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IN REPLY
REFER TO DSCC-VAT (M Radecki/DSN 850-0561/(614) 692-0561) March 20, 2002

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Initial Draft of MIL-PRF-49464B (Capacitors, Chip, Single Layer, Fixed, Parallel Plate, Ceramic Dielectric, Established Reliability, General Specification for), and MIL-PRF-49464/1B (Capacitors, Chip, Single Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability, Style CPCR01 (High Frequency)); Project Numbers 5910-2177 and 5910-2177-01

The initial drafts of the above subject document is now available for viewing and downloading from the DSCC-VA web site:

http://www.dscc.dla.mil/Programs/MilSpec/DocSearch.asp

If you use wish to review this document, you may download it by using the link above. Once on that page, enter MIL-PRF-49464 in the blank box to the left of the GO box and select GO. Select the appropriate links to download the initial drafts. Initial drafts are identified with "(Initial Draft)" after the document number.

A manufacturer asked to have these previously cancelled specifications reinstated and revised. They have interest in qualifying and there appears to be a need for these types of capacitors. The documents were rewritten in the latest military specification format. Groups A and B were combined into group A and periodic group C was renamed to group B.

Concurrence or comments are required at this Center no later than May 4, 2002 (45 days). Comments from military departments must be identified as either “Essential” or “Suggested”. Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians or this office, as applicable, in sufficient time to allow for considering the department reply.

Please forward your comments or concurrence electronically to the project engineer listed below. This can be done in the form of a return email, with or without an attached text file. If an electronic response is not possible, we will accept comments via letter, facsimile, or phone call but only after you have contacted the project officer. Any further coordination concerning these documents will be circulated only to firms and organizations that furnish comments or reply that they have an interest.

The point of contact for these documents is Mr. Michael Radecki, DSCC-VAT. The preferred method of contact is via email: michael.radecki@dscc.dla.mil. Mr. Radecki can also be reached by phone at 614-692-0561/DSN 850-0561, or by facsimile 614-693-1644.

KENDALL A. COTTONGIM
Chief
Electronic Components Team

NOTE: This draft, dated 19 March 2002 prepared by DLA-CC has not been approved and is subject to modification.
DO NOT USE FOR ACQUISITION PURPOSES. (Project 5910-2177)

INCH-POUND
MIL-PRF-49464B

SUPERSEDING
MIL-C-49464A
25 June 1992

PERFORMANCE SPECIFICATION

CAPACITORS, CHIP, SINGLE LAYER, FIXED, PARALLEL PLATE,
CERAMIC DIELECTRIC, ESTABLISHED RELIABILITY,
GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for ceramic plate, single layer capacitors. These capacitors are intended for stripline or microstrip applications, usually at frequencies of 1 GHz and higher. Capacitors covered by this specification have failure rate levels (FRL) ranging from 1.0 to 0.001 percent per 1,000 hours. These failure rate levels are established at a 90-percent confidence level and maintained at a 10-percent producer's risk. They are based on life tests performed at a maximum rated voltage at maximum rated temperature. An acceleration factor of 8:1 has been used to relate life test data obtained at 200 percent of rated voltage at maximum rated temperature, to rated voltage at rated temperature. A parts per million (PPM) quality system is used for documenting and reporting the outgoing quality of capacitors supplied to this specification. Statistical Process Control (SPC) techniques are required in the manufacturing process to minimize variation in production of capacitors supplied to the requirements of this specification.

1.2 Classification. Capacitors covered by this specification should be classified by the style, as specified (see 3.1).

1.2.1 Part or Identifying Number (PIN). Capacitors specified herein (see 3.1) are identified by a PIN which consists of the basic number of the performance specification and a series of coded characters. The coded characters provides information concerning the capacitors temperature coefficient, specification sheet number, case code, dash number, capacitance tolerance, and termination finish. The PIN should be in the following form:

M49464	E	01	A	001	P	N
Performance specification MIL-PRF-49464	Temperature coefficient (1.2.1.1)	Specification sheet number MIL-PRF-49464/1	Case code (1.2.1.2)	Dash number (1.2.1.3)	Capacitance tolerance (1.2.1.4)	Termination finish (1.2.1.5)

1.2.1.1 Temperature coefficient limits. The rated temperature and temperature coefficient limits are identified by a single letter. The rated temperature of these parts is -55°C to +125°C. The letter indicates the temperature coefficient limits as shown in table I.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC/VAT, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

TABLE I. Temperature coefficient limits.

Symbol	PPM/°C	Class	Symbol	PPM/°C	Class
E	+90 ±30	1A	T	-3300 ±1000	1C
F	0 ±15	1A	U	-3900 ±1000	1C
G	0 ±30	1A	V	-4700 ±1000	1C
N	-750 ±250	1B	X	±15%	2
P	-1500 ±500	1B	Y	±25%	2
R	-2200 ±600	1B	Z	+22% - 82%	3 1/
S	-2400 ±1000	1B			

1/ Temperature coefficient for symbol Z measured between +10°C and +85°C.

1.2.1.2 Case code. The case code is identified by a single letter (see 3.1).

1.2.1.3 Dash number. The dash number represents a specific capacitance value, voltage and FRL (see table II and 3.1).

TABLE II. FRL (established at a 90 percent confidence level).

Symbol	FRL (percent per 1,000 hours)
M	1.0
P	0.1
R	0.01
S	0.001

1.2.1.4 Capacitance tolerance. The capacitance tolerance is identified by a single letter in accordance with table III.

TABLE III. Capacitance tolerance.

Symbol	Capacitance tolerance
P	± .01 pF
A	± .05 pF
B	± .10 pF
C	± .25 pF
D	± .50 pF
F	±1 percent
G	±2 percent
J	±5 percent
K	±10 percent
M	±20 percent
V	-0 +100 percent
Z	-20 +80 percent

1.2.1.5 Termination finish. The termination finish is identified by either the letter “N” or “P”. The letter “N” identifies a termination suitable for solder attachment (see 3.5.2). The letter “P” identifies a termination suitable for attachment by conductive epoxy or eutectic methods (see 3.5.2).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-PRF-49464/1	-	Capacitors, Chip, Single Layer, Fixed Unencapsulated, Ceramic Dielectric, Established Reliability, Style CPCR01 (High Frequency).

