REVISION RECORD		
REV	DESCRIPTION	DATE
0	INITIAL RELEASE	09/16/97
A	• PAGE 4, PARAGRAPH 4.4.2, GROUP B INSPECTION WAS REDEFINED. PARAGRAPH 4.4.3, GROUP D INSPECTION WAS REDEFINED. • PAGE 5, PARAGRAPH 4.5, SOURCE INSPECTION WAS REDEFINED. • PAGE 10, CORRECTED TYPO ON TABLE II, V_{RLINE} PARAMETER.	12/29/97
B	• PAGE 4, AMENDED PARAGRAPHS 4.1 AND 4.1.1 TAKING EXCEPTION TO ANALYSIS OF CATASTROPHIC FAILURES.	04/08/98
C	• PAGE 6, ADDED 0JA OF 35°C/W AND ADDED 0JC OF 3°C/W TO FIGURE 1.	09/28/99
D	• PAGE 3, PARAGRAPH 3.7, CHANGED VERBIAGE FROM "SPECIFIED IN TABLE III" TO "AND AS SPECIFIED IN TABLE III HEREIN", LINE 2. PARAGRAPH 3.9, ADDED "HEREIN" AFTER "TABLE II" LINE 2. • PAGE 4, PARAGRAPH 4.3, ADDED "HEREIN" AFTER "TABLE III", LINE 2. PARAGRAPH 4.4.1, ADDED "HEREIN" AFTER "TABLE III", LINE 2. PARAGRAPH 4.4.2.2, CHANGED VERBIAGE IN LINE 1 FROM "ALL FOOTNOTES OF TABLE IIA IN MIL-STD-883". • PAGE 5, PARAGRAPH 4.4.3.2, CHANGED VERBIAGE IN LINE 1 FROM "ALL FOOTNOTES OF TABLE IV OF MIL-STD-883" TO "ALL FOOTNOTES PERTAINING TO TABLE IV IN MIL-STD-883".	04/05/00
E	• PAGE 4: PARAGRAPH 3.6, TABLE IA CHANGED TO TABLE II. PARAGRAPH 3.7, TABLE III CHANGED TO TABLE IV. PARAGRAPH 3.9, TABLE II CHANGED TO TABLE III. PARAGRAPH 3.11.1 WAS CHANGED "…to an initial rate of rads to 240 rads/sec. PARAGRAPHS 4.1 THROUGH 4.2 CHANGES WERE DONE TO CLARIFY GROUP SAMPLING. • PAGE 5: PARAGRAPHS 4.3 THROUGH 4.4.2.1 CHANGES WERE DONE TO CLARIFY GROUP SAMPLING. PARAGRAPH 4.4.3 CHANGE WAS DONE TO CLARIFY GROUP SAMPLING. (SEE NEXT PAGE REVISION CONTINUED)	03/08/05

REVISION RECORD AND DESCRIPTION CONTINUED ON NEXT PAGE.

CAUTION: ELECTROSTATIC DISCHARGE SENSITIVE PART

REVISION	PAGE NO.	1	2	3	4	5	6	7	8	9	10	11	12					
INDEX	REVISION	**K**	**K**	**K**	**K**	**K**	**K**	**K**	**K**	**K**	**K**	**K**	**K**					
REVISION	PAGE NO.																	
INDEX	REVISION																	

				LINEAR TECHNOLOGY CORPORATION			
	ORIG			**MILPITAS, CALIFORNIA**			
	DSGN			TITLE:			
	ENGR			**MICROCIRCUIT, LINEAR,**			
	MFG			**RH1085M, 3A LOW DROPOUT**			
	CM			**POSITIVE ADJUSTABLE REGULATOR**			
	QA			SIZE	CAGE CODE	DRAWING NUMBER	REV
	PROG				**64155**	**05-08-5105**	**K**
APPLICATION	FUNCT	SIGNOFFS	DATE	CONTRACT:			

