

REVISION RECORD		
REV	DESCRIPTION	DATE
0	INITIAL RELEASE	06/24/03
A	<ul style="list-style-type: none"> <li>PAGE 3, CHANGED INITIAL RATE OF RADS TO 240 RADS/SEC.</li> </ul>	03/16/05
B	<ul style="list-style-type: none"> <li>PAGE 4, 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. CHANGED TABLE IIA: POST IRRADIATION, <math>V_S=TV</math>, 3V, 50Krad, IB MAX FROM 809 TO 800 nA, PAGE 13.</li> </ul>	01/09/08
C	<ul style="list-style-type: none"> <li>PAGE 3, PARAGRAPH 3.11.1 CHANGED VERBIAGE.</li> </ul>	05/05/08
D	<ul style="list-style-type: none"> <li>PAGE 4, PARAGRAPH 4.4.2 CHANGED VERBIAGE.</li> <li>PAGE 12, DATA SHEET CHANGE TO INPUT BIAS CURRENT MATCH (CHANNEL TO CHANNEL) LIMITS FROM 100 nA TO 180 nA.</li> </ul>	01/22/09
E	<ul style="list-style-type: none"> <li>PAGES 10 - 13, TABLES 1, 1A, II, IIA CORRECTED TYPO IN THE <math>V_{OUT}</math>, OUTPUT VOLTAGE SWING HIGH CONDITION FROM <math>I_{SINK} = 1mA</math> AND <math>I_{SINK} = 2.5 mA</math> TO <math>I_{SOURCE} = 1mA</math> AND <math>I_{SOURCE} = 2.5mA</math>.</li> </ul>	10/26/09
F	<ul style="list-style-type: none"> <li>PAGE 13, TABLE II, ELECTRICAL CHARACTERISTICS, (PRE-IRRADIATION) <math>V_S = 3V, 5V</math>, DELETED 3V.</li> <li>PARAMETER <math>A_{VOL}</math>, DELETED <math>V_S = 3V</math>, <math>V_O = 75mV</math> TO <math>2.8V</math>, <math>R_I = 10k</math>.</li> <li>PARAMETER <b>CMRR</b>, COMMON MODE REJECTION RATIO - DELETED <math>V_S = 3V</math>, <math>V_{CM} = V^+</math> TO <math>V^-</math>; DELETED <math>V_S = 3V</math>, <math>V_{CM} = 0.5V</math> TO <math>2.5V</math>.</li> <li>PARAMETER <b>CMRR</b>, MATCH (CHANNEL-TO-CHANNEL) - DELETED <math>V_S = 3V</math>, <math>V_{CM} = V^+</math> TO <math>V^-</math>; DELETED <math>V_S = 3V</math>, <math>V_{CM} = 0.5V</math> TO <math>2.5V</math>.</li> <li>PARAMETER <math>I_{SC}</math>, DELETED <math>V_S = 3V</math>.</li> <li>PAGE 14, TABLE IIA, ELECTRICAL CHARACTERISTICS, (PRE-IRRADIATION) <math>V_S = 3V, 5V</math>, DELETED 3V.</li> </ul>	02/25/10

**CAUTION: ELECTROSTATIC DISCHARGE SENSITIVE PART**

REVISION	PAGE NO.	1	2	3	4	5	6	7	8	9	11	12	13	14				
INDEX	REVISION	F	F	F	F	F	F	F	F	F	F	F	F	F				
REVISION	PAGE NO.																	
INDEX	REVISION																	
											<div>LINEAR TECHNOLOGY CORPORATION</div> <div>MILPITAS, CALIFORNIA</div> <div>TITLE:</div> <div>MICROCIRCUIT, LINEAR,</div> <div>RH1498M, 10MHz, 6V/ms, Dual Rail-to-Rail</div> <div>Input and Output Precison C-Load Op Amp</div>							
		ORIG																
		DSGN																
		ENGR																
		MFG																
		CM																
		QA																
		PROG									SIZE	CAGE CODE		DRAWING NUMBER		REV		
												64155		05-08-5201		F		
APPLICATION		FUNCT			SIGNOFFS			DATE		CONTRACT:								

FOR OFFICIAL USE ONLY

**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 RH1498M, 10MHz, 6V/ $\mu$ s, Dual Rail-to-Rail Input and Output Precision C-Load Op Amp processed to space level manufacturing flow.
- 3.2 Part Number: RH1498MW (Glass Sealed Flatpak, 10 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: (Note 1)

