REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Make changes to table I, 1.4, figure 1 and throughout. Add a new figure to the drawing. Editorial changes throughout.	90-03-06	M. A. FRYE
B	Drawing updated to reflect current requirements. - ro	02-08-20	R. MONNIN

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																			
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REV																			
SHEET																			

REV STATUS	REV	B	B	B	B	B	B	B	B	B	B	B	B	B	B
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A

PREPARED BY
RICK C. OFFICER

DEFENSE SUPPLY CENTER COLUMBUS
COLUMBUS, OHIO 43216
http://www.dscc.dla.mil

STANDARD MICROCIRCUIT DRAWING

CHECKED BY
CHARLES E. BESORE

APPROVED BY
MICHAEL A. FRYE

MICROCIRCUIT, LINEAR, 8-BIT A/D CONVERTER WITH INPUT AMPLIFIER, MONOLITHIC SILICON

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

DRAWING APPROVAL DATE
88-11-23

AMSC N/A

REVISION LEVEL	SIZE	CAGE CODE	
B	A	**67268**	**5962-87635**

SHEET 1 OF 14

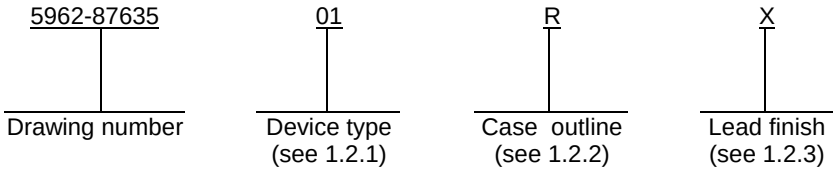
DSCC FORM 2233
APR 97

5962-E543-02

1. SCOPE

1.1 Scope. This drawing describes device requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A.

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



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

Device type	Generic number	Circuit function
01	AD670	8-bit A/D converter with input amplifier

1.2.2 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
R	GDIP1-T20 or CDIP2-T20	20	Dual-in-line

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

1.3 Absolute maximum ratings.

V_{CC} to ground ..... 0 V dc to +7.5 V dc
Digital inputs:
BPO/$\overline{UPO}$, FORMAT, R/$\overline{W}$, $\overline{CS}$, $\overline{CE}$ pins ..... -0.5 V dc to V_{CC} +0.5 V dc
Digital outputs:
DB0 – DB7, STATUS OUTPUT pins ..... Momentary short to V_{CC} or ground
Analog inputs:
V_{IN-} (HIGH), V_{IN-} (LOW), V_{IN+} (HIGH), V_{IN+} (LOW) pins ..... -30 V dc to +30 V dc
Power dissipation (P_D) ..... 450 mW
Storage temperature range ..... -65°C to +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}) ..... 85°C/W

1.4 Recommended operating conditions.

Supply voltage range (V_{CC}) ..... 4.75 V dc to 5.5 V dc
Operating ambient temperature range (T_A) ..... -55°C to +125°C

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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-38535 -- Integrated Circuits, Manufacturing, General Specification for.

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-103 -- List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available 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 requirements shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-PRF-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-PRF-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-PRF-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535, appendix A and herein.

3.2.1 Case outline. The case outline shall be in accordance with 1.2.2 herein.

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

3.2.3 Truth tables. The truth tables shall be as specified on figures 2, 3, and 4.

3.2.4 Block diagram. The block diagram shall be as specified on figure 5.

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 ambient 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 described in table I.

3.5 Marking. Marking shall be in accordance with MIL-PRF-38535, appendix A. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in MIL-HDBK-103 (see 6.6 herein). 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.

3.5.1 Certification/compliance mark. A compliance indicator “C” shall be marked on all non-JAN devices built in compliance to MIL-PRF-38535, appendix A. The compliance indicator “C” shall be replaced with a "Q" or "QML" certification mark in accordance with MIL-PRF-38535 to identify when the QML flow option is used.

3.6 Certificate of compliance. 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 herein). The certificate of compliance submitted to DSCC-VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38535, appendix A and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DSCC-VA shall be required in accordance with MIL-PRF-38535, appendix A.

