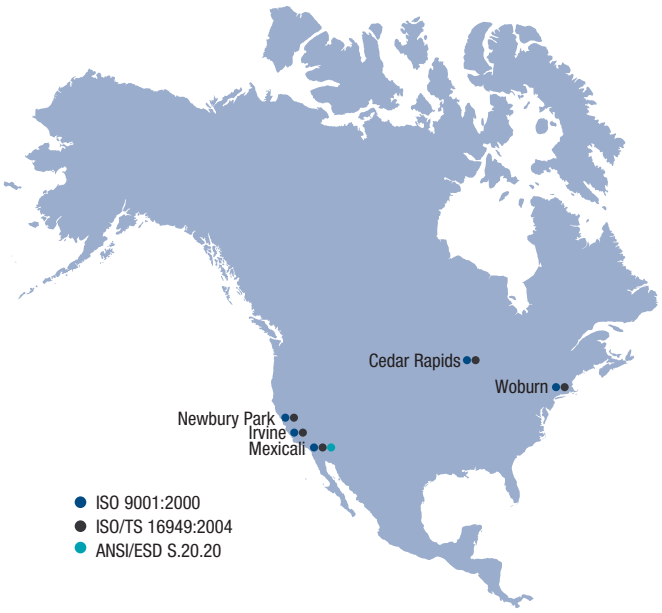
Quality/Reliability

Certifications

As an industry leader, Skyworks has demonstrated its quality leadership and strengthened its commitment to customer satisfaction through formal, third-party registration to ISO 9001, ISO/TS 16949 and ANSI/ESD S.20.20.



ISO 9001

ISO 9001 is an internationally recognized Quality Management System standard that promotes customer satisfaction through continual improvement of the system's effectiveness. ISO 9001 provides a model for a Quality Management System which focuses on the effectiveness of the processes in a business to achieve desired results. The standard promotes the adoption of a process approach emphasizing the requirements, added value, process performance and effectiveness, and continual improvement through objective measurements.

ANSI/ESD S.20.20

ANSI/ESD S20.20 is a standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment. The standard covers the requirements necessary to design, establish, implement, and maintain an Electrostatic Discharge (ESD) Control Program.

ISO/TS 16949

One of the major challenges facing today's manufacturers is that, even though there is a low failure probability for each individual component, the total failure probability for all parts combined may reach unacceptable levels. The ISO/TS 16949 standard answers this challenge by defining requirements focused on continual improvement, and the understanding of process interaction. It also creates an implementation framework for customer specific requirements, and includes clear requirements for development processes and techniques to prevent problems in the earliest possible stage of product development.

Jointly developed by International Automotive Task Force (IATF), ISO/TS 16949 is the automotive industry's international quality management system standard intended to answer the need for global consistency, continual improvement, and increased customer satisfaction. It is approved and released by the International Organization for Standardization (ISO).

What Certification Means to You

- Partnering with a company that has made a commitment to quality
- Doing business with an organization with a recognized management system model
- Assurance that necessary resources have been dedicated
- Consistent processes and products
- A management team that has established clear quality objectives and targets that are constantly monitored and analyzed
- Quality systems and procedures that are continuously audited and improved

Quality Policy

Skyworks has adopted a simple yet powerful quality policy that guides business decisions day-in and day-out.

Skyworks is committed to the never-ending quest for perfect quality.

Our ultimate goals:

- No Field Failures
- No Customer Returns
- No Reliability Failures
- No Yield Loss

ISO 14001:2004

As an industry leader, Skyworks is committed to the protection and preservation of the environment in all its business operations. We understand that our actions today can have environmental impacts tomorrow. Improvements at our facility will affect our customers and ultimately consumers. To this end, we have an established ISO 14001 certified Environment Management System by which we operate. We build products in consideration of regulatory and industry requirements, such as Restriction of Hazardous Substances Derivative (RoHS), and offer lead (Pb)-free, RoHs-compliant, and Green™ solutions to meet the needs of our customers in today's environmentally-conscious market.

Quality Testing Programs

Environmental and electrical tests are used to verify and improve the reliability of commercial semiconductor components.

Six Sigma

As we strive for continuous improvement, Skyworks has adopted the Six Sigma approach, a practical methodology that applies statistical tools and methods to aid in continuous process improvement.

Quality Conformance Testing

Quality conformance testing (also called lot acceptance testing), is testing performed on a sample of the lot to determine that the devices meet specified electrical and mechanical requirements.

Qualification Test

Qualification testing is used to determine that the manufacturer of a device can supply devices that meet the full electrical and environmental capability requirements of the customer's specification. Skyworks qualification testing is conducted according to JEDEC standards.