Total Supply Voltage ( $V^+$ to $V^-$ )	36V
Input Current	$\pm 10$ mA
Output Short-Circuit Duration (Note 2)	Continuous
Operating Temperature	-55°C to +125°C
Specified Temperature Range	-55°C to +125°C
Junction Temperature	150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 sec)	+300°C

**Note #1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.**

**Note #2: A heat sink may be required to keep the junction temperature below this absolute maximum rating when the output is shorted indefinitely.**

- 3.5 Electrostatic discharge sensitivity, ESDS, shall be Class 2.
- 3.6 Electrical Performance Characteristics: The electrical performance characteristics shall be as specified in Table I (Pre-Irradiation), Table IA (Post-Irradiation), Table II (Pre-Irradiation), and Table IIA (Post-Irradiation).
- 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: Static Burn-In, Figure 4; Dynamic Burn-In, Figure 5.
- 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 42 and the lead finish is 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%  |
|         | Group B, Subgroup 3 = 10%  | (*per wafer or inspection lot<br>whichever is the larger quantity) |
|         | 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)

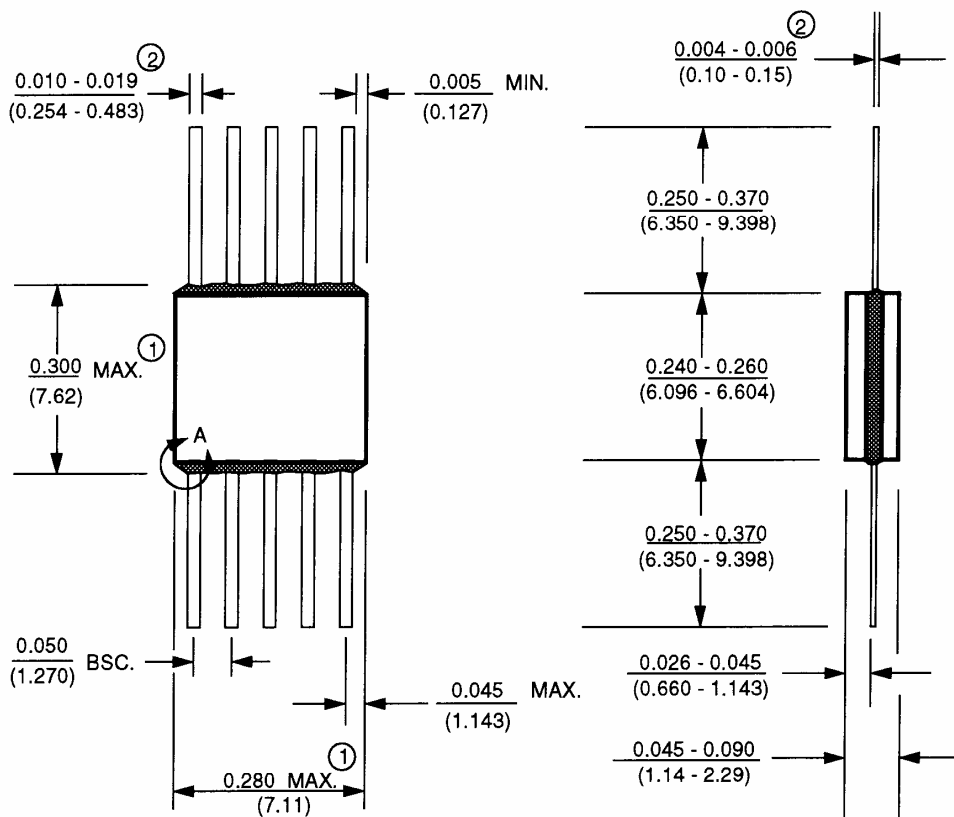
4.6.8 X-Ray Negatives and Radiographic Report

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.

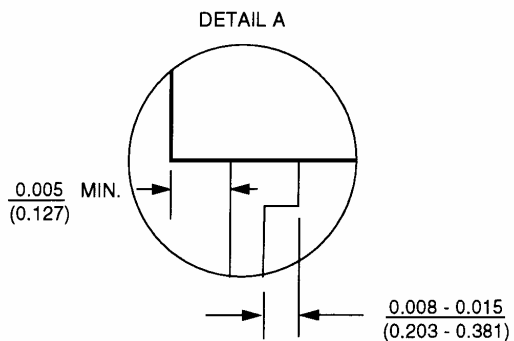
Note: Items 4.6.1 and 4.6.10 will be delivered as a minimum, with each shipment. This is noted on the Purchase Order Review Form as "No Charge Data".

