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1 Purpose & Scope

Qorvo is committed to reducing the impact of known toxic substances in our products and processes. This starts with reducing or eliminating chemicals and substances that have been identified as hazardous to air, water, soil or human health in our processes and products – from the starting materials through to assembly and shipping materials. The purpose of this document is to inform Qorvo suppliers about the requirements for testing their materials to ensure these substances are not contained.

This document applies to those suppliers whose chemicals, materials, and/or components are used to manufacture Qorvo products. These suppliers provide chemicals, materials, and/or components to Qorvo Sub-Contract Assemblers (SCAs) or to Qorvo facilities, who then manufacture the Qorvo product.

These materials are platings, components, or assembly materials that become incorporated into Qorvo's final product. These requirements apply to materials to be used in engineering trials also.

If a supplier has any questions regarding this specification, please contact the Qorvo Product Compliance Team at QorvoGreen@Qorvo.com for advice.

2 Definitions & Acronyms

Please see LIS-000602 for definitions related to this specification.

3 Roles & Responsibilities

Role	Responsibilities
Qorvo Green Group (QGG)	1. Monitor worldwide regulations and standards to determine the potential impact on Qorvo products 2. Monitor Significant Customer requirements to determine the potential impact on Qorvo products 3. Use the information gathered from Steps 1 and 2 above to revise and update this specification. NOTE: All related Assembly Subcontractor and Supplier data shall be forwarded to the Qorvo Green Group at QorvoGreen@Qorvo.com
Qorvo Assembly Subcontractor (Sub-con) and Suppliers:	1. Comply with sections 5 and 6 of this document. If the material composition of a component or material is changed, the Supplier shall send Qorvo updated 3rd party analytical testing per the requirements in Sections 5 and 6 below.

4 References

The following documents are referred to in this document.

Internal References

Reference	Title	Location
LIS-000602	Product Compliance Definitions	Qorvo Doc Center
COR.103	Supplier Quality Manual	Qorvo Doc Center
SPE-001275	Qorvo Banned and Restricted Substances Specification	Qorvo Doc Center

External References

Name Used in this Document	Official Name of Reference	Official Reference Number	Location
EU RoHS	Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive	2011/65/EU Amended by: 2015/863/EU	EU RoHS 2 Follow the EU RoHS process here.
China National VOC Regulations	People's Republic of China "Blue Sky Campaign" and associated standards. The referenced standards place limits on Volatile Organic Compounds (VOCs) in adhesives, industrial protective coatings, and printing inks.	GB 33372-2020 GB 30981-2020 GB 38507-2020	Official version may be found by searching the standard code here
Significant Customer Requirement	Qorvo has identified several "significant" customers who are also industry leaders in Product Compliance Management. These customers' requirements are incorporated into this document. Some of these customers' requirements go beyond regulatory requirements, which will explain the stricter nature of some of Qorvo's requirements.	Not applicable	Not applicable

5 Compliance Requirements

5.1 3rd Party Lab Test Reports

5.1.1 Suppliers whose products will be used to manufacture Qorvo wafers

5.1.1.1 3rd Party Lab Reports are not required.

5.1.2 Suppliers whose products will be used to assemble Qorvo products

5.1.2.1 Suppliers providing components and materials used in Qorvo products must also provide independent lab test reports at the homogeneous material level for substances listed in Table 1. This applies to all components and materials (i.e. platings, solder pastes, capacitors, inductors, couplers, resistors, substrates, die attaches, mold compounds, bond wires, under-bump metallization, lead frames, etc.).

5.1.2.1.1 Testing should be based on samples that represent the "final state" of the material after processing and incorporated into Qorvo's final products. Materials should be cured or plated into solid form. Liquid plating baths or uncured samples may not be accepted.

5.1.2.1.1.1 NOTE – Test labs may be able to do this for you as part of the sample preparation process. Please ensure the lab report indicates how this was done and includes a photo of the cured/plated material. See Appendix A for examples.

5.1.2.1.2 Independent lab testing shall be performed by an ISO 17025 Certified Test Lab. Upon request, supplier shall provide the current ISO 17025 certificate for the external laboratory.

5.1.2.1.3 Test reports should be updated annually and never be more than 12 months old, based on the report date in the test report.

