REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
B	Change to military drawing format. Add case outline 2. Inactivate G and P case outlines for device types 01 and 02 for new design. Delete vendor CAGE 34371. Editorial changes throughout.	87-07-24	M. A. FRYE
C	Add three vendors, CAGE 07933, CAGE 64155, and CAGE 54186. Make changes to paragraphs 1.2.2, 4.2, and 4.3. Make changes to table I, table II, and figure 1. Editorial changes throughout.	89-01-24	M. A. FRYE
D	Changes in accordance with NOR 5962-R062-93.	93-07-13	M. A. FRYE
E	Make correction to marking paragraph 3.5. Drawing updated to reflect current requirements. Redrawn. -rrp	06-03-01	R. MONNIN

CURRENT CAGE CODE 67268

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																			
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REV																			
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REV STATUS	REV		E	E	E	E	E	E	E	E	E								
OF SHEETS	SHEET		1	2	3	4	5	6	7	8	9								

PMIC N/A	PREPARED BY RICK OFFICER	**DEFENSE SUPPLY CENTER COLUMBUS** **COLUMBUS, OHIO 43218-3990** **http://www.dscc.dla.mil**
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY WILLIAM J. JOHNSON	
	APPROVED BY MICHAEL A. FRYE	MICROCIRCUIT, LINEAR, LOW OFFSET OPERATIONAL AMPLIFIERS, MONOLITHIC SILICON
	DRAWING APPROVAL DATE 83-04-15	
	REVISION LEVEL E	SIZE: A; CAGE CODE: **14933**; **82036** SHEET 1 OF 9

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:

82036	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) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	OP-07A	Operational amplifier, ultra low offset
02	OP-07	Operational amplifier, low offset

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
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 is as specified in MIL-PRF-38535, appendix A.

1.3 Absolute maximum ratings.

Supply voltage (V_{CC})	±22 V dc
Input voltage range (V_{IN})	±V_{CC}
Differential input voltage range	±30 V dc
Output short circuit duration	1/
Lead temperature (soldering, 60 seconds)	+300°C
Storage temperature range	-65°C to +150°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA}):	
Cases P and 2	120°C/W
Case G	150°C/W
Maximum power dissipation (P_D): 2/	
Case G	330 mW at T_A = +125°C
Cases P and 2	400 mW at T_A = +125°C

1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	±5.0 V dc to ±20.0 V dc
Ambient operating temperature range (T_A)	-55°C to +125°C

1/ Output may be shorted to ground indefinitely at V_S = ±15 V, T_A = +25°C. Temperature and supply voltages must be limited to ensure dissipation rating is not exceeded.
2/ Must withstand the added P_D due to short circuit test, e.g., I_{OS}.

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 cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

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

DEPARTMENT OF DEFENSE STANDARDS

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

DEPARTMENT OF DEFENSE HANDBOOKS

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

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil or 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(s). The case outline(s) shall be in accordance with 1.2.2 herein.

3.2.2 Terminal connections and logic diagrams. The terminal connections and logic diagrams 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-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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ $V_{CC} = \pm 15$ V, unnuled, $V_{CM} = 0$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input offset voltage	V_{IO}	1/ 2/	1	01	-25	25	µV
		2/	2, 3		-60	60	
		1/ 2/	1	02	-75	75	
		2/	2, 3		-200	200	
Input offset voltage temperature sensitivity	dV_{IO}/dT	3/	2, 3	01	-0.6	0.6	µV/°C
				02	-1.3	1.3	
Input bias current	$+I_{IB}$		1	01	-2	2	nA
			2, 3		-4	4	
			1	02	-3	3	
			2, 3		-6	6	
	$-I_{IB}$		1	01	-2	2	
			2, 3		-4	4	
			1	02	-3	3	
			2, 3		-6	6	
Input offset current	$+I_{IO}$		1	01	-2	2	nA
			2, 3		-4	4	
			1	02	-2.8	2.8	
			2, 3		-5.6	5.6	
Power supply rejection ratio	+PSRR	$V_{CC}+ = 20$ V to 5 V, $V_{CC}- = -15$ V	1	01, 02		10	µV/V
			2, 3			20	
	-PSRR	$V_{CC}+ = 15$ V, $V_{CC}- = -20$ V to -5 V	1			10	
			2, 3			20	
Common mode rejection ratio	CMRR	$V_{CM} = \pm 10$ V	1	01, 02	110		dB
		$V_{CM} = \pm 13$ V	2, 3		106		
Output short circuit current	$I_{OS(+)}$	$t \le 25$ ms 4/	1, 2	01, 02	-65		mA
			3		-70		
	$I_{OS(-)}$		1, 2			65	
			3			70	
Supply current	I_{CC}		1	01, 02		4	mA
			2, 3			5	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ $V_{CC} = \pm 15$ V, unnuled, $V_{CM} = 0$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage swing (minimum)	V_{OP}	$R_L = 1\ k\Omega$	4, 5, 6	01, 02	-10	10	V
		$R_L = 2000\ \Omega$			-12	12	
Open loop voltage gain (single ended)	A_{VS}	$T_A = +25°C$ 5/	4	01	300		V/mV
		5/	5, 6		200		
		$T_A = +25°C$ 5/	4	02	200		
		5/	5, 6		150		

