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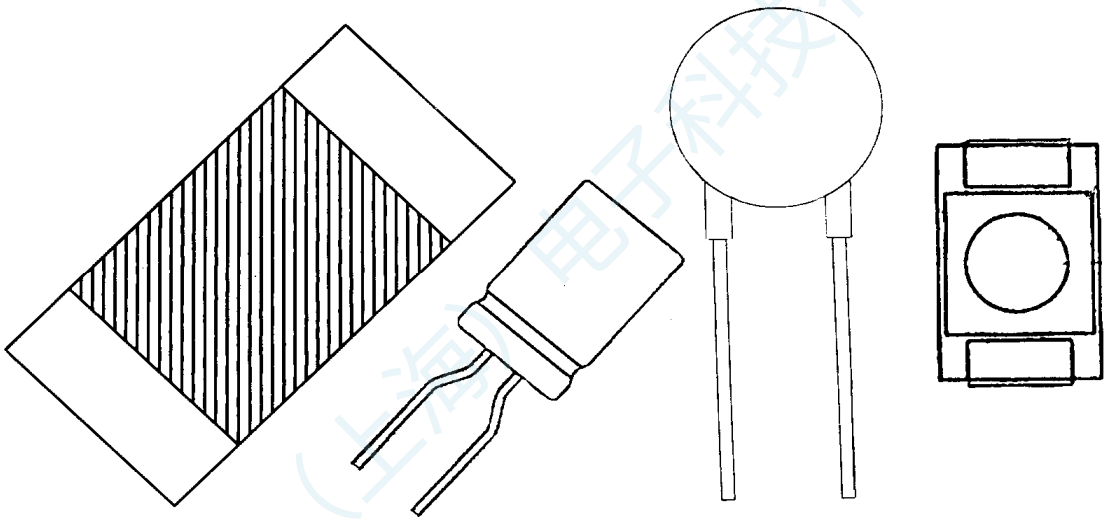
STRESS TEST QUALIFICATION FOR PASSIVE COMPONENTS



Automotive Electronics Council
Component Technical Committee

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STRESS TEST QUALIFICATION FOR PASSIVE ELECTRICAL DEVICES

1.0 SCOPE

1.1 Description

This specification defines the minimum stress test driven qualification requirements and references test conditions for qualification of passive electrical devices. This document does not relieve the supplier of their responsibility to meet their own company's internal qualification program or meeting any additional requirements needed by their customers. In this document, "user" is defined as all companies that adhere to this document. The user is responsible to confirm and validate all qualification and assessment data that substantiates conformance to this document.

1.1.1 Definition of Stress-Test Qualification

Stress-Test "Qualification" is defined as successful completion of test requirements outlined in this document. The minimum temperature range required for each passive electrical component type is listed below (maximum capability) as well as example applications typical of each grade (application specific):

GRADE	TEMPERATURE RANGE		PASSIVE COMPONENT TYPE Maximum capability unless otherwise specified and qualified	TYPICAL/EXAMPLE APPLICATION
	MINIMUM	MAXIMUM		
0	-50°C	+150°C	Flat chip ceramic resistors, X8R ceramic capacitors	All automotive
1	-40°C	+125°C	Capacitor Networks, Resistors, Inductors, Transformers, Thermistors, Resonators, Crystals and Varistors, all other ceramic and tantalum capacitors	Most underhood
2	-40°C	+105°C	Aluminum Electrolytic capacitors	Passenger compartment hot spots
3	-40°C	+85°C	Film capacitors, Ferrites, R/R-C Networks and Trimmer capacitors	Most passenger compartment
4	0°C	+70°C		Non-automotive

Qualification of the noted device type to its minimum temperature grade allows the supplier to claim the part as "AEC qualified" to that grade and all lesser grades. Qualification to temperatures less than the minimum specified above would allow the supplier to claim the part as "AEC qualified" at the lower grade only.

Determining the temperature grade of a passive component type or an application not mentioned above should be agreed to between the supplier and user.

1.1.2 Approval for Use in an Application

"Approval" is defined as user approval for use of the part being qualified in the intended application along with any applicable supplements and compliance to any applicable user packaging specification. The user's method of approval is beyond the scope of this document.

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1.2 Reference Documents

Current revision of the referenced documents will be in effect at the date of agreement to the qualification plan. Subsequent qualification plans will automatically use updated revisions of these referenced documents.

1.2.1 Military/EIA

1. EIA-469	Destructive Physical Analysis (DPA)
2. MIL-STD-202	Test Methods for Electronic and Electrical Parts
3. EIA-198	Ceramic Dielectric Capacitors Classes I,II,III,IV
4. EIA-535	Tantalum Capacitors
5. J-STD-002	Solderability Spec
6. JESD22	JEDEC Standard
7. MIL-PRF-27	Test Methods for Inductors/Transformers
8. JESD201	Environmental Requirements for Tin Whisker Susceptibility of Tin and Tin Alloy Surface Finishes
9. JESD22-A121	Test Method for Measuring Whisker Growth on Tin and Tin Alloy Surface Finishes

1.2.2 Industrial

1. UL-STD-94	Test for Flammability of Plastic Materials
2. ISO-7637-1	Road Vehicle Electrical Disturbance
3. IEC ISO/DIS10605	ESD Human Body Model (modify Q200-002)
4. iNEMI	Recommendations for Pb-free Termination Plating

1.2.3 AEC

1. AEC-Q200-001	Flame Retardance Test
2. AEC-Q200-002	ESD (Human Body Model) Test
3. AEC-Q200-003	Beam Load (Break Strength) Test
4. AEC-Q200-004	Polymeric Resettable Fuse Test
5. AEC-Q200-005	Flame Retardance Test
6. AEC-Q200-006	Measurement Methods for Resettable Fuses
7. AEC-Q200-007	Voltage Surge Test
8. AEC-Q005	Pb-Free Test Requirements

1.3 Glossary of Terms/Abbreviations

1. AEC	AUTOMOTIVE ELECTRONIC COUNCIL
2. ESD	ELECTROSTATIC DISCHARGE
3. FIT	FAILURE IN TIME
4. DWV	DIELECTRIC WITHSTANDING VOLTAGE
5. 8D	DISCIPLINED APPROACH FOR PROBLEM SOLVING PROCESS

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2.0 GENERAL REQUIREMENTS

2.1 Objective

The objective of this document is to ensure the device to be qualified meet the qualification requirements detailed in Tables 2 - 14.

2.2 Precedence of Requirements

In the event of conflict in the requirements of this specification and those of any other documents, the following order of precedence applies:

1. The purchase order
2. The user's individual device specification
3. This document
4. The reference documents in Section 1.2 of this document
5. The supplier's data sheet

For the device to be considered a qualified part, the purchase order and/or individual device specification cannot waive or detract from the requirements of this document.

2.3 The Use of Generic Data to Satisfy Qualification and Requalification Requirements

Generic data is relevant data that the supplier can use as a substitute for part-specific data per the family rules outlined in Appendix 1.

Appendix 1 defines the criteria by which components are grouped into a qualification family for the purpose of considering the data from all family members to be equal and generically acceptable to the qualification of the device in question.

With proper attention to these qualification family guidelines, information applicable to other devices in the family can be accumulated. This information can be used to demonstrate generic reliability of a device family and minimize the need for device-specific qualification test programs. This can be achieved through qualification of a range of devices representing the "four corners" of the qualification family (e.g. maximum value / temperature extremes / rated voltage). The supplier needs to define what constitutes four corners for a given device family (e.g., mid/low/hi C value, hi/low V for capacitors, case size for resistors and other large part families and communicate that to the user as part of the qualification reporting. These corners need to account for different materials (e.g., X7R capacitors with several different dielectrics, thicknesses, number of layers, K of powder). This determination can be complicated by the number of relevant variables that may need to be considered for a given part family (e.g., the worst case board flex may not necessarily be the highest CV value).

Sources of generic data can come from certified test labs, internal supplier's qualifications, user-specific qualifications and supplier's in-process monitors. The generic data to be submitted must meet or exceed the test conditions specified in Tables 2-14. End-point test temperature must address worst case temperature extremes and designed product life for the applications. The user(s) will be the final authority on the acceptance of generic data in lieu of specific device test data (to include temperature ranges of the devices.)

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2.3.1 Wearout Reliability Tests (End of Life Testing)

Testing for the failure mechanisms specific to each component technology should be available to the user whenever a new technology or material relevant to the appropriate wearout failure mechanism is to be qualified. The data, test method, calculations, and internal criteria need not be demonstrated or performed on the qualification of every new device, but should be available to the user upon request.

Note: This information may be subject to a confidentiality agreement, since it contains proprietary information of the supplier.

2.4 Test Samples

2.4.1 Lot Requirements

Lot requirements are designated in Table 1, herein.

2.4.2 Production Requirements

All qualification parts shall be produced on tooling and processes at the manufacturing site that will be used to support part deliveries at projected production volumes.

2.4.3 Reusability of Test Samples

Devices used for nondestructive qualification tests may be used to populate other qualification tests. Devices that have been used for destructive qualification tests may not be used any further except for engineering analysis.

2.4.4 Sample Size Requirements

Sample sizes used for qualification testing and/or generic data submission must be consistent with the specified minimum sample sizes and acceptance criteria in Table 1. If the supplier elects to submit generic data for qualification, the specific test conditions and results must be reported. Existing applicable generic data shall first be used to satisfy these requirements and those of Section 2.3 for each test required in Table 1. Such generic data shall not be more than 2 years old. Part specific qualification testing shall be performed if the generic data does not satisfy these requirements. Dip-fixturing of parts during reliability testing is prohibited when stress-testing a large number of components.

2.4.5 Pre and Post Stress Test Requirements

Pre- and post-stress electrical tests are performed at nominal (room) temperature only unless otherwise stated in the additional requirements section of the applicable test. Any extreme endpoint test temperatures (e.g., minimum and maximum designed operational per section 1.1.1 or the device datasheet) are specified in the "Additional Requirements" column Tables 2-13 for each test.

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For qualifications to applications in higher grade environments, the specific value of temperature must address the temperature extremes and designed product life for the application for at least one lot of data (generic or part specific) submitted per test. For example, if the supplier designs a device intended solely for use in a Grade 3 environment (e.g. -40°C to +85°C), his endpoint test temperature extremes need only address those application limits for the applicable stress tests requiring electrical testing to the designed operational temperature extremes. Qualification to applications in higher grade environments (e.g. -40°C to +125°C for Grade 1) will require testing of at least one lot using these additional endpoint test temperature extremes. All endpoint test conditions must include all user specifications for any given family.

2.5 Definition of Test Failure After Stressing

Test failures are defined as those devices not meeting the user's individual device specification, post-test criteria specific to the test or the supplier's data sheet, in order of significance as defined in Section 2.2. Any device that shows external physical damage attributable to the environmental test is also considered a failed device. If the cause of failure is agreed (by the manufacturer and the user) to be due to mishandling or ESD, the failure shall be discounted, but reported as part of the data submission. Suppliers must describe their parametric fail criteria for each stress test as part of the qualification data submission to the user for approval. A listing of suggested parameters for each component type is included after each component type test table. The specific listing of failure criteria for each component type and parameter in this document is beyond its scope.

2.6 Criteria for Passing Qualification

Passing all appropriate qualification tests specified in Tables 1 and 2-14, either by performing the test (acceptance of zero failures using the specified minimum sample size) on the specific part or demonstrating acceptable family generic data (using the family definition guidelines defined in Appendix 1 and the total required lot and sample sizes), qualifies the device per this document.

