REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED

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

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

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DRAWING APPROVAL DATE
93-06-29

REVISION LEVEL

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, LINEAR, POSITIVE VOLTAGE REGULATOR, 18 VOLT FIXED, MONOLITHIC SILICON

SIZE	CAGE CODE	
A	67268	5962-89915

SHEET 1 OF 13

DESC FORM 193
JUL 91

5962-E693-92

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

9004708 0010495 827

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:

5962-89915	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) shall identify the circuit function as follows:

Device type	Generic number	Circuit function
01	7818A	Positive regulator, 18 volt fixed

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

Outline letter	Descriptive designator	Terminals	Package style
U	See figure 1	3	TO-257, flange mounted can, with isolated tab
X	See figure 1	3	TO-39, can
Y	See figure 1	2	TO-3, can
Z	See figure 1	2	TO-66, can
2	CQCC1-N20	20	square chip carrier

1.2.3 Lead finish. The lead finish shall be as specified in MIL-M-38510. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Input voltage:	
Operating or output shorted to ground	35 V dc
Transient	50 V dc 1/
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+150°C 2/
Power dissipation (P_D):	
T_C = +25°C:	
Cases X and 2	2 W
Case Y	20 W
Cases Z and U	15 W
T_A = +25°C:	
Cases X and 2	1.0 W
Case Y	4.3 W
Cases Z and U	3.0 W

1/ The 50 V input rating refers to the ability of the regulator to withstand high line or transient condition without damage. Since the regulator's maximum current capability is reduced, the output may fall out of regulation at high input voltages under nominal loading.

2/ The device is protected by a thermal shutdown circuit which is designed to turn off the output transistor whenever the device junction temperature is in excess of +150°C.

1.3 Absolute maximum ratings - continued.

Thermal resistance:
Junction-to-case (Θ_{JC}):

Case X	15°C/W
Case Y	3°C/W
Case Z	6°C/W
Case U	4.2°C/W
Case 2	See MIL-STD-1835
Junction-to-ambient (Θ_{JA}):	
Cases X and 2	120°C/W
Case Y	29°C/W
Cases Z and U	42°C/W

1.4 Recommended operating conditions.

Ambient operating temperature range (T_A)	-55°C to +125°C
Input voltage range	+17.5 V dc to +30 V dc

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and bulletin. Unless otherwise specified, the following specification, standards, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARDS

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.
MIL-STD-1835 - Microcircuit Case Outlines.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standards, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

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 shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.4 herein and figure 1.

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

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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified		Group A subgroups	Limits Min	Limits Max	Unit
Output voltage	V_{OUT}	T_A = +25°C		1	17.7	18.3	V
		V_{IN} = 21 V to 33 V 2/		1, 2, 3	17.5	18.5	
Line regulation 3/ 4/	V_{RLINE}	$-55°C \le T_J \le +125°C$	V_{IN} = 21 V to 33 V	1		20	mV
				2, 3		50	
			V_{IN} = 24 V to 30 V	1		15	
				2, 3		25	
Load regulation 3/	V_{RLOAD}	$-55°C \le T_J \le +125°C$	I_{OUT} = 5.0 mA to 1.5 A 5/	1		35	mV
			I_{OUT} = 5.0 mA to 1.0 A 5/	2, 3		75	
			I_{OUT} = 250 mA to 750 mA 5/	1		21	
				2, 3		45	
			I_{OUT} = 5 mA to 500 mA 6/	1		50	
				2, 3		75	
Standby current drain	I_{SCD}			1		6.0	mA
				2, 3		6.5	
Standby current drain change with line	ΔI_{SCD} (line)	V_{IN} = 21 V to 30 V		1, 2, 3		0.8	mA
Standby current drain change with load	ΔI_{SCD}	I_{OUT} = 5.0 mA to 1000 mA 5/		1, 2, 3		0.5	mA
		I_{OUT} = 5.0 mA to 500 mA 6/				0.5	
Dropout voltage	V_{DO}	T_A = +25°C, ΔV_{OUT} = 100 mV	I_{OUT} = 1.0 A 5/	1		2.5	V
			I_{OUT} = 500 mA 6/				
Peak output current	I_{OUT} (pk)	T_A = +25°C	5/	1	1.5	3.3	A
			6/		0.5	1.7	

