REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Change input to output voltage differential in 1.3, 1.4, V_{REF}, V_{RLINE}, I_{ADJ}, and ΔI_{ADJ} conditions. Change I_{LIM} test limits for conditions ($V_{IN} - V_{OUT}$) = 2.5 V from 0.05 A to 0.075 A. Add case outline Y (TO-39).	92-08-19	M. A. FRYE
B	Changes in accordance with NOR 5962-R034-94.	92-12-23	M. A. FRYE
C	Add case outline Z. Technical and editorial changes throughout.	94-08-09	M. A. FRYE
D	Changes in accordance with NOR 5962-R044-99.	99-03-24	R. MONNIN
E	Add case outlines M and T. - ro	02-02-21	R. MONNIN
F	Remove max limits for the current limit test, I_{LIM}, in table I. -rrp	07-07-23	ROBERT M. HEBER

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																			
SHEET																			
REV																			
SHEET																			
REV STATUS	REV	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F			
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14				

PMIC N/A

PREPARED BY
JOSEPH A. KERBY

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
90-07-24

REVISION LEVEL
F

MICROCIRCUIT, LINEAR, POSITIVE REGULATOR, ADJUSTABLE, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	**67268**	**5962-89981**

SHEET 1 OF 14

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:

5962-89981	01	U	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	LT1086 / OM1860	Positive regulator, adjustable

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
M	See figure 1	3	Flange mount, glass sealed with gull wing leads
T	CBCC1-N3	3	Bottom terminal chip carrier
U	See figure 1	3	TO-257 Single row flange mount with isolated tab and glass sealed
X	See figure 1	2	TO-3 Flange mount
Y	See figure 1	3	TO-39 Can
Z	See figure 1	3	Z-tab

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

1.3 Absolute maximum ratings.

Input to output voltage differential	25 V dc
Output current (I_{MAX}):	
Cases M, T, X, U, and Z	1.0 A
Case Y	0.5 A
Power dissipation (P_D)	Internally limited
Junction temperature (T_J)	+150°C
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC}):	
Case M	7.1°C/W
Case T	4.1°C/W
Case X	3.0°C/W
Cases U and Z	4.2°C/W
Case Y	40°C/W

1.3 Absolute maximum ratings – Continued.

Thermal resistance, junction-to-ambient (θ_{JA}):

Case M	60°C/W
Case T	80°C/W
Case X	35°C/W
Cases U and Z	42°C/W
Case Y	140°C/W

1.4 Recommended operating conditions.

Input to output voltage differential	15 V dc
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 and figure 1.

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

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Reference voltage	V_{REF}	I_{OUT} = 10 mA, $(V_{IN} - V_{OUT})$ = 3.0 V	1	01	1.238	1.262	V
		1.5 V ≤ $(V_{IN} - V_{OUT})$ ≤ 15 V, 2/ 10 mA ≤ $I_{OUT} \le I_{MAX}$	1,2,3		1.225	1.270	
		1.5 V ≤ $(V_{IN} - V_{OUT})$ ≤ 15 V, 3/ 10 mA ≤ $I_{OUT} \le I_{MAX}$			1.220	1.270	
Line regulation 4/	V_{RLINE}	1.5 V ≤ $(V_{IN} - V_{OUT})$ ≤ 15 V, I_{OUT} = 10 mA	1,2,3	01		0.2	%
Load regulation 4/	V_{RLOAD}	$(V_{IN} - V_{OUT})$ = 3.0 V, 2/ 10 mA ≤ $I_{OUT} \le I_{MAX}$	1	01		0.3	%
			2,3			0.4	
		$(V_{IN} - V_{OUT})$ = 3.0 V, 3/ 10 mA ≤ $I_{OUT} \le I_{MAX}$	1			0.8	
			2,3			1.0	
Dropout voltage	V_{DO}	$I_{OUT} = I_{MAX}$, ΔV_{REF} = 1.0 %	1,2,3	01		1.5	V
Thermal regulation	---	30 ms pulse, T_A = +25°C	1	01		0.04	%/W
Ripple rejection	ΔV_{IN} / ΔV_{OUT}	C_{ADJ} = 25 µF, f = 120 Hz, C_{OUT} = 25 µF (tantalum), $I_{OUT} = I_{MAX}$, $(V_{IN} - V_{OUT})$ = 3.0 V	4,5,6	01	60		dB
Adjust pin current	I_{ADJ}	1.5 V ≤ $(V_{IN} - V_{OUT})$ ≤ 15 V, 10 mA ≤ $I_{OUT} \le I_{MAX}$	1,2,3	01		120	µA
Adjust pin current change	ΔI_{ADJ}	10 mA ≤ $I_{OUT} \le I_{MAX}$, 1.5 V ≤ $(V_{IN} - V_{OUT})$ ≤ 15 V	1,2,3	01		5.0	µA