Passing the acceptance criteria of all the tests in Table 1 and the conditions in Tables 2-14 qualify the device per this document. When the number of failures for any given test in Table 1 exceeds the acceptance criteria using the procedure herein, the device shall not be qualified until the root cause of the failure(s) is (are) determined and the corrective and preventive actions are implemented and confirmed to be effective in an 8D or other acceptable user format. New samples or data may be requested to verify the corrective and prevented action.

Any unique reliability test or conditions requested by the user and not specified in this document shall be agreed upon between the supplier and user requesting the test, and will not preclude a device from passing stress-test qualification as defined by this document.

2.7 Alternative Testing Requirements

Any deviation from the test requirements, listed in Table 1 and the test conditions listed in Tables 2-14, must be approved by the users through supporting data presented by the supplier demonstrating equivalency. These deviations will be clearly reported when the results of the qualification are submitted to the user for approval.

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3.0 QUALIFICATION AND REQUALIFICATION

3.1 Qualification of a New Device

Requirements for qualification of a new device are listed in Table 1, with the corresponding test conditions listed in Tables 2-14. For each qualification, the supplier must present data for ALL of these tests, whether it is stress test results on the device to be qualified or acceptable generic family data. A review is to be made of other parts in the same generic family to ensure that there are no common failure mechanisms in that family. Justification for the use of generic data, whenever it is used, must be demonstrated by the supplier and approved by the user.

For each part qualification, the supplier must present a Certificate of Design, Construction and Qualification data see Appendix 2.

3.2 Qualification of a Lead (Pb) – Free Device

Added requirements needed to address the special quality and reliability issues that arise when lead (Pb) free processing is utilized is specified in AEC-Q005 Pb-Free Requirements. Materials used in lead-free processing include the termination plating and the board attachment (solder). These new materials usually require higher board attach temperatures to yield acceptable solder joint quality and reliability. These higher temperatures will likely adversely affect the moisture sensitivity level of plastic packaged semiconductors. As a result, new, more robust mold compounds may be required. If an encapsulation material change is required to provide adequate robustness for Pb-free processing of the device, the supplier should refer to the process change qualification requirements in this specification. Preconditioning should be run at the Pb-free reflow temperatures described in AEC-Q005 Pb-Free Requirements before environmental stress tests.

3.3 Requalification of a Device

Requalification of a device shall be required when the supplier makes a change to the product and/or process that impact the form, fit, function, quality and reliability of the device.

3.3.1 Process Change Notification

The supplier shall submit a projection to the users of all forecasted process changes. This projection of implemented changes shall be submitted at least 6 months in advance. Information required for submission to the user will include the following as a minimum:

1. Benefit to the user (value, time and quality).
2. For each user part numbers involved in the change, the following information is required:
   a) Supplier part number
   b) An estimated date of the last production lot of unchanged parts.
   c) An estimated final order date and final ship date of unchanged parts.
   d) The first projected shipment date and date code of changed parts.
3. A detailed description of the change in terms of the materials, processes, visual/electrical/mechanical characteristics, rating, circuit design, internal element layout and size, as applicable.
4. Technical data and rationale to support the proposed changes.
5. An electrical characterization comparison (between the new and original product) of all significant electrical parameters over temperature extremes which could be affected by the change. Changes in median and dispersion performances shall be noted even though conformance to specification limits is still guaranteed. This is needed to evaluate any adverse impact on specific end customer applications.

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6. The supplier shall submit an updated Certificate of Design, Construction and Qualification along with information required by this section (section 3.2.1) plus any changes impacting Appendix 2 information as originally submitted.
7. The results of completed supplier Requalification tests of the changed device(s).

Items 1 through 5 are background information needed up front to evaluate the impact of the change on supply and reliability and to come to agreement on a qualification plan acceptable to the supplier and user. Items 5, 6 and 7 must be submitted prior to any final approval to implement any change on the user's product. **No change shall be implemented without prior approval of the users.**

3.3.2 Changes Requiring Requalification

As a minimum, any change to the product, as defined in Appendix 1, requires performing the applicable tests listed in Tables 1 and 2-14. Table 2A-14A will be used as a guide for determining which tests need to be performed or whether equivalent generic data can be submitted for that test. This table is a superset of tests that the supplier and user should use as a baseline for discussion of tests that are required for the qualification in question. It is the supplier's responsibility to present rationale for why any of these tests need not be performed or whether any of the tests can be supplemented with generic data. Original test data from the old process (if it exists and is applicable) can be used as a baseline for comparative data analysis. At a minimum, electrical characterization test #19 should be performed on a comparative basis. An agreement between the supplier and the user(s) with justification for performing or not performing any recommended test shall occur before the implementation of a Requalification plan.

3.3.3 Criteria for Passing Requalification

It is the responsibility of each user to review the data, change notices, and supporting documentation to either qualify or not qualify the change based on the results of the tests performed. All criteria requirements described in 2.6 apply.

3.3.4 User Approval

A change may not affect a part's qualification status, but may affect it's performance in an application. Individual user authorization of a process change will be required for that user's particular application(s), and this method of authorization is outside the scope of this document.

4.0 QUALIFICATION TESTS

4.1 General Tests

Test details are given in Tables 1-14. Not all tests apply to all devices. For example, certain tests apply only to hermetically packaged devices, others apply only to SMD large can devices, and so on. The applicable tests for the particular device type are indicated in the "Note" column of Table 1 and the "Additional Requirements" in Tables 2-14. The "Additional Requirements" column of Tables 2-14 also serves to highlight test requirements that supersede those described in the referenced test.

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4.2 Device Specific Tests

The following tests must be performed on the specific device to be qualified for all devices. Generic data is not allowed for these tests. Device specific data, if it exists, is acceptable.

1. Electrostatic Discharge (ESD) - All product.

2. Electrical Characterization - The supplier must demonstrate that the part is capable of meeting parametric limits detailed in the individual user device specification. This data must be taken from at least three lots of the required sample size over the specified temperature range.

3. Additional Environmental Testing may be required because of the user's experience with the supplier.

4.3 Data Submission Format

Data summary shall be submitted as defined in Appendix 4. Raw data and histograms shall be submitted upon request by the individual user. **All data and documents (e.g justification for non-performed test, etc.) shall be maintained by the supplier in accordance with QS-9000 requirements.**

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TABLE 1 - QUALIFICATION SAMPLE SIZE REQUIREMENTS					
Stress	**NO.**	**Note**	**Sample Size Per Lot**	**Number of lots**	**Accept on Number failed**
Pre-and Post-Stress Electrical Test	1	G	All qualification parts submitted for testing		0
High Temperature Exposure	3	DG	77 Note B	1	0
Temperature Cycling	4	DG	77 Note B	1	0
Destructive Physical Analysis	5	DG	10 Note B	1	0
Moisture Resistance	6	DG	77 Note B	1	0
Humidity Bias	7	DG	77 Note B	1	0
High Temperature Operating Life	8	DG	77 Note B	1	0
External Visual	9	NG	All qualification parts submitted		0
Physical Dimensions	10	NG	30	1	0
Terminal Strength	11	DGL	30	1	0
Resistance to Solvent	12	DG	5	1	0
Mechanical Shock	13	DG	30 Note B	1	0
Vibration	14	DG			
Resistance to Solder Heat	15	DG	30	1	0
Thermal Shock	16	DG	30	1	0
ESD	17	D	15	1	0

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TABLE 1 - QUALIFICATION SAMPLE SIZE REQUIREMENTS (continued)					
Stress	**NO.**	**Note**	**Sample Size Per Lot**	**Number of lots**	**Accept on Number failed**
Solderability	18	D	15 each condition	1	0
Electrical Characterization	19	NG	30 Note A	3	0
Flammability	20	D	Present certificate of compliance		
Board Flex	21	DS	30	1	0
Terminal Strength (SMD)	22	DS	30	1	0
Beam Load	23	DG	30	1	0
Flame Retardance	24	DG	30	1	0
Rotation Life	25	DG	30	1	0
Surge Voltage	27	DG	30	1	0
Salt Spray	29	DG	30	1	0
Electrical Transient Conduction	30	DG	30	1	0
Shear Strength	31	DG	30	1	0
Short Circuit Fault Current Durability	32	DG	30	1	0
Fault Current Durability	33	DG	30	1	0
End-of-Life Mode Verification	34	DG	30	1	0
Jump Start Endurance	35	DG	30	1	0
Load Dump Endurance	36	DG	30	1	0

LEGEND FOR TABLE 1

Note: A For parametric verification data, sometimes circumstances may neccessitate the acceptance of only one lot by the user. Should a subsequent user decide to use a previous user's qualification approval, it will be the subsequent user's responsibility to verify an acceptable number of lots were used.
B Where generic (family) data is provided in lieu of component specific data, 3 lots are required.
H Required for hermetic packaged devices only.
L Required for leaded devices only.
N Nondestructive test, devices can be used to populate other tests or they can be used for production.
D Destructive test, devices are not to be reused for qualification or production.
S Required for surface mount devices only.
G Generic data allowed. See Section 2.3.

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TABLE 2 - TABLE OF METHODS REFERENCED TANTALUM & CERAMIC CAPACITORS			
Stress	**No.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed at 25±5°C except as specified in the applicable stress reference and the additional requirements in Table 2.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	Unpowered 1000 hours. Measurement at 24±4 hours after test conclusion. The maximum rated temperature should be employed for the dielectric used in the device.
Temperature Cycling	4	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Destructive Physical Analysis	5	EIA-469	Only applies to SMD Ceramics. Electrical Test not required.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85% RH. Note: Ceramics only - Specified conditions: Rated Voltage and 1.3 to 1.5 volts. Add 100Kohm resistor. Tantalums - Rated Voltage Only. Measurement at 24±4 hours after test conclusion. For ceramics that have silver content (e.g., PdAg electrodes), the low voltage portion of this test must also be performed.
Operational Life	8	MIL-STD-202 Method 108	Condition D Steady State T_A=125°C. 2/3 rated for Tantalum caps Full rated for Ceramic caps Measurement at 24±4 hours after test conclusion. The maximum rated temperature and voltage rating for the dielectric employed in the device shall be used.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: Ceramics: A (454 g), C (227 g), E (1.45 kg-mm). Tantalums: A (2.27 kg), C (227 g), E (1.45 kg-mm).
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: It is applicable to marked and/or coated components. Add Aqueous wash chemical OKEMCLEAN (A 6% concentrated Oakite cleaner) or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213 SMD: Condition F LEADED: Condition C

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TABLE 2 - TABLE OF METHODS REFERENCED TANTALUM & CERAMIC CAPACITORS			
Stress	**No.**	**Reference**	**Additional Requirements**
Vibration	14	MIL-STD-202 Method 204	5g's for 20 min., 12 cycles each of 3 orientations Note: Use 8"X5" PCB .031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	No pre-heat of samples. Note: Test condition D for SMD. Test condition B for Leaded. Pre-heat condition of 150ºC, 60-120sec is allowed for ceramic components.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @155°C dry heat @235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures. Parameters C, DF, IR at min / room / max temperatures to be measured at a minimum. SEE PARAMETER TABLE FOR SUGGESTIONS.
Board Flex	21	AEC-Q200-005	Required for MLCCs only. 60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC-Q200-006	
Beam Load Test	23	AEC-Q200-003	Ceramics Only

NOTE: Pre-stress electrical tests also serve as electrical characterization
Interval measurements for 1000 hour tests required at 250 and 500 hrs.

