSC's technical and commercial requirements.

Also, Vendor must

- have complete thick film HMC manufacturing line in India certified for manufacturing space grade HMCs.
- must have manufactured and delivered space grade HMCs to any space agencies.
- provide details like make, model, year of purchase etc. of thick film infrastructure facility screen printer, screen preparation equipment, screen exposure unit, screen cleaning equipment, Thickness measurement unit, firing furnace (up to 1000°C), Microscope (magnification of about 250x to 400x), laser trimming system, laminar flow table of class 100, desiccators for bare silicon chips/partially assemble hybrid storage, Deep freezer (-40°C), Class 100 oven (+150°C), Fine & Gross leak testing facilities, Marking machine, Powder coating equipment, and Test lab with power supplies, voltmeters, current meters, oscilloscope and functional generators.
- manufacturing Lab environment (Temp: 22°C±3°C, Humidity: 50% ±5% RH, Cleanliness: Class 10000) with ESD safe operating and monitoring condition.

Vendors must submit supporting documentation for all above criteria along with the bid for Technical evaluation.

15 Tender process

The tender process will be conducted in two parts: technical compliance and commercial terms. Vendors must demonstrate their technical capabilities related to the manufacturing space-grade convertor HMCs as per criteria laid down in the **Section 14**. In the second part, the price bid of the selected vendors who meet the specified criteria will be opened and ranked as L1, L2, L3 and so on based on their bid. The vendor with the lowest bid (L1) will be awarded the contract to manufacture the entire quantity.

16 Non-Disclosure Agreement

All documents/ drawings part of this RFP and subsequent documents/part drawings issued for Fabrication and execution of works and any other communication revealed during the contract work will be exclusive property of URSC and Vendor shall have no right whatsoever on them and shall not disclose to any other person/party not involved in the execution of the allotted work. The Manufacturing vendor must take an undertaking on NDA as per the URSC prescribed format.

17 Batch Fabrication details, Schedule and Documentation

17.1 Batch Fabrication details

Table 5. Batch Fabrication

S.No.	HMC art no	Total Qty Required	Batch Size	No of Batches
1	112SS	700	100	7

17.2 Batch delivery schedule

1. FIM Components will be distributed in batches, with delivery timelines commencing from FIM issue date.
2. Each batch of FIM issue initiates an eight-week time delivery period for 100 numbers of HMCs.
3. Final delivery should match according to the work progression shown in figure 1.

Part-II

18 Documentation required at various stages of fabrication, Screening and Testing

Table 6. Vendor Documentation list

Sl. No	List of Document
To be provided along with each batch of Hybrid Microcircuits fabricated.	
i.	Process and material details in URSC specified Formats **(Part-III)**
ii.	Pre-seal electrical measurement
iii.	Pre-seal inspection report
iv.	Failure report/ non-conformance report if any
v.	Seal Leak Results (Fine & Gross)
vi.	Post seal electrical measurements
vii.	External visual inspection report
To be provided along with each batch of Screened Hybrid Microcircuits.	
i.	External visual inspection report
ii.	Post Seal Leak results
iii.	Initial electrical measurements
iv.	Records of Bake, Thermal cycles, Constant Acceleration, PIND tests, Burn-in tests and Active Thermal Cycling (ATC)
v.	Pre/Post Burn-in Electrical Measurement
vi.	Post ATC Electrical Measurement
vii.	Final Seal Leak test results
viii.	Final Electrical test results
ix.	Failure report / non-conformance report
x.	Destructive Physical Analysis (DPA) Report
xi.	Final external visual inspection report

19 Progression of the Activity and Responsibility Matrix

Table 7. ACTIVITY AND RESPONSIBILITY MATRIX FOR FABRICATION AND TESTING OF PRODUCTS

Sl. No.	ACTIVITY	PROCEDURE	DOCUMENTS	RESPONSIBILITY	REMARKS
1	Submission of purchase order to vendor along with production document	Issue details with approval by URSC & DESIGNER and in the specified format	Production document	URSC	
2	Procurement of HMC package & Raw materials	Generate Procurement Specifications which shall clearly identify the specifications for items being purchased and request certification of conformance to the required specifications	Procurement specification shall contain Part details Quality requirements	VENDOR	
3	Perform Incoming inspection to ensure that the components received are of required part no. and carry out visual inspection for any defects.			VENDOR	
4	Substrate fabrication (print, fire, trim) Clearance for 1st level assembly	As per approved PID	SCS (process traveller format) Inspection report	VENDOR	Inspection on 100% samples
5	1st level assembly (die attach and wire bonding as	As per approved PID	SCS (process traveller format)	VENDOR	Inspection on

Sl. No.	ACTIVITY	PROCEDURE	DOCUMENTS	RESPONSIBILITY	REMARKS
	applicable)				100% samples,
6	Clearance for 2nd level assembly (substrate attach, post to substrate wire bonding)		Inspection report	VENDOR	Inspection on 100% samples,
7	Pre seal electrical testing & precap inspection	As per specified procedure	SCS including electrical test report	VENDOR	
8	Transport 100% samples (regular HMCs) to URSC	Take all precautions during transportation	SCS (process traveller format)	VENDOR	
	Pre cap visual inspection and clearance for go ahead for sealing/ encapsulation			URSC	
9	Application of Particle Getter (If applicable)	As per approved PID	SCS (process traveller format)	VENDOR	100%
10	Sealing and post seal leak checks	As per approved PID	SCS (process traveller format)	VENDOR	100%
11	Post seal electrical test	As per procedure specified	SCS (process traveller format)	VENDOR	100%
12	Submit fabrication data for review and clearance		SCS (process traveller format)	VENDOR	

Sl. No.	ACTIVITY	PROCEDURE	DOCUMENTS	RESPONSIBILITY	REMARKS
	Review of fabrication data and clearance for go ahead for screening			URSC	
13	Screening	As per approved PID		VENDOR	100%
14	Transportation of HMCs along with all technical documents to URSC	Take all precautions during transportation	SCS	VENDOR	
15	Review all data and perform sample check for acceptance			URSC	

20 Screening Test Matrix

Table 8. SCREENING TEST MATRIX FOR HYBRID MICROCIRCUITS

SL NO	Test	Requirement
1	External Visual Examination	30X
2	Initial Electrical	As per specification(1)
3	Stabilization Bake	125°C, 72 hrs
4	Thermal Cycling	+125°C to -55°C 10 cycles 10 min dwell at each temperature extreme
5	Mechanical shock	As per specification(2)
6	PIND	MIL-STD-883, Method 2020
7	Pre-burn in Electrical Test	As per specification(1)
8	Burn-in	+125°C powered, 320hrs
9	Post Burn-in Electrical Test	As per specification(1)
10	Active Thermal Cycling(ATC)	-30°C to +85°C, 5 cycles
11	Post ATC Electrical Test	As per specification(1)
12	Seal leak i) Fine Leak ii) Gross leak	Fine leak: 5×10^{-8} atm cc/sec Gross leak: free from stream of bubbles.
13	Final Electrical	As per specification(1)
14	External visual examination	30x

1. Specification of 112SS will be provided to Vendor at the time of testing HMCs

21 DPA sequence for 112SS HMCs

Table 9. Destructive Physical Analysis Sequence for 112SS HMCs

Sl. No	TEST	MIL-STD-883 TEST METHOD
1.	External visual examination	Method 2009
2.	Lead fatigue test	Method 2004
3.	External visual examination	Method 2009
4.	Seal leak Test* (a) Fine leak (b) Gross leak	Method 1014
5.	Internal visual examination	Method 2017
6.	Bond pull test	Method 2011
7.	Die shear test	Method 2019

***Bombing pressure:**

Fine leak:

- 45 psia, 5 hrs. for package with substrate size of 0.7" X 0.7" with a cavity height of 0.2"

Gross leak:

- 60 psia, 4 hrs. for package with substrate size of 0.7" X 0.7", with a cavity height of 0.2"

Part-III

Table 10. Parts Approval Document

	Ref :	
	DATE	**PAGE**

PARTS APPROVAL DOCUMENT

CONTRACT DETAILS:

VENDOR NAME:

CONTRACT NUMBER:

SUBSYSTEM/CARD:

DIE DETAILS:

PART NUMBER:

PART DESCRIPTION:

MANUFACTURER:

LOT CODE:

QUALITY LEVEL:

PROCUREMENT SPEC(MIL/ESCC/NASA/OTHERS):

DATAPACK DETAILS:

SCREENING: LAT/QCI: RADIATION:
DPA:

NON-CONFORMANCES:

QC DETAILS:

SCREENING:

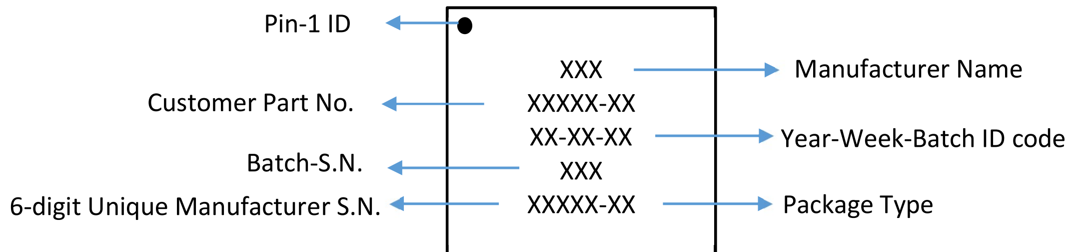
INCOMING INSPECTION:

NON-CONFORMANCES:

22 Specification Control Sheet Format

22.1 Dispatch Summary

HMC Project		**Customer Part/No**	



Pin details					
Pin 01		Pin 02		Pin 03	
Pin 04		Pin 05		Pin 06	
-----		-----		-----	
Pin N-1		Pin N			

Work Order No/Date	
No. of HMCs and Dispatch Date	

Package Dimension [L x B x H]	
LID Dimension [L x B x T]	
Package Material	

HMC Batch details: Batch ID			
Batch-S.N.	6-Digit Unique S.N.	Batch-S.N.	6-Digit Unique S.N.

