

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

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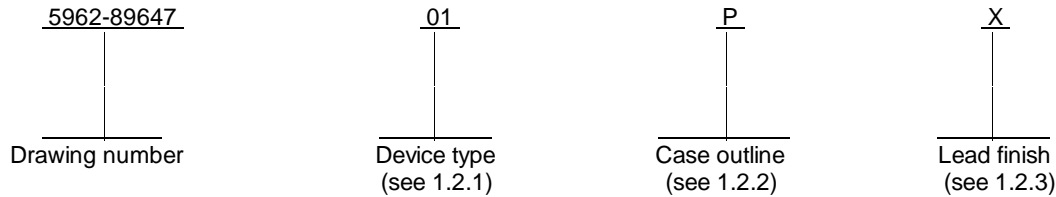
REV STATUS OF SHEETS	REV																	
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12					

PMIC N/A	PREPARED BY Rick C. Officer	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444											
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Charles E. Besore	MICROCIRCUIT, LINEAR, HIGH SPEED, LOW POWER OPERATIONAL AMPLIFIER, MONOLITHIC SILICON											
	APPROVED BY Michael A. Frye												
	DRAWING APPROVAL DATE 93-01-19	SIZE A	CAGE CODE 67268	5962-89647									
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1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

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



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	AD847S	High speed, low power, operational amplifier

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

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

1.2.3 Lead finish. The lead finish shall be as specified in MIL-M-38510. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings. (Unless otherwise specified, $T_A = +25^\circ\text{C}$)

Positive supply voltage ($+V_S$)	.....	+18 V dc
Negative supply voltage ($-V_S$)	.....	-18 V dc
Differential input voltage	± 6.0 V dc
Input common mode voltage	.....	$\pm V_S$
Storage temperature range	.....	-65°C to $+150^\circ\text{C}$
Power dissipation (P_D) ^{1/}	.....	1.1 W
Lead temperature (soldering, 10 seconds)	.....	$+300^\circ\text{C}$
Thermal resistance, junction-to-case (Θ_{JC})	.....	See MIL-STD-1835
Thermal resistance, junction-to-ambient (Θ_{JA})	.....	110°C/W
Junction temperature (T_J)	$+175^\circ\text{C}$

1.4 Recommended operating conditions.

Positive supply voltage range ($+V_S$)	.....	+4.5 V dc to +15 V dc
Negative supply voltage range ($-V_S$)	.....	-4.5 V dc to -15 V dc
Common mode input voltage (V_{CM})	± 12 V dc
Ambient operating temperature range (T_A)	-55°C to $+125^\circ\text{C}$

^{1/} Derate linearity above $T_A = +25^\circ\text{C}$ at $7.3\text{ mW}/^\circ\text{C}$.

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2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and bulletin. Unless otherwise specified, the following specification, standards, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-1835 - Microcircuit Case Outlines.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standards, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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 shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

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

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

3.3 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits <u>2/</u>		Unit
					Min	Max	
Input offset voltage	V _{IO}	V _{CM} = 0 V, V _S = ±5 V	1	01		±1.0	mV
			2,3			±4.0	
Input bias current	+I _B	V _{CM} = 0 V, V _S = ±5 V, V _S = ±15 V	1	01		+5.0	μA
			2,3			+7.5	
	-I _B		1			+5.0	
			2,3			+7.5	
Input offset current	I _{IO}	V _{CM} = 0 V, V _S = ±5 V, ±15 V	1	01		±300	nA
			2,3			±400	
Common mode input voltage range <u>3/</u>	+IVR	V _{CM} = +2.5 V, V _S = ±5 V	1,2,3	01		+2.5	V
	-IVR	V _{CM} = -2.5 V, V _S = ±5 V				-2.5	
	+IVR	V _{CM} = +12 V, V _S = ±15 V	1,2,3			+12	
	-IVR	V _{CM} = -12 V, V _S = ±15 V				-12	

