

|  |  |       |  |                                  |   |                          |   |   |   | REVISIONS   |  |   |  |  |  |           |  |                 |  |  |
|--|--|-------|--|----------------------------------|---|--------------------------|---|---|---|---|--|---|--|--|--|-----------|--|-----------------|--|--|
|  |  |       |  |                                  |   |                          |   |   |   | LTR   | DESCRIPTION  |   |  |  |  | DATE      |  | APPROVED        |  |  |
|  |  |       |  |                                  |   |                          |   |   |   | A   | Added capacitance 1,100 µF at 350 V dc.<br>Editorial changes throughout. |   |  |  |  | 92/07/14  |  | D. Moore        |  |  |
|  |  |       |  |                                  |   |                          |   |   |   | B   | Editorial changes throughout.  |   |  |  |  | 11 Dec 00 |  | K. Cottongim    |  |  |
|  |  |       |  |                                  |   |                          |   |   |   | C   | Editorial changes throughout.  |   |  |  |  | 6 June 06 |  | Michael Radecki |  |  |
| <div>CURRENT DESIGN ACTIVITY CAGE CODE 037Z3<br/>DEFENSE LOGISTICS AGENCY<br/>DEFENSE SUPPLY CENTER COLUMBUS<br/>COLUMBUS, OHIO 43218-3990</div> |  |       |  |                                  |   |                          |   |   |   |   |  |   |  |  |  |           |  |                 |  |  |
| Prepared in accordance with ASME Y14.100   |  |       |  |                                  |   |                          |   |   |   | Selected item drawing   |  |   |  |  |  |           |  |                 |  |  |
| REV  |  |       |  |                                  |   |                          |   |   |   |   |  |   |  |  |  |           |  |                 |  |  |
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| REV STATUS<br>OF PAGES   |  | REV   |  | C                                | C | C                        | C | C | C | C   | C  | C |  |  |  |           |  |                 |  |  |
|  |  | PAGES |  | 1                                | 2 | 3                        | 4 | 5 | 6 | 7   | 8  | 9 |  |  |  |           |  |                 |  |  |
| PMIC N/A   |  |       |  | PREPARED BY<br>Robert E. Grillot |   |                          |   |   |   | DESIGN ACTIVITY<br>DEFENSE ELECTRONICS SUPPLY CENTER<br><br>DAYTON, OH 45444-5000               |  |   |  |  |  |           |  |                 |  |  |
| Original date of drawing<br><br>21 April 1989  |  |       |  | CHECKED BY<br>Heraldine Johnson  |   |                          |   |   |   | TITLE<br><br>CAPACITORS, FIXED, ELECTROLYTIC<br>POLARIZED, ALUMINUM OXIDE, LOW SCREW-<br>INSERT |  |   |  |  |  |           |  |                 |  |  |
|  |  |       |  | APPROVED BY<br>David E. Moore    |   |                          |   |   |   |   |  |   |  |  |  |           |  |                 |  |  |
|  |  |       |  | SIZE<br>A                        |   | CODE IDENT. NO.<br>14933 |   |   |   | DWG NO.<br><br>89012  |  |   |  |  |  |           |  |                 |  |  |
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## 1. SCOPE

1.1 Scope. This drawing describes the requirements for aluminum oxide, electrolytic capacitors.

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

89012  
|  
Drawing  
number

-XX  
|  
Dash number  
(see table I)

## 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 ([see 6.2](#)).

### SPECIFICATIONS

#### DEPARTMENT OF DEFENSE

[MIL-PRF-39018](#) - Capacitors, Fixed, Electrolytic (Aluminum Oxide), Established Reliability, and Non-established Reliability, General Specification for.

### STANDARDS

#### DEPARTMENT OF DEFENSE

[MIL-STD-202](#) - Test Methods Standard for Electronic and Electrical Component Parts.  
[MIL-STD-1285](#) - Marking of Electrical and Electronic Parts.

(Copies of these documents are available online at <http://assist.daps.dla.mil/> or <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 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 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 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-39018](#) and herein ([see figure 1](#)).