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Minimum load current	I_{MIN}	$(V_{IN} - V_{OUT}) = 25$ V	1,2,3	01		10	mA
Current limit	I_{LIM}	$(V_{IN} - V_{OUT}) = 5.0$ V, case X only	1,2,3	01	1.5		A
		$(V_{IN} - V_{OUT}) = 5.0$ V 3/			1.5		
		$(V_{IN} - V_{OUT}) = 5.0$ V, case Y only			0.5		
		$(V_{IN} - V_{OUT}) = 25$ V, case X only			0.05		
		$(V_{IN} - V_{OUT}) = 25$ V 3/			0.075		
		$(V_{IN} - V_{OUT}) = 25$ V, case Y only			0.02		
Temperature stability 5/	$\Delta V_{OUT} / \Delta T$	$-55°C \le T_J \le +125°C$	1,2,3	01		1.5	%
Long term stability 5/	$\Delta V_{OUT} / \Delta t$	$T_A = +125°C$, t = 1000 hrs.	2	01		1.0	%

1/ For case outlines, M, T, X, U, and Z, $I_{MAX} = 1.0$ A. For case outline Y, $I_{MAX} = 0.5$ A.

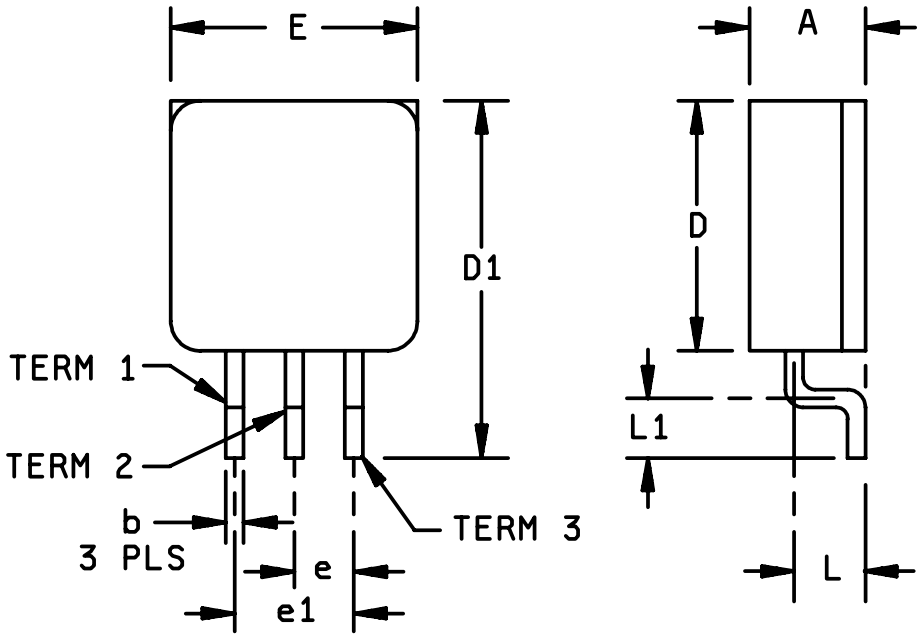
2/ Applies to cases X and Y.

3/ Applies to cases M, T, U, and Z.

