

### Technical Compliance Matrix for End to End Fabrication and Testing of HMCs

| SN.      | Specification  | Compliance (Y/N) |
|----------|--|------------------|
| <b>1</b> | <b>Manufacturing of following Line Items</b>   |                  |
| 1.1      | HD4042T-HF: 42V, 40W Triple output converter   |                  |
| 1.2      | Functional Test Jig  |                  |
| 1.3      | Burn-in Test Jig   |                  |
| <b>2</b> | End to end Manufacturing, Procurement of Components, Raw materials and Packages, Fabrication of HMCs, Fabrication of Test Jigs, Testing and Screening of Space Qualified Hybrid Microcircuits (HMCs)   |                  |
| <b>3</b> | <b>Entitlement Criteria</b>  |                  |
| 3.1      | Indian industry whose line is qualified and having expertise in manufacturing & Delivering Space Qualified DC-DC Converter Hybrid Microcircuits (HMCs)   |                  |
| 3.2      | Provide supporting documents as per section 13 of RFP for evaluation of certified manufacturing line   |                  |
| <b>4</b> | <b>Applicable Standards and Process Identification Document (PID) for Reference</b>  |                  |
| 4.1      | The standards/ specifications spelt out in the MIL-PRF-38534 will form the basis for execution of all tasks.   |                  |
| 4.2      | 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.   |                  |
| 4.3      | 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.   |                  |
| 4.4      | The process steps as listed in approved PID duly approved by URSC/ISRO is to be followed at every stage of product realization.  |                  |
| <b>5</b> | <b>Procurement of HMC Packages and Raw Materials</b>   |                  |
| 5.1      | Vendor is responsible to procure all raw materials (substrates, printing inks, adhesives, wire/ribbons, packages, cleaning agents, gases, SIL clips, solders etc.) from sources approved by URSC.  |                  |
| 5.2      | Perform Incoming goods inspection for each material as per approved procedures and submit data.  |                  |
| 5.3      | Submit samples for adhesives for outgassing tests to URSC and obtain approval  |                  |
| 5.4      | Use shelf life limited items before date of expiration specified by the manufacturer.  |                  |
| 5.5      | The HMC packages shall be procured as per as per Part IV, section 26 from a qualified source. On receipt of packages, weight simulated packages are to be subjected for Lot Acceptance Tests (LAT) as per Section 20, Table 6. Certificate of Conformance (CoC) along with LAT fabrication / test data pack are to be submitted to ISRO for review and approval. |                  |

