

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Correct typos in table I and 6.6 .	25-07-28	Mark Rush
B	Updated available ratings.	26-02-05	Mark Rush

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
HAS CHANGED NAMES TO:
DLA WEAPONS SUPPORT (COLUMBUS)
COLUMBUS, OHIO 43218-3990



Prepared in accordance with [ASME Y14.100](#)

Selected item drawing

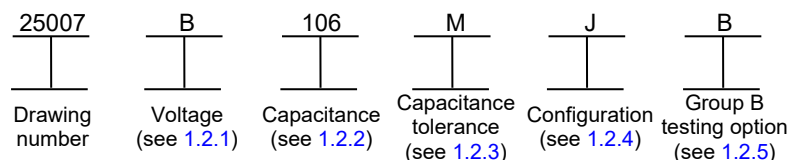
REV STATUS OF PAGES	REV	B	B	B	B	B	B	B	B	B									
	PAGES	1	2	3	4	5	6	7	8	9									

PMIC N/A Original date of drawing 25-04-07	PREPARED BY John Bonitatibus					DESIGN ACTIVITY DLA LAND AND MARITIME COLUMBUS, OH 43218-3990													
	CHECKED BY John Bonitatibus					TITLE CAPACITOR, FIXED, CERAMIC DIELECTRIC (X7R), HORIZONTALLY STACKED, SIZE 2220													
	APPROVED BY Mark A. Rush																		
	SIZE A		CAGE CODE 037Z3			DWG NO. 25007													
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1. SCOPE

1.1 Scope. This drawing describes the general requirements for stacked ceramic capacitors.

1.2 Part or Identifying Number (PIN). The complete PIN is as follows:



1.2.1 Rated voltage. The rated voltage for continuous operation at +125°C is identified by a single letter as follows:

Symbol	Rated voltage
X	10
Y	16
Z	25
A	50
B	100
C	200

1.2.2 Capacitance. The nominal capacitance value, expressed in picofarads (pF) is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow.

1.2.3 Capacitance tolerance. The capacitance tolerance is identified by a single letter in accordance with the following:

Symbol	Capacitance tolerance
M	± 20 percent

1.2.4 Configuration. The configuration is identified by single letter as follows (see [figure 1](#)):

Symbol	Lead style
J	Formed inward (2 "feet")
L	Formed outward (2 "feet")
G	Formed inward (paddle)
H	Formed outward (paddle)

1.2.5 Group B testing option. To require group B testing as specified herein, use the letter B in this location. If group B testing is not desired, leave this location blank. NOTE: Group B testing includes a 1,000-hour life test which may extend the processing time by 45 days or more.

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 documents in sections 3 and 4 of this specification, whether or not they are listed herein.

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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 cited in the solicitation or contract (see 6.2).

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-32535	-	Capacitor, Chip, Fixed, Ceramic Dielectric (Temperature Stable and General Purpose), Extended Range, High Reliability and Standard Reliability, General Specification for
MIL-PRF-32535/8	-	Capacitor, Chip, Fixed, Ceramic Dielectric (Temperature Stable and General Purpose), Extended Range, High Reliability and Standard Reliability, Size 2220
MIL-PRF-49470	-	Capacitor, Fixed, Ceramic Dielectric, Switch Mode Power Supply (General Purpose and Temperature Stable), Standard Reliability and High Reliability, General Specification for

(Copies of these documents are available online at <https://quicksearch.dla.mil/>.)

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, 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 Interface and physical dimensions. The interface and physical dimensions shall be as specified herein (see [figure 1](#)).

3.1.1 Configuration. Lead frame style J, L, G, or H (see 1.2.4 and [figure 1](#)).

3.1.2 Lead frame composition. The lead frame material shall be 0.15 mm thick phosphor bronze, half hard. The terminal lead finish shall be 10 µm thick Sn60Pb40 bright solder over a 2 to 3 µm thick Ni underplating.

3.1.2.1 Pure tin. The use of pure tin, as an underplate or final finish is prohibited both internally and externally. Tin content of capacitor components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.3).

