

REVISIONS																			
LTR	DESCRIPTION										DATE (YR-MO-DA)				APPROVED				
H	Update document to current MIL-H-38534 requirements. Editorial changes throughout.										92-05-20				G. A. Lude				
J	Changes in accordance with NOR 5962-R126-94.										94-03-29				K. A. Cottongim				
K	Add vendor CAGE 51651. Change to table 1 and figure 1.										98-06-22				K. A. Cottongim				
L	Update drawing boilerplate.										04-02-23				Raymond Monnin				
M	Table I, Rise time test, conditions column, correct $R_s = 100\text{ k}\Omega$ to $R_s = 100\text{ }\Omega$.										06-02-09				Raymond Monnin				
N	Add class K, device type 02, and Radiation Hardness Assurance (RHA) requirements. -gz										10-06-28				Charles F. Saffle				
P	1.5, remove "≥" from maximum total dose. Table I, I_{IO} test limits for device type 02, RHA level R, correct $\pm 25\text{ }\mu\text{A}$ to $\pm 30\text{ }\mu\text{A}$. -gz										11-11-07				Charles F. Saffle				
R	Update drawing to the latest requirements of MIL-PRF-38534. -gc										18-08-02				Charles F. Saffle				

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.



CURRENT CAGE CODE 67268

REV																			
SHEET																			
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REV STATUS	REV			R	R	R	R	R	R	R	R	R	R	R	R	R			
OF SHEETS	SHEET			1	2	3	4	5	6	7	8	9	10	11					

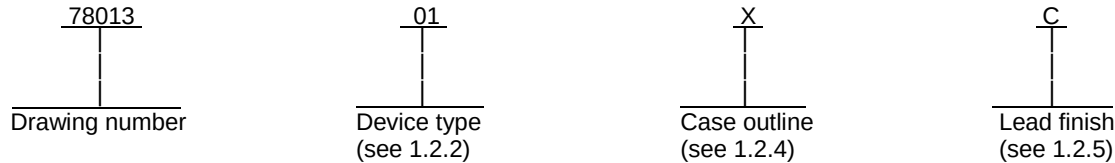
PMIC N/A	PREPARED BY Joan M. Fisher	DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.dla.mil/landandmaritime																	
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY C. R. Jackson																		
	APPROVED BY N. A. Hauck																		
	DRAWING APPROVAL DATE 79-01-17																		
		MICROCIRCUIT, HYBRID, LINEAR, HIGH CURRENT AMPLIFIER, THICK/THIN FILM																	
		SIZE A	CAGE CODE 14933	78013															
		SHEET 1 OF 11																	

1. SCOPE

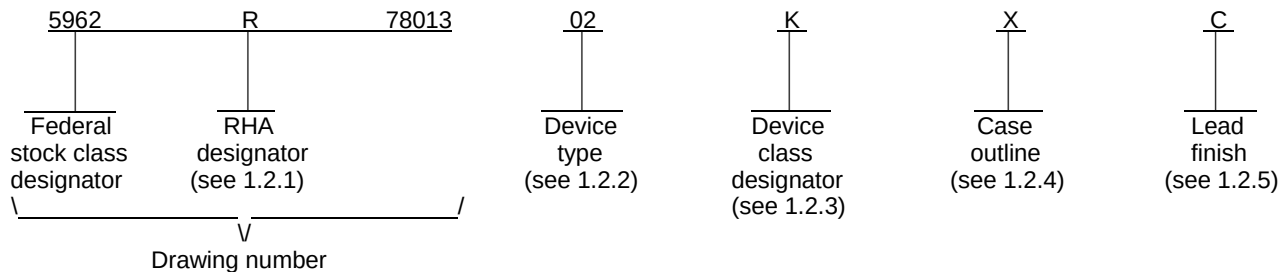
1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN is as shown in the following example:

For class H devices:



For classes H and K radiation hardened devices:



1.2.1 Radiation hardness assurance (RHA) designator. Device classes H and K RHA marked devices meet the MIL-PRF-38534 specified RHA levels and are marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device types. The device types identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	0002, MSK 0002H	Current amplifier
02	MSK 0002RH	Current amplifier

1.2.3 Device class designator. This device class designator is a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

<u>Device class</u>	<u>Device performance documentation</u>
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).

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- E Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
- D Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

1.2.4 Case outlines. The case outlines is as designated in MIL-STD-1835 and as follows: 1/

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
G	MACY1-X8	8	Can
X	See figure 1	8	Can

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 2/

Supply voltage (Vs)	±22 V dc
Input voltage range	±22 V dc
Storage temperature range	-65°C to +150°C
Power dissipation (Pd), TA = +25°C	600 mW <u>3/</u>
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θJC)	40°C/W
Junction temperature (Tj)	+175°C

1.4 Recommended operating conditions.

Ambient operating temperature range (TA)	-55°C to +125°C
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1.5 Radiation features.

