

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with NOR 5962-R119-92.	92-02-12	M. A. Frye
B	Add device types 02, 03, and 04. Changes in table I and figure 1. Editorial changes throughout.	93-05-26	M. A. Frye
C	Changes in accordance with NOR 5962-R010-94.	93-10-15	M. A. Frye
D	Incorporate revision C, NOR. Update drawing to current requirements. Editorial changes throughout. - drw	07-04-25	Robert M. Heber

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

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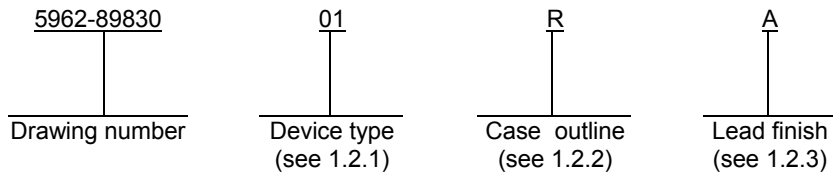
REV STATUS OF SHEETS	REV	D	D	D	D	D	D	D	D	D	D	D	D			
	SHEET	1	2	3	4	5	6	7	8	9	10	11				

PMIC N/A	PREPARED BY Rick C. Officer	<p align="center">DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990 http://www.dsc.dla.mil</p>													
<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	CHECKED BY Charles E. Besore														
	APPROVED BY Michael A. Frye	<p align="center">MICROCIRCUIT, LINEAR, DATA ACQUISITION SYSTEM, MONOLITHIC SILICON</p>													
	DRAWING APPROVAL DATE 90-03-08														
	REVISION LEVEL D	<table border="1"> <tr> <td>SIZE A</td> <td>CAGE CODE 67268</td> <td>5962-89830</td> </tr> </table>	SIZE A	CAGE CODE 67268	5962-89830										
SIZE A	CAGE CODE 67268	5962-89830													
		SHEET 1 OF 11													

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 types. The device types identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>	<u>Gain error</u>
01	LTC1090	10-bit data acquisition system	±2.0 LSB
02	LTC1290B	12-bit data acquisition system	±0.5 LSB
03	LTC1290C	12-bit data acquisition system	±1.0 LSB
04	LTC1290D	12-bit data acquisition system	±4.0 LSB

1.2.2 Case outline. The case outline is as designated in MIL-STD-1835 as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
R	GDIP1-T20 or CDIP2-T20	20	Dual-in-line

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

1.3 Absolute maximum ratings. 1/

Supply voltage (V+) to GND or (V-)	12 Vdc
Negative supply voltage (V-).....	-6 V to GND
Analog and reference input voltage range	(V-) -0.3 V to V+ +0.3 V
Digital input voltage range	-0.3 V to 12 V
Digital output voltage range	-0.3 V to V+ +0.3 V
Power dissipation (P _D)	500 mW
Lead temperature (soldering, 10 seconds)	+300°C
Storage temperature range.....	-65°C to +150°C
Junction temperature (T _J)	+175°C
Thermal resistance, junction-to-case (θ _{JC}).....	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ _{JA}).....	70°C/W

1/ All voltage values are with respect to ground with DGND, AGND, and REF- wired together, unless otherwise noted.

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1.4 Recommended operating conditions. 2/

Positive supply voltage range (V+)	4.5 V dc to 10 V dc
Negative supply voltage range (V-).....	-5.5 V dc to 0 V dc
Shift clock frequency range (f _{SCLK}):	
Device type 01	0 to 1.0 MHz
Device type 02, 03, 04.....	0 to 2.0 MHz
A/D clock frequency range (f _{ACLK}):	
Device type 01	f _{SCLK} to 2.0 MHz
Device type 02, 03, 04.....	f _{SCLK} to 4.0 MHz
Total cycle time (t _{CYC}):	
Device type 01	10 SCLK + 48 ACLK cycles minimum
Device type 02, 03, 04.....	12 SCLK + 56 ACLK cycles minimum
Hold time, CS low after last SCLK negative edge (t _{HCS}).....	0 ns minimum
Hold time, D _{IN} after SCLK positive edge (t _{HD}):	
Device type 01	150 ns minimum
Device type 02, 03, 04.....	50 ns minimum
Setup time, CS negative edge before clocking in first address bit (t _{SUCS}):	
Device type 01	2 ACLK cycles + 1 μs minimum
Device type 02, 03, 04.....	2 ACLK cycles + 100 ns minimum
Setup time, D _{IN} stable before SCLK positive edge (t _{SUD}):	
Device type 01	400 ns minimum
Device type 02, 03, 04.....	50 ns minimum
ACLK high time (t _{WHACLK}), device type 01	127 ns minimum
ACLK low time (t _{WLACLK}), device type 01	200 ns minimum
CS high time during conversion (t _{WHCS}):	
Device type 01	44 ACLK cycles minimum
Device type 02, 03, 04.....	52 ACLK cycles minimum
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 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.

2/ V+ = 5.0 V dc, unless otherwise noted.

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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. The case outline 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-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. 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.