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-202	-	Electronic and Electrical Component Parts, Test Methods for.
MIL-STD-690	-	Failure Rate Sampling Plans and Procedures.
MIL-STD-790	-	Standard Practice for Established Reliability and High Reliability Qualified Products List (QPL) Systems for Electrical, Electronic, and Fiber Optic Parts Specifications.
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines.
MIL-STD-883	-	Test Methods and Procedures for Microelectronics.

(Unless otherwise indicated, copies of the above specifications, standard, and handbooks are available from the Defense Printing Service Detachment Office, Building 4D, Customer Service, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

EIA-554-1	-	Assessment of Average Outgoing Quality Levels in Parts Per Million (PPM). (DoD Adopted).
EIA-557	-	Statistical Process Control Systems. (DoD Adopted).

(Application for copies should be addressed to the Electronic Industries Association, 2500 Wilson Boulevard, Arlington, VA 22201-3834.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. Capacitors furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award. In addition, the manufacturer shall obtain certification from the qualifying activity that the QPL system requirements of 3.3 and 4.2 have been met and are being maintained. Authorized distributors who are approved to MIL-STD-790 distributor requirements by the QPL manufacturer are listed in the QPL.

3.3 QPL system. The manufacturer shall establish and maintain a QPL system for parts covered by this specification. Requirements for this system are specified in MIL-STD-690 and MIL-STD-790. In addition, the manufacturer shall establish a Statistical Process Control (SPC) system and Part Per Million (PPM) system which meets the requirements of 3.3.1 and 3.3.2.

3.3.1 SPC system. As part of the overall MIL-STD-790 QPL system, the manufacturer shall establish an SPC system which meets the requirements of EIA-557. Typical manufacturing processes for application of SPC include raw material mixing and blending, dielectric sheet manufacturing, firing, metallization, dicing, and packaging.

3.3.2 PPM system. As part of the overall MIL-STD-790 QPL system, the manufacturer shall establish a ppm system for assessing the average outgoing quality of lots in accordance with EIA-554-1. Data exclusion, in accordance with EIA-554-1 may be used with approval of the qualifying activity. The ppm system shall identify the ppm rate at the end of each month and shall be based on a six month moving average.

3.4 Materials. Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the capacitors to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

3.5 Interface and physical dimension requirements. Capacitors shall meet the interface and physical dimensions specified (see 3.1).

3.5.1 Body structure. The body shall be a single ceramic plate that meets the requirements specified herein (see 3.1).

3.5.2 Terminations. The terminations shall be a minimum of 50 microinches of gold over a suitable barrier base metal “N” or a termination suitable for attachment by conductive epoxy or eutectic methods “P”. Tin plating is prohibited as a final finish or as an undercoat. Tin-lead (Sn-Pb) finishes are acceptable provided that the minimum lead content is 3 percent.

3.6 Voltage conditioning. When tested as specified in 4.8.3, capacitors shall withstand voltage conditioning without visible damage and meet the following requirements:

a. Capacitance (at +25°C): Shall be within the tolerance as specified in 3.7.

b. Dissipation factor (at +25°C): Shall not exceed the value as specified in 3.8.

c. Insulation resistance (at +25°C): Shall not be less than the value specified in 3.9.

d. Dielectric withstanding voltage (at +25°C): Shall be as specified in 3.10. Not applicable if optional voltage conditioning was performed at or above 250 percent of rated voltage.

3.7 Capacitance. When measured as specified in 4.8.4, the capacitance shall be within the specified tolerance (see 3.1).

3.8 Dissipation factor. When determined as specified in 4.8.5, the dissipation factor for capacitors of 4.7 pF or greater shall not exceed:

class 1A characteristics:	.15 percent
class 1B characteristics:	.25 percent
symbol S, class 1B characteristics:	.5 percent
class 1C characteristics:	1.5 percent
class 2 characteristics:	2.5 percent
class 3 characteristics:	4.0 percent

3.9 Insulation resistance. When measured as specified in 4.8.6, the insulation resistance at +25°C shall be not less than:

classes 1A, 1B, and 1C:	10^6 megohms
classes 2 and 3:	10^5 megohms

At +125°C it should not be less than:

classes 1A, 1B, and 1C:	10^5 megohms
classes 2 and 3:	10^4 megohms

3.10 Dielectric withstanding voltage. When capacitors are tested as specified in 4.8.7, there shall be no evidence of breakdown or visible evidence of arcing or damage.

3.11 Solderability. When capacitors are tested as specified in 4.8.8, the dipped surface of the leads shall be at least 95 percent covered with a new, smooth, solder coating. The remaining 5 percent may contain only small pinholes or rough spots; these shall not be concentrated in one area. Bare base metal where the solder dip failed to cover the original coating is an indication of poor solderability, and pinholes or rough spots shall be determined by actual measurement of these areas, as compared to the total area.

3.12 Bond strength. When tested as specified in 4.8.9, bond strength shall be at least 3.0 grams force, and there shall be no fracturing of the bond at the wire to electrode interface or separation of the electrode from the dielectric.

3.13 Die shear strength. When tested as specified in 4.8.10, parts shall not shear from their mountings within the gram force limits specified.

3.14 Temperature coefficient limits. When capacitors are tested as specified in 4.8.11, the capacitance change shall not exceed the limits specified in table I. For negative temperature characteristics in classes 1A, 1B, and 1C, the negative tolerance from +25°C to -55°C shall be calculated according to the formula: Negative tolerance (PPM/°C) = -36 - (1.22 X specified positive tolerance) + (0.20 X nominal temperature coefficient).

3.15 Thermal shock and immersion. When tested as specified in 4.8.12, capacitors shall meet the following requirements:

a. Visual examination: No mechanical damage.

b. Dielectric withstanding voltage: As specified in 3.10.

c. Insulation resistance (+25°C): Not less than 30 percent of the initial requirement (see 3.9).

d. Capacitance change:

(1) Classes 1A and 1B characteristics shall change not more than 0.5 percent of the nominal value or 0.5 pF, whichever is greater, from the initial value.

