

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
H	Add vendors CAGE 07933, 04713, and 27014. Add device type 02. Inactive case D for new design. Change input offset current limit for +25°C. Change group A subgroups for large signal voltage gain test and output voltage swing test. Editorial changes throughout.	89-07-20	M.A. Frye
J	Changes in accordance with NOR 5962-R261-94.	94-08-12	M.A. Frye
K	Update boilerplate. Changes to thermal resistance, junction-to-ambient (θ_{JA}). Add case outline X. Editorial changes throughout.	97-07-10	R. Monnin
L	Case outline "X" dimensions L, R, and R1 are updated. -rrp	97-12-15	R. Monnin
M	Changes to I_{IO} , I_B , V_{ICR} , A_{VD} , and V_{OL} tests in table I. Add I_{CC} and I_{OS} tests to table I. -rrp	98-03-02	R. Monnin

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

CURRENT CAGE CODE 67268

REV																				
SHEET																				
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SHEET																				
REV STATUS OF SHEETS	REV	M	M	M	M	M	M	M	M	M	M	M								
	SHEET	1	2	3	4	5	6	7	8	9	10									
PMIC N/A	PREPARED BY Rajesh Pithadia	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216																		
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Rajesh Pithadia																			
	APPROVED BY Raymond Monnin																			
	DRAWING APPROVAL DATE 77-09-13																			
	REVISION LEVEL M																			
	SIZE A	CAGE CODE 14933	77043																	
	SHEET	1	OF	10																

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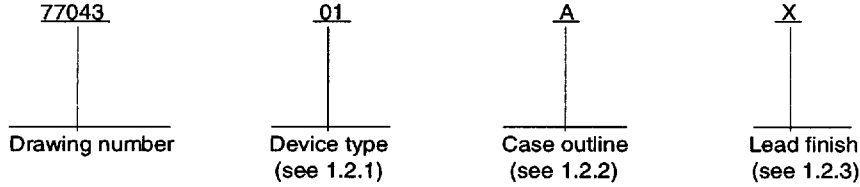
5962-E209-98

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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:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	LM124	Quad operational amplifier
02	LM124A	Quad operational amplifier

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

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
A	GDFP5-F14 or CDFP6-F14	14	Flat pack
C	GDIP1-T14 or CDIP2-T14	14	Dual-in-line
D	GDFP1-F14 or CDFP2-F14	14	Flat pack
2	CQCC1-N20	20	Square leadless chip carrier
X	See figure 1	14	Flat pack

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)	32 V dc relative to ground
Differential input voltage (VID)	32 V dc
Input voltage (V _{IN})	-0.3 V dc to +32 V dc
Power dissipation (P _D) 1/	750 mW
Output short circuit to GND (one amplifier) 2/	Continuous
Storage temperature range	-65° C to +150° C
Lead temperature (soldering, 10 seconds)	+300° C
Junction temperature (T _J)	+150° C
Thermal resistance, junction-to-case (θ _{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ _{JA}):	
Case C	103° C/W
Case D	126° C/W
Case 2	91° C/W
Case X	176° C/W

1/ Dissipation is total of four amplifiers. Use external resistor to allow amplifier to saturate or reduce power dissipation in the circuit.

2/ Short circuits from output to +V can cause excessive heating and destruction. Maximum output current is approximately 60 mA independent of magnitude of +V. Where V supply > +15 V dc, continuous short circuits can exceed P_D ratings and cause destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.

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1.4 Recommended operating conditions.

Ambient operating temperature range (T_A) -55° C to +125° C

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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

DEPARTMENT OF DEFENSE

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

STANDARDS

DEPARTMENT OF DEFENSE

- MIL-STD-883 - Test Method Standard Microcircuits.
- MIL-STD-973 - Configuration Management.
- MIL-STD-1835 - Interface Standard For Microcircuit Case Outlines.

HANDBOOKS

DEPARTMENT OF DEFENSE

- MIL-HDBK-103 - List of Standard Microcircuit Drawings (SMD's).
- MIL-HDBK-780 - Standard Microcircuit Drawings.

