

INCH-POUND

MIL-C-55365C
AMENDMENT 5
21 April 1994
SUPERSEDING
AMENDMENT 4
2 August 1993

MILITARY SPECIFICATION

CAPACITOR, FIXED, ELECTROLYTIC (TANTALUM), CHIP,
ESTABLISHED RELIABILITY,

GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-C-55365C, dated
23 August 1990, and is approved for use by all
Departments and Agencies of the Department of Defense.

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* 1.2.1.3, delete: "E - Tin plated (100 microinch minimum)." and "J - Tin fused (60 microinch minimum)."

1.2.1.3, add the following: "All termination finishes except B shall have a barrier metal. The barrier metal for termination finish B shall be at the option of the manufacturer."

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Following 3.5.2.1.1, add:

"3.5.2.2 Tin plated finishes. Tin plating is prohibited as a final finish or as an undercoat, effective 6 months from the date of Amendment 4. Tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is three percent (see 6.11)."

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TABLE VII, Subgroup 2, under Mechanical examination (PPM-3), add: "(physical dimensions only)".

TABLE VII, Subgroup 3, delete: "Physical dimensions - - - 3.1".

TABLE VII: Delete footnote 1/ and the reference thereto in its entirety.

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TABLE VIII, Subgroup 2, under Mechanical examination (PPM-3), add: "(Physical dimensions only)".

TABLE VIII, Subgroup 3, delete: "Physical dimensions - - - 3.1".

TABLE VIII, Inspection column, Subgroup 4, Stability at low and high temperatures, add: "3/".

TABLE VIII, bottom of table, add the following footnote: "3/ Sampling need only conform to the requirements of 4.6.1.1.1 (exponential distribution) inspection lot."

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TABLE IX, delete in its entirety and substitute:

"TABLE IX. Sampling plans for PPM categories."

Lot size	Sample Size	
	PPM-2	PPM-3
1 - 13	100%	100%
14 - 125	100%	13
126 - 150	125	13
151 - 280	125	20
281 - 500	125	29
501 - 1,200	125	34
1,201 - 3,200	125	42
3,201 - 10,000	192	50
10,001 - 35,000	294	60
35,001 - 150,000	294	74
150,001 - 500,000	345	90
500,001 - UP	435	102

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4.6.1.2.5.1, line 2, delete: "4.6.1.1" and substitute "4.6.1.1.1".

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4.6.1.3.1, line 2, delete "2" and substitute "3".

4.6.1.3.1, line 5, delete "month" and substitute "3-month period".

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TABLE X, delete in its entirety and substitute:

"TABLE X. Group C inspection.

Inspection	Requirement paragraph	Method paragraph	Number of sample units to be inspected	Number of failures allowed
<u>Subgroup I</u> Thermal shock 1/	3.11	4.7.8	12	1
<u>Subgroup II</u> Resistance to soldering heat Moisture resistance	3.12 3.14	4.7.9 4.7.11	18	
<u>Subgroup III</u> Life (2,000 hrs at +125°C) 1/	3.17	4.7.14	24	
<u>Subgroup IV</u> Life (10,000 hrs at +85°C) FR (exponential only)	3.17	4.7.14.1	25 minimum per style	See 4.4.4.1
<u>Subgroup V</u> Resistance to solvents 2/	3.19	4.7.16	8	0

1/ If the manufacturer can demonstrate that this test has been performed five consecutive times with zero failures, the frequency of this test, with the approval of the qualifying activity can be performed on an annual basis. If the design, material, construction or processing of the part is changed or, if there are any quality problems or failures, the qualifying activity may require resumption of the original test frequency.

2/ If the manufacturer can demonstrate that this test has been performed five consecutive times with zero failures, this test, with the approval of the qualifying activity, can be deleted. The manufacturer, however, shall perform this test every 3 years after the deletion as part of long term design verification. If the design, material, construction or processing of the part is changed or, if there are any quality problems, the qualifying activity may require resumption of the specified testing. Deletion of testing does not relieve the manufacturer from meeting the test requirement in case of dispute."

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4.7.9d, delete in its entirety.

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4.7.12, line 5, after "are not required.", add the following: "After the measurements of capacitance and dissipation factor have been made at the -55°C temperature (step 2), rated voltage shall be applied through a 33-ohm resistor for the minimum of 5 minutes."

