

REVISIONS																			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED																
B	Adding device type 03 for generic part number LM199A-20. Make changes to 1.2.1, 1.2.2, table I, and 6.4.	93-04-27	M. A. FRYE																

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REV STATUS OF SHEETS				REV	B	B	B	B	B	B	B	B	B						
				SHEET	1	2	3	4	5	6	7	8							
PMIC N/A				PREPARED BY CHARLES E. BESORE				DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444											
<b>STANDARDIZED MILITARY DRAWING</b>  THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE  AMSC N/A				CHECKED BY RAY MONNIN															
				APPROVED BY D. A. DICENZO															
				DRAWING APPROVAL DATE 88-07-26															
				REVISION LEVEL B				SIZE A	CAGE CODE 67268	5962-88561									
								SHEET 1 OF 8											

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DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

5962-E223-93

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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:

5962-88561	01	X	X
Drawing number	Device type (see 1.2.1)	Case outline (see 1.2.2)	Lead finish (see 1.2.3)

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

Device type	Generic number	Circuit function
01	LM199A	Precision voltage reference
02	LM199	Precision voltage reference
03	LM199A-20	Precision voltage reference

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

Outline letter	Descriptive designator	Terminals	Package style
X	MACY1-X4	4	Can

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.

Temperature stabilizer voltage ( $V_H$ )	40 V
Reverse breakdown current ( $I_R$ )	20 mA
Forward current	1 mA
Reference to substrate voltage	40 V
Power dissipation ( $P_D$ )	140 mW
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 60 seconds)	+300°C
Junction temperature ( $T_J$ )	+150°C
Thermal resistance, junction-to-case ( $\Theta_{JC}$ )	See MIL-STD-1835
Thermal resistance, junction-to-ambient ( $\Theta_{JA}$ )	200°C/W

## 1.4 Recommended operating conditions.

Ambient operating temperature ( $T_A$ )	-55°C to +125°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 and figure 1.

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.

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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T <sub>A</sub> ≤ +125°C V <sub>H</sub> = 30 V unless otherwise specified	Group A subgroups	Device type	Limits 1/		Unit
					Min	Max	
Reverse breakdown voltage	V <sub>R</sub>	.5 mA ≤ I <sub>R</sub> ≤ 10 mA	1,2,3	ALL	6.8	7.1	V
Reverse breakdown change with current	ΔV <sub>R</sub>	.5 mA ≤ I <sub>R</sub> ≤ 10 mA	1,2,3	ALL		9	mV
Reverse breakdown temperature coefficient	ΔV <sub>Z</sub> / ΔT	-55°C ≤ T <sub>A</sub> ≤ +85°C, I <sub>R</sub> = 1 mA	2,3	01,03		0.5	ppm/°C
				02		1	
		+85°C ≤ T <sub>A</sub> ≤ +125°C, I <sub>R</sub> = 1 mA		01,03		10	
				02		15	
Reverse dynamic impedance	Z <sub>R</sub>	I <sub>R</sub> = 1 mA, T <sub>A</sub> = +25°C	1	ALL		1	Ω
Forward voltage	V <sub>F</sub>	I <sub>R</sub> = 1 mA, T <sub>A</sub> = +25°C	1	ALL	-1.6		V
Stabilized heater current	I <sub>H</sub>	V <sub>H</sub> = 30 V, (tested after 5 seconds of heater turn on time)	1	ALL		30	mA
		V <sub>H</sub> = 30 V, (still air) 2/	2		14		
			3		85		
Long term stability		Stabilized, 1000 hours, I <sub>R</sub> = 1 mA, ±0.1 %, +22°C ≤ T <sub>A</sub> ≤ +28°C	1	03		20	ppm
Zener peak noise voltage	V <sub>NPK</sub>	10 Hz ≤ frequency ≤ 10 kHz, I <sub>R</sub> = 1 mA, V <sub>H</sub> = 40 V, T <sub>A</sub> = +25°C	1	ALL		80	μV
Zener RMS noise voltage	V <sub>NRMS</sub>	10 Hz ≤ frequency ≤ 10 kHz, I <sub>R</sub> = 1 mA, V <sub>H</sub> = 40 V, T <sub>A</sub> = +25°C	4	ALL		20	μV
Peak heater current	I <sub>HPK</sub>	V <sub>H</sub> = 40 V, 1% duty cycle, T <sub>A</sub> = +25°C	4	ALL		200	mA

