

**REVISIONS**

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Remove vendor CAGE 13919. Add device type 02. Add vendors CAGE 31757 and 60024. Change to reflect MIL-H-38534 processing. Editorial changes throughout.	91-09-13	Tim H. Noh
B	Table I, device type 01, correct output voltage peak and output current peak tests.	00-01-11	Raymond Monnin
C	Drawing updated to reflect current requirements. -sld	02-12-16	Raymond Monnin
D	Figure 1, case outline X, dimension C, delete 0.260" minimum and change 0.300" maximum to 0.340" maximum.	03-09-25	Raymond Monnin
E	Table I, input offset current, device type 01, subgroup 2, change min/max limits from $\pm 7$ nA to $\pm 15$ nA. Table I, current limits, device type 02, change test conditions to $\pm V_{CC} = \pm 14$ V dc, $\pm R_{CL} = 1 \Omega$ , $R_L = 6 \Omega$ and change min/max limits to 0.6 A / 0.89 A. Table II, add note to Group C end-point test parameters. -gz	09-07-27	Charles F. Saffle
F	Updated drawing to the latest requirements of MIL-PRF-38534. -sld	14-12-15	Charles F. Saffle

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																			
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REV																			
SHEET																			
REV STATUS OF SHEETS	REV SHEET	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F			
PMIC N/A	PREPARED BY Donald R. Osborne	<p align="center"><b>DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990</b>  <a href="http://www.landandmaritime.dla.mil/">http://www.landandmaritime.dla.mil/</a></p>																	
<b>STANDARD MICROCIRCUIT DRAWING</b>	CHECKED BY D. A. Di Cenzo																		
THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE	APPROVED BY N. A. Hauck	<p align="center"><b>MICROCIRCUIT, HYBRID, LINEAR, HIGH POWER OPERATIONAL AMPLIFIER</b></p>																	
	DRAWING APPROVAL DATE  87-09-16																		
AMSC N/A	REVISION LEVEL F	SIZE <b>A</b>	CAGE CODE <b>67268</b>	<b>5962-87620</b>															
		SHEET		1 OF 12															

1. SCOPE

1.1 Scope. This drawing documents one product assurance class, class H (high reliability) and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN).

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Device type(s). The device type(s) identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	42106, PA51M-1/883	High power operational amplifier
02	42106-1, PA51M/883	High power operational amplifier

1.2.2 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
X	See figure 1	8	Flange mount
Y	See figure 1	8	Flange mount

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

1.3 Absolute maximum ratings.

Supply voltage range .....	±40 V dc maximum
Differential input voltage .....	±V <sub>CC</sub> - 3 V
Common mode input .....	±V <sub>CC</sub>
Maximum power dissipation (P <sub>D</sub> ):	
Device type 01 .....	80 W <u>1/</u>
Device type 02 .....	97 W <u>2/</u>
Thermal resistance, junction-to-case (θ <sub>JC</sub> ):	
Device type 01 .....	2.2°C/W
Device type 02 .....	1.8°C/W
Junction temperature (T <sub>J</sub> ) .....	+200°C
Lead temperature (soldering, 10 seconds) .....	+300°C
Storage temperature range .....	-65°C to +150°C

1.4 Recommended operating conditions.

Supply voltage (±V <sub>CC</sub> ) .....	±34 V dc
Operating temperature range:	
Device type 01 (T <sub>A</sub> ) .....	-55°C to +125°C
Device type 02 (T <sub>C</sub> ) .....	-55°C to +125°C

1/ At ambient temperature of +25°C, derate at 2.2°C/W above ambient temperature of +25°C.  
2/ At case temperature of +25°C, derate at 1.8°C/W above case temperature of +25°C.

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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/> 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 drawing and the references cited herein, the text of this drawing 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 performance requirements for device class H shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 may include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for 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 1.2.2 herein and on figure 1.

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

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.

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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.