Ongoing Reliability Monitoring Program

The reliability monitor program is administered and executed by the Quality Assurance Department. The intent of this program is to:

- Provide an ongoing evaluation of our product reliability.
- Maintain a pulse on the fabrication and assembly processes.
- Samples are selected quarterly from representative qualified products from the production line that have passed functional electrical test. The product selection lists will include considerations for forecasted product volume and customer requests.

Product Qualification Testing

Test[1]	Qty. (SS x lot)	Conditions	Standard	Endpoints	Accept Criteria
Dynamic operating life (HTOL)	77 x 1	T_{CASE} = 125 °C or T_J or T_{CH} = 150 °C; Depends on accel factor and life expectancy. Typically 1000 hours	JESD22-A108	Electrical test, pre and post stress with additional readpoints per qual plan	0 fail/77
ESD – HBM	3 per level per partition[2]	Post-zap 1 positive discharge and 1 negative discharge per pin for each pin combination	JESD22-A114	Electrical test, pre and post stress	Pass/fail criterion is ATE functional test w/production limits
ESD – MM	3 per level per partition	Post-zap 1 positive discharge and 1 negative discharge per pin for each pin combination	JESD22-A115	Electrical test, pre and post stress	Pass/fail criterion is ATE functional test w/production limits
ESD – CDM	3 per level	Post-zap 5 discharges per pin; field-induced, charge-discharge method	JESD22-C101	Electrical test, pre and post stress	Pass/fail criterion is ATE functional test w/production limits
Preconditioning	231 x 1	Sequence: visual inspection min. 25X, 24 hr bake at 125 °C, moisture soak per MSL, reflow 3x	JESD22-A113	Electrical test, pre and post stress	0 fail/231
HAST or THB or unbiased HAST or autoclave	77 x 1	96 hrs, 130 °C, 85% RH, 18.6 psig or 1000 hrs, 85 °C, 85% RH, or 96 hrs, 121 °C, 100% RH, 15 PSIG; preconditioned samples	JESD22 -A110 (HAST) -A101 (THB) -A102 (AC), -A118 (unbiased HAST)	Electrical test, pre and post stress	3% LTPD (0 fail/77)
Temperature cycling	77 x 1	-65 °C to +150 °C 500 cycles, or -55 °C to +125 °C 1000 cy. Preconditioned samples	JESD22-A104	Electrical test, pre and post stress	3% LTPD (0 fail/77)
High temp storage	77 x 1	150 °C 500 hours (preproduction) 1000 hours (production) Preconditioned samples	JESD22-A103	Electrical test, pre and post stress	3% LTPD (0 fail/77)

Ongoing Reliability Monitor Program

Test	Qty.	Standard	Endpoints	Accept Criteria
Dynamic operating life (HTOL)	77/lot	JESD22-A108	48 or 168 hours, and 1000 hours	0 fail/77
Preconditioning (PC)	154/lot	JESD22-A113	3X reflow	0 fail/154
HAST or unbiased HAST or autoclave	77/lot (from PC)	JESD22 -A110 (HAST) -A102 (AC), -A118 (unbiased HAST)	96 hours	3% LTPD (0 fail/77)
Temperature cycling	77/lot (from PC)	JESD22-A104	500 cycles	3% LTPD (0 fail/77)

*Temp. cycle and THB/autoclave will be redone if the moisture sensitivity classification changes, otherwise these tests are repeated each year.

ESD Awareness

Skyworks deploys state-of-the-art ESD controls from wafer fabrication through to assembly, test, and pack. In order to maintain device integrity, Skyworks has outlined critical ESD guidelines that should be followed as a minimum. Skyworks adheres to the requirements outlined in MIL-HDBK-263, MIL-STD-1686 and ESD Association 2.0 Handbook. GaAs products can be damaged at ESD voltages in the 250 V range. In this case, strict adherence to ESD Class 0 guidelines is recommended.

Device Handling

Remove ESD-sensitive devices from protective containers at approved ESD work stations only.

ESD wrist straps are required when handling devices outside their ESD-protective packaging.

All personnel shall be properly grounded (footstraps/wrist straps) prior to opening static shielding bags.

ESD-sensitive devices should always be handled by the part body. Avoid touching the leads. When hand tools are required to accomplish an operation, use only tools that are dissipative, conductive, or treated with topical antistat.

ESD Workstation

Your ESD-safe work area should follow the requirements outlined in MIL-HDBK-263 and ESD Association Handbook 2.0. The following requirements are strongly recommended:

Personnel

The use of constant wrist strap monitors is highly recommended. This monitor guarantees that the connection to ground is continuously made. An alarm will sound when that connection is broken.

Clothing

An ESD-protective garment (smock, etc.) shall be used at the workstation. While a person may be grounded using a wrist strap or foot strap, that does not ensure that certain clothing fabrics can dissipate a charge to ground. The use of a conductive smock is required.

Floors

Conductive or dissipative ESD flooring shall be utilized whenever possible. This flooring shall be checked for ESD properties on a regular basis.