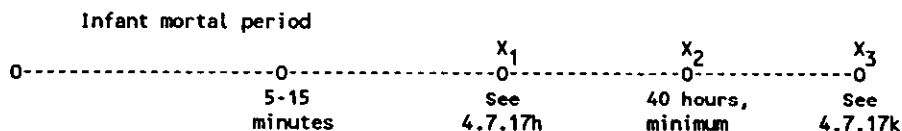
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* 4.7.17, delete in its entirety and substitute:

" 4.7.17 Weibull FR level grading (see 3.20). Capacitors shall be tested in accordance with method 108 of MIL-STD-202. The following details and exceptions shall apply:

- a. Distance of the heating source from specimens, in inches: Not applicable.
- b. Method of mounting: Capacitors shall be mounted by their terminations.
- c. Test temperature and tolerance: +85°C +4°C, -0°C.
- d. Operating conditions: Accelerated dc voltage, +4, -0 percent, as applicable (see table XII), shall be applied gradually (not to exceed 5 minutes by a slow build-up of the voltage). Maximum nominal acceleration factor (see table XII), 20,000:1. Only the capacitors used in 4.7.17e must be fused. Voltage shall be applied continuously, except for failure count periods. The impedance of the voltage source, as seen from the terminals of each capacitor, shall not exceed 1 ohm. An electronic power supply capable of supplying at least 5 amperes when a capacitor is shorted shall be used. A 1- to 2- ampere fuse shall be connected in series with each capacitor. Slow-blow fuses shall not be used. If separate equipment is used for testing the sample and the rest of the lot, the equipment shall be cross calibrated for temperature, voltage, and time to ensure equivalent test conditions.
- e. Minimum sample size for monitoring at beginning of test prior to infant mortal period: 300 pieces, or 100 percent, whichever is less. If the sample size is less than 100 percent, the remainder shall be subjected to the same accelerated dc voltage for the same amount of time.
- f. Duration of test: 40 hours minimum. The manufacturer shall record the test start and stop times for each lot tested.

Timing:



- g. Failure definition: A failure is defined as a blown fuse or equivalent.
- h. Failure count during test: The lot size (see 4.6.1.1.2) to be graded is established after removal of gross defectives (infant mortality) (5-15 minutes). The first failure count shall be performed at 2 hours ± 0.3 hour after the test was started. If there are no failures at time X₁, the manufacturer may use one of the following options:
 - (1) Complete a minimum of 40 hours and compute the failure rate from MIL-STD-690, table II FRSP-90, based on the number of failures at time X₂, or;
 - (2) Extend time X₁ from 2 hours to a maximum of 10 hours. A failure cannot be assumed. If there are still no failures, option (1) shall be used, or;

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- (3) Make one restart at a higher voltage (if applicable) to induce a failure at time X_1 . The manufacturer shall assume no previous hours. The restart voltage and time shall be recorded. If there are still no failures, option (1) shall be used. If the sample size is less than 100 percent, the remainder of the lot must be subjected to the final determined restart time and voltage.

The number of blown fuses and the time under test shall be recorded to within ± 0.1 hour. Calculate the fraction failed, p_1 , at time x_1 , see equation 4 (6.7.2).

- i. Failure count after test: A failure count shall be performed after 40 hours minimum after the test was started. The number of blown fuses and the time under test shall be recorded to within ± 0.1 hour. Calculate the cumulative fraction failed, p_2 , at time, x_2 (see equation 4 (6.7.2)). If there are no failures at time X_2 , the manufacturer may use one of the following options:
 - (1) Assume one failure and calculate the cumulative fraction failed, p_2 , at time X_2 (see equation 4 (6.7.2)), or;
 - (2) Compute the failure rate from MIL-STD-690, table II FRSP-90, based on the accelerated part hours generated (see 6.7.2, example C), or;
 - (3) Continue testing. The start and stop times shall be recorded. If there are still no failures, option (2) may be used.
- j. Lot failure rate: Determine $2(t)$ from equation 3 (6.7.1). If the desired failure rate has been achieved, the lot may be removed from test.
- k. Continuation grading: If the desired failure rate has not been reached, the lot may be continued on test. The time to reach the failure rate goal may be estimated from equation 5 (6.7.2). If the time calculated to reach the goal failure rate is excessive, the lot may be discarded in favor of a new lot. If the lot is continued on test, a new failure rate shall be performed after the extended test. Calculate the cumulative fraction failed, p_3 , at time X_3 (see equation 4 (6.7.2)). Determine if the failure rate has been achieved from 4.7.17).
- l. Measurements after exposure: Capacitors shall be removed from the test, stabilized at room ambient conditions (see 4.3.1) and the dc leakage, capacitance, dissipation factor, and ESR (when specified, see 3.1) shall be measured as specified in 4.7.4, 4.7.5, 4.7.6, and 4.7.10, respectively. "

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Following 6.10, add:

"6.11 Tin plated finishes. Tin plating is prohibited (see 3.5.2.2) because it may result in tin whisker growth. Tin whisker growth could adversely affect the operation of electronic equipment systems. For additional information, see ASTM B545, "Standard Specification for Electrodeposited Coating of Tin."

The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

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CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities:

Army - AR, MI
Navy - AS, CG, MC, OS, SH
Air Force - 17, 19, 99
NASA - NA
DLA - ES

Preparing activity:

Army - ER

Agent:

DLA - ES

(Project 5910-1890)