

REVISION HISTORY

<u>REV</u>	<u>DATE</u>	<u>ORIGIN</u>	<u>REASON FOR CHANGE (S)</u>
A	3/22/2011	Scott Ubl	NEW
B	6/30/2011	Scott Ubl	Added XRF, changed sampling for Xray, updated permanency test and added solderability
C	9/8/2011	Scott Ubl	Improved definitions of COC, 3, 5, 5c,d,e and g, updated sampling on decap.
D	7/25/2012	Scott Ubl	Improvements to the requirements, added program check
E	9/14/2021	Rich Low	Remove electrical continuity testing, added golden sample, clarified redacted labelling for active components
F	9/17/2021	Rich Low	Updated language on golden sample testing
G	4/08/2022	Preston Gruett	Added TZZ to the TXX Test Code Matrix, and table TZZ
H	8/01/2022	Preston Gruett	Updated TZZ in TXX Test Code Matrix, removed table TZZ, updated Proof of Solderability definition

Test Specification

**For products without
OCM/OEM traceability requirements**

The following are the tests and quality requirements for product purchased under the test code TXX. The “XX” represents the specific test requirements as specified on the Plexus PO or through an alternate communication. Unless the supplier receives a written waiver from Plexus, the supplier agrees to coordinate and abide by the requirements listed below. All testing must be performed by a laboratory explicitly approved by Plexus.

ALL Shipments-The documentation and quality requirements for each shipment of parts are as follows:

- A. Certificate of Compliance (COC) – Must include a statement of compliance from the supplier of the material to all applicable specifications (drawing, PO, customer specifications, IPC specifications, etc...). It also must include the following for traceability:
- Name of Supplier
 - Name of Manufacturer/OEM/OCM
 - Manufacturer's/OEM's/OCM's Part Number
 - The Manufacturer/OEM/OCM Lot # and/or Date Code (both preferred, but date code at a minimum) for each shipment - COC and packing slip must contain each lot and/or date code which match the parts and all included documentation.
 - Plexus part number ordered on the PO
 - EC level or Revision level as specified on the PO for the Plexus part number ordered
 - Plexus PO number
- B. Proof of Solderability – All parts, which are solderable and are older than 2 years of age, must have a solderability test completed per J-STD-002. Certification of the solderability test can be included separately or within other specified documentation.

- C. Golden Sample - A Golden Sample is a component that is traceable to an authorized or franchised source. Previous inspection and test records of Golden Samples may be used in place of physical destruction of additional components. Where available, component testing shall include 1 golden sample with the **Test Report** providing comparative results.
- D. Test Report - Testing and the **Test Report** will be completed in order to determine if there is evidence of counterfeiting or that the material is not authentic. The testing and **Test Report** at a minimum will include the following:
- 1) The **Test Report** will include a summary acceptance statement with the wording below:
 - a) With respect to the observation of anomalies or evidence of counterfeiting, no inconsistencies were found with the lot or test samples during the inspection.Or
 - b) With respect to the observation of anomalies or evidence of counterfeiting, inconsistencies were found between the lot or test samples during the inspection.
 - 2) The **Test Report** will include a statement of acceptance for each of the required tests. The acceptance statement shall make reference to the Golden Sample results where applicable.
 - 3) **Test Report** Header Information
 - Name of part manufacturer
 - Manufacturer's part number
 - The Lot # and/or Date Code (both preferred, but date code at a minimum) for each part
 - Plexus part number ordered on the PO
 - The Plexus Test Code
 - Any additional final Customer Specifications
 - 4) The applicable tests and sample plan will be determined from the 2nd and 3rd digit of the Test Code (T-code) and the following inspection table (see the example below the table).

