REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	Pg. 6, 7: Added static cond. A,B, C to Burn-IN and Life test paragraphs	9/30/81	
B	Change to approved source format, update document.	3/12/84	
C	Page 4, table I, change output short circuit current and output noise voltage. Guarantee TC for output voltage and ripple rejection.	29 Nov 85	
D	Page 2: Absolute maximum rating; change power dissipation rating. Page 4: Table I, change test condition for line and load regulation, stand-by current, ripple rejection, and output noise voltage. Add I_L value to footnote 1. Page 9: R - package not available from approved source.	3 July 86	RR Evans

Prepared in accordance with DOD-STD-100

Selected item drawing

REV										
PAGE										
REV STATUS	**REV**	D	D	C	D		C	C	C	D
OF PAGES	**PAGES**	1	2	3	4	5	6	7	8	9

Original date of drawing
5 December 1977

PREPARED BY William E. Sharp 12-9-77

CHECKED BY C.R. Jackson 1-31-78

APPROVED BY 1 Feb 78

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO

TITLE MICROCIRCUIT, LINEAR, DUAL TRACKING VOLTAGE REGULATOR, MONOLITHIC SILICON

SIZE A	**CODE IDENT. NO.** 14933	**DWG NO.** 77054
REV D		**PAGE** 1 **OF** 9

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

1. SCOPE

1.1 Scope. This drawing describes the requirements for a monolithic silicon, dual tracking voltage regulator. This drawing provides for a level of microcircuit quality and reliability assurance for acquisition of microcircuits in accordance with MIL-M-38510.

1.2 Part number. The complete part number shall be as shown in the following example:

77054	01	C	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish (3.3)

1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit
01	4194	Dual tracking voltage regulator

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
C	D-1 (14-lead, 1/4" x 3/4", DIP)
R	9 Pin TO-66 (see figure 1)

1.3 Absolute maximum ratings.

Input voltage ±V to ground	±45 V
Input-output voltage differential	±45 V
Power dissipation at 25°C:	
DIP	900 mW
TO-66	3.0 W
Load current:	
DIP	150 mA
TO-66	250 mA
Operation junction temperature range	-55°C to +125°C
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Power dissipation, (T_C = +25°C):	
DIP	1.8 W
TO-66	13.9 W
Thermal resistance junction-to-ambient:	
DIP (θ_{JA})	128°C/W
TO-66 (θ_{JA})	41.6°C/W
Thermal resistance junction-to-case:	
DIP (θ_{JC})	55°C/W
TO-66 (θ_{JC})	7.15°C/W

2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, 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.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

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

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein. The country of manufacture requirement of MIL-M-38510 does not apply.

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 Design documentation. The design documentation shall be in accordance with MIL-M-38510 and, unless otherwise specified in the contract or purchase order, shall be retained by the manufacturer but be available for review by the acquiring activity or contractor upon request.

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

3.2.3 Case outlines. The case outlines shall be in accordance with 1.2.2.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510.

3.4 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full recommended ambient operating temperature range.

3.5 Marking. Marking shall be in accordance with 1.2 herein. The Vendor Similar Part Number may also be marked in accordance with 6.8 herein. Both part numbers, when used, shall be printed on the same surface. The "M38510/XXX" part number and the "JAN" or "J" mark shall not be used. Lead finish letter "X" is used only as specified in MIL-M-38510 and shall not be marked on the microcircuit or its packaging. The country of origin shall be marked on the microcircuit.

3.6 Quality assurance requirements. Microcircuits furnished under this drawing shall have been subjected to, and passed all the requirements, tests, and inspections detailed herein including screening and quality conformance inspections.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions	Group A subgroups	Limits		Unit
				Min	Max	
Line regulation		$\Delta V_{IN} = 0.1\ V_{IN}$ $V_{IN} = V_{MAX}$	4, 5, 6		0.1	$\%V_{OUT}$
Load regulation		DIP: I_L = 1 to 100 mA	4, 5, 6		0.004	$\%V_{O/mA}$
		TO-66: I_L = 1 to 200 mA $\pm V_S = \pm(V_O + 5)$ $V_S = \pm 10$ V	4, 5, 6		0.004	$\%V_{O/mA}$
TC of output 2/ voltage			4, 5, 6		.015	%/°C
Stand by current drain 3/		$V_{IN} = V_{MAX}$, $V_O = 0$ V $I_L = 0$	1, 2, 3		+2.5 -4.0	mA mA
Input voltage range			1, 2, 3	±9.5	±45	V
Output voltage scale factor		R_{SET} = 71.5 kΩ, T_J = 25°C	4	2.38	2.62	kΩ/V
Output voltage range		R_{SET} = 71.5 kΩ	1, 2, 3	0.05	±42	V
Output voltage tracking			4, 5, 6		2.0	%
Input-output voltage differential		I_L = 50 mA	1, 2, 3	3.0		V
Ripple 2/ rejection		f = 120 Hz, T_J = 25°C $V_O = \pm 15$ V $V_{IN} = \pm 19$ V	4	40		dB
Output short circuit current		$V_{IN} = \pm 30$ V max. T_J = 25°C	1		600	mA
Output noise voltage		C_L = 4.7 µF, $V_O = \pm 5$ V f = 10 Hz to 100 kHz T_J = 25°C $V_{IN} = \pm 30$ V	4		350	µV rms
Internal thermal shutdown				4/		