1/ Users are cautioned to use the group C end-point limits for design purposes due to drift experienced with this parameter during steady-life test (see table III).
2/ Testing will occur at least 250 ms after application of power.
3/ Shall be guaranteed if not tested, to the specified parameters.
4/ Continuous short circuit limits are considerably less than the indicated test limits since maximum power dissipation cannot be exceeded.
5/ $V_{OUT} = 0$ V to +10 V for $A_{VS}(+)$ and $V_{OUT} = 0$ to -10 for $A_{VS}(-)$. $R_L = 2000\ \Omega$.

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.

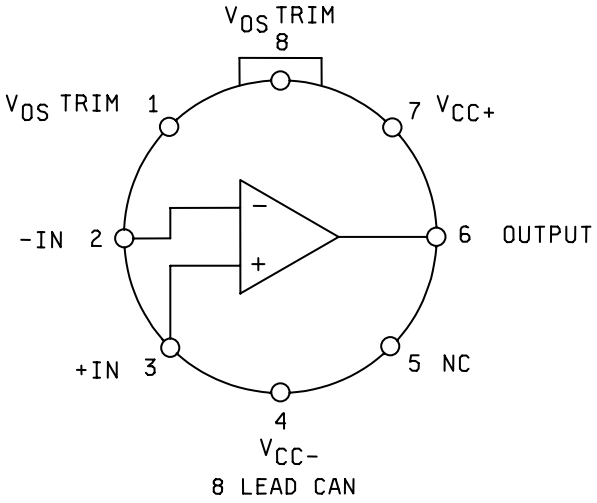
3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DSCC-VA shall be required for any change that affects this drawing.

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.

DEVICE TYPES 01 AND 02

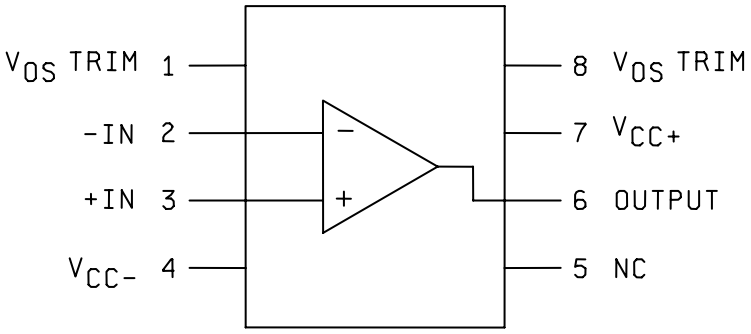
CASE G



8 LEAD CAN

DEVICE TYPES 01 AND 02

CASE P



8 LEAD DIP

FIGURE 1. Terminal connections and logic diagrams.