5.1.2.1.4 Test reports must contain:

- the name and address of the laboratory
- references to the accreditation of the laboratories, inspection body, or certification body
- the results of the lab reports, along with any method, quantitation, and detection limits.
- a description of the methods of sample preparation and analysis used. This can be in the form of a flow chart
- a picture of the material that was tested

5.1.3 Suppliers who assemble Qorvo products

5.1.3.1 Suppliers completing assembly of Qorvo products must conduct independent lab testing at the homogeneous material level for substances listed in Table 3. This applies to all cleaners and demolders used during the assembly process. Reports shall be provided upon request.

5.1.3.1.1 Independent lab testing shall be performed by an ISO 17025 Certified Test Lab. Upon request, supplier shall provide the current ISO 17025 certificate for the external laboratory.

5.1.3.1.2 Test reports should be updated annually and never be more than 12 months old, based on the report date in the test report.

5.1.3.1.3 Test reports must contain:

- the name and address of the laboratory
- references to the accreditation of the laboratories, inspection body, or certification body
- the results of the lab reports, along with any method, quantitation, and detection limits.
- a description of the methods of sample preparation and analysis used. This can be in the form of a flow chart
- a picture of the material that was tested

5.2 Documentation Control and Recordkeeping

5.2.1 All documentation regarding Product Compliance should be maintained within a document control system that allows traceability to the products and to the organizations that created the documents. Supplier should maintain all documentation supporting material declarations, certificates of compliance, and analytical reports for a minimum of 10 years. Supporting documentation should be checked for consistency between material declarations, SDSs, and/or analytical reports. Discrepancies between any of this documentation should be resolved.

6 3rd Party Lab Analysis Requirements

Table 1 below lists the substances and substance categories for which Qorvo requires 3rd Party Test reports. Table 1 lists:

- The substance or substance category that is restricted or banned.
- The materials that are required to be tested for the listed substance or substance category
- The reason that Qorvo has this testing requirement
- The analytical methods and equipment to be used for this testing requirement and the detection limit required.

TABLE 1 - Testing Requirements

Substance to be Tested	Materials to be Tested	Reason for Testing Requirements	Analytical Methods
RoHS Substances			
Cadmium (Cd)	All Materials	**EU RoHS**	**Test Equipment:** ICP-AES/OES, AAS, ICP-MS **Test Method:** IEC62321-5:2013 **Note:** The detection limit should be ≤ 2 ppm
Chromium VI (Cr^{6+})	All Materials	**EU RoHS**	**Test Equipment:** UV-VIS, IC (Cr(VI)), ICP-AES/OES, AAS, ICP-MS (Total Cr) **Test Method:** IEC 62321-7-1:2015 (coatings on metals) or IEC62321-7-2:2017 (polymers and electronics) **Note:** The detection limit should be ≤ 8 ppm.
Lead (Pb)	All Materials	**EU RoHS**	**Test Equipment:** ICP-AES/OES, AAS, ICP-MS **Test Method:** IEC 62321-5:2013 **Note:** The detection limit should be ≤ 5 ppm.

Substance to be Tested	Materials to be Tested	Reason for Testing Requirements	Analytical Methods
Mercury (Hg)	All Materials	**EU RoHS**	**Test Equipment:** ICP-AES/OES, AAS, ICP-MS, TD-AAS, CV-AAS/AFS **Test Method:** IEC 62321-4:2013 **Note:** If a combination of a sample preparation method and a measurement method can ensure that the limit of quantification for mercury is ≤ 2 ppm if the material being tested is not a battery, the combination is applicable. If the material being tested is a battery, a detection limit of ≤ 1 ppm is required.
Polybrominated Biphenyls (PBBs)	All materials except metals or glass	**EU RoHS**	**Test Equipment:** GC/MS, GC/ECD, HPLC/UV, IAMS **Test Method:** IEC 62321-6:2015 **Note:** The detection limit should be ≤ 5 ppm.
Polybrominated Diphenyl Ethers (PBDEs)	All materials except metals or glass	**EU RoHS**	**Test Equipment:** GC/MS, GC/ECD HPLC/UV, IAMS **Test Method:** IEC 62321-6:2015 **Note:** The detection limit should be ≤ 5 ppm.
RoHS Phthalates			
Bis (2-ethylhexyl) phthalate (DEHP)	Organic Materials (plastics, polymers, etc.) and ceramic materials	**EU RoHS**	**Test Equipment:** GC/MS, LC/MS, IAMS, Py-GC/MS **Test Method:** IEC 62321-8:2017, EN 14372:2004 **Note:** The detection limit should be ≤ 50 ppm for each phthalate. For ceramic materials, testing should be done after material is sintered.
Butyl benzyl phthalate (BBP)			
Dibutyl phthalate (DBP)			
Diisobutyl phthalate (DIBP)			
Other Metals			
Antimony (Sb)	All Materials	**Significant Customer Requirement**	**Test Equipment:** ICP-AES/OES, AAS, ICP-MS **Test Method:** EPA 3050B, ISO 8124-3, EPA 3052, KS K 0852, KS K 0731, EPA 7062 **Note:** The detection limit should be ≤ 10 ppm.

