

REVISIONS

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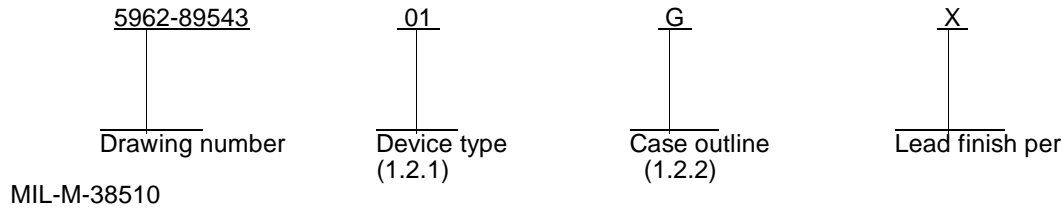
REV STATUS OF PAGE	REV																			
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PMIC N/A	PREPARED BY Rick Officer	DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444																	
STANDARDIZED MILITARY DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Charles E. Besore	TITLE: MICROCIRCUITS, LINEAR, JFET-INPUT, OPERATIONAL AMPLIFIER, MONOLITHIC SILICON																	
	APPROVED BY Michael A. Frye																		
	DRAWING APPROVAL DATE 25 OCTOBER 1989	SIZE A	CAGE CODE 67268	5962-89543															
	REV	PAGE 1 OF 10																	

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 number. The complete part number shall be as shown in the following example:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	OP-16A	JFET-Input, operational amplifier
02	OP-16B	JFET-Input, operational amplifier
03	OP-16C	JFET-Input, operational amplifier

1.2.2 Case outline. The case outline shall be as designated in appendix C of MIL-M-38510, and as follows:

<u>Outline letter</u>	<u>Case outline</u>
G	A-1 (8-lead, .370" x .185"), can package
P	D-4 (8-lead, .405" x .310" x .200"), dual-in-line package

1.3 Absolute maximum ratings.

Supply voltage range (V_S):

Devices 01 and 02:

Positive supply voltage (V_+) -----	+22 V dc
Negative supply voltage (V_-) -----	-22 V dc

Device 03:

Positive supply voltage (V_+) -----	+18 V dc
Negative supply voltage (V_-) -----	-18 V dc

Storage temperature range ----- -65° C to +150° C

Maximum power dissipation (P_D) ^{1/} ----- 1.15 W

Lead temperature (soldering, 60 seconds) ----- +300° C

Junction temperature (T_J) ----- +150° C

Differential input voltage:

Devices 01 and 02 -----	±40 V dc
Device 03 -----	±30 V dc

Input voltage:

Devices 01 and 02 -----	±40 V dc
Device 03 -----	±30 V dc

Output short circuit duration ----- Indefinite

Thermal resistance, junction-to-case (Θ_{JC}) ----- See MIL-M-38510, appendix C

Thermal resistance, junction-to-case (Θ_{JA}):

Case G -----	150° C/W
Case P -----	119° C/W

^{1/} Derate linearly 6.7 mW/°C above $T_A = +75^\circ\text{C}$ for P package; derate linearly 7.1 mW/°C above $T_A = +80^\circ\text{C}$ for G package.

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1.4 Recommended operating conditions.

Supply voltage (V_S) ----- ±15 V
 Ambient operating temperature (T_A)----- -55° C to +125° C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, 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

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics

BULLETIN

MILITARY

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

(Copies of the specification, standard, 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 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

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 case 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-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _A ≤ +125°C unless otherwise specified	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Input offset voltage	V _{OS}	V _{CM} = 0 V	01	1		±0.5	mV
				2, 3		±0.9	
		V _{CM} = 0 V	02	1		±1.0	
				2, 3		±2.0	
		V _{CM} = 0 V	03	1		±3.0	
				2, 3		±4.5	
Input offset current	I _{OS}	V _S = ±20 V V _{CM} = 0 V <u>2/</u>	01	1, 3		±10.0	pA
				2		±4.0	nA
			02	1, 3		±20.0	pA
				2		±6.0	nA
			03	1, 3		±50.0	pA
				2		±9.0	nA
Input bias current	I _{IB}	V _S = ±20 V V _{CM} = 0 V <u>2/</u>	01	1, 3		±50.0	pA
				2		±5.0	nA
		V _S = ±20 V V _{CM} = 0 V <u>2/</u>	02	1, 3		±100.0	pA
				2		±7.5	nA
		V _S = ±20 V V _{CM} = 0 V <u>2/</u>	03	1, 3		±200.0	pA
				2		±10	nA