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

- (1) Test condition B 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)  $T_A = +125^{\circ}\text{C}$  minimum for device type 01 and  $T_C = +125^{\circ}\text{C}$  minimum for device type 02 as specified in accordance with table I of method 1015 of MIL-STD-883..

b. 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 -55°C ≤ T <sub>A</sub> ≤ +125°C ±V <sub>CC</sub> = ±34 V dc unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V <sub>IO</sub>	T <sub>A</sub> = +25°C	1	01	-5	+5	mV
Input offset voltage drift	DV <sub>IO</sub>	T <sub>A</sub> = -55°C and +125°C	2, 3	01	-40	+40	μV/°C
Input bias current	I <sub>IB</sub>		1	01	-20	+20	nA
			2, 3		-35	+35	
Input offset current	I <sub>IO</sub>		1	01	-3	+3	nA
			2		-15	+15	
			3		-7	+7	
Power supply rejection ratio	+PSRR	-V <sub>CC</sub> = -34 V dc, +V <sub>CC</sub> = +10 V to +40 V dc	1	01	-100	+100	μV/V
			2, 3		-200	+200	
	-PSRR	+V <sub>CC</sub> = +34 V dc, -V <sub>CC</sub> = -10 V to -40 V dc	1		-100	+100	
			2, 3		-200	+200	
Common mode rejection ratio	CMRR	V <sub>CM</sub> = ±22 V, f = dc	1	01	80		dB
			2, 3		76		
Supply current	I <sub>CC</sub>	V <sub>CM</sub> = 0 V, no load condition	1, 2, 3	01	-10	+10	mA
Output voltage peak	V <sub>OP</sub>	I <sub>O</sub> = 10 A peak	4	01		-26	V
		I <sub>O</sub> = 10 A peak	4		26		
		R <sub>L</sub> = 10 kΩ	5, 6			-30	
		R <sub>L</sub> = 10 kΩ	5, 6		30		
Output current peak	I <sub>OP</sub>	R <sub>L</sub> = 2.6 Ω, T <sub>A</sub> = +25°C	4	01	10		A
Voltage gain	A <sub>VS</sub>	R <sub>L</sub> = 10 kΩ	4, 5, 6	01	94		dB
Slew rate	SR	R <sub>L</sub> = 6.5 Ω, T <sub>A</sub> = +25°C	4	01	1.35		V/μs

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T <sub>C</sub> ≤ +125°C ±V <sub>CC</sub> = ±34 V dc unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Supply current	I <sub>S</sub>	V <sub>IN</sub> = 0 V dc, G = 100, <u>2/</u> ±R <sub>CL</sub> = 0.1 Ω, V <sub>CM</sub> = 0 V dc	1, 3	02		10	mA
			2			13	
Input offset voltage	V <sub>OS</sub>	V <sub>IN</sub> = 0 V dc, G = 100, <u>2/</u> ±R <sub>CL</sub> = 0.1 Ω, ±V <sub>CC</sub> = ±10 V dc	1	02	-16.0	+16.0	mV
			2		-22.5	+22.5	
			3		-21.2	+21.2	
			1		-10.0	+10.0	
			2		-16.5	+16.5	
			3		-15.2	+15.2	
		V <sub>IN</sub> = 0 V dc, G = 100, <u>2/</u> ±R <sub>CL</sub> = 0.1 Ω, ±V <sub>CC</sub> = ±34 V dc	1	-11.2	+11.2		
			2	-17.7	+17.7		
			3	-16.7	+16.7		
			1	-11.2	+11.2		
			2	-17.7	+17.7		
			3	-16.7	+16.7		
Input bias current (+IN)	+I <sub>S</sub>	V <sub>IN</sub> = 0 V dc, R <sub>BIAS</sub> ≤ 100 MΩ	1	02		40.0	nA
			2, 3			80.0	
Input bias current (-IN)	-I <sub>S</sub>	V <sub>IN</sub> = 0 V dc, R <sub>BIAS</sub> ≤ 100 MΩ	1	02		40.0	nA
			2, 3			80.0	
Input offset current	I <sub>OS</sub>	V <sub>IN</sub> = 0 V dc, R <sub>BIAS</sub> ≤ 100 MΩ	1	02		10.0	nA
			2, 3			30.0	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T <sub>C</sub> ≤ +125°C ±V <sub>CC</sub> = ±34 V dc unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage	V <sub>O</sub>	±V <sub>CC</sub> = ±40 V dc, I <sub>O</sub> = 68 mA, R <sub>L</sub> = 500 Ω	4, 5, 6	02	34		V
		±V <sub>CC</sub> = ±34 V dc, I <sub>O</sub> = 4 A, R <sub>L</sub> = 6 Ω	4, 5, 6		24		
		±V <sub>CC</sub> = ±18 V dc, I <sub>O</sub> = 10 A, R <sub>L</sub> = 1 Ω, T <sub>C</sub> = +25°C and -55°C	4, 6		10		
		±V <sub>CC</sub> = ±16 V dc, I <sub>O</sub> = 8 A, R <sub>L</sub> = 1 Ω, T <sub>C</sub> = +125°C	5		8		
Current limits	I <sub>CL</sub>	±V <sub>CC</sub> = 14 V dc, ±R <sub>CL</sub> = 1 Ω, R <sub>L</sub> = 6 Ω, T <sub>C</sub> = +25°C <u>2/</u>	4	02	0.6	0.89	A
Stability/noise	E <sub>N</sub>	±V <sub>CC</sub> = ±34 V dc, C <sub>L</sub> = 1.5 nF, G = 1	4, 5, 6	02		1.0	mV
Slew rate	S <sub>R</sub>	±V <sub>CC</sub> = ±34 V dc, V <sub>IN</sub> ≥ 4 Vp-p, R <sub>L</sub> = 500 Ω	4, 5, 6	02	1.0	10	V/μs
Open loop gain	A <sub>OL</sub>	±V <sub>CC</sub> = ±34 V dc, V <sub>IN</sub> ≥ 4 Vp-p, R <sub>L</sub> = 500 Ω, f = 15 Hz	4, 5, 6	02	91		dB
Common mode rejection	CMR	±V <sub>CC</sub> = ±15 V dc, V <sub>CM</sub> = ±9 V dc, +f = dc	4, 5, 6	02	70		dB

