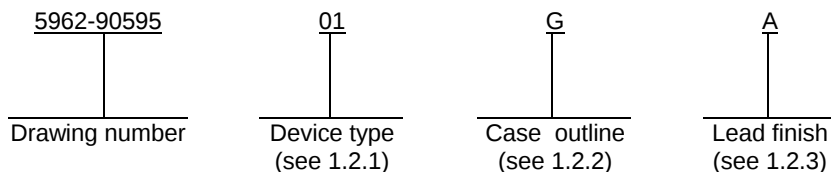


REVISIONS																			
LTR	DESCRIPTION										DATE (YR-MO-DA)				APPROVED				
A	Changes in accordance with N.O.R. 5962-R010-95.										95-01-05				M. A. FRYE				
B	Changes in accordance with N.O.R. 5962-R163-95.										95-06-29				M. A. FRYE				
C	Drawing updated to reflect current requirements. - ro										02-11-14				R. MONNIN				
D	Five year review requirement. - ro										08-01-23				R. HEBER				
THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.																			
REV																			
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REV STATUS				REV		D	D	D	D	D	D	D	D	D					
OF SHEETS				SHEET		1	2	3	4	5	6	7	8	9					
PMIC N/A				PREPARED BY RICK C. 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 CHARLES E. BESORE															
				APPROVED BY MICHAEL A. FRYE															
				DRAWING APPROVAL DATE 90-12-07															
								REVISION LEVEL D						SIZE A	CAGE CODE 67268	5962-90595			
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:



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

Device type	Generic number	Circuit function
01	LT1019A-10	10 V precision reference
02	LT1019A-5	5 V precision reference
03	LT1019A-4.5	4.5 V precision reference
04	LT1019A-2.5	2.5 V precision reference
05	LT1019-10	10 V precision reference
06	LT1019-5	5 V precision reference
07	LT1019-4.5	4.5 V precision reference
08	LT1019-2.5	2.5 V precision reference

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 (V_{IN})	40 V dc
Output voltage (V_{OUT}), ($V_{IN} \geq V_{OUT}$)	16 V dc
Output short circuit duration (I_{OS}):	
$V_{IN} \geq 20$ V	Indefinite
20 V $\leq V_{IN} \leq 35$ V	10 seconds
Trim pin voltage	± 30 V dc
Temperature pin voltage	5 V dc
Heater voltage:	
(Continuous)	18 V dc
(Intermittent, 30 seconds)	32 V dc
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA})	+150°C/W

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1.4 Recommended operating conditions.

Differential voltage (V_{DIFF}), ($V_{IN} - V_{OUT}$) 5 V dc
Load current (I_L) 5 mA
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.

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.

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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 tolerance		T _A = +25°C	1	01-04		0.05	%
				05-08		0.20	
Output voltage temperature coefficient	T _C	<u>1</u> /	2,3	01-04		10	ppm/°C
				05-08		25	
Line regulation <u>2</u> /	VR _{LN}	(V _{OUT} +1.5 V) ≤ V _{IN} ≤ +40 V, V _{OUT} = 10 V	1	01,05		3	ppm/°V
			2,3			5	
		(V _{OUT} +1.5 V) ≤ V _{IN} ≤ +40 V, V _{OUT} = 5 V	1	02,06		3	
			2,3			5	
		(V _{OUT} +1.5 V) ≤ V _{IN} ≤ +40 V, V _{OUT} = 4.5 V	1	03,07		3	
			2,3			5	
		(V _{OUT} +1.5 V) ≤ V _{IN} ≤ +40 V, V _{OUT} = 2.5 V	1	04,08		3	
			2,3			5	
Load regulation, series	VR _{LD1}	I _L = 0 mA to 10 mA <u>2</u> / <u>3</u> /	1	All		0.05	mV /mA
			2,3			0.08	
Load regulation, shunt	VR _{LD2}	I _L = 1 mA to 10 mA <u>2</u> / <u>3</u> / <u>4</u> /	1,2,3	All		0.80	mV/mA
Thermal regulation		ΔP _D = 200 mW, <u>5</u> / t = 50 ms, T _A = +25°C	1	All		0.50	ppm / mW
Quiescent current, series mode	I _{CC}		1	01-04		1.0	mA
			2,3			1.3	
			1	05-08		1.2	
			2,3			1.5	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued.