3.5.1 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions ^{1/} -55°C ≤ T _A ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
High level input voltage	V _{IH}	V ₊ = 5.25 V	1, 2, 3	All	2.0		V
Low level input voltage	V _{IL}	V ₊ = 4.75 V	1, 2, 3	All		0.8	V
High level input current	I _{IH}	V _{IN} = V ₊	1, 2, 3	All		2.5	μA
Low level input current	I _{IL}	V _{IN} = 0 V	1, 2, 3	All		-2.5	μA
High level output voltage	V _{OH}	V ₊ = 4.75 V, I _O = 360 μA	1, 2, 3	All	2.4		V
Low level output voltage	V _{OL}	V ₊ = 4.75 V, I _O = 1.6 mA	1, 2, 3	All		0.4	V
Hi-Z output leakage	I _{OZ}	V _{OUT} = V ₊ , $\overline{\text{CS}}$ high	1, 2, 3	All		3.0	μA
		V _{OUT} = 0 V, $\overline{\text{CS}}$ high				-3.0	
Positive supply current	I ₊	$\overline{\text{CS}}$ high, REF+ open	1, 2, 3	01		2.5	mA
				02, 03, 04		12	
Reference current	I _{REF}	V _{REF} = 5 V	1, 2, 3	01		1.0	mA
				02, 03, 04		0.05	
Negative supply current	I ₋	$\overline{\text{CS}}$ high, V ₋ = -5 V	1, 2, 3	All		50	μA
Offset error ^{2/}	V _{OS}		1, 2, 3	01		±0.5	LSB
				02, 03, 04		±1.5	
Linearity error ^{2/, 3/}			1, 2, 3	01, 02, 03		±0.5	LSB
				04		±0.75	
Gain error ^{2/}	A _E		1, 2, 3	01		±2.0	LSB
				02		±0.5	
				03		±1.0	
				04		±4.0	

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	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Total unadjusted error ^{2/} , ^{4/}		V _{REF} = 5 V	1, 2, 3	01		±2.0	LSB
Analog and REF input range ^{5/}			1, 2, 3	All	(V-) -0.02	(V+) +0.02	V
On channel leakage current ^{6/}	R _{ON}	On channel = 5 V, Off channel = 0 V	1, 2, 3	All		1	μA
		On channel = 0 V, Off channel = 5 V				-1	
Off channel leakage current ^{6/}	R _{OFF}	On channel = 5 V, Off channel = 0 V	1, 2, 3	All		1	μA
		On channel = 0 V, Off channel = 5 V				-1	
Delay time, SCLK negative edge to D _{OUT} data valid	t _{dDO}	See figures 2 and 3	9, 10, 11	01		450	ns
				02, 03, 04		270	
Delay time, CS positive edge to D _{OUT} Hi-Z	t _{dis}	See figures 2 and 3	9, 10, 11	01		300	ns
				02, 03, 04		100	
Delay time, 2nd CLK negative edge to D _{OUT} enabled	t _{en}	See figures 2 and 3	9, 10, 11	01		400	ns
				02, 03, 04		200	
D _{OUT} fall time	t _f	See figures 2 and 3	9, 10, 11	01		300	ns
				02, 03, 04		130	
D _{OUT} rise time	t _r	See figures 2 and 3	9, 10, 11	01		300	ns
				02, 03, 04		50	

^{1/} V+ = 5 V, V_{REF+} = 5 V, V_{REF-} = 0 V, V- = 0 V for unipolar mode and -5 V for bipolar mode, ACLK = 4.0 MHz unless otherwise specified.

^{2/} Applies for both unipolar and bipolar modes.

^{3/} Linearity error is specified between the actual end-points of the A/D transfer curve.

^{4/} Total unadjusted error includes offset, gain, linearity, multiplexer and hold step errors.

^{5/} Two on-chip diodes are tied to each reference and analog input which will conduct for reference or analog input voltages, one diode drop below V- or one diode drop above V_{CC}. Be careful during testing at low V_{CC} levels (4.5 V), as high level reference or analog inputs (5 V) can cause this input diode to conduct, especially at elevated temperatures, and cause errors for inputs near full-scale. This specification allows 50 mV forward bias of either diode. This means that as long as the reference or analog input does not exceed the supply voltage by more than 50 mV, the output code will be correct. To achieve an absolute 0 V to 5 V input voltage range will therefore require a minimum supply voltage of 4.950 V over initial tolerance, temperature variations and loading.