3.9 Verification and review. DSCC, DSCC'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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Relative accuracy 1/	RA		1	01		1 / 2	LSB
			2,3			1	
Differential nonlinearity 2/ 3/	DNL		1,2,3	01		8	Bits
Gain error 1/	AE		1	01		±1.5	LSB
			2,3			±2.5	
Unipolar offset error	OE	0 V to +2.56 V input range FS	1	01		±1	LSB
			2,3			±2	
Bipolar offset error	B_{OE}	-1.28 V to +1.27 V FS	1	01		±1	LSB
			2,3			±2	
Input resistance 3/	R_{IN}	2.55 V input range	1	01	8	12	kΩ
Input bias current 3/	I_B	255 mV input range	1,2,3	01		500	nA
Input offset current 3/	I_{OS}	255 mV input range	1,2,3	01		200	nA
Absolute input signal range 3/ 4/ 5/	V_{ABS}	Low range	1	01	-0.34	V_{CC} - 3.3	V
			2,3		-0.15	V_{CC} - 3.5	
		High range	1		-3.4	V_{CC}	
			2,3		-1.5	V_{CC}	
Power supply rejection ratio	PSRR	2.55 V FS, V_{CC} = +4.75 V to +5.5 V	1,2,3	01		±0.015	%FS / %

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Power supply current	I_{CC}	V_{CC} = 5.5 V, (DB0 – DB7, R/$\overline{W}$ high); (STATUS, $\overline{CE}$, $\overline{CS}$, FORMAT, BPO, $\overline{UPO}$ - low)	1,2,3	01		45	mA
Digital input high voltage 3/	V_{IH}		1,2,3	01	2.0		V
Digital input low voltage 3/	V_{IL}		1	01		0.8	V
			2,3			0.7	
Digital input high current 3/	I_{IH}	V_{IH} = 5 V	1,2,3	01		100	µA
Digital input low current 3/	I_{IL}	V_{IL} = 0 V	1,2,3	01		-100	µA
Digital output low voltage	V_{OL}	I_{OL} = 1.6 mA, V_{CC} = 5.5 V	1,2,3	01		0.4	V
Digital output high voltage	V_{OH}	I_{OH} = 0.5 mA, V_{CC} = 4.5 V	1,2,3	01	2.4		V
Digital output low current	I_{OL}	V_{OL} = 0.4 V, V_{CC} = 5.5 V	1,2,3	01	-1.6		mA
Digital output high current	I_{OH}	V_{OL} = 2.4 V, V_{CC} = 4.5 V	1,2,3	01	0.5		mA
Common mode rejection ratio 3/	CMRR	V_{CM} = -0.15 V to	1	01		±1	LSB
		V_{CC} – 3.8 V	2,3			±2	
Three-state leakage current 3/	I_{OZ}	$V_{applied}$ = 5 V, $V_{applied}$ = 0 V	1,2,3	01		±40	µA
Functional tests		See 4.3.1c	7,8	01			
Bus access time 3/	t_{TD}	R_L = 3 kΩ, C_L = 90 pF, see figure 5, T_A = +25°C	9	01		250	ns

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ V_{CC} = +5 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output float delay 3/	t_{DT}	R_L = 3 kΩ, see figure 5, T_A = +25°C	9	01		150	ns
Write / start pulse width 3/	t_W	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01	300		ns
Input data setup time	t_{DS}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01	200		ns
Input data hold time	t_{DH}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01	10		ns
R/$\overline{W}$ setup before control	t_{RWC}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01	0		ns
Delay to convert start	t_{DC}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01		700	ns
Delay from STATUS OUTPUT to data read	t_{SD}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01		250	ns
Data hold time	t_{DH}	R_L = 3 kΩ, C_L = 90 pF, 6/ see figure 6, T_A = +25°C	9	01	25		ns
Conversion time 3/	t_C	V_{CC} = +5 V	9	01		10	µs
			10,11 7/			13	

1/ Tested on both 2.55 V full scale and –1.28 V to 1.27 V full scale.
2/ Minimum resolution for which there are no missing codes.
3/ Parameter is tested at V_{CC} = 5 V but is guaranteed from V_{CC} = 4.5 V to V_{CC} = 5.5 V.
4/ The absolute input signal range defines the limits of input signal value from either the (+) or (-) input to ground (as a function of V_{CC}) over which the device will produce distinct output codes.
5/ The differential input signal range defines the input signal span over which distinct output codes are produced. As this range is exceeded, the device ceases to change output state (see figure 4).
6/ Guaranteed, if not tested, to the limits specified in table I herein.
7/ 255 mV range. CMRR tested with 0 V and full scale applied to analog inputs output change measured from 0 to V_{CM} maximum and 0 to V_{CM} minimum and will not exceed specified limits.

Device type	01
Case outline	R
Terminal number	Terminal symbol
1	DB0 (LSB)
2	DB1
3	DB2
4	DB3
5	DB4
6	DB5
7	DB6
8	DB7 (MSB)
9	STATUS OUTPUT
10	POWER GROUND
11	BPO/$\overline{\text{UPO}}$
12	FORMAT (SEE NOTE)
13	R/$\overline{\text{W}}$
14	$\overline{\text{CS}}$
15	$\overline{\text{CE}}$
16	V_{IN-} (HIGH)
17	V_{IN-} (LOW)
18	V_{IN+} (HIGH)
19	V_{IN+} (LOW)
20	V_{CC}

NOTE: Twos complement / $\overline{\text{straight binary}}$

FIGURE 1. Terminal connections.