DEVICE TYPES 01 AND 02

CASE 2

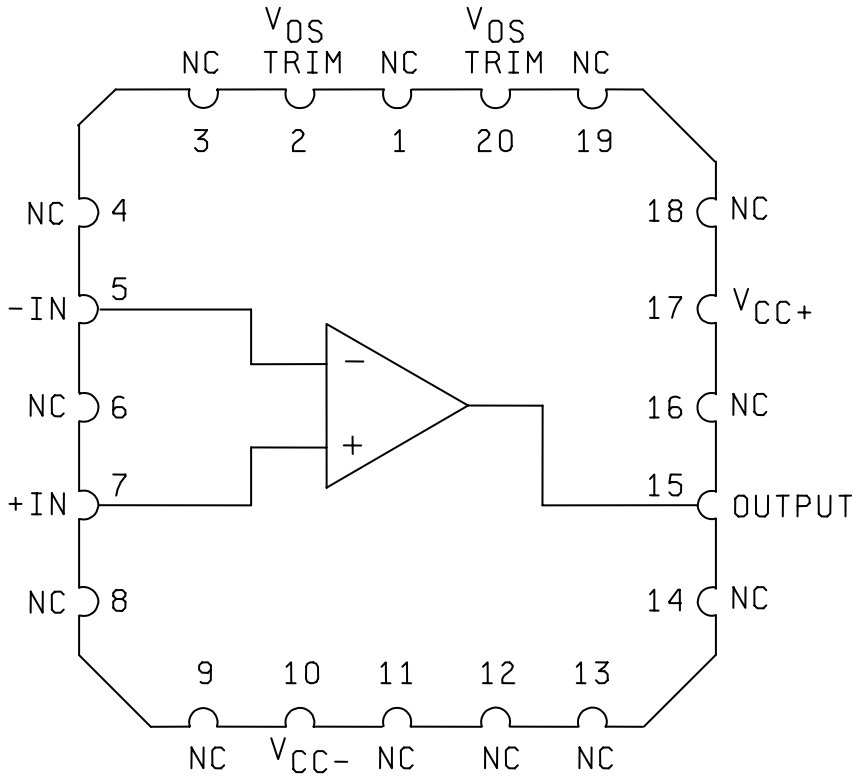


FIGURE 1. Terminal connections and logic diagrams – Continued.

4. VERIFICATION

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

* PDA applies to subgroup 1 excluding V_{IO}.
** Table III limits used for V_{IO} and $\pm I_{IB}$ in place of table I limits.

Table III. Group C end-point electrical parameters.

T_A = +25°C, $\pm V_{CC}$ = ±15 V, V_{CM} = 0 V									
Test	Device 01				Device 02				Unit
	Limits		Delta		Limits		Delta		
	Min	Max	Min	Max	Min	Max	Min	Max	
V_{IO}	-100	+100	-75	75	-175	+175	-100	100	µV
$\pm I_{IB}$	-3	+3	-1	1	-4.5	+4.5	1.5	1.5	nA

5. PACKAGING

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

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 (DSCC) 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 43218-3990, 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: 06-03-01

Approved sources of supply for SMD 82036 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 information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DSCC maintains an online database of all current sources of supply at http://www.dscc.dla.mil/Programs/Smcr/ .

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/	Reference Military Specification Part Number
8203601GA	3V146	OP07AH/883	M38510/13501BGA
	3/	OP07AJ	
	3/	OP-07AT/883B	
	3/	OP-07AH/883	
	3/	MPOP07AJ/883	
8203601PA	3V146	OP07AJ8/883	M38510/13501BPA
	3/	OP07AZ	
	3/	OP-07ADE/883B	
	3/	OP-07AJ8/883	
	3/	MPOP07AZ/883	
82036012A	3V146	OP07AE/883	M38510/13501B2A
	3/	OP07ARC	
	3/	MPOP07AL/883	
8203602GA	3V146	OP07H/883	M38510/13502BGA
	3/	OP07J	
	3/	OP-07T/883B	
	3/	OP-07H/883	
	3/	MPOP07J/883	
8203602PA	3V146	OP07J8/883	M38510/13502BPA
	3/	OP07Z	
	3/	OP-07DE/883B	
	3/	OP-07J8/883	
	3/	MPOP07Z/883	
82036022A	3V146	OP07E/883	M38510/13502B2A
	3/	OP07RC	
	3/	MPOP07L/883	

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.

3/ Not available from an approved source of supply.

Vendor CAGE number	Vendor name and address
3V146	Rochester Electronics Inc. 17 Malcolm Hoyt Drive Newburyport, MA 01950

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