SCS clearance			
Checked by		Approved by	
Name		Name	
Sign and Date		Sign and Date	

22.2 Batch Yield Details-Summary

HMC Part No:		**Batch No:**	

Batch Quantity:

Process	Start Qty	Accepted Qty	Rejected Qty	Remarks (Attached NC)
Scribing				
Printing, settling, Drying & firing				
Fired substrate inspection				
Trimming				
Trimmed Substrate inspection				
Epoxy printing				
Die attach				
Substrate to package Attach				
Wire bonding Preparation				
Wire bonding				
Pre seal Electrical test				
Pre Cap internal visual inspection				
Customer Pre – cap Visual inspection				
Getter Gel application & Curing				
Vacuum baking, Sealing & Leak test				
Marking				
Post seal Electrical test				
External visual inspection				

Accepted PFT Sl Nos	
Used PFT SL Nos for FAB	

Verified by & Date			

22.3 Summary of Raw materials used for the fabrication of HMC

HMC Part No:		Batch Qty:	

CODE	Type of material & composition	Manufacturer	Part No.	Lot No / Batch No	ORG / RQ1 / RQ2 Expiry/Retest date	Used Date	IGA No
1	Alumina (96% Al_2O_3) substrates	Ceramtec / Coorstek	-				
2	D I water	Inhouse	-				
3	Photo Positive film	URSC	-				
4	Stainless steel mesh	HK WIRE Netting Ind / Paul GmbH & Co	250/280/325				
5	CDF Emulsion	Ulano Industries/Mc DERMID	CDF 3 /5 &5*				
6A	Ag Pd Conductor Paste	DuPont	7484 R				
6B	Gold (Au) Conductor paste	DuPont	5715 & 5771				
6B1	Solderable Gold Paste	DuPont	4597				
6C	Via Fill Gold Conductor Paste	DuPont	5727				
6D	Dielectric paste	DuPont	5704				
6E	Resistor paste 3 Ω/Sqm	DuPont	1703				
6E1	Resistor paste 10 Ω/Sqm	DuPont	1708H				
6E2	Resistor paste 100 Ω/Sqm	DuPont	1718H				
6E3	Resistor paste 1K Ω/Sqm	DuPont	1728				
6E4	Resistor paste 10K Ω/Sqm	DuPont	1738R				
6E5	Resistor paste 100K Ω/Sqm	DuPont	1748R				
6F	Over Glaze	DuPont	9137				
M7	Electronic Grade IPA	Merck/ RANKEM	-				
M8A	Conductive Silver epoxy	Ablestik (LOCTITE HENKEL) /EPOTEK	84 - 1LMI NB1/H20E				
M8B	Non-Conductive epoxy	Ablestik (LOCTITE HENKEL) /EPOTEK	8700K/H74				

CODE	Type of material & composition	Manufacturer	Part No.	Lot No / Batch No	ORG / RQ1 / RQ2 Expiry/Retest date	Used Date	IGA No
M9A & M9B	Bare Dies, Capacitors.	ISRO Supplied /procured	Refer components details enclosed				
M10A	Au/Ni plated KOVAR packages	HCC Aegis/EGIDE Other reputed manufacturer					
M10B	Au/Ni plated ceramic Packages	Kyocera/NTK Other reputed manufacturer					
M10C	Au/Ni plated KOVAR LIDS	Hirel/EGIDE Other reputed manufacturer					
M11	Adhesive film for substrate to Package attach	Ablestik (LOCTITE HENKEL)	5020K/5025E				
M12 A,B,C &D	Au - Wire (0.7mil/1.0 mil /1.5 mil/2.0 mil)	HEREAUS/ Other reputed manufacturer					
M13A	Gold ribbon (12milX2mil)	HEREAUS/ Other reputed manufacturer					
M14A	Al wire(5 mil)	HEREAUS/ Other reputed manufacturer					
M15	Marking Ink	MARKEM/ Other reputed manufacturer	7261 Black				
M24	Getter Gel material	Dow corning / Other reputed manufacturer	SYLGARD 527				

22.4 Component Details

HMC Part No.		W.O. No.		Qty	

SL NO	Component (Dice/chip)	Die ID	Manufacturer	Lot no & Date code	Class K/H	LAT Cleared by at source/ISRO	LAT Status	Recd. date	Recd Qty.	Acc Qty.	Rej Qty.	Reason for rejection	Inspected by & date

Verified by & Date			

22.5 Thick Film Substrate Fabrication

22.5.1 Scribing setup details

HMC Part No.		Batch No.	
Equipment Make & Sl.No./Model No.		Equipment Name & Asset No.	

IGA ref no/ Manufacturer	Lot No./ Batch No.	Substrate thickness (25 mils)	Hole Dia 10 ± 2 mils	Measurement of scribe Depth 10 mils to 12.5 mils				Pulse spacing 5 -7 mils	Dimensions		Scribe line width 6 ± 2 mils.	No. of substrates scribed	Date & time started	Date & time Ended
				1	2	3	4		Actual	Measured				

IGA ref no/ Manufacturer	Lot No./ Batch No.	Substrate thickness (40 mils)	Hole Dia (10/28) ± 2 mils	Measurement of scribe Depth 16 mils to 20 mils				Pulse spacing 5 -7 mils	Dimensions		Scribe line width 6 ± 2 mils.	No. of substrates scribed	Date & time started	Date & time Ended
				1	2	3	4		Actual	Measured				

22.5.2 Scribing Machine Parameters

Equipment Make & Sl.No./Model No.		Equipment Name & Asset No.	

Process	Temp 22 ± 3°C	Humidity 55±5%RH	Power (100 W - 400W)	Table speed Inch/sec (0.03”- 5”/sec)	Laser ON time (300-500 /6000 800 microsec)	Done on	Done by
Scribing							
Drilling/Machine							

22.5.3 Substrate Deburring

Qty Deburred	Done on	Done by

22.5.4 Substrate Cleaning

Equipment Make & Sl.No./Model No			Equipment Name & Asset No.			
Resistivity of DI water	Ultrasonic cleaning time	No. of substrates cleaned	Drying Time	Drying temperature	Performed by	Done on

22.5.5 Stress removal by firing

Furnace Parameter						
Equipment Make & Sl.No./Model No			Equipment Name & Asset No.			
Furnace Id (F2/F3)	Furnace Belt speed (3.8 /4 inch/min)	Total Cycle time (60min)	Dwell Time at 850°C (10 ± 1 min)	Qty	Done on	Done by

22.5.6 Substrate Batch yield data after scribing

Inspection Qty.	Accepted Qty.	Reason for rejection	Remarks	Signature

22.5.7 Screen preparation and tension measurement

Equipment Make & Sl.No./Model No					Equipment Name & Asset No.					
Screen for	**IGA no of Mesh**	**Lot / Batch no**	**Frame size (In inches)**	**Mesh count**	**Screen tension in >15 N/Cm**					**Done by & Date**
					1	**2**	**3**	**4**	**5**	
PTH printing										
AgPd Conductor printing										
Conductor printing (Au1 &Au2)										
Solderable Gold Conductor Printing (1 & 2)										
Dielectric printing (D1)										
Dielectric printing (D2)										
Conductor printing (Top-cond)										
Via fill Printing										
Resistor printing 3 Ω										
Resistor printing 10 Ω										
Resistor printing 100 Ω										
Resistor printing 1k Ω										
Resistor printing 10k Ω										
Resistor printing 100k Ω										
PTH printing										
AgPd Conductor printing										

22.6 Inspection under backlight using 10x magnification

Equipment Make & Sl.No./Model No				**Equipment Name & Asset No.**		
Screen for	**Design & Exposed dimension matching**	**Edge Definition**	**Air Bubbles**	**Physical Damage**	**Pin holes**	**Inspected by & Date**
PTH printing						
AgPd Conductor printing						
Conductor printing (Au1 &Au2)						
Solderable Gold Conductor Printing (1 & 2)						
Dielectric printing (D1)						
Dielectric printing (D2)						
Conductor printing (Top-cond)						
Via fill Printing						
Resistor printing 3 Ω						
Resistor printing 10 Ω						
Resistor printing 100 Ω						
Resistor printing 1k Ω						
Resistor printing 10k Ω						
Resistor printing 100k Ω						
Over Glaze printing						
Epoxy printing						

22.7 Thick Film Printing

22.7.1 Conductor Printing layer

22.7.1.1 Layer - I

Printing	Conductor	**Layer id**	Single Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	IGA Ref No./ Batch no	Shelf life / Expiry date			Printer ID No.	Drier ID No.	Furnace ID No.	Temp 22±3°C	Humidity 50±5% RH	Done by & date
Dupont / 5715/5771		1st Qualified	1st Re-Qualified	2nd Re-Qualified	MPM / TF – 100 2637 / 03		F2 – BTU / (VCD-01) F3- btu/tff142-126A4B			

Printer M/c Parameter				Drier parameter			Furnace parameter				
Sq. Speed (0.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 / **20** min)	Dry Thickness (23 ± 3μ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 /30 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (12 ± 2 μ)
							F2 3.8 / 6.65 60 /30	F3 4 / 5.5 60 / 30			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	Porosity	Peel-off	Voids, Scratch	Alignment	Open, shorts	Foreign Particles	Inspected Qty	Accepted Qty	Inspected by Date

22.7.1.2 Layer -II

Printing	Conductor	**Layer id**	Second Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 5715/5771		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**	**MPM / TF – 100 2637 / 03**		**F2 – BTU / (VCD-01) F3- btu/tff142-126A4B**			

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (0.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 / **20** min)	Dry Thickness (23 ± 3µ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 /30 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (12 ± 2 µ)
							F2 3.8 / 6.65 60 /30	F3 4 / 5.5 60 / 30			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	**Porosity**	**Peel-off**	**Voids, Scratch**	**Alignment**	**Open, shorts**	**Foreign Particles**	**Inspected Qty**	**Accepted Qty**	**Inspected by Date**

22.7.2 Solderable Gold Conductor Printing

22.7.2.1 Layer-I

Printing	Gold	**Layer id**	Single Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	IGA Ref No./ Batch no	Shelf life / Expiry date			Printer ID No.	Drier ID No.	Furnace ID No.	Temp 22±3°C	Humidity 50±5% RH	Done by & date
Dupont / 4597		1st Qualified	1st Re-Qualified	2nd Re-Qualified	MPM / TF – 100 2637 / 03					

Printer M/c Parameter				Drier parameter			Furnace parameter				
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (23 ± 3µ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 /30 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (12 ± 2 µ)
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	Porosity	Peel-off	Voids, Scratch	Alignment	Open, shorts	Foreign Particles	Inspected Qty	Accepted Qty	Inspected by Date

22.7.2.2 Layer-II

Printing	Gold	**Layer id**	Second Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 4597		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**						

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 / **20** min)	Dry Thickness (23 ± 3µ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 /30 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (18 ± 2 µ) for 2 layers
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	**Porosity**	**Peel-off**	**Voids, Scratch**	**Alignment**	**Open, shorts**	**Foreign Particles**	**Inspected Qty**	**Accepted Qty**	**Inspected by Date**

22.7.3 Dielectric Printing

22.7.3.1 Layer-I

Printing	Dielectric	**Layer id**	Single Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	IGA Ref No./ Batch no	Shelf life / Expiry date			Printer ID No.	Drier ID No.	Furnace ID No.	Temp 22±3°C	Humidity 50±5% RH	Done by & date
Dupont / 5704		1st Qualified	1st Re-Qualified	2nd Re-Qualified						

