REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add one vendor, CAGE 06665. Make changes to table I and throughout the drawing. Remove one vendor, CAGE 34333.	90-02-01	M. A. Frye
B	Add device type 02. Add case outlines G and P. Table I changes. Add one vendor, CAGE 64155. Editorial changes throughout.	94-08-09	M. A. Frye

THE ORIGINAL FIRST PAGE OF THIS DRAWING HAS BEEN REPLACED.

REV																			
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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	9						

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

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

AMSC N/A

PREPARED BY
Rick C. Officer

CHECKED BY
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Michael A. Frye

DRAWING APPROVAL DATE
87-07-15

REVISION LEVEL
B

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, PRECISION VOLTAGE COMPARATOR/BUFFER, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**67268**	**5962-86877**

SHEET 1 OF 9

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:

5962-86877	01	G	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	PM111, LM111	Precision voltage comparator/buffer
02	LT111A	Precision voltage comparator/buffer

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
G	MACY1-X8	8	Can
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line
2	CQCC1-N20	20	Square leadless chip carrier

1.2.3 Lead finish. The lead finish shall be as specified in MIL-STD-883 (see 3.1 herein). 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.

Ground to negative supply voltage	-30.0 V
Total supply voltage (V+ to V-)	±36.0 V
Output to negative supply voltage	-50.0 V
Input voltage	±15 V 1/
Differential input voltage	±30.0 V
Output sink current	50 mA
Output short circuit duration	10 seconds
Maximum strobe current	10 mA
Power dissipation (P_D)	500 mW
Thermal resistance, junction-to-case (Θ_{JC})	See MIL-STD-1835
Storage temperature range	-65°C to +150°C
Junction temperature (T_J)	+175°C 2/
Lead temperature (soldering, 60 seconds)	+300°C

1.4 Recommended operating conditions.

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

1/ Rating applies to V_S = ±15 V. The positive input voltage limit is 30 V above the negative suply. The negative input voltage limit is equal to the negative supply voltage or 30 V below the positive supply, whichever is less negative.

2/ For short term test (in the specific burn-in and life test configuration when required and up to 138 hours maximum) T_J = +275°C.

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-I-38535 - 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. 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-I-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-I-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-I-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-STD-883 (see 3.1 herein) 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.

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).