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	
Minimum shunt current		<u>6/</u>	1,2,3	All		0.8	mA
Minimum input-output voltage differential	V _{DIFF}	I _{OUT} ≤ 1 mA <u>7/</u>	1,2,3	All		1.1	V
		I _{OUT} = 10 mA				1.3	
Trim range		T _A = +25°C	1	All	-3.5	+3.5	%
Heater resistance	R _{HT}	T _A = +25°C	1	All	300	500	Ω
Short circuit current (output connected to GND)	I _{OS}	V _{IN} = 2 V to 35 V	1	All	15		mA
			2,3		10		
Output voltage noise	N _O	f = 10 Hz to 10 kHz, <u>8/</u> T _A = +25°C	4	All		4	ppm (rms)

- 1/ Output voltage drift is measured using the box method: Output voltage is recorded at T_{MIN}, +25°C, and T_{MAX}. The lowest of these three readings is subtracted from the highest and the resultant difference is divided by (T_{MAX} – T_{MIN}).
- 2/ Line regulation and load regulation are measured on a pulsed-basis using low duty cycle. Effects due to die heating must be taken into account separately; refer to the thermal regulation test.
- 3/ Load regulation is measured at a point 0.125 inch below the base of the package and is Kelvin-contacted.
- 4/ Measured with the input floating. Limits guaranteed with the input connected (V_{IN} – V_{OUT}) > 1 V.
0 mA ≤ I_{SINK} ≤ 10 mA. Shunt and sink current flow into the output.
- 5/ Thermal regulation is caused by die temperature gradients created by load current or input voltage changes. The result of this effect must be taken into account when computing both line and load regulation performance.
- 6/ Minimum shunt current is measured with shunt voltage held 20 mV below the value measured at 1 mA shunt current.
- 7/ Minimum input-output voltage differential is measured by forcing the input voltage 0.5 V above the nominal output voltage while measuring V_{IN} to V_{OUT}.
- 8/ RMS noise is measured with a single 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 value; not rms. To obtain the rms value, a correction factor of 1.1 is used to convert from average to rms, and a second factor of 0.88 is used to compensate for the non-ideal behavior of the filters. 0.1 Hz to 10 Hz peak-to-peak noise is usually 2.5 ppm.

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Device types	All
Case outline	G
Terminal number	Terminal symbol
1	NC (see note)
2	INPUT
3	TEMP
4	GND
5	TRIM
6	OUTPUT
7	HEATER
8	NC (see note)

NC = No connection

NOTE: Internally connected. Do not connect externally.

FIGURE 1. Terminal connections.

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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.

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 C. 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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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.

4.3.2 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 C. 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.

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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: 08-01-23

Approved sources of supply for SMD 5962-90595 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> /
5962-9059501GA	60264	MTLT1019AQH-10
	<u>3</u> /	LT1019AMH-10/883
5962-9059502GA	60264	MTLT1019AQH-5
	<u>3</u> /	LT1019AMH-5/883
5962-9059503GA	60264	MTLT1019AQH-4.5
	<u>3</u> /	LT1019AMH-4.5/883
5962-9059504GA	60264	MTLT1019AQH-2.5
	<u>3</u> /	LT1019AMH-2.5/883
5962-9059505GA	60264	MTLT1019QH-10
	<u>3</u> /	LT1019MH-10/883
5962-9059506GA	60264	MTLT1019QH-5
	<u>3</u> /	LT1019MH-5/883
5962-9059507GA	60264	MTLT1019QH-4.5
	<u>3</u> /	LT1019MH-4.5/883
5962-9059508GA	60264	MTLT1019QH-2.5
	<u>3</u> /	LT1019MH-2.5/883

- 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

60264

Vendor name
and address

Minco Technology Labs, Inc.
1805 Rutherford Lane
Austin, TX 78754-5101

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