

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Add pure tin, manufacturer eligibility, and high power pulse paragraphs. Removal of the short time overload test. Manufacturer requested changes. Editorial changes throughout.	14-03-28	M. Radecki
B	Update Hyperlink, editorial changes throughout	19-08-14	M. Radecki

CURRENT DESIGN ACTIVITY CAGE CODE 037Z3
HAS CHANGED NAMES TO:
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990



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

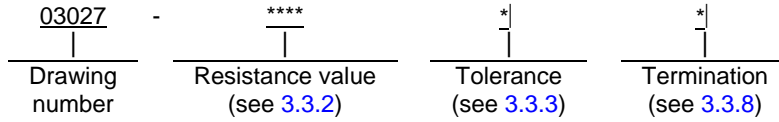
Selected Item Drawing

REV STATUS OF PAGES	REV	B	B	B	B	B	B	B									
	PAGES	1	2	3	4	5	6	7									
PMIC N/A	PREPARED BY Andrew R. Ernst							DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OH									
Original date of drawing 04-12-17	CHECKED BY Andrew R. Ernst							TITLE RESISTOR, CHIP, FIXED, FILM, HIGH VOLTAGE, STYLE 2512									
	APPROVED BY Kendall A. Cottongim																
	SIZE A	CAGE CODE 037Z3						DWG NO. 03027									
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1. SCOPE

1.1 Scope. This drawing describes the requirements for a high voltage, fixed, film, chip resistors, style 2512.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:



2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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.

DEPARTMENT OF DEFENSE SPECIFICATION

[MIL-PRF-55342](#) - Resistor, Chip, Fixed, Film, Nonestablished Reliability, Established Reliability, Space Level, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[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.

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

2.2 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 (except for related, specification sheets), 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 Item requirements. The individual item requirements shall be as specified herein.

3.2 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-55342](#) and herein (see [figure 1](#)). Passivation is not applicable, however, a protective coating over the element shall be provided.

3.3 Electrical characteristics.

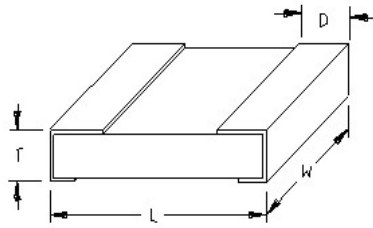
3.3.1 Resistance. The nominal resistance expressed in ohms is identified by four characters, consisting of three digits and a letter. The letter is used simultaneously as a decimal point and as a multiplier. For resistance values:

- a. Greater than or equal to 12 megohm but less than 1 gigohms, the letter "M" is used to represent a decimal point.
- b. Greater than or equal to 1 gigohm but less than 50 gigohms, the letter "G" is used to represent a decimal point.

All digits preceding and following the letters (M or G) of the group represent significant figures. The resistance value designations are shown in [table I](#). Minimum and maximum resistance values shall be as specified herein (see [table II](#)). The resistance values for tolerances F, G, J, and K may be any value within the limits specified herein. Resistance values not listed in the "10 to 100" decade table of [MIL-PRF-55342](#) for the appropriate resistance tolerance shall be considered as not conforming to the specification. The standard values for every decade shall follow the sequence demonstrated for the "10 to 100" decade table specified in [MIL-PRF-55342](#).

3.3.2 Resistance range. The resistance range shall be from 12 Megohms to 50 Gigohms.

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Dimensions			
L	W	T	D (Max)
0.250 ±0.006 (6.350 ±0.152)	0.126 ±0.006 (3.200 ±0.152)	0.025 ±0.002 (0.635 ±0.051)	0.025 (0.635)

NOTES:

1. Dimensions are in millimeters.
2. Inch equivalents are given for general information only.
3. The pictorial view of the styles above is given as representative of the envelope of the item. Slight deviations from the outline shown, which are contained within the envelope and do not alter the functional aspects of the device, are acceptable.

FIGURE 1. Chip resistor.