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TABLE 2A - Ceramic/Tantalum Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
5. Destructive Physical Analysis
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
21. Board Flex
22. Terminal Strength (SMD)
23. Beam Load Test

Note: A letter or "●" indicates that performance of that stress test should be considered **(not necessarily required)** for the appropriate process change

Test # From Table 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	22	23					
MATERIAL																									
Binder Material		●	●									●		●											
Dielectric Change	●	●	●		●	●			●	●	●	●		●	●		**B**	C		●					
Electrode Attach	●	●				●							C	●			**B**	C	●						
Electrode Material	●	●	●		●	●			●	●		●		●	●		**B**								
Encapsulation		●		●	●		●	●		●															
Lead Material		●	●			●	●		●			●	●			●	**B**								
PROCESS																									
Dicing	●	●		●	●		●	●		●	●						**B**			C					
Electrode Apply	C				C								C	C	C		**B**C	C							
Firing Profile		●	●			●								●	●		**B**			C					
Lamination/Press Technique			●		●								●	●			**B**	●		C					
Powder Particle Size		●			●								●		●		**B**	●							
Screening/Printing						C					C				C		**B**C			C					
Termination Process	●	●	●	●	●	●	●	●	●	●	●	●	●			●	**B**	●	●						
DESIGN																									
Electrode Thickness	●	●	●			●		●			●	●		●	●		**B**								
Layer Thickness	●	●	●		●	●		●	●		●			●	●		**B**			C					
Lead Diameter		●		●	●	●	●	●	●			●													
Number of Layers		C	C		C	C		C			C			C	C		**B**C			C					
Termination Area	●			●			●	●				●						●	●						
Terminal Interface	●	●	●	●	●	●			●		●	●	●				**B**	●	●						
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	**B**	●	●	C					
Material Suppliers	●	●	●	●	●	●			●	●	●	●	●	●	●	●	**B**	●	●	C					
New/Modified Mfg. Equipment		●		●	●	●		●	a			●			●	●	**B**			C					

a = termination equipment only **B = comparative data (unchanged vs. Changed) required** C = Ceramics only **D = Tantalums only**

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Table 2B – Acceptance Criteria for Ceramic C0G SMD Capacitors

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

	Acceptance Criteria		
Measured Parameter => AEC-Q200 Test:	**Capacitance**	**Q**	**Insulation Resistance**
1a. Initial limits	Within specified limits	Within specified limits	Within specified limits
3. High temp exposure	Initial limit	Initial limit	Initial limit
4. Temperature cycling	Change <= greater of +/-x% or +/-y pF	Initial limit	Initial limit
5. Destructive physical analysis	Per AEC-Q200 - Electrical test not required.		
6. Moisture resistance	Change <= greater of +/-x% or +/-y pF	>= a	>= m% Initial limit
7. Biased Humidity	Change <= greater of +/-x% or +/-y pF	<a pF: Q >= b + (c /pf * C) >=a pF: Q >= d% initial	>= m% Initial limit
8. Operational Life	Change <= greater of +/-x% or +/-y pF	<a pF: Q >= b + (c /pf * C) d pF to e pF: Q>= f + (g /pf * C) >= h pF: Q >= i	>= m% Initial limit
9. External Visual	Per AEC-Q200 - Electrical test not required.		
10. Physical Dimensions	Per AEC-Q200 - Electrical test not required.		
12. Resistance to Solvents	Initial limit	Initial limit	Initial limit
13. Mechanical Shock	Initial limit	Initial limit	Initial limit
14. Vibration	Initial limit	Initial limit	Initial limit
15. Resistance to Soldering Heat	Change <= greater of +/-x% or +/-y pF	Initial limit	Initial limit
16. Thermal shock	Change <= greater of +/-x% or +/-y pF	Initial limit	Initial limit
17. ESD	Initial limit	Initial limit	Initial limit
18. Solderability	Per AEC-Q200 - Electrical test not required.		
19a. Elec. Char. @ 25°C	Initial limit	Initial limit	Initial limit
	Dielectric Withstanding Voltage: 250% rated voltage		
19b. Elec. Char. @ -55°C	Change <= +/-x%	No spec	No spec
19c. Elec. Char. @ 125°C	Change <= +/-x%	No spec	>= m% Initial limit
21. Board Flex	Initial limit	Initial limit	Initial limit
	>=x mm (record deflection at point of electrical failure)		
22. Terminal Strength (SMD)	Initial limit	Initial limit	Initial limit
	0603 and greater: x N 0402 and less: y N		
23. Beam Load Test	Per AEC-Q200 - Electrical test not required.		

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Table 2C - Acceptance Criteria for Ceramic X7R and X5R SMD Capacitors

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

	Acceptance Criteria		
Measured Parameter => AEC-Q200 Test	**Capacitance**	**Dissipation Factor**	**Insulation Resistance**
1a. Initial limits	Within specified limits	Within specified limits	Within specified limits
3. High temp exposure	Initial limit	Initial limit	Initial limit
4. Temperature cycling	Change <= +/-x %	Initial limit	Initial limit
5. Destructive physical analysis	Per AEC-Q200 - Electrical test not required.		
6. Moisture resistance	Change <= +/-x%	>=a V: <= b% c V to < d V: <= e% d to < f V: <=g%	>= m% Initial limit
7. Biased Humidity	Change <= +/-x%	<a% initial	>= m% Initial limit
8. Operational Life	Change <= +/-x%	<a% initial	>=m% Initial limit
9. External Visual	Per AEC-Q200 - Electrical test not required.		
10. Physical Dimensions	Per AEC-Q200 - Electrical test not required.		
12. Resistance to Solvents	Initial limit	Initial limit	Initial limit
13. Mechanical Shock	Initial limit	Initial limit	Initial limit
14. Vibration	Initial limit	Initial limit	Initial limit
15. Resistance to Soldering Heat	Change <= +/-x%	Initial limit	Initial limit
16. Thermal shock	Change <= +/-x%	Initial limit	Initial limit
17. ESD	Initial limit	Initial limit	Initial limit
18. Solderability	Per AEC-Q200 - Electrical test not required.		
19a. Elec. Char. @ 25°C	Initial limit	Initial limit	Initial limit
	Dielectric Withstanding Voltage: 250% rated voltage		
19b. Elec. Char. @ -55°C	Change <= +/-x%	No spec	No spec
19c. Elec. Char. @ 125°C	Change <= +/-x%	No spec	>=m% Initial limit
21. Board Flex	Initial limit	Initial limit	Initial limit
	>=x mm (record deflection at point of electrical failure)		
22. Terminal Strength (SMD)	Initial limit	Initial limit	Initial limit
	0603 and greater: x N 0402 and less: y N		
23. Beam Load Test	Per AEC-Q200 - Electrical test not required.		

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Table 2D - Acceptance Criteria for Tantalum and Niobium Oxide Capacitors

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

Measured Parameter => AEC-Q200 Test	Acceptance Criteria General requirements: 1. Acceptance criteria below apply unless otherwise specified. 2. Supplier spec limits apply, if required parameter is unspecified by the user.			
	Capacitance	Dissipation factor	ESR	Leakage current
1a. Initial limits	Within specified tolerance	Below specified upper limit	Below specified upper limit	Below specified upper limit
1b. Test Conditions	X Hz, y Vrms max. AC, u V max. DC, v C	a Hz, b Vrms max. AC, c V max. DC, d C	m Hz, n C	p% rated DC voltage, q C, 1kohm series resistor, measurment taken after cap is fully charged (typically r minutes)
3. High temp exposure	Change <=x%	Initial limit	Initial limit	Initial limit
4. Temperature cycling	Change <=x%	Initial limit	Initial limit	Initial limit
6. Moisture resistance	Change <=x%	Initial limit	<=m % initial limit	Initial limit
7. Biased Humidity	Change <=x%	<=a% initial limit	<=m% initial limit	<=p% initial limit
8. Operational Life	Change <=x%	Initial limit	Initial limit	<=p% initial limit
9. External Visual	Per AEC-Q200 - Electrical test not required.			
10. Physical Dimensions	Per AEC-Q200 - Electrical test not required.			
11. Terminal Strength (leaded)	Per AEC-Q200 - Electrical test not required.			
12. Resistance to Solvents	Change <=x%	Initial limit	No spec	Initial limit
13. Mechanical Shock	Change <=x%	Initial limit	No spec	Initial limit
14. Vibration	Change <=x%	Initial limit	No spec	Initial limit
15. Resistance to Soldering Heat	Change <=x%	Initial limit	No spec	Initial limit
16. Thermal shock	Change <=x%	Initial limit	Initial limit	Initial limit
17. ESD	Initial limit	Initial limit	Initial limit	Initial limit
18. Solderability	Per AEC-Q200 - Electrical test not required.			
19a. Elec. Char. @ 25C	Initial limit	Initial limit	Initial limit	Initial limit
19b. Elec. Char. @ -55C (or specified lower operating temperature limit)	Change <=x%	<=a% Initial limit	No spec	No spec
19c. Elec. Char. @ 85C (or specified upper operating temperature limit)	Change <=x%	Initial limit	No spec	<=p% initial limit
19d. Elec. Char. @ 125C (or specified upper operating temperature limit)	Change <=x%	Initial limit	No spec	<=p% initial limit
20. Flammability	Per AEC-Q200 - Electrical test not required. Present certificate of compliance.			
21. Board Flex (SMD only)	Measure board deflection at incipient electrical failure up to x mm.			
22. Terminal Strength (SMD)	Per AEC-Q200 - Electrical test not required.			

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TABLE 3 - TABLE OF METHODS REFERENCED ALUMINUM ELECTROLYTIC CAPACITORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 3.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85°C. Same applies for 105°C & 125°C). Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-40°C to 105°C) Note: If 85°C or 125°C part the 1000 cycles will be at that temperature rating. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Rated Voltage. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	Note: 1000 hrs @ 105°C. If 85°C or 125°C part will be tested at that temperature. Rated Voltage applied. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (454 g), C (227 g), E (1.45 kg-mm)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Also aqueous wash chemical - OKEM clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick with 7 secure points on one 8" side and 2 secure points on corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.

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TABLE 3 - TABLE OF METHODS REFERENCED ALUMINUM ELECTROLYTIC CAPACITORS			
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B no pre-heat of samples. Note: Single Wave Solder. Procedure 1 with solder within 1.5mm of device body for Leaded and 0.75mm for SMD. SMD – remove carrier.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3 c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 Acceptable. Test is applicable to components having a resin case.
Board Flex	21	AEC-Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC-Q200-006	
Surge Voltage	27	JIS-C-5101-1	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Component Technical Committee

TABLE 3A - Electrolytic Capacitor Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling

6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)
27. Surge Voltage

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 3	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	27					
MATERIAL																									
End Seal		●	●	●	●	●	●		●				●				●								
Housing		●	●				●			●			●				●								
Sleeving		●	●		●	●	●		●				●				●								
Lead/Termination								●			●	●			●	B		●	●						
PROCESS																									
Curing		●		●	●		●						●	●		B				●					
Impregnation method	●	●			●									●		B				●					
Terminal Attach		●						●		●		●	●			B		●	●						
Winding		●			●						●					B									
DESIGN																									
Electrolyte Change	●	●			●								●	●		B				●					
Foil Design		●			●									●		B				●					
Insulation Change		●			●									●		B				●					
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●	●	●					
Material Suppliers	●	●	●	●				●	●	●	●	●	●		●	B	●	●	●						
New/Modified Mfg. Equipment		●			●		●	●		●	●			●		B				●					

B = comparative data (unchanged vs. Changed) required

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TABLE 4 - TABLE OF METHODS REFERENCED FILM CAPACITORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 4.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85C. Same applies for 100°C & 125°C parts.). Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-55°C to 85°C) Note: If 100°C or 125°C part the 1000 cycles will be at that temperature rating. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Moisture Resistance	6	MIL-STD-202 Method 106	t = 24 hours/cycle. Note: Steps 7a & 7b not required. Unpowered. Measurement at 24±4 hours after test conclusion.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 40°C/93%RH. Rated Voltage. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hours T_A=85°C, Note: Condition D (1000 hrs) If 100°C or 125°C the 1000 hrs. will be at that temperature. Metallized Film: 125% of rated voltage at 85°C. 100% of rated voltage above 85°C. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (2.27 kg), C (227 g), E (1.45 kg-mm)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Also aqueous wash chemical - OKEM clean or equivalent. Do not use banned solvents
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations Use 8"X5" PCB, .031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.