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$ $V_H = 30\text{ V}$ unless otherwise specified	Group A subgroups	Device type	Limits <sup>1/</sup>		Unit
					Min	Max	
Leakage zener to substrate	$I_L$	$V_H = 40\text{ V}, T_A = +25^{\circ}\text{C}$	4	01,02		100	$\mu\text{A}$
				03		250	nA

<sup>1/</sup> The algebraic convention, whereby the most negative value is a minimum and the most positive is a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.

<sup>2/</sup> If not tested, shall be guaranteed to the limits specified in table I herein.

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:

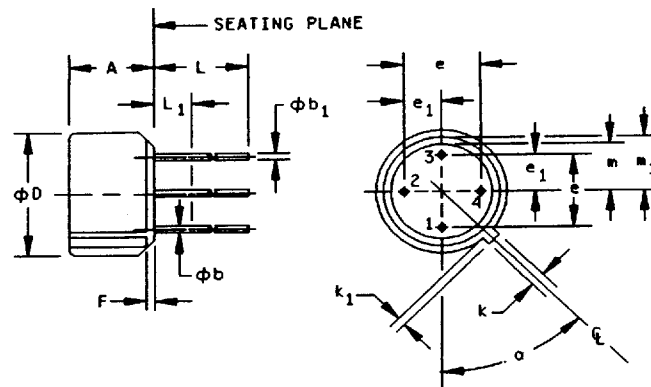
a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition 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)  $T_A = +125^{\circ}\text{C}$ , 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.

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Dimension					Notes
Symbol	Inches		Millimeters		
	Min	Max	Min	Max	
A	.224	.234	5.69	5.94	
φb	.016	.019	0.41	0.48	2
φb <sub>1</sub>	.016	.021	0.41	0.48	2
φD	.398	.419	10.11	10.39	
e	.100 BSC		2.54 BSC		4
e <sub>1</sub>	.050 BSC		1.27 BSC		4
F	.010 BSC		0.25 BSC		

Dimension					
Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
k	.047 BSC		1.19 BSC		
k <sub>1</sub>	.008 BSC		0.20 BSC		3
L	.400	- - -	10.16	- - -	
L <sub>1</sub>	.200	- - -	5.08	- - -	
m	.145 BSC		3.68 BSC		
m <sub>1</sub>	.175 BSC		4.44 BSC		
α	45° BSC		45° BSC		4

NOTES:

1. Dimensions are in inches.
2. (All leads)  $\phi b$  applies between  $L_1$  and the seating plane.  $\phi b_1$  applies between  $L_1$  and .400 (10.16 mm) from the seating plane.
3. Measured from the maximum diameter of the product.
4. Leads having a maximum diameter .019 (0.48 mm) measured in gaging plane .054 (1.37 mm) + .001 (0.03 mm) - .000 (0.00 mm) below the base plane of the product shall be within .007 (0.18 mm) of their true-position relative to a maximum width tab.
5. The product may be measured by direct methods or by gage.
6. Metric equivalents are given for general information only.

FIGURE 1. Case outline and terminal connection.

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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
Group A test requirements (method 5005)	1, 2, 3, 4
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

\* PDA applies to subgroup 1.

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 5, 6, 7, 8, 9, 10, and 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. 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.

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## 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. Replaceability is determined as follows:

- a. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- b. When a QPL source is established, the device specified in this drawing will be replaced by the microcircuit identified as PIN M38510/124BYX.

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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