1/ During all group A testing, terminal connection F. O. (pin 7) is left open.

2/ A current limiting resistor (R<sub>CL</sub>) is connected between C<sub>L</sub>+ to the output and C<sub>L</sub>- to the output during these tests.

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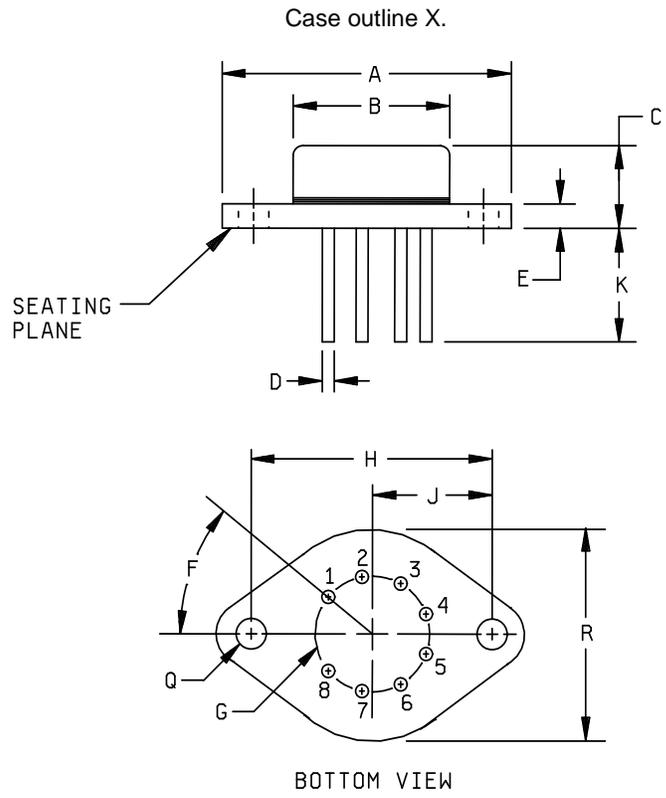
DLA LAND AND MARITIME  
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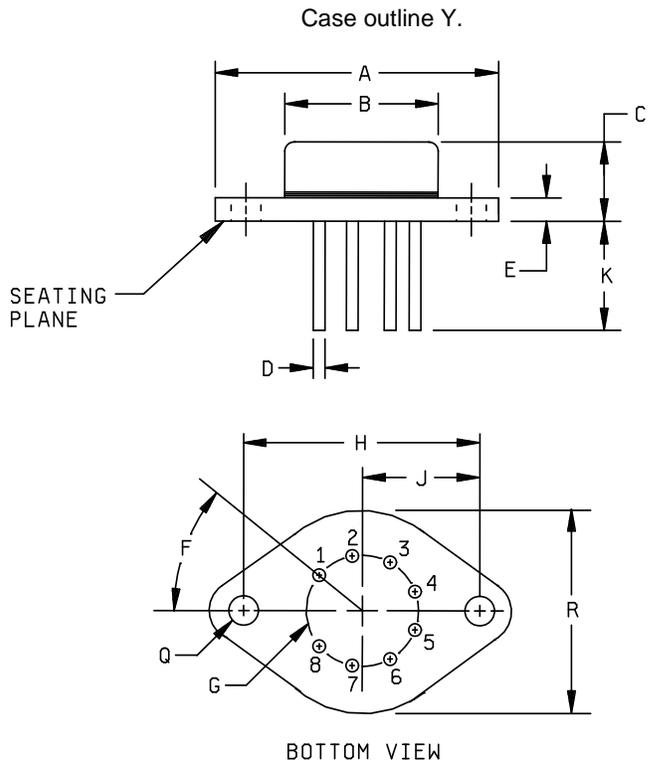
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	1.510	1.550	38.35	39.37
B	.745	.770	18.92	19.56
C		.340		8.64
D	0.038	.042	.97	1.07
E	0.080	.105	2.03	2.67
F	40° BSC		40° BSC	
G	.500 BSC		12.7 BSC	
H	1.186 BSC		30.12 BSC	
J	.593 BSC		15.06 BSC	
K	.400	.500	10.16	12.70
Q	.151	.161	3.84	4.09
R	.980	1.020	24.89	25.91