R/$\overline{W}$	$\overline{CS}$	$\overline{CE}$	Operation	Output
X	X	X	Converting (see note 1)	Three-state
0	0	0	Write/convert (see note 2)	Three-state
1	0	0	Read (see note 2)	Data valid
X	X	1	None (see note 3)	Three-state
X	1	X	None (see note 3)	Three-state

NOTES:
1. Status output high.
2. Status output low.
3. Status output don't care.

FIGURE 2. Control signal truth table..

Mode	Range	Min	Max	Unit
Unipolar	Low	0	255	mV
Unipolar	High	0	2.55	V
Bipolar	Low	-128	127	mV
Bipolar	High	-1.28	1.27	V

FIGURE 3. Differential input signal range truth table.

BPO/$\overline{UPO}$	FORMAT	Input range / output format
0	0	Unipolar / straight binary
1	0	Bipolar / offset binary
0	1	Unipolar / 2s complement
1	1	Bipolar / 2s complement

FIGURE 4. Input selection / output format truth table.

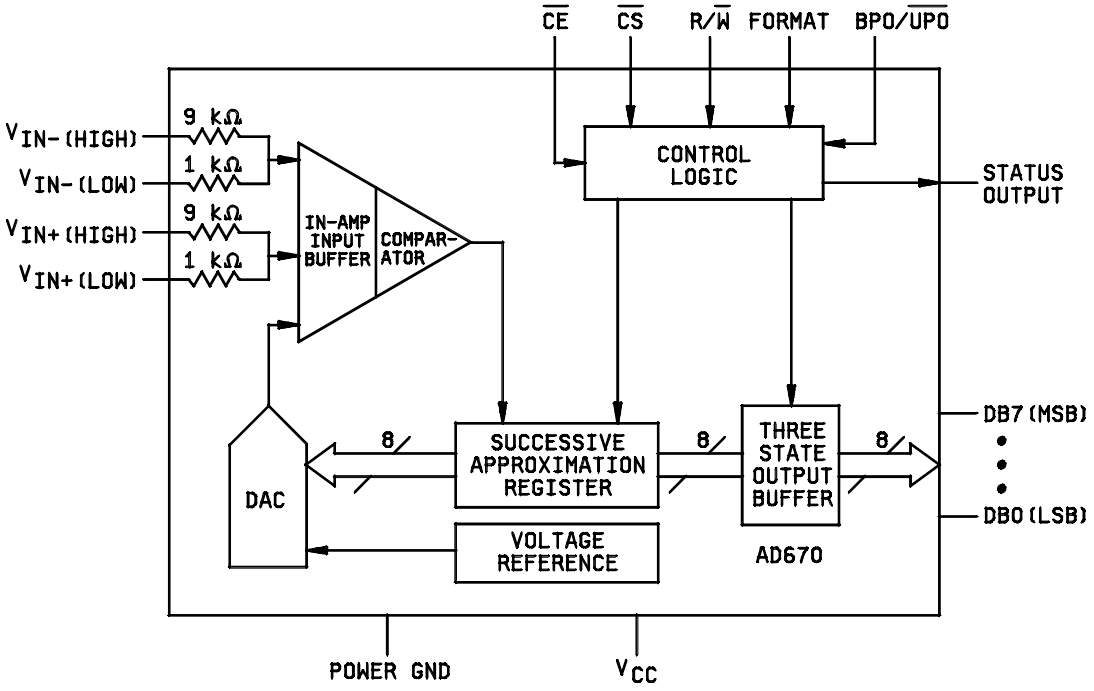


FIGURE 5. Block diagram.