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	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Common-mode rejection ratio	CMRR	V _{CM} = IVR = ±10.5 V	01,02	1	86		dB
		V _{CM} = IVR = ±10.4 V		2,3	85		
		V _{CM} = IVR = ±10.3 V	03	1	82		
		V _{CM} = IVR = ±10.25 V		2,3	80		
Output voltage swing	V _O	R _L ≥ 2 kΩ	All	4	±11.0		V
		R _L ≥ 10 kΩ		5,6	±12.0		
Large-signal voltage gain	A _{VO}	V _O = ±10 V; R _L ≥ 2 kΩ	01	4	100.0		V/mV
				5,6	35.0		
			02	4	75.0		
				5,6	30.0		
			03	4	50.0		
				5,6	25.0		
Supply current	I _S	V _O = 0 V	01,02	1		7.0	mA
				2,3		11.0	
			03	1		8.0	
				2,3		12.0	
Power supply rejection ratio	PSRR	V _S = ±10 V to ± 18 V	01,02	1	86		dB
				2,3	85		
		V _S = ±10 V to ± 15 V	03	1	82		
				2,3	80		

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	Device types	Group A subgroups	Limits		Unit
					Min	Max	
Slew rate	SR	A _{VCL} = +1 V	01	7	18.0		V/μs
				8a	10.0		
			02	7	12.0		
				8a	7.0		
			03	7	9.0		
				8a	5.0		
Gain bandwidth product	GBW	T _A = +25°C, f ₀ = 100 kHz	01	7	5.5		MHz
			02		4.0		
			03		3.0		
Power dissipation	P _D	V _O = 0 V	01,02	1		210	mW
			03			240	
Settling time	t _s	^{3/}	All	9,10		4	μs

^{1/} Unless otherwise specified V_S = ±15 V; R_S = 50Ω.

^{2/} Subgroup 3 is guaranteed if not tested.

^{3/} Subgroup 10 is guaranteed if not tested.

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-ECS 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-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

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Device types	01, 02, and 03
Case outlines	G and P
Terminal number	Terminal symbols
1	BAL
2	-IN
3	+IN
4	V-
5	BAL
6	OUT
7	V+
8	NC

FIGURE 1. Terminal connections.

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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 A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).
 - (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 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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 using the circuit submitted with the certificate of compliance (see 3.6 herein).
 - (2) $T_A = +125^\circ\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 4, 5, 6, 8a
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 7, 8a, 9, 10**
Groups C and D end-point electrical parameters (method 5005)	1, 4

* PDA applies to subgroup 1. (V_{OS} and I_{OS} excluded from PDA).

** Subgroup 10, if not tested, shall be guaranteed to the limits specified in table I herein.

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 OEM 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.

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-ECC telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECC, Dayton, Ohio 45444, or telephone 513-296-5375.

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6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. 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-ECS. The approved sources of supply listed below are for information purposes only and are current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor <u>1</u> / similar part number
5962-8954301GX	06665	OP-16AJ/883
5962-8954301GX	64155	OP-16AH/883
5962-8954301PX	06665	OP-16AZ/883
5962-8954302GX	06665	OP-16BJ/883
5962-8954302GX	64155	OP-16BH/883
5962-8954302PX	06665	OP-16BZ/883
5962-8954303GX	64155	OP-16CH/883
5962-8954303PX	06665	OP-16CZ/883
5962-8954303PX	64155	OP-16CJ8/883

1/ Caution. Do not use this number for item acquisition. Items acquired by this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number

06665

64155

Vendor name and address

Precision Monolithic, Incorporated
1500 Space Park Drive
Santa Clara, CA 95050

Linear Technology Corporation
1630 McCarthy Boulevard
Milpitas, CA 95035-7487

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