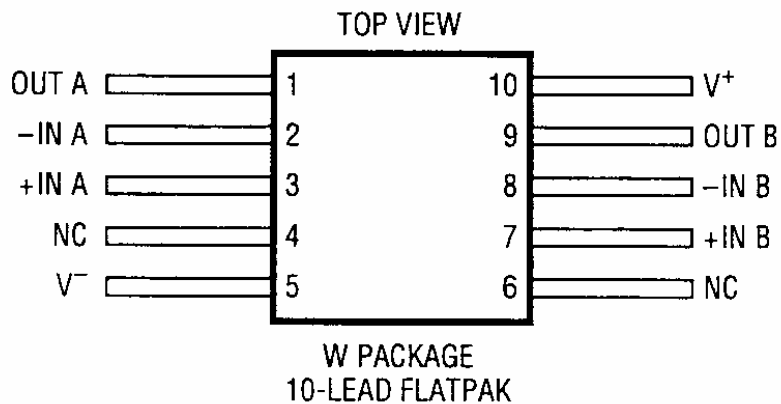
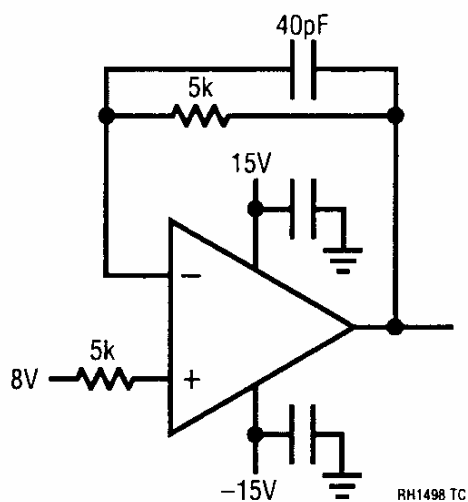
5.0 Packaging Requirements: Packaging shall be in accordance with Appendix A of MIL-PRF-38535. All devices shall be packaged in conductive material or packaged in anti-static material with an external conductive field shielding barrier.

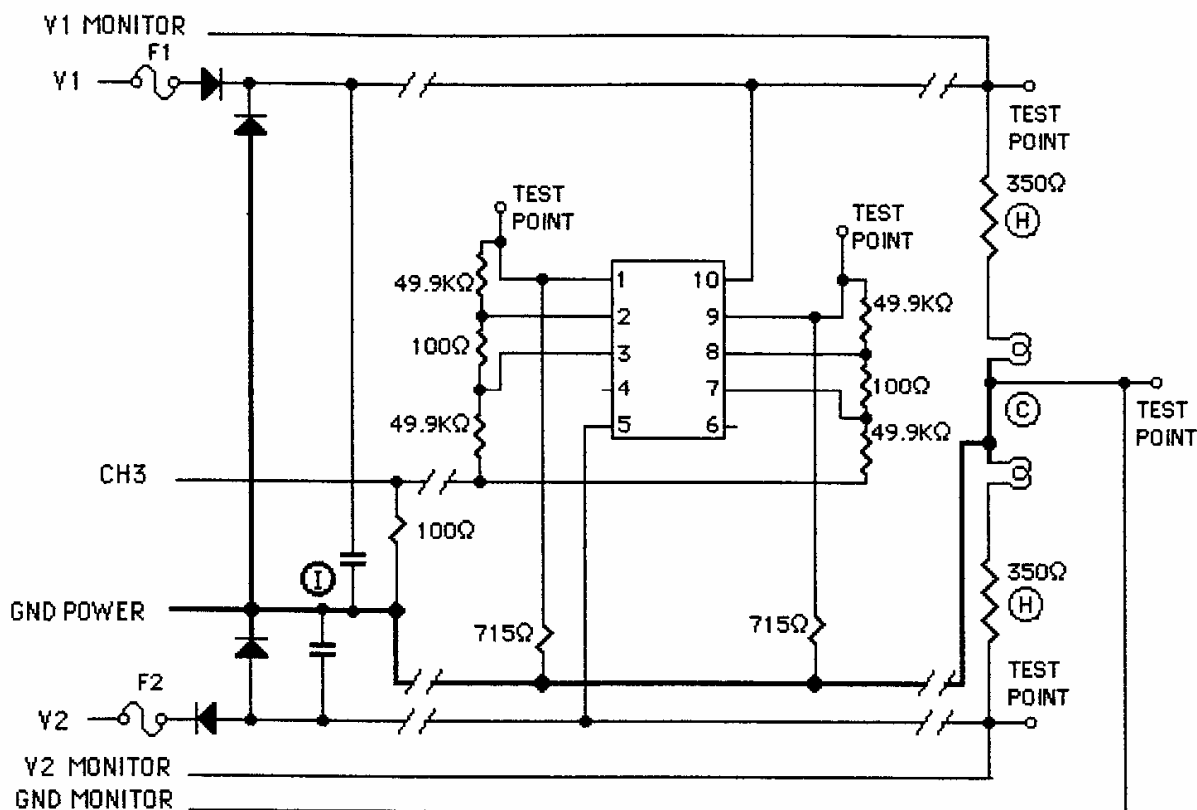
**(W) Glass Sealed Flatpak / 10 LEADS CASE OUTLINE****NOTES:**