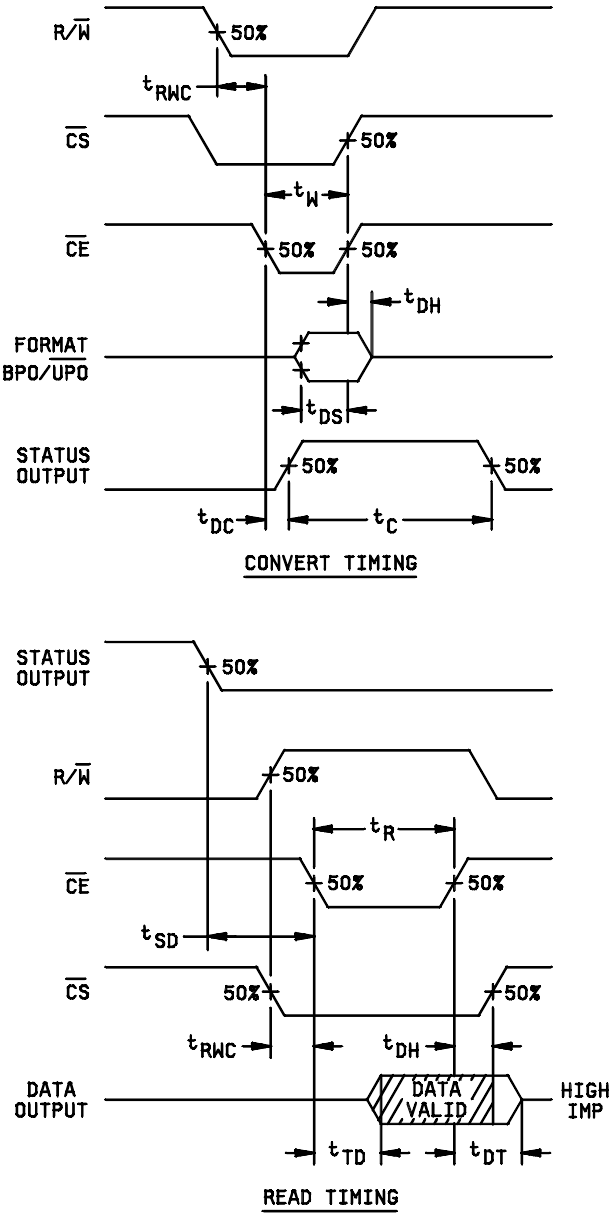
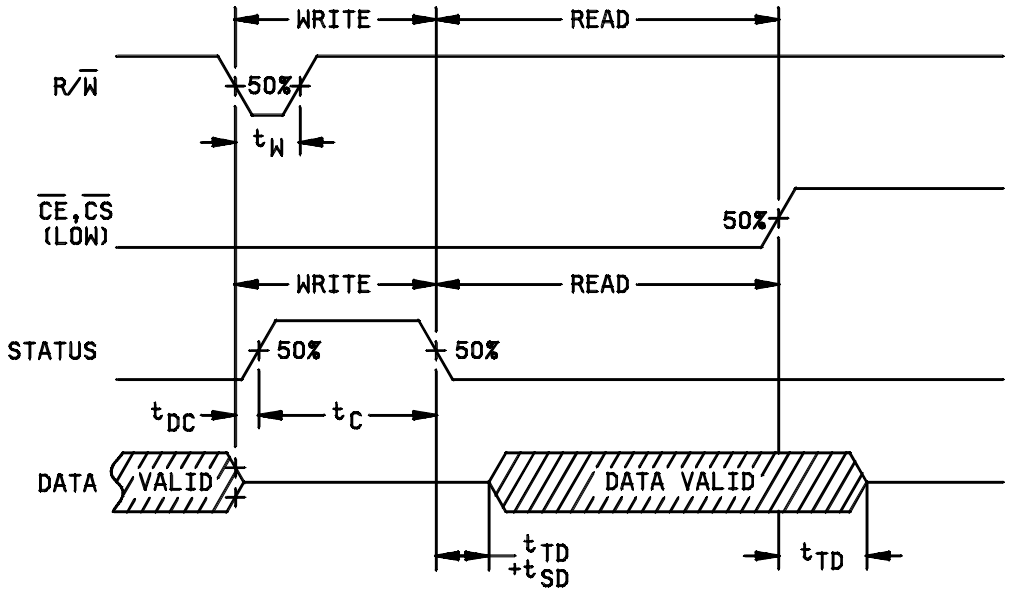


FIGURE 6. Timing diagrams.



STAND-ALONE TIMING

FIGURE 6. Timing diagrams – Continued.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

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 test method 1015 of MIL-STD-883.

(2) T_A = +125°C, minimum.

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.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 4, 5, and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroups 7 and 8 shall include verification of the truth table.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test conditions, 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 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 test method 1005 of MIL-STD-883.

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535, appendix A.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with MIL-STD-883, method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*,2,3,9
Group A test requirements (method 5005)	1,2,3,7,9,10**,11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.
** Subgroups 10 and 11 are guaranteed, if not tested, to the limits specified in table I herein.

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 with the users of record for the individual documents. This coordination will be accomplished using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. DSCC 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 microelectronics devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0547.

6.6 Approved sources of supply. Approved sources of supply 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 DSCC-VA.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 02-08-20

Approved sources of supply for SMD 5962-87635 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 DSCC-VA. This bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-8763501RA	24355	AD670SD/883B

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.

Vendor CAGE number	Vendor name and address
24355	Analog Devices Route 1 Industrial Park P.O. Box 9106 Norwood, MA 02062 Point of contact: 804 Woburn Street Wilmington, MA 01887-3462