Maximum total dose available:	
Device type 02	100 krad(Si) <u>4/</u> <u>5/</u>

- 1/ Use 7801301XX to replace older devices marked 7801301GX (date codes prior to 30 August 1985) for applications requiring the case outline described on figure 1 herein.
- 2/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
- 3/ No heat sink.
- 4/ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end-point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A. Dose rate shall be in accordance with MIL-STD-883, method 1019, condition A.
- 5/ Bipolar device types may degrade from displacement damage from radiation which could affect RHA levels. These device types have not been characterized for displacement damage.

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2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing 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-38534 - Hybrid Microcircuits, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.

MIL-STD-1835 - Interface Standard for Electronic Component Case Outlines.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.

MIL-HDBK-780 - Standard Microcircuit Drawings.

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

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 shall include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outlines. The case outlines shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking of devices. Marking of devices shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DLA Land and Maritime-VA) upon request.

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3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DLA Land and Maritime-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Pre-seal burn-in test, method 1030 of MIL-STD-883. (optional for class H)

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1030 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

c. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/ 2/ 3/</u> $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
DC input offset current	I_{IO}	$R_S = 10\text{ k}\Omega$, $R_L = 1.0\text{ k}\Omega$	1,2,3	01	-10	+10	μA
			1	02	-15	+15	
			2,3		-20	+20	
			M,D,P,L,R <u>2/</u>	02	-30	+30	
DC input offset voltage	V_{IO}	$R_S = 300\text{ }\Omega$, $R_L = 1.0\text{ k}\Omega$	1,2,3	01,02	-30	+30	mV
Output voltage swing	V_O	$V_{IN} = \pm 12\text{ V}$, $R_L = 1.0\text{ k}\Omega$, $T_A = +25^{\circ}\text{C}$	4	01,02	± 10		V
		$V_{IN} = \pm 10\text{ V}$, $R_L = 100\Omega$, $V_S = \pm 15\text{ V}$, $T_A = +25^{\circ}\text{C}$			± 9.5		
		M,D,P,L,R <u>2/</u>	4	02	± 8.4		
Supply currents	$+I_{CC}$	$R_S = 10\text{ k}\Omega$, $R_L = 1.0\text{ k}\Omega$ $V_{IN} = 0\text{ V}$, $T_A = +25^{\circ}\text{C}$	1	01,02		+10.0	mA
	$-I_{CC}$				-10.0		
Voltage gain	A_V	$V_{IN} = 3.0\text{ Vp-p}$, $R_S = 10\text{ k}\Omega$, $R_L = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$	4,5,6 <u>4/</u>	01,02	0.95		V/V
		M,D,P,L,R <u>2/</u>	4	02	0.90		
Input impedance <u>5/</u>	Z_{IN}	$V_{IN} = 1.0\text{ V rms}$, $R_S = 200\text{ k}\Omega$, $R_L = 1.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $T_A = +25^{\circ}\text{C}$	4	01,02	180		$\text{k}\Omega$
Output impedance <u>5/</u>	Z_{OUT}	$V_{IN} = 1.0\text{ V rms}$, $R_S = 10\text{ k}\Omega$, $R_L = 50\text{ }\Omega$, $f = 1.0\text{ kHz}$, $T_A = +25^{\circ}\text{C}$	4	01,02		10	Ω
Rise time	t_r	$V_{OUT} = 2.5\text{ Vp-p}$, $R_S = 100\text{ }\Omega$, $R_L = 50\text{ }\Omega$, $T_A = +25^{\circ}\text{C}$	4	01,02		12	ns

See footnotes on the next page.

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TABLE I. Electrical performance characteristics.

- 1/ $V_S = \pm 12 \text{ V}$, unless otherwise specified.
- 2/ Device type 02 has been characterized through all levels M, D, P, L, and R of irradiation. However, device type 02 is tested at 1.5 times the R level. Pre and post irradiation values are identical unless otherwise specified in table I. When performing post irradiation electrical measurements for any RHA level, $T_C = +25^\circ\text{C}$.
- 3/ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end-point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A.
- 4/ Subgroups 5 and 6 shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to the limits specified for subgroups 5 and 6 for all lots not specifically tested.
- 5/ Parameter and limits specified shall be guaranteed, but not tested.

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Case outline X.