Work Surfaces

Your ESD work surface shall be covered with soft dissipative material. This surface shall be tied to earth ground and shall be configured in a common point ground. In addition, the work surface shall be free of any static generating material, such as nonessential plastics, or cellophane tape.

Equipment

All equipment used to process ESD-sensitive devices shall be checked for the generation of static charging. Whether soldering irons, wave solder machines, device insertion machines or test equipment, the generation of static electricity is of concern.

ESD Component Classifications

ESD-sensitive components are classified according to their ESD withstand voltage using the test procedure described in this standard. The HBM ESDS components classification levels are shown below.

ESD Component Classification

JEDEC Standard	Test	Class	Voltage Range
JESD22-C101	Charged-Device Model CDM	1	<200 V
JESD22-C101	Charged-Device Model CDM	2	200–500V
JESD22-C101	Charged-Device Model CDM	3	500–1000 V
JESD22-C101	Charged-Device Model CDM	4	>1000 V
JESD22-A114	Human Body Model HBM	0	<250 V
JESD22-A114	Human Body Model HBM	1A	250–500 V
JESD22-A114	Human Body Model HBM	1B	500–1000 V
JESD22-A114	Human Body Model HBM	1C	1000–2000 V
JESD22-A114	Human Body Model HBM	2	2000–4000 V
JESD22-A114	Human Body Model HBM	3A	4000–8000 V
JESD22-A114	Human Bodv Model HBM	3B	>8000 V
JESD22-A115	Machine Model (MM)	A	< 200 V
JESD22-A115	Machine Model (MM)	B	200–400 V
JESD22-A115	Machine Model (MM)	C	>400 V

JANTX Screening Requirement in Accordance with Table E-IV-MIL-PRF-19500

Step	Process	Conditions	Comments	JANTX
1	Visual inspection	MIL-STD-750 - Method 2073		X
2	High temperature bake	MIL-STD-750 - Method 1032		X
3	Temperature cycling	MIL-STD-750 - Method 1051	Condition C	X
4	Constant acceleration	MIL-STD-750 - Method 2006	20,000G's min., Y1 axis only	X
5	Initial electrical test		Serialize, read & record	X
6	High temperature reverse bias	MIL-STD-750 - Method 1038	Condition A, t = 48 hrs	X
7	Interim electricals		Read and record	X
8	Burn-in	MIL-STD-750 - Method 1038	Condition B, t = 96 hrs	X
9	Final electrical test		Read and record	X
10	Delta calculation		Compare interim test to final test	X
11	PDA		Percent defective allowable = 10% max.	X
12	Fine leak	MIL-STD-750 - Method 1071	Condition H	X
13	Gross leak	MIL-STD-750 - Method 1071	Condition C	X
14	External visual inspection	MIL-STD-750 - Method 2071		X
Group A Inspection in Accordance with Table E-V-MIL-PRF-19500				
Subgroup 1				
1	Visual and mechanical inspection	MIL-STD-750 - Method 2071	Sample size = 45 (0)	X
Subgroup 2				
1	Electrical testing		DC (statc) @ T_A = 25 °C, sample size = 116 (0)	X
Subgroup 3				
1	Electrical testing		DC (static) @ min. & max. operating temp., sample size = 116 (0)	X
Subgroup 4				
1	Electrical testing		Dynamic @ T_A = 25 °C, sample size = 116 (0)	X
Subgroup 5			Not applicable for diodes	N/A
Subgroup 6			Not applicable for diodes	N/A
Subgroup 7			Not applicable for diodes	N/A

