

# **Skyworks Supplier Quality Manual**

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**Revision History**

<b>Rev</b>	<b>Name</b>	<b>Change</b>	<b>Date</b>
1	Carole Rosenberger	Initial Release	3/10/03
2	Carole Rosenberger	Added definition of Team in Section 6.2, Process Objectives in Sec. 3.0, and updated Sec. 6.4.1 – 6.4.5 to add specific details of supplier monitoring.	5/1/03
3	Carole Rosenberger	Updated Section 6.3.6 to add further reference to service qualification, added site document numbers in Section 4.0 and Section 6.4.	6/4/03
4	Carole Rosenberger	Added Level 3 (site) documents in Section 4.0, Internal Applicable Documents	3/19/04
5	Daniel Le Saux	Added reference to WB-W0082 – Supplier / Subcontractor Cost Of Quality (SCOQ) Program. Added Approved Supplier List, Supplier Audit Reports and Supplier Corrective Action Requests to Quality records section.	6/17/04
6	Indi Jeyarajah	Complete rewrite. Removed supplier qualification section.	8/18/05
7	Daniel Le Saux	Renumbered sections 5.10 through 5.17. Section 5.11 - corrected reference to Supplier Self Audit Assessment Survey from SQ04-0070 to SQ04-0005. Section 5.9.1 - modified supplier quality system requirements to specify mandatory registration to ISO 9001:2000. Sections 3 and 5.9.2 - added reference to SQ03-0145 Measurement System Analysis and use of the ANOVA method for such studies. Deleted reference to TL 9000. Added reference to SQ03-0133 Generating a Process Failure Mode Effects Analysis. Section 1.2 - modified scope to include reliability. Added reference to the AIAG PPAP manual. Changed supplier survey frequency to every three years or more frequent if so requested. Deleted RPN threshold.	8/24/06
8	Daniel Le Saux	Removed reference to corporate supplier quality department. Removed requirement to have supplier provide a copy of the quality plan to supplier quality engineer for review and approval. Changed supplier corrective action containment time to 72 hours and submission of 8D to 30 days.	01/26/07
9	Daniel Le Saux	Changed language in section 5.9.6 Maverick lot program.	02/13/07
10	Daniel Le Saux	Added requirement in section 5.10 Reports to provide certificate of analysis and/or certificate of conformance with all shipments. Added definition for certificate of analysis and certificate of conformance	03/30/07

11	Daniel Le Saux	Modified section 5.12 to increase Cpk requirement from 1.5 to 1.67. Added section 5.13 Control of Skyworks Owned Product or Equipment. Added references to SQ03-0041, SQ03-0044, SQ03-0047, SQ03-0050. Replaced SQ03-0133 and SQ03-0145 with AIAG FMEA and MSA manuals. Added requirements in 5.9.5 for formalized 8D process and associated training. Added section 5.9.9 addressing work environment.	06/28/07
12	Fernanda Barraza / Daniel Le Saux	Modified section 3 Associated Documents to include the supplier portal for process related documents. SCAR timelines in Section 5.9.5 Corrective Actions and Failure analysis were updated to align Skyworks practices with customer expectations. Added section 5.10.1 for calibration reporting expectations.	12/10/07
13	Daniel Le Saux	Updated environmental and social accountability requirements in sections 5.3.1 and 5.4	04/17/08
14	Daniel Le Saux	Removed requirement for recurring supplier survey.	11/26/08
15	Daniel Le Saux	Replaced 5.9.2 Process Flow Diagram with section entitled Process Controls that more accurately describes expected manufacturing controls. Clarified section 5.8 Product Traceability. Added reference to Advanced Product Quality Planning and Control Plan Manual in section 3. Updated SQ04-0005 Supplier Audit Assessment Survey accordingly.	01/30/09
16	Daniel Le Saux	Added SQ03-0038 Wafer Acceptance Criteria and SQ03-0314 Silicon Diode Wafer Acceptance Criteria for Sub-Cons in section 3.0. Also added language confirming incorporation of referenced documents into the contractual agreement. Added requirement to adhere to referenced workmanship standard in section 5.9.2. Added section 5.9.3 Purchasing. Renumbered all other sections accordingly. Added Sub Tier Supplier in section 2 Acronyms / Terminology and Description / Definition. Section 5.9.1: Replaced reference to ISO9001:2000 with ISO 9001.	06/11/09
17	Fernanda Barraza	Added SQ03-0319 Mounting Broken Wafer for Scribe at Sub-Contractors, SQ03-0268 Using SkyDocs System by External Partners and link to SkyDocs for external partners in section 3.0.	07/02/2009
18	Daniel Le Saux	Added requirement in section 5.9.1 Quality System to ensure suppliers notify Skyworks of any change in status of their Quality management system.	07/09/2009
19	Daniel Le Saux	Added section 4.1 to describe Supplier Performance Monitoring protocol. Added section 5.9 Reliability. Renumbered all other sections accordingly. Added definition Fitness For Use in section 2.0. Added requirement for accreditation mark in section 5.9.1. Corrected grammar in first paragraph of section 5.13.	02/11/2010