3.1.1 Terminals. Low screw-insert terminals ([see figure 1](#)).

3.1.2 Case. Case shall be made with insulated tubular metal.

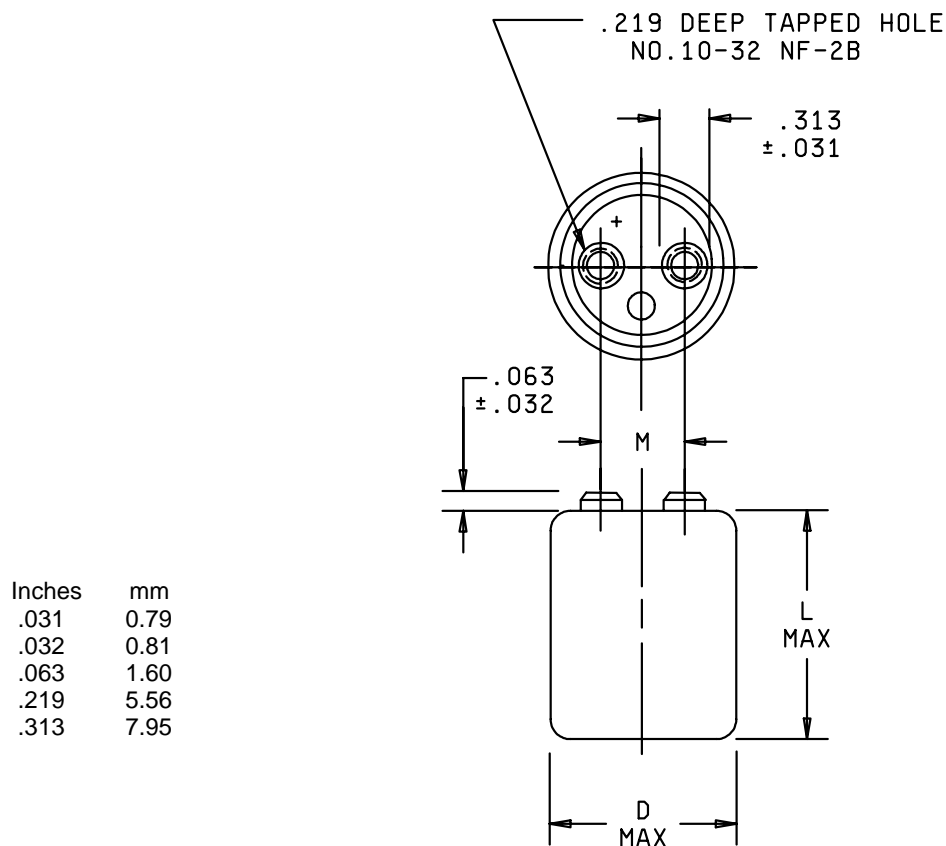
3.1.3 Operating and storage temperature range. The operating and storage temperature range shall be -40°C to +85°C.

3.1.4 Insulating sleeves. Insulating sleeves shall meet the requirements of [MIL-PRF-39018](#).

3.2 Electrical characteristics.

3.2.1 Rated voltage. The rated voltage shall be in accordance with [table I](#).

|  |                  |                                |                         |
|--|------------------|--------------------------------|-------------------------|
| DEFENSE ELECTRONICS SUPPLY CENTER,<br>DAYTON, OHIO | SIZE<br><b>A</b> | CODE IDENT NO.<br><b>14933</b> | DWG NO.<br><b>89012</b> |
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| Case<br>code | Inches   |          |            | Millimeters |          |            |
|--------------|----------|----------|------------|-------------|----------|------------|
|              | D<br>Max | L<br>Max | M<br>±.016 | D<br>Max    | L<br>Max | M<br>±0.40 |
| AA           | 1.453    | 2.250    | .500       | 36.90       | 57.15    | 12.70      |
| AB           | 1.453    | 3.250    | .500       | 36.90       | 82.55    | 12.70      |
| AC           | 1.453    | 4.250    | .500       | 36.90       | 107.95   | 12.70      |
| BB           | 2.078    | 3.250    | .875       | 52.78       | 82.55    | 22.22      |
| BC           | 2.078    | 4.250    | .875       | 52.78       | 107.95   | 22.22      |
| BF           | 2.078    | 5.750    | .875       | 52.78       | 146.05   | 22.22      |
| CC           | 2.578    | 4.250    | 1.125      | 65.48       | 107.95   | 28.57      |
| CD           | 2.578    | 4.750    | 1.125      | 65.48       | 120.65   | 28.57      |
| CF           | 2.578    | 5.750    | 1.125      | 65.48       | 146.05   | 28.57      |
| DF           | 3.078    | 5.750    | 1.250      | 78.18       | 146.05   | 31.75      |
| DJ           | 3.078    | 8.750    | 1.250      | 78.18       | 222.25   | 31.75      |

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Polyvinyl chloride insulating sleeve to be permanently fixed to aluminum case.

FIGURE 1. Case dimensions and configuration.

|  |                  |                                |                         |
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3.2.2 Dielectric. The dielectric shall be aluminum oxide in accordance with [MIL-PRF-39018](#).