- ① THIS DIMENSION ALLOWS FOR OFF-CENTER LID, MENISCUS AND GLASS OVER RUN
- ② INCREASE DIMENSIONS BY 0.003 INCH WHEN LEAD FINISH IS APPLIED (SOLDER DIPPED)

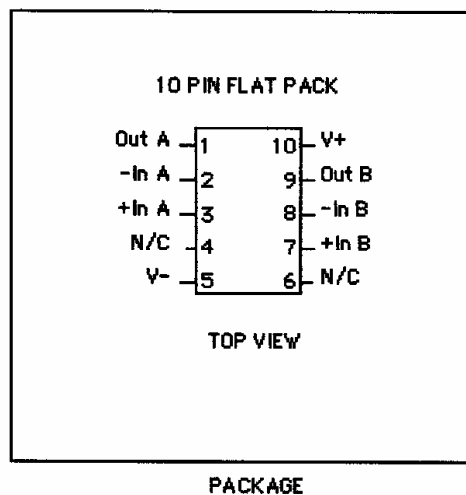
$\theta_{ja} = +170^{\circ}\text{C/W}$   
 $\theta_{jc} = +40^{\circ}\text{C/W}$

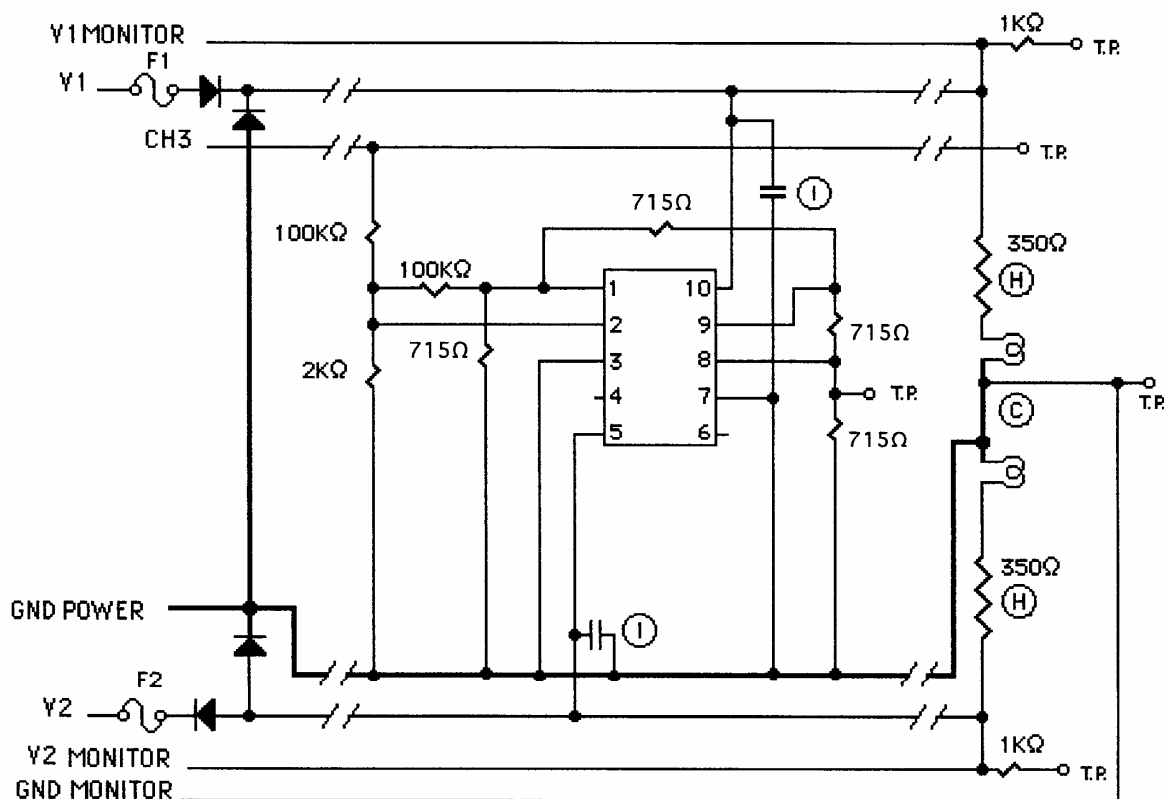
**FIGURE 1**

**TERMINAL CONNECTIONS****FIGURE 2****TOTAL DOSE BIAS CIRCUIT****FIGURE 3**

**STATIC BURN-IN CIRCUIT**  
**Glass Sealed Flatpak / 10 LEADS****NOTES:**

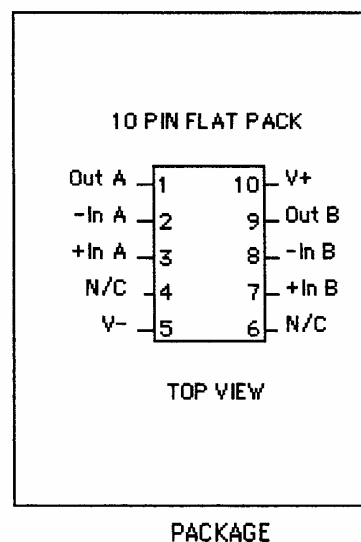
1. Unless otherwise specified, component tolerances shall be per military specification.
2.  $T_j = +161^\circ \text{C}$  maximum.
3.  $T_a = +125^\circ \text{C}$ .
4. Burn-in Voltages:  $V_1 = +16\text{V}$  to  $+17\text{V}$   
 $V_2 = -16\text{V}$  to  $-17\text{V}$
5. Current used per device:  
 $V_+ = 5\text{mA}$  plus  $50\text{mA}$  per board for lamp.  