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 _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits <u>2/</u>		Unit	
					Min	Max		
Open loop gain	+A _{VOL}	V _{OUT} = +2.5 V, R _L = 500Ω, V _S = ±5 V	1	01	2.0		V/mV	
			2,3		1.0			
	V _{OUT} = +10 V, R _L = 1 kΩ, V _S = ±15 V	1	3.0					
		2,3	1.5					
	-A _{VOL}	V _{OUT} = -2.5 V, R _L = 500Ω, V _S = ±5 V	1		2.0			
			2,3		1.0			
V _{OUT} = -10 V, R _L = 1 kΩ, V _S = ±15 V	1	3.0						
	2,3	1.5						
Common mode rejection ratio	+CMRR	V _{CM} = +2.5 V, V _S = ±5 V	1	01	80		dB	
			V _{CM} = +12 V, V _S = ±15 V		1	80		
					2,3	75		
	-CMRR	V _{CM} = -2.5 V, V _S = ±5 V	1		80			
			V _{CM} = -12 V, V _S = ±15 V		1	80		
					2,3	75		
Output current <u>4/</u>	I _{OUT}	V _{OUT} = ±2.5 V, V _S = ±5 V, T _A = +25°C	4	01	13		mA	
					V _{OUT} = ±10 V, V _S = ±15 V, T _A = +25°C	20		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits 2/		Unit
					Min	Max	
Output voltage swing	+V _{OUT}	V _S = ±5 V, R _L = 500Ω	1	01	+3.0		V
			2,3		+2.5		
		V _S = ±5 V, R _L = 150Ω	1		+2.5		
		V _S = ±15 V, R _L = 1 kΩ	1,2,3		+12		
		V _S = ±15 V, R _L = 500Ω	1		+10		
	-V _{OUT}	V _S = ±5 V, R _L = 500Ω	1		-3.0		
			2,3		-2.5		
		V _S = ±5 V, R _L = 150Ω	1		-2.5		
		V _S = ±15 V, R _L = 1 kΩ	1,2,3		-12		
		V _S = ±15 V, R _L = 500Ω	1		-10		
Quiescent power supply current	I _{CC}	V _{OUT} = 0 V, I _{OUT} = 0 mA, V _S = ±5 V	1	01		5.7	mA
			2,3			7.8	
		V _{OUT} = 0 V, I _{OUT} = 0 mA, V _S = ±15 V	1			6.3	
			2,3			8.4	
Power supply rejection ratio	PSRR	V _S = ±5 V to ±15 V	1	01	75		dB
			2,3		72		

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 _A ≤ +125°C unless otherwise specified	Group A subgroup	Device type	Limits <u>2/</u>		Unit
					Min	Max	
Quiescent power consumption <u>5/</u>	P _Q	V _{OUT} = 0 V, I _{OUT} = 0 mA, V _S = ±5 V	1	01		57	mW
			2,3			78	
		V _{OUT} = 0 V, I _{OUT} = 0 mA, V _S = ±15 V	1			189	
			2,3			252	
Differential input <u>4/</u> resistance	R _{IN}	V _{CM} = 0 V, T _A = +25°C, V _S = ±5 V, ±15 V	4	01	80		kΩ
Slew rate <u>6/ 4/</u>	+SR	V _{OUT} = -2.5 V to +2.5 V, R _L = 500Ω, A _V = 1 V/V, V _S = ±5 V, measured from 10% to 90% point, rising edge	4	01	120		V/μs
			5,6		90		
	-SR	V _{OUT} = +2.5 V to -2.5 V, R _L = 500Ω, A _V = 1 V/V, V _S = ±5 V, measured from 90% to 10% point, falling edge	4		90		
			5,6		65		
	+SR	V _{OUT} = -5 V to +5 V, R _L = 1 kΩ, A _V = 1 V/V, V _S = ±15 V, measured from 10% to 90% point, rising edge	4		200		
			5,6		130		
	-SR	V _{OUT} = +5 V to -5 V, R _L = 1 kΩ, A _V = 1 V/V, V _S = ±15 V, measured from 90% to 10% point, falling edge	4		145		
			5,6		120		
Gain bandwidth product <u>4/</u>	GBWP	V _{OUT} = ±100 mV, R _L = 500Ω, V _S = ±5 V, T _A = +25°C	4	01	25		MHz
		V _{OUT} = ±100 mV, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C			40		