Printer M/c Parameter				Drier parameter			Furnace parameter				
Sq. Speed (0.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (40 ± 5µ) for 1 layer	Furnace ID Belt speed (Inch/min) Total Cycle time (60 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (22 ± 2 µ) for 1 layer
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	Voids/ scratches	Alignment	Pin holes	Extension of dielectric on sides of conductor < 3mils	Foreign Particles	Inspected Qty	Accepted Qty	Inspected by Date

22.7.3.2 Layer-II

Printing	Dielectric	**Layer id**	Second Layer
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 5704		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**						

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (0.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (40 ± 5μ) for 1 layer	Furnace ID Belt speed (Inch/min) Total Cycle time (60 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired Thickness (40 ± 2 μ) for 2 layer
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Edge Definition	**Voids/ scratches**	**Alignment**	**Pin holes**	**Extension of dielectric on sides of conductor < 3mils**	**Foreign Particles**	**Inspected Qty**	**Accepted Qty**	**Inspected by Date**

22.7.4 Via filling conductor printing

Printing	Via filling conductor	**Layer id**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 5727/5747		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**						

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Thickness (Via fill >75% of via plug)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired thickness (Via fill >75% of via plug)
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Voids	**Lifting**	**Peel-off**	**Blistering**	**Alignment**	**Via Flatness**	**Inspected Qty**	**Accepted Qty**	**Inspected by Date**

22.7.5 Resistor Printing

Printing	Resistor Printing	**Layer id**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 17G series		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**						

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (26 ± 3 µ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 min)		Peak tempr (850±3°C)	Dwell Time at 850°C (10±1min)	Fired thickness (13 ±2 µ)
							F2 3.8 60	F3 4 60			

Inspection under backlight using 10x to 40x magnification (100%)

Alignment	Minimum overlap should be 4mils	Edge definition	Voids, Crack	Blisters	Increase or decrease in width	Inspected Qty	Accepted Qty	Done by & date

22.7.6 Over Glaze Printing

Printing	Over Glaze	**Layer id**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	**IGA Ref No./ Batch no**	**Shelf life / Expiry date**			**Printer ID No.**	**Drier ID No.**	**Furnace ID No.**	**Temp 22±3°C**	**Humidity 50±5% RH**	**Done by & date**
Dupont / 9137		**1st Qualified**	**1st Re-Qualified**	**2nd Re-Qualified**						

Printer M/c Parameter				**Drier parameter**			**Furnace parameter**				
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (26 ± 3 µ)	Furnace ID Belt speed (Inch/min) Total Cycle time (60 min)		Peak tempr (850±3°C)/(500±5°C)	Dwell Time at 850°C/500°C (10±1min)	Fired thickness (12 ±2 µ)
							F2 3.8 60	F3 4 60			

Fired over glaze visual Inspection using 10x to 40x magnification (100%)

22.7.7 Pre-Trimmed resistor measurement

Pre-trimmed resistor value measurement substrate ID No: Dummy

Resistor ID	Resistor value minimum	Resistor value Typical	Resistor value maximum	Resistor value measured

Multimeter ID No.		**Cal due date**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Manufacturer /Part No.	IGA Ref No./ Batch no	Shelf life / Expiry date			Printer ID No.	Drier ID No.	Furnace ID No.	Temp 22±3°C	<u>Humidity 50±5% RH</u>	Done by & date
		1st Qualified	**1st Re-Qualified**	**2nd Re-Qualified**						
Dupont / 17G 17__										

Printer M/c Parameter				Drier parameter			Furnace parameter			
Sq. Speed (1.5-2.5 inch/ sec)	Sq. Pressure (10-15 lbs)	Snap off distance (25-75 mils	Down stop (10-15 mils)	Temp (150°C)	Time (15 min)	Dry Thickness (26 ± 3 μ)	<u>Furnace ID</u> <u>Belt speed</u> <u>(Inch/min)</u> Total Cycle time (60 min)	Peak tempr (850±3°C)/(500±5°C)	Dwell Time at 850°C/500°C (10±1min)	Fired thickness (12 ±2 μ)

22.8 Fired substrates visual inspection (QC check 100%)

REJECTION CRITERIA	No of inspected substrates	No of Accepted substrates	No of Rejected substrates	Remarks
Substrate Defects Crack, Chip In, Chip Out				
PTH Printing: Scratch, Lifting, Peeling, corrosion, Open, alignment, wall coverage & through hole continuity				
AgPd Conductor Printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Solderable gold Conductor Printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Conductor printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Via Fill Conductor printing Voids, lifting, pealing, Blistering, alignment, Via flatness				
Dielectric printing Scratch, voids, pin holes, extension of dielectric on sides conductor (if < 3mil)				
Presence of foreign particles				
Miscellaneous observations				
Inspected by/Date				

22.9 Resistor trimming setup check

Date:

Wrist Strap availability [Yes/No]			
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

ESD check (OK/ Not OK)	Temp 22±3 °C	Humidity 55±5 % RH	Trimmer	Laser Type	Laser power (3 – 4.5 Watts)	Q RATE (5004000)	BYTE SIZE (50-150)	Total QTY	Done by & date

22.9.1 Delta R Calculation

Resistor ID	Initial value (I)	Final value (F) after heating on hot plate at 300°C for 10 mins	ΔR =((F-I)/I)*100 R (≤0.5%)	Resistor ID

22.9.2 Trimming process capability measurement

	Sample 1		Sample 2		Sample 3		Sample 4	
Part no								
CLS 1 or 3								
Tolerance								
Nominal val								
Specification	**USL**	**LSL**	**USL**	**LSL**	**USL**	**LSL**	**USL**	**LSL**
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
Mean								
Sigma								
USL-mean								
LSL-mean								
3 σ								
CpK								
Done by								

22.9.3 Trimmed resistor value measurement

Substrate ID No			
Multimeter ID/S. No.		**Cal due date**	

Resistor ID	**Tolerance**	**Resistor value Minimum**	**Resistor value Typical**	**Resistor value Maximum**	**Resistor value measured**
Result	**Accept/Reject**		**Done by Date**		

22.9.4 Trimmed Substrate Visual inspection (100 %)

Equipment Make & Sl.No./Model No		Equipment Name & Asset No.		
REJECTION CRITERIA	**No of inspected substrates**	**No of Accepted substrates**	**No of Rejected substrates**	**Remarks**
Substrate Defects Crack, Chip In, Chip Out				
PTH Printing: Scratch, Lifting, Peeling, corrosion, Open, alignment, wall coverage & through hole continuity				
AgPd Conductor Printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Solderable gold Conductor Printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Conductor printing Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity				
Via Fill Conductor printing Voids, lifting, pealing, Blistering, alignment, Via flatness				
Dielectric printing Scratch, voids, pin holes, extension of dielectric on sides conductor (if < 3mil)				
Resistors printing Crack, void, Evidence of repair, dis-coloration, Increase/decrease in width, resistor overlap over the conductor (if <5 mils)				
Trimmed Resistors Kerf should be 5 mils away from conductor pad**,** Kerf width minimum 0.5 mil, Kerf should be clean, No occurrence of debris/micro cracks, 50% of resistor width should be left after trimming, Kerf Depth (5-8µ), Dis-colourization				
Presence of foreign particles				
Miscellaneous observations				
Inspected by/Date				

22.9.5 PFT Inspection prior to assembly

Equipment Make & Sl.No./Model No		Equipment Name & Asset No.											
HMC Part No		PFT Inspection Prior to Assembly											
Batch Qty													
Date of Inspection													
Sl.No.	**Rejection Criteria**	**Substrate ID**											
1	**Substrate Defects:** Crack, Chip In, Chip Out												
2	**Conductor Printing:** Scratch, voids, lifting, pealing, corrosion, bridging, open, alignment, Porosity												
3	**Dielectric Printing:** Scratch, voids, lint, cut, pinholes, Extension of dielectric on sides conductor (if <3 mils)												
4	**Resistors Printing:** Crack, void, evidence of repair, discoloration, Increase/decrease in width, resistor overlap over the conductor (if <5 mils)												
5	**Over Glaze Printing:** OG coverage on conductor pad, dust, lint												
6	Presence of foreign particle:												
7	Miscellaneous observations:												
Accept/ Reject													
Quality Inspector's Signature with Remarks (if any)													

22.10 Chip and Wire assembly

22.10.1Die attachment

22.10.1.1 Substrate Cleaning

HMC Part No.		Batch Qty			
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)			
Equipment Make & Sl.No./Model No		Equipment Name & Asset No.			
IGI/ Batch/ Lot No. of Electronic Grade IPA	Cleaning Time (<1 min)	N2 Blow 25 PSI 10Sec	ID Number of Substrates	Total No. of Substrates Cleaned	Performed by (Sign& Name) & Date

22.10.1.2 Conductive Epoxy Printing at PFT Department

HMC Part No.							Batch Qty							
Temp (22±3 deg C):				Humidity (50±5 %RH):			ESD Check: (pass /fail)							
Equipment Make & Sl.No./Model No							Equipment Name & Asset No.							
Epoxy Part Number & Make	Epoxy LOT No.	Epoxy Expiry date		Sq. speed 1.5"-2.5"/sec	Epoxy stirring Time Approx - 30 Sec	Sq. Pressure 10-15 lbs	Snap off 25 - 75 mils	Down stop 10-15 mils	Wet Thickness 0.9-2.0 mils	Set up approval by Quality (Name &Sign)	ID Number of Substrates Printed	Total qty	Performed by (Sign& Name) & date	
		Shelf life	Pot life											

Note: Epoxy kneading to be performed before use % Die attachment must be completed within 24hrs of epoxy printing/dispensing

* Epoxy print thickness to be monitored for every 10 Substrates and recorded

22.10.1.2.1 Manual Conductive Epoxy Dispensing

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	

Active Bare Dice & Passive Components/ Capacitors

Equipment Make & Sl.No./Model No				**Equipment Name & Asset No.**						
Epoxy dispensing Mode	Epoxy Part Number & Make	Epoxy Lot No.	Epoxy Expiry date		Nozzle Size	Air pressure	Set up approval By Quality (Name &Sign)	Sl.No. of substrates dispensed	Total qty	Performed by (Sign& Name) & date
			Shelf life	Pot life						

Note: If Epoxy printing process is not feasible, manual conductive epoxy dispensing process shall be carried out.