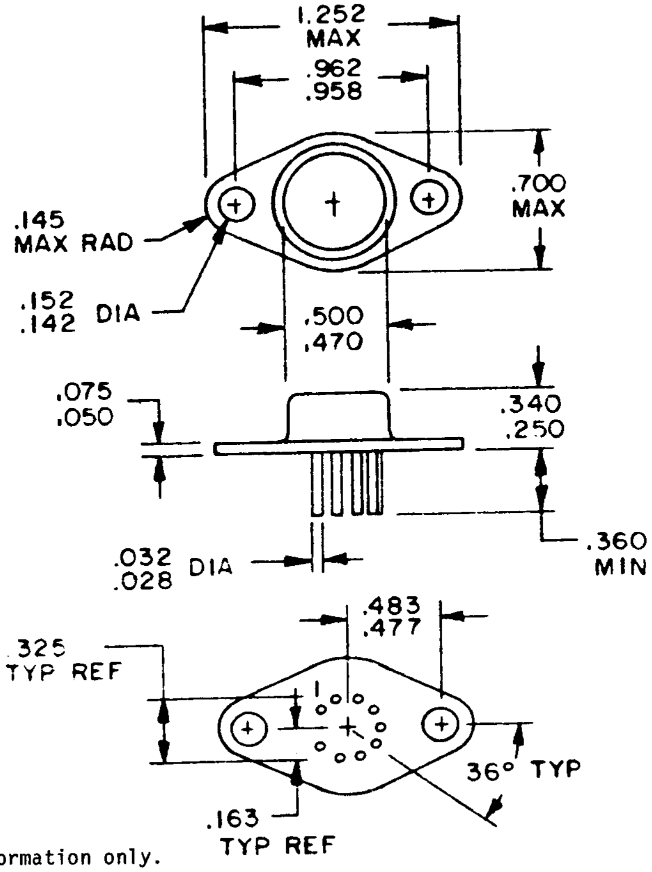
1/ $\pm 5 \leq V_{OUT} \leq V_{MAX}$; $-55°C \leq T_J \leq \pm 125°C$; $I_L = \pm 1$ mA, unless otherwise specified.

2/ If not tested, shall be guaranteed to the specified limits.

3/ Plus or minus quiescent current will increase by 50 $\mu A/V_{OUT}$ on positive side and 100 $\mu A/V_{OUT}$ on negative side.

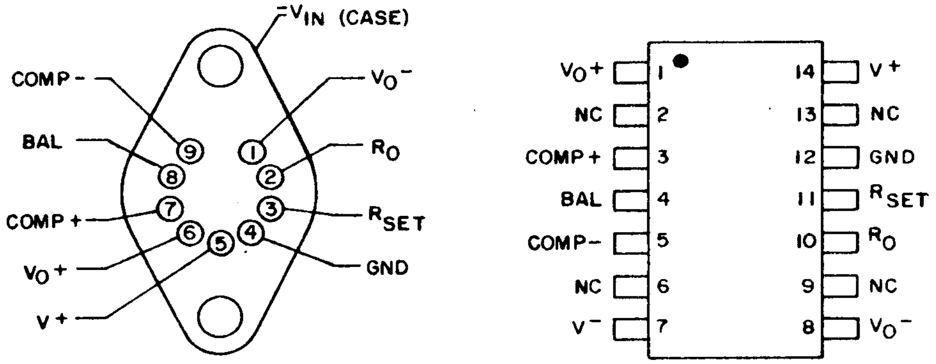
4/ Internal thermal shutdown occurs typically at 175°C.

Inches	mm	Inches	mm
.028	0.71	.340	8.64
.032	0.81	.360	9.14
.050	1.27	.470	11.94
.075	1.90	.477	12.12
.142	3.61	.483	12.27
.145	3.68	.500	12.70
.152	3.86	.700	17.78
.163	4.14	.956	24.28
.250	6.35	.962	24.43
.325	8.26	1.252	31.80



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

FIGURE 1. Case outline R dimensions.



BOTTOM VIEW
TO - 66
PACKAGE R

TOP VIEW
DUAL IN-LINE
PACKAGE C

FIGURE 2. Terminal connections.

DEFENSE ELECTRONICS SUPPLY CENTER **DAYTON, OHIO**	SIZE A	CODE IDENT. NO. **14933**	DWG NO. 77054
		REV	PAGE 5

DESC FORM 144A
APR 83

3.6.1 Screening. Screening shall be in accordance with method 5004, class B, of MIL-STD-883 and 4.2 herein.

3.6.2 Qualification. Qualification inspection for the device type specified herein shall not be required.

3.6.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and 4.4 herein.