3.2 Electrical characteristics.

3.2.1 Capacitance. When measured as specified in [MIL-PRF-32535](#), the capacitance shall be within the specified tolerance (see [table I](#)).

3.2.2 Capacitance tolerance. See 1.2.3 and [table I](#).

3.2.3 Temperature characteristic. X7R as specified in [MIL-PRF-32535](#).

3.2.4 Rated voltage (V_{dc}). See 1.2.1 and [table I](#).

3.2.5 Operating temperature range. -55°C to +125°C.

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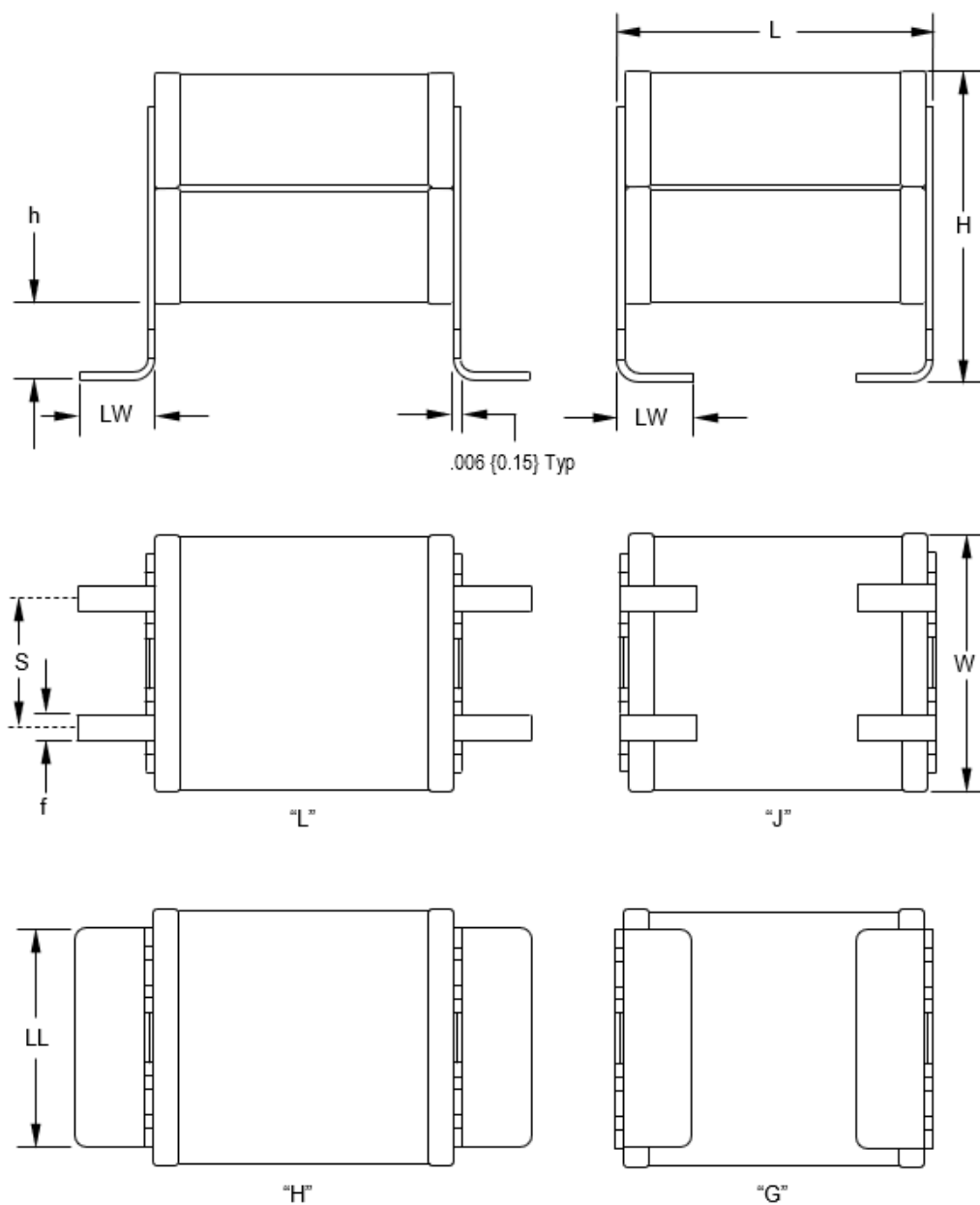


FIGURE 1. Dimensions and configuration.