(2) Classes 1C, 2, and 3 characteristics shall change not more than ±10 percent from the initial measured value.

e. Dissipation factor: Shall be as specified in 3.8.

3.16 Resistance to soldering heat. When tested as specified in 4.8.13, capacitors shall meet the following requirements:

a. Visual inspection: There shall be no evidence of mechanical damage.

b. Capacitance change:

(1) Classes 1A and 1B characteristics shall change not more than 0.5 percent of the nominal value or 0.5 pF from the initial value, whichever is greater,.

(2) Classes 1C, 2, and 3 characteristics shall change not more than ±10 percent from the initial measured value.

3.17 Moisture resistance. When tested as specified in 4.8.14, capacitors shall meet the following requirements:

a. Visual examination: No mechanical damage.

b. Dielectric withstanding voltage: As specified in 3.10.

c. Insulation resistance (+25°C): Not less than 30 percent of the initial +25°C requirement (see 3.9).

d. Capacitance change:

(1) Classes 1A and 1B characteristics shall change not more than 0.5 percent of the nominal value or 0.5 pF from the initial value, whichever is greater,.

(2) Classes 1C, 2, and 3 characteristics shall change not more than ±10 percent from the initial measured value.

3.18 Low voltage humidity. When tested as specified in 4.8.15, capacitors shall meet the following requirements:

a. Visual examination: No mechanical damage.

b. Dielectric withstanding voltage: As specified in 3.10.

c. Insulation resistance (+25°C): Not less than 30 percent of the initial +25°C requirement (see 3.9).

d. Capacitance change:

(1) Classes 1A and 1B characteristics shall change not more than 0.5 percent of the nominal value or 0.5 pF from the initial value, whichever is greater,.

(2) Classes 1C, 2, and 3 characteristics shall change not more than ±10 percent from the initial measured value.

3.19 Life (at +125°C). When tested as specified in 4.8.16, capacitors shall meet the following requirements:

a. Visual examination: No mechanical damage.

b. Insulation resistance (at +125°C): Shall not be less than 30 percent of initial requirement.

c. Insulation resistance (at +25°C): Shall not be less than 30 percent of initial requirement.

d. Capacitance change:

(1) Classes 1A and 1B characteristics shall change not more than 2.0 percent of the nominal value or 0.5 pF from the initial value, whichever is greater,.

(2) Classes 1C, 2, and 3 characteristics shall change not more than ±10 percent from the initial measured value.

e. Dissipation factor: Shall be as specified in 3.8.

3.20 Fungus. The manufacturer shall certify that all materials are fungus resistant or shall perform the test as specified in 4.8.17. When capacitors are tested as specified in 4.8.17, there shall be no evidence of fungus growth on the external surface.

3.21 Marking. There shall be no marking on the capacitors. Capacitor packaging containers shall be marked with the PIN, capacitance, capacitance tolerance, voltage, date code and lot symbol, “JAN” brand, and the Commercial and Government Entity (CAGE) code.

3.21.1 JAN and J marking. The United States Government has adopted, and is exercising legitimate control over the certification marks "JAN" and "J", respectively, to indicate that items so marked or identified are manufactured to, and meet all the requirements of specifications. Accordingly, items acquired to and meeting all of the criteria specified herein and in applicable specification, shall bear the certification mark "JAN" except that items too small to bear the certification mark "JAN" shall bear the letter "J". The "JAN" or "J" shall be placed immediately before the part number except that if such location would place a hardship on the manufacturer in connection with such marking, the "JAN" or "J" may be located on the first line above or below the part number. Items furnished under contracts or orders which either permit or require deviation from the conditions or requirements specified herein and in applicable specifications shall not bear "JAN" or "J". In the event an item fails to meet the requirements of this specification and the applicable specification sheets or associated specifications, the manufacturer shall remove completely the military part number and the "JAN" or the "J" from the sample tested and also from all items represented by the sample. The "JAN" or "J" certification mark shall not be used on products acquired to contractor drawings or specifications. The United States Government has obtained Certificate of Registration Number 504,860 for the certification mark "JAN" and Registration Number 1,586,261 for the certification mark "J".

3.21.2 Substitutability of FRL. A manufacturer may supply to all higher FRLs than to which they are qualified. Items of an exponential FRL as shown below and marked to lower FRL's with procuring agency approval, are substitutable for higher FRL's, and shall not be remarked unless specified in the contract or order (see 6.2), the lot date codes on the parts are unchanged, and the workmanship criteria is met.

Parts qualified to product level	Are substitutable for product level
S	R, P, and M
R	P, and M
P	M
M	

3.21.3 Substitution of capacitance tolerance and rated voltage. Parts qualified and marked to tighter capacitance tolerance or higher rated voltage are, with procuring agency approval, substitutable for parts marked to looser capacitance tolerance or lower rated voltage, provided all other values, such as case size, characteristic, and leads are the same. The substitutable parts shall not be remarked unless specified in the contract or order (see 6.2).

3.22 Recycling and waste prevention. Recovered materials or environmentally preferable materials shall be used wherever possible without jeopardizing the intended use of this item.

3.23 Workmanship. Capacitors shall be processed in such a manner as to be uniform in quality when using 20x minimum to 40x maximum magnification. External leads shall not exhibit pits, cracks, rough edges, adhered foreign material and other defects that will affect life or serviceability. The capacitors shall exhibit no demetalization (lift-off, blisters, or roll back) or voids or scratches on the electrodes that expose the dielectric over more than 5 percent of the area.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.4).

b. Verification of qualification (see 4.5).

c. Conformance inspection (see 4.6).

d. Periodic group B inspection (see 4.7).

4.2 QPL system. The manufacturer shall establish and maintain a QPL system in accordance with 3.3. Evidence of such compliance is a prerequisite for qualification and retention of qualification.