4/ Line and load regulation are measured at a constant junction temperature using a low duty cycle pulse technique. Although power dissipation is internally limited, regulation is guaranteed up to the maximum power dissipation of 15 W. Power dissipation is determined by the input/output differential voltage and the output current. Guaranteed maximum power dissipation will not be available over the full input/output voltage range.

5/ If not tested, shall be guaranteed to the limits specified in table I.

Case outline M



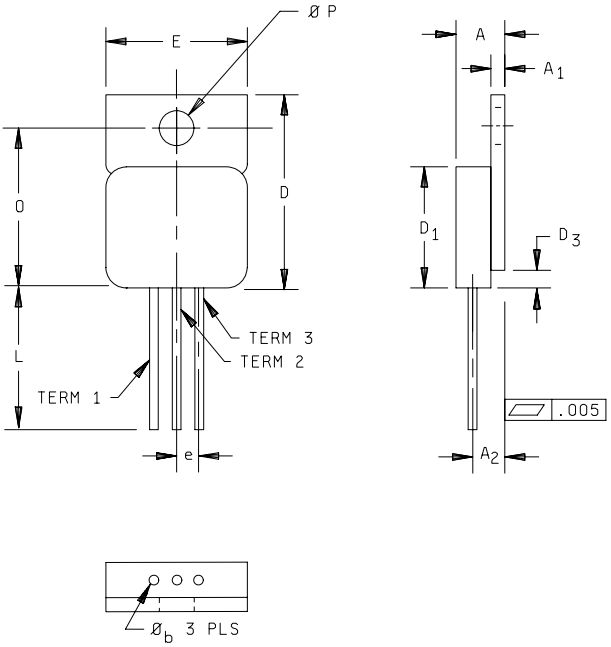
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.210	4.83	5.33
b	---	.030	---	0.76
D	.410	.430	10.41	10.92
D1	.580	.610	14.73	15.49
e	---	.100	---	2.54
e1	---	.200	---	5.08
E	.410	.420	10.41	10.67
L1	.090	.110	2.29	2.79
L	.115	.125	2.92	3.18
N	3		3	

NOTE:

The U.S. 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.

FIGURE 1. Case outline.

Case outline U



Inches	mm
.005	0.13

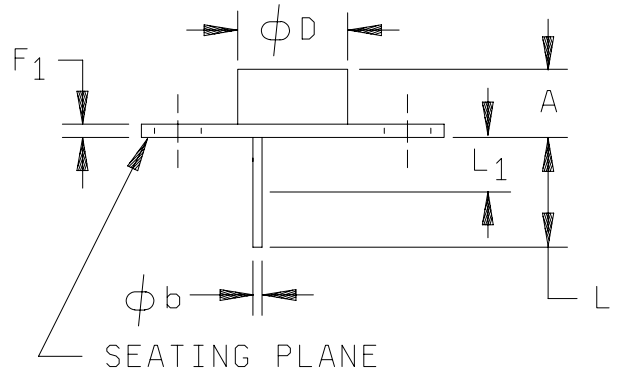
Letter	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.200	4.83	5.08
A_1	.035	.045	0.89	1.14
A_2	.120 BSC		3.05 BSC	
ϕb	.025	.035	0.64	0.89
D	.645	.665	16.38	16.89
D_1	.410	.430	10.41	10.92
D_3	---	.065	---	1.65
e	.100 BSC		2.54 BSC	
E	.410	.422	10.41	10.72
L	.500	.750	12.70	19.05
O	.527	.537	13.39	13.64
ϕP	.140	.150	3.56	3.81

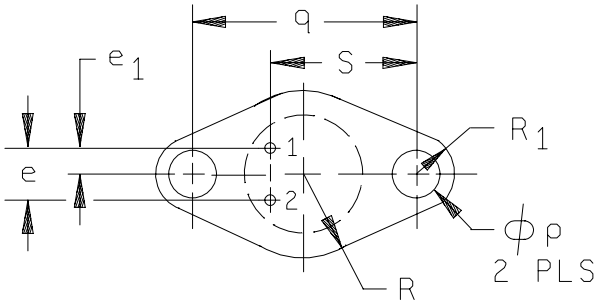
NOTE:

The U.S. 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.