| 6   | <b>Procurement of EEE Components</b>   | <b>Compliance (Y/N)</b> |
|-----|--|-------------------------|
| 6.1 | Vendor is responsible for the procurement of all EEE components like MOSFET, Diode, Zener Diode, and Transistor in bare die form referring to Part-IV for component details and Part V, section 30 for procurement specifications of the same.   |                         |
| 6.2 | The components procured for the realization of the product are to be space grade. Parts shall be procured from QML/QPL listed Original Component Manufacturers (OCM) or authorized distributors.   |                         |
| 6.3 | Die diagram for procurement shall be as per HMC approved layout. Any deviation from that of layout shall be approved by URSC.  |                         |
| 6.4 | Post procurement, Vendor is required to perform Incoming goods inspection (IGI) as per approved Process Identification Document (PID), to ensure that the components received are of required quality with necessary certificates and data pack as specified in the procurement specification as per Part V, section 30. |                         |
| 6.5 | Vendor shall submit Incoming Inspection report (IGI Report), CoC, Quality Conformance and all other technical details for every component listed in Bill of Materials (BOM) in the "Parts Approval Document" format attached as in Part-III. Approval shall be obtained from URSC before the start of fabrication.       |                         |
| 6.6 | Any deviation request from the suppliers during the component procurement or during incoming inspection has to be reported to URSC and obtain approval before the procurement/start of fabrication as the case may be.   |                         |
| 6.7 | The procured components shall be handled and stored as recommended in section 7.3. Storage conditions for components with respect to environment, humidity and particulate contamination shall be as per the URSC guidelines. All ESD guidelines must also be adhered to.  |                         |
| 7   | <b>Fabrication of Items</b>  |                         |
| 7.1 | Fabricate HMC Products as per Process Identification Document (PID) duly approved by URSC (no deviations from approved process are permitted).   |                         |
| 7.2 | Fabrication of batches of converters for URSC QA clearance, testing, Screening adhering to the specifications provided and delivery to URSC within given schedule.   |                         |
| 7.3 | Fabrication of Functional and Burn-in jigs as per fabrication specifications of jigs in Part V, section 31. Delivery of jigs meeting delivery terms as per table 9.  |                         |
| 7.4 | Activities and URSC Inspection check points that are to be carried out during fabrication and post fabrication are as per Part II, Table-3.  |                         |
| 7.5 | Document all process details in Specification Control Sheet (SCS) formats as per Section 23.   |                         |
| 7.6 | Inform URSC about schedule for pre-cap inspection at least one week in advance (URSC may depute its representative for performing pre-cap, if required).   |                         |
| 7.7 | Perform inspection of Products on 100% basis at various stages of fabrication as per approved procedure and document along with SCS.   |                         |
| 7.8 | Submit SCS for review/ approval in formats and obtain clearance for Screening of HMCs.   |                         |

| <b>8</b>  | <b>Screening of HMC Products</b>  | <b>Compliance (Y/N)</b> |
|-----------|---|-------------------------|
| 8.1       | Vendor is responsible for carrying out Screening of HMCs as per the requirements spelt out in Part II, Table-4.   |                         |
| 8.2       | Initiate Screening only after receiving Fabrication clearance from URSC.  |                         |
| 8.3       | After completion of Screening, samples (as per the requirement provided by URSC) shall be subjected to DPA as per requirements given in Table-5.  |                         |
| 8.4       | Document all test results in the Screening Document formats and deliver them along with the products.   |                         |
| <b>9</b>  | <b>Data Pack</b>  |                         |
| 9.1       | After completion of fabrication of functional as well as Burn-in Jigs, fabricated jigs along with datapack shall be delivered as per section 21.2, table 9. of RFP to URSC for review and clearance of jigs for usage in testing of HMCs.   |                         |
| 9.2       | 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.  |                         |
| 9.3       | After completion of Screening, HMCs shall be delivered to URSC as per section 21, table 8 of RFP along with Screening data pack for each batch.   |                         |
| <b>10</b> | <b>Vendor's other Responsibility:</b>   |                         |
| 10.1      | Collection of required design details of HMC and design details of test jig, fabrication details and test procedures.   |                         |
| 10.2      | Submission of samples along with precap electrical test results to URSC for precap inspection before sealing (will be returned to vendor).  |                         |
| 10.3      | Submission of SCS of fabrication (up to precap stage) to URSC for sealing clearance.  |                         |
| 10.4      | Submission of fabrication data, SCS, Inspection reports, test results and applicable data for the activities as listed in section 16 and 17 for the fabricated samples to URSC.   |                         |
| 10.5      | Storage and maintenance of functional test and burn-in jigs as per procedure provided by URSC and return back to URSC after execution of the work.  |                         |
| 10.6      | Packing of HMCs in ESD safe boxes as per approved procedures and delivery to URSC.  |                         |
| 10.7      | Vendor shall Submit all documents as 'hard copy' as well as the 'soft copy (scanned) in Compact Disc' along with the Products.  |                         |
| 10.8      | Vendor shall Use all technical data supplied by URSC only for the intended purpose for which it is given. All Drawings, Documents and material of any kind passed on by URSC shall be held confidential by vendor or their Sub-Contractor/s, and shall remain the property of URSC. A Non-Disclosure Agreement (NDA) will be signed at the time of placement of purchase order. |                         |
| 10.9      | Vendor shall Participate in reviews related to failure of Products/Jigs and carry out failure analysis as required and implement identified corrective actions.   |                         |
| 10.10     | 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.   |                         |
| 10.11     | Failures of HMCs/Jig if traced due to the manufacturing process at any stage of fabrication, testing and screening, vendor is liable for manufacturing new product/Jig as the replacement of failed product.  |                         |