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TABLE 4 - TABLE OF METHODS REFERENCED FILM CAPACITORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Note: For SMD use Procedure 2; For Leaded use Procedure 1 with solder within 1.5mm of device body.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical Test not required.
Board Flex	21	AEC-Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC-Q200-006	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval Measurements for 1000 hour tests required at 250 hrs. and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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TABLE 4A - Film Capacitor Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 4	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22						
MATERIAL																									
Epoxy	●	●	●	●	●	●	●		●	●	●		●				●								
Housing		●		●	●	●	●	●		●	●				●										
Lead/Termination			●				●	●		●		●			●	B		●	●						
PROCESS																									
Epoxy Fill	●	●		●	●	●			●																
Terminal attach		●	●		●			●	●							B		●	●						
Winding	●				●									●		B									
DESIGN																									
Foil Design		●			●									●		B									
Insulation Change		●			●									●		B									
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●	●						
Material Suppliers	●	●	●		●			●	●		●	●	●		●		●		●						
New/Modified Mfg. Equipment		●	●		●			●					●	●		B			●						

B = comparative data (unchanged vs. Changed) required

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TABLE 5 - TABLE OF METHODS REFERENCED MAGNETICS (INDUCTORS/TRANSFORMERS)			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 5.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 125°C part can be stored for 1000 hrs. @ 125°C. Same applies for 105°C and 85°C. Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-40°C to +125°C). Note: If 85°C part or 105°C part the 1000 cycles will be at that temperature. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Unpowered. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-PRF-27	1000 hrs. @ 105°C. If 85°C or 125°C part will be tested at that temperature. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (910 g), C (1.13 kg), E (1.45 kg-mm)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB, .031" thick, 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.

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TABLE 5 - TABLE OF METHODS REFERENCED MAGNETICS (INDUCTORS/TRANSFORMERS)			
Stress	**NO.**	**Reference**	**Additional Requirements**
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave Solder - Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 Acceptable
Board Flex	21	AEC-Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC-Q200-006	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Component Technical Committee

TABLE 5A - Inductive Products Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 5	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22						
MATERIAL																									
Bobbin material	●	●		●	●	●				●			●				●								
Core material		●			●	●				●			●			B	●								
Insulation material	●	●		●	●	●			●			●	●	a		B	●								
Lead material					●	●		●			●	●			●			●	●						
Mold material	●	●	●	●	●	●			●	●			●			B	●								
Solder material		●				●		●		●	●		●		●			●	●						
Wire/foil material			●	●	●	●								●		B		●	●						
PROCESS																									
Insulation strip			●			●			●			●													
Lead prep/plating		●				●		●			●	●	●		●			●	●						
Terminal Attach		●	●			●		●		●	●	a	●		●										
Marking						●			●																
Molding	●	●		●	●	●	●		●	●			●			B	●								
Soldering		●				●		●			●		●		●			●	●						
Winding - Insulation				●	●				●			●		a		B									
Winding - Wire			●		●	●										B									
DESIGN																									
Bobbin		●				●	●			●			●	●		B									
Core		●				●	●			●	●		●			B									
Insulation system				●	●	●	●		●			●		a		B	●								
Lead						●	●	●			●	●		●	●			●	●						
Mold		●	●			●	●		●	●			●			B									
Wire/foil		●				●	●						●			B		●	●						
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●		●			●				●	●			B			●						
Material Suppliers		●	●			●	●	●					●			B									
Process Control Change						●	●																		

a = Multilayer only

B = comparative data (unchanged vs. Changed) required

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TABLE 6 - TABLE OF METHODS REFERENCED NETWORKS (R-C/C/R)			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 6.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated temperature (e.g. 85°C part can be stored for 1000 hrs. at 85°C. Same applies for 125°C part. Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-55°C to 125°C) Note: If 85C part the 1000 cycles will be at that temperature. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Capacitor Networks - Rated Voltage Resistor Networks - 10% Rated Power. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hrs. T_A=85°C Note: If 125°C part the 1000 hrs. will be at that rated temperature. Rated Voltage. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Supplier spec. Electrical test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Condition: A (227 g), C (227 g)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick, 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave Solder - Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.

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TABLE 6 - TABLE OF METHODS REFERENCED NETWORKS (R-C/C/R)			
Stress	**NO.**	**Reference**	**Additional Requirements**
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 acceptable
Board Flex	21	AEC-Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC-Q200-006	
Salt Spray	29	MIL-STD-202 Method 101	Test condition B

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 and 500 hours.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Automotive Electronics Council
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TABLE 6A/7A - Networks and Resistors Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)
24. Flame Retardance
29. Salt Spray

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Tables 6 and 7	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	24	29				
MATERIAL																									
Ink/Wire Material	●	●			●			W					●	F		**B**		●	●	R					
Package	●	●	●	●		●	●	●	●		●		●	●			●	●	●	R					
Passivation	●	●	●	●	●				●				●				●			R	N				
Substrate Material		●	●	●	●			●				●	●		●	**B**		●	●						
PROCESS																									
Ink Fire		●			●			R								**B**									
Ink Print	●	●			●			R					●			**B**		R	R	R					
Laser Trim				●	●											**B**									
Lead Form				●		●	●	●							●	**B**					N				
Termination Attach				●				●		●		●				**B**					N				
Marking						●			●																
Molding	●	●	●	●		●	●	●	●		●		●	●			●	●	●	R					
DESIGN																									
Package	●	●	●	●		●	●	●	●		●	●	●	●	●		●	●	●	R					
Passivation	●	●	●	●	●				●				●				●			R	N				
Res/Cap Tolerance	●	●			●							●	●	●		**B**									
Res/Cap Value	●	●			●							●	●	●		**B**				R					
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●			●	●	●		**B**		●	●	R	N				
Material Suppliers		●	●				●	●	●			●	●	●		**B**	●			R	N				
New/Modified Mfg. Equipment		●	●		●								●	●		**B**									

R = Resistors Only
N = Networks Only
F = Film products only
W = Wirewound products only
B = comparative data (unchanged vs. Changed) required

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TABLE 7 - TABLE OF METHODS REFERENCED RESISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 7.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. @ T=125°C. Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	Condition D Steady State T_A=125°C at rated power. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (2.27 kg), C (227 g), E (1.45 kg-mm)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Vibration	14	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave Solder - Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	

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TABLE 7 - TABLE OF METHODS REFERENCED RESISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	
Flame Retardance	24	AEC-Q200-001	

NOTE: Pre-stress electrical tests also serve as electrical characterization. Interval measurements for 1000 hour tests required at 250 hrs and 500 hrs.

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Table 7B - Acceptance Criteria for Carbon Film Leaded Fixed Resistors

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

AEC-Q200 Test	Acceptance Criteria Resistance
1. Initial Limits	Within specified tolerance
3. High Temperature Exposure (storage)	±x% +yΩ
4. Temperature Cycling	±x% +yΩ
6. Moisture Resistance	±x% +yΩ
7. Biased Humidity	±x% +yΩ
8. Operational Life	±x% +yΩ
9. External Visual	Per AEC-Q200 – Electrical test not required
10. Physical Dimensions	Per AEC-Q200 – Electrical test not required
11. Terminal Strength (leaded)	±x%
12. Resistance to Solvents	Marking must remain legible
13. Mechanical Shock	±x% +yΩ
14. Vibration	±x% +yΩ
15.Resistance to Soldering Heat	±x% +yΩ
16.Thermal Shock	±x% +yΩ
17. ESD	Per AEC-Q200-002
18. Solderability	Per AEC-Q200 – Electrical test not required
19a. Elec. Char. @25°C	Initial limit
19b. Elec. Char. @Min. operating temp.	Initial limit ± change allowed over temp. range
19c. Elec. Char. @Max operating temp.	Initial limit ± change allowed over temp. range
20. Flammability	Per AEC-Q200 – Electrical test not required
21. Flame Retardance	See AEC-Q200-001

Significant characteristics:

1. D.C. Resistance
2. Temperature Coefficient of Resistance

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Table 7C - Acceptance Criteria for Metal Film Leaded Fixed Resistors
(Includes molded flat leaded surface mount)

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

AEC-Q200 Test	Acceptance Criteria
	Resistance
1. Initial Limits	Within specified tolerance
3. High Temperature Exposure (storage)	±x% +yΩ
4. Temperature Cycling	±x% +yΩ
6. Moisture Resistance	±x% +yΩ
7. Biased Humidity	±x% +yΩ
8. Operational Life	±x% +yΩ
9. External Visual	Per AEC-Q200 – Electrical test not required
10. Physical Dimensions	Per AEC-Q200 – Electrical test not required
11. Terminal Strength (leaded)	±x% +yΩ
12. Resistance to Solvents	Marking must remain legible
13. Mechanical Shock	±x% +yΩ
14. Vibration	±x% +yΩ
15.Resistance to Soldering Heat	±x% +yΩ
16.Thermal Shock	±x% +yΩ
17. ESD	Per AEC-Q200-002
18. Solderability	Per AEC-Q200 – Electrical test not required
19a. Elec. Char. @25°C	Initial limit
19b. Elec. Char. @Min. operating temp.	Initial limit ± change allowed over temp. range
19c. Elec. Char. @Max operating temp.	Initial limit ± change allowed over temp. range
20. Flammability	Per AEC-Q200 – Electrical test not required
21. Board Flex (SMD)	N/A
22. Terminal Strength (SMD)	N/A
Flame Retardance	See AEC-Q200-001

Significant characteristics:

1. D.C. Resistance
2. Temperature Coefficient of Resistance

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Table 7D - Acceptance Criteria for Metal Oxide Leaded Fixed Resistors

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

AEC-Q200 Test	Acceptance Criteria Resistance
1. Initial Limits	Within specified tolerance
3. High Temperature Exposure (storage)	±x% +yΩ
4. Temperature Cycling	±x% +yΩ
6. Moisture Resistance	±x% +yΩ
7. Biased Humidity	±x% +yΩ
8. Operational Life	±x% +yΩ
9. External Visual	Per AEC-Q200 - Electrical test not required
10. Physical Dimensions	Per AEC-Q200 - Electrical test not required
11. Terminal Strength (leaded)	±x% +yΩ
12. Resistance to Solvents	Marking must remain legible
13. Mechanical Shock	±x% +yΩ
14. Vibration	±x% +yΩ
15.Resistance to Soldering Heat	±x% +yΩ
16.Thermal Shock	±x% +yΩ
17. ESD	Per AEC-Q200-002
18. Solderability	Per AEC-Q200 - Electrical test not required
19a. Elec. Char. @25°C	Initial limit
19b. Elec. Char. @Min. operating temp.	Initial limit ± change allowed over temp. range
19c. Elec. Char. @Max operating temp.	Initial limit ± change allowed over temp. range
20. Flammability	Per AEC-Q200 - Electrical test not required
21. Flame Retardance	See AEC-Q200-001