4.3 Inspection conditions and methods.

4.3.1 Inspection conditions. Unless otherwise specified herein, all inspections shall be made in accordance with the "GENERAL REQUIREMENTS" of MIL-STD-202 except relative humidity shall not exceed 75 percent. Accuracy of all test voltage measurements shall be within ±2.0 percent of the specified voltage.

4.3.2 Reference measurements. When requirements are based on comparative measurements made before and after conditioning, the reference measurement shall be considered the last measurement made at +25°C ±3°C prior to conditioning. Unless reference measurements have been made within 30 days prior to the beginning of conditioning, they shall be repeated.

4.3.3 Power supply. The power supply used for life testing shall have a regulation of ±2 percent or less of the specified test voltage. The power supply used for insulation resistance measurements shall be stabilized to at least ±100 parts per million. Voltage fluctuations shall not occur during measurements that would produce a variation in the current measurement.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3), on sample units produced with equipment and procedures normally used in production. Samples shall be selected in accordance with 4.6.1.1.1 and shall be representative of the highest capacitance value.

4.4.1 Sample size. The number of capacitors to be submitted for qualification inspection shall be as specified in table IV and in the appendix to this specification. Each separate capacitor class shall be qualified separately.

4.4.2 Test routine. Sample units shall be subjected to the qualification inspection as specified in table IV, in the order shown. All sample units shall be subjected to the inspections of group I. The sample shall then be divided as specified in table IV for groups II through VII inclusive, and subjected to the tests for their particular group.

4.4.3 Failures. Failures in excess of those allowed in table IV shall be cause for refusal to grant qualification approval.

TABLE IV. Qualification inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of sample units to be inspected	Number of defectives permitted	
Group I					
Voltage conditioning	3.6	4.8.3			
Insulation resistance (+125°C) 1/	3.9	4.8.6	97		
Capacitance 1/	3.7	4.8.4		0	
Dissipation factor 1/	3.8	4.8.5	2/ 3/ 4/		
Insulation resistance 1/	3.9	4.8.6			
Dielectric withstanding voltage 1/	3.10	4.8.7			
Visual and mechanical inspection	3.1, 3.4, 3.5, 3.23	4.8.1			
Group II					
Solderability 5/	3.11	4.8.8	6	1	
Bond strength	3.12	4.8.9			
Die shear strength	3.13	4.8.10			
Group III					1
Temperature coefficient limits	3.14	4.8.11	18	1	
Thermal shock and immersion	3.15	4.8.12			
Group IV					
Resistance to soldering heat	3.16	4.8.13	18		
Moisture resistance	3.17	4.8.14		1	
Group V					
Life	3.19	4.8.16	25	1	
Group VI					
Fungus 2/	3.20	4.8.17	6	0	
Group VII					
Low voltage humidity	3.18	4.8.18	12	0	

1/ Performed as part of voltage conditioning.
2/ Only 91 samples are needed if certification is given for fungus (see 3.20).
3/ Only 91 samples are needed if solderability is not applicable.
4/ Only 85 samples are needed if solderability is not applicable and certification is given for fungus.
5/ Solderability test is only applicable to termination N capacitors.

4.4.4 FRL and quality level verification.

4.4.4.1 FR qualification and lot conformance FR inspection. FR qualification and lot conformance FR inspection shall be in accordance with the general and detailed requirements of MIL-STD-690 and the following details:

a. Procedure I: Qualification at the initial FR level. Level M (1.0 percent) of FRSP-90 shall apply. Sample units shall be subjected to the qualification inspection specified in group I, table IV prior to being tested as specified in group V, table IV (see 4.4.2).

b. Procedure II: Extension of qualification to lower FR levels. To extend qualification to the P (0.1 percent), R (0.01 percent), and S (0.001 percent) FR levels, two or more voltages within a temperature coefficient limit may be combined. For FR levels R and S, two or more voltage temperature characteristics may be combined.

c. Procedure III: Maintenance of FR level qualification. Maintenance period B of FRSP-10 shall apply. Regardless of the number of production lots produced during this period, the specified number of unit hours shall be accumulated to maintain qualification.

4.4.4.2 Quality level verification. The manufacturer is responsible for establishing a quality system to assess the ppm defect level of lots that are subjected to the group A inspections. The ppm defect level shall be maintained for each specification sheet. The ppm defect level shall be based on a 6-month moving average.

4.5 Verification of qualification. Every 6 months, the manufacturer shall provide verification of qualification to the qualifying activity. Continuation of qualification shall be based on meeting the following requirements:

a. MIL-STD-790 program.

b. The capacitor design has not been modified.

c. Lot rejection for group A inspection does not exceed 10 percent or one lot, whichever is greater.

d. Periodic group B inspection.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.6.1.1 Inspection and production lot.

4.6.1.1.1 Inspection lot. An inspection lot shall consist of all capacitors of the same voltage-temperature characteristics, produced under essentially the same conditions and offered for inspection during a single work month. Each inspection lot shall be kept separate from every other inspection lot. The capacitance values and voltages produced shall be represented in the lot in approximately the ratio of production.

4.6.1.1.2 Production lot. A production lot shall consist of all capacitors of the same voltage rating, nominal capacitance value, voltage-temperature characteristic, and termination finish. The manufacture of all parts in the production lot shall have been started, processed, assembled, and tested as a group. Lot identity shall be maintained throughout the manufacturing cycle.

4.6.2 Group A inspection. Group A inspection shall consist of the inspections specified in table V in the order shown.

4.6.2.1 Subgroup 1.

4.6.2.1.1 Sampling plan. Subgroup 1 shall be performed on a production lot basis on 100 percent of the product supplied under this specification. Capacitors failing the tests of this subgroup shall be removed from the lot. If, during the 100 percent inspection, screening requires that more than 8 percent of the capacitors be discarded (8 percent defective allowable (PDA)), the entire lot shall be rejected.

