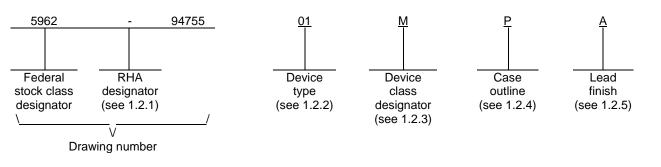
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1. SCOPE

1.1 <u>Scope</u>. This drawing documents two product assurance class levels consisting of high reliability (device classes Q and M) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of Radiation Hardness Assurance (RHA) levels is reflected in the PIN.

1.2 <u>PIN</u>. The PIN is as shown in the following example:



1.2.1 <u>RHA designator</u>. Device classes Q and V RHA marked devices meet the MIL-PRF-38535 specified RHA levels and are marked with the appropriate RHA designator. Device class M RHA marked devices meet the MIL-PRF-38535, appendix A specified RHA levels and are marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 <u>Device types</u>. The device types identify the circuit function as follows:

Device type	Generic number	Circuit function
01	AD7893-10	12-bit serial 6 μs A/D converter
02	AD7893-2	12-bit serial 6 μs A/D converter

1.2.3 <u>Device class designator</u>. The device class designator is a single letter identifying the product assurance level as follows:

Device class	Device requirements documentation
Μ	Vendor self-certification to the requirements for MIL-STD-883 compliant, non- JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A
Q or V	Certification and qualification to MIL-PRF-38535

1.2.4 <u>Case outline</u>. The case outline are as designated in MIL-STD-1835 as follows:

Outline letter	Descriptive designator	<u>Terminals</u>	Package style
Р	GDIP1-T8 or CDIP2-T8	8	Dual-in-line

1.2.5 <u>Lead finish</u>. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990		REVISION LEVEL C	SHEET 2

1.3 Absolute maximum ratings. 1/

V _{DD} to AGND V _{DD} to DGND	
Analog input voltage to AGND :	
Device type 01 Device type 02	
Reference input voltage to AGND	-0.3 V dc to V _{DD} + 0.3 V dc
Digital input voltage to DGND	-0.3 V dc to V _{DD} + 0.3 V dc
Digital output voltage to DGND	-0.3 V dc to V _{DD} + 0.3 V dc
Power dissipation (P _D)	450 mW
Storage temperature range	$\text{-}65^{\circ}C \leq T_A \leq \text{+}150^{\circ}C$
Junction temperature (T _J)	+150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA})	125°C/W

1.4 <u>Recommended operating conditions</u>.

Input voltage range (V _{IN})	±10 V dc
REF IN input voltage range	+2.375 V \leq V_{REF} \leq 2.625 V
Ambient operating temperature range (T _A)	$-55^{\circ}C \leq T_A \leq +125^{\circ}C$

2. APPLICABLE DOCUMENTS

2.1 <u>Government specification, standards, and handbooks</u>. 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-38535 - Integrated Circuits, Manufacturing, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits. MIL-STD-1835 - Interface Standard 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 <u>https://assist.dla.mil/quicksearch/</u> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 <u>Order of precedence</u>. 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.

1/ 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.

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	3

3. REQUIREMENTS

3.1 <u>Item requirements</u>. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 as specified herein, 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. The individual item requirements for device class M shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein.

3.2 <u>Design, construction, and physical dimensions</u>. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein for device classes Q and V or MIL-PRF-38535, appendix A and herein for device class M.

3.2.1 Case outline. The case outline shall be in accordance with 1.2.4 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.3 Input/output code table. The input/output code table shall be as specified on figure 2.

3.3 <u>Electrical performance characteristics and postirradiation parameter limits</u>. Unless otherwise specified herein, the electrical performance characteristics and postirradiation parameter limits are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 <u>Electrical test requirements</u>. 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 <u>Marking</u>. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device. For RHA product using this option, the RHA designator shall still be marked. Marking for device classes Q and V shall be in accordance with MIL-PRF-38535. Marking for device class M shall be in accordance with MIL-PRF-38535, appendix A.

3.5.1 <u>Certification/compliance mark</u>. The certification mark for device classes Q and V shall be a "QML" or "Q" as required in MIL-PRF-38535. The compliance mark for device class M shall be a "C" as required in MIL-PRF-38535, appendix A.

3.6 <u>Certificate of compliance</u>. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). For device class M, a certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-HDBK-103 (see 6.6.2 herein). The certificate of compliance submitted to DLA Land and Maritime-VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and herein or for device class M, the requirements of MIL-PRF-38535, appendix A and herein.