Group B Inspection in Accordance With Table E-VIB - MIL-PRF-19500				
Step	**Process**	**Conditions**	**Comments**	**JANTX**
Subgroup 1				
1	Solderablity	MIL-STD-750 - Method 2026	Sample size = 15 (0)	X
2	Resistance to solvents	MIL-STD-750 - Method 1022	Sample size = 15 (0)	X
Subgroup 2				
1	Temperature cycling	MIL-STD-750 - Method 1051	Condition C, sample size = 22 (0)	X
3	Fine leak	MIL-STD-750 - Method 1071	Condition H, sample size = 22 (0)	X
4	Gross leak	MIL-STD-750 - Method 1071	Condition C, sample size = 22 (0)	X
5	Electrical testing		DC @ T_A = 25 °C, sample size = 22 (0)	X
Subgroup 3				
1	Steady-state operation life	MIL-STD-750 - Method 1027	Sample size = 45 (0)	X
2	Electrical testing		DC @ T_A = 25 °C, sample size = 45 (0)	X
3	Bond strength	MIL-STD-750 - Method 2037	Sample size = 11 wires (0)	X
Subgroup 4				
1	Decap internal visual	MIL-STD-750 - Method 2075	Sample size = 1 (0)	X
Subgroup 5				
1	Thermal resistance	MIL-STD-750 - Method 4081	Sample size = 15 (0)	X
Subgroup 6				
1	High temperature life	MIL-STD-750 - Method 1032	t = 340 hrs @ max. rated storage temp., sample size = 32 (0)	X
2	Electrical testing		DC @ T_A = 25 °C, sample size = 32 (0)	X
Group C Inspection in Accordance with Table E-VII-MIL-PRF-19500				
Subgroup 1				
1	Physical dimensions	MIL-STD-750 - Method 2066	Sample size = 15 (0)	X
Subgroup 2				
1	Thermal shock	MIL-STD-750 - Method 1056	Sample size = 22 (0)	X
2	Temperature cycling	MIL-STD-750 - Method 1051	Condition C, sample size = 22 (0)	X
3	Fine leak	MIL-STD-750 - Method 1071	Condition H, sample size = 22 (0)	X
4	Gross leak	MIL-STD-750 - Method 1071	Condition C, sample size = 22 (0)	X
5	Moisture resistance	MIL-STD-750 - Method 1021	Sample size = 22 (0) (hermetic packages only)	X
6	Electrical testing		DC @ T_A = 25 °C, sample size = 22 (0)	X
Subgroup 3				
1	Shock	MIL-STD-750 - Method 2016	Sample size = 22 (0)	X
2	Vibration, variable frequency	MIL-STD-750 - Method 2056	Sample size = 22 (0)	X
3	Constant acceleration	MIL-STD-750 - Method 2006	Sample size = 22 (0)	X
4	Electrical testing		DC @ T_A = 25 °C, sample size = 22 (0)	X
Subgroup 4				
1	Salt atmosphere	MIL-STD-750 - Method 1041	Sample size = 15 (0)	X
Subgroup 5				
1	Thermal resistance	MIL-STD-750 - Method 4081	Sample size = 15 (0)	X
Subgroup 6				
1	Steady-state operation life	MIL-STD-750 - Method 1026	Sample size = 22 (0)	X
2	Electrical testing		DC @ T_A = 25 °C, sample size = 22 (0)	X
Subgroup 7				
1	Internal water vapor	MIL-STD-750 - Method 1018	Sample size = 3 (0) (hermetic packages only)	X

High Reliability Product Flow for Element Evaluation

Product	MIL-PRF-38534	Application
Bare Die	Class H Class K	Military Space

Skyworks provides Discrete “bare die” and beam-lead products with Class H and Class K element evaluation in accordance with MIL-PRF-38534 Table C-II for Microcircuit and semiconductor die and Table C-III for Passive devices.

IE: CLA4601-000 = Commercial Product Flow
CLA4601H000 = Class H
CLA4601K000 = Class K

Chip Element Evaluation for Microcircuits and Semiconductors

Test Inspection	MIL-STD-883		Requirement	
	Method	Condition	Class H	Class K
Element electrical	Per product specification	On-wafer	100%	100%
Element visual	2010	A = Class K B = Class H	100%	100%
Internal visual	2010		10/0	10/0
Stabilization bake	1008	C	N/A	10/0
Temperature cycling	1010	C	N/A	10/0
Mechanical shock or Constant acceleration	2002 2001	B, Y1 direction A, Y1 direction	N/A	10/0 10/0
Interim electrical	Per product specification	25 °C, Min. and Max. operating temps.	N/A	
Burn-in	1015	240 hrs. min. @ 125 °C	N/A	10/0
Post burn-In electrical	Per product specification	25 °C, Min. and Max. operating temps.	N/A	10/0
Steady–state life	1005	1,000 hrs min. @ 125 °C	N/A	10/0
Final electrical	Per product specification	25 °C, Min. and Max. operating temps.	10/0	10/0
Wire bond evaluation	2011	C	10/0	10/0
SEM	2018		N/A	4/0

Chip Element Evaluation for Passive Devices

Subgroup	Class		Test	MIL-STD-883		Quantity (accept number)	Reference Paragraph
	K	H		Method		Condition	
1	X	X	Element electrical			100%	C.3.4.1
2	X	X	Visual inspection	2032		100% 22 (0)	C.3.4.2
3	X		Temperature cycling	1010	C	10 (0)	C.3.4.3
	X		Mechanical shock or	2002	B, V1 direction	10 (0)	
	X		Constant acceleration	2001	3,000Gs Y1 direction	10 (0)	
	X		Voltage conditioning or			10 (0)	C.3.4.7
	X		Aging (capacitors)			10 (0)	
	X		Visual inspection	2032		10 (0)	C.3.4.5
	X	X	Electrical			10 (0)	C.3.4.4
4	X	X	Wire bond evaluation	2011		10 (0) wires or 20 (1) wires	C.3.4.3 C.3.4.6