3.2.3 Capacitance. Nominal capacitance shall be within -10 percent, +100 percent of the value shown in [table I](#) at +25°C, measured at 120 Hz and 1.0 V rms maximum.

3.2.4 Equivalent series resistance (ESR). Equivalent series resistance at 120 Hz shall not exceed the values shown in [table I](#) at +25°C, when measured with a maximum of 1.0 V rms applied. ESR at 10 kHz is shown in table I.

3.2.5 DC leakage current. DC leakage current shall not exceed values determined from the equation:

Where 
$$I = k\sqrt{CV}$$

I = leakage current in  $\mu\text{A}$

k = a constant: 4.0 at +25°C

32.0 at +85°C

C = rated capacitance in  $\mu\text{F}$

V = rated dc voltage

In no case, however, shall the dc leakage current exceed 20,000  $\mu\text{A}$  when normally stabilized at +85°C.

3.2.6 Ripple current. Capacitors shall withstand the rms ripple current at 120 Hz and +85°C ([see table I](#)).

3.2.7 Life test. One hundred percent of rated voltage applied at +85°C for 1,000 hours. After test, capacitors shall meet the following:

- Capacitors shall then be removed from the test chamber and stabilized at room temperature.
- The capacitance, when measured in accordance with [3.2.3](#), shall not have changed more than  $\pm 15$  percent from the initial value.
- The equivalent series resistance, when measured in accordance with [3.2.4](#), shall not have increased to more than 150 percent of the initial requirement.
- The leakage current shall meet the requirement specified in [3.2.5](#).

3.2.8 Reverse voltage. Not applicable.

3.2.9 Reverse voltage aging. Not applicable.

3.3 Environmental characteristics.

3.3.1 Altitude operation. The altitude operation shall not exceed 200,000 feet.

3.3.2 Shelf test. Capacitors shall be subjected to a shelf test at +85°C  $\pm 3^\circ\text{C}$  for 500 hours. No voltage shall be applied. After test, capacitors shall be removed from the test chamber and stabilized at room temperature, and meet the following:

- The capacitance, when measured in accordance with [3.2.3](#), shall be within  $\pm 15$  percent of the initial measured value.
- The equivalent series resistance, when measured as specified in accordance with [3.2.4](#), shall not exceed 130 percent of the initial requirement.
- The leakage current, when measured as specified in [3.2.5](#), except, 10 minutes after reaching rated working voltage, shall not exceed 200 percent of the initial requirement.

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### 3.4 Physical characteristics.

3.4.1 Terminal strength. Mounting terminals shall withstand the torque pressure shown below when applied in a clockwise direction in a plane perpendicular to the axis of the terminal for a period of 5 to 15 seconds.

| <u>Screw thread</u><br><u>Terminal</u> | <u>Number of</u><br><u>threads</u><br><u>engaged</u> | <u>Torque</u><br><u>(pound-</u><br><u>inches)</u> |            |
|--|--|---|------------|
|  |  | <u>Min</u>  | <u>Max</u> |
| No. 10-32                              | 3  | 12.0  | 18.0       |
| No. 10-32                              | 6  | 20.0  | 25.0       |

3.5 Marking. Marking shall be in accordance with [MIL-STD-1285](#), except the PIN shall be as specified in [1.2](#) with the manufacturer's name or code and date code.

3.6 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable 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.

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

3.8 Workmanship. The capacitor shall be uniform in quality and free from any defects that will affect life, serviceability, or appearance.

## 4. VERIFICATION

4.1 Qualification inspection. Qualification inspection is not required.

4.2 Conformance inspection.

4.2.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the group A inspection of [MIL-PRF-39018](#). Group B inspection shall be performed when specified on the purchase order.

4.2.2 Certification. The acquiring activity, at its discretion, may accept a certificate of compliance with group B requirements instead of performing group B tests ([see 6.2c](#)).

4.2.3 Inspection of packaging. Inspection of packaging shall be in accordance with [MIL-PRF-39018](#).

4.3 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth herein where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

## 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.

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## 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.

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

- a. Complete PIN ([see 1.2](#)).
- b. Requirements for delivery of one copy of the conformance inspection data or certificate of compliance that parts have passed conformance inspection with each shipment of parts by the manufacturer.
- c. Whether the manufacturer performs the group B tests or provides certification of compliance with group B requirements.
- d. Requirements for notification of change of product to acquiring activity, if applicable.
- e. Requirements for packaging and packing.

6.3 Replaceability. Capacitors covered by this drawing will replace the same commercial device covered by contractor-prepared specification or drawing.