3.7 <u>Certificate of conformance</u>. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 or for device class M in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 <u>Notification of change for device class M</u>. For device class M, notification to DLA Land and Maritime -VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change that affects this drawing.

3.9 <u>Verification and review for device class M</u>. For device class M, DLA Land and Maritime, DLA Land and Maritime's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

3.10 <u>Microcircuit group assignment for device class M</u>. Device class M devices covered by this drawing shall be in microcircuit group number 81 (see MIL-PRF-38535, appendix A).

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	4

Test	Symbol	$\begin{array}{ll} Conditions & \underline{1}/\\ -55^\circ C \leq T_A \leq +125^\circ C\\ \text{unless otherwise specified} \end{array}$	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Signal to (noise + distortion) ratio	SND	f _{IN} = 10 kHz sine wave, f _{SAMPLE} = 117 kHz, T _A = +25°C	1	All	70		dB
Total harmonic distortion	THD	f _{IN} = 10 kHz sine wave, f _{SAMPLE} = 117 kHz	1, 2, 3	All		-80	dB
Peak harmonic or spurious noise	PHN	f _{IN} = 10 kHz sine wave, f _{SAMPLE} = 117 kHz	1, 2, 3	All		-80	dB
Intermodulation distortion	IMD	2 nd and 3 rd order terms	1, 2, 3	All		-80	dB
Resolution	RES		1, 2, 3	All	12		Bits
Minimum resolution	MRES	No missing codes are guaranteed	1, 2, 3	All	12		Bits
Relative accuracy	RA		1, 2, 3	All		±1	LSB
Differential nonlinearity	DNL		1, 2, 3	All		±1	LSB
Positive full-scale error	PFSE		1, 2, 3	All		±3	LSB
Negative full-scale error	NFSE		1, 2, 3	01		±3	LSB
Unipolar offset error	UOFSE		1, 2, 3	02		±4	LSB
Bipolar zero error	BZE		1, 2, 3	01		±4	LSB
Input resistance	R _{IN}		1, 2, 3	All	16		kΩ
Reference input resistance	I _{RIN}		1, 2, 3	All		10	μA
Input capacitance	C _{IN}	See 4.4.1c, T _A = +25°C <u>2</u> /	4	All		10	pF
Input high voltage	VIHN	$V_{DD} = 5 V \pm 5\%$	1, 2, 3	All	2.4		V
Input low voltage	VINL	$V_{DD} = 5 \text{ V} \pm 5\%$	1 ,2, 3	All		0.8	V
Logic input current	I _{LIN}	$V_{IN} = 0 V$ to V_{DD}	1, 2, 3	All		±10	μA
Output high voltage	Vон	I _{SOURCE} = 200 μA	1, 2, 3	All	4.0		V
Output low voltage	V _{OL}	I _{SINK} = 1.6 mA	1, 2, 3	All		0.4	V

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME

COLUMBUS, OHIO 43218-3990

SIZE A		
	REVISION LEVEL	S

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	TADLL		<u>acteristics</u> – coi	ninueu.			
Test	Symbol	$\begin{array}{ll} Conditions & \underline{1}/\\ -55^\circ C \leq T_A \leq +125^\circ C\\ \text{unless otherwise specified} \end{array}$	Group A subgroups	Device type	Lin	nits	Unit
					Min	Max	
Conversion time	tCONV	<u>3/, 4/</u>	9, 10, 11	All		6	μS
Track / hold acquisition time until	t _{TH}	$T_A = +25^{\circ}C \frac{4}{2}$	9	All		1.5	μs
Supply current	I _{DD}		1, 2, 3	All		9	mA
CONVST pulse width	t ₁	<u>3/, 4/</u>	9, 10, 11	All	50		ns
SCLK high pulse width	t2	<u>3/, 4/</u>	9, 10, 11	All	70		ns
SCLK low pulse width	t3	<u>3/, 4/</u>	9, 10, 11	All	40		ns
Bus relinquish time after time after falling edge of SCLK	t5	<u>3</u> /, <u>4</u> /	9, 10, 11	All	10	100	ns

TABLE I. Electrical performance characteristics - continued.

<u>1</u>/ Unless otherwise specified, V_{DD} = +5 V, REF IN = +2.5 V, AGND = DGND = 0 V.

2/ Tested initially and after any design changes which may affect this parameter.

- 3/ See figure 3.
- <u>4</u>/ Guaranteed, if not tested to the limits specified in table I herein.