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Dimensions, inch (mm)							
L (max.)	W (max.)	H (max.)	h ± .012 (0.30)	f ± .012 (0.30)	LW ± .006 (0.15)	LL ± .012 (0.30)	S ± .012 (0.30)
.292 (7.4)	.222 (5.62)	See table I	.059 (1.5)	.020 (.508)	.059 (1.5)	.161 (4.1)	.100 (2.54)

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in millimeters and are given for information only.

FIGURE 1. Dimensions and configuration - continued.

3.3 Test criteria. The test criteria shall be in accordance with [MIL-PRF-32535](#), [MIL-PRF-49470](#), and as specified herein.

3.3.1 In-process visual examination. When capacitors are inspected as specified in [MIL-PRF-49470](#), no device shall be acceptable that exhibits the defects specified in [3.3.1.1](#) and [3.3.1.2](#).

3.3.1.1 Ceramic body defects. Prior to assembly, chip capacitors shall be visually examined for ceramic body defects as specified in [MIL-PRF-49470](#).

3.3.1.2 Lead attachment defects. Following lead attachment in accordance with the manufacturer's specifications, capacitor assemblies shall be visually examined for lead attachment defects as specified in [MIL-PRF-49470](#).

3.3.3 Thermal shock and voltage conditioning.

3.3.3.1 Thermal shock.

- a. Group A: As specified in [MIL-PRF-32535](#) for 20 cycles.
- b. Group B: As specified [MIL-PRF-32535](#) for 100 cycles. The capacitors shall be mounted in accordance with the manufacturer's specifications.

3.3.3.2 Voltage conditioning. As specified in [MIL-PRF-32535](#) for T level capacitors.

3.3.4 Insulation resistance. As specified in [MIL-PRF-32535](#).

3.3.5 Dielectric withstanding voltage. As specified in [MIL-PRF-32535](#).

3.3.6 Dissipation factor. As specified in [MIL-PRF-32535](#).

3.3.7 Visual and mechanical examination. All capacitors shall be examined using 7X to 10X magnification to verify that the design, construction, and physical dimensions are in accordance with the applicable requirements (see [figure 1](#)). All capacitors shall also be examined using 2X to 4X magnification to verify that workmanship is in accordance with the applicable requirements (see [3.8](#)).

3.3.8 Solderability. As specified in [MIL-PRF-49470](#) except the leads shall be immersed above the lead bend.

3.3.9 Peel force (2 lbs.). In accordance with the manufacturer's specifications.

3.3.10 Life. As specified in [MIL-PRF-32535](#) (1,000 hours), except the capacitors shall be mounted in accordance with the manufacturer's specifications.

3.3.11 Resistance to soldering heat. As specified in [MIL-PRF-32535](#), except the capacitors shall be mounted in accordance with the manufacturer's specifications.

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3.3.12 Temperature humidity bias. As specified in [MIL-PRF-32535](#) (96 hours), except the capacitors shall be mounted in accordance with the manufacturer's specifications.

3.3.13 Destructive physical analysis. As specified in [MIL-PRF-49470](#).

3.4 Marking. Capacitor marking is not required. Capacitor packaging containers shall be marked with the DLA Weapons Support (Columbus) drawing PIN (see [1.2](#)), capacitance, capacitance tolerance, voltage, date code and lot symbol, and the Commercial and Government Entity (CAGE) code.

3.5 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.6 Manufacturer Eligibility. To be eligible for listing as a source of supply, a manufacturer shall be listed in the [MIL-PRF-32535 Qualified Products Database](#) for at least one [MIL-PRF-32535/8](#) part, or perform the group A and group B inspections as specified herein on a sample of parts agreed upon by the manufacturer and DLA Weapons Support (Columbus) - VAT.

3.7 Certificate of compliance. A certificate of compliance shall be required from manufacturers requesting to be an approved source of supply.