FOR OFFICIAL USE ONLY

REVISION RECORD		
REV	DESCRIPTION	DATE
E	• PAGE 6: PARAGRAPHS 4.6.2 THROUGH 4.6.4 WERE RE-WRITTEN. THESE DATA PROVIDED, AND DATA AVAILABLE. PARAGRAPH 4.6.10 NOTE, ADDED FURTHER EXPLANATION OF MINIMUM DELIVERED DATA. • PAGE 7: ADDED "SEATING PLANE" TO THE SEATING PLANE DIMENSION OF CASE OUTLINE. • PAGE 9: BURN-IN CIRCUIT CHANGED FROM "Tj = 170°C AT Ta OF 150°C" TO "Tj = 168°C MAX AT Ta OF 150°C". • PAGES 7 THROUGH 9: ALL FIGURE TITLES CHANGED TO HAVE DEVICE AND PACKAGE TYPES AT TOP OF PAGE, AND HAVE ALL FIGURES AT BOTTOM OF PAGE.	03/08/05
F	• PAGE 5, CHANGED IN BOTH PARAGRAPHS 4.2, 4.3 IN CONJUNCTION TO 3.3 CHANGED TO 3.4 AND PARAGRAPH 4.3 CHANGED 3.1.1 TO 3.1 AND 3.2.1 TO 3.1.1	09/10/07
G	• Page 10, Remove note 5 reference to standard datasheet [1] full load current limit. • Page 11, Added RH1085 short circuit current limit curve attached.	10/31/07
H	• Page 4, Paragraph 3.10.3 changed lead material from Alloy 42 to Alloy 52 for TO3 metal can 2 lead. Paragraph 3.11.1 changed verbiage.	04/28/08
J	PAGE 3, PARAGRAPH 3.1 – REMOVED TEST ON TO3 PACKAGE. PAGE 5, PARAGRAPH 4.4.2 GROUP B INSPECTION: ADDING (SUBGROUP 1-4 PLUS 6 ARE PERFORMED ON EVERY ASSEMBLY LOT, AND) TO THE VERBIAGE. PAGE 9, CHANGED BURN-IN CIRCUIT TO 04-06-0302.	01/12/09
K	**PAGE 10, UPDATED REFERENCE VOLTAGE vs POST-IRRADIATION LIMITS IN TABLE 1A – ELECTRICAL CHARACTERISTICS. NOTE ADDED RELATED TO TABLES I AND II. NOTES RENUMBERED ON TABLES I AND II. NEW NOTE IS NOW NOTE 1.**	12/06/10

1.0 SCOPE:

1.1 This specification defines the performance and test requirements for a microcircuit processed to a space level manufacturing flow.

2.0 APPLICABLE DOCUMENTS:

2.1 Government Specifications and Standards: the following documents listed in the Department of Defense Index of Specifications and Standards, of the issue in effect on the date of solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS:

MIL-PRF-38535	Integrated Circuits (Microcircuits) Manufacturing, General Specification for
MIL-STD-883	Test Method and Procedures for Microcircuits
MIL-STD-1835	Microcircuits Case Outlines

2.2 Order of Precedence: In the event of a conflict between the documents referenced herein and the contents of this specification, the order of precedence shall be this specification, MIL-PRF-38535 and other referenced specifications.

3.0 REQUIREMENTS:

3.1 General Description: This specification details the requirements for the RH1085M, 3A LOW DROPOUT POSITIVE ADJUSTABLE REGULATOR, processed to space level manufacturing flow.