4.6.2.1.2 Manufacturer's production inspection. If the manufacturer performs tests similar to those specified in subgroup 1, table V as the final step of their production process, group A, subgroup 1 inspection may be waived and the data resulting from the manufacturer's production tests may be used instead. Authority to waive the subgroup 1 inspections shall be granted by the qualifying activity only. The following criteria must be complied with:

a. Tests conducted by the manufacturer during production shall be clearly identical to, or more stringent than, that specified for subgroup 1.

b. Manufacturer subjects 100 percent of the product supplied under this specification to their production tests.

c. The parameters measured and the failure criteria shall be the same as, or more stringent than, those specified herein.

d. The lot rejection criteria is the same as, or more stringent than, that specified herein.

e. The manufacturer shall make available all information concerning the test procedures and instrumentation used in their production tests.

f. Once approved, the manufacturer shall not change the test procedures or criteria without prior notification of, and concurrence by, the qualifying activity.

4.6.2.1.3 Rejected lots. Production lots exceeding the PDA of group A, subgroup 1 inspection shall be rejected and shall not be resubmitted.

TABLE V. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph	Sampling procedure
Subgroup 1			
Voltage conditioning	3.6	4.8.3	100% inspection
Capacitance 1/	3.7	4.8.4	
Dissipation factor 1/	3.8	4.8.5	
Insulation resistance 1/	3.9	4.8.6	
Dielectric withstanding voltage 1/	3.10	4.8.7	
Subgroup 2			
Visual and mechanical examination: 2/			
Material	3.4	4.8.1	13 samples 0 failures
Physical dimensions	3.1		
Interface requirements (other than physical dimensions) 2/	3.5		
Workmanship	3.23		
Subgroup 3			
Solderability (N termination capacitors only) 3/	3.11	4.8.8	5 samples 0 failures
Subgroup 4			
Bond strength	3.12	4.8.9	13 samples 0 failures
Die shear strength	3.13	4.8.10	
Subgroup 5			
Temperature coefficient limits	3.14	4.8.11	13 samples 0 failures

1/ Performed as part of voltage conditioning tests.

2/ The manufacturer may request the deletion of the visual and mechanical examination provided an in-line or process control system to assure the visual and mechanical requirements are met can be validated and approved by the qualifying activity. Deletion of these examinations does not relieve the manufacturer from meeting these requirements in case of dispute. 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 these examinations.

3/ Solderability test is only applicable to termination N capacitors. Defective units from subgroups 1 and 2 tests may be used. Parts subjected to this test shall not be delivered. The manufacturer may request the deletion of the subgroup 4 solderability test, provided an in-line or process control system for assessing and assuring the solderability of leads can be validated and approved by the qualifying activity. Deletion of the test does not relieve the manufacturer from meeting this test requirement in case of dispute. 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 test.

4.6.2.2 Subgroup 2.

4.6.2.2.1 Sampling plan. Subgroup 2 shall be performed on an inspection lot basis. In the event of one or more failures the lot shall be rejected.

4.6.2.2.2 Rejected lots. The rejected lots shall be segregated from new lots and those that have passed inspection. Rejected lots shall be 100 percent reworked or scrapped. The rejected lot may be rescreened and the defects removed. The lot may then be resubmitted to the sample plan. If one or more defects of the same type are found in this second sample, the lot is rejected and shall not be supplied to this specification. If another defect of a different type is found in the second sample, a rescreen for that defect is also permitted.

4.6.2.3 Subgroup 3.

4.6.2.3.1 Sampling plan. Subgroup 3 shall be performed on an inspection lot basis. The sampling procedure shall be as specified in table V.

4.6.2.3.2 Rejected lots. If there are one or more defects, the inspection lot shall be rejected. The manufacturer may use the following option to rework the lot:

The individual production lot, or lots, from which the defect originated shall be individually subjected to the solderability test as required in 4.6.2.3.1. Production lots that pass the solderability test are available for shipment.

4.6.2.4 Subgroup 4 and subgroup 5.

4.6.2.4.1 Sampling plan. Subgroup 4 and subgroup 5 shall be performed on a production lot basis. In the event of one or more failures the lot shall be rejected.

4.6.2.4.2 Rejected lots. The rejected lots shall be segregated from new lots and those that have passed inspection. Rejected lots shall be 100 percent reworked or scrapped. The rejected lot may be rescreened and the defects removed. The lot may then be resubmitted to the sample plan. If one or more defects of the same type are found in this second sample, the lot is rejected and shall not be supplied to this specification. If another defect of a different type is found in the second sample, a rescreen for that defect is also permitted.

4.6.2.4.3 Disposition of sample units. Sample units that have been subjected to subgroup 4 or subgroup 5 shall not be delivered on the contract or purchase order.

4.7 Periodic group B inspection. Periodic group B inspection shall consist of the tests specified in table VI in the order shown, and shall be performed on sample units selected from lots that have passed group A inspection. Capacitor styles manufactured during each 3-month or 6-month period, as applicable, shall be represented, as far as practical, in at least the approximate ratio of production. Except where the results of this inspection show noncompliance with the applicable requirements (see 4.7.3), delivery of products that have passed group A inspection shall not be delayed pending the results of this periodic inspection.

4.7.1 Sampling plan.

4.7.1.1 Subgroups 1 through 3. Twenty-two sample units shall be taken from production every 6 months and subjected to the applicable tests for their particular subgroup. Permitted failures shall be as specified in table VI.

4.7.1.2 Subgroup 4. A minimum of 10 sample units of the highest capacitance value per style produced shall be selected from each inspection lot produced during a 3-month period.

4.7.2 Disposition of sample units. Sample units that have been subjected to group B inspection shall not be delivered on the contract.

4.7.3 Noncompliance. If a sample unit fails to pass group B inspection, the manufacturer shall notify the qualifying activity and cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the Government, has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed), at the option of the qualifying activity. Group A inspection may be reinstituted; however, final acceptance shall be withheld until the group B inspection has shown that corrective action was successful.

TABLE VI. Periodic group B inspection.