22.10.1.2.2 Non-Conductive Epoxy Dispensing-Passive Components/Capacitors

HMC Part No.		**Batch Qty**	
Temp (22±3 eg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	

Equipment Make & Sl.No./Model No				**Equipment Name & Asset No.**						
Epoxy dispensing Mode	Epoxy Part Number & Make	Epoxy Lot No.	Epoxy Expiry date		Nozzle Size	Air pressure	Set up approval By Quality (Name &Sign)	Sl.No. of substrates dispensed	Total qty	Performed by (Sign& Name) & date
			Shelf life	Pot life						

22.10.1.3 Die attach and curing

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Components Details	Sl.No. of Die attached Substrates	Total No of die attached Substrates	Curing Schedule			Set up approval By Quality (Name &Sign)	Performed by (Name & Sign) & date
			Curing Temp	Curing Time	Oven ID		

22.10.1.4 Pre-cure Die attach Assembly Inspection

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	
Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Substrate ID	**Accept/ Reject Criteria**					
	Adhesive not visible on all 4 sides	Adhesive build up < 30% of components height	Adhesive material on top surface of die/Chip capacitor/ Die resistor	Spread of adhesive material on substrate	Die/Cap/Res Placement/ Orientation	Epoxy cracks/ Blow holes/ pin holes

Total Number of Substrates Inspected	
Number of Substrates Accepted	
Number of Substrates Rejected	
Inspected By production (Name & Sign) & Date	
Inspected by Quality (QC) (Name & Sign) & Date	

22.10.1.5 Non-Conductive Epoxy staking/Buildup & curing-Passive components/capacitors

HMC Part No.							**Batch Qty**					
Temp (22±3 deg C):			**Humidity (50±5 %RH):**				**ESD Check: (pass /fail)**					
Equipment Make & Sl.No./Model No						**Equipment Name & Asset No.**						
Epoxy Part Number & Make	Epoxy dispensing Mode	Lot Number of Non Conductive Epoxy	Epoxy Expiry date		Nozzle Size	Air pressure	Serial No of Substrates completed	Curing Schedule			Set up approval By Quality (Sign & Name)	Performed by (Sign & Name) & date
			Shelf life	Pot life				Curing Temp	Curing Time	Oven ID		

22.10.1.6 Conductive Epoxy Build up & Curing

HMC Part No.							**Batch Qty**					
Temp (22±3 deg C):			**Humidity (50±5 %RH):**				**ESD Check: (pass /fail)**					
Equipment Make & Sl.No./Model No						**Equipment Name & Asset No.**						
Epoxy Part Number & Make	Epoxy dispensing Mode	Lot Number of Non Conductive Epoxy	Epoxy Expiry date		Nozzle Size	Air pressure	Serial No of Substrates completed	Curing Schedule			Set up approval By Quality (Sign & Name)	Performed by (Sign & Name) & date
			Shelf life	Pot life				Curing Temp	Curing Time	Oven ID		

22.10.1.7 Post-cure Die attach Assembly Inspection

HMC Part No.				**Batch Qty**		
Temp (22±3 deg C):		**Humidity (50±5 %RH):**		**ESD Check: (pass /fail)**		
Equipment Make & Sl.No./Model No				**Equipment Name & Asset No.**		
Substrate ID	**Accept/ Reject Criteria**					
	Adhesive not visible on all 4 sides	Adhesive build up < 30% of components height	Adhesive material on top surface of die/Chip capacitor/ Die resistor	Spread of adhesive material on substrate	Die/Cap/Res Placement/ Orientation	Epoxy cracks/ Blow holes/ pin holes
Total Number of Substrates Inspected						
Number of Substrates Accepted						
Number of Substrates Rejected						
Inspected By production (Name & Sign) & Date						
Inspected by Quality (QC) (Name & Sign) & Date						

22.10.2Package Inspection (Before S/P attach, After S/P attach process)

Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**											
HMC Part No		**Package Inspection**											
Batch Qty													
Date of Inspection													
Sl.No.	**Rejection Criteria**	**Package ID**											
1	Evidence of any non-conformance with detail drawing i.e. No. of pins, Package size, Pin 1 identification & lead pitch.												
2	Package which exhibits peeling, flaking, pitting, blistering, delaminating, bumps, dents, discoloration & corrosion.												
3	Pits/bumps/Burrs, contamination, dents, nicks, embedded particle & non-uniformity on the seal periphery.												
4	Cracks, crazing, chip out, chip off, bubble, hole, red particles, gold particles, negative meniscus in glass to metal area.												
5	Gross leads bend, broken leads.												
6	Chip out, broken or cracks on the package body.												
7	Scratches that expose base metal due to damage.												
Quantity Received													
Quantity Accepted													
Quantity Rejected													
Inspection done by (Sign, Name & Date)													

22.10.2.1 Empty Package Ultrasonic cleaning

<table>
<tr><td colspan="2">HMC Part No.</td><td colspan="2"></td><td colspan="2">Batch Qty</td><td colspan="2"></td></tr>
<tr><td colspan="2">Temp (22±3 deg C):</td><td colspan="2">Humidity (50±5 %RH):</td><td colspan="4">ESD Check: (pass /fail)</td></tr>
<tr><td colspan="2">Equipment Make & Sl.No./Model No</td><td colspan="2"></td><td colspan="2">Equipment Name & Asset No.</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Lot Number of Electronic grade IPA</td><td rowspan="2">Lot Number of Package</td><td rowspan="2">Ultrasonic Dipping Time (3-5 min)</td><td rowspan="2">N2 BLOW 25 psi 10 sec</td><td rowspan="2">No. of Packages Cleaned</td><td colspan="2">Inspect at 40 X Magnification</td><td rowspan="2">Performed by (Sign & Name) & Date</td></tr>
<tr><td>IN QTY</td><td>OUT QTY</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

22.10.2.2 Inspection after Ultrasonic Cleaning

<table>
<tr><td colspan="2">HMC Part No.</td><td colspan="2"></td><td colspan="2">Batch Qty</td></tr>
<tr><td colspan="2">Temp (22±3 deg C):</td><td colspan="2">Humidity (50±5 %RH):</td><td colspan="2">ESD Check: (pass /fail)</td></tr>
<tr><td colspan="2">Equipment Make & Sl.No./Model No</td><td colspan="2"></td><td colspan="2">Equipment Name & Asset No.</td></tr>
<tr><td>Number of Packages Cleaned</td><td>Inspect at 40X Magnification</td><td>No of Packages Accepted</td><td>No of Packages Rejected</td><td>Remarks</td><td>Inspected By Quality (Sign & Name) & Date</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

After N2 blowing, packages are inspected under 40x microscope for visual criteria by quality personnel.

Remarks:

22.10.2.3 Substrate to Package attach assembly & curing – 5020K able film

Package Part Number & Make		**LAT Cleared (Yes/No)**	
Lot No. of Package		**LAT Report No & Date**	

Able film Part Number & Make	Lot Number of Able film	Able film Expiry Date	Pre-Cure Temp 100°C (2-5 Min)	Pre-Cure Temp 140°C (30-60 Sec)	Set up approval By Quality (Sign & Name)	Total S/P attached Details *	Curing Schedule			Performed by (Sign & Name)& Date
							Curing Time (90 min)	Curing Temp (150°C)	Curing Oven ID	

Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Substrate ID No.																			
Package ID No.																			

Remarks:

22.10.2.4 Post cure package attach assembly inspection

Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

Package ID	**Accept/Reject Criteria**					
	Adhesive not visible on all 4 sides	**Adhesive build up < 30% of Substrate height**	**Evidence of bubbles visible through naked eyes**	**Spread of adhesive material on posts**	**Substrate orientation >10 degrees**	**Foreign Particle presence on the Adhesive**

Total Number of S/P Attached Packages Inspected	
Number of S/P Attached Packages Accepted	
Number of S/P Attached Packages Rejected	
Inspected By production (Sign & Name) & Date	
Inspected by Quality (QC) (Sign & Name) & Date	

22.10.2.5 Vapour degreasing before wire bonding

Equipment Make & Sl.No./Model No			Equipment Name & Asset No.		
Lot number of electronic grade IPA	**Temperature of IPA (200 -250°C)**	**Vapour Degreasing time (30-60 Sec)**	**N2 Blow 25 psi, 10 sec**	**Number of Pkgs/Sub.**	**Performed by (Sign & Name) & Date**

22.10.2.6 Vacuum Baking (Pre-Wire bonding)

Equipment Make & Sl.No./Model No				Equipment Name & Asset No.					
Number of Packages	**Vacuum (0-100 m torr)**	**Temperature (145- 155°C)**	**Number of Intervals**	**Start**		**End**		**Duration (hours)**	**Performed by (Sign & Name) & Date**
				Date	**Time**	**Date**	**Time**		

Intervals	Duration	Temperature	Function
1	20 min	150 ° C	Evacuation
2	45 min	150 ° C	N_2 purging
3	1 hr	150 ° C	Vacuum baking
4	20 min	25 ° C	Back filling

22.10.3Wire bond Assembly

22.10.3.1 Plasma Cleaning (Pre-Wire bonding)

HMC Part No.		Batch Qty	
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)	

Argon cylinder Output Pressure (40-50psi)	Vacuum (1.0-1.6 torr)	Plasma power (0.3-0.4kw)	Plasma expose Time (4-6min)	Plasma Cleaned Quantity	Performed by (Sign & Name) & Date

22.10.3.2 Wire Bonding

Equipment Make & Sl.No./Model No		Equipment Name & Asset No.						
HMC Part number	Wire diameter	Au/Al	Make	IGI/ Lot No., of Au/Al wire	Number of Packages/Substrates Wire Bonded	Sl No. of the Packages/Sub Wire Bonded	Set up approval by Quality (Sign & Name)	Performed by (Sign & Name) & Date

22.10.3.3 Wire Bonding Parameters-Die/post pin to substrate/post to chassis

Temperature on the Packages (145 +/- 5 ° C)	Parameter setting					
	I – bond (Ball)			II –bond (Wedge)		
	Power	Force (gms)	Time (msec)	Power	Force (gms)	Time (msec)

22.10.3.4 Wire Bonding Parameters for K&S-3 – Wire bonder

HMC Part No.		Batch Qty	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	

Sl.No.	Wire bond parameters	0.7 mil	1mil	1.5 mil Die	1.5 mil Post	2 mil Die	2 mil Post	1.5 mil Post to chassis
1	**Ultrasonic power Ball**	2.0 to 2.3	1.5 to 1.7	1.8 to 2.0	1.8 to 2.2	1.9 to 2.0	3.1 to 3.5	1.8 to 2.2
2	**Ultrasonic power Wedge**	5 to 6.5	3.5 to 4	4.1 to 5	4.1 to 5	6.2 to 6.5	6.2 to 6.5	4.1 to 5
3	**Bond force-Ball**	27 to 32	31 to 34	55 to 65	45 to 51	87 to 90	70 to 75	45 to 51
4	**Bond force-wedge**	60 to 80	70 to 90	60 to 100	60 to 100	85 to 90	85 to 90	60 to 100
5	**Bond time-Ball**	30 to 40	49 to 55	35 to 45	50 to 55	67 to 70	50 to 55	50 to 55
6	**Bond time Wedge**	70 to 100	90 to 150	80 to 120	80 to 120	105 to 110	105 to 110	80 to 120