3.7 Manufacturer eligibility. To be eligible to supply microcircuits to this drawing, a manufacturer shall have manufacturer certification in accordance with MIL-M-38510 for at least one line and have part I listing on Qualified Products List QPL-38510 for at least one device type (not necessarily the one for which the acquisition of this drawing is to apply).

3.8 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply (see 6.7 and 6.8).

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and method 5005 of MIL-STD-883, except as modified 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.

(2) T_A = +125°C, minimum.

b. Initial and final electrical test parameters shall be as specified in table II herein, except initial electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

c. The percent defective allowable (PDA) shall be as specified in MIL-M-38510.

4.3 Qualification inspection. Qualification inspection for the device type specified herein shall not be required.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and method 5005 of MIL-STD-883. Groups A and B inspections shall be performed on each inspection lot or as specified in method 5005 of MIL-STD-883. Groups C and D shall be performed on a periodic basis in accordance with MIL-M-38510. Generic test data (see 6.5) may be used to satisfy the requirements for groups C and D inspections. Manufacturers shall keep lot records for 5 years (minimum), monitor for compliance to the prescribed procedures, and observe that satisfactory manufacturing conditions and records on lots are maintained for these devices. The records, including an attributes summary of all screening and quality conformance inspections conducted on each lot shall be available for review by customers at all times.

4.4.1 Group A inspection. Group A inspection shall consist of the test subgroups and LTPD values shown in table I of method 5005 of MIL-STD-883, class B, and as follows:

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

b. Subgroups 7, 8, 9, 10, and 11 of table I of method 5005 of MIL-STD-883 shall be omitted.

4.4.2 Group B inspection. Group B inspection shall consist of the test subgroups and LTPD values shown in table IIb of method 5005 of MIL-STD-883, class B.

4.4.3 Groups C and D inspections. Groups C and D inspections shall consist of the test subgroups and LTPD values shown in tables III and IV of method 5005 of MIL-STD-883, Class B, and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test (method 1005 of MIL-STD-883) conditions:

(1) Test conditions A, B, C, or D.

(2) T_A = +125°C, minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Initial electrical parameters (pre burn-in) (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3, 4
Group A test requirements (method 5005)	1, 2, 3, 4, 5, 6
Groups C and D end-point electrical parameters (method 5005)	1
Additional electrical subgroups for group C periodic inspections	

*PDA applies to subgroup 1 (see 4.2c).

5. PACKAGING

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

6. NOTES

6.1 Notes. Only the note "Reevaluation of lot quality" of the notes specified in MIL-M-38510 shall apply to this drawing.

6.2 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 OEM application. This drawing is intended exclusively to prevent the proliferation of unnecessary duplicate specifications, drawings, and stock catalog listings. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, this drawing will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.3 Ordering data. The contract or purchase order should specify the following:

a. Complete part number (see 1.2).

b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.

c. Requirements for certificate of compliance, if applicable.

d. Requirements for notification of change of product or process to contracting activity, if applicable.

e. Requirements for special carriers, lead lengths, or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements will not apply to direct shipment to the Government.

6.4 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.5 Generic test data. Generic test data may be used to satisfy the requirements of 4.4.3. Generic test data is defined as test data from devices manufactured during the same time period, by means of the same production technique, materials, controls, and design, and in the same microcircuit group (see terms, definitions and symbols of MIL-M-38510) as the deliverable devices. The same time period shall be interpreted as covering a maximum span of 180 days between the generic test sample fabrication and the fabrication of deliverable devices. The vendor is required to retain generic data for a period not less than 5 years from the date of shipment.

6.6 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, OH 45444, or telephone 513-296-5375.

6.7 Submission of certificate of compliance. The certificate of compliance submitted to DECS-ECS, prior to listing as an approved source of supply in 6.8, shall state that the manufacturer's product meets the provisions for MIL-STD-883 compliant devices and the requirements herein.

6.8 Approved source of supply. An approved source of supply is listed herein. Additional sources will be added as they become available. The vendor listed herein has agreed to this drawing and a certificate of compliance (see 3.8) has been submitted to DESC-ECS.

DESC drawing part number	Vendor CAGE number	Vendor similar part number 1/
7705401CX	07933	RM4194DC/883B
7705401RX	2/	RM4194TK/883B

1/ Caution: Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

2/ Not available from approved source.

Vendor CAGE number	Vendor name and address
07933	Raytheon Company Semiconductor Division 350 Ellis Street Mountain View, CA 94040

DEFENSE ELECTRONICS SUPPLY CENTER **DAYTON, OHIO**	SIZE A	CODE IDENT. NO. **14933**	DWG NO. 77054
		REV D	PAGE 9