20	Daniel Le Saux	Replaced section 5.3 Green Procurement Supplier Specification with 5.3 Sustainability. Removed sections 5.3.1 Environmental Management, 5.4 Social Accountability and safety requirements from 5.9.11 Work Environment (i.e. all sustainability requirements are now stated in SQ03-0337). Added SQ03-0337 Skyworks Supplier Sustainability Specification to section 3.0 Associated Documents. Added section 5.3.1 Banned and Restricted Substances and added SQ03-0132 to list of applicable documents.	02/16/2010
21	Daniel Le Saux	Added reference to SQ03-0120 Skyworks Customer Labeling Requirements in section 3.0 Associated Documents and 5.6 Product Identification. Added reference to JESD-46 for product / process change notification criteria.	05/21/2010
22	Daniel Le Saux	Added reference to SQ03-0353 Component Supplier Reliability Requirements in section 3.0 Associated Documents as well as 5.8.5 Reliability. Also added reference to SQ04-0174 Process Control Optimization Checklist in section 3.0 Associated Documents as well as 5.8 Quality Plan.	11/04/2010
23	Daniel Le Saux	Reformatted section 3.0 Associated documents. Referenced SQ04-0019 General Terms and Conditions in section 4.0 Supplier Qualification. Added SQ04-0019 General Terms and Conditions to section 3.0 Associated documents	02/10/2011
24	Daniel Le Saux	Modified section 5.8.1 Quality System to add language regarding ISO/IEC 17025 accreditation scope.	03/10/2011
25	Daniel Le Saux	Modified section 5.4 Risk Management Policy to add "upon request, the supplier shall provide evidence that second sources for critical supplies, materials and components have been identified". Modified section 3.0 Associated Documents to change title of SQ03-0120 Skyworks Customer Labeling Requirements to Skyworks Labeling Requirements. Corrected double negative in section 5.5.1 Non-Conforming Product.	07/26/2011

## **1 Purpose and Scope**

### **1.1 Purpose**

The purpose of this manual is to define the basic quality systems and business procedures required of the suppliers who currently or potentially manufacture and/or supply production material and/or services to Skyworks.

This manual also defines quality requirements, business practices and applicable documents for these suppliers, in order to maintain their status as an approved supplier.

This manual, the Commercial Agreement, the Nondisclosure Agreement, and the Skyworks purchase orders are intended as the agreement on all the terms and provisions. This manual supersedes any prior written or oral agreements concerning any of the subject matter of this manual.

### **1.2 Scope**

This procedure applies to Skyworks suppliers of Level 1 Materials and Level 4 Services that directly affect the form, fit, function, quality or reliability of the finished product.

## **2 Acronyms / Terminology and Description / Definition**

### **Approved**

The supplier status is such that Skyworks' Sourcing may buy qualified products from that supplier.

### **ASL**

Approved Supplier List

### **Certificate of Analysis**

Signed document that provides quantitative data for the items being delivered that certifies that the product conforms to all purchase order requirements and, reference specifications.

### **Certificate of Conformance**

Signed document certifying that delivered products conform to all purchase order requirements and, reference specifications.

### **Disqualified**

The supplier performance has proven unacceptable such that no further orders may be placed.

### **Fitness for Use**

Product or service that fits Skyworks' defined purpose, under anticipated or specified operational conditions (e.g. JEDEC or other industry standards).