22.10.3.5 Wire Bonding Parameters for ASM Eagle-60

Sl.No.	Wire bond parameters	0.7 mil	1mil
1	**Ultrasonic power -- Ball**	28 to 32	60 to 65
2	**Ultrasonic power -- Wedge**	95 to 105	85 to 95
3	**Bond force-Ball**	15 to 20	15 to 20
4	**Bond force-wedge**	70 to 80	85 to 95
5	**Bond time-Ball**	8 to 12	10 to 15
6	**Bond time wedge**	40 to 50	60 to70

HMC Part No.		Batch Qty	
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)	

DPT Acceptable: 2.5 gms for 0.7 mil, 6.0 gms for 1 mil Au, 10 gms for 1.5 mil Au,15 gms for 2.0 mil Au wires

1st off/setup clearance (DPT acceptable: ______ gms)									
Pull tester ID	Time of calibration	Set up approval By Quality (Sign & Name)	Visual inspection result	DPT results					
				Ambient/ Post 300 deg	No of wire	Min strength	No of wire tested	No of wire failed	Failed bond strength

2nd off clearance (NDPT acceptable: _______gms)							
Pull tester ID	Time of calibration	Set up approval By Quality (Sign & Name)	Visual inspection result	NDPT results			
				ID of the Package/ Substrate	No of wire tested	No of wire Failed	Failed bond strength

22.10.3.6 Wire Bond Visual inspection

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	

Equipment Make & Sl.No./Model No					**Equipment Name & Asset No.**					
Part No.	**Wire Dia**	**Ball size (<3d or >5d)**	**Wire exit not within the periphery of the ball**	**Golf ball/ oblong ball**	**Wedge w(<1.5d / > 3d) & L(<1.5d / > 4d)**	**Excessive loop/ sag of wire**	**Nick/cuts/ crimps/ scoring/ Neck down of wire**	**Wire bonding not according to diagram**	**Tearing of the junction of wire bond, sharp bends/kinks in wire**	**Performed by (Sign & Name) & Date**
QUALITY INSPECTION (QC) DONE BY & DATE										
REMARKS										
NDPT setting: 1.6 gms for 0.7 mil Au, 2.4 gms for 1 mil Au & 4.0 gms for 1.5 mil Au, 6.2 gms for 2.0 mil Au wires										

Equipment Make & Sl.No./Model No						Equipment Name & Asset No.							
Production Run					Patrol Inspection Details (Die /Post to substrate/post to chassis)								
ID No of Packages /Substrate wire bonded	100% NDPT results				Pull Tester ID	Time of calibration	Set up approval By Quality (Sign & Name)	Visual inspection result	NDPT results				
	Number of wire tested	Number of wire failed	Failed bond strength	Performed by (Name & Sign)& Date					ID of Package/ Substrate	Number of wire tested	Number of wire failed	Failed bond strength	Performed by (Sign & Name)& Date
QUALITY INSPECTION (QC) DONE BY (Sign & Name) & DATE													

Note: 100% NDPT results of first & last HMCs of the batch will be attached along with DPT & NDPT results of setup clearance of HMCs.

22.10.3.7 Die Rework Details

HMC Part No.		Batch Qty	
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)	

Equipment Make & Sl.No./Model No				Equipment Name & Asset No.			
Package ID No.	Die replacement		Reason for rework	No of Dice reworked	<u>Rework done as per drawing.</u>	Rework done & verified by (Sign & Name) & Date	Inspected by QA (Sign & Name) & Date
	P/N	ID No.					

22.10.3.8 Wire Rework Details

Equipment Make & Sl.No./Model No				Equipment Name & Asset No.						
Pkg ID	No of re-bonds		Reason for Rework			NDPT Result	Visual inspection result	As per drawing rework, ok?	Done by (Sign & Name) & Date	Verified By QA (Sign & Name) & Date
	Dice to substrate	Post to substrate	Location/ ID of wire	Dice to substrate	Post to Substrate					

22.10.4Pre-Seal Electrical Test Report

HMC Part No		**Batch Qty**	

Temp (22±3 Deg C):	**Humidity (50±5 %RH):**	**ESD Check (Pass /Fail):**

Date		**Manufacturer**	
HMC Type		**Date Code, Batch No.**	
QTY Tested		**QTY Accepted**	

Sl.No. of Packages tested:

Result: ____

22.10.4.1 List of tests and measuring equipment:

Description	**Make**	**Equipment ID**	**Cal Due on**	**Parameter**	**Selected Range**
DC Power Supply1					
DC Power Supply2					
CRO					
Signal Generator					
Current/Multi-meter					
					Sign
Test performance by					
Approved By					

22.10.4.2 HMC Pre-Cap Visual Inspection List

Model		**Customer**	URSC	**Project**		**Batch Qty**	
Date		**Equipment Used**	Microscope	**Inspection by**			

Sl No	**Inspection Criteria**			**Specification**	**Pkg No**	**Pkg No**	**Pkg No**	**Pkg No**	**Pkg No**
	Subgroup		**Details**						
1	Substrate	1	**Component to substrate edge separation**	**0.1mm**					
		2	**Functional metallization to substrate –edge separation**	**0.1mm**					
		3	**Chipping**	**<0.05mm**					
		4	**Cracks/Holes**	**Nil**					
		5	**Discoloration**	**Nil**					
		6	**Miscellaneous observation**	**Nil**					
2	Conductor Printing Quality	1	**Scratches /Void reducing conductor width by more than 25%**	**Nil**					
		2	**Resistors overlap on metallization pad**	**>0.1mm**					
		3	**Metallization Bridging**	**Nil**					
		4	**Miscellaneous observation**	**Nil**					
3	Dielectric/ Overglaze	1	**Insulating dielectric layer spread beyond metallization (Either side)**	**No**					
		2	**Voids /Pinhole in insulating dielectric layer**	**No**					
		3	**Miscellaneous observation**	**Nil**					
4	Resistors	1	**Cracks/Voids/Scratches /Spreading/ mesh marks on resistor**	**Nil**					
		2	**Discoloration/stains in kerfs**	**Nil**					
		3	**Resistor width reduction less than 25% after trimming**	**Nil**					
		4	**Resistors overlap over the conductor 5 MIL**	**Nil**					
		5	**Miscellaneous observation**	**Nil**					
		6	**Chipping**	**Nil**					
		7	**Contamination on surface**	**Nil**					
		8	**Metallization discontinuities**	**Nil**					
		9	**Metallization Bridging**	**Nil**					
		10	**Miscellaneous observation**	**Nil**					

Sl No	Inspection Criteria			Specification	Pkg No	Pkg No	Pkg No	Pkg No	Pkg No
	Subgroup		Details						
5	(a)Die	1	Cracks on Die/chip.	Nil					
		2	Chipping.	Nil					
		3	Contamination on surface.	Nil					
		4	Metallization Discontinuities.	Nil					
		5	Metallization bridging	Nil					
		6	Miscellaneous observation	Nil					
	(b)Die/Chip Attachment	1	Die orientation on mounting pad	As per layout <5deg.Misalignment					
		2	Conductive Die mounting	Visible on all sides, Good Wetting with die					
		3	Conductive Die mounting epoxy running onto bare substrate.	Nil					
		4	Conductive Die mounting epoxy build-up at die edges.	Upto20% of die height					
		5	Crack in epoxy greater than 10%of total periphery coverage at contact area.	Nil					
		6	Miscellaneous Observation						
	(C) Wire Bonding	1	Gold –wire ball bond, ball size.	2.0d<x<5.0d (d=diameter)					
		2	Wire exit from ball	From the centre of ball					
		3	Die to metallization interconnections	As per layout					
		4	Ball-bond alignment with pad Aligned with centre of bond pad	(covering not less than 75%of pad area whenever ball-bond and pad area are comparable)					
		5	Bond –wire to die clearance.	Twice wire dia (min)					
		6	Wedge-bond size.	1.5d<x<3.0d (d=diameter)					
		7	Metallization to point interconnections	As per layout					
		8	No of re-bonds	<10% of total bonds					
		9	NDPT of wires	100% required at specified NDPT value.					

Sl No	Inspection Criteria			Specification	Pkg No	Pkg No	Pkg No	Pkg No	Pkg No
	Subgroup		Details						
5	**D) Al 5 mil Wire bonding**	10	Ideal Bond impression						
		11	Heal Crack spikes in bond	Nil					
		12	Wire tears @ junction b/w ribbon loop & bond	Nil					
	E) Au 2X12 mil Ribbon wire bond	13	Bond which does not exhibit 100% bond impression	Nil					
		14	Bond tail longer than one ribbon width or 10.0mils whichever is lesser.	Nil					
		15	Miscellaneous Observation	Nil					
6	**Package Assembly**	1	Substrate orientation	Aligned with cavity, as per layout.					
		2	Substrate epoxy visible at periphery	All sides of periphery(preferred)					
		3	Cracks in epoxy greater than 10% of total periphery coverage at contact area.	Nil					
		4	Epoxy residues at sites other than specified.	Nil					
		5	Contamination in cavity.	Nil					
		6	Seal in periphery	Free from any Contamination					
		7	Cracks in glass to metal seal.	Radial &circumferential crack not allowed, and meniscus crack is acceptable.					
		8	Overall Package(body wall/bottom)/lead inspection	Discoloration& corrosion, Any burrs, peeling, flaking, pitting, blistering, delamination, bumps, dents, cracks					
		9	Overall cleanliness.	Free from Contamination					
		10	Miscellaneous Observation						
7	**Documentation**	1	Parts & Material Traceability.						
		2	Process traveller duly completed.						
		3	Process as per PID						
		4	Final in –house QC approval available.						
		5	QC comments/suggestions implemented.						
			ACCEPT / REJECT?						
Quality Inspector's Signature with remarks(if any):									

22.10.5Cleaning Activities before loading the HMCs to Vacuum baking & Seam Sealing

22.10.5.1 Cleaning of loose particles/contamination from the surface of the HMCs

Customer Pre- cap clearance Status /Details	Is the loose particles /Contaminations are cleared from the HMCs using Clean wipe dipped in E.G.IPA??	Is the Package seal periphery is cleaned using clean wipe dipped in E.G.IPA??	Is the HMC/Circuit wire bonds are disturbed during the Cleaning Process?	Total Qty cleaned & cleared for further processes	Performed by (Sign & Name) & Date

22.10.5.2 Cleaning of Vacuum Baking Oven, Vacuum baking jigs and sealing enclosure

Is the vacuum Baking oven is thoroughly cleaned using Clean wipes and E.G.IPA ?	Is the vacuum Baking Jigs are cleaned using Clean wipes and E.G.IPA ?	Is the Seam sealing enclosure is cleaned using Vacuum cleaner, Clean wipes and E.G.IPA ?	Cleaning Performed by (Sign & Name) and date