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	6

01, 02
Р
Terminal symbol
REF IN
VIN
AGND
SCLK
SDATA
DGND
CONVST
V _{DD}

FIGURE 1.	Terminal	connections.
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Device type 01

Analog input <u>1</u> /	Digital output code transition
+FSR/2 – 1 LSB (9.995117) 2/	011110 to 011111
+FSR/2 – 2 LSBs (9.990234)	011101 to 011110
+FSR/2 – 3 LSBs (9.985352)	011100 to 011101
AGND + 1 LSB (0.004883)	000000 to 000001
AGND (0.000000)	111111 to 000000
AGND – 1 LSB (-0.004883)	111110 to 111111
-FSR/2 + 3 LSBs (-9.985352)	100010 to 100011
-FSR/2 +2 LSBs (-9.990234)	100001 to 100010
-FSR/2 + 1 LSB (-9.995117)	100000 to 100001

Device type 02

Analog input <u>3</u> /	Digital output code transition
+FSR – 1 LSB <u>4</u> /	111110 to 111111
+FSR – 2 LSB	111101 to 111110
+FSR – 3 LSB	111100 to 111101
AGND + 3 LSB	000010 to 000011
AGND + 2 LSB	000001 to 000010
AGND + 1 LSB	000000 to 000001

NOTES:

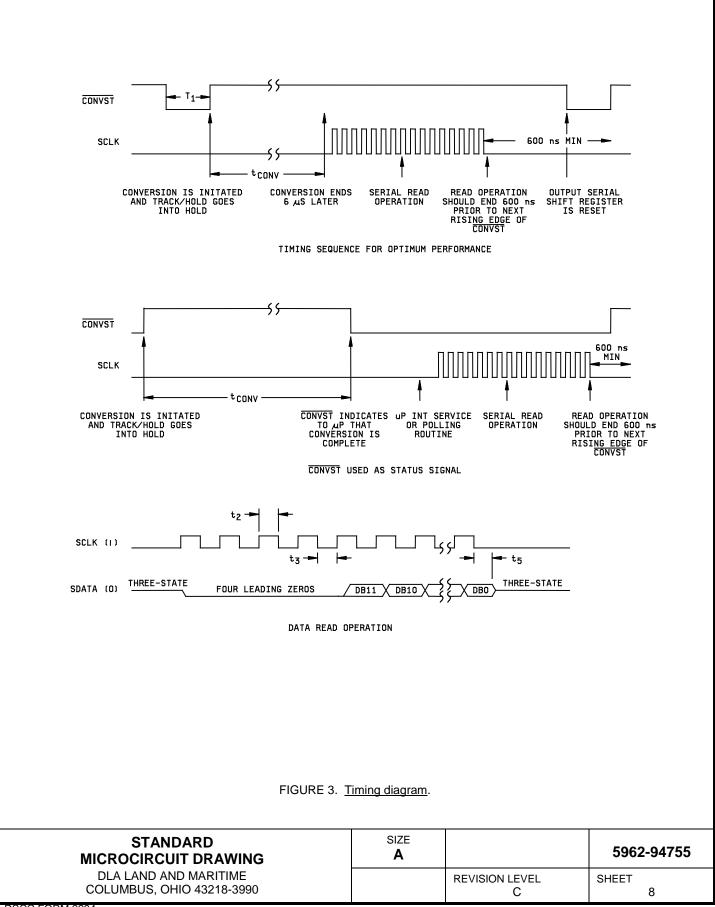
 $\underline{1}$ / FSR is full-scale range and is 20 V with REF IN = +2.5 V.

2/ 1 LSB = FSR/4096 = 4.883 mV with REF IN = +2.5 V.

 $\frac{3}{4}$ FSR is full-scale range and is 2.5 V with REF IN = +2.5 V $\frac{4}{4}$ 1 LSB = FSR/4096 and is 0.6 mV with REF IN = +2.5 V.

FIGURE 2. Ideal input/output code table .

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	7



4. VERIFICATION

4.1 <u>Sampling and inspection</u>. For device classes Q and V, sampling and inspection procedures shall be in accordance with MIL-PRF-38535 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. For device class M, sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

4.2 <u>Screening</u>. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and shall be conducted on all devices prior to qualification and technology conformance inspection. For device class M, screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection.

4.2.1 Additional criteria for device class M.

- a. 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 the preparing or acquiring activity upon request. 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) $T_A = +125^{\circ}C$, minimum.
- b. Interim and final electrical test parameters shall be as specified in table II herein.
- 4.2.2 Additional criteria for device classes Q and V.
 - a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document revision level control of the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. 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.
 - b. Interim and final electrical test parameters shall be as specified in table II herein.
 - c. Additional screening for device class V beyond the requirements of device class Q shall be as specified in MIL-PRF-38535, appendix B.

