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Automotive Electronics Council-Q200 Stress Test Qualification for Passive Components

Syfer AEC-Q200-Rev C Qualification

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1. Introduction

The Automotive Electronics Council (AEC) Component Technical Committee is the standardization body for establishing standards for reliable, high quality electronic components. Components meeting these specifications are suitable for use in the harsh automotive environment without additional component-level qualification testing.

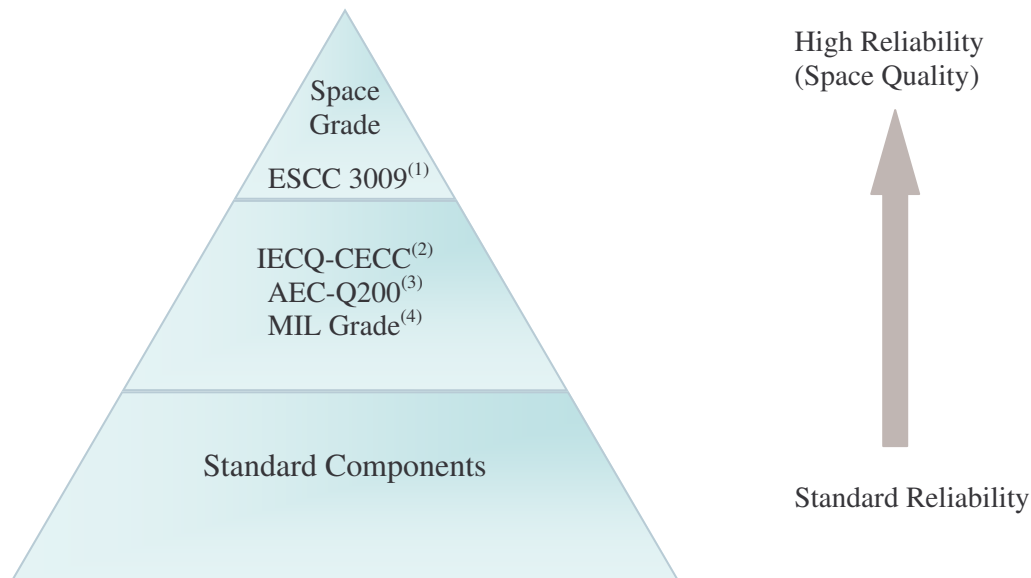
The Component Technical Committee established AEC-Q200 “Stress Test Qualification for Passive Components” to define the minimum stress test driven qualification requirements for passive electrical devices including ceramic capacitors.

This application note provides information on tests performed by Syfer in accordance with the AEC-Q200 specification.

For further information regarding the Automotive Electronics Council and AEC-Q200, refer to website www.aecouncil.com.

Note: Supply of AEC-Q200 qualified components is not limited to the automotive industry. Other industries are also recognising the benefits of AEC-Q200 qualified components.

2. Syfer Product Reliability Guide



Notes:

- (1) Space Grade tested in accordance with ESCC 3009. Refer to Syfer specification S02A 0100.
- (2) IECQ-CECC. The International Electrotechnical Commission (IEC) Quality Assessment System for Electronic Components. This is an internationally recognised product quality certification. View Syfer’s IECQ-CECC approvals at <http://www.iecq.org/certificates> or at www.syfer.com
- (3) AEC-Q200. Automotive Electronics Council Stress Test Qualification For Passive Components.
- (4) MIL Grade. Released in accordance with US MIL standards available on request.



3. AEC-Q200 Stress-Test Qualification

Qualification is defined as successful completion of the test requirements defined in AEC-Q200. Approval is defined as user approval for use of the component within the customer’s application and, as such, is beyond the scope of AEC-Q200.

3.1 AEC-Q200 Temperature Range Grades

Temperature range grades defined in AEC-Q200:

Grade	Temperature Range		PASSIVE COMPONENT TYPE Maximum capability	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	Aluminium 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

Syfer AEC-Q200 qualified components are rated from -55 °C to +125 °C. Corresponding AEC-Q200 qualified grades are 1, 2, 3 and 4.

3.2 Qualification Families

Syfer AEC-Q200 qualification has been conducted in accordance with AEC-Q200 qualification family guidelines. AEC-Q200 defines a qualification family as a group of components that share the same major process and material elements. All components categorized in the same family are qualified by association when one family member successfully completes qualification.

Qualification test summary is available on request.