 $V_- = 5\text{mA}$  plus  $50\text{mA}$  per board for lamp.  
 $\text{Gnd} = 4\text{mA}$  plus  $100\text{mA}$  per board for lamps.
6. USE ALL OTHER INFORMATION ON # 04-06-0391

**FIGURE 4**

**DYNAMIC BURN-IN CIRCUIT**  
**Glass Sealed Flatpak / 10 LEADS****NOTES:**

1. Unless otherwise specified, component tolerances shall be per military specification.
2.  $T_j = 161^\circ\text{C}$  maximum.
3.  $T_a = 125^\circ\text{C}$ .
4. Burn-in voltages:  $V_1 = +16\text{V}$  to  $+17\text{V}$   
 $V_2 = -16\text{V}$  to  $-17\text{V}$

CH. 3 = Square wave,  $+1.0\text{V}$  to  $+1.1\text{V}$   
 Gnd.  $-1.0\text{V}$  to  $-1.1\text{V}$   
 Frequency, 4.5hz (222ms) to 5.5hz (182ms)

**FIGURE 5**

**TABLE I: ELECTRICAL CHARACTERISTICS (PRE-IRRADIATION)****(Preirradiation)  $V_S = \pm 15V$ ,  $V_{CM} = V_{OUT} = 0V$ , unless otherwise noted.**