3.2 Part Number: RH1085MK (TO3 METAL CAN, 2 LEAD)

3.3 Part Marking Includes:

a. LTC Logo

b. LTC Part Number (See Paragraph 3.2)

c. Date Code

d. Serial Number

e. ESD Identifier per MIL-PRF-38535, Appendix A

3.4 The Absolute Maximum Ratings:

Power Dissipation	Internally Limited
Input to Output Voltage Differential	30V
Operating Junction Temperature Range	
Control circuitry	-55°C to +150°C
Power transistor	-55°C to +200°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 sec)	+300°C

3.5 Electrostatic discharge sensitivity, ESDS, shall be Class 1.

3.6 Electrical Performance Characteristics: The electrical performance characteristics shall be as specified in **Table I** and **Table II.**

3.7 Electrical Test Requirements: Screening requirements shall be in accordance with 4.1 herein, MIL-STD-883, Method 5004, and as specified in **Table IV** herein.

3.8 Burn-In Requirement: Burn-in circuit is specified in Figure 4.

3.9 Delta Limit Requirement: Delta limit parameters are specified in **Table III** herein, are calculated after each burn-in, and the delta rejects are included in the PDA calculation.

3.10 Design, Construction, and Physical Dimensions: Detail design, construction, physical dimensions, and electrical requirements shall be specified herein.

3.10.1 Mechanical / Packaging Requirements: Case outlines and dimensions are in accordance with Figure 1.

3.10.2 Terminal Connections: The terminal connections shall be as specified in Figure 2.

3.10.3 Lead Material and Finish: The lead material and finish for Device shall be Alloy 52 with hot solder dip (Finish letter A) in accordance with MIL-PRF-38535.

3.11 Radiation Hardness Assurance (RHA):

3.11.1 The manufacturer shall perform a lot sample test as an internal process monitor for total dose radiation tolerance. The sample test is performed with MIL-STD-883 TM1019 Condition A as a guideline.

3.11.2 For guaranteed radiation performance to MIL-STD-883, Method 1019, total dose irradiation, the manufacturer will provide certified RAD testing and report through an independent test laboratory when required as a customer purchase order line item.

3.11.3 Total dose bias circuit is specified in Figure 3.

3.12 Wafer Lot Acceptance: Wafer lot acceptance shall be in accordance with MIL-PRF-38535, Appendix A, except for the following: Topside glassivation thickness shall be a minimum of 4KÅ.

3.13 Wafer Lot Acceptance Report: SEM is performed per MIL-STD-883, Method 2018 and copies of SEM photographs shall be supplied with the Wafer Lot Acceptance Report as part of a Space Data Pack when specified as a customer purchase order line item.

4.0 VERIFICATION (QUALITY ASSURANCE PROVISIONS)

4.1 Quality Assurance Provisions: Quality Assurance provisions shall be in accordance with MIL-PRF-38535. Linear Technology is a QML certified company and all Rad Hard candidates are assembled on qualified Class S manufacturing lines.

4.2 Sampling and Inspection: Sampling and Inspection shall be in accordance with MIL-STD-883, Method 5005 with QML allowed and TRB approved deviations in conjunction with paragraphs 3.1.1, 3.2.1, and 3.4 of the test method.

4.3 Screening: Screening requirements shall be in accordance with MIL-STD-883, Method 5004 with QML allowed and TRB approved deviations in conjunction with paragraphs 3.1, 3.1.1, and 3.4 of the test method. Electrical testing shall be as specified in Table IV herein.

4.3.1 Analysis of catastrophic (open/short) failures from burn-in will be conducted only when a lot fails the burn-in or re-burn-in PDA requirements.

4.4 Quality Conformance Inspection: Quality conformance inspection shall be in accordance with 4.2 and 4.3 herein and as follows:

4.4.1 Group A Inspection: Group A inspection shall be performed in accordance with 4.1 herein, per MIL-STD-883, Method 5005, and specified in Table IV herein.

4.4.2 Group B Inspection: When purchased, a full Group B is performed on an inspection lot. As a minimum, Subgroups 1-4 plus 6 are performed on every assembly lot, and Subgroup B2 (Resistance to Solvents / Mark Permanency) and Subgroup B3 (Solderability) are performed prior to the first shipment from any inspection lot and Attributes provided when a Full Space Data Pack is ordered. Subgroup B5 (Operating Life) is performed on each wafer lot. This subgroup may or may not be from devices built in the same package style as the current inspection lot. Attributes and variables data for this subgroup will be provided upon request at no charge.