4. AEC-Q200 Stress Test Qualification Requirements

Stress	Test #	Test Method	Sample size per lot	Accept on number failed	Additional Requirements
Pre- and Post Stress Electrical Test	1	User Spec.	All qualification parts submitted for testing	0	
Test Not Used	2	-	-	-	-
High Temperature Exposure (Storage)	3	MIL-STD-202 Method 108	77	0	Unpowered 1000 hours @ 150°C
Temperature Cycling	4	JESD22 Method JA-104	77	0	1000 cycles (-55°C to 125°C)
Destructive Physical Analysis	5	EIA-469	10	0	10ea x 3 lots
Moisture Resistance	6	MIL-STD-202 Method 106	77	0	t = 24 hours/cycle. Unpowered.
Biased Humidity	7	MIL-STD-202 Method 103	77	0	1000 hrs 85°C/ 85%RH. 1.5Vdc and Rated Voltage
Operational Life	8	MIL-STD-202 Method 108	77	0	Rated Voltage @ 125°C
External Visual	9	MIL-STD-883 Method 2009	All qualification parts submitted for testing	0	Inspect device construction and workmanship. Electrical test not required.
Physical Dimension	10	JESD22 Method JB-100	30	0	Verify physical dimensions to the device specification
Terminal Strength (Leaded)	11	Not applicable for surface mount capacitors	-	-	-
Resistance to Solvents	12	MIL-STD-202 Method 215	5	0	Note: Add Aqueous wash chemical – OKEM or equivalent. No banned substances.
Mechanical Shock	13	MIL-STD-202 Method 213	30	0	Figure 1 of Method 213 SMD: Condition F.
Vibration	14	MIL-STD-202 Method 204			5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000Hz.
Resistance to Soldering Heat	15	MIL-STD-202 Method 210	30	0	Condition B No pre-heat of samples.
Thermal Shock	16	MIL-STD-202 Method 107	30	0	-55°C/+125°C. 300 cycles. Max transfer time: 20s. Dwell time: 15minutes. Air-Air.
ESD	17	AEC-Q200-002	15	0	
Solderability	18	J-STD-002 JESD22-B102 ⁽²⁾	15 each condition	0	a) Method B, 4hrs @155°C dry heat @ 235°C b) Method B @ 215°C cat 3 c) Method D cat 3 @ 260°C



Stress	Test #	Test Method	Sample size per lot	Accept on Number failed	Additional Requirements
Electrical Characterization	19	User specification	30	0	Parametrically test per lot at room temp & min, max temps
Test not used	20	-	-	-	-
Board flex	21	AEC-Q200-005	30	0	2mm (min) for all except 3mm for Class 1.
Terminal strength	22	AEC-Q200-006	30	0	Force of 1.8kg for 60s.
Beam Load Test	23	AEC-Q200-003	30	0	

Table 1 – Stress Test Qualification Requirements

5. Batch Tests (Standard & Optional Tests Available)

Test	Standard tests	Test	Optional tests
Solderability	●	100% Burn-In. (2xRV @ 125° for 168hours).	○
Resistance to soldering heat	●	Load sample test @ 125°C	○
Plating thickness verification (if plated)	●	Humidity sample test. 85 °C/85%RH	○
DPA (Destructive Physical Analysis)	●	Hot IR sample test	○
Voltage Proof Test (DWV & Flash)	●	Axial Pull sample test (MIL-STD-123)	○
Insulation Resistance	●	Breakdown Voltage sample test	○
Capacitance Test	●	Deflection (Bend) sample test	○
Dissipation Factor Test	●	SAM (Scanning Acoustic Microscopy)	○
100% Visual Inspection	●		

For further details, optional test quotations please contact Syfer Sales department.



6. AEC-Q200 Qualified Component Ranges

Surface Mount Capacitors

	<i>Max Cap</i>	50V	63V	100V	200V	500V	1.0KV
0603	COG/NPO	470pF	470pF	330pF	100pF	n/a	n/a
	X7R	33nF	33nF	10nF	5.6nF	n/a	n/a
0805	COG/NPO	2.7nF	2.7nF	1.8nF	680pF	330pF	n/a
	X7R	150nF	150nF	47nF	27nF	8.2nF	n/a
1206	COG/NPO	10nF	10nF	6.8nF	2.2nF	1.5nF	470pF
	X7R	330nF	330nF	150nF	100nF	33nF	4.7nF
1210	COG/NPO	18nF	18nF	12nF	4.7nF	3.9nF	1nF
	X7R	680nF	680nF	470nF	220nF	100nF	15nF
1812	COG/NPO	39nF	39nF	27nF	12nF	10nF	3.3nF
	X7R	1.5μF	1.5μF	1μF	470nF	270nF	56nF

Balanced Line EMI Chip Ranges (E03)

	<i>Max Cap</i>	50V	100V
0805	COG/NPO	470pF	330pF
	X7R	33nF	15nF
1206	COG/NPO	1.5nF	1nF
	X7R	150nF	47nF
1410	COG/NPO	5.6nF	3.9nF
	X7R	330nF	150nF
1812	COG/NPO	10nF	6.8nF
	X7R	560nF	330nF

3 Terminal EMI Chips (E01)

	<i>Max Cap</i>	50V	100V
0805	COG/NPO	820pF	560pF
	X7R	47nF	15nF
1206	COG/NPO	1.0nF	1.0nF
	X7R	100nF	15nF
1806	COG/NPO	2.2nF	2.2nF
	X7R	200nF	68nF