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	Limits Min	Limits Max	Unit
Short circuit current 7/	I_{OS}	V_{IN} = 35 V	5/	1		1.2	A
				2,3		2.8	
			6/	1		0.7	
				2,3		2.0	
Ripple rejection	$\frac{\Delta V_{IN}}{\Delta V_{OUT}}$	f = 120 Hz, ΔV_{IN} = 10 V		4	59		dB
				5, 6 8/	57		
Output noise voltage 8/	N_O	T_A = +25°C, f = 10 Hz to 100 kHz		7		40	µV/V rms
Long term stability 8/	$\frac{\Delta V_{OUT}}{\Delta t}$	T_A = +25°C, t = 1000 hours		7		150	mV

1/ Unless otherwise specified, V_{IN} = 27 V and I_{OUT} = 500 mA for cases U, Y, and Z, V_{IN} = 27 V and I_{OUT} = 100 mA for cases X and 2. Maximum test current for cases X and 2 is 500 mA.
2/ For cases X and 2: I_{OUT} = 5 mA to 500 mA, $P \le 2$ W. For case Y: I_{OUT} = 5 mA to 1.0 A, $P \le 20$ W. For cases U and Z: I_{OUT} = 5 mA to 1.0 A, $P \le 15$ W.
3/ All regulation tests are made at constant junction temperature with low duty cycle testing.
4/ Minimum load current for full line regulation is 5.0 mA.
5/ For cases U, Y, and Z only.
6/ For cases X and 2 only.
7/ Short circuit protection is only assured up to V_{IN} = 35 V.
8/ Guaranteed, if not tested, to the limits specified.

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-STD-883 (see 3.1 herein). 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-BUL-103 (see 6.6 herein).

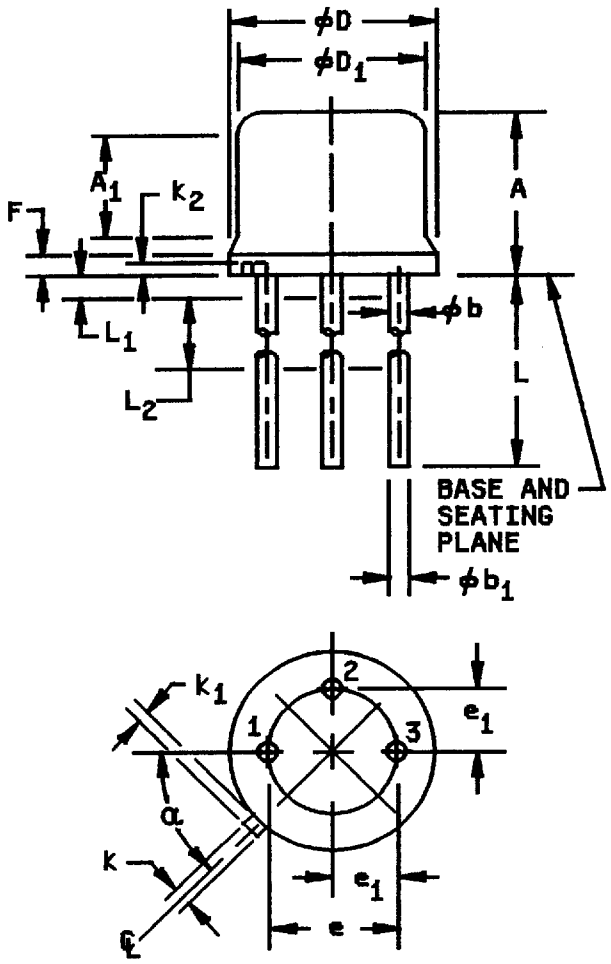
3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-EC shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC'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.