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available 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 and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

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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 as listed in MIL-HDBK-103 (see 6.6 herein). For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device.

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 in accordance with MIL-PRF-38535, appendix A.

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.

4. QUALITY ASSURANCE PROVISIONS

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 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 I. Electrical performance characteristics.

Test	Symbol	Conditions +V = 5.0 V dc -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Input offset voltage	V _{IO}	1/	1	01		±5	mV
			2, 3			±7	
			1	02		±2	
			2, 3			±4	
Input offset current	I _{IO}	+I _{IN} = (-I _{IN}) V _{CM} = 0 V	1	01		±30	nA
			2, 3			±100	
		+I _{IN} = (-I _{IN}) V _{CM} = 0 V	1	02		±10	
			2, 3			±30	
Input bias current	I _B	+I _{IN} or -I _{IN} 2/ V _{CM} = 0 V	1	01		-150	nA
			2, 3			-300	
		+I _{IN} or -I _{IN} 2/ V _{CM} = 0 V	1	02		-50	
			2, 3			-100	
Input common mode voltage range	V _{ICR}	+V = 30 V 3/	1	All	0	+V - 1.5	V
			2, 3		0	+V - 2.0	
Large signal voltage gain	A _{VD}	+V = 15 V (for large V _O swing), R _L ≥ 2 kΩ, V _O = 1 V to 11 V	4	All	50		V/mV
			5, 6		25		
Output voltage swing	V _{OUT}	+V = 30 V, R _L = 2 kΩ	4, 5, 6	All	26		V
	V _{OH}	+V = 30 V, R _L ≥ 10 kΩ	4, 5, 6	All	27		
	V _{OL}	R _L ≥ 10 kΩ	4, 5, 6	All		20	
Common mode rejection ratio	CMRR	+V = 30 V, T _A = +25°C	4	All	70		dB

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions +V = 5.0 V dc -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device Type	Limits		Unit
					Min	Max	
Amplifier to amplifier coupling ^{3/}		1 kHz, 20 kHz, T _A = +25°C	4	All	80		dB
Power supply rejection ratio	PSRR	T _A = +25°C	4	All	65		dB
Output current source	I _O (source)	+V _{IN} = 1.0 V, -V _{IN} = 0 V, +V = 15 V	1	All	20		mA
			2, 3		10		
Output current sink	I _O (sink)	+V _{IN} = 0 V, -V _{IN} = +1.0 V, +V = 15 V	1	All	10		mA
			2, 3		5		
			+V _{IN} = 0 V, -V _{IN} = +1.0 V, V _O = 200 mV	1	All	12	
Power supply current	I _{CC}		1, 2, 3	All		1.2	mA
		+V = 30 V	1			3.0	
			2, 3			4.0	
Short circuit current	I _{OS}	V _O = 0 V	1	All	-60		mA

- 1/ V_O = 1.4 V dc, +V from 5 V dc to 30 V dc; and over full input common mode range (0 V dc to +V = -1.5 V dc).
 2/ The direction of the input current is out of the I.C. due to the PNP input state. This current is essentially constant, independent of output state, so no loading change exists on the input lines.
 3/ If not tested, shall be guaranteed to specified limit.

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.