3.8 Workmanship. Capacitors shall be processed in such a manner as to be uniform in quality when using 2X to 4X maximum magnification. Leads shall not exhibit cuts, nicks, or scrapes exceeding 10 percent of the length of the leads. The surface of the lead may exhibit bare base metal on the edges and cut ends but not on the flat portion of the leads. These capacitor leads are not expected to be solderable above the lead bend.

TABLE I. Size 2220 capacitor characteristics.

DLA Weapons Support (Columbus) drawing PIN 1/	Capacitance (μ F)	Rated voltage (V _{dc})	Capacitance tolerance	Maximum H dimension 2/ (inch (mm))
25007B825M --	8.2	100	M	.295 (7.5)
25007B106M --	10	100	M	.295 (7.5)
25007B146M --	14	100	M	.414 (10.5)
25007A156M --	15	50	M	.295 (7.5)
25007A186M --	18	50	M	.295 (7.5)
25007A206M --	20	50	M	.295 (7.5)
25007A226M --	22	50	M	.295 (7.5)
25007A306M --	30	50	M	.414 (10.5)
25007Z276M --	27	25	M	.295 (7.5)
25007Z336M --	33	25	M	.295 (7.5)
25007Z476M --	47	25	M	.295 (7.5)
25007Z666M --	66	25	M	.414 (10.5)

[1/](#) The complete PIN (see [1.2](#)) shall include additional symbols to indicate configuration and group B testing option.

[2/](#) See [figure 1](#).

4. VERIFICATION

4.1 Qualification inspection. Qualification inspection shall only be required as specified (see [3.6](#)).

4.2 Conformance inspection.

4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the in-process inspection and group A inspection. Group B testing shall be required if specified in the PIN (see [1.2](#) and [1.2.5](#)).

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4.2.2 In-process inspection. Each production lot shall be inspected as individual chips prior to assembly and as stacked assemblies, after attachment of the termination lead frame, in accordance with [table II](#).

TABLE II. In-process inspection.

Inspection	Requirement paragraph	Sampling procedure
Visual examination (ceramic body defects)	3.3.1.1	100%
Visual examination (lead attachment defects)	3.3.1.2	100%

4.2.3 Group A inspection. Group A inspection shall consist of the inspections specified in [table III](#).

TABLE III. Group A inspection.

Inspection	Requirement paragraph	Sampling procedure
<u>Subgroup 1</u> Thermal shock and voltage conditioning ^{1/} Insulation resistance (at +125°C) Dielectric withstanding voltage (at +25°C) Insulation resistance (at +25°C) Capacitance (at +25°C) Dissipation factor (at +25°C)	3.3.3 3.3.4 3.3.5 3.3.4 3.2.1 3.3.6	100% inspection
<u>Subgroup 2</u> Visual and mechanical examination: Physical dimensions Workmanship	3.3.7 Figure 1 3.8	13 samples 0 failures
<u>Subgroup 3</u> Solderability	3.3.8	3 samples 0 failures
<u>Subgroup 4</u> Peel force (2 lbs.)	3.3.9	2 samples 0 failures

^{1/} Capacitance and dissipation factor failures shall be removed from the lot but shall not be considered defective for the determination of the percent defective allowable (PDA).

4.2.3.1 Subgroup 1. Subgroup 1 shall be performed on each production lot on 100 percent of the product supplied under this drawing. Capacitors failing the tests of this subgroup shall be removed from the lot. If, during the 100 percent inspection, screening requires that more than 10 percent (or 1 unit, whichever is greater) of the capacitors be discarded (10 PDA), the entire lot shall be rejected.

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

4.2.3.2 Subgroup 2. Subgroup 2 tests shall be performed on each production lot on a sample basis. In the event of one or more failures, the lot shall be rejected.

4.2.3.2.1 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 drawing. If another defect of a different type is found in the second sample, a rescreen for that defect is also permitted.

4.2.3.3 Subgroup 3. Solderability tests shall be performed on each production lot on a sample basis. The samples shall be selected randomly and subjected to the solderability test. The manufacturer may use electrical rejects from the subgroup 1 and subgroup 2 tests for all or part of the samples to be used for solderability testing. If there are one or more defects, the lot shall be rejected.