TABLE I. Designation of resistance values.

Designation	Resistance ohms
6M00 to 9M99 incl.	6,000,000 to 9,999,999 incl.
10M0 to 99M9 incl.	10,000,000 to 99,999,999 incl.
100M to 999M incl.	100,000,000 to 999,999,999 incl.
1G00 to 9G99 incl.	1,000,000,000 to 9,999,999,999 incl.
10G0 to 50G0 incl.	10,000,000,000 to 50,000,000,000 incl.

3.3.3 Resistance tolerance. Resistors are available in resistance tolerances as specified in table II.

TABLE II. Resistance tolerance.

Symbol	Resistance tolerance percent	Symbol	Resistance tolerance percent
F	± 1	J	± 5
G	± 2	K	± 10

3.3.4 Power rating. The power rating for chip resistors shall be .700 watt at +70°C derated to +150°C at zero power (see figure 2).

3.3.5 Voltage rating. The maximum continuous working voltage shall not exceed 3000 volts. Voltage derating should be applied if low pressure or high humidity is encountered.

3.3.6 Resistance temperature coefficient. The resistance temperature coefficient shall be ±100 ppm/°C. For resistance values greater than 1 gigohm the resistance temperature coefficient shall be ±300 ppm/°C.

3.3.7 Operating temperature. The operating temperature shall be -25°C to +150°C.

3.3.8 Termination. The termination material shall be in accordance with MIL-PRF-55342, code letter B, C, G, and U.

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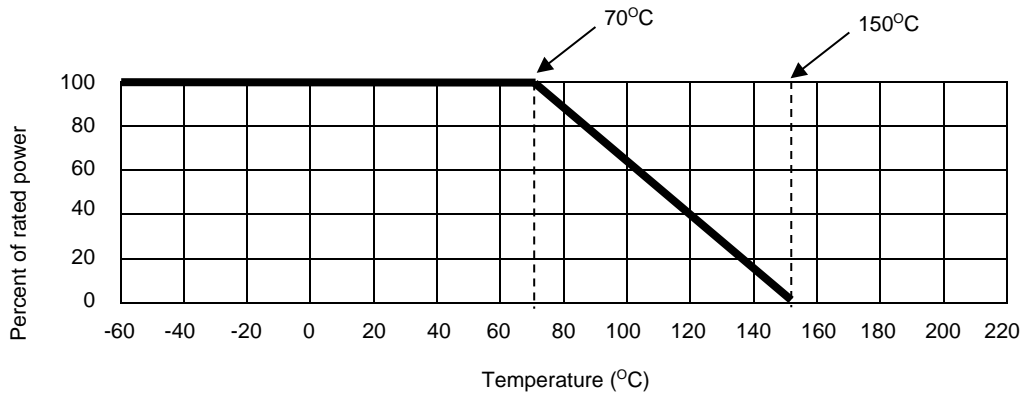


FIGURE 2. Derating curve.

3.3.9 Pure tin. The use of pure tin, as an underplate or final finish is prohibited both internally and externally. Tin content of resistor components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.4).

3.4 DC resistance. When resistors are tested as specified in 4.6, the dc resistance shall be within the specified tolerance of the nominal resistance.

3.5 Thermal shock. When resistors are tested as specified in 4.7, the thermal shock change in resistance shall not exceed ± 0.5 percent +0.01 ohm.

3.6 Low temperature operation. When resistors are tested as specified in 4.9, the low temperature operation change in resistance shall not exceed ± 5.5 percent +0.01 ohm for ohmic values ≤ 12 gighms, and ± 2.0 percent +0.01 ohm for ohmic values > 12 gighm to ≤ 50 gighms.

3.7 Resistance to solder heat. When resistors are tested as specified in 4.10, the resistance to bonding exposure change in resistance shall not exceed ± 0.5 percent +0.01 ohm.

3.8 Resistance temperature characteristic. When resistors are tested as specified in 4.11, the RTC shall not exceed the values specified (see 3.3.6).