### **Level 1 Material**

Material used in the manufacture of finished product and directly affects the form, fit, function or reliability of the finished product.

### **Level 4 Service**

Service provided by an outside contractor that directly affects the form, fit, function or reliability of the finished product.

### **RMA**

Returned Material Authorization: typically a requirement for returning nonconforming products to the supplier.

### **SCAR**

Supplier Corrective Action Request: formal request for improvement issued by any member of the team.

**SQE**

Supplier Quality Engineer

**Sub Tier Suppliers**

Suppliers used by the supplier

**3 Associated Documents**

Access to generic Skyworks documentation our [Supplier Web Site](#). Access to product related documents is enabled through [SkyDocs](#) system (login required). Refer to **SQ03-0268 Using SkyDocs System by External Partners** for details on using this system.

The documents listed below contain requirements that become part of the contractual agreement between the supplier and Skyworks.

**Skyworks Documents**

*Referenced in this document and applicable to all suppliers:*

<b>SQ03-0132</b>	Green Procurement Supplier Specification
<b>SQ03-0138</b>	Supplier Qualification and Monitoring
<b>SQ03-0268</b>	Using SkyDocs System by External Partners
<b>SQ03-0337</b>	Skyworks Supplier Sustainability Specification
<b>SQ03-0353</b>	Component Supplier Reliability Requirements
<b>SQ03-0360</b>	Process Control Optimization Manual
<b>SQ04-0005</b>	Supplier Survey and Audit Questionnaire
<b>SQ04-0019</b>	General Terms and Conditions
<b>SQ04-0070</b>	Supplier Product / Process Change Notice
<b>SQ04-0099</b>	Process FMEA Template

*Applicable to wafer foundries and assembly suppliers:*

<b>SQ03-0038</b>	Wafer Acceptance Criteria GaAs (pHEMT and HBT) and Silicon CMOS Wafers
<b>SQ03-0314</b>	Silicon Diode Wafer Acceptance Criteria for Sub-Cons Silicon Diode Wafers
<b>SQ03-0319</b>	Mounting Broken Wafers for Scribe at Sub-Contractors

*Applicable to probe and test suppliers:*

<b>SQ03-0041</b>	Part Number Revision Control for Package Assembly Suppliers
<b>SQ03-0044</b>	Skyworks Supplier Test Data Transfer Set-up
<b>SQ03-0047</b>	Supplier Requirements for Test Flow/Data Management
<b>SQ03-0050</b>	Test Transfer Correlation Procedure
<b>SQ03-0120</b>	Skyworks Labeling Requirements

**National and International Standards**

*Referenced in this document and applicable to all suppliers:*

<b>ANSI/ESD S.20.20</b>	Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment
<b>ISO/TS 16949</b>	Quality Management Systems – Particular Requirements for the Application of ISO 9001 for Auto-Motive Production and Relevant Service Organizations
<b>APQP</b>	AIAG Advanced Product Quality Planning and Control Plan Manual
<b>FMEA</b>	AIAG Failure Mode Effects Analysis Manual
<b>ISO 9001</b>	Quality Management Systems – Requirements
<b>ISO/IEC 17025</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>JESD-46</b>	Customer Notification of Product/Process Changes by Semiconductor Suppliers
<b>JESD-50</b>	Special Requirements for Maverick Product Elimination
<b>MSA</b>	AIAG Measurement Systems Analysis Manual
<b>PPAP</b>	AIAG Production Part Approval Process Manual

**4 Supplier Qualification**

Supplier terms and condition of purchase are outlined in **SQ04-0019 General Terms and Conditions**. Additional supplier quality expectations are included in Section 5 of this document. Conformance to these requirements is verified by means of supplier surveys, requested self-appraisals, and on-site assessments performed by Skyworks or a third party. All requirements in each applicable element shall be fulfilled for a supplier to be considered qualified to provide materials or services to Skyworks. Detailed work instructions regarding this process can be found in **SQ03-0138 Supplier Qualification and Monitoring**.

**4.1 Supplier Performance Monitoring**

Supplier performance is monitored monthly based on a demerit system that gives equal weight to quality and delivery. The maximum score is 100%. Suppliers that fall below 70% for three consecutive months are placed on probation and an improvement plan is expected. Suppliers that fail to show improvement may be disqualified.