Inspection	Requirement paragraph	Test method paragraph	Number of sample units to be inspected	Number of defectives permitted 1/	
Subgroup 1 (every 6 months) Temperature coefficient limits 2/ Thermal shock and immersion	3.14 3.15	4.8.11 4.8.12	18	1	1
Subgroup 2 (every 6 months) Resistance to soldering heat Moisture resistance	3.16 3.17	4.8.13 4.8.14	18	1	
Subgroup 3 (every 6 months) Low voltage humidity	3.18	4.8.15	18	1	
Subgroup 4 (every 3 months) Life	3.19	4.8.16	25	1	

1/ A sample unit having one or more defects shall be charged as a single defective.
2/ Need not be repeated if performed on same samples as group A inspection.

4.8 Methods of examination and test.

4.8.1 Visual and mechanical examination. Capacitors shall be examined to verify that the materials, design, construction, physical dimensions, and workmanship are in accordance with the applicable requirements (see 3.1, 3.4, 3.5, and 3.23).

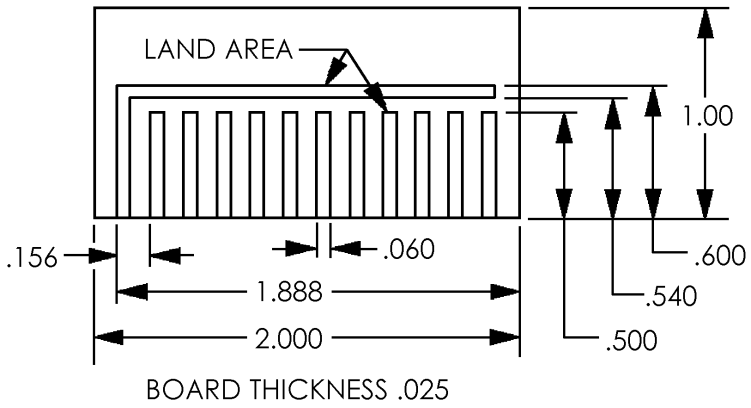
4.8.2 Mounting for testing. When it is specified in the test procedure that the capacitors shall be mounted, they shall be mounted on a suitable substrate (e.g., 99 percent alumina). The substrate material shall be such that it will not be the cause of , nor contribute to, the failure of any test for which it may be used. The capacitors shall be mounted on the substrate as follows:

a. A substrate shall be prepared with metallized surface land areas. A typical "tests card" is shown in figure 1.

b. The capacitors to be tested shall each be soldered to one land area by any convenient method (see 1.2.1.5).

c. The connection to the common land area shall begin with a thermosonic ball bond of a one mil gold wire to the exposed capacitor terminal and end with a stitch bond on the common land area of the substrate.

4.8.2.1 Test rack. When specified, the substrate shall be mounted on a test rack that shall be designed as to permit readout for electrical parameters at +25°C and +125°C and to monitor each chip capacitor under test for failure. This will insure uniform and uninterrupted voltage and heat stresses.



Inches	mm
.025	0.64
.060	1.52
.156	3.96
.500	12.70
.540	13.72
.600	15.24
1.000	25.40
1.888	47.96
2.000	50.80

NOTES:
1. Dimensions are in inches. Metric equivalents are given for general information only.
2. The metallized land areas of the "test card" selected to facilitate testing of the chips shall be of the proper spacing to accommodate the attachment of the applicable chips to the card.

FIGURE 1. Typical "test card".

4.8.3 Voltage conditioning (see 3.6). The intent of voltage conditioning is that all parts be exposed to a predetermined test voltage ±5 percent, for a defined time and temperature. Voltage conditioning is done to help eliminate infant mortality capacitors from the production lot. All parts offered for electrical testing shall be subjected to the voltage conditioning test in 4.8.3.1 or 4.8.3.2. It shall be verifiable that all parts offered for electrical tests have been exposed to the required voltage conditioning for the required time duration. See figure 2 for a suggested test circuit. An alternate test circuit can be used, provided the notes of figure 2 are followed.

4.8.3.1 Standard voltage conditioning. Voltage conditioning shall consist of applying a minimum of twice the rated voltage to the unit at the maximum rated temperature +4°C, -0°C for 100 +25, -4 hours. After testing, perform measurements of 4.8.3.3.

4.8.3.2 Optional voltage conditioning. The manufacturer, with approval from the qualifying activity, may perform an optional voltage conditioning test instead of the standard voltage conditioning tests of 4.8.3.1. All conditions of 4.8.3.1 apply, with the exception of the voltage applied and the test time. The accelerated condition selected for the optional voltage conditioning shall be used for the duration of the test. At no time shall a combination of standard and optional voltage conditioning be allowed on the same samples. The minimum time duration, T(test) minimum, shall be calculated as follows:

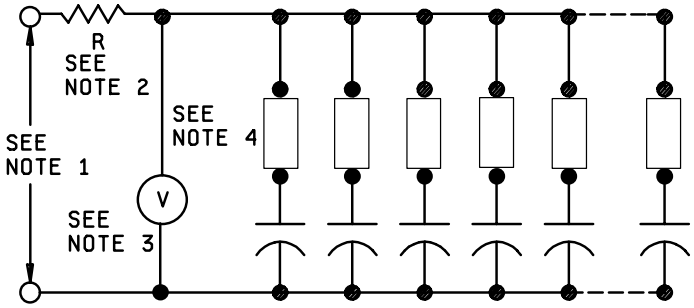
$$T_{test}\ (min.) = \frac{800}{(E_{test} / E_{rated})^{3}}$$

Where: $2 \times E_{rated} \le E_{test} \le 4 \times E_{rated}$

E_{test} = Applied voltage

E_{rated} = Rated voltage of the capacitor

4.8.3.3 Measurements after testing. After completion of the test the units shall be allowed to stabilize at room temperature (+25°C) for a period up to 24 hours. After stabilization at room temperature, the capacitance, dissipation factor, insulation resistance and dielectric withstanding voltage shall be measured as specified in 4.8.4, 4.8.5, 4.8.6, and 4.8.7, respectively.



NOTES:
1. The power supply shall be capable of supplying the required test voltage.
2. The current limiting device shall be a resistor or a fuse. The current shall be limited to no less than 30 milliamperes (mA) and no more than 10 A.
3. There shall be a voltage monitor that will indicate when the applied voltage drops or increases by more than 5 percent, and shut off the test. The resistance of the voltage monitor shall be a minimum of 10X the equivalent resistance of the series resistor and the device under test.
4. Each device under test must have a resistor or fuse in series with it. The value of the resistor shall be such that it does not restrict the power supply's ability to provide the required test voltage to the device under test (±5 percent).