FIGURE 1. Case outline – Continued.

Case outline X



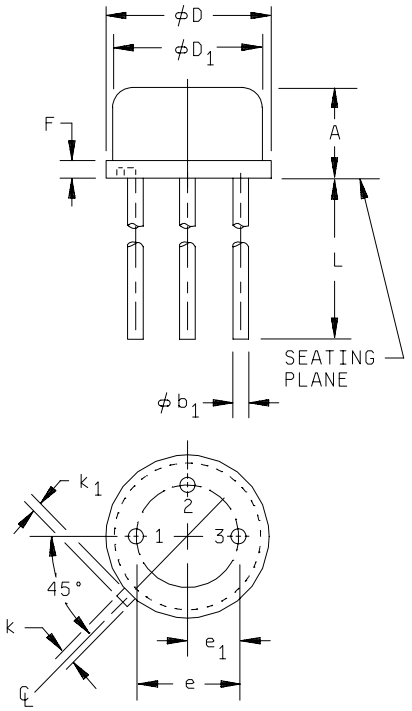


Letter	Inches		Millimeters	
	Min	Max	Min	Max
A	.250	.450	6.35	11.43
ϕb	.038	.043	.97	1.09
ϕD	---	.875	---	22.23
e	.420	.440	10.67	11.18
e_1	.205	.225	5.21	5.72
F_1	.060	.135	1.52	2.43
L	.312	.500	7.92	12.70
L_1	---	.050	---	1.27
ϕp	.151	.161	3.84	4.09
q	1.177	1.197	29.90	30.40
R	.495	.525	12.57	13.34
R_1	.131	.188	3.33	4.78
S	.655	.675	16.64	17.15

NOTE: 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.

FIGURE 1. Case outline – Continued.

Case outline Y

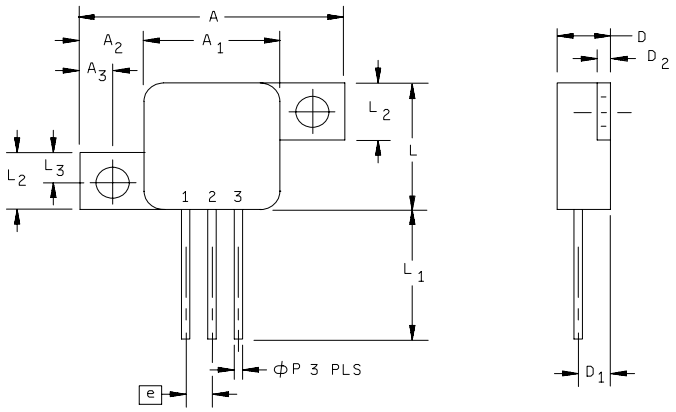


Letter	Inches		Millimeters	
	Min	Max	Min	Max
A	.165	.185	6.35	11.43
ϕb1	.016	.019	0.97	1.09
ϕD	.340	.370	8.64	22.23
ϕD1	.305	.335	4.10	1.09
e	.200 typ NOTE 2		5.08 typ NOTE 2	
e1	.100 typ NOTE 2		2.54 typ NOTE 2	
k	.028	.038	0.71	0.97
k1	.026	.045	0.66	1.27
L	.500	---	12.70	---

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. Leads having a maximum diameter of .019 inch (0.48 mm) measured in gauging plane .054 inch ± .001 inch (1.37 mm ± 0.03 mm) below the base plane of the product shall be within .007 inch (0.18 mm) of their true position relative to the maximum width tab.

FIGURE 1. Case outline – Continued.