4.4.2.1

Group B, Subgroup 2c = 10%	Group B, Subgroup 5 = *5% (*per wafer or inspection lot whichever is the larger quantity)
Group B, Subgroup 3 = 10%	
Group B, Subgroup 4 = 5%	Group B, subgroup 6 = 15%

4.4.2.2 All footnotes pertaining to Table IIa in MIL-STD-883, Method 5005 apply. The quantity (accept number) of all other subgroups are per MIL-STD-883, Method 5005, Table IIa.

4.4.3 Group D Inspection: When purchased, a full Group D is performed on an inspection lot. As a minimum, periodic full Group D sampling is performed on each package family for each assembly location every 26 weeks. A generic Group D Summary is provided when a full Space Data Pack is ordered.

4.4.3.1 Group D, Subgroups 3, 4 and 5 = 15% each (Sample Size Series).

4.4.3.2 All footnotes pertaining to Table IV in MIL-STD-883, Method 5005 apply. The quantity (accept number) or sample number and accept number of all other subgroups are per MIL-STD-883, Method 5005, Table IV.

4.5 Source Inspection:

4.5.1 The manufacturer will coordinate Source Inspection at wafer lot acceptance and pre-seal internal visual.

4.5.2 The procuring activity has the right to perform source inspection at the supplier's facility prior to shipment for each lot of deliverables when specified as a customer purchase order line item. This may include wafer lot acceptance and final data review.

4.6 Deliverable Data: Deliverable data that will ship with devices when a Space Data Pack is ordered:

4.6.1 Lot Serial Number Sheets identifying all devices accepted through final inspection by serial number.

4.6.2 100% attributes (completed lot specific traveler; includes Group A Summary)

4.6.3 Burn-In Variables Data and Deltas (if applicable)

4.6.4 Group B2, B3, and B5 Attributes (Variables data, if performed on lot shipping)

4.6.5 Generic Group D data (4.4.3 herein)

4.6.6 SEM photographs (3.13 herein)

4.6.7 Wafer Lot Acceptance Report (3.13 herein)

4.6.8 X-Ray Negatives and Radiographic Report

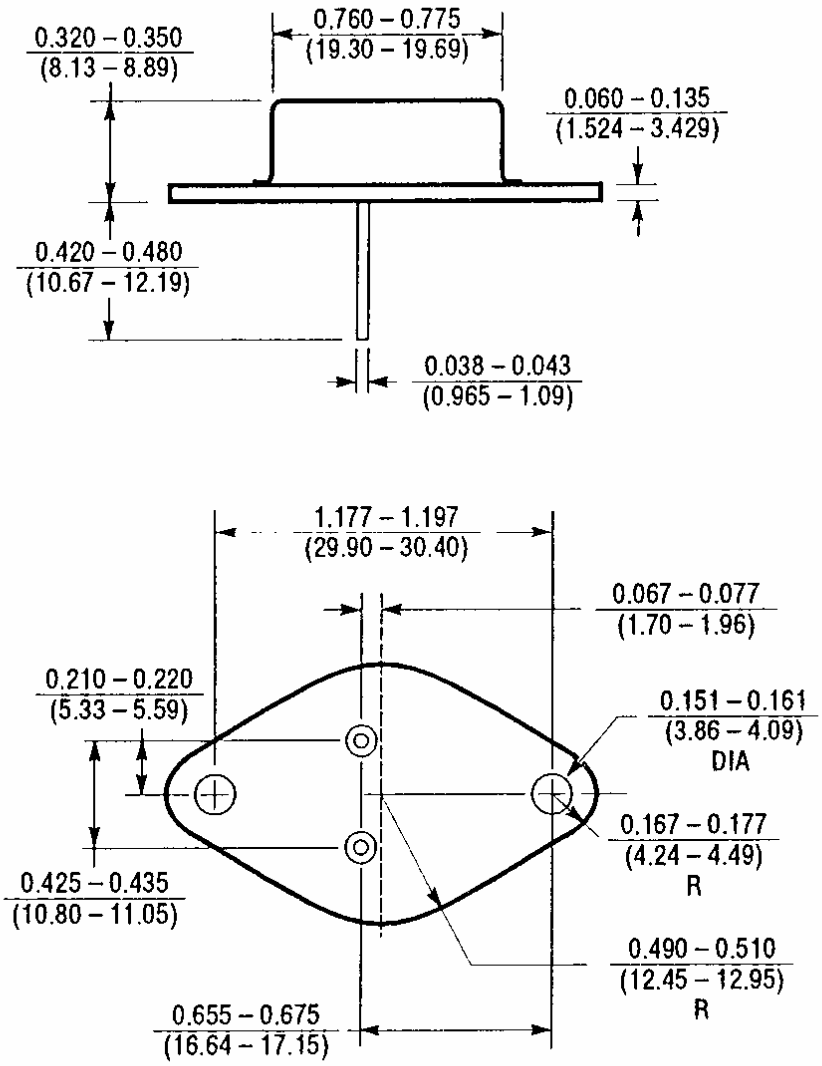
4.6.9 A copy of outside test laboratory radiation report if ordered