FIGURE 2. Suggested test circuit.

4.8.4 Capacitance (see 3.7). Unmounted capacitors shall be tested in accordance with method 305 of MIL-STD-202. The following detail and exception shall apply:

a. Test frequency: 1 MHz ±50 kHz.

b. Test voltage: A root-mean-square potential of 1.0 ±0.2 volts, when no polarizing voltage is applied.

For class 2 and class 3 characteristics only: Following a dielectric withstanding voltage or insulation resistance, capacitance may be measured after holding the capacitor for a period of time not to exceed 24 hours.

4.8.5 Dissipation factor (see 3.8). The dissipation factor shall be measured with a capacitance bridge or other suitable method at the frequency and voltage as specified in 4.8.4. The capacitors shall be unmounted.

4.8.6 Insulation resistance (see 3.9). Unmounted capacitors shall be tested in accordance with method 302 of MIL-STD-202. The following details and exceptions shall apply:

Prior to performing this test, capacitors shall be carefully cleaned to remove any contamination including fingerprints. Care must be taken to maintain cleanliness in test chamber and while making measurements.

a. Test conditions: Rated voltage as specified (see 3.1) applied through a series resistor sufficient to limit the charging current to a maximum of 50 milliamperes.

b. Special conditions: If a failure occurs at a relative humidity of 50 percent or higher, the insulation resistance may be measured again at a relative humidity of less than 50 percent.

c. Points of measurement: Between the terminations.

4.8.7 Dielectric withstanding voltage (see 3.10). Unmounted capacitors shall be tested in accordance with method 301 of MIL-STD-202. The following details and exceptions shall apply:

a. Magnitude and nature of test voltage: 250 percent of dc rated voltage.

b. Duration of application of test voltage: 2 second minimum.

c. Points of application of test voltage: Between the capacitor-element terminals.

d. Limiting value of surge current: 50 mA maximum.

e. Examination after test: Capacitors shall be examined for evidence of damage and breakdown.

4.8.8 Solderability (see 3.11). Capacitors shall be tested in accordance with method 208 of MIL-STD-202. The following details and exceptions shall apply:

a. The terminations shall be immersed to a depth of .020 + .010, -.001 (0.51 + 0.25, -0.00 mm).

b. Inspection of terminations shall be in accordance with 3.11. In case of dispute, the percent coverage with pinholes or rough spots shall be determined by actual measurement of these areas, as compared to the total area.

c. No physical damage after test.

4.8.9 Bond strength (see 3.12). Capacitors shall be tested as specified in method 2011 of MIL-STD-883. The following details shall apply:

a. Capacitors shall be mounted as specified in 4.8.2.

b. Test condition D.

4.8.10 Die sheer strength (see 3.13). Capacitors shall be mounted as specified in 4.8.2 and tested as specified in method 2019 of MIL-STD-883.

4.8.11 Temperature coefficient limits (see 3.14). Capacitors shall be tested as specified in 4.8.4 except that the capacitance measurements shall be made at the steps shown in table VII and at a sufficient number of intermediate points between steps B and D of table VII to establish a true characteristic curve. The capacitance value obtained in step C of table VII shall be considered as the reference point. Capacitors shall be kept at each temperature until a temperature equilibrium is attained. These measurements need be performed only on capacitors having a value of 10 pF or greater. Capacitors of less than 10 pF shall be characterized as having the same temperature coefficient limits as those of 10 pF or more manufactured in the same lot.

TABLE VII. Temperature coefficient limit cycle.

Step	Voltage, dc	Temperature, °C
A	None	+25 ± 2
B	None	-55 ± 2
C (reference)	None	+25 ± 2
D	None	+125 +4, -0

4.8.12 Thermal shock and immersion (see 3.15).

4.8.12.1 Thermal shock. Capacitors shall be tested in accordance with method 107 of MIL-STD-202. The following details shall apply:

a. Test condition: A, except that in step 3, sample units shall be tested at +125°C.

b. Minimum time for steps 1 and 3 shall be 1/4 hour.

c. Measurement after cycling: not applicable.

4.8.12.2 Immersion. Following thermal shock, capacitors shall be tested in accordance with method 104 of MIL-STD-202. The following details shall apply:

a. Test condition: B.

b. Examinations and measurements after final cycle: Capacitors shall meet the requirements of 3.15.

4.8.13 Resistance to soldering heat (see 3.16). Capacitors shall be mounted as specified in 4.8.2 and tested in accordance with method 210 of MIL-STD-202. The following details and exceptions shall apply:

a. Test condition: C.

b. Measurements after test: Capacitors shall be allowed to cool 10 minutes and up to 24 hours maximum prior to measurement. After mounting, capacitors shall meet the requirements of 3.16.

4.8.14 Moisture resistance (see 3.17). Capacitors shall be tested in accordance with method 106 of MIL-STD-202. The following details and exceptions shall apply:

a. Initial measurements: Capacitance as specified in 3.7.

b. Number of cycles: Twenty continuous cycles except that steps 7a and 7b shall be omitted.

c. Polarizing voltage shall be 50 V dc.

e. Final measurement: Capacitance as specified in 3.17.

4.8.15 Low voltage humidity (see 3.20). Capacitors shall be mounted as specified in 4.8.2 and 4.8.2.1 and placed in a test chamber at +85°C ±2°C and 85 percent ±5 percent relative humidity for 240 hours. During the entire test, a bias voltage of 1.5 volts dc ±10 percent shall be applied to the capacitors.