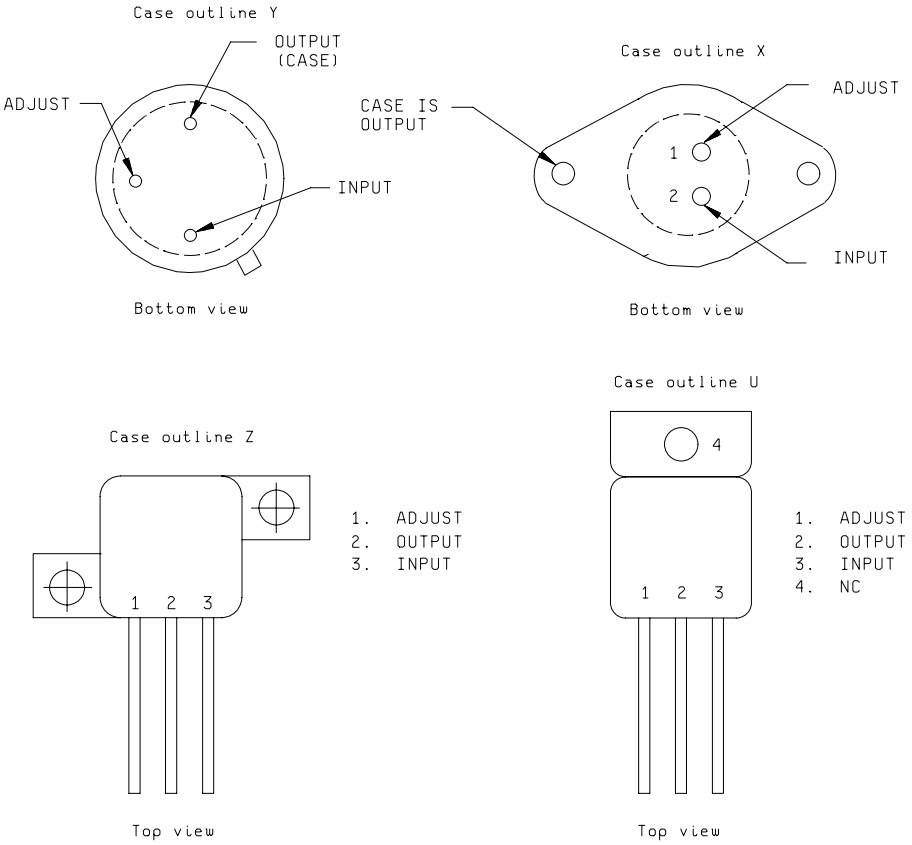
Case outline Z



Letter	Inches		Millimeters	
	Min	Max	Min	Max
A	.910	.920	23.11	23.37
A_1	.410	.420	10.41	10.67
A_2	.245	.255	6.22	6.48
A_3	.120	.130	3.05	3.30
ϕb	.120	.130	3.05	3.30
D	.135	.220	4.70	5.59
D_1	.115	.125	2.92	3.18
D_2	.035	.045	0.89	1.14
e	.100 BSC		2.54 BSC	
L	.410	.420	10.41	10.67
L_1	.500	.750	12.70	19.05
L2	.245	.255	6.22	6.48
L3	.120	.130	3.05	3.30
ϕp	.028	.032	0.71	0.81

NOTES: 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.

FIGURE 1. Case outline – Continued.



Device type	01	
Case outlines	M	T
Terminal number	Terminal symbol	
1	ADJUST	ADJUST
2	OUTPUT	INPUT
3	INPUT	OUTPUT

FIGURE 2. Terminal connections.

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.

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, 8A, 8B, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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*,2,3,4,5,6
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.

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.

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: 07-07-23

Approved sources of supply for SMD 5962-89981 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/
5962-8998101MA	69210	OM1860SRM
5962-8998101TA	69210	OM1860N5M
5962-8998101UA	21845	SDP1086UMD
	3/	FM186S7
	69210	OM1860STM
5962-8998101XA	21845	SDP1086XMD
	69210	OM1860NKM
	3/	LT1086MK/883
5962-8998101YA	21845	SDP1086YMD
	69210	OM1860NHM
	3/	LT1086MH/883
5962-8998101ZA	21845	SDP1086ZMD
	69210	OM1860STZM

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
21845	Solitron Devices Incorporated 3301 Electronics Way West Palm Beach, FL 33407-4697
69210	International Rectifier 205 Crawford Street Leominster, MA 01453-2353