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 _A ≤ +125°C unless otherwise specified	Group A subgroup	Device type	Limits <u>2/</u>		Unit
					Min	Max	
Full power bandwidth <u>4/ 7/</u>	FPBW	V _{PK} = 2.5 V, R _L = 500Ω, V _S = ±5 V, T _A = +25°C	4	01	5.7		MHz
		V _{PK} = 10 V, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C			2.8		
Closed loop stable gain <u>4/</u>	CLSG	R _L = 1 kΩ, V _S = ±5 V, ±15 V	4,5,6	01	1.0		V/V
Rise time <u>4/ 8/</u>	t _r	V _{OUT} = 0 V to +200 mV, A _V = +1, R _L = 1 kΩ, V _S = ±15 V	4,5,6	01		10	ns
Fall time <u>4/ 8/</u>	t _f	V _{OUT} = 0 V to -200 mV, A _V = +1, R _L = 1 kΩ, V _S = ±15 V	4,5,6	01		10	ns
Settling time <u>4/</u>	t _s	A _V = -1 V/V, 10 V step at 0.1% of the fixed value, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C	4	01		150	ns
		A _V = -1 V/V, 10 V step at 0.01% of the fixed value, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C				200	
Overshoot <u>4/</u>	+OS	V _{OUT} = 0 V to +200 mV, A _V = +1, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C	4	01		30	%
	-OS	V _{OUT} = 0 V to -200 mV, A _V = +1, R _L = 1 kΩ, V _S = ±15 V, T _A = +25°C				30	

1/ Unless otherwise specified, for dc tests, R_S < 100Ω, R_L > 100 kΩ, V_{OUT} = 0 V, and C_L ≤ 10 pF.

Unless otherwise specified, for ac tests, A_V = ±1 V/V, R_L = 1 kΩ, and C_L ≤ 10 pF.

2/ The limiting terms "min" (minimum) and "max" (maximum) shall be considered to apply to magnitudes only. Negative current shall be defined as conventional current flow out of a device terminal.

3/ This test is guaranteed by testing CMRR.

4/ If not tested, shall be guaranteed to the limits specified in table I herein.

5/ Quiescent power consumption is based on quiescent supply current test maximum (no load at the output).

6/ Slew rate test limits are guarantee after 5 minutes of warm-up.

7/ Full power bandwidth = SR/(2πV_{PK}).

8/ Rise and fall times measured between 10 percent and 90 percent point.