6.4 Similar vendor types. See [table II](#).

6.5 Users of record. Coordination of this document for future revisions is coordinated only with the suggested 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: Defense Supply Center, Columbus, ATTN: DSCC/VAT, Post Office Box 3990, Columbus, OH 43218-3990 or emailed to [capacitorfilter@dsc.dla.mil](mailto:capacitorfilter@dsc.dla.mil) also by telephone (614) 692-0563 or DSN 850-0563.

6.6 Suggested sources of supply. A suggested sources of supply are listed herein. Additional sources will be added as they become available. For assistance in the use of this drawing, contact Defense Supply Center, Columbus, ATTN: DSCC-VAT, P. O. Box 3990, Columbus, OH 43216-5000, by e-mail to [capacitorfilter@dsc.dla.mil](mailto:capacitorfilter@dsc.dla.mil), or by telephone (614) 692-0563 or DSN 850-0563.

|  |                  |                                |                         |
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TABLE I. Electrical characteristics.

| DSCC drawing<br>89012-           | $\mu\text{F}$ | Maximum ESR at<br>120 Hz, +25°C<br>(ohms) | Maximum rms ripple<br>current at 120 Hz,<br>+85°C (amperes) | Case<br>code |
|----------------------------------|---------------|---|---|--------------|
| 150 V dc working, 175 V dc surge |               |   |   |              |
| 01                               | 700           | 0.2983                                    | 1.56  | AA           |
| 02                               | 1,300         | 0.1611                                    | 2.47  | AB           |
| 03                               | 1,900         | 0.1117                                    | 3.34  | AC           |
| 04                               | 2,700         | 0.0799                                    | 4.41  | BB           |
| 05                               | 4,100         | 0.0536                                    | 6.00  | BC           |
| 06                               | 6,100         | 0.0371                                    | 8.20  | BF           |
| 07                               | 8,200         | 0.0319                                    | 9.31  | CD           |
| 08                               | 10,000        | 0.0263                                    | 11.09   | CF           |
| 09                               | 15,000        | 0.0221                                    | 13.50   | DF           |
| 10                               | 25,000        | 0.0145                                    | 19.87   | DJ           |
| 200 V dc working, 250 V dc surge |               |   |   |              |
| 11                               | 470           | 0.3398                                    | 1.46  | AA           |
| 12                               | 930           | 0.1739                                    | 2.38  | AB           |
| 13                               | 1,300         | 0.1251                                    | 3.15  | AC           |
| 14                               | 1,800         | 0.0915                                    | 4.12  | BB           |
| 15                               | 2,800         | 0.0600                                    | 5.67  | BC           |
| 16                               | 4,200         | 0.0410                                    | 7.80  | BF           |
| 17                               | 5,600         | 0.0350                                    | 8.89  | CD           |
| 18                               | 7,200         | 0.0280                                    | 10.75   | CF           |
| 19                               | 10,000        | 0.0238                                    | 13.01   | DF           |
| 20                               | 18,000        | 0.0153                                    | 19.34   | DJ           |
| 250 V dc working, 300 V dc surge |               |   |   |              |
| 21                               | 340           | 0.4508                                    | 1.27  | AA           |
| 22                               | 680           | 0.2260                                    | 2.09  | AB           |
| 23                               | 990           | 0.1565                                    | 2.82  | AC           |
| 24                               | 1,300         | 0.1196                                    | 3.60  | BB           |
| 25                               | 2,000         | 0.0787                                    | 4.95  | BC           |
| 26                               | 3,000         | 0.0535                                    | 6.83  | BF           |
| 27                               | 4,100         | 0.0430                                    | 8.02  | CD           |
| 28                               | 5,300         | 0.0340                                    | 9.76  | CF           |
| 29                               | 7,800         | 0.0268                                    | 12.26   | DF           |
| 30                               | 12,000        | 0.0175                                    | 18.08   | DJ           |

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TABLE I. Electrical characteristics - Continued.