NOTES:

1. Leads in true position within .010 inch (0.25 mm) R at MMC at seating plane.
2. The U. S. preferred system of measurement is the metric SI. This case outline was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound shall take precedence.
3. Pin numbers are for reference and may not be marked on package.

FIGURE 1. Case outlines.

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Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	1.510	1.550	38.35	39.37
B	.745	.770	18.92	19.56
C	.225	.250	5.71	6.35
D	.038	.042	.97	1.07
E	.080	.105	2.03	2.67
F	40° BSC		40° BSC	
G	.500 BSC		12.7 BSC	
H	1.186 BSC		30.12 BSC	
J	.593 BSC		15.06 BSC	
K	.400	.500	10.16	12.70
Q	.151	.161	3.84	4.09
R	.980	1.020	24.89	25.91

**NOTES:**

1. Leads in true position within .010 inch (0.25 mm) R at MMC at seating plane.
2. The U. S. preferred system of measurement is the metric SI. This case outline was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound shall take precedence.
3. Pin numbers are for reference and may not be marked on package.

FIGURE 1. Case outlines - Continued.

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Device types	01 and 02
Case outlines	X and Y
Terminal number	Terminal symbol
1	Output
2	+Current limit ( $C_{L+}$ )
3	+ $V_{CC}$
4	+IN
5	-IN
6	- $V_{CC}$
7	No connection
8	-Current limit ( $C_{L-}$ )

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	1
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters <u>1/</u>	1, 2, 3
End-point electrical parameters for Radiation Hardness Assurance (RHA) devices	Not applicable

\* PDA applies to subgroup 1.

1/ As a minimum, for all Group C testing performed after July 27, 2009 manufacturers shall perform subgroups 1, 2, and 3 from the Group A electrical test table (Table C-Xa of MIL-PRF-38534).

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 B 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)  $T_A = +125^\circ\text{C}$  minimum for device type 01 and  $T_C = +125^\circ\text{C}$  minimum for device type 02 as specified in accordance with table I of method 1015 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 inspection is not currently applicable to this drawing.

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 shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD to that system. 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: 14-12-15

Approved sources of supply for SMD 5962-87620 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 at <http://www.landandmaritime.dla.mil/Programs/Smcr/>.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962-8762001XA 5962-8762001XC 5962-8762001YA	31757 31757 60024	42106 42106 PA51M-1/883
5962-8762002XA 5962-8762002XC 5962-8762002YA	31757 31757 60024	42106-1 42106-1 PA51M/883

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 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.

Vendor CAGE  
number

Vendor name  
and address

31757

Micropac Industries, Incorporated  
905 East Walnut Street  
Garland, TX 75040-6611

60024

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