Case outline X

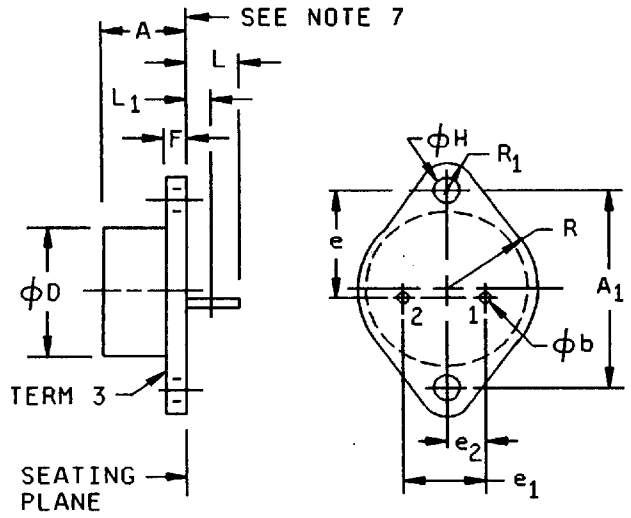


Symbol	Inches		Millimeter		Notes
	Min	Max	Min	Max	
A	.165	.185	4.19	4.70	
ϕb	.016	.019	0.41	0.48	2
ϕb_1	.016	.021	0.41	0.53	2
ϕD	.335	.370	8.51	9.40	
ϕD_1	.305	.335	7.75	8.51	
e	.200 T.P.		5.08 T.P.		4
e_1	.100 T.P.		2.54 T.P.		4
F		.050		1.27	
k	.028	.034	0.71	0.86	
k_1	.029	.045	0.74	1.14	3
k_2	.009	.041	0.23	1.04	
L	.500		12.70		
L_1		.050		1.27	
L_2	.250		6.35		
α	45° T.P.		45° T.P.		4

NOTES:
1. Dimensions shall be measured in inches.
2. Metric equivalents are given for general information only.
3. (All leads) ϕb applies between L_1 and L_2. ϕb_1 applies between L_2 and .500 inch (12.70 mm) from the reference plane. Diameter is uncontrolled in L_1 and beyond .500 inch (12.70 mm) from the reference plane.
4. Measured from the maximum diameter of the product.
5. Leads having a maximum diameter .019 inch (0.48 mm) measured in gauging plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below the base plane of the product shall be within .007 inch (0.18 mm) of their true-position relative to a maximum width tab.
6. The product may be measured by direct methods or by gauge.

FIGURE 1. Case outlines.