Significant characteristics:

1. D.C. Resistance
2. Temperature Coefficient of Resistance

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Table 7E - Acceptance Criteria for Wire Wound Leaded Fixed Resistors
(Includes molded flat lead surface mount)

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

AEC-Q200 Test	Acceptance Criteria Resistance
1. Initial Limits	Within specified tolerance
3. High Temperature Exposure (storage)	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±a% +bΩ
4. Temperature Cycling	±x% +yΩ
6. Moisture Resistance	±x% +yΩ
7. Biased Humidity	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
8. Operational Life	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
9. External Visual	Per AEC-Q200 – Electrical test not required
10. Physical Dimensions	Per AEC-Q200 – Electrical test not required
11. Terminal Strength (leaded)	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
12. Resistance to Solvents	Marking must remain legible
13. Mechanical Shock	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
14. Vibration	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
15.Resistance to Soldering Heat	Technologies J and K (Crimped): ±x% +yΩ Technology H (Welded): ±x% +yΩ
16.Thermal Shock	±x% +yΩ
17. ESD	Per AEC-Q200-002
18. Solderability	Per AEC-Q200 – Electrical test not required
19a. Elec. Char. @25°C	Initial limit
19b. Elec. Char. @Min. operating temp.	Initial limit ± change allowed over temp. range
19c. Elec. Char. @Max operating temp.	Initial limit ± change allowed over temp. range
20. Flammability	Per AEC-Q200 – Electrical test not required
21. Flame Retardance	See AEC-Q200-001

Significant characteristics:

1. D.C. Resistance
2. Temperature Coefficient of Resistance

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Table 7F - Acceptance Criteria for SMD chip resistors

(Does not include molded flat leaded SMD, but does include coated metal strip)

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

AEC-Q200 Test	Acceptance Criteria Resistance
1. Initial Limits	Within specified tolerance
3. High Temperature Exposure (storage)	±x% +yΩ
4. Temperature Cycling	±x% +yΩ
6. Moisture Resistance	Technologies L, M: ±x% +yΩ Technologies N, T: ±x% +yΩ Technology U: ±x% +yΩ Technology P, R: ±x% +yΩ
7. Biased Humidity	Technologies L, M, and U: ±x% +yΩ Technologies N, P, R and T : ±x% +yΩ
8. Operational Life	Technologies L, M, N and U: ±x% +yΩ Technologies P, R and T : ±x% +yΩ
9. External Visual	Per AEC-Q200 – Electrical test not required
10. Physical Dimensions	Per AEC-Q200 – Electrical test not required
12. Resistance to Solvents	Marking must remain legible
13. Mechanical Shock	±x% +yΩ
14. Vibration	±x% +yΩ
15.Resistance to Soldering Heat	Technologies L, M, and U: ±x% +yΩ Technology N: ±x% +yΩ Technologies P, R, and T : ±x% +yΩ
16.Thermal Shock	±x% +yΩ
17. ESD	Per AEC-Q200-002
18. Solderability	Per AEC-Q200 – Electrical test not required
19a. Elec. Char. @25°C	Initial limit
19b. Elec. Char. @Min. operating temp.	Initial limit ± change allowed over temp. range
19c. Elec. Char. @Max operating temp.	Initial limit ± change allowed over temp. range
20. Flammability	Per AEC-Q200 – Electrical test not required
21. Board Flex (SMD)	±x% +yΩ
22. Terminal Strength (SMD)	±x% +yΩ
23. Flame Retardance	See AEC-Q200-001

Significant characteristics:

1. D.C. Resistance
2. Temperature Coefficient of Resistance

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TABLE 8 - TABLE OF METHODS REFERENCED THERMISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 8.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85°C, same applies for 125°C part. Unpowered. Measurement at 24±2 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 Cycles (-55°C to +125°C) Measurement at 24±2 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. 10% Rated Power. Measurement at 24±2 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hrs. T=125°C Note: If 85°C part 1000 hrs. will be at that temperature. Rated power at temperature - steady state. Measurement at 24±2 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (2.27 kg), C (227 g).
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202-213	Figure 1 of Method 213 SMD: Condition F LEADED: Condition C
Vibration	14	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations Note: Use 8"X5" PCB .031" thick. 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave Solder - Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5 mm of part body.

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TABLE 8 -TABLE OF METHODS REFERENCED THERMISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	

NOTE: Pre-stress electrical tests also serve as electrical characterization. Interval measurements for 1000 hour tests required at 250 hrs. and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Automotive Electronics Council
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TABLE 8A - Thermistor Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 8	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22						
MATERIAL																									
Ink Material	●	●		●	●									●		B									
Protective Coat	●	●	●										●												
Substrate Material										●		●	●		●		●								
PROCESS																									
Lead Form			●			●	●	●								B		●	●						
Marking						●			●																
Molding	●	●				●	●		●		●	●			●		●								
Termination Attach			●	●	●			●		●				●	●	B		●	●						
DESIGN																									
Package	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●								
Thermistor Value	●	●			●									●		B									
Thermistor Tolerance	●	●			●							●		●		B									
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●		●	●	●	●		●	●	●	●	●	●	B	●	●	●						
Material Suppliers		●	●		●			●	●			●	●		●	B	●	●	●						

B = comparative data (unchanged vs. Changed) required

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TABLE 9 - TABLE OF METHODS REFERENCED TRIMMER CAPACITORS/RESISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 9.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs. at 85°C and the same applies for 125°C). Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 Cycles (-55°C to 85°C) Note: If 125°C part the 1000 cycles will be at that temperature rating. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Capacitive Trimmers - Rated Voltage Resistive Trimmers - 10% Rated Power. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hrs T_A=85°C Note: If 125°C part it will be tested at that temperature. Rated Voltage for trimmer caps. Rated power at temperature for trimmer resistors. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Supplier spec. Electrical test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (227 g), C (227 g)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213 SMD: Condition F LEADED: Condition C

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TABLE 9 - TABLE OF METHODS REFERENCED TRIMMER CAPACITORS/RESISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Vibration	14	MIL-STD-202 Method 204	5 g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick, 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave solder - Procedure 1 with solder within 1.5 mm of device body for Leaded. Procedure 1 except 230°C and immerse only to level to cover terminals for SMD.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	
Rotation Life	25	MIL-STD-202 Method 206	Condition A

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 hrs. and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Automotive Electronics Council
Component Technical Committee

TABLE 9A - Trimmers Capacitors/Resistors Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)
25. Rotation Life

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 9	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	25					
MATERIAL																									
Element Material		●	●											●		**B**				●					
Housing Material		●			●	●	●						●												
Substrate		●		●						●			●												
Termination Material		●			●		●	●	●	C	●	●	●		●			●	●						
Washer	●	●	●						●						●					●					
PROCESS																									
Brush Attach		●		●							●		●			**B**				●					
Termination Attach		●			●			●				●	●					●	●						
DESIGN																									
Element		●	●											●		**B**				●					
Housing	●	●			●	●	●		●				●				●								
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	**B**	●	●	●	●					
Material Suppliers		●					●			C					●										

C = Capacitive Trimmers only **B = comparative data (unchanged vs. Changed) required**

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TABLE 10 - TABLE OF METHODS REFERENCED VARISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 10.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. @ T=150°C. Unpowered. Measurement at 24±2 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-40°C to 125°C) Electrical test before and after TC. Note: If 85°C part the 1000 cycles will be at that temperature rating. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Bias at 85% (+5%/-0%) of rated Varistor voltage (1 mA) Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hrs. T_A=125°C. Note: If 85°C part 1000 hrs will be at that temperature. Bias at 85% (+5%/-0%) of rated Varistor voltage (ma) Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Supplier spec. Electrical test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (2.27 kg), C (227 g)
Resistance to Solvents	12	MIL-STD-202 Method 215	Also aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213 SMD: Condition F LEADED: Condition C
Vibration	14	MIL-STD-202 Method 204	5 g's for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick with 7 secure points on one 8" side and 2 secure points on corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.

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TABLE 10 - TABLE OF METHODS REFERENCED VARISTORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave solder - Procedure 2 for SMD. Procedure 1 with solder within 1.5 mm of device body for Leaded.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	
Electrical Transient Conduction	30	ISO-7637-1	Test pulses 1 to 3

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 hrs and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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Automotive Electronics Council
Component Technical Committee

TABLE 10A - Varistors Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)
30. Electrical Transient Conduction

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 10	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30					
MATERIAL																									
Coating Material	●	●	●			●			●	●	●		●				●								
Electrode Attach	●	●			●			●				●	●			B		●	●	●					
Element Material	●	●			●					●			●	●		B				●					
Passivation		●	●										●					●							
Termination	●	●			●			●				●	●		●	B		●	●	●					
PROCESS																									
Coating Dip/Cure	●	●	●			●	●		●				●				●								
Dicing		●		●		●	●						●			B		●	●	●					
Lead Forming	●		●	●			●	●			●	●	●		●	B									
Marking	●					●			●																
Sintering	●	●	●		●								●	●		B				●					
Termination Attach	●	●			●		●	●			●	●	●			B		●	●	●					
Termination Plating	●	●			●		●	●				●	●		●	B		●	●						
DESIGN																									
Element Size		●	●		●					●	●		●	●		B				●					
Grain Boundary Size			●		●									●		B				●					
Grain Size					●											B				●					
Layer - Number of		●	●		●						●		●							●					
Layer - Thickness			●		●											B		●	●	●					
Package Size		●	●		●	●	●	●		●	●		●	●				●		●					
Passivation Thickness		●	●		●					●			●			B									
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●		●	●	●	●	●	●	B		●	●	●					
Material Suppliers	●	●	●		●			●			●	●		●	●	B		●	●	●					
New/Modified Mfg. Equipment		●	●		●			●			●			●		B				●					

B = comparative data (unchanged vs. Changed) required

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TABLE 11 - TABLE OF METHODS REFERENCED QUARTZ CRYSTALS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 11.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85°C. Same applies for 125°C). Unpowered. Measurement at 24±4 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-40°C to 125°C) Note: If 85°C part the 1000 cycles will be at that temperature rating. Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Rated V_{DD} applied with 1 MΩ and inverter in parallel, 2X crystal C_L capacitors between each crystal leg and GND. Measurement at 24±4 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	Note: 1000 hrs @ 125°C. If 85C part will be tested at that temperature. Rated V_{DD} applied with 1 MΩ and inverter in parallel, 2X crystal C_L capacitors between each crystal leg and GND. Measurement at 24±4 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (227 g), C (227 g).
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Also aqueous wash chemical - OKEM clean or equivalent. Do not use banned solvents.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C

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TABLE 11 - TABLE OF METHODS REFERENCED QUARTZ CRYSTALS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick with 7 secure points on one 8" side and 2 secure points on corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave solder - Procedure 1 with solder within 1.5 mm of device body for Leaded. Procedure 1 except 230°C and immerse only to level to cover terminals for SMD.
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 Acceptable
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval measurements for 1000 hour tests required at 250 and 500 hrs.