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	$R_S = 50\Omega$; V_{IC} = 0 V, 13 V, and -14.5 V	1	01		±3.0	mV
			2, 3			±4.0	
			1	02		±1.0	
			2, 3			±2.0	
		$R_S = 50\Omega$; V_{IC} = 0 V; V_S = ±2.5 V	1	01		±3.0	
			2, 3			±4.0	
			1	02		±1.0	
			2, 3			±2.0	
Raised input offset voltage 3/	$V_{IO(R)}$	$R_S = 50\Omega$; V_{IC} = 0 V, 13 V, and -14.5 V $V_{BAL} = V_{BAL/STB} = V+$	1	01		±3.0	mV
				02		±1.0	
			2, 3	01		±4.5	
				02		±2.5	
Input offset voltage temperature coefficient	$\Delta V_{IO}/\Delta T$	$R_S = 50\Omega$ 4/	2, 3	01, 02		±25	µV/°C
Input offset current	I_{IO}	V_{IC} = 0 V, 13 V, and -14.5 V	1, 2	01		±10	nA
			3			±20	
			1, 2	02		±5	
			3			±10	
Raised input offset current 3/	$I_{IO(R)}$	V_{IC} = 0 V; $V_{BAL} = V_{BAL/STB} = V+$	1, 2	01, 02		±25	
			3			±50	
Input offset current temperature coefficient	$\Delta I_{IO}/\Delta T$	+25°C to +125°C 4/	1, 2	01, 02		±100	pA/°C
		+25°C to -55°C 4/	1, 3	01, 02		±200	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input bias current	$+I_{IB}$	V_{IC} = 0 V	1, 2	All	-100	+0.1	nA
			3	All	-150	+0.1	
		V_{IC} = 13 V and -14.5 V	1, 2	All	-150	+0.1	
			3	All	-200	+0.1	
	$-I_{IB}$	V_{IC} = 0 V	1, 2	All	-100	+0.1	
			3	All	-150	+0.1	
		V_{IC} = 13 V and -14.5 V	1, 2	All	-150	+0.1	
			3	All	-200	+0.1	
Collector output voltage (STROBED)	$V_{O(STB)}$	R_S = 50Ω; ISTB = -3.0 mA	1, 2, 3	All	14		V
Common mode rejection	CMR	R_S = 50Ω; V_{IC} = 13 V and -14.5 V	1, 2, 3	All	80		dB
Output leakage current	I_{CEX}	V_S = ±18 V; V_{IN} = 5 mV V_O = 32 V	1	All	-1	10	nA
			2	All	-1	500	
Input leakage current	I_{I1}	V_S = ±18 V; V_{ID} = -29 V	1, 2, 3	All	-5	500	nA
	I_{I2}	V_S = ±18 V; V_{ID} = 29 V	1, 2, 3	All	-5	500	
Positive supply current	I+		1	All		6.0	mA
			2	All		6.0	
			3	All		7.0	
Negative supply current	I-		1	All		-5.0	mA
			2	All		-5.0	
			3	All		-6.0	
Output short circuit current	I_{OS}	10 ms maximum test duration	1	All	0	200	mA
			2	All	0	150	
			3	All	0	250	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Adjustment for input offset voltage	V_{IO} (ADJ)+	$R_S = 50\Omega$	$T_A = +25°C$	1	All	+5.0		mV
	V_{IO} (ADJ)-			1	All	-5.0		
Low level output voltage	V_{OL1}	V+ = 4.5 V; V- = 0 V; V_{IC} = 0.75 V; V_{ID} = -6.0 mV; I_O = 8 mA		1, 2, 3	All	0	0.4	V
	V_{OL2}	V+ = 4.5 V; V- = 0 V; V_{IC} = -1.75 V; I_O = 8 mA; V_{ID} = -6.0 mV		1, 2, 3	All	0	0.4	
Low level output voltage	V_{OL3}	V_S = ±15 V; V_{ID} = -5.0 mV; V_{IC} = 13 V; I_O = 50 mA		1, 2, 3	All	0	1.5	V
	V_{OL4}	V_S = ±15 V; V_{ID} = -5.0 mV; V_{IC} = -14 V; I_O = 50 mA		1, 2, 3	All	0	1.5	
Voltage gain (emitter output)	+AVE	$R_L = 600\Omega$		4	All	10		V/mV
				5, 6	All	8		
Response time, low-to-high, collector output	t_{RLHC}	V_{OD} (overdrive) = -5 mA C_L = 50 pF (min); V_{IN} = 100 mV		7, 8B	All	0	300	ns
				8A	All	0	640	
Response time, high-to-low, collector output	t_{RHLC}	V_{OD} (overdrive) = +5 mA C_L = 50 pF (min); V_{IN} = 100 mV		7, 8B	All	0	300	
				8A	All	0	500	

1/ Unless otherwise specified, V_{IC} = 0 V and V_S = ±15 V.

2/ V_{IC} is achieved by algebraically subtracting the common mode voltage from each V_S (power supplies) and algebraically adding it to V_{IN}. V_{IC} can be calculated by using the following formula:

$$V_{IC} = \frac{-[(V+) + (V-)]}{2} + V_{IN}$$

3/ Subscript (R) indicates tests which are performed with input stage current raised by connecting BAL and BAL/STB terminals to V+.

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

Device types	01 and 02	02
Case outlines	2	G and P
Terminal number	Terminal symbol	Terminal symbol
1	NC	GROUND
2	EMIT OUT	IN+
3	NC	IN-
4	NC	V-
5	IN+	BALANCE
6	NC	BAL/STRB
7	IN-	OUT
8	NC	V+
9	NC	---
10	V-	---
11	NC	---
12	BALANCE	---
13	NC	---
14	NC	---
15	BAL/STRB	---
16	NC	---
17	COL OUT	---
18	NC	---
19	NC	---
20	V+	---

NC = No connection; no external connection should be made to these pins.

FIGURE 1. Terminal connections.

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 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°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 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°C, minimum.

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

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, 5, 6, 7, 8A, 8B
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-883 (see 3.1 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 in accordance with MIL-STD-973 using DD Form 1692, 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 45444-5270, 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.

STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN

DATE: 94-08-09

Approved sources of supply for SMD 5962-86877 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.

Standard microcircuit drawing PIN	Vendor CAGE number	Vendor similar PIN 1/	Replacement military specification
5962-8687701PX	06665 64155	PM111RC LM111J8/883	M38510/10304BPX
5962-86877012X	06665	PM111RC	M38510/10304B2X
5962-8687701GX	64155	LM111H/883	
5962-8687702PX	64155	LT111AJ8/883	
5962-8687702GX	64155	LT111AH/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	Vendor name and address
06665	Analog Devices-Precision Monolithics Division 1500 Space Park Drive P.O. Box 58020 Santa Clara, CA 95050-8020
64155	Linear Technology 1630 McCarthy Blvd Milpitas, CA 95035-7487