Case outline Y

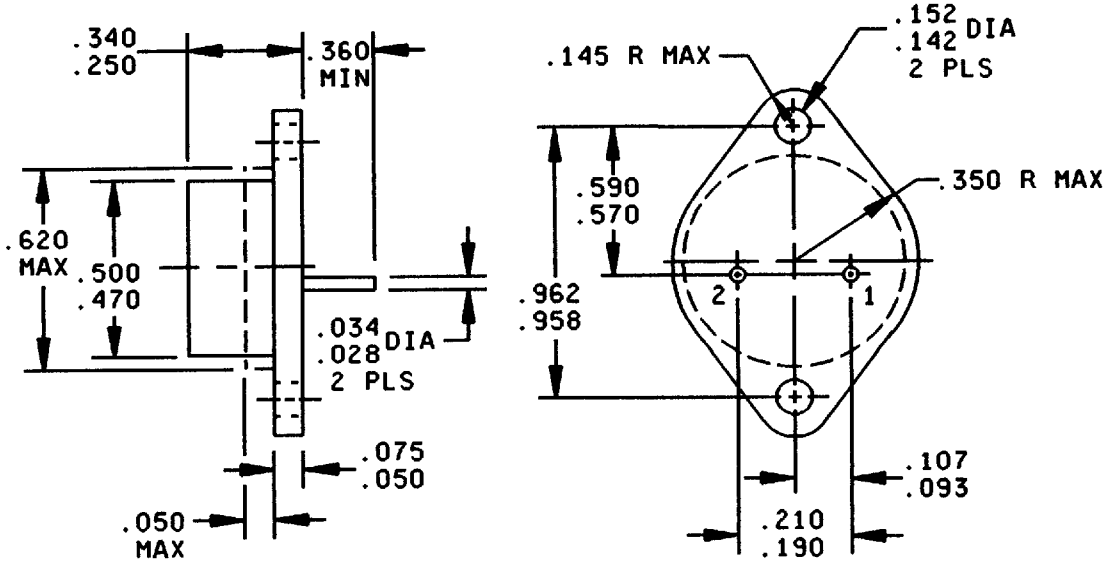


Symbol	Inches		Millimeter		Notes
	Min	Max	Min	Max	
A	.250	.450	6.35	11.43	
A_1	1.177	1.197	29.90	30.40	
ϕb	.038	.043	.97	1.09	2,6
ϕD		.875		22.22	
e	.655	.675	16.64	17.14	
e_1	.420	.440	10.67	11.16	
e_2	.205	.225	5.21	5.72	
F	.060	.135	1.52	3.43	
ϕH	.151	.161	3.84	4.09	4, 5
L	.312	.500	7.92	12.70	3
L_1		.050		1.27	2,3
R	.495	.525	12.57	13.34	
R_1	.131	.188	3.33	4.78	

NOTES:
1. Dimensions shall be measured in inches.
2. Metric equivalents are given for general information only.
3. (Two leads) ϕb applies between L_1 .500 inch (12.70 mm) from the seating plane. Diameter is uncontrolled in L_1 and beyond .500 inch (12.70 mm) from the seating plane.
4. Two leads.
5. Two holes.
6. Two holes located at true position within diameter .010 inch (0.25 mm).
7. Leads having a maximum diameter .043 inch (1.09 mm) measured in gauging plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below the seating plane shall be located at a true position within diameter .014 inch (0.36 mm).
8. The mounting surface of the header shall be flat to convex within .003 inch (0.08 mm) inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat to convex within .006 inch (0.15 mm) overall.

FIGURE 1. Case outlines - Continued.

Case outline Z

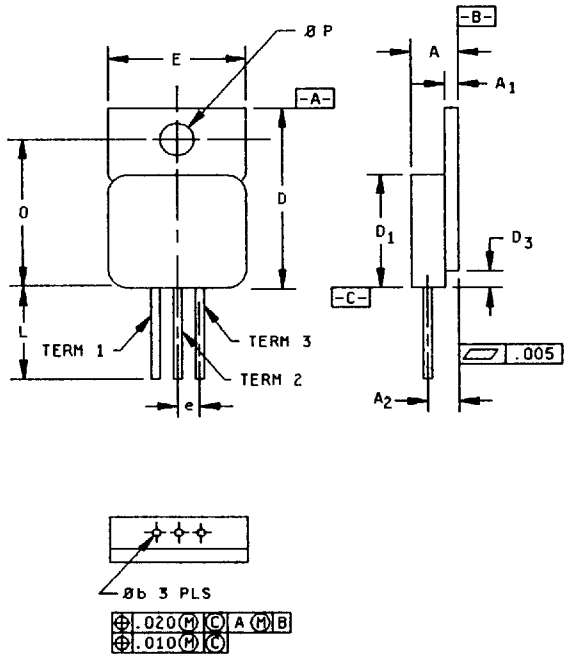


Inches	mm	Inches	mm
.028	0.71	.250	6.35
.034	0.86	.340	8.64
.050	1.27	.350	8.89
.075	1.91	.360	9.14
.093	2.36	.470	11.94
.107	2.72	.500	12.70
.142	3.61	.570	14.48
.145	3.68	.590	14.99
.152	3.86	.620	15.75
.190	4.83	.958	24.33
.210	5.33	.962	24.43

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.

FIGURE 1. Case outlines - Continued.