TXX TEST CODE MATRIX									
Group	2 nd Digit Designation	3rd Digit Designation							
		Active Component				Passive Component			
		L	M	H	Z	L	M	H	Z
A	Golden Sample Test Comparison	Suggested	Suggested	Suggested	N/A	Suggested	Suggested	Suggested	N/A
	Outer & Inner Packaging and Related Documentation Check	100%	100%	100%	N/A	100%	100%	100%	N/A
	Component Optical Inspection	3 random samples	Statistical samples	100%	N/A	3 random samples	3 random samples	100%	N/A
	Marking Permanency	3 random samples	3 random samples	Statistical samples	N/A	3 random samples	3 random samples	Statistical samples	N/A
	XRF	3 random samples	3 random samples	3 random samples	N/A	3 random samples	3 random samples	3 random samples	N/A
	X-Ray	3 random samples	Statistical samples	100%	N/A	3 random samples	3 random samples	Statistical samples	N/A
	De-Cap and Die Inspection	1 random sample	3 random samples	3 random samples	N/A	* 1 random sample	* 3 random samples	* 3 random samples	N/A
B	CSAM (Note 2)	3 random samples	Statistical samples	100%	N/A	* 3 random samples	Statistical samples	100%	N/A
	SEM and Elemental Analysis	3 random samples	Statistical samples	2	N/A	* 3 random samples	Statistical samples	2	N/A
C	Electrical testing - Functional, Conditioning, Performance or Parametric (Note 3)	N/A	Statistical samples	100%	N/A	N/A	Statistical samples	100%	N/A
Z	Customer System/Test Requirement	N/A	N/A	N/A	See tab TZZ - Customer Test Specs. within form 6939	N/A	N/A	N/A	See tab TZZ - Customer Test Specs. within form 6939

* Some tests are not applicable to certain types of passive components (Ceramic capacitors, etc.)

Statistical sample per ASQ Z1.4 Sampling Plan, AQL .65, Inspection level II, C=0 (Unless otherwise defined)

- 1) Plexus customer assigns risk (3rd digit) based on their understanding of the component function, test coverage, and end use of the product.
- 2) CSAM is at the discretion of the test facility if other indications warrant this type of test (poor packaging, expired humidity indicator, sign of component recovery, etc.
- 3) Exact criteria will be explicitly prescribed and defined by Plexus' customer.
- 4) Test requirements are cumulative. Ex: Group B includes Group A tests; Group C include Group A and B tests; etc
- 5) For Customer Test Requirements, see tab TZZ - Customer Test Specs. within form 6939.

Example: The T code printed on the PO for an active component is **TBM** (Group (B), Medium (M)) and would require the following:

1. Outer and Inner Packing 100 %
2. Component Optical Inspection (Statistical Sample, with Golden Sample)
3. Marking Permanency (3 Random Samples, with Golden Sample)
4. XRF (3 Random Samples, with Golden Sample)
5. X-Ray (Statistical Sample, with Golden Sample)
6. CSAM (Statistical Sample –see note 2, with Golden Sample)
7. De-cap, Die and Internal Inspection (3 Random Samples with Golden Sample)
8. SEM and Elemental Analysis (Statistical Sample, with Golden Sample)

*Notice: This document is considered “UNCONTROLLED” when it exists in any printed form.
See the Partner - Supplier – section of the Plexus Web page for the current master of this Test Specification.