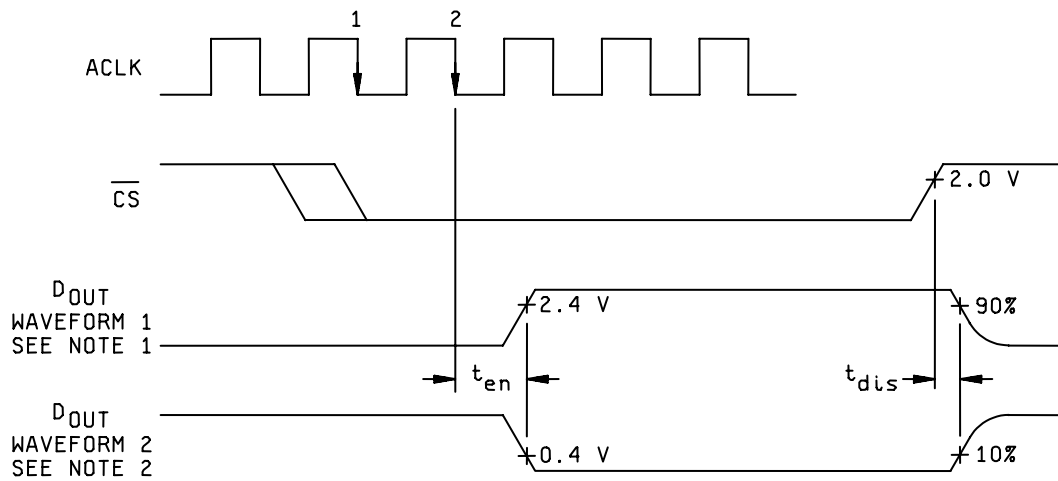
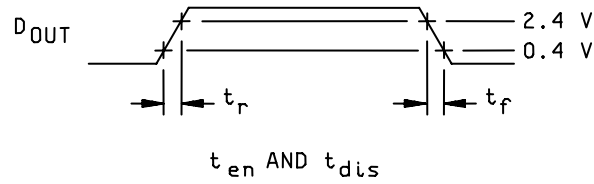
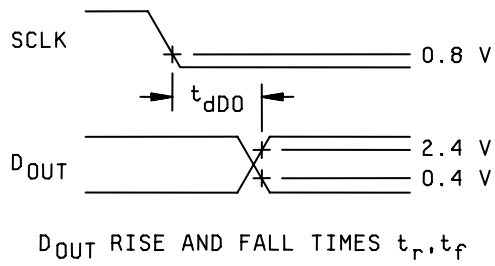
^{6/} Channel leakage current is measured after the channel selection

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Device type	01, 02, 03, 04
Case outline	R
Terminal number	Terminal symbol
1	CH0
2	CH1
3	CH2
4	CH3
5	CH4
6	CH5
7	CH6
8	CH7
9	COM
10	DGND
11	AGND
12	V-
13	REF-
14	REF+
15	$\overline{\text{CS}}$
16	D _{OUT}
17	D _{IN}
18	SCLK
19	ACLK
20	V+

FIGURE 1. Terminal connections.

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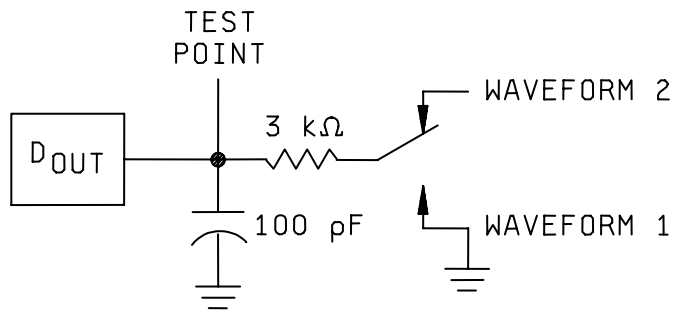


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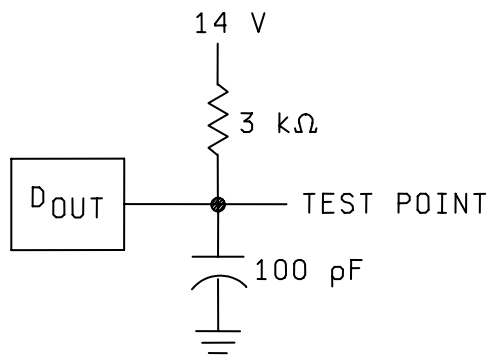
1. Waveform 1 is for an output with internal conditions such that the output is high unless disabled by the output control.
2. Waveform 2 is for an output with internal conditions such that the output is low unless disabled by the output control.

FIGURE 2. Timing waveforms.

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LOAD CIRCUIT FOR t_{dis} AND t_{en}



LOAD CIRCUIT FOR t_{dD0} , t_r , AND t_f

FIGURE 3. Test circuits.

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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) $T_A = +125^{\circ}\text{C}$, 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.

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)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 9, 10, 11
Group A test requirements (method 5005)	1, 2, 3, 9, 10, 11
Groups C and D end-point electrical parameters (method 5005)	1

* 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 4, 5, 6, 7, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

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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) $T_A = +125^{\circ}\text{C}$, 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-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.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 07-04-25

Approved sources of supply for SMD 5962-89830 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.dscclia.mil/Programs/Smcr/>.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962-8983001RA	<u>3/</u>	LTC1090MJ/883C
5962-8983002RA	<u>3/</u>	LTC1290BMJ/883C
5962-8983003RA	<u>3/</u>	LTC1290CMJ/883C
5962-8983004RA	<u>3/</u>	LTC1290DMJ/883C

- 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. The last known supplier is listed below.

Vendor CAGE number

64155

Vendor name and address

Linear Technology Corp.
1630 McCarthy Blvd.
Milpitas, CA 95035-7417

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