22.10.5.3 QA Inspection before loading it into Vacuum baking process

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	
Is all the HMCs are 100% Visually Inspected by Quality Department?	Quantity cleared after G0 – N0 G0 Electrical Testing	Total No of HMCs Accepted /Cleared for further Processes	Inspected by Quality (Sign & Name) and Date

22.10.5.4 Pre-Seal Vacuum Baking

Equipment Make & Sl.No./Model No					**Equipment Name & Asset No.**					
Vacuum Oven ID	**Total number of Packages loaded**	**Vacuum (1-100Milli torr)**	**Temperature (145-155°C)**	**Number of intervals**	**Start**		**End**		**Duration (hours)**	**Performed by (Sign & Name) & Date**
					Date	**Time**	**Date**	**Time**		

22.10.5.5 Vacuum baking sequence/intervals

Intervals	**Duration**	**Temperature**	**Function**
1	45 min	150 ° C	Evacuation
2	45 min	150 ° C	N_2 purging
3	72 hrs	150 ° C	Vacuum baking
4	45 min	25 ° C	Back filling

22.10.6Package Sealing

Equipment Make & Sl.No./Model No		Equipment Name & Asset No.	
Dew Pont (-45°C to -65°C			

HMC Part No.		Batch Qty
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)

1ST WELD PARAMETER				2ND WELD PARAMETER			
PULSE - 1		PULSE - 2		PULSE - 1		PULSE - 2	
WELD CURRENT (0.1 – 2.40 kA)	PULSE DURATION (1 – 15m Sec)	WELD CURRENT (0.1 – 2.40 kA)	PULSE DURATION (1 – 15m Sec)	WELD CURRENT (0.1 – 2.40 kA)	PULSE DURATION (1 – 15m Sec)	WELD CURRENT (0.1 – 2.40 kA)	PULSE DURATION (1 – 15m Sec)

Weld Speed (0.01 - 1.5 Inch/Sec)	**Weld force** (250 - 2500 grams)	Length and Width (as per LID size)	**Track Specification** (Min 0.001 - 0.090 inch)	**Over Travel** (0.001 - 0.2 Inch)	**Electrode Details**

Serial Nos of the Seam sealed HMCs /Packages	Set up Approval by Quality (Name & Date)	Process Performed by (Name, Sign & Date)

Note: N2 purity should be 99.998% and helium purity (which is used as a tracer gas) should be 99.995% pure and should have the dew points better than -45°C

22.10.6.1 Visual Inspection after Seam Sealing (100%)

HMC Part No.		**Batch Qty**	
Temp (22±3 deg C):	**Humidity (50±5 %RH):**	**ESD Check: (pass /fail)**	

Equipment Make & Sl.No./Model No		**Equipment Name & Asset No.**	

HMC Pkg Sl No		**VISUAL INSPECTION CRITERIA**	**ACCEPT**	**REJECT**	**OBSERVATION/ REMARKS**
	Weld Stitch Marks related	Should be well etched			
		Dragging in weld Flow			
		Gold spot visibility			
		Cracks in stich area			
		Spark marks in Weld stitch			
		Line definition			
		Whitish appearance			
	Weld Flow related	Weld flow Separation/Gap (weld flow should be visible all along the Seal periphery)			
		Spikes in weld flow			
		Side wall coverage			
	General	Pits, bumps, burrs on the seal periphery			
		Dents/deep scratches on the package /LIDs			
		Visible evidence of corrosion, contamination, broken, grossly bent leads			
		Visible evidence of peeling of gold plating on the package and leads			
		Glass to metal seal problems like: Crazing of glass seal surface, Radial cracks ,Circumferential cracks, Cracks in the meniscus of glass seal surface, Voids, bubbles in the sealing glass			
Inspection done by Production (Name & sign) & Date **Inspection done by Quality (Name & Sign) & Date**					

22.10.7Seal leak testing

HMC Part No		Batch Qty	
Temp (22±3 Deg C):	Humidity (50±5 %RH):	ESD Check (Pass /Fail):	

Helium bombing specification:	FC/Galden bombing specification:
5 hrs at 45psi for 0.7”X1.27” to 1.33”X2”	4 hrs at 60 psi for 1.25” x 1.25” & lesser
24 hrs at 30psi for 2”X 2” DC-DC	8 hrs at 45 psi for 1.33” x 1.83”
	24 hrs at 30psi for 2”x2” DC-DC

22.10.7.1 Fine leak Test Report

Date		Package Size	
HMC Type		Date Code, Batch No	
Qty Tested		Qty Accepted	

Package Size	Pressure	Time
1” x 1”, 1” x 1½” & 1” x 0.5”	45 psia	5 Hrs
DC-DC Converter	30 psia	24 Hrs

Helium Bombing Time In/Out Summary			
Date	Time In	Date	Time out
Helium Detection Summary			
Date	Time In	Date	Time out

Detection Equipment Used				
Description	Make	Model	Sl Number	Cal Due on

6-digit code	PACKAGE SL No.	LEAK RATE observed (atm cc / sec) of Helium (Acceptable leak rate: <5x 10^{-8} atm cc/sec)	RESULT

Test Performed By	Name	Sign
Approved By		

22.10.7.2 Gross Leak Test Report

Date		Package Size	
HMC Type		Date Code, Batch No	
Qty Tested		Qty Accepted	

Package Size	Pressure	Time
1” x 1”, & 1” x 0.5”	60 psia	4 Hrs
1” x 1½”	45 psia	8 Hrs
DC-DC Converter	30 psia	24 Hrs

FLUOROCARBON BOMBING TIME IN/OUT SUMMARY				
Fluoro carbon liquid used	Date	Time in	Date	Time out
GALDEN DET				

GROSS LEAK DETECTION SUMMARY					
Fluoro carbon liquid used	FC liquid temp	Date	Time in	Date	Time out
GALDEN DO_2	125°C				

Gross Leak Detection Equipment Used				
Description	Make	Model	Sl Number	Cal Due on

6 digit code	PACKAGE SL No.	RESULT

Test Performed By	Name	Sign
Approved By		

22.10.8Package Marking

HMC Part No.		Batch Qty	
Temp (22±3 deg C):	Humidity (50±5 %RH):	ESD Check: (pass /fail)	

Equipment Make & Sl.No./Model No				Equipment Name & Asset No.				
Number of packages marked	Lot no of ink & Expiry date	Ink Part Number & Colour	Marking Monogram	Set up approval By Quality (Name &Sign)	Curing schedule			Performed by (Sign & Name) & Date
					Curing Time	Curing Temp	Oven ID	

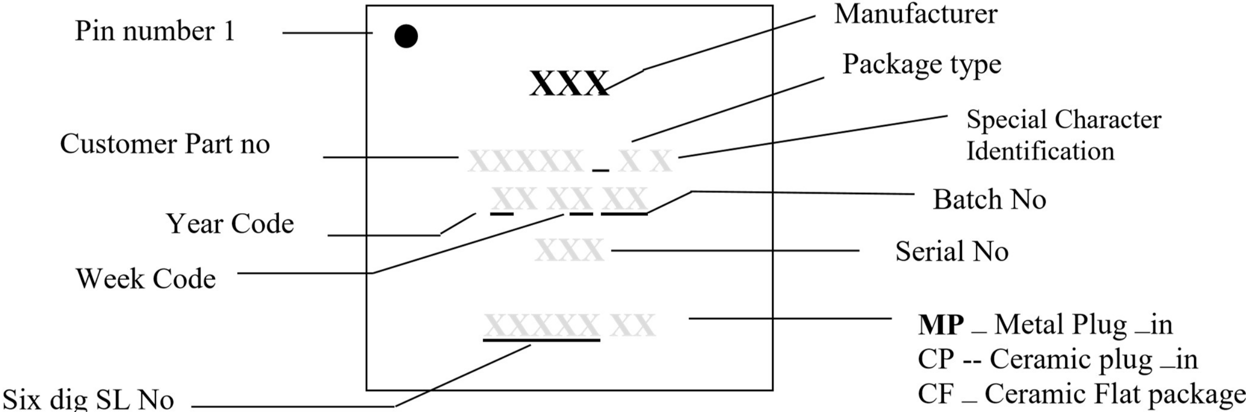
22.10.8.1 Visual inspection of marking (100%) (IPI 9)

Equipment Make & Sl.No./Model No					Equipment Name & Asset No.				
Marking details as per Drawing specification	Type of ink used	Identification of Pin no. 1	Marking alignment	Foreign materials	Multiple impressions	Qty Inspected	Qty Rejected	Set up approval By Quality (Sign & Name)	Performed by (Sign & Name)& date

22.10.8.2 Marking Permanency Test

Wrist strap check Pass/Fail	Chemical & its IGA/Lot No	Process followed	Dip time in chemical	Rubbing by brush & No of cycles	No of Packages checked	Result	Performed by (Sign & Name) & Date

22.10.8.3 Marking Monogram



22.10.9External Visual Inspection

HMC Type:		**Manufacturer:**		**Date:**	
Batch No./DC & Batch Qty:		**Qty Inspected:**		**Qty Accepted:**	

Ref Doc.: MIL-STD-883 METHOD 2009
Microscope ID No.:

Package Code No (6 Digits)	SL NO	Marking	Lead Inspection	Glass To Metal	Sealing periphery/ Weld Flow On Pkg wall	Pkg Braze area / Ceramic wall to seal ring Braze	Chip outs/ corrosion/ cleaning	Overall Lid & Package inspection	Residual spots	Lid Deflection	Result

	NAME	SIGN.
TEST DONE BY		
CHECKED BY		

22.11 Screening of Hybrid Microcircuits (Formats)

Table 11. List of Documents to be Submitted for each Batch of Screened Hybrids and applicable formats