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ C$			SUB-GROUP	$-55^\circ C \leq T_A \leq 125^\circ C$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
$V_{OS}$	Input Offset Voltage	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$			200	800	1		350	1100	2, 3	$\mu V$ $\mu V$
	Input Offset Voltage Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$	3		250	1400			450	1800		$\mu V$ $\mu V$
$I_B$	Input Bias Current	$V_{CM} = V^+$ $V_{CM} = 14.5V$ $V_{CM} = V^-$ $V_{CM} = -14.5V$		0	250	715	1		500	1200	2, 3	nA nA nA nA
	Input Bias Current Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$	3	0	12	200			50	400		nA nA
$I_{OS}$	Input Offset Current	$V_{CM} = V^+, V^-$ $V_{CM} = 14.5V, -14.5V$			6	70	1		40	300	2, 3	nA nA
	Input Voltage Range			-15		15		-14.5		14.5		V
	Input Noise Voltage	0.1Hz to 10Hz			400							nV <sub>P-P</sub>
$e_n$	Input Noise Voltage Density	$f = 1kHz$			12							nV/ $\sqrt{Hz}$
$i_n$	Input Noise Current Density	$f = 1kHz$			0.3							pA/ $\sqrt{Hz}$
$A_{VOL}$	Large-Signal Voltage Gain	$V_O = -14.5V \text{ to } 14.5V$ , $R_1 = 10k$ $V_O = -10V \text{ to } 10V$ , $R_1 = 2k$		1000	5200		4	60	400		5, 6	V/mV V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$		90	102		1	86	102		2, 3	dB dB
	CMRR Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = 14.5V \text{ to } -14.5V$	3	84	103			80	100			dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2V \text{ to } \pm 16V$		90	110		1	88			2, 3	dB
	PSRR Match (Channel-to-Channel) (Note 3)	$V_S = \pm 2V \text{ to } \pm 16V$	3	83	110			82	100			dB
$V_{OL}$	Output Voltage Swing (Low) (Note 4)	No Load $I_{SINK} = 1mA$ $I_{SINK} = 10mA$ $I_{SINK} = 5mA$	4		18 50 230	30 100 500	4		25 70 180	75 150 500	5, 6	mV mV mV mV
$V_{OH}$	Output Voltage Swing (High) (Note 4)	No Load $I_{SOURCE} = 1mA$ $I_{SOURCE} = 10mA$ $I_{SOURCE} = 5mA$	4		2.5 75 420	10 150 800	4		5 100 300	25 250 800	5, 6	mV mV mV mV
$I_{SC}$	Short-Circuit Current			$\pm 15$	$\pm 30$		1	$\pm 7.5$	$\pm 12$		2, 3	mA
$I_S$	Supply Current per Amp				1.8	2.5	1		2.2	3	2, 3	mA
GBW	Gain-Bandwidth Product	$f = 100kHz$		6.8	10.5			5.8	8.5			MHz
SR	Slew Rate	$A_V = -1$ , $R_L = 10k$ , $V_O = \pm 10V$ , Measure at $V_O = \pm 5V$		3.5	6		4	2.2	4		5, 6	V/ $\mu s$

NOTES FOR THIS TABLE ARE ON PAGE 13.

**TABLE IA: ELECTRICAL CHARACTERISTICS (POST-IRRADIATION)****(Postirradiation)  $V_S = \pm 15V$ ,  $V_{CM} = 0V$ ,  $T_A = 25^\circ C$ , unless otherwise noted.**

SYMBOL	PARAMETER	CONDITIONS	NOTES	10-Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		UNITS
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$V_{OS}$	Input Offset Voltage	$V_{CM} = V^+, V^-$		950		950		950		950		950		$\mu V$
$I_B$	Input Bias Current	$V_{CM} = V^+, V^-$		765		815		865		915		965		nA
$I_{OS}$	Input Offset Current	$V_{CM} = V^+, V^-$		100		100		100		100		100		nA
	Input Voltage Range			$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	V
$A_{VOL}$	Large-Signal Voltage Gain	$V_O = -14.5V$ to $14.5V$ , $R_1 = 10k$		500		500		500		500		500		V/mV
		$V_O = -10V$ to $10V$ , $R_1 = 2k$		250		250		250		250		250		V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+$ to $V^-$		86		86		86		86		86		dB
	CMRR Match (Channel-to-Channel)	$V_{CM} = V^+$ to $V^-$	3	83		83		83		83		83		dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2V$ to $\pm 16V$		90		90		90		90		90		dB
	PSRR Match (Channel-to-Channel)	$V_S = \pm 2V$ to $\pm 16V$	3	83		83		83		83		83		dB
$V_{OUT}$	Output Voltage Swing Low	No Load	4	60		60		60		60		60		mV
		$I_{SINK} = 1mA$		100		100		100		100		100		mV
		$I_{SINK} = 10mA$		500		500		500		500		500		mV
	Output Voltage Swing High	No Load	4	20		20		20		20		20		mV
		$I_{SOURCE} = 1mA$		150		150		150		150		150		mV
		$I_{SOURCE} = 10mA$		800		800		800		800		800		mV
$I_{SC}$	Short-Circuit Current			$\pm 10$		$\pm 10$		$\pm 10$		$\pm 10$		$\pm 10$		mA
$I_S$	Supply Current			2.5		2.5		2.5		2.5		2.5		mA
GBW	Gain-Bandwidth Product	$f = 100kHz$		4.5		4.5		4.5		4.5		4.5		MHz
SR	Slew Rate	$A_V = -1$ , $R_L = 10k$ , $V_O = \pm 10V$ , Measure at $V_O = \pm 5V$		3		3		3		3		3		V/ $\mu s$