|           | <b>Vendor's other Responsibility:</b>  | <b>Compliance (Y/N)</b> |
|-----------|--|-------------------------|
| 10.12     | Vendor shall provide status report on various activities related to fabrication and testing of products and jigs.  |                         |
|           | Vendor cannot subcontract the services, in any form, partially or fully, to third party, accept the followings:<br><b>(i)</b> Fabrication of functional & burn-in jigs as per Part V, section 31.<br><b>(ii)</b> Environmental and mechanical tests as listed in Screening matrix of Part II, Table 4. |                         |
| <b>11</b> | <b>Delivery Schedules</b>  |                         |
| 11.1      | <b>Procurement Schedule:</b> Completion as per Part I, table 1 of RFP for procurement of components, raw materials, and packages procured as per Part IV and Part V, Section 30.   |                         |
| 11.2      | <b>Fabrication schedules of Test Jigs:</b> This covers fabrication and delivery of functional and burn-in jigs as per in Section 21.2.   |                         |
| 11.3      | Delivery of HMC converters as per delivery schedule of section 21.1.   |                         |
| 11.4      | Delivery of Functional & Burn-jigs Test jigs along with all technical documents to URSC as per section 21.2.   |                         |
| <b>12</b> | <b>Guidelines to be followed as a minimum during handling, storage and packing</b>   |                         |
| 12.1      | Handle all materials with care while processing and safety precaution followed as per technical manuals/ data sheet supplied by the manufacturer/s.  |                         |
| 12.2      | Precap HMCs/ Partially fabricated HMCs supplied to URSC shall be delivered in Nitrogen purged desiccators.   |                         |
| 12.3      | Use of Proper sockets to avoid damage to leads during all tests.   |                         |
| 12.4      | Caution shall be exercised to avoid damage to Products due to ESD/ EOS during all electrical tests.  |                         |
| 12.5      | Storage of all fabrication materials as per the instructions given in the technical manuals/ data sheet supplied by manufacturer/s.  |                         |
| 12.6      | Use of Nitrogen purged systems for storing the bare chip components.   |                         |
| 12.7      | Use of Nitrogen purged systems for storing half assembled products.  |                         |
| 12.8      | Storage of photo-sensitive films in dark room and limiting their exposure to yellow light while handling/ using.   |                         |
| <b>13</b> | <b>Precautions shall be taken to prevent failures due to Electro-static discharge (ESD)</b>  |                         |
| 13.1      | Use of wrist straps while handling assembled substrates & devices and connecting wrist straps to thick grounding lines and proper anti-static mats.  |                         |
| 13.2      | Use of antistatic wrist strap, tablemats and ground mats during assembly inspection and testing of Products.   |                         |
| 13.3      | Use of antistatic gloves during sealing of Products & carrying sealed packages in antistatic boxes.  |                         |
| 13.4      | Use of Teflon tweezers and finger cots while handling metallised substrates.   |                         |
| 13.5      | Use of metallic trays covered with lids (glass) while transporting products from one work area to another during their assembly.   |                         |
| <b>14</b> | <b>Acceptance of Products: Manufactured products will be accepted by URSC based on:</b>  |                         |
| 14.1      | Review of fabrication/SCS/Screening data   |                         |
| 14.2      | External visual inspection   |                         |
| 14.3      | Verification of test results through electrical checks   |                         |
| 14.4      | Manufactured & delivered items shall have warranty period of one year from the date of acceptance of items.  |                         |