Sl. No	Description	Format No.
1.	Screening Test Summary	HMC-S-SUM Rev 01
2.	Initial Electrical Test – Summary and Test report	HMC-S-01 Rev 00
3.	External Visual Inspection report	HMC-S-02 Rev 00
4.	Stabilization Bake – Test Report and monitoring chart	HMC-S-03 Rev 00
5.	Temperature Cycling – Test Report and Monitoring Chart	HMC-S-04 Rev 00
6.	Constant Acceleration or	HMC-S-05 Rev 00
	Mechanical Shock	HMC-S-06 Rev 00
7.	PIND	HMC-S-14 Rev 00
8.	Pre-Burn in Electrical Test-Summary and Test Report	HMC-S-01 Rev 00
9.	Burn in – Summary and Monitoring Chart	HMC-S-07 Rev 00
10.	Post Burn in Electrical Test-Summary and Test Report	HMC-S-01 Rev 00
11.	Active Thermal Cycling – Summary and monitoring Chart	HMC-S-08 Rev 00
12.	Post ATC Electrical Test-Summary and Test Report	HMC-S-01 Rev 00
13.	Seal Leak Test – Summary	HMC-S-09 Rev 00
	Fine Leak test Report	HMC-S-09A Rev 00
	Gross Leak Test Report	HMC-S-09B Rev 00
14.	External Visual Inspection Report	HMC-S-02-Rev 00
15.	Destructive Physical Analysis – Summary sheet	HMC-S-10 Rev 00
	External Visual Inspection	HMC-S-02 Rev 00
	Lead Fatigue Test	HMC-S-11 Rev 00
	External Visual Inspection	HMC-S-02 Rev 00
	Seal Leak Test – Summary	HMC-S-09 Rev 01
	Fine Leak test Report	HMC-S-09A Rev 00
	Gross Leak Test Report	HMC-S-09B Rev 00
	Destructive Physical Analysis-Summary	HMC-S-10 Rev 00
	Lead Fatigue Test	HMC-S-11 Rev 00
	Bond Pull Test	HMC-S-12 Rev 00
	Die Shear Test	HMC-S-13 Rev 00

22.11.1Screening Test Summary (Format HMC-S_SUM Rev 01)

FORMAT HMC-S-SUM Rev 01 Page 1/1

Product Monogram Details

URSC Work Order Number		Date	

IDs of Products Tested

From (6 digits)	To (6 digits)	Except

SCREENING SEQUENCE (MIL-STD-883)			Qty in	Qty failed	Qty out
1	External Visual Inspection	Method 2009			
2	Initial Electrical Test	Per specified procedure			
3	Stabilization Bake	Method 1008			
4	Temperature Cycling	Method 1010			
5	Constant Acceleration (for HMCs)	Method 2001			
	Mechanical Shock (for DC/ DC)	As per specified procedure			
6	PIND	Method 2020			
7	Pre-Burn in Electrical Test	Per specified procedure			
8	Burn in	Method 1015			
9	Post Burn in Electrical Test	Per specified procedure			
10	ATC	Per specified procedure			
11	Seal Leak Test	Method 1014			
12	Final Electrical Test	Per specified procedure			
13	External Visual Inspection	Method 2009			

SCREENING TEST SUMMARY		
List Tests where failure observed	ID (6 digits) of Products failed	NCR Reference

	NAME	SIGNATURE	DATE
Prepared By			
Verified By			

22.11.2Electrical Test (Format HMC-S-01 Rev 00)

FORMAT HMC-S-01 Rev 00 Page 1/1

Product Monogram Details

Vendor Ref No.		Stage	Initial/ Pre-Burn in/Post Burn-in/Post ATC/ Final/ Any Other
Test Procedu/re	URSC Specified Procedure		

Note – Post burn-in/ATC electrical tests should be performed within 72 hours of completion of burn-in/ATC

Equipment Used

Sl. No.	Equipment	Equipment ID	Calibration status

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity

Additional Information for Post Burn-in/Electrical Tests

	Date	Time
Completion of Burn in/ ATC		
Completion of electrical test		

Test Results

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	
NC References	

	Name	Sign
Test Performed By		
Approved By		

22.11.3External Visual Inspection-Summary (Format HMC-S-02 Rev 00)

FORMAT HMC-S-02 Rev 00-Page1/2

Product Monogram Details

Vendor Ref No.		**Stage**	Initial/ Final /Any Other

PARAMETERS TO BE CHECKED (at 30X magnification)

1. The Product is free from corrosion
2. The Product has no broken or loose leads
3. Marking is proper
4. There are no dent (@)/ chipouts (#) (applicable for metal (@)/ cermaic packages(#)
5. There are no cracks in glass to metal seal
6. Weld flow around seal periphery is uniform.

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity

Test Results

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	**Sign**
Test Performed By		
Approved By		

Note – While performing the initial external visual examination please confirm that Process specification control sheet for the Products is available. Look specifically for the following documents before starting the screening

- Pre-cap visual examination
- Pre-seal electrical test results
- Seal leak test results
- Post seal electrical test results
- External visual examination report

22.11.4External Visual Inspection-Test Report (Format HMC-S-02 Rev 00)

FORMAT HMC-S-02 Rev 00-Page 2/2

Product Monogram Details

Vendor Ref No.		**Stage**	Initial/ Final /Any Other

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity

Package ID (6 digit)	Inspection Parameter						Remarks
	Corrosion and marking	Dents	Lead integrity	Glass To Metal seal	Sealing periphery	Weld Flow on Package Wall	

	Name	Sign
Test Performed By		
Approved By		

22.11.5 Stabilization Bake-Test Report (Format HMC-S-03 Rev 00)

FORMAT HMC-S-03 Rev 00-Page 1/2

Product Monogram Details

Vendor Ref No.	

Applicable Test Method	MIL STD 883 Method 1008 Temperature: 125°C Duration: 72 Hours

Note: Ensure that temperature does not exceed 125°C

Climatic Chamber Details	
Chamber Name	
Chamber ID	
Calibration Status	

	Date	**Time**
Test Start		
Test Completion		

DETAILS OF INTERRUPTIONS, if applicable

Interruption			**Reason for Interruption**
Date	**Time From**	**Time to**	

Note: If total duration of interruption exceeds 2 hours, the test completion should be suitably delayed complying with requirement of 72 hours baking.

IDs of Products Tested

From (6 digits)	**To (6 digits)**	**Quantity**

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

22.11.6Stabilization Bake-Monitoring Chart (Format HMC-S-03 Rev 00)

FORMAT HMC-S-03 Rev 00-Page 2/2

Product Monogram Details

Vendor Ref No.	

	Date	**Time**
Test Start		
Test Completion		

IDs of Products Tested

From (6 digits)	**To (6 digits)**	**Quantity**

Time	**Temp**	**Monitored By**	**Time**	**Temp**	**Monitored By**

Note – Temperature should be monitored at least once every 3 hours

	Name	**Signature**	**Date**
Checked By			

22.11.7Thermal Cycling-Test Report (Format HMC-S-04 Rev 00)

FORMAT HMC-S-04 Rev 00-Page 1/2

Product Monogram Details

Vendor Ref No.	

Applicable Test Method	MIL STD 883 Method 1010 Temperature: 125°C, 10 minutes dwell : -55°C, 10 minutes dwell No. of Cycles: 10 Duration: 72 Hours

Note: Ensure that temperature does not exceed 125°C

Climatic Chamber Details	
Chamber Name	
Chamber ID	
Calibration Status	

	Date	**Time**
Test Start		
Test Completion		

DETAILS OF INTERRUPTIONS, if applicable

Interruption			**Reason for Interruption**
Date	**Time From**	**Time to**	

Note: In case of interruption, the cycle in progress at the time of interruption should not be counted.

IDs of Products Tested

From (6 digits)	**To (6 digits)**	**Quantity**

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

22.11.8Thermal Cycling-Monitoring Chart (Format HMC-S-04 Rev 00)

FORMAT HMC-S-04 Rev 00-Page 2/2

Product Monogram Details

Vendor Ref No.	

	Date	Time
Test Start		
Test Completion		

Cycle No	Hot Cycle			Cold cycle		
	Temp	Time in	Time out	Temp	Time in	Time out

	Name	Signature	Date
Test Performed By			
Checked By			

22.11.9Constant Acceleration (Format HMC-S-05 Rev 00)

FORMAT HMC-S-05 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	

Applicable Test Method	MIL STD 883: Method 2001 Condition: 5000g

TEST PROCEDURE:

a. Subject Each Product to constant acceleration of 5000g, duration 1 minute.
b. While mounting, ensure that lead pins are facing inward
c. Load minimum of two Products simultaneously with their weight difference not exceeding 800 mg.
d. Test two dummy HMCs prior to testing the flight Products to verify adequacy of test set up

ACCEPTANCE CRITERIA - Product should not show any evidence of substrate / Element detachment

FACILITY LOCATION
CALIBRATION STATUS

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity	IDs of failed Products

	Name	Signature	Date
Test Performed By			
Checked By			

22.11.10 Mechanical Shock (Format HMC-S-06 Rev 00)

(Applicable only for DC-DC Converters)

FORMAT HMC-S-06 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	

Applicable Test Method	

Equipment Location: Calibration Status

ID of Product Tested

Product ID from (6 Digit)	Product ID to (6 digit)

Test Results

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

22.11.11 PIND Test Report (Format HMC-S-14 Rev 00)

FORMAT HMC-S-14 Rev 00-Page 1/1

HMC Type		**Batch No**		**Manufacturer**		**Date**	

Method	**MIL STD-883E, Method 2020, Condition A (20g peak @ 60Hz)**

Equipment details		**Calibration Status**	

Start time		**End Time**	

Sl.No	**HMC No.**	**No.of cycles**					**Result**
		1	**2**	**3**	**4**	**5**	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Cycle No.	**1**	**2**	**3**	**4**	**5**
Qty Tested					
Qty Pass					
Qty Fail					
Qty cleared					

P: Pass, F: Fail

	ICG	**SRG**
Tested By		

22.11.12 Burn-In (Format HMC-S-07 Rev 00)

FORMAT HMC-S-07 Rev 00-Page 1/2

Product Monogram Details

Vendor Ref No.	

Applicable Test Procedure	Document will be supplied by URSC

Test Conditions	Temperature: 125°C, (measured at case using thermocouple for DC/DC, else chamber temperature) Duration: 320 Hours

Note: Ensure that temperature does not exceed 125°C (at case for DC-DC)

EQUIPMENT USED

Sl. No.	**Equipment**	**Equipment ID**	**Calibration status**

PARAMETERS (FROM TEST SET UP) TO BE LOGGED

Voltage		
Supply Voltage	Volts	Voltmeter ID No.
Vdd		
Vee		

Current		
Current consumed	mA	Current meter ID No.
Idd		
Iee		

Frequency		
Frequency port	Hz @ V	meter ID No.
Input		
Output		

BURN IN SUMMARY

	Start		**Completion**		**Duration**
	Date	**Time**	**Date**	**Time out**	
Test condition 1					
Test condition 2*					

* For types involving change over

FORMAT HMC-S-07 Rev 00-Page 2/2

Product Monogram Details

Vendor Ref No.	

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity

Test Results

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	**Sign**
Test Performed By		
Approved By		

Note – Detailed report and test monitor should accompany this table for each Product

22.11.13 Active Thermal Cycling (Format HMC-S-08 Rev 00)

FORMAT HMC-S-08 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	

Test Conditions	Between -30°C to +65°C in the sequence specified below - 2 cycles of 2 hrs duration - 1 cycle with 48 hrs, cold duration cold, 24 hrs hot duration - 2 cycles of 2 hrs duration

Climatic Chamber Details	
Chamber Name	
Chamber ID	
Calibration Status	

IDs of Products Tested

From (6 digits)	**To (6 digits)**	**Quantity**

Test Results

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	**Sign**
Test Performed By		
Approved By		

Note – The list of parameters monitored should accompany this table for each Product type

22.11.14 Seal Leak Test -Test Summary (Format HMC-S-09 Rev 00)

FORMAT HMC-S-09 Rev 00-Page 1/3

Product Monogram Details

Vendor Ref No.	