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Automotive Electronics Council
Component Technical Committee

TABLE 11A - Quartz Crystal Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 11	3	4	6	7	8	9	10	11	12	13	14	15	16	18	19	20	21	22							
MATERIAL																									
Quartz Blank	●	●			●					●	●		●		B		●								
Base		●		●		●	●		●	●	●						●	●							
Lead/Termination		●				●	●	●	●		●	●		●	B		●	●							
Glass Seal	●	●	●	●	●	●		●	●	●	●	●	●		B		●	●							
Can/Cap		●		●		●	●		●	●	●						●								
Blank Support		●			●					●	●		●		B		●								
Overmold	●	●	●			●	●		●	●	●	●	●			●	●	●							
Case Sealing	●	●		●		●			●	●	●	●	●		B	●	●								
Electrode	●	●			●						●		●												
Insulator	●	●	●			●	●		●		●	●	●		B	●	●								
PROCESS																									
Quartz Blank		●			●					●	●		●		B		●								
Base Assembly	●	●		●		●	●	●		●	●	●	●	●			●	●							
Blank Etch/Clean															B										
Electrode Formation		●			●						●				B		●								
Auto Trim										●	●				B		●								
Bond/Anneal Blank	●	●			●					●	●		●		B		●								
Cap/Can Attach	●	●		●	●	●	●			●	●		●		B		●								
Overmolding		●	●			●	●			●	●		●		B	●	●	●							
Marking						●			●																
Aging										●	●		●		B		●								
DESIGN																									
Quartz Blank		●								●	●				B		●								
Base	●	●		●		●	●	●		●	●		●				●	●							
Lead/Termination		●				●	●	●		●	●	●	●	●	B		●	●							
Can/Cap		●	●	●		●	●			●	●		●		B		●								
Blank Support		●			●					●	●		●		B		●								
Package (Molded)		●	●			●	●	●	●	●	●	●	●		B	●	●	●							
Insulator						●	●		●																
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●	●							
Material Suppliers		●	●		●	●	●	●	●	●	●		●	●	B	●	●	●							
Process Control Change						●	●																		

B = comparative data (unchanged vs. Changed) required

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Table 11B - Acceptance Criteria for Quartz Crystals

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

Measured Parameter =>	Oscillation Frequency	Equivalent Series Resistance
3. High Temp. Exposure	Change <= +/-x ppm	Change <= +/-a% or b Ohms
4. Temperature Cycling	Change <= +/-x ppm	Change <= +/-a% or b Ohms
6. Moisture Resistance	Change <= +/-x ppm	Change <= +/-a% or b Ohms
7. Biased Humidity	Change <= +/-x ppm	Change <= +/-a% or b Ohms
8. Operational Life	Change <= +/-x ppm	Change <= +/-a% or b Ohms
9. External Visual	Per AEC-Q200 - Electrical test not required	
10. Physical Dimension	Per Supplier datasheet	
11. Terminal Strength (Leaded)	No damage on specimen	
12. Resistance to Solvents	Per AEC-Q200 - Electrical test not required	
13. Mechanical Shock	Change <= +/-x ppm	Change <= +/-a% or b Ohms
14. Vibration	Change <= +/-x ppm	Change <= +/-a% or b Ohms
15. Resistance to Soldering Heat	Change <= +/-x ppm	Change <= +/-a% or b Ohms
16. Thermal Shock	Change <= +/-x ppm	Change <= +/-a% or b Ohms
18. Solderability	After solder dipped, over x% of terminal must be covered by solder.	
21. Board Flex	Change <= +/-x ppm	Change <= +/-a% or b Ohms
22. Terminal Strength (SMD)	Change <= +/-x ppm	Change <= +/-a% or b Ohms

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TABLE 12 - TABLE OF METHODS REFERENCED CERAMIC RESONATORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 12.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85°C. Same applies for 125°C parts.). Unpowered. Measurement at 24±2 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-55°C to 85°C) Note: If 125°C part the 1000 cycles will be at that temperature rating. Measurement at 24±2 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Rated V_{DD} applied with 1 MΩ and inverter in parallel, 2X resonator C_L capacitors between each resonator leg and GND. Measurement at 24±2 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hours T_A=85°C, Note: Condition D (1000 hrs) If 125°C the 1000 hrs. will be at that temperature. Rated V_{DD} applied with 1 MΩ and inverter in parallel, 2X resonator C_L capacitors between each resonator leg and GND. Measurement at 24±2 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (2.27 kg), C (227 g)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Also aqueous wash chemical - OKEM clean or equivalent. Do not use banned solvents
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C

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TABLE 12 - TABLE OF METHODS REFERENCED CERAMIC RESONATORS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations Use 8"X5" PCB, .031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Note: Single Wave solder - Procedure 1 with solder within 1.5 mm of device body for Leaded. Procedure 1 except 230°C and immerse only to level to cover terminals for SMD.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval Measurements for 1000 hour tests required at 250 hrs. and 500 hrs.

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Component Technical Committee

TABLE 12A - Ceramic Resonator Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
21. Board Flex
22. Terminal Strength (SMD)

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 12	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	21	22							
MATERIAL																									
Ceramic Element	●	●	●		●			●		●	●		●			B									
Inner Electrode	●	●	●		●			●		●	●		●	●											
Epoxy Resin Overcoat	●	●		●	●	●	●	●	●																
Outer Electrode		●	●			●	●	●	●		●	●	●	●	●		●	●							
Wax						●										B									
Terminal Solder		●				●									●		●	●							
Element/Lead Attach	●	●	●		●			●		●	●	●	●	●		B									
Case	●	●	●		●	●	●		●	●	●	●	●				●	●							
Case Adhesive/Seal	●	●	●		●	●	●	●	●	●	●	●	●				●	●							
Capacitor	●	●	●		●			●		●	●	●	●	●		B	●	●							
PROCESS																									
Ceramic Blank		●			●			●		●	●		●			B	●	●							
Lapping		●						●		●	●		●			B	●	●							
Electroding		●			●			●		●	●		●	●		B	●	●							
Cutting								●		●	●		●			B	●	●							
Annealing					●			●		●	●		●			B	●	●							
Polarize/Freq. Adjust														●		B									
Element/Lead Attach		●			●			●		●	●			●		B	●	●							
Adhesive/Epoxy Seal		●		●	●	●				●	●						●								
Epoxy Dip & Cure			●		●	●	●	●	●																
Wax Application						●	●																		
Terminal Solder	●	●	●		●	●	●	●							●		●	●							
Marking						●			●																
DESIGN																									
Ceramic Element		●			●		●			●	●		●			B	●								
Electrode/Capacitor		●			●		●			●	●		●	●		B	●	●							
Case		●	●		●	●	●			●	●		●				●	●							
Termination		●			●	●		●		●	●		●		●		●	●							
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●							
Material Suppliers		●	●		●	●	●	●	●	●	●		●		●	B	●	●							
New/Modified Mfg. Equipment						●	●																		

B = comparative data (unchanged vs. Changed) required

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Table 12B - Acceptance Criteria for Ceramic Resonators

Note: The contents in this table are meant to serve as examples of wording or limits for each test and relative parameter to be measured and NOT actual requirements. Variables are denoted by lower-case letters (e.g., x, y). The measured parameters, values and wording of each acceptance criteria for each test should be agreed to between the user and supplier.

	Oscillation Frequency	Resonant Impedance	Load Capacitance
3. High Temp. Exposure	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
4. Temperature Cycling	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
6. Moisture Resistance	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
7. Biased Humidity	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
8. Operational Life	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
9. External Visual	Per AEC-Q200 - Electrical test not required		
10. Physical Dimension	Per Supplier datasheet		
11. Terminal Strength (Leaded)	Meet Initial Spec	Meet Initial Spec	Meet Initial Reference Spec
12. Resistance to Solvents	Per AEC-Q200 - Electrical test not required		
13. Mechanical Shock	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
14. Vibration	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
15. Resistance to Soldering Heat	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
16. Thermal Shock	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
17. Solderability	After reflow soldering at least x% of terminal must be covered with solder.		
18. ESD	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
21. Board Flex	Change <= +/-x%	Meet Initial Spec	Meet Initial Reference Spec
22. Terminal Strength (SMD)	Meet Initial Spec	Meet Initial Spec	Meet Initial Reference Spec

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TABLE 13 - TABLE OF METHODS REFERENCED FERRITE EMI SUPPRESSORS/FILTERS			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 13.
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	1000 hrs. at rated operating temperature (e.g. 85°C part can be stored for 1000 hrs at 85°C. Same applies for 125°C parts.). Unpowered. Measurement at 24±2 hours after test conclusion.
Temperature Cycling	4	JESD22 Method JA-104	1000 cycles (-55°C to 85°C) Note: If 125°C part the 1000 cycles will be at that temperature rating. Measurement at 24±2 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Destructive Physical Analysis	5	EIA-469	Electrical Test not required.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85%RH. Apply Maximum rated Voltage and current. Measurement at 24±2 hours after test conclusion.
Operational Life	8	MIL-STD-202 Method 108	1000 hours T_A=85°C, Note: If 125°C the 1000 hrs. will be at that temperature. Rated I_L applied. Measurement at 24±2 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical Test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification. Note: User(s) and Suppliers spec. Electrical Test not required.
Terminal Strength (Leaded)	11	MIL-STD-202 Method 211	Test leaded device lead integrity only. Conditions: A (910g), C (1.13kg) , E (1.45 Kg-mm)
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Also aqueous wash chemical - OKEM clean or equivalent. Do not use banned solvents
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213. SMD: Condition F Leaded:Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations Use 8"X5" PCB, .031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10-2000 Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Note: Condition B No pre-heat of samples. Note: Single Wave solder - for SMD use Procedure 2; For Leaded use Procedure 1.

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TABLE 13 - TABLE OF METHODS REFERENCED FERRITE EMI SUPPRESSORS/FILTERS			
Stress	**NO.**	**Reference**	**Additional Requirements**
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical Test not required. Magnification 50 X. Conditions: Leaded: Method A @ 235°C, category 3. SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235°C b) Method B @ 215°C category 3. c) Method D category 3 @ 260°C.
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V-0 or V-1 are acceptable. Electrical Test not required.
Board Flex	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	
Electrical Transient Conduction	30	ISO-7637-1	Test pulses 1 to 3
Shear Strength	31	AEC-Q200-004	

NOTE: Pre-stress electrical tests also serve as electrical characterization.
Interval Measurements for 1000 hour tests required at 250 hrs. and 500 hrs.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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TABLE 13A - Ferrite EMI Suppressor/ Filter Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

3. High Temperature Exposure (Storage)
4. Temperature Cycling
5. Destructive Physical Analysis
7. Biased Humidity
8. Operational Life
9 External Visual
10. Physical Dimension
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. Electrostatic Discharge (ESD)
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex
22. Terminal Strength (SMD)
30. Electrical Transient Conduction
31. Shear Strength

Note: A letter or "●" indicates that performance of that stress test should be considered for the appropriate process change