**5 Supplier Expectations****5.1 Corporate Policies and Objectives**

It is the policy of Skyworks that materials and services used in the design and production of Skyworks products be procured in a professional and ethical manner that results in achieving the lowest total cost of ownership for Skyworks and for our customers. Further, all purchased materials and services must be in compliance with agreed upon requirements, be delivered on time, and have competitive lead times and prices

**5.2 Regulatory Agency Compliance**

It is the supplier's responsibility to ensure that their product is in compliance with all applicable regulatory agency and product safety requirements, and claims including that stated in supplier published product advertising, catalogues and data sheets. The supplier must be prepared at all times to substantiate compliance by providing copies of test reports and making records available for review if requested.

### **5.3 Sustainability**

All requirements set forth in **SQ03-0337 Skyworks Supplier Sustainability Specification** apply.

#### **5.3.1 Banned and Restricted Substances**

Refer to **SQ03-0132 Green Procurement Supplier Specification** for all materials restrictions and reference to Skyworks' banned and restricted substances.

### **5.4 Risk Management Policy**

The supplier shall have an up-to date documented Risk Management Policy ensuring that in the event of disaster or inability to perform, the supplier has plans to take necessary action in order to minimize and or eliminate such risk, from Skyworks. This needs to be provided with completion of **SQ04-0005 Supplier Survey and Audit Questionnaire**. Upon request, the supplier shall provide evidence that second sources for critical supplies, materials and components have been identified.

### **5.5 Notification of Product Quality or Delivery Issues**

#### **5.5.1 Non-Conforming Product**

Delivery of product to Skyworks not meeting supplier's internal manufacturing specifications for measurements as identified on the control plan, acceptance criteria, outlier limits, Maverick limits or Skyworks specifications requires:

- Supplier to review non-conformance through a cross functional Material Review Board (MRB) to determine acceptability of shipping material to Skyworks.
- Generation of a Non-Conforming Material Report (NCFR) to the Skyworks' Supplier Quality Engineer specifying nature of non-conformance, associated data with non-conformance, and why supplier believes non-conformance will not impact Skyworks' product performance, quality or yield.
- Approval of the NCFR by Skyworks Quality Department.

#### **5.5.2 Product / Process Changes**

The Supplier shall have a process to manage and track changes in requirements and product data. This shall include revision history documentation of the resulting changes in engineering documentation.

The Supplier shall notify Skyworks of product or process changes made after the product has been approved in accordance with the requirements of **JESD-46** and **SQ04-0070 Supplier Product / Process Change Notice**.

### **5.6 Product Identification**

The Supplier shall have a system of manufacturing control such as a route card, run card, control software, etc, used for the identification of products with regard to type, lot or serial number, and their status during all stages of production and test.

Shipments originating from any assembly and/or test location, including subcontractor shipments that are sent directly to customers shall be labeled in accordance with **SQ03-0120 Skyworks Customer Labeling Requirements**.

### **5.7 Product Traceability**

The Supplier shall have a system for ensuring finished product traceability back to the subassembly, component and raw materials. Traceability shall be achieved by means of date code, lot and/or serial number.

### **5.8 Quality Plan**

Skyworks being a leader in the wireless industry will continuously strive to improve Quality and provide world-class products to our customers. To ensure we are able to meet and maintain this objective, Skyworks expects the elements in this section to be present with its suppliers. In the event the supplier does not have an element of this plan, Skyworks will at its discretion, decide if we want to work and assist the supplier develop the missing element. The Quality plan may be

reviewed by the Skyworks Supplier Quality Engineer prior to a supplier being qualified. For existing suppliers, Skyworks Quality Engineers may work with supplier to document and/or develop an acceptable Quality Plan.

The requirement of the Quality Plan is one of the most critical steps in becoming an approved supplier to Skyworks. Skyworks' intent is to purchase material from suppliers on a Ship to Stock Program. This is a process where Skyworks receives parts and materials from suppliers and uses them with a minimum of internal inspection and test costs or losses resulting from the supplier's fault non-conformances. Skyworks will not accept the cost of excessive testing and poor quality, and will not pay the cost of our suppliers doing extensive testing or the resulting poor yields and escapes.