Substance to be Tested	Materials to be Tested	Reason for Testing Requirements	Analytical Methods
Arsenic (As)	Glass Materials only	Significant Customer Requirement	**Test Equipment:** ICP-AES/OES, AAS, ICP-MS **Test Method:** EPA 3050B, EPA 3052, EN 1122 etc. **Note:** The detection limit should be ≤ 10 ppm.
Beryllium (Be)	Metals and Ceramics	Significant Customer Requirement	**Test Equipment:** ICP-AES/OES, ICP-MS **Test Method:** EPA 3050B, EPA 3052 **Note:** The detection limit should be ≤ 5 ppm.
Halogens			
Bromine (Br)	All materials except metals and ceramics	Significant Customer Requirement	**Test Equipment:** Combustion-IC, Oxygen Bomb-IC **Test Method:** IEC 62321-3-2, EN 14582:2016, ASTM D7359 **Note:** The detection limit should be ≤ 50 ppm.
Chlorine (Cl)	All materials except metals and ceramics	Significant Customer Requirement	**Test Equipment:** Combustion-IC, Oxygen Bomb-IC **Test Method:** IEC 62321-3-2, EN 14582:2016, ASTM D7359 **Note:** The detection limit should be ≤ 50 ppm.
Fluorine (F)	All materials except metals and ceramics	Significant Customer Requirement	**Test Equipment:** Combustion-IC, Oxygen Bomb-IC **Test Method:** IEC 62321-3-2, EN 14582:2016, ASTM D7359 **Note:** The detection limit should be ≤ 50 ppm.
Iodine (I)	All materials except metals and ceramics	Significant Customer Requirement	**Test Equipment:** Combustion-IC, Oxygen Bomb-IC **Test Method:** IEC 62321-3-2, EN 14582:2016 **Note:** The detection limit should be ≤ 50 ppm.
PFOS/PFOA			
Perfluorooctane sulfonate (PFOS)	Inks, Coatings, and Fluoropolymer Materials	Significant Customer Requirement	**Test Equipment:** LC-MS-MS **Test Method:** EN 17681-1:2022, EN17681-2:2022 **Note:** The detection limit should be ≤ 25 ppb.

Substance to be Tested	Materials to be Tested	Reason for Testing Requirements	Analytical Methods
Perfluorooctanoic acid (PFOA)	Inks, Coatings, and Fluoropolymer Materials	**Significant Customer Requirement**	**Test Equipment:** LC-MS-MS **Test Method:** EN 17681-1:2022, EN17681-2:2022 **Note:** The detection limit should be ≤ 25 ppb.
Volatile Organic Compounds (VOCs)			
Volatile Organic Compounds (VOCs)	Adhesives	**China National VOC Regulations** **Significant Customer Requirement**	**Note:** Please refer to China GB 33372-2020 for specific test methods
	Industrial Protective Coatings		**Note:** Please refer to China GB 30981-2020 for specific test methods
	Inks		**Note:** Please refer to China GB 38507-2020 for specific test methods

TABLE 2 – Summary of Testing Requirements

Material Type	RoHS 4 (Cd, Pb, Hg, Cr VI)	RoHS 6 (Cd, Pb, Hg, Cr VI, PBBs, PBDEs)	RoHS Phthalates (DEHP, DBP, BBP, DIBP)	Antimony (Sb)	Arsenic (As)	Beryllium (Be)	Halogens (Br/Cl/F/I)	PFOS/PFOA	Volatile Organic Compounds (VOCs)
Ceramic		X	X	X		X			
Organic Materials (plastics, polymers, etc.)		X	X	X			X	X	X
Glass	X			X	X		X		
Metal	X			X		X			