Case outline U



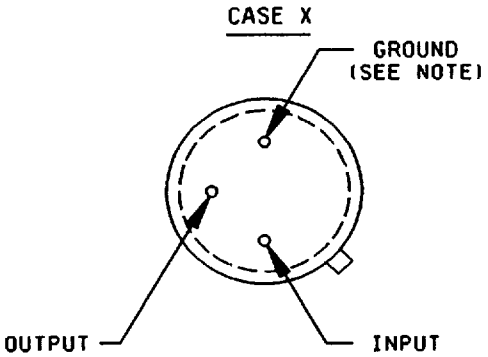
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.200	4.83	5.08
A_1	.035	.045	0.89	1.14
A_2	.120 BSC		3.05 BSC	
ϕb	.025	.035	0.64	0.89
D	.645	.665	16.38	16.89
D_1	.410	.430	10.41	10.92
D_3	.000	.065	---	1.65
e	.100 BSC		2.54 BSC	
E	.410	.422	10.41	10.72
L	.500	.750	12.70	19.05
O	.527	.537	13.39	13.64
ϕP	.140	.150	3.56	3.81

Inches	mm
.005	0.13
.010	0.25
.020	0.51

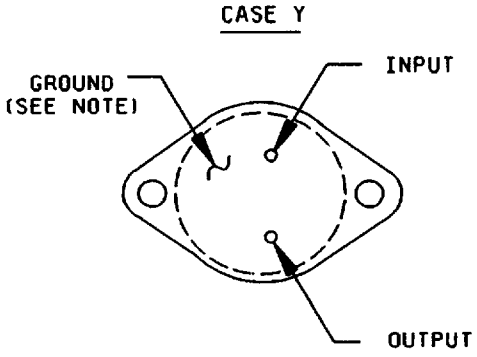
NOTES:
1. Dimensions are in inches
2. Metric equivalents are given for general information only.

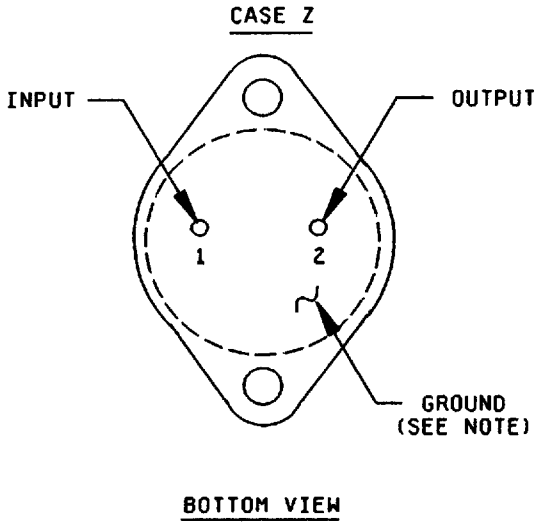
FIGURE 1. Case outlines - Continued.

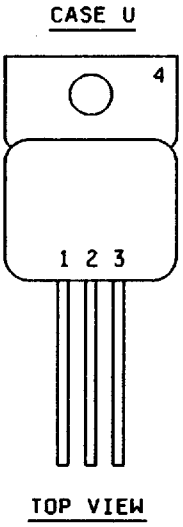
Case outline X



Case outline Y







Case U

1 - Input
2 - Ground
3 - Output
4 - No connection

NOTE: Case is connected to ground.

FIGURE 2. Terminal connections.

STANDARDIZED MILITARY DRAWING DEFENSE ELECTRONICS SUPPLY CENTER DAYTON, OHIO 45444	SIZE A		5962-89915
		REVISION LEVEL	SHEET 10

Device type	01
Case outline	2
Terminal number	Terminal symbol
1	NC
2	V_{IN}
3	NC
4	NC
5	NC
6	NC
7	GND
8	NC
9	NC
10	V_{OUT}
11	NC
12	V_{OUT}
13	NC
14	NC
15	V_{OUT} SENSE
16	NC
17	V_{IN}
18	NC
19	NC
20	NC

NOTE: For normal operation, the V_{OUT} SENSE pin must be connected externally to the load.

FIGURE 2. Terminal connections - Continued.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with method 5005, table I)
Interim electrical parameters (method 5004)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 4
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6, 7 **
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.
** Subgroups 5, 6, and 7, if not tested, are guaranteed to the limits specified in table I.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

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°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. Tests shall be as specified in table II herein.

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

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.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for original equipment manufacturer application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

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-481 using DD Form 1693, Engineering Change Proposal (Short Form).

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC 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 DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444, or telephone (513) 296-5377.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-EC.