The intent is to emphasize process capability improvement and controls and/or monitoring that will have the greatest impact on quality and reliability and ultimately zero defects, zero repeat issues and low cost of ownership goals. Skyworks has introduced a new concept called Process Control Optimization or PCO that may be used to reach these goals. PCO is outlined in **SQ03-0360 - Process Control Optimization Manual**. Each supplier will be responsible for defining critical processes and if required, report to Skyworks Supplier Quality Engineer the measurement index as well as a continuous improvement plan.

The Quality Plan will normally consist of the following elements as a minimum; additional requirements may be requested by Skyworks:

### **5.8.1 Quality System**

Suppliers are expected to have an effective quality system in place that assures consistent on-time delivery of conforming product. Registration to **ISO 9001** by an accredited third party certification body is required at a minimum with conformity to **ISO/TS 16949** as the long-term goal. The supplier's third party certificate must include a valid certification body accreditation mark. Registration to **ISO/IEC 17025** is required for calibration and testing laboratories. The parameter and/or equipment applicable to the laboratory service being provided must be within the scope of accreditation.

Supplier shall notify Skyworks of any change in status of their Quality management system (e.g. change of scope, registrar, standard, etc.) in accordance with section 5.5.2. This requirement shall apply to **ISO 9001, ISO/TS 16949** and/or **ISO/IEC 17025**.

### **5.8.2 Process Controls**

The supplier shall plan and carry out manufacturing processes under controlled conditions that shall include:

- The use and development of control plans as outlined in **the AIAG Advanced Product Quality Planning and Control Plan (APQP)** manual
- The use of documented work instructions available at point of use
- The use of suitable equipment supported by a preventive maintenance program for key process equipment
- The use of equipment for test, inspection and measurement of Skyworks product. This equipment shall require Gage reproducibility and repeatability (R&R) studies to demonstrate the capability of the equipment and measuring process. These studies shall be performed using the ANOVA method outlined in the **AIAG Measurement System Analysis (MSA)** manual. All such equipment with > 10% error needs to be reported to Skyworks.
- Adherence to Skyworks workmanship standards listed in section 3.0.
- The use of statistical tools such as Statistical Process Control (SPC) and capability studies (see section 5.12). The supplier shall initiate a reaction plan for characteristics that become incapable or unstable.
- A production scheduling system that supports Skyworks' delivery expectations

### **5.8.3 Purchasing**

The supplier shall have a defined process for their purchasing process that includes:

- The use of approved sub tier suppliers for the procurement of materials and/or services that directly affect the form, fit, function or reliability of Skyworks products

- A supplier development program that emphasizes the flow down of the requirements set forth in this manual to sub tier suppliers
- The generation of purchasing information that clearly describes the product being purchased
- The implementation of verification activities to ensure that incoming product meets specified purchase requirements
- Sub tier supplier performance monitoring

#### **5.8.4 Failure Mode and Effect Analysis (FMEA)**

It is strongly recommended that the supplier develop a Process or Product FMEA and use those results to determine the appropriate test and inspection points as well as appropriate control methods. Additional information can be found in the **AIAG FMEA manual**. The supplier may also use **SQ04-0099 Process FMEA Template**.

#### **5.8.5 Reliability**

Suppliers shall have a qualification process for their products, processes and/or components that ensure quality, reliability and fitness for use (see 2.0). This process must be followed for new products as well as product or process changes (see 5.5.2). This process must also include on-going (quarterly at a minimum) reliability testing that gathers and monitors reliability data on qualified production products and processes.

Component suppliers (e.g. capacitors, resistors, filters, etc.) are required to forward on-going reliability reports to Skyworks FA/Reliability department on a quarterly basis. This and other requirements are outlined in **SQ03-0353 Component Supplier Reliability Requirements**.

Other suppliers may be requested to provide these reports on an as-needed basis.

#### **5.8.6 Production Part Approval**

Skyworks may request suppliers to conform to the production part approval process as outlined in the **AIAG PPAP manual**.

#### **5.8.7 Corrective Action and Failure Analysis**

Skyworks will use a Supplier Corrective Action Request (SCAR) as the trigger to engage the supplier for a request for containment, root cause analysis, corrective action and verification. All responses from supplier need to be in an 8D format. The supplier should have a formal, 8D process with evidence that key personnel have been trained. Failure Analysis capabilities and support needs to be identified in the Quality Plan.