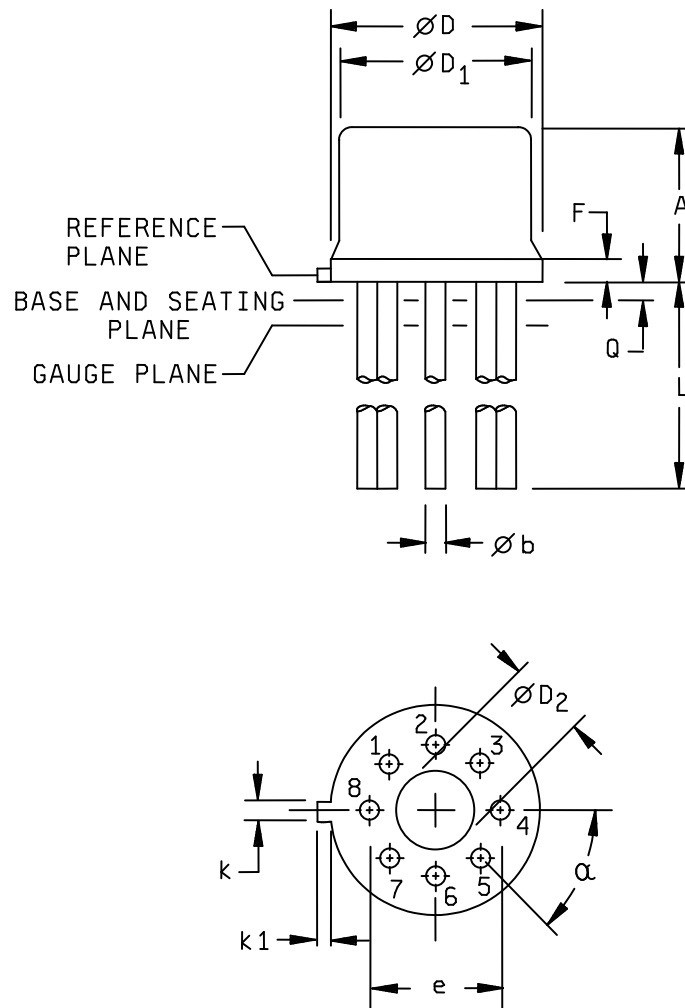


FIGURE 1. Case outline.

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Case outline X - Continued.

Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.155	.185	3.94	4.70	4
Øb	.015	.019	0.38	0.48	
ØD	.335	.370	8.51	9.40	
ØD ₁	.305	.335	7.75	8.51	
ØD ₂	.110	.160	2.79	4.06	5
e	.230 BSC		5.84 BSC		
F	---	.040	---	1.02	6
k	.027	.034	0.69	0.86	
k ₁	.027	.045	0.69	1.14	
L	.500	.750	12.70	19.05	
Q	---	.050	---	1.27	5
α	45° BSC		45° BSC		

NOTES:

1. Dimensions are in inches
2. Metric equivalents are given for general information only.
3. The product may be measured by direct methods or by gauge.
4. All leads: Increase maximum limit by .003 inch (0.08 mm) when lead finish A is applied.
5. Optional base and seating plane.
6. Measured from the maximum diameter of the product.

FIGURE 1. Case outline - Continued.

Device types	01 and 02
Case outlines	G and X
Terminal number	Terminal symbol
1	V ₁ +
2	V ₂ +
3	E ₃
4	Output
5	E ₄
6	V ₂ -
7	V ₁ -
8	Input

FIGURE 2. Terminal connections.

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TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	---
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4
Group C end-point electrical parameters	1, 2, 3, 4
End-point electrical parameters for Radiation Hardness Assurance (RHA) devices	1

* PDA applies to subgroup 1.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

- a. Tests shall be as specified in table II herein.
- b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test, method 1005 of MIL-STD-883.
 - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.
 - (2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

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4.3.5 Radiation Hardness Assurance (RHA) inspection. RHA qualification is required for those devices with the RHA designator as specified herein. End-point electrical parameters for radiation hardness assurance (RHA) devices shall be specified in table II. Radiation testing will be in accordance with the qualifying activity (DLA Land and Maritime-VQ) approved plan and with MIL-PRF-38534, Appendix G.

4.3.5.1 Total dose irradiation testing. Total dose irradiation testing shall be in accordance with MIL-STD-883 method 1019, condition A and as specified herein. Sample testing in accordance with table I shall be performed on the device type at initial qualification and after any design or process changes which may affect the RHA response. Sample size is a minimum of 8 devices (4 biased and 4 not biased). This sample testing is repeated for each new combination for wafers of active elements .

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users should inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD. DLA Land and Maritime will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DLA Land and Maritime-VA, telephone (614) 692-8108.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-1081.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 18-08-02

Approved sources of supply for SMD 78013 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime -VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534. DLA Land and Maritime maintains an online database of all current sources of supply <https://landandmaritimeapps.dla.mil/programs/Smcr/>.

Standard microcircuit drawing PIN <u>1</u> /	Vendor CAGE number	Vendor similar PIN <u>2</u> /
7801301GA	<u>3</u> /	CTS0002 (GEN)
7801301XA 7801301XC	13409 13409	SEN-0002H SEN-0002H
7801301XA	27851	FLH0002H/883
7801301XA 7801301XC	<u>3</u> / 31597	MSK 0002H MSK 0002H
5962R7801302HXA 5962R7801302HXC	<u>3</u> / 31597	MSK 0002HRH MSK 0002HRH
5962R7801302KXA 5962R7801302KXC	<u>3</u> / 31597	MSK 0002KRH MSK 0002KRH

- 1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.
- 2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- 3/ Not available from an approved source of supply.

Vendor CAGE
numberVendor name
and address

13409

Sensitron Semiconductor
221 West Industry Court
Deer Park, NY 11729

27851

Spectrum Microwave, Inc.
400 Nickerson Rd.
Marlborough, MA 01752

31597

Anaren Microwave Inc.
6635 Kirkville Road
East Syracuse, NY 13057

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