Test # From Table 13	3	4	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	30	31				
MATERIAL																									
Binder Material		●									●		●			B									
Dielectric	●	●	●	●				●		●	●		●	●		B		●							
Terminal Interface	●	●	●	●						●	●		●	●		B		●							
Conductor Material	●	●	●	●	●			●			●		●			B		●							
Encapsulation			●			●	●		●			●	●												
Lead/Termination		●				●	●	●			●	●			●	B			●						
PROCESS																									
Dicing	●	●		●		●	●		●	●						B	●								
Conductor Apply	●			●	●							●	●	●		B		●							
Ekectrode Formation		●	●		●									●		B				●					
Firing Profile		●	●										●	●		B		●		●					
Lamination Press			●	●								●	●			B		●							
Powder Particle Size		●		●								●		●		B		●							
Screen Printing		●												●		B									
Termination Process	●	●	●	●		●	●	●		●	●	●			●	B		●	●						
DESIGN																									
Conductor Thickness	●	●	●							●			●	●		B									
Lead/Term. Thickness		●				●	●	●			●							●	●		●				
Number of Layers		●	●	●			●						●	●		B		●							
Termination Area		●				●	●				●							●	●		●				
Terminal Interface	●	●	●	●					●	●	●	●	●	●		B		●	●	●					
MISCELLANEOUS																									
Mfg. Site Transfer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●	●		●				
Material Suppliers	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	B	●	●	●		●				
New/Modified Mfg. Equipment		●		●			●	a			●			●	●	B									

a = termination equipment only

B = comparative data (unchanged vs. Changed) required

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TABLE 14 - TABLE OF METHODS REFERENCED POLYMERIC RESETTABLE FUSES			
Stress	**NO.**	**Reference**	**Additional Requirements**
Pre- and Post-Stress Electrical Test	1	User Spec.	Test is performed except as specified in the applicable stress reference and the additional requirements in Table 14.
Temperature Cycling	4	JESD22 Method JA-104	1000 Cycles (-40℃ to 125℃) Note: if 85℃ part, 1000 Cycles will be at that temperature rating. Tri-temperature Pre and post stress required. Post-stress measurements to start 1 to 24 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1 min. maximum transition time.
Biased Humidity	7	MIL-STD-202 Method 103	1000 hours 85°C/85% RH. Biased at10% of rated hold current Post-stress measurements to start 1 to 24 hours after test conclusion.
Operational Life	8	AEC-Q200-004	1000 hours (at 125℃) Note: if 85℃ part, test temperature will be at that temperature rating. Post-stress measurements to start 1 to 24 hours after test conclusion.
External Visual	9	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship. Electrical test not required.
Physical Dimension	10	JESD22 Method JB-100	Verify the physical dimensions to the applicable user spec. Electrical test not required
Terminal Strength (Leaded)	11	AEC-Q200-004	Test leaded device lead integrity only
Resistance to Solvents	12	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents. Verify marking permanency. Not required for laser etched parts.
Mechanical Shock	13	MIL-STD-202 Method 213	Figure 1 of Method 213 SMD: Condition F LEADED: Condition C
Vibration	14	MIL-STD-202 Method 204	5g's for 20 minutes, 12 cycles each of 3 orientations. Test from 10-2000 Hz. Note: Use 8"X5" PCB .03 " thick. 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" of any secure points.

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TABLE 14 - TABLE OF METHODS REFERENCED POLYMERIC RESETTABLE FUSES			
Stress	**NO.**	**Reference**	**Additional Requirements**
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	Revised per latest Mil Spec. Willie putting new into all tables. Cooling time prior to final measurement: 24 hrs. min.
Thermal Shock	16	MIL-STD-202 Method 107	300 cycles (-40℃ to 125℃) Note: if 85℃ part, 300 Cycles will be at that temperature rating. Note: Maximum transfer time: 20 seconds, Dwell time-15 minutes. Medium: Air-Air Tri-temperature Pre and post stress required. Post-stress measurements to start 1 to 24 hours after test conclusion.
ESD	17	AEC-Q200-002 or ISO/DIS 10605	
Solderability	18	J-STD-002	For both Leaded & SMD. Electrical test not required. Magnification 50 X. Conditions: Leaded : Method A @ 235℃, Category 3 SMD: a) Method B, 4 hrs @ 155°C dry heat @ 235℃ b) Method B @ 215℃, category 3 c) Method D Category 3 @ 260℃
Electrical Characterization	19	User Spec.	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
Flammability	20	UL-94	V0 or V1 acceptable. Electrical test not required.
Board Flex (surface mount only)	21	AEC Q200-005	60 sec minimum holding time.
Terminal Strength (SMD)	22	AEC Q200-006	
Short Circuit Fault Current Durability	32	AEC-Q200-004	
Fault Current Durability	33	AEC-Q200-004	
End-of-life Mode verification	34	AEC-Q200-004	
Jump Start Endurance	35	AEC-Q200-004	
Load Dump Endurance	36	AEC-Q200-004	

Note: Pre stress electrical tests also serve as electrical characterization if required data per Stress 19 is collected at that time.

Acceptance Criteria:
Per supplier specification, unless otherwise specified in the user component specification.

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TABLE 14A – Polymeric Resettable Fuses Process Change Qualification Guidelines for the Selection of Tests

For a given change listed below, the supplier should justify why a suggested test does not apply for the given part(s) under consideration. Collaboration with their customer base is highly recommended.

4. Temperature Cycling
6. Moisture Resistance
7. Biased Humidity
8. Operation Life
9. External Visual
10. Physical Dimension (10 Samples only)
11. Terminal Strength (Leaded)
12. Resistance to Solvents
13. Mechanical Shock
14. Vibration
15. Resistance to Soldering Heat
16. Thermal Shock
17. ESD
18. Solderability
19. Electrical Characterization
20. Flammability
21. Board Flex (Surface Mount Only)
22. Terminal Strength (Surface Mount Only)
31. Short Circuit Current Durability
32. Fault Current Durability
33. End-of-Life Mode Verification
34. Jump Start Endurance
35. Load Dump Endurance

Note: A letter or "● " indicates that performance of that stress test should be considered for the appropriate process change.

Test # From Table 14	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	31	32	33	34	35	
MATERIAL																								
PTC Core Material			●	●	●						●	●			B					●	●			
Marking					●			●																
Terminal/Lead					●	●	●		●	●				●			●	●						
Terminal/Lead Attachment					●	●			●	●		●		●			●	●						
Protective Coating			●	●	●	●						●				●								
PROCESS																								
PTC Forming			●	●							●					●	●							
Substrate Singulation					●	●																		
Terminal/Lead Attachment			●	●	●		●					●		●			●	●						
Protective Coating			●	●	●	●						●												
Marking					●			1																
DESIGN																								
Form Factor					●	●									B									
Teminal Configuration (Kink)					●	●	●		●	●														
Characteristics Specification															B									
MISCELLANEOUS																								
Mfg. Site Transfer	●	●	●	●	●	●	●	1	●	●	●	●	●	●	B		●	●	●	●	●	●	●	

Note 1: For parts marked with ink only. Laser and stamped marked parts shall be exempt from this test.
Note 2: Test numbers are the last sub paragraph numbers of requirements or procedure paragraphs.
B = comparative data (unchanged vs. Changed) required

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APPENDIX 1 - Definition of a Qualification Family

The qualification of a particular process will be defined within, but not limited to, the categories listed below. The supplier will provide a complete description of each process, case size and material of significance. There must be valid and obvious links between the data and the subject of qualification.

For devices to be categorized in a qualification family, they all must share the same major process and materials elements as defined below. All devices using the same process and materials are to be categorized in the same qualification family for that process and are qualified by association when one family member successfully completes qualification with the exception of the device specific requirements of section 4.2.

Prior qualification data 2 years old or newer obtained from a device in a specific family may be extended to the qualification of subsequent devices in that family provided the supplier can insure no process changes have been made.

For broad changes that involve multiple attributes (e.g. site, material(s), process(es)), refer to section 2.3 which allows for the selection of worst-case test vehicles to cover all the possible permutations.

1. Sub Assembly

Each process technology must be considered and qualified separately. No matter how similar, processes from one fundamental technology cannot be used for the other.

Family Requalification with the appropriate tests is required when the process or a material is changed. The important attributes defining a qualification family are listed below:

1) CAPACITOR TECHNOLOGY
* Aluminum Electrolytic
* Tantalum
* Ceramic
* Film
* Networks
* Trimmers

2) RESISTOR TECHNOLOGY
* Thin Film
* Thick Film
* Networks
*Trimmers
* Wirewounds
* Molded Metal Strip

3) INDUCTORS
* Fixed (Axial/Radial/SMD)
* Ferrite Cores
* Wirewound
* Multilayer
* Variable

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4) TRANSFORMERS
* Pulse Transformers
* SMD (for DC TO DC CONVERTERS)
* Switch Mode Power Transformers
* SMD (for Pulse Applications)

5) VARISTORS
* Ring Varistors (Barium-Titanium Oxide)
* Disc Varistors (Zinc Oxide)
* Multilayer Surface Mounted Varistors

6) THERMISTORS
* For Motor Starting
* For Overcurrent Limiting
* For Temperature Compensation

7) CRYSTALS
* Metal AT CUT
* Metal AT STRIP
* Molded Surface Mounted

2. Assembly Process

The processes for each package type must be considered and qualified separately. For devices to be categorized in a qualification family, they all must share the same major process and material elements as defined below. Family Requalification with the appropriate tests are required when the process or a material is changed. The supplier must submit technical justification to the user to support the acceptance of generic data with package type if different than the device to be qualified.

The important attributes defining a qualification family are listed below:

1) Package Type (e.g. 0402-0603-0805-1206 etc - Ceramic caps)
(e.g. A-B-C-D-X size etc - Tantalum caps)
(e.g. 1812-1210-1206-1008-0805 etc - SMD Inductors)
(e.g. 0603-1206-1210-1825 etc - SMD Resistors)

2) Assembly Site

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3. Qualification of Multiple Families and Sites

When the specific product or process attribute to be qualified or requalified will affect more than a family, the qualification test vehicles should be three lots of a single device type from each of the technology and package families that are projected to be most sensitive to the changed attribute with sample sizes split to include a minimum of 30 pieces from each of 3 assembly lots from each assembly site.

Below is the recommended process for qualifying changes across many process and product families:

1) Identify all products affected by the proposed process changes.

2) Identify the critical structures and interfaces potentially affected by the proposed change.

3) Identify and list the potential failure mechanisms and associated failure modes for the critical structures and interfaces.

4) Define the product groupings or families based upon similar characteristics as they relate to the technology process and package families and device sensitivities to be evaluated, and provide technical justification for these groupings.

5) Provide the qualification test plan, including a description of the change, the matrix of tests and the representative products, which will address each of the potential failure mechanisms and associated failure modes.

6) Robust process capability must be demonstrated at each site (e.g. control of each process step, capability of each piece of equipment involved in the process, equivalence of the process step-by-step across all affected sites) for each of the affected process step(s).

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APPENDIX 2 - Certificate of Design, Construction and Qualification (CDCQ)

The following information, as applicable, is required to identify a component which has met the requirements of this specification. This page is available as a stand-alone document.

Supplier		Lead/terminal attachment method	
User P/N(s)		Package outline drawing	
Supplier P/N(s)		Flammability rating	
Data sheet		ESD characterization(s)	
Assembly Location		Lead/Termination material	
Process Identifier		Lead plating/coating	
Final QC Facility Location		Construction cross section	
Family number		Package Subcontractor(s)	
Technology description		Element composition	
All dimensions in millimeters		Solvent exposure restriction	
Metallization material		Marking method	
Number of active layers		Exceptions taken to AEC- Q200	
Electrode/Internal element attachment method		Subassembly location	
Thickness range		Insulation material	
Package material			

Attachments:
1) Cross section photo.
2) Package outline drawing.
3) Special test circuits.
4) Letter stating exceptions taken to AEC-Q200.

Requirements:
1) A separate CDCQ shall be submitted for each family as defined by Appendix 1 and Appendix 2

2) Document shall be signed by a responsible individual at the supplier who can verify that all of the above information is correct.