3.9 Moisture resistance. When resistors are tested as specified in 4.12, the moisture resistance change in resistance shall not exceed ± 0.5 percent +0.01 ohm.

3.10 High temperature exposure. When resistors are tested as specified in 4.13 the high temperature exposure change in resistance shall not exceed ± 0.5 percent +0.01 ohm.

3.11 Life. When resistors are tested as specified in 4.14, the life change in resistance shall not exceed ± 5.0 percent +0.01 ohm for ohmic values ≤ 12 gighms, and ± 10.0 percent +0.01 ohm for ohmic values > 12 gighm to ≤ 50 gighms.

3.12 Solderability. The requirement for solderability shall be as specified in 4.8 and 4.4.1.1.3.

3.13 Marking. Marking is not required on this resistor; however, each waffle pack shall be marked with the PIN assigned herein (see 1.2), the manufacturer's identification code, the date code, and the lot code. At the option of the manufacturer, the resistor may be marked (i.e., laser, color dot, etc.). The marking shall remain legible after all tests.

3.14 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.

3.15 Manufacturer eligibility. To be eligible for listing as an approved source of supply, a manufacturer shall be listed on the [MIL-PRF-55342 Qualified Products List](#) for at least one part, or perform the group A and group B inspections specified herein on a sample agreed upon by the manufacturer and DLA Land and Maritime-VAT.

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

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3.16 Workmanship. Resistors shall be processed in such a manner as to be uniform in quality and be free from defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Product assurance program. The product assurance program specified in [MIL-PRF-55342](#) and maintained in accordance with [MIL-STD-790](#) is not applicable to this document.

4.2 Qualification inspection. Qualification inspection is not applicable to this document.

4.3 Product level qualification. The product level qualification specified in [MIL-PRF-55342](#) and [MIL-STD-690](#) is not applicable to this document.

4.4 Conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspections.

4.4.1.1 Group A inspection. Group A inspection shall consist of the inspections specified in table III, and shall be made on the same set of sample units, in the order shown. Part per million testing and verification as specified in [MIL-PRF-55342](#) is not applicable to this document.

TABLE III. Group A inspection.

Inspection	Requirement paragraph	Method paragraph	Number of samples
<u>Subgroup I</u>			
Thermal shock	3.5	4.7	100 percent
DC resistance	3.4	4.6	
<u>Subgroup II</u>			
Visual inspection	3.2 , 3.13 , 3.16	4.5	13
<u>Subgroup III</u>			
Solderability	3.12	4.8	5

4.4.1.1.1 Subgroup I. Subgroup I tests shall be performed on 100 percent of the product supplied under this document. Resistors that are out of resistance tolerance, or which experience a change in resistance greater than that permitted for the tests of this subgroup shall be removed from the lot. Lots having more than 5 percent total rejects, due to exceeding the specified resistance tolerance change limit shall not be furnished on contracts.

4.4.1.1.2 Subgroup II. A sample of 13 parts shall be randomly selected, if one or more defects are found, the lot shall be rescreened and defects removed. A new sample of 13 parts shall then be randomly selected. If one or more defects are found in this second sample, the lot shall be rejected and shall not be supplied against this document.

4.4.1.1.3 Subgroup III. A sample of five parts shall be randomly selected, if one or more defects are found, the lot shall be rejected/rescreened in accordance with [MIL-PRF-55342](#).

4.4.1.2 Group B inspection. Group B inspection shall consist of the inspections specified in [table IV](#), and shall be made on the same set of sample units, in the order shown.

4.4.1.2.1 Certification. The procuring activity may accept a certificate of compliance in lieu of group B inspection (see [6.2d](#)).

4.4.1.2.2 Action in case of failure. If any of the subgroups fail the group B inspection and an appropriate lot screen can be established, the lot shall be screened and a new set of samples (see [table IV](#)) from the screened lot, shall be submitted to the subgroup that failed. If one or more defects are found in the resubmitted samples, the lot shall be rejected and shall not be supplied to this specification.