| DSCC drawing<br>89012-           | $\mu\text{F}$ | Maximum ESR at<br>120 Hz, +25°C<br>(ohms) | Maximum rms ripple<br>current at 120 Hz,<br>+85°C (amperes) | Case<br>code |
|----------------------------------|---------------|---|---|--------------|
| 350 V dc working, 400 V dc surge |               |   |   |              |
| 31                               | 160           | 0.7841                                    | 0.96  | AA           |
| 32                               | 320           | 0.3893                                    | 1.59  | AB           |
| 33                               | 470           | 0.2659                                    | 2.16  | AC           |
| 34                               | 660           | 0.1914                                    | 2.85  | BB           |
| 35                               | 990           | 0.1281                                    | 3.88  | BC           |
| 52                               | 1,100         | 0.1520                                    | 4.08  | CC           |
| 36                               | 1,400         | 0.0911                                    | 5.23  | BF           |
| 37                               | 1,900         | 0.0712                                    | 6.23  | CD           |
| 38                               | 2,500         | 0.0550                                    | 7.67  | CF           |
| 39                               | 3,700         | 0.0412                                    | 9.88  | DF           |
| 40                               | 6,100         | 0.0259                                    | 14.86   | DJ           |
| 450 V dc working, 525 V dc surge |               |   |   |              |
| 41                               | 99            | 1.3113                                    | 0.74  | AA           |
| 42                               | 190           | 0.6760                                    | 1.20  | AB           |
| 43                               | 270           | 0.4752                                    | 1.62  | AC           |
| 44                               | 380           | 0.3408                                    | 2.13  | BB           |
| 45                               | 570           | 0.2271                                    | 2.91  | BC           |
| 46                               | 860           | 0.1512                                    | 4.06  | BF           |
| 47                               | 1,100         | 0.1219                                    | 4.76  | CD           |
| 48                               | 1,400         | 0.0963                                    | 5.80  | CF           |
| 49                               | 2,000         | 0.0710                                    | 7.53  | DF           |
| 50                               | 2,200         | 0.0656                                    | 7.84  | DF           |
| 51                               | 3,500         | 0.0412                                    | 11.48   | DJ           |



TABLE II. Similar vendor types.

| DSCC<br>drawing<br>89012- | Similar <u>1/</u><br>vendor type | DSCC<br>drawing<br>89012- | Similar <u>1/</u><br>vendor type |
|---------------------------|----------------------------------|---------------------------|----------------------------------|
| 01                        | 36DX701F150AA2A                  | 27                        | 36DX412F250CD2A                  |
| 02                        | 36DX132F150AB2A                  | 28                        | 36DX532F250CF2A                  |
| 03                        | 36DX192F150AC2A                  | 29                        | 36DX782F250DF2A                  |
| 04                        | 36DX272F150BB2A                  | 30                        | 36DX123F250DJ2A                  |
| 05                        | 36DX412F150BC2A                  | 31                        | 36DX161F350AA2A                  |
| 06                        | 36DX612F150BF2A                  | 32                        | 36DX321F350AB2A                  |
| 07                        | 36DX822F150CD2A                  | 33                        | 36DX471F350AC2A                  |
| 08                        | 36DX103F150CF2A                  | 34                        | 36DX661F350BB2A                  |
| 09                        | 36DX153F150DF2A                  | 35                        | 36DX991F350BC2A                  |
| 10                        | 36DX253F150DJ2A                  | 52                        | 36DX11588                        |
| 11                        | 36DX471F200AA2A                  | 36                        | 36DX142F350BF2A                  |
| 12                        | 36DX931F200AB2A                  | 37                        | 36DX192F350CD2A                  |
| 13                        | 36DX132F200AC2A                  | 38                        | 36DX252F350CF2A                  |
| 14                        | 36DX182F200BB2A                  | 39                        | 36DX372F350DF2A                  |
| 15                        | 36DX282F200BC2A                  | 40                        | 36DX612F350DJ2A                  |
| 16                        | 36DX422F200BF2A                  | 41                        | 36DX990F450AA2A                  |
| 17                        | 36DX562F200CD2A                  | 42                        | 36DX191F450AB2A                  |
| 18                        | 36DX722F200CF2A                  | 43                        | 36DX271F450AC2A                  |
| 19                        | 36DX103F200DF2A                  | 44                        | 36DX381F450BB2A                  |
| 20                        | 36DX183F200DJ2A                  | 45                        | 36DX571F450BC2A                  |
| 21                        | 36DX341F250AA2A                  | 46                        | 36DX861F450BF2A                  |
| 22                        | 36DX681F250AB2A                  | 47                        | 36DX112F450CD2A                  |
| 23                        | 36DX991F250AC2A                  | 48                        | 36DX142F450CF2A                  |
| 24                        | 36DX132F250BB2A                  | 49                        | 36DX202F450DF2A                  |
| 25                        | 36DX202F250BC2A                  | 50                        | 36DX222F450DF2A                  |
| 26                        | 36DX302F250BF2A                  | 51                        | 36DX352F450DJ2A                  |

1/ Caution. Do not use this number for item acquisition and marking. The similar vendor type may not satisfy the performance requirements of this drawing.

Vendor CAGE  
number

7M138

Vendor name  
and address

United Chemi-Con  
185 McNeil Road  
Lansing, NC 28643-8301

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