Type name and sign.

Completed by:	Date:	Certified By:	Title	Date:

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APPENDIX 3 - Qualification Test Plan Format

The supplier is requested to complete and submit the Passive Component Qualification Plan as part of the pre-launch Control Plan whenever production approval submission is required. Acceptance and subsequent sign-off of the plan will establish a qualification agreement between the user and the supplier determining requirements for both new parts and process changes prior to commencement of testing. Where "family" data is being proposed, the plan will document how the reliability testing previously completed fulfills the requirements outlined in this specification. An approved copy of the qualification plan should be included with each production approval submission.

The test plan section of the form should detail ONLY the testing that will be performed on the specific part shown. **Testing MUST include the additional requirements listed in the applicable table 2-14.** For process change qualifications, multiple parts can be included on the same plan. Supporting generic or family data reports should be noted in the comment section and attached. When requesting use of generic or family data, attach a separate page detailing similarities or differences between parts referencing the criteria in Appendix1. There must be valid and obvious links between the data and the subject of qualification.

The example below is provided to demonstrate how the Qualification Plan Form should be used. In this case, a ceramic multilayer capacitor was chosen as being representative of a typical new part qualification requesting reduced component testing by including generic test data. The part comes from a supplier who previously qualified the package, assembly site etc. This ***EXAMPLE*** is shown for illustration purposes only and should not limit any requirements from Table 1 - 14herein.

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EXAMPLE Passive Component Qualification Test Plan

User P/N : N611045BFDDAARA

User Component Engineer : John Doe

User Spec. # : ES-N6110450FDAARA

General Specification : AEC-Q200

Supplier : Sam's Discount Capacitor

Supplier Manufacturing Site : Shanghai, China

Supplier P/N: N611045BFDDAARA

Required production approval Submission Date : 5/1/96

Family Type : X7R1206 Ceramic

Reason for Qualification : New device Qualification

Item	Test	Test conditions	Exceptions	Est. Start	Est. Comp.	# Lots	S. S.	Additional Requirements
1	Electrical Test	@ -55°C, 25°C, 125 °C		4/1/09	4/5/09	all	all	
3	High Temp Exposure	1000 Hours @ 150°C		4/11/09	6/24/09	3	40	
4	Temperatur e Cycling	1000 cycles (-55°C to +125°C)		4/15/09	6/24/09			
5	Destructive Physical Analysis			4/22/09	4/29/09			
6	Moisture Resistance	Cycled 25°C to 65°C, 80-100% RH, 24 hours/cycle 10 Cycles		4/29/09	5/27/09			
7	Biased Humidity	1000 hours 85°C/85RH	Use attached generic data for this package related test. Comment #1	4/28/09	6/24/09			generic data uses +70C/85% (rather than 85C) Rated and 1.3V. Add 100K Ohm resistor.
8	Operating Life	1000 hours 125°C with Full rated Voltage		4/15/09	6/24/09			
9	External Visual	Per Spec.		4/22/09	4/29/09			
10	Physical Dimensions	Per user(s) Spec.		4/22/09	4/28/09			
12	Resistance to Solvents	MIL STD 215 and Aqueous Wash materials		4/22/09	4/26/09			
13	Mechanical Shock	½ Sine Pulse 1500g Peak		5/19/09	5/26/09			

Test summaries are to include mean, std. Deviation, min. & max. Reading for all endpoint tests.

Comments:

1. Supplier requests 1 lot qualification of this device type in addition to attached reliability reports of similar parts.

Prepared by: (supplier)

Approved by: (User Engineer)

Example of Passive Component Qualification Plan

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APPENDIX 4 - Data Presentation Format and Content

The supplier is required to complete and submit an Environmental Test Summary and Parametric Verification Summary with each Passive Component production approval submittal. Figure 4-1 is an ***EXAMPLE*** of a completed Environmental Test Summary. The format shall be followed.

Production Part Approval - Environmental Test Summary

EXAMPLE

SUPPLIER Sam's Discount Capacitors		USER PART NUMBER N611045BFDAARA			
NAME OF LABORATORY SDS Qual Lab.		PART NAME Ceramic Capacitor			
Test #	Description	Test Conditions	# Lots Tested	Qty Tested	Number Failed
3	High Temp. Exposure	Per Spec.	3	120	0
5	Destructive Physical Analysis	Per Spec.	3	15	0
9	External Visual	Per Spec.	3	260	0
10	Physical Dimensions	Per Spec.	3	30	0
12	Resistance to Solvents	Per Spec.	1	5	0
13	Mechanical Shock	½ Sine Pulse 1500g	3	90	0

Figure 4-1 Environmental Test Summary

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Figure 4-2 is an ***EXAMPLE*** of a completed Parametric Verification Summary. The format shall be followed.

Production Part Approval -
Parametric Verification Summary

Supplier SAM's Discount Passive Components			Part Number N611045BFDAARA				
Lot Number 394A			Temperature -55°C				
Test Name	User Spec. LSL	User Spec. USL	Min.	Max.	Mean	Std. Dev.	Cpk
Capacitance	0.09 µF	0.11 µF	0.0971 µF	0.1086 µF	0.103 µF	0.0013 µF	1.79
DF	------	±2.5%	1.07%	1.98%	1.6%	.092%	3.79
IR	20GΩ	------	40GΩ	100GΩ	70GΩ	30GΩ	7.03
Temperature Coefficient	-15.0%	+15%	-14.83%	-5.97%	-11.4%	1.01%	1.19

Figure 4-2 Parametric Verification Summary

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Revision History

Rev #	Date of change	Brief summary listing affected paragraphs
-	April 30, 1996	Initial Release.
A	June 16, 1997	(1.1.1) Add Crystals, Resonators, Ferrites (2.1) Changed "qualification program" to "document" Added "user's" to item #2. (2.3) Changed 2-10, 2A-10A to 2-13,2A-13A (2.4.5) Changed 2-10 to 2-13 (2.6) " " (2.7) " " (3.1) " " (3.2.2) Changed 2-10, 2A-10A to 2-13,2A-13A (4.1) Table 1 - Remove N on Test 12. Add S on Test 21-22 Table 2 - Remove Test 24 Add 1.5mm to Test 15 Table 2A - Remove Test 24 Table 4 - Changed temperature on Test 16 Table 9 - Added 230C, term. coverage Test 15 Changed minutes to seconds Test 16 Tables 2-10- Added 24 Hour meas. Tests3,4,6-8. Add 10-2000 Hz on Test 14 Tables 11-13-Added Tables 11-13, 11A-13A Appendix 2 - Added resp. Individual to requirement 2
B	March 15, 2000	Removed CDF designation through document. Removed Chrysler, Delco, and Ford logo from each heading. Removed Automotive Grade through document. Added Component Technical Committee to each heading. (1.2.3) Replaced Automotive with AEC Tables 14 –14A Added Tables for Polymetric Resettable Fuses. Changed all references to Tables 2– 13 to 2–14 Changed all references to Tables 2A – 13A to 2A –14A (4.1) Changed reference to Table 1-13 to 1-14 (2.4.1) Changed to Lot requirements are designated in Table1, herein Tables 2-13, item 18 – Reversed Method a and b for SMD solderability requirements Table 3, item 16 – Changed dwell time to 15 minutes Table 5, item 16 – Changed dwell time to 15 minutes Table 6, item 21 – Added 3mm board flex for COG devices Table 1, Added Note A and Note B. Table 1, item 18 - Changed sample size from 10 to 15. Table 1, item 18 – Added each condition. Ledgen for Table 1- Added Note A and B

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Revision History - Continued

Rev #	Date of change	Brief summary listing affected paragraphs
C	June 17, 2005	Acknowledgements – latest information on members Table of Contents – page number corrections (1.1.1) Temperature Grades – definition of AEC qualified (1.2.1) MIL-PRF-27 reference correction (1.2.3) Addition of AEC subspec test method references (2.3) editorial (2.4.3) editorial (3.2) Added section: Qualification of a Lead (Pb) – Free Device (3.3.2) comparative testing of parts (4.3) Added section: Lead (Pb) – Free Specific Tests (4.4) Data maintenance per TS-16949 Table 1: Solderability note C and legend description Test 21: AEC-Q200-005 reference in Table of Tests Test 22: AEC-Q200-006 reference in Table of Tests Test 19: B reference in Change tables and legend description Test 27: AEC-Q200-007 reference in Table of Tests Test 8: MIL-PRF-27 reference in Table of Tests #5 Appendix 1, family 7 & 8
D	June 1, 2010	Acknowledgements – latest information on members Notice Statement (Page 3) Added Table of Contents – page number corrections (1.1.1): Temperature Grades – definition of AEC qualified (1.1.2): Approval for Use in an Application – editorial (1.2.1): JESD201 and JESD22-A121 addition. (1.2.2): IEC ISO/DIS10605 and iNEMI addition. (1.2.3): AEC-Q200-005, -006, -007, Q005 clarification/addition. (2.3): editorial (2.4.4): Prohibit – Dip-Fixturing (2.4.5): Pre- and post-stress electrical tests at room temperature. (3.2): Describe new Qualification of Pb–Free Device requirement. (3.3.1): adverse impact on specific end customer applications. Items 1 through 5 are background information. (3.3.2): baseline for comparative data analysis. Table 1: Lot Size – Test Item 5. Added Items 31 - 36 Table 2: Test Items 3,4,7,8,12,15,17,19,21,&22 updated. Table 2A: Collaboration statement added. D added for Tantalums Table 2B: Acceptable Criteria table added. Table 2C: Acceptable Criteria table added. Table 2D: Acceptable Criteria table added. Table 3: Test Items 3,4,7,8,17,20,21,22,&27 updated. Criteria reg Table 3A: Collaboration statement added.

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Revision History - Continued

Rev #	Date of change	Brief summary listing affected paragraphs
D – Cont.	June 1, 2010	Table 3: Test Items 3,4,6,7,8,17,21,&22 updated. Criteria reg Table 3A: Collaboration statement added. Table 4: Test Items 3,4,6,7,8,17,21,&22 updated. Criteria reg Table 4A: Collaboration statement added. Table 5: Test Items 3,4,7,8,17,21,&22 updated. Criteria reg Table 5A: Collaboration statement added. Table 6: Test Items 3,4,7,8,17,21,&22 updated. Criteria reg Table 6A/7A: Collaboration statement added. Table 7: Test Items 3,4,7,8,17,21,&22 updated. Table 7B: Acceptable Criteria table added. Table 7C: Acceptable Criteria table added. Table 7D: Acceptable Criteria table added. Table 7E: Acceptable Criteria table added. Table 7F: Acceptable Criteria table added. Table 8: Test Items 4,17,21,&22 updated. Criteria reg Table 8A: Collaboration statement added. Table 9: Test Items 3,4,7,8,17,21,&22 updated. Criteria reg Table 9A: Collaboration statement added. Table 10: Test Items 4,7,8,17,21,&22 updated. Criteria reg Table 10A: Collaboration statement added. Table 11: Test Items 3,4,7,8,21,&22 updated. Table 11A: Collaboration statement added. Table 11B: Acceptable Criteria table added. Table 12: Test Items 4,17,21,&22 updated. Table 12A: Collaboration statement added. Table 12B: Acceptable Criteria table added. Table 13: Test Items 4,17,21,&22 updated. Criteria reg Table 13A: Collaboration statement added. Table 14: Test Items 4,17,21,&22 updated. Criteria reg Table 14A: Collaboration statement added.

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