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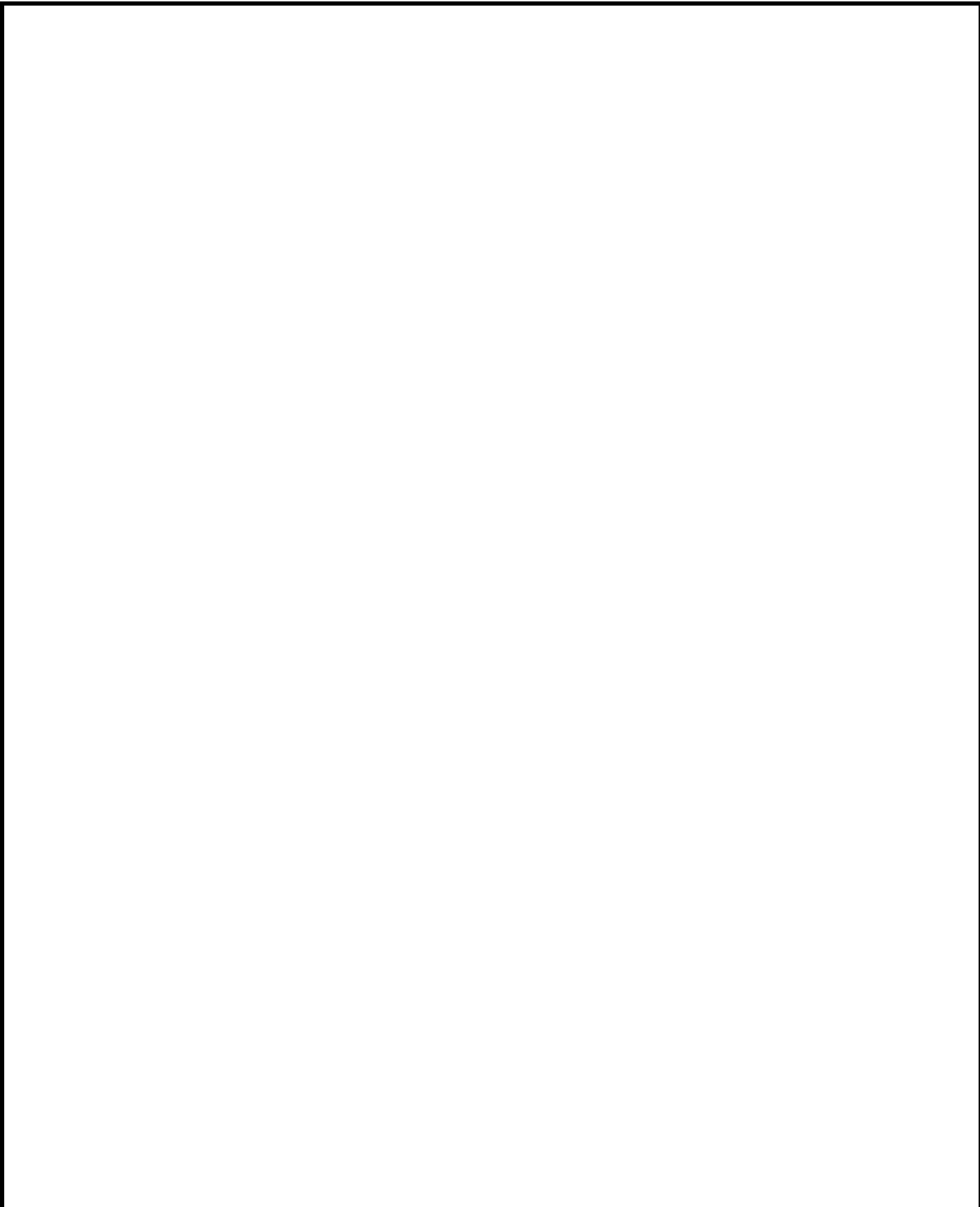
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Device type	01
Case outline	P
Terminal number	Terminal symbol
1	NULL
2	INPUT-
3	INPUT+
4	-V _S
5	NC
6	OUTPUT
7	+V _S
8	NULL

NC = No connection

FIGURE 1. Terminal connections.

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3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). 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-BUL-103 (see 6.6 herein).

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-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-EC shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC'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.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

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 B. 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) $T_A = +125^\circ\text{C}$, 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 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1,2,3,4,5,6
Group A test requirements (method 5005)	1,2,3,4,5,6
Groups C and D end-point electrical parameters (method 5005)	1,2,3

* PDA applies to subgroup 1.

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 B. 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) $T_A = +125^\circ\text{C}$, 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-M-38510.

6. NOTES

6.1 Intended use. Microcircuits 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 original equipment manufacturer application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

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

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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 in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC 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 DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5377.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-EC.

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STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE: 93-01-19

Approved sources of supply for SMD 5962-89647 are listed below for immediate acquisition only and shall be added to MIL-BUL-103 during the next revision. MIL-BUL-103 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 DESC-EC. This bulletin is superseded by the next dated revision of MIL-BUL-103.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN 1/
5962-8964701PX	24355	AD847SQ/883

1/ 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

24355

Vendor name and address

Analog Devices, Incorporated
Route 1 Industrial Park
Norwood, MA 02062
Point of contact: 804 Woburn Street
Wilmington, MA 01887

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