Test Conditions	Fine Leak: Product size up to 1.0” x 1.0” - 45 psia for 45 hrs Product size 2.0” x 2.0” - 30 psia for 24 hrs Acceptable leak rate: < 5 x 10^{-3} atm cc/ sec Helium
	Gross Leak: Product size up to 1.0” x 1.0” - 60 psia for 4 hrs Product size 1.0” x 1.5”, 1.0” x 2.0” -45 psia for 8 hrs Product size 2.0” x 2.0“ -30 psia for 24 hrs Acceptable leak rate: Free from stream of bubbles

IDs of Products Tested

From (6 digits)	To (6 digits)	Quantity

Test Results

Quantity Passed		
Quantity Failed	**Fine Leak**	
	Gross Leak	
IDs OF Failed Products		

	Name	Sign
Checked By		

22.11.15 Fine Leak Test -Test Report (Format HMC-S-09A Rev 00)

FORMAT HMC-S-09A Rev 00-Page 2/3

Product Monogram Details

Vendor Ref No.	

Equipment Location: Calibration Status

Detector Calibration	
Standard ID	
With Valve Closed	
With Valve Open	

Package Size	

Test Conditions	Bombing Pressure
	Test Duration

Helium Bombing Details			
Date	**Time In**	**Date**	**Time Out**

Helium Detection Details			
Date	**Time In**	**Date**	**Time Out**

Size of Test Batch (Qty)			
Sl.No	**Product ID**	**Leak Rate Observed**	**Remarks**

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

22.11.16 Gross Leak -Test Report (Format HMC-S-09B Rev 00)

FORMAT HMC-S-09B Rev 00-Page 3/3

Product Monogram Details

Vendor Ref No.	

Equipment Location: Calibration Status

Package Size	

Test Conditions	Bombing Pressure
	Test Duration

Size of Test Batch (Qty)			
Sl.No	**Product ID**	**Observation**	**Remarks**

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

Test Summary

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	**Sign**
Test Performed By		
Approved By		

22.11.17 Destructive Physical Analysis-Summary (Format HMC-S-10 Rev 00)

FORMAT HMC-S-10 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	

Test Standard	MIL-STD-883

ID of Product Tested	

Test Sequence			
Sl No	Test	Test Method	Performed (Yes/ No)
1	External visual examination	Method 2009	
2	Lead fatigue test	Method 2004	
3	Seal leak test – fine leak	Method 1014	
	Seal leak test – gross leak	Method 1014	
4	Internal visual examination	Method 2017	
5	Bond pull test	Method 2011	
6	Die shear test	Method 2019	

Enclose Attach all reports

	Name	**Signature**	**Date**
Test Performed By			
Checked By			

DISPOSITION

(Signature, Name & Date) ____

22.11.18 Lead Fatigue Test (Format HMC-S-11 Rev 00)

FORMAT HMC-S-11 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	

Applicable Test Procedure	MIL-STD 883 Method 2004

Test Specifications	-8 oz (228 grams), +45 degrees, 3 cycles

EQUIPMENT USED			
Sl. No.	Equipment	Equipment ID	Calibration status

Test Result				
Sl No	Product ID (6 digit)	Pin nos. tested	Pins not meeting spec	Passed (Specify Yes/ No)
1				
2				
3				
4				
5				
6				

Test Summary

Quantity Passed	
Quantity Failed	
IDs OF Failed Products	

	Name	Sign
Test Performed By		
Approved By		

22.11.19 Bond Pull Test (Format HMC-S-12 Rev 00)

FORMAT HMC-S-12 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	
Stage Test Performed	

Applicable Test Procedure	MIL-STD 883 Method 2011

ID OF PRODUCT TESTED

Observations

Sl.NO	**MEASUREMENT**	**POST /PAD**	**POST/SUBST**
1	Wire Bond Used	Gold	Gold
2	Diameter of the wire	1.0 Mil	1.5 Mil
3	Minimum Bond Strength Required (gmf)	2.5	4.0

OBSERVED BOND STRENGTH OF DIE TO SUBSTRATE BONDS			
4	Minimum Bond Strength Observed (gmf)		
5	Average Bond Strength Observed (gmf)		
6	Maximum Bond Strength Observed (gmf)		
7	Standard Deviation (gmf)		

OBSERVED BOND STRENGTH OF POST TO SUBSTRATE BONDS			
8	Minimum Bond Strength Observed (gmf)		
9	Average Bond Strength Observed (gmf)		
10	Maximum Bond Strength Observed (gmf)		
11	Standard Deviation (gmf)		

	Name	**Sign**
Test Performed By		
Checked By		

22.11.20 Die Shear test (Format HMC-S-13 Rev 00)

FORMAT HMC-S-13 Rev 00-Page 1/1

Product Monogram Details

Vendor Ref No.	
Stage Test Performed	

Applicable Test Procedure	MIL-STD 883 Method 2019

ID OF PRODUCT TESTED

DIE Shear Test Observations

Sl No	**DIE TYPE**	**AREA**	**STRENGTH REQD (MIN) (Kgf)**	**STRENGH OBSERVED (Kgf)**	**REMARKS**

RESULT OF DIE SHEAR TEST: PASS/ FAIL

REMARKS: ____

	Name	**Sign**
Test Performed By		
Checked By		

Part-IV

23 Material details

23.1 List of FIM for each 112SS HMC

Table 12. List of FIM for each 112SS HMC

Components as FIM				
S.No.	**DICE**	**Part No.**	**QTY**	**SIZE (Typical)**
1	MOSFET DICE	2N7389	4	0.121"X 0.186"
2	Transistor DICE	2N3019/2N3700	4	0.030"X 0.030"
3	Diode DICE	IN4148/1N3070/1N6642	4	0.015"X 0.015"
4	Zenor Diode DICE	1N759/1N6326	4	0.025"X 0.025"

23.2 Printed resistor requirements in each 112SS HMC

Table 13. Thick Film Resistor Requirements for each 112SS HMC

Thick Film Resistor Requirements for each 112SS HMC			
S.No.	**Part Number**	**Qty**	**Size**
1	15K, 2%, 8mW	4	0.040"X0.032"
2	47K, 2%, 22mW	4	0.032"X0.084"
3	100K, 2%, 10mW	4	0.032"X0.040"
4	10K, 2%, 2mW	4	0.032"X0.040"
5	5.6K, 2%, 1mW	4	0.032"X0.070"
6	27K, 2%, 4mW	4	0.070"X 0.032"

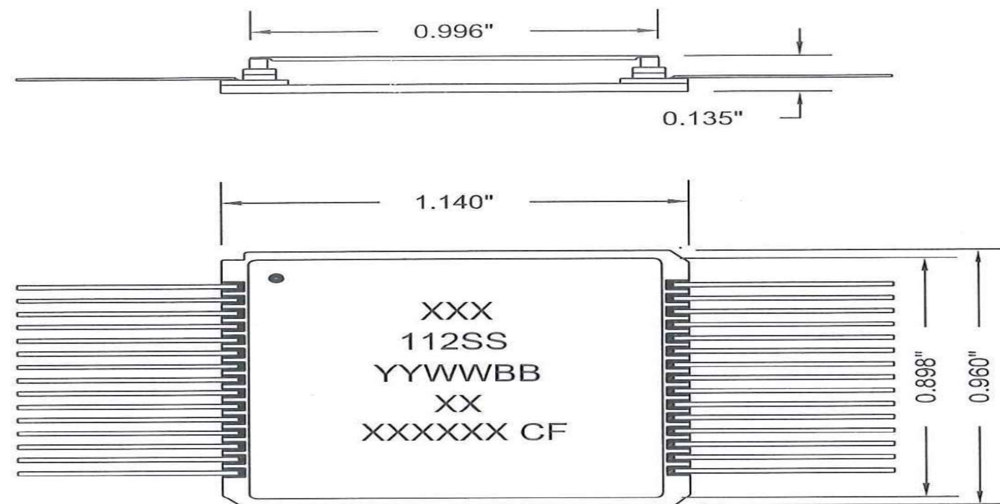
23.3 List of Materials required for fabrication

Table 14. Material list for fabrication of 112SS HMC

S.No.	Material	Details (Dimension, Product ID, Manufacturer etc)
1	Substrate	0.74-inch x 0.74-inch x 0.025-inch, AL_2O_3 – 96%
2	1st Conductor	DuPont 5275/5771
3	2nd Conductor	DuPont 5275/5771
4	Dielectric	DuPont 5704
5	Resistor 10K	DuPont 1738
6	Resistor 100K	DuPont 1748
7	Epoxy	H20E
8	Substrate Attachment	H74
9	1 mil Au wire	Wire bond
10	1.5 mil Au wire	Wire bond
11	5 mil Al wire	Wire bond

24 Mechanical Package details

24.1 Package outline

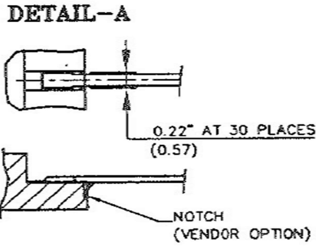


24.2 Package drawing details

DRG. 85210

NOTE:
1. GOLD PLATING THICKNESS TO BE AS PER CUSTOMER SPECIFICATION
2. LEAD RESISTANCE 0.1 OHMS MAX.
3. SEAL AREA TO BE METALLIZED
4. DIE AREA TO BE NOT METALLIZED.
5. LEAD THICKNESS APPLIES OUTSIDE OF LEAD FRAME UP TO 0.080 INCH AWAY FROM CERAMIC BASE. (TO ALLOW FOR SPACE ALLOY BUILD UP)
6. DIMENSIONS ARE IN INCHES.
7. DIMENSIONS IN BRACKET ARE MM

DETAIL–A



24.3 Pin details

Table 15. Pin details of 112SS HMC

PIN number	Description
P1	RAW BUS-1
P2	
P3	OUTPUT-1
P4	
P5	RET-1
P6	MON-1
P7	INPUT-1
P8	DGND-1&2
P9	INPUT-2
P10	MON-2
P11	RET-2
P12	OUTPUT-2
P13	
P14	RAW BUS-2
P15	
P16	RAW BUS-3
P17	
P18	OUTPUT-3
P19	
P20	RET-3
P21	MON-3
P22	INPUT-3
P23	DGND-3 &4
P24	INPUT-4
P25	MON-4
P26	RET-4
P27	OUTPUT-4
P28	
P29	RAW BUS-4
P30	

End of Document