4.2.3.3.1 Rejected lots. Rejected lots shall not be supplied to this drawing.

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4.2.3.3.2 Disposition of samples. The solderability test is considered a destructive test and samples submitted to the solderability test shall not be supplied on the contract or order.

4.2.3.4 Subgroup 4. The peel force test shall be performed on each production lot on a sample basis. The samples shall be selected randomly and subjected to the peel force test. The manufacturer may use electrical rejects from the subgroup 1 and subgroup 2 tests for all or part of the samples to be used for peel force testing. If there are one or more defects, the lot shall be rejected.

4.2.3.4.1 Rejected lots. The rejected lot shall be 100 percent inspected for those quality characteristics found defective in the sample and any defectives found removed from the lot. A new sample of parts of 2 pieces shall then be randomly selected and subjected to the peel force test. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied to this drawing.

4.2.3.4.2 Disposition of samples. The peel force test is considered a destructive test and samples submitted to the peel force test shall not be supplied on the contract or order.

4.2.4 Group B inspection. Group B inspection shall consist of the tests specified in [table IV](#) and shall be performed on sample units from lots that have been subjected to and have passed group A inspection.

4.2.4.1 Failure in group B inspection. In the event of failures in excess of those allowed in [table IV](#), the lot shall be rejected and shall not be supplied to this drawing.

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

TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Sampling procedure
<u>Subgroup 1</u> Thermal shock (mounted) Life	3.3.3.1 3.3.10	12 samples 1 failure
<u>Subgroup 2</u> Resistance to soldering heat Temperature humidity bias	3.3.11 3.3.12	12 samples ^{1/} 0 failures
<u>Subgroup 3</u> Destructive physical analysis	3.3.13	3 samples 0 failures

^{1/} The samples shall be divided evenly (i.e., 6 and 6) for the resistance to soldering heat and temperature humidity bias tests.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see [6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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, which may be helpful, but is not mandatory.)

6.1 Intended use. Capacitors conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. This drawing is intended exclusively to prevent the proliferation of unnecessary duplicate specifications, drawings, and stock catalog listings. When a military specification exists and the product covered by this drawing has been qualified for listing, this drawing becomes obsolete and will not be used for new design.

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6.2 Ordering data. The contract or purchase order should specify the following:

- a. Complete DLA Weapons Support (Columbus) CAGE code and PIN (see 1.2).
- b. Requirements for packaging and packing (see 5.1). Contact manufacturer for more information.

6.3 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers.

6.4 Users of record. Coordination of this document for future revisions is coordinated only with the approved sources of supply and the users of record of this document. Requests to be added as a recorded user of this drawing should be in writing to: DLA Weapons Support (Columbus), ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990 or e-mailed to capacitorfilter@dla.mil.

6.5 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue 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 previous issue.

6.6 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. For assistance in the use of this drawing, contact DLA Weapons Support (Columbus), ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990 or e-mailed to capacitorfilter@dla.mil.

DLA Weapons Support (Columbus) drawing PIN 1/	Vendor A similar type 2/
25007B825M --	MBH21C825M --- A
25007B106M --	MBH21C106M --- A
25007B146M --	MBH31C146M --- A
25007A156M --	MBH25C156M --- A
25007A186M --	MBH25C186M --- A
25007A206M --	MBH25C206M --- A
25007A226M --	MBH25C226M --- A
25007A306M --	MBH35C306M --- A
25007Z276M --	MBH23C276M --- A
25007Z336M --	MBH23C336M --- A
25007Z476M --	MBH23C476M --- A
25007Z666M --	MBH33C666M --- A

- 1/ Parts must be purchased to the DLA Weapons Support (Columbus) CAGE code and PIN to assure that all performance requirements and tests are met.
- 2/ The complete vendor similar type includes additional symbols to indicate the testing option, configuration, and packaging (1 = tape and reel, 6 = waffle pack).

Vendor	Vendor CAGE	Vendor name and address
A	U6827	KYOCERA AVX Components Ltd. 5 Hillmans Way Coleraine BT52 2DA, Ireland

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