The initial response (3D) needs to be provided within 1 business day of the receipt of samples. The root cause analysis and corrective action plan (5D) shall be provided within 10 business days of the receipt of samples. The actual deployment and verification of corrective actions (6D through 8D) may take longer based on the complexity of the problem.

#### **5.8.8 Maverick Lot Program**

Skyworks encourages suppliers to have a Maverick lot program in the spirit of **JESD-50**.

#### **5.8.9 Document Control System**

Skyworks requires suppliers to have a Document control system in place. Suppliers must ensure that the latest Skyworks specifications, work instructions, and other related documents are maintained in this system

#### **5.8.10 Internal Quality Audits**

Suppliers shall perform internal quality audits in accordance with documented procedures and control plans. The supplier shall review audit results, plan corrective action and perform follow-up verification of corrective action effectiveness.

The supplier will publish the frequency of internal audits performed in the supplier facility in the Quality Plan. Periodically, the supplier may be requested to share details of the internal audits and follow-up items with Skyworks Supplier Quality Engineer.

**5.8.11 Work Environment**

Suppliers shall determine and manage the aspects of work environment needed to achieve conformity to product requirements. Examples of aspects include but are not limited to temperature, humidity, cleanliness and electrostatic discharge protection.

Suppliers who handle ESD sensitive parts are expected to establish and maintain an ESD management system in accordance with ANSI/ESD S20.20.

**5.8.12 Problem Resolution, Escalation and Key Contacts**

The Quality Plan will also define who has authority for resolving quality, technical and supply issues and the escalation process to the next level of management in the event that a decision can not be reached at any level.

The supplier is expected to designate a key contact person and will furnish their name, daytime phone number, pager/mobile number, and email address. This individual will be the owner for taking action on quality alerts and ensuring all reports and corrective action request are rendered to Skyworks in a timely fashion. The supplier will be responsible for the assuring the availability of this individual or a back-up is available to Skyworks at all times.

**5.9 Reports**

All shipments must be accompanied by a certificate of conformance and/or certificate of analysis traceable back to the items being delivered.

The supplier may be requested to provide periodic reports or summary reports of inspection or test results. The Skyworks Supplier Quality Engineer may review the metrics and reporting formats and frequency. Additionally the supplier may be requested by Skyworks Supplier Quality Engineer to provide periodic summary reports of FA and evaluation results on SCARs / RMAs. These will need to be in the format prescribed by Skyworks Supplier Quality Engineer.

**5.9.1 Calibration Reports**

For calibration service providers, calibration reports must include evidence of conformance to requirements. Calibration shall be performed in accordance with manufacturer's specifications unless otherwise noted on the purchase order. The calibration report shall include as a minimum the following information:

- Equipment identification, including the measurement standard against which the equipment is calibrated
- Any out-of-specification readings as received for calibration/verification
- A statement of conformity to specification after calibration/verification

**5.10 Supplier Self Assessment Survey**

**SQ04-0005 Supplier Survey and Audit Questionnaire** shall be completed by the supplier during the initial supplier qualification and will be kept on file by Skyworks. This form will also be used as the template for on-site audits performed by Skyworks. An updated survey may be requested by the Skyworks Supplier Quality Engineer if deemed necessary.

**5.11 Capability Indices**

The supplier shall establish a procedure to assure that critical Cpk's are  $\geq 1.67$ . This procedure may be reviewed by the Skyworks Supplier Quality Engineer. For those critical Cpk's which are  $< 1.67$  for two consecutive quarters, the supplier will have documented improvement plans that shall be made available to Skyworks upon request.

**5.12 Control of Skyworks Owned Product or Equipment**

Secondary materials (such as carrier tape, trays, packaging, etc.) and consigned material provided or specified by Skyworks shall be verified to meet Skyworks requirements and fitness for use before being accepted.

Custom equipment and/or tooling purchased by Skyworks shall remain the property of Skyworks. All Skyworks-owned equipment and tools will be marked with Skyworks' control numbers prior to shipment to the supplier.

Skyworks owned equipment, tools, test correlation parts, secondary materials or consigned material shall be controlled, stored, handled and maintained in a manner that protects them from loss and damage.