NOTES FOR THIS TABLE ARE ON PAGE 13.

**TABLE II: ELECTRICAL CHARACTERISTICS (PRE-IRRADIATION)****(Preirradiation)  $V_S = 5V$ ;  $V_{CM} = V_{OUT} =$  half supply, unless otherwise noted.**

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ C$			SUB-GROUP	$-55^\circ C \leq T_A \leq 125^\circ C$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
$V_{OS}$	Input Offset Voltage	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$			150	800	1		300	1100	2, 3	$\mu V$ $\mu V$
	Input Offset Voltage Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+ \text{ to } V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$	3		200	1400			350	1800		$\mu V$ $\mu V$
$I_B$	Input Bias Current	$V_{CM} = V^+$ $V_{CM} = V^+ - 0.5V$ $V_{CM} = V^-$ $V_{CM} = V^- + 0.5V$		0	250	650	1	0	450	1100	2, 3	nA nA nA nA
	Input Bias Current Match (Channel-to-Channel) (Note 3)	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$	3	0	10	180		0	30	400		nA nA
$I_{OS}$	Input Offset Current	$V_{CM} = V^+, V^-$ $V_{CM} = V^+ - 0.5V, V^- + 0.5V$			5	65	1		15	300	2, 3	nA nA
	Input Voltage Range			$V^-$		$V^+$		$V^- + 0.5V$		$V^+ - 0.5V$		V
	Input Noise Voltage	0.1Hz to 10Hz			400							nV <sub>p-p</sub>
$e_n$	Input Noise Voltage Density	$f = 1\text{kHz}$			12							nV/ $\sqrt{\text{Hz}}$
$i_n$	Input Noise Current Density	$f = 1\text{kHz}$			0.3							pA/ $\sqrt{\text{Hz}}$
$C_{IN}$	Input Capacitance				5							pF
$A_{VOL}$	Large-Signal Voltage Gain	$V_S = 5V, V_O = 75\text{mV to } 4.8V$ , $R_L = 10k$		600	3800		4	60	210		5, 6	V/mV
$CMRR$	Common Mode Rejection Ratio	$V_S = 5V, V_{CM} = V^+ \text{ to } V^-$ $V_S = 5V, V_{CM} = 0.5V \text{ to } 4.5V$		76	90			68	85			dB dB
	CMRR Match (Channel-to-Channel) (Note 3)	$V_S = 5V, V_{CM} = V^+ \text{ to } V^-$ $V_S = 5V, V_{CM} = 0.5V \text{ to } 4.5V$	3	75	91			66				dB dB
$PSRR$	Power Supply Rejection Ratio	$V_S = 4.5V \text{ to } 12V$ , $V_{CM} = V_O = 0.5V$		88	105		1	86	104		2, 3	dB
	PSRR Match (Channel-to-Channel) (Note 3)	$V_S = 4.5V \text{ to } 12V$ , $V_{CM} = V_O = 0.5V$	3	82	120			80	118			dB
$V_{OL}$	Output Voltage Swing (Low) (Note 4)	No Load $I_{SINK} = 1\text{mA}$ $I_{SINK} = 2.5\text{mA}$	4		14 50 90	30 100 200	4		25 65 110	75 150 220	5, 6	mV mV mV
$V_{OH}$	Output Voltage Swing (High) (Note 4)	No Load $I_{SOURCE} = 1\text{mA}$ $I_{SOURCE} = 2.5\text{mA}$	4		2.5 70 140	10 150 250	4		5 100 180	25 250 300	5, 6	mV mV mV
$I_{SC}$	Short-Circuit Current	$V_S = 5V$		$\pm 12.5$	24		1	$\pm 5$	$\pm 10$		2, 3	mA
$I_S$	Supply Current per Amp				1.7	2.2	1		2	2.7	2, 3	mA
GBW	Gain-Bandwidth Product	$V_S = 5V, f = 100\text{kHz}$		6.8	10.5			5.8	8.5			MHz
SR	Slew Rate	$V_S = \pm 2.5V, A_V = -1$ , $R_L = 10k, V_O = \pm 2V$ , Measure at $V_O = \pm 1V$		2.6	4.5		4	2	3.6		5, 6	V/ $\mu$ s