4.6.10 Certificate of Conformance certifying that the devices meet all the requirements of this specification and have successfully completed the mandatory tests and inspections herein.

Note: Items 4.6.1 and 4.6.10 will be delivered as a minimum, with each shipment. This is noted on the Purchase Order Review Form as "No Charge Data".

5.0 Packaging Requirements: Packaging shall be in accordance with Appendix A of MIL-PRF-38535. All devices shall be packaged in conductive material or packaged in anti-static material with an external conductive field shielding barrier.

(K) TO3 / 2 LEADS CASE OUTLINE



θ_{ja} = 35°C/W
θ_{jc} = 3°C/W

FIGURE 1

TERMINAL CONNECTIONS

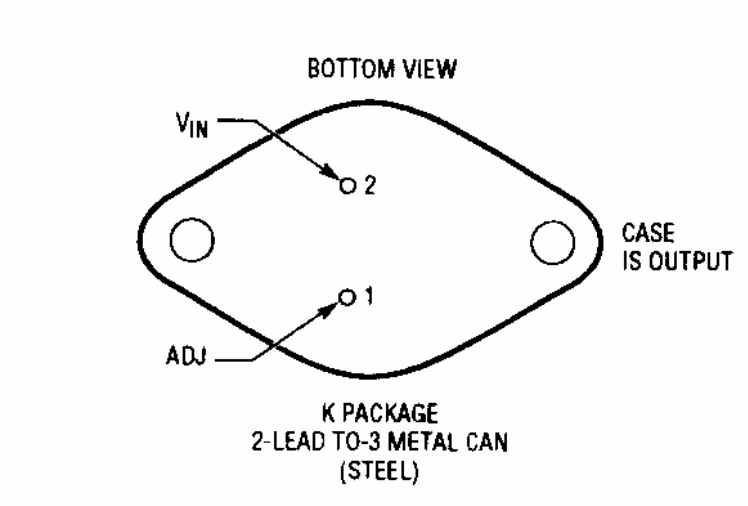


FIGURE 2

TOTAL DOSE BIAS CIRCUIT

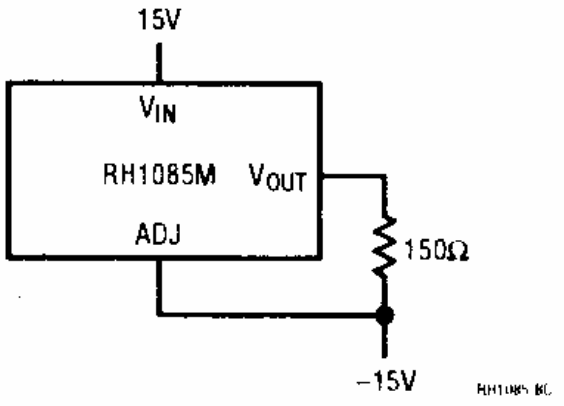
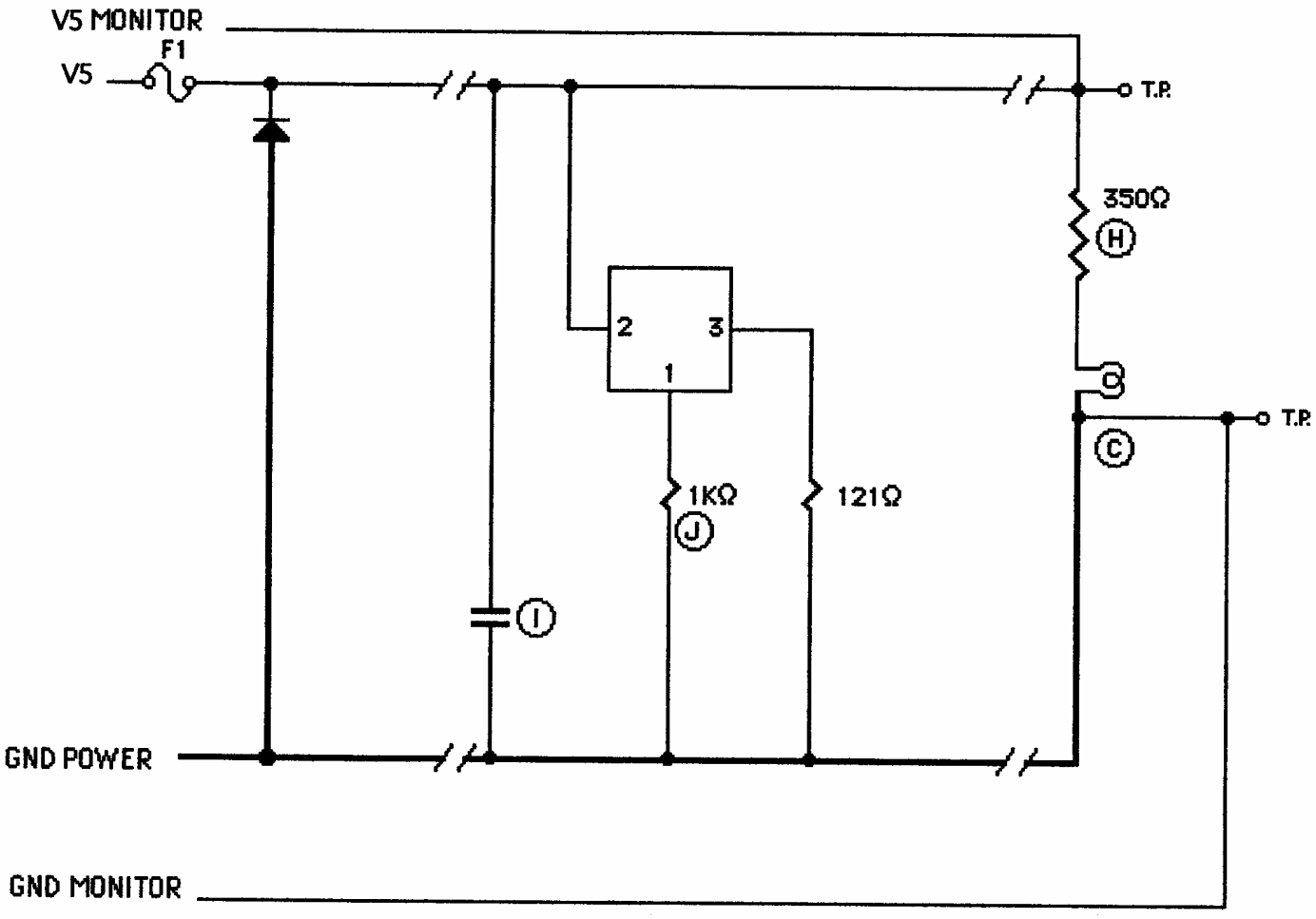


