

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with N.O.R. 5962-R274-92.	92-10-02	M. A. FRYE
B	Drawing updated to reflect current requirements. - ro	01-12-06	R. MONNIN
C	Make correction to V_{IN} under the conditions title as specified in TABLE I. - ro	04-07-01	R. MONNIN

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

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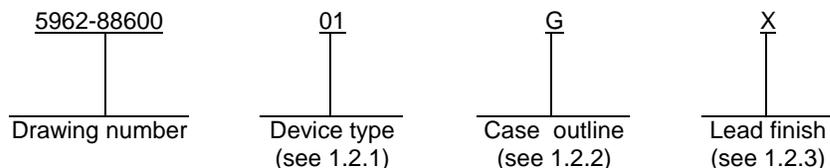
REV STATUS	REV	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
OF SHEETS	SHEET	1	2	3	4	5	6	7	8										

PMIC N/A	PREPARED BY GARY ZAHN	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990 http://www.dsccl.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 RAY MONNIN	MICROCIRCUIT, LINEAR, PRECISION, 10 VOLT, VOLTAGE REFERENCE, MONOLITHIC SILICON				
	APPROVED BY MICHAEL A. FRYE					
	DRAWING APPROVAL DATE 88-03-31					
	REVISION LEVEL C					
	SIZE A	CAGE CODE 67268	5962-88600			
	SHEET 1 OF 8					

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:

Device type	Generic number	Circuit function	ΔV_{OUT} (V)	$\Delta V_{OUT} / \Delta T$ (ppm/°C)
01	LT1021BM-10	10 V voltage reference	± 0.05 V	5.0
02	LT1021CM-10	10 V voltage reference	± 0.005 V	20.0
03	LT1021DM-10	10 V voltage reference	± 0.05 V	20.0

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

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

1.3 Absolute maximum ratings.

Input voltage	40 V dc
Input-output voltage differential	35 V dc
Output to ground voltage	16 V dc ^{1/}
Trim pin to ground voltage:	
Positive	Equal to V_{OUT}
Negative	-20 V dc
Output short-circuit duration:	
at $V_{IN} = 35$ V	10 seconds
at $V_{IN} \leq 20$ V	Indefinite
Power dissipation (P_D)	500 mW
Junction temperature (T_J)	+175°C
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA})	+150°C/W

1.4 Recommended operating conditions.

Ambient operating temperature range (T_A)	-55°C to +125°C
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^{1/} Shunt mode current limit.

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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.dia.mil/quicksearch/> or www.dodssp.daps.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. 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C V _{IN} = 15 V, I _{OUT} = 0 mA unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage <u>1/</u>	V _{OUT}	T _A = +25°C	1	01,03	9.95	10.05	V
				02	9.995	10.005	
Output voltage temperature coefficient <u>2/</u>	ΔV _{OUT} / ΔT	T _A = +125°C, -55°C	2,3	01		5.0	ppm / °C
				02,03		20	
Line regulation <u>3/</u>	V _{RLN}	11.5 V ≤ V _{IN} ≤ 14.5 V	1	All		4.0	ppm / V
			2,3			6.0	
		14.5 V ≤ V _{IN} ≤ 40 V	1			2.0	
			2,3			4.0	
Load regulation <u>3/</u> (sourcing mode)	V _{RLD1}	0 mA ≤ I _{OUT} ≤ 10 mA	1	All		25	ppm / mA
			2,3			40	
Load regulation <u>3/ 4/</u> (shunt mode)	V _{RLD2}	1.7 mA ≤ I _{SHUNT} ≤ 10 mA	1	All		100	ppm / mA
			2,3			150	
Supply current (series mode)	I _{CC}		1	All		1.7	mA
			2,3			2.0	
Minimum current (shunt mode)	I _{MIN}	V _{IN} = open	1	All		1.5	mA
			2,3			1.7	
Output voltage noise <u>5/</u>	N _O	10 Hz ≤ f _O ≤ 1.0 kHz, T _A = +25°C	4	All		6.0	μV rms
Long term stability <u>6/</u> of output voltage	ΔV _{OUT} / Δt	t = 1,000 hours, T _A = +25°C	4	All		60	ppm

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

- 1/ Output voltage is measured immediately after turn-on. Changes due to chip warm-up are typically less than 0.005 percent.
- 2/ Temperature coefficient is measured by dividing the change in output voltage over the temperature range by the change in temperature. Separate tests are done for hot and cold: -55°C to +25°C, and +25°C to +125°C. Incremental slope is also measured at +25°C.
- 3/ Line and load regulation are measured on a pulse basis. Output changes due to die temperature change must be taken into account separately. Package thermal resistance is 150°C/W.
- 4/ Shunt mode regulation is measured with input open. With the input connected, shunt mode current can be reduced to 0 mA. Load regulation will remain the same.
- 5/ The RMS noise is measured with a 2-pole high pass filter at 10 Hz and a 2-pole low pass filter at 1 kHz. The resulting output is full wave rectified and then integrated for a fixed period, making the final reading an average as opposed to rms. Correction factors are used to convert from average to RMS and to correct for the non-ideal bandpass of the filters.
- 6/ Guaranteed, if not tested, to the limits specified in table 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-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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Device types	01, 02, 03
Case outline	G
Terminal number	Terminal symbol
1	No connection <u>1/</u>
2	Input voltage
3	No connection <u>1/</u>
4	Ground
5	Trim
6	Output voltage
7	No connection <u>1/</u>
8	No connection <u>1/</u>

1/ These pins are connected internally. Do not connect external circuitry to these pins.

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

* PDA applies to subgroup 1.

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.

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.

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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: 04-07-01

Approved sources of supply for SMD 5962-88600 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.

Standard microcircuit drawing PIN <u>1</u> /	Vendor CAGE number	Vendor similar PIN <u>2</u> /	Reference military specification PIN
5962-8860001GA	64155	LT1021BMH-10/883B	MIL-M-38510/12409BGA
5962-8860002GA	64155	LT1021CMH-10/883B	
5962-8860003GA	64155	LT1021DMH-10/883B	

- 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.

Vendor CAGE
number

64155

Vendor name
and address

Linear Technology Corporation
1630 McCarthy Boulevard
Milpitas, CA 95035-7417

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