4.4.1.2.3 Disposition of sample units. Sample units which have been subjected to group B inspections shall not be supplied to this specification.

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TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Method paragraph	Number of Samples	Number of failures allowed
<u>Subgroup I</u> Life	3.11	4.14	10	0
<u>Subgroup II</u> Thermal shock	3.5	4.7	30	
Low temperature operation	3.6	4.9		
<u>Subgroup III</u> Resistance to soldering heat	3.7	4.10	30	
Resistance temperature characteristic	3.8	4.11		
Moisture resistance	3.9	4.12		
<u>Subgroup IV</u> High temperature exposure	3.10	4.13	30	

4.5 Visual and mechanical examination. Resistors shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with the applicable requirements of [MIL-PRF-55342](#).

4.6 DC resistance. DC resistance shall be tested in accordance with [MIL-PRF-55342](#).

4.7 Thermal shock. Thermal shock shall be tested in accordance with [MIL-PRF-55342](#).

4.8 Solderability. Solderability shall be tested in accordance with [MIL-PRF-55342](#) and 4.4.1.1.3 herein.

a. Coating durability: 1 hour ±5 minutes steam aging.

4.9 Low temperature operation. Low temperature operation shall be tested in accordance with [MIL-PRF-55342](#).

4.10 Resistance to soldering heat. Resistance to soldering heat shall be tested in accordance with [MIL-PRF-55342](#).

4.11 Resistance temperature characteristic. Resistance temperature characteristic shall be tested in accordance with [MIL-PRF-55342](#).

4.12 Moisture resistance. Moisture resistance shall be tested in accordance with [MIL-PRF-55342](#).

4.13 High temperature exposure. High temperature exposure shall be tested in accordance with [MIL-PRF-55342](#).

4.14 Life. Life shall be tested in accordance with [MIL-PRF-55342](#) with the following exception.

a. Test condition: One thousand hours elapsed time for inspection with all samples.

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 activity within the Military Department 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 that may be helpful, but is not mandatory.)

6.1 Intended use. Chip resistors are intended to be used in thick or thin film circuits where microcircuitry is intended, also, for use in surface mounting application.

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

- a. Complete DLA Land and Maritime CAGE CODE and PIN (see 1.2).
- b. Requirements for delivery: One copy of the conformance inspection data or a certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- c. Packaging requirements (see 5.1). (i.e. Electrostatic discharge sensitive packaging).
- d. Whether the manufacturer performs the group B tests or provides certificate of compliance with group B (see 4.4.1.2.1).

6.3 Electrostatic charge. Under several combinations of conditions, these resistors can be electrically damaged, by electrostatic charges, and drift from specified value. Users should consider this phenomena when ordering or shipping resistors. Direct shipment to Government is controlled by MIL-DTL-39032 that specifies a preventative packaging procedure.

6.4 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. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.5 Pulse applications. Designers are CAUTIONED on using the above resistors in high power pulse applications. Since they have not been qualified nor tested for such applications, damage and premature failure are possible.

6.6 User 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 may be achieved on-line at resistor@dla.mil or in writing to: DLA Land and Maritime - VAT, P.O. Box 3990, Columbus, OH 43218-3990 or by telephone (614) 692-8754 or DSN 850-8754.

6.7 Approved source of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. Assistance in the use of this drawing may be obtained on on-line at resistor@dla.mil or contact DLA Land and Maritime - VAT, P.O. Box 3990, Columbus, OH 43218-3990, or by telephone (614) 692-8754 or DSN 850-8754.

DLA Land and Maritime drawing PIN	Vendor similar designation or type number <u>1/</u>	Vendor CAGE	Vendor name and address
03027-*****	CRHVTCX* (2512)	91637	Vishay Techno 1122 23rd St. Columbus, NE 68601

1/ Parts must be purchased to the DLA Land and Maritime CAGE Code and PIN to assure that all performance requirements and tests are met.

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