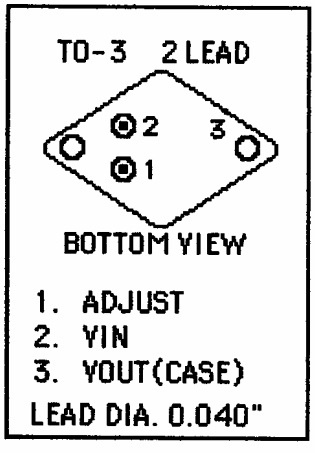
FIGURE 3

STATIC BURN-IN CIRCUIT
TO3 METAL CAN / 2 LEADS



NOTES:

Unless otherwise specified, component tolerances shall be per military specification.
For 1085:
Burn-In Voltage to be V5 = +28V to +30V
Tj = 170 °C max at Ta of 150 °C.
Tj = 145 °C max at Ta of 125 °C.



PACKAGE AND PINOUT

FIGURE 4

TABLE I: ELECTRICAL CHARACTERISTICS (PRE-IRRADIATION)

PARAMETER	CONDITIONS	NOTES	T_J = 25°C MIN	TYP	MAX	SUB-GROUP	–55°C ≤ T_J ≤ 125°C MIN	TYP	MAX	SUB-GROUP	UNITS
Reference Voltage	I_{OUT} = 10mA, (V_{IN} – V_{OUT}) = 3V		1.238	1.250	1.262	1					V
	10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$, 1.5V ≤ (V_{IN} – V_{OUT}) ≤ 25V	6	1.225		1.270		1.225		1.270	2,3	V
Line Regulation	I_{LOAD} = 10mA, 1.5V ≤ (V_{IN} – V_{OUT}) ≤ 15V 15V ≤ (V_{IN} – V_{OUT}) ≤ 30V	2, 3		0.015	0.2 0.5	1 1		0.035 0.050	0.2 0.5	2,3 2,3	% %
Load Regulation	(V_{IN} – V_{OUT}) = 3V, 10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$	2, 3, 6		0.1	0.3	1		0.2	0.4	2,3	%
Dropout Voltage	ΔV_{REF} = 1%, I_{OUT} = $I_{FULL\ LOAD}$	4			1.5	1		1.3	1.5	2,3	V
Current Limit	(V_{IN} – V_{OUT}) = 5V (V_{IN} – V_{OUT}) = 25V		3.2 0.2			1 1	3.2 0.2	4.0 0.5		2,3 2,3	A A
Minimum Load Current	(V_{IN} – V_{OUT}) = 25V				10	1		5.0	10	2,3	mA
Thermal Regulation	T_A = 25°C, 30ms Pulse			0.004	0.02	4					%/W
Ripple Rejection	f = 120Hz, C_{ADJ} = 25µF, C_{OUT} = 25µF Tantalum, I_{OUT} = $I_{FULL\ LOAD}$, (V_{IN} – V_{OUT}) = 3V	6	60			4	60	75		5,6	dB
Adjust Pin Current	T_J = 25°C			55	120	1			120	2,3	µA
Adjust Pin Current Change	10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$, 1.5V ≤ (V_{IN} – V_{OUT}) ≤ 25V	6			5	1		0.2	5	2,3	µA
Temperature Stability								0.5			%
Long Term Stability	T_A = 125°C, 1000 Hrs	5						0.3			%
RMS Output Noise (% of V_{OUT})	T_A = 25°C, 10Hz ≤ f ≤ 10kHz			0.003							%
Thermal Resistance	Control Circuitry/Power Transistor	5		0.9/3.0							°C/W

SEE NOTES ON NEXT PAGE.