4.8.16 Life (at +125°C) (see 3.18). Capacitors shall be tested in accordance with method 108 of MIL-STD-202. The following details and exceptions shall apply:

a. Capacitors shall be mounted as specified in 4.8.2 and 4.8.2.1.

b. Test temperature and tolerance: +125°C, +4°C, -0°C.

c. Operating conditions: Capacitors shall be subjected to 200 percent of rated voltage (see 3.1). The surge current shall not exceed 50 mA. When necessary, a suitable current-limiting resistor may be inserted into the circuit.

d. Test condition: F (2,000 hours).

e. Measurements during and after exposure: After 1,000 hours and at the conclusion of this test and while capacitors are still held at +125°C, insulation resistance shall be measured as specified in 4.8.6. The capacitors shall then be returned to the inspection conditions specified in 4.3 and shall be visually inspected for evidence of mechanical damage, and capacitance, dissipation factor, and insulation resistance shall be measured as specified in 4.8.4, 4.8.5, and 4.8.6, respectively.

f. Final measurement: capacitors shall meet the requirements of 3.19.

4.8.17 Fungus (see 3.20). Capacitors shall be tested in accordance with method 508 of MIL-STD-810.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. These capacitors are primarily designed for use in stripline or microstripline applications, usually at frequencies of 1 GHz and higher. Capacitors covered by this specification are unique due to the fact that they must be able to operate satisfactorily in military systems under the following demanding conditions: extreme temperatures (-55°C to +125°C) and damp environments. These capacitors also offer established reliability that is verified under a qualification system. Commercial components are not designed to withstand these military conditions.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Title, number, and date of the applicable specification sheet.

c. The complete PIN (see 3.1 and 1.2.1).

d. Packaging requirements.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Defense Supply Center, Columbus, ATTN: DSCC-VQP, PO Box 3990, Columbus, OH 43216-5000.

6.3.1 Copies of SD-6, "Provisions Governing Qualification" may be obtained upon application to the Defense Automation and Production Service, Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.4 PIN. This specification requires a PIN that describes codification and/or classification and appropriate references to associated documents (see 1.2.1 and 3.1).

6.5 Ambient operating conditions. Designers are cautioned to give consideration to the change in dielectric constant with temperature, shelf aging, and electric-field intensity, and should recognize that the insulation resistance may vary with humidity and organic contamination of the ceramic chip surfaces. Care should be taken to assure that the capacitors are properly and thoroughly cleaned of organic contamination especially before the insulation resistance test.

6.6 Barometric pressure test. These units are not subjected to the barometric pressure test since the likelihood of failure is remote.

6.7 Subject term (key word) listing.

Capacitance
Microstrip
Stripline

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

APPENDIX

PROCEDURE FOR QUALIFICATION INSPECTION

10 SCOPE

10.1 This appendix details the procedure for submission of samples for qualification inspection of capacitors covered by this specification. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance. The procedure for extending qualification of the required sample to other capacitors covered by this specification is also outlined herein.

20 APPLICABLE DOCUMENTS. This section is not applicable to this appendix.

30 SUBMISSION

30.1 Sample.

30.1.1 Single-style submission. A sample of the size required in the qualification inspection table, of the smallest and largest case sizes, highest capacitance value in each voltage rating, in each temperature coefficient limits for which qualification is sought shall be submitted.

40 EXTENT OF QUALIFICATION

40.1 Qualification of voltage rating. Voltage rating qualification will be restricted to those submitted (see table VIII). Each temperature coefficient limit shall be qualified at the highest standard capacitance value listed.

TABLE VIII. Combined submission.

Style	PIN 1/ M49464	Number of units 2/ 3/	Rated voltage
CPCR01	E01A007PN	48	50
CPCR01	F01A006PN	48	50
CPCR01	G01A009PN	48	50
CPCR01	N01A012CN	48	50
CPCR01	P01A015CN	48	50
CPCR01	R01A021CN	48	50
CPCR01	S01A021CN	48	50
CPCR01	T01A033CN	48	50
CPCR01	U01A037CN	48	50
CPCR01	V01A035CN	48	50
CPCR01	X01A047JN	48	50
CPCR01	Y01A049JN	48	50
CPCR01	Z01A061MN	48	50
CPCR01	E01J039FN	49	50
CPCR01	F01J037FN	49	50
CPCR01	G01J051FN	49	50
CPCR01	N01J057GN	49	50
CPCR01	P01J061GN	49	50
CPCR01	R01J064GN	49	50
CPCR01	S01J065GN	49	50
CPCR01	T01J066JN	49	50
CPCR01	U01J071JN	49	50
CPCR01	V01J071JN	49	50
CPCR01	X01J167JN	49	50
CPCR01	Y01J168JN	49	50

See footnotes at end of table.

TABLE VIII. Combined submission - Continued.

Style	PIN 1/ M49464	Number of units 2/ 3/	Rated voltage
CPCR01	Z01J170MN	49	50
CPCR01	E01A079PN	48	100
CPCR01	F01A078PN	48	100
CPCR01	G01A081PN	48	100
CPCR01	N01A084CN	48	100
CPCR01	P01A087CN	48	100
CPCR01	R01A093CN	48	100
CPCR01	S01A093CN	48	100
CPCR01	T01A105CN	48	100
CPCR01	U01A109CN	48	100
CPCR01	V01A107CN	48	100
CPCR01	X01A119CN	48	100
CPCR01	Y01A121JN	48	100
CPCR01	Z01A133MN	48	100
CPCR01	E01J111FN	49	100
CPCR01	F01J109FN	49	100
CPCR01	G01J123FN	49	100
CPCR01	N01J129GN	49	100
CPCR01	P01J133GN	49	100
CPCR01	R01J137GN	49	100
CPCR01	S01J139GN	49	100
CPCR01	T01J141JN	49	100
CPCR01	U01J150JN	49	100
CPCR01	V01J150JN	49	100
CPCR01	X01J155JN	49	100
CPCR01	Y01J156JN	49	100
CPCR01	Z01J158MN	49	100

1/ Qualification to N termination will qualify termination P.
2/ Forty-five units of the smallest case and 46 units of the largest case shall be submitted if solderability is not applicable.
3/ Forty-two units of the smallest case and 43 units of the largest case shall be submitted if certification is given for fungus and solderability is not applicable.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Review activities:
Army - AT, AV, ME, MI
Navy - MC
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5910-2177)