NOTES FOR THIS TABLE ARE ON PAGE 13.

**TABLE IIA: ELECTRICAL CHARACTERISTICS (POST-IRRADIATION)****(Postirradiation)  $V_S = 5V$ ;  $V_{CM} =$  half supply,  $T_A = 25^\circ C$ , unless otherwise noted.**

SYMBOL	PARAMETER	CONDITIONS	NOTES	10Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		UNITS
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$V_{OS}$	Input Offset Voltage	$V_{CM} = V^+, V^-$		950		950		950		950		950		$\mu V$
$I_B$	Input Bias Current	$V_{CM} = V^+, V^-$		700		750		800		850		900		nA
$I_{OS}$	Input Offset Current	$V_{CM} = V^+, V^-$		65		65		65		65		65		nA
	Input Voltage Range			$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	$V^-$	$V^+$	V
$A_{VOL}$	Large-Signal Voltage Gain	$V_O = 75mV$ to $V^+ - 0.2V$ $R_1 = 10k$		300		300		300		300		300		V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = V^+$ to $V^-$		70		70		70		70		70		dB
	CMRR Match (Channel-to-Channel)	$V_{CM} = V^+$ to $V^-$	3	70		70		70		70		70		dB
PSRR	Power Supply Rejection Ratio	$V_S = 4.5V$ to $12V$ , $V_{CM} = V_O = 0.5V$		88		88		88		88		88		dB
	PSRR Match (Channel-to-Channel)	$V_S = 4.5V$ to $12V$ , $V_{CM} = V_O = 0.5V$	3	82		82		82		82		82		dB
$V_{OUT}$	Output Voltage Swing Low	No Load	4	60		60		60		60		60		mV
		$I_{SINK} = 1mA$		100		100		100		100		100		mV
		$I_{SINK} = 2.5mA$		200		200		200		200		200		mV
	Output Voltage Swing High	No Load	4	20		20		20		20		20		mV
		$I_{SOURCE} = 1mA$		150		150		150		150		150		mV
		$I_{SOURCE} = 2.5mA$		250		250		250		250		250		mV
$I_{SC}$	Short-Circuit Current			$\pm 8$		$\pm 8$		$\pm 8$		$\pm 8$		$\pm 8$		mA
$I_S$	Supply Current			2.2		2.2		2.2		2.2		2.2		mA
SR	Slew Rate	$V_S = \pm 2.5V$ , $A_V = -1$ , $R_L = 10k$ , $V_O = \pm 2V$ , Measure at $V_O = \pm 1V$		2		2		2		2		2		V/ $\mu$ s

**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:** A heat sink may be required to keep the junction temperature below this absolute maximum rating when the output is shorted indefinitely.

**Note 3:** Matching parameters are the difference between amplifiers A and B.

**Note 4:** Output voltage swings are measured between the output and power supply rails.

**Special Note:** Notes 1 and 2 pertain only to Absolute Maximum Ratings on page 2 of this specification.

**TABLE III: POST BURN-IN ENDPOINTS AND DELTA LIMIT REQUIREMENTS** $T_A = 25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ 

PARAMETER	ENDPOINT LIMIT		DELTA		UNITS
	MIN	MAX	MIN	MAX	
$V_{OS}$	-800	+800	-250	+250	$\mu\text{V}$
$I_B$	-715	+715	-350	+350	nA
$I_{OS}$	-70	+70	-50	+50	nA

**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.