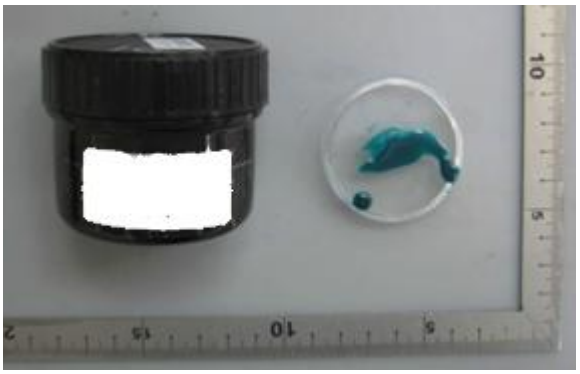
TABLE 3 – Cleaner and Demolder Testing Requirements

Substance to be Tested	Materials to be Tested	Reason for Testing Requirements	Analytical Methods
Benzene	Cleaners and Demolders	**Significant Customer Requirement**	**Test Equipment:** GC-MS or HPLC-MS **Note:** The detection limit should be ≤ 5 ppm
Bromine	Cleaners and Demolders	**Significant Customer Requirement**	**Test Method:** EN 14582, US EPA SW-846 5050/9056, ASTM D 7359-14a, DIN 53474:2017-12, or IEC62321-3-2 for total bromine **Note:** The detection limit should be ≤ 50 ppm.
Chlorine	Cleaners and Demolders	**Significant Customer Requirement**	**Test Method:** EN 14582, US EPA SW-846 5050/9056, ASTM D 7359-14a, DIN 53474:2017-12, or IEC62321-3-2 for total chlorine **Note:** The detection limit should be ≤ 50 ppm.
N-Hexane	Cleaners and Demolders	**Significant Customer Requirement**	**Test Equipment:** GC-MS or HPLC-MS **Note:** The detection limit should be ≤ 5 ppm
N-Methylpyrrolidone (NMP)	Cleaners and Demolders	**Significant Customer Requirement**	**Test Equipment:** GC-MS or HPLC-MS **Note:** The detection limit should be ≤ 5 ppm
Toluene	Cleaners and Demolders	**Significant Customer Requirement**	**Test Equipment:** GC-MS or HPLC-MS **Note:** The detection limit should be ≤ 5 ppm

7 Records

This document should be reviewed annually. If updates are required, the target date to complete the update is September 30th of each year.

8 Appendix A (Sample Preparation Photos)

Acceptable	Not Acceptable
 Plated Nickel	 Nickel Sulphamate Solution
 Cured Soldermask	 Uncured Soldermask

9 Revision History

Revision	Create Date (mm/dd/yyyy)	Description of Change	Initiator of Change
A	07/05/2017	Original revision. These requirements were removed from the Qorvo Banned and Restricted Substances Specification (QAL-21-1028)	John Sharp
B	01/05/2018	Minor Typo fixed. Replacement of COR.024 by LIS-000602 (Definitions). Being rev'd to add codes for distribution in Supplier Portal.	John Sharp
C	09/21/2018	Updated formatting of Section 5. Removed references to specific assembly sites in Section 5. Added requirement in Section 5 that testing be conducted on the material in the form present in the final Qorvo product. Amended "Materials to be Tested" section for Beryllium entry in Table 1. Added PFOS/PFOA entry to Table 1.	M. Mybeck
D	10/1/2019	Updated test method for Chromium VI (Cr^{6+}). Updated target date of annual update.	M. Mybeck
E	10/12/2020	Annual update. Added China VOC standards to External References. Removed detection limits from 5.1.2.1.4. Updated test methods for all substances in Table 1. Split out PFOA from PFOS and updated detection limit in Table 1. Added VOC testing to Table 1. Added Table 2, Summary of Testing Requirements. Added Appendix A (Sample Preparation Photos).	M. Mybeck
F	9/30/2022	Updated section 5.1.2.1.2. Updated section 7 to clarify that the document shall be reviewed annually, and updated as required.	M. Mybeck
G	9/28/2023	Annual update. Made the following updates to Table 1: • Revised Lead test method. • Added Fluorine. • Updated PFOS/PFOA material to be tested. Updated Table 2.	M. Mybeck

Revision	Create Date (mm/dd/yyyy)	Description of Change	Initiator of Change
H	4/25/2025	Made the following updates to Table 1: • Reordered substances in table • Added Iodine. • Updated Beryllium Analytical methods • Removed Sample Preparation details from Heavy Metals • Updated Halogen Analytical methods • Updated PFOS/PFOA Analytical methods Updated Table 2	M. Mybeck
I	9/30/2025	Added section 5.1.3 and Table 3, adding the requirement for assembly suppliers to test cleaner and demolder materials for the substances in Table 3.	M. Mybeck