TABLE II ELECTRICAL CHARACTERISTICS (POST-IRRADIATION TA = 25°C, UNLESS OTHERWISE NOTED

PARAMETER	CONDITIONS	10KRAD (Si) MIN	10KRAD (Si) MAX	20KRAD (Si) MIN	20KRAD (Si) MAX	50KRAD (Si) MIN	50KRAD (Si) MAX	100KRAD (Si) MIN	100KRAD (Si) MAX	200KRAD (Si) MIN	200KRAD (Si) MAX	UNITS
Reference Voltage (Note 6)	I_{OUT} = 10mA ($V_{IN} - V_{OUT}$) = 3V	1.234	1.262	1.230	1.262	1.225	1.262	1.220	1.262	1.205	1.262	V
	10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$ 1.7V ≤ ($V_{IN} - V_{OUT}$) ≤ 15V	1.220	1.275	1.219	1.275	1.215	1.275	1.210	1.275	1.20	1.275	V
Line Regulation (Notes 2, 3)	I_{OUT} = 10mA 1.5V ≤ ($V_{IN} - V_{OUT}$) ≤ 15V		0.2		0.21		0.23		0.25		0.3	%
Load Regulation (Notes 2, 3, 6)	($V_{IN} - V_{OUT}$) = 3V 10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$		0.3		0.3		0.3		0.3		0.3	%
Dropout Voltage (Note 4)	ΔV_{REF} = 1%, I_{OUT} = 3A		1.5		1.5		1.55		1.6		1.65	V
Current Limit	($V_{IN} - V_{OUT}$) = 5V ($V_{IN} - V_{OUT}$) = 25V	3.2 0.2		3.17 0.20		3.15 0.20		3.10 0.20		3.0 0.2		A A
Minimum Load Current	($V_{IN} - V_{OUT}$) = 25V		10		10		10		10		10	mA
Adjust Pin Current			120		120		120		120		120	µA
Adjust Pin Current Change (Note 6)	10mA ≤ I_{OUT} ≤ $I_{FULL\ LOAD}$ 1.5V ≤ ($V_{IN} - V_{OUT}$) ≤ 15V		5		5		5		5		5	µA

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing.

Note 3: Line and load regulation are guaranteed up to the maximum power dissipation of 30W for RH1085. 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.

Note 4: Dropout voltage is specified over the full output current range of the device. Test points and limits are shown on the Dropout Voltage curve in the LT®1085 data sheet.

Note 5: Guaranteed by design, characterization, or correlation to other tested parameters.

Note 6: For compliance with 883 revision C current density specifications, the RH1085 is rated to 2A.

TABLE III: POST BURN-IN ENDPOINTS AND DELTA LIMIT REQUIREMENTS

$T_A = 25°C$, $(V_{IN} - V_{OUT}) = 3V$ $I_{OUT} = 10mA$

	ENDPOINT LIMIT		DELTA		
PARAMETER	MIN	MAX	MIN	MAX	UNITS
V_{REF}	1.238	1.262	-0.01	0.01	V
$+I_{ADJ}$	15	120	-10	10	µA
V_{RLINE}	-0.2	0.2	-0.1	0.1	%

TABLE IV: ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUP
FINAL ELECTRICAL TEST REQUIREMENTS (METHOD 5004)	1*, 2, 3,4,5,6
GROUP A TEST REQUIREMENTS (METHOD 5005)	1, 2, 3,4,5,6
GROUP B AND D FOR CLASS S ENDPOINT ELECTRICAL PARAMETERS (METHOD 5005)	1, 2, 3

*PDA APPLIES TO SUBGROUP 1.

PDA TEST NOTE: The PDA is specified as 5% based on failures from Group A, Subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883. The verified failures of Group A, Subgroup 1 and delta rejects after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.