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- 5) The testing specification shall not substitute for any additional final Customer specifications or standard practices used by a supplier, but the tests do not need to be duplicated if the minimum requirements are met. All testing completed on a sample that is less than 100% must be completed on each lot/date code contained in the lot. The sample shall be taken from multiple places on the reel or packaging. Testing, Test results and the **Test Report** will at a minimum include the following elements:
- a) **Golden Sample Comparison** –Golden sample test results are documented within the individual test results and include a comparison statement to the components being evaluated. **Test Report** shall identify the lot, date code, manufacture and part number clearly on the test report. Test protocols include destructive testing and components are to be disposed of according to Suppliers process.
 - b) **Visual Inspection of Packaging** – Visual inspection shall be completed on 100% all levels of inner and outer packaging and labels. This inspection shall include the scanning and verification of manufacturers bar code labeling. The inspection shall be completed as described in IDEA 1010 and include photo documentation in the **Test Report** and any redacted information noted.
 - c) **Visual Inspection of Component** – Visual inspection shall be completed on the selected components. The inspection shall be completed as described in IDEA 1010 and include photo documentation in the **Test Report**.
 - d) **Marking Permanency and Blacktopping** – Marking permanency tests with optical inspection shall be completed. Blacktopping/permanency tests using acetone, mineral spirits, heated Dynasolve (or equiv) and scrap tests shall be completed to assure the parts have not been blacktopped or remarked. Where applicable testing shall be per Mil STD 883.
 - e) **Radiographic (X-ray) Inspection** –Inspection shall be completed to verify the lead-frame, die characteristics and /or inside of the component package matches the parts specification sheet, a validated database and/or an exemplar part. The inspection shall also verify the consistency throughout the lot/sample. The inspection shall conducted at an appropriate magnification and include an assessment of the wire bonds (including ball on ball bonding), die size, lead frame, any die marking and any other applicable features. The **Test Report** shall include photo documentation.
 - f) **XRF Test** – XRF testing of component lead finish to verify RoHS (non leaded)/Non RoHS (leaded) is in compliance with the product label and specification sheet. The finish thicknesses must be within the manufacturer’s tolerances. Certification or proof of the test and plating measurements shall be included in the **Test Report**.
 - g) **CSAM Inspection** – Inspection shall be completed to verify the package does not indicate that the part was exposed to uncontrolled thermal cycles. The inspection shall include an assessment of the package interfaces and/or any other features as applicable. The report shall include photo documentation in the **Test Report**.
 - h) **Physical Internal Inspection (Decap, Delid and Die Inspection)** – Optical Inspection of the construction of the component must be analyzed through decapsulating and exposing the internal/integrated circuit. The wire bonds and die markings of the integrated circuit shall be inspected to verify the die inside the package matches the part’s specification sheet, consistency throughout the lot/sample and/or an exemplar part. With explicit approval from Plexus, this can also be performed through micro section analysis in specific applications. The **Test Report** shall include photo documentation. This requirement is only applicable to product with a die.
 - i) **SEM and Elemental Inspection** – Inspection shall be completed on the selected components. The inspection and elemental analysis shall determine if the texture on the top surface of the device is consistent with the bottom surface or an unadulterated device. Under high magnification (5000x) the surface should have the appearance that it is made up of randomly sized particles (the absence of smaller sized particles or the particles having an appearance of being smashed or deformed is a concern). A device using “Quantitative Optical Inspection” such as the DTEK inspection device by Covisus may be substituted for the surface inspection SEM test with prior Plexus approval. The **Test Report** shall include photographs, elemental scans and the results.

- j) Comprehensive/Functional Electrical Screening Test – Monitor and verify electrical function performance. This shall include a statistical analysis of the testing data. This may include monitoring after and/or during thermal and other conditioning requirements. Specifics of the testing and **Test Report** will be provided from the Plexus end customer.

Upon completion of the testing at a 3rd party all units will be shipped to Plexus or the requesting party. Components used in non-destructive tests must be packaged separately and labeled as such. Components used in destructive tests must be packaged separately and labeled as such. Product will be baked and properly packaged for moisture sensitivity control in accordance with IPC/JEDEC J-STD-033 and labeled appropriately per EIA JEP 113.

The above listed documentation must be submitted by the supplier to the requesting party and Plexus prior to and along with each shipment. Any lot or shipment of product identified per the statement in section 1b shall be considered defective and held by the Supplier. Any shipment received by Plexus without this documentation will be considered defective. All cartons, packing slips, reports and certifications must have part number, revision, MFG, MFG PN, quantity and P.O. number listed on them.