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Case X

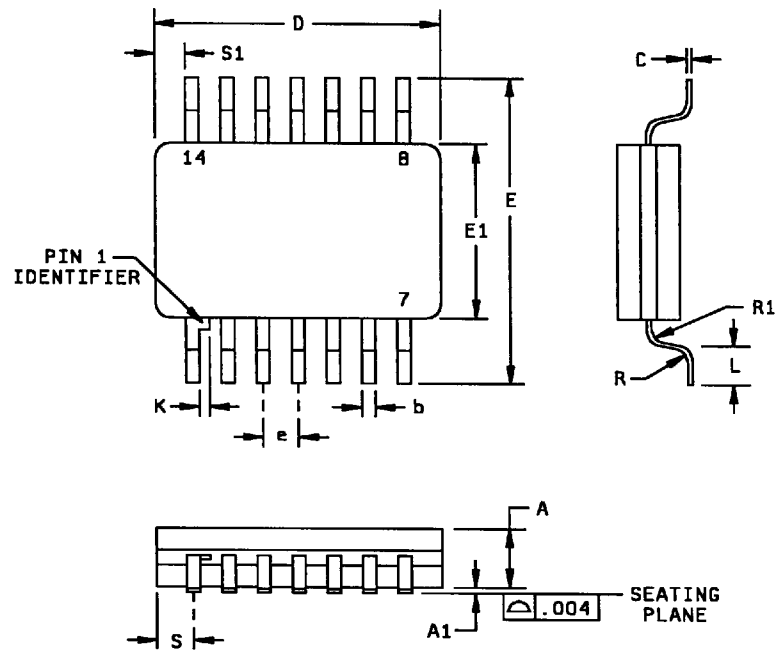


FIGURE 1. Case outline.

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Case X

Ltr	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.050	.080	1.27	2.03	
A1	.004	.012	0.10	0.30	
b	.015	.019	0.38	0.48	2
C	.004	.008	0.10	0.20	2
D		.390		9.91	
E		.420		10.67	
E1	.245	.270	6.22	6.86	
e	.050 BSC		1.27 BSC		
K	.007	.012	0.18	0.30	
L	.037	.043	0.94	1.09	
R	.013	.017	0.33	0.43	
R1	.013	.017	0.33	0.43	
S		.045		1.14	
S1	.005		0.13		

NOTES:

1. The US government preferred system of measurement is the metric SI system. However, since this item was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.
2. Maximum limit may be increased by .003 inches after lead finish is applied.

FIGURE 1. Case outline - Continued.

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Device types	01 and 02	
Case outlines	A, C, D, X	2
Terminal number	Terminal symbol	
1	V _{O1}	NC
2	-V _{IN1}	V _{O1}
3	+V _{IN1}	-V _{IN1}
4	+V	+V _{IN1}
5	+V _{IN2}	NC
6	-V _{IN2}	+V
7	V _{O2}	NC
8	V _{O3}	+V _{IN2}
9	-V _{IN3}	-V _{IN2}
10	+V _{IN3}	V _{O2}
11	GND	NC
12	+V _{IN4}	V _{O3}
13	-V _{IN4}	-V _{IN3}
14	V _{O4}	+V _{IN3}
15	----	NC
16	----	GND
17	----	NC
18	----	+V _{IN4}
19	----	-V _{IN4}
20	----	V _{O4}

FIGURE 2. Terminal connections.

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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, 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

* PDA applies to subgroup 1.

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 in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus 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) 692-0525.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0674.

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.

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STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN

DATE: 98-03-02

Approved sources of supply for SMD 77043 are listed below for immediate acquisition 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 bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/	Equivalent device specification part number
7704301AA		3/	M38510/11005BAX
7704301CA	01295 07933 27014	LM124JB LM124DC/883B LM124J/883	M38510/11005BCX
7704301DA	01295	LM124WB	M38510/11005BDX
77043012A	01295 27014	LM124FKB LM124E/883	----
7704301XA	27014	LM124WG/883	----
7704302CA	27014 01295	LM124AJ/883 LM124AJB	----
77043022A	27014 01295	LM124AE/883 LM124AFKB	----
7704302XA	27014	LM124AWG/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/ The "A" case outline is no longer available.

STANDARD MICROCIRCUIT DRAWING SOURCE APPROVAL BULLETIN - Continued

<u>Vendor CAGE number</u>	<u>Vendor name and address</u>
01295	Texas Instruments Inc. 13500 N Central Expressway P O Box 655303 Dallas, TX 75265 Point of contact: I-20 at FM 1788 Midland, TX 79711-0448
07933	Raytheon Company Semiconductor Division 350 Ellis Street Mountainview, CA 94039-7016
27014	National Semiconductor 2900 Semiconductor Drive P O Box 58090 Santa Clara, CA 95052-8090

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