4.3 <u>Qualification inspection for device classes Q and V</u>. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Inspections to be performed shall be those specified in MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4 <u>Conformance inspection</u>. Technology conformance inspection for classes Q and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections and as specified herein. Quality conformance inspection for device class M shall be in accordance with MIL-PRF-38535, appendix A and as specified herein. Inspections to be performed for device class M shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	9

4.4.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 5, 6, 7, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 (C_{IN} measurement only) shall be measured only for the initial test and after process or design changes which may affect input capacitance.

	1	n	
	Subgroups	Subg	roups
Test requirements	(in accordance with	(in accord	lance with
restrequirements	MIL-STD-883,	MIL-PRF-38535, table III)	
	method 5005, table I)		
	Device	Device	Device
	class M	class Q	class V
Interim electrical	1.0.0	4.0.0	1 2 2
parameters (see 4.2)	1, 2, 3	1, 2, 3	1, 2, 3
Final electrical	1, 2, 3, 4, 9, 10, 11	1, 2, 3, 4, 9,	1, 2, 3, 4, 9,
parameters (see 4.2)	<u>1</u> /	10, 11 <u>1</u> /	10, 11 <u>1</u> /
Group A test	4 0 0 4 0 40 44	1, 2, 3, 4, 9,	1, 2, 3, 4, 9,
requirements (see 4.4)	1, 2, 3, 4, 9, 10, 11	10, 11	10, 11
Group C end-point electrical	4.0.0	4.0.0	1, 2, 3, 4, 9,
parameters (see 4.4)	1, 2, 3	1, 2, 3	10, 11
Group D end-point electrical	1.0.0	4.0.0	1.0.0
parameters (see 4.4)	1, 2, 3	1, 2, 3	1, 2, 3
Group E end-point electrical			
parameters (see 4.4)			

TABLE II.	Electrical test requirements.
	Lieutituai test requirements.

<u>1</u>/ PDA applies to subgroup 1.

4.4.2 <u>Group C inspection</u>. The group C inspection end-point electrical parameters shall be as specified in table II herein.

4.4.2.1 Additional criteria for device class M. Steady-state life test conditions, method 1005 of MIL-STD-883:

- a. 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 the preparing or acquiring activity upon request. 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.
- b. $T_A = +125^{\circ}C$, minimum.
- c. Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.4.2.2 Additional criteria for device classes Q and V. The steady-state life test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The test circuit shall be maintained under document revision level control by the device manufacturer's TRB in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. 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.

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	10

4.4.3 Group D inspection. The group D inspection end-point electrical parameters shall be as specified in table II herein.

4.4.4 <u>Group E inspection</u>. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein).

- a. End-point electrical parameters shall be as specified in table II herein.
- b. For device classes Q and V, the devices or test vehicle shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535 for the RHA level being tested. For device class M, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535, appendix A for the RHA level being tested. All device classes must meet the postirradiation end-point electrical parameter limits as defined in table I at T_A = +25°C ±5°C, after exposure, to the subgroups specified in table II herein.

5. PACKAGING

5.1 <u>Packaging requirements</u>. The requirements for packaging shall be in accordance with MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

6. NOTES

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

6.1.1 <u>Replaceability</u>. Microcircuits covered by this drawing will replace the same generic device covered by a contractor prepared specification or drawing.

6.1.2 <u>Substitutability</u>. Device class Q devices will replace device class M devices.

6.2 <u>Configuration control of SMD's</u>. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished using DD Form 1692, Engineering Change Proposal.

6.3 <u>Record of users</u>. Military and industrial users should inform DLA Land and Maritime when a system application requires configuration control and which SMD's are applicable 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.

6.4 <u>Comments</u>. Comments on this drawing should be directed to DLA Land and Maritime -VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0540.

6.5 <u>Abbreviations, symbols, and definitions</u>. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

6.6 Sources of supply.

6.6.1 <u>Sources of supply for device classes Q and V</u>. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime -VA and have agreed to this drawing.

6.6.2 <u>Approved sources of supply for device class M</u>. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime -VA.

STANDARD MICROCIRCUIT DRAWING	SIZE A		5962-94755
DLA LAND AND MARITIME		REVISION LEVEL	SHEET
COLUMBUS, OHIO 43218-3990		C	11

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 13-04-23

Approved sources of supply for SMD 5962-94755 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 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 revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

Standard	Vendor	Vendor
microcircuit drawing	CAGE	similar
PIN <u>1</u> /	number	PIN <u>2</u> /
5962-9475501MPA	24355	AD7893SQ-10/883B
5962-9475502MPA	24355	AD7893SQ-2/883B

- <u>1</u>/ 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.

Vendor CAGE <u>number</u> Vendor name and address

24355

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The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.