

REVISION RECORD

REV	DESCRIPTION	DATE
0	INITIAL RELEASE	06/12/96
A	<ul style="list-style-type: none"> PAGE 2 - ADDED PARAGRAPHS 3.2.1 - 3.2.3 REFERENCING THE PACKAGE OPTIONS. PARAGRAPH 3.3.b, ADDED "(SEE PARAGRAPH 3.2)". PARAGRAPH 3.2.3, CHANGED PACKAGE OPTION FROM "10LEAD FLATPACK" TO "10 LEAD BOTTOM BRAZED FLATPACK". PAGE 3, PARAGRAPH 3.6 - CHANGED "TABLE I" AND "TABLE IA" TO "TABLE 1" AND "TABLE 1A" TO MATCH THE ACTUAL TABLES ON PAGES 17 AND 18. PAGE 4 - DELETED PARAGRAPH 3.12.1. PAGE 6, FIGURE 1, PAGE 7, FIGURE 2, AND PAGE 8, FIGURE 3 - ADDED θ_{ja}, θ_{jc}, AND T_{jMAX}. PAGE 9, FIGURE 6 - CHANGED TO VIEW OF THE 10 LEAD W PACKAGE. PAGES 10 - 13, FIGURES 7 - 10 - REMOVED REFERENCE TO LTC SPEC. PAGES 14 AND 15, FIGURES 11 AND 12 - REMOVED NOTE ON CALCULATION OF T_{jMAX} SUPPLIED BY CUSTOMER. CHANGED PACKAGE TYPE FROM "FLATPACK" TO "BOTTOM BRAZED FLATPACK" ON BOTH PAGES. PAGE 17 - REMOVED EXTRA HEADER FOR PRE-IRRADIATION ELECTRICAL TABLE. 	08/01/97
B	<ul style="list-style-type: none"> PAGE 20 - CHANGED DELTA LIMITS ON +IB AND -IB PARAMETERS FROM MIN -10, MAX 10 TO -30, MAX 30. 	09/29/97
C	<ul style="list-style-type: none"> PAGE 4, ADDED PARAGRAPHS 3.8.1, 3.8.2, 3.8.3. PAGE 5, PARAGRAPH 4.4.2, GROUP B INSPECTION, WAS REDEFINED. PAGE 6, PARAGRAPH 4.4.3, GROUP D INSPECTION, WAS REDEFINED. PARAGRAPH 4.5, SOURCE INSPECTION WAS REDEFINED. 	12/01/97
D	<ul style="list-style-type: none"> PAGE 5, AMENDED PARAGRAPHS 4.1 AND 4.1.1 TAKING EXCEPTION TO ANALYSIS OF CATASTROPHIC FAILURES. ADDED A SECOND PAGE FOR REVISION RECORD. UPDATED ENTIRE SPEC TO NEXT REVISION DUE TO THE ADDITIONAL PAGE. 	03/20/98
E	<ul style="list-style-type: none"> PAGE 3, CHANGED PARAGRAPH 3.2.3, PACKAGE OPTION FROM "10 LEAD BOTTOM BRAZED FLATPACK" TO "10 LEAD CERPAK". PAGE 9 CHANGED "(WB) BOTTOM BRAZED FLATPACK" TO "(W) CERPAK". PAGE 10 CHANGED OPTION 3 FROM "(WB) BOTTOM BRAZED FLATPACK" TO "(W) CERPAK". PAGE 15, 16, CHANGED FIGURE 11, 12, FROM "BOTTOM BRAZED FLATPACK" TO "CERPAK". PAGE 4, CHANGED OPTION 3 TO "CERPAK". 	10/16/98
F	<ul style="list-style-type: none"> PAGE 7, TO5 CASE OUTLINE, CHANGED θ_{jc} FROM 60°C/W TO 40°C/W, θ_{ja} DOES NOT CHANGE. PAGE 8, CERPAC CASE OUTLINE, CHANGED θ_{ja} FROM 120°C/W TO 110°C/W, θ_{jc} CHANGED FROM 50°C/W TO 30°C/W. 	7/19/99

CONTINUED ON NEXT PAGE.....

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	13	14	15	16	17	
INDEX	REVISION	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
REVISION	PAGE NO.	18	19	20	21	22													
INDEX	REVISION	V	V	V	V	V													

		ORIG								<p style="text-align: center;">LINEAR TECHNOLOGY CORPORATION MILPITAS, CALIFORNIA</p> <p>TITLE:</p> <p style="text-align: center;">MICROCIRCUIT, LINEAR, RH27, OPERATIONAL AMPLIFIER</p>							
		DSGN															
		ENGR															
		MFG															
		CM															
		QA															
		PROG								SIZE	CAGE CODE	DRAWING NUMBER	REV				
											64155	05-08-5029	V				
APPLICATION	FUNCT	SIGNOFFS		DATE		CONTRACT:											

FOR OFFICIAL USE ONLY

REVISION RECORD		
REV	DESCRIPTION	DATE
G	<ul style="list-style-type: none"> PAGE 9, FIGURE 3, CHANGED θ_{ja} AND θ_{jc}. 	09/29/99
H	<ul style="list-style-type: none"> PAGE 3, PARAGRAPHS 3.2.1, 3.2.2, 3.2.3 HAD FIGURES 1, 2, 3 REMOVED. PAGE 4, 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 5, 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 OF MIL-STD-883" TO "ALL FOOTNOTES PERTAINING TO TABLE IIA IN MIL-STD-883". PAGE 6, 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". 	01/04/00
J	<ul style="list-style-type: none"> PAGE 9, CHANGED THETA JA TO $\theta_{JA}=170^{\circ}\text{C/W}$ AND THETA JC TO $\theta_{JC}=40^{\circ}\text{C/W}$ FROM $\theta_{JA}=225^{\circ}\text{C/W}$ AND $\theta_{JC}=18^{\circ}\text{C/W}$ PER PACKAGE ENGINEER. 	09/05/00
K	<ul style="list-style-type: none"> PAGE 3, PARAGRAPHS 3.2.1, 3.2.2, 3.2.3, ADDED "OPTION" BEFORE EACH DEVICE SELECTION. PAGE 4, PARAGRAPH 3.6, TABLE IA CHANGED TO TABLE II. PARAGRAPH 3.7, TABLE III CHANGED TO TABLE IV. PARAGRAPH 3.10.3, ADDED "DEVICE OPTIONS 1, 2, AND 3" TO LINE 1. PAGE 5, PARAGRAPH 3.11.1 WAS CHANGED FROM "...dosage rate of approximately 20 Rads per second" TO "...dosage rate of less than or equal to 10 Rads per second". PARAGRAPHS 4.1 THROUGH 4.4.2.1 CHANGES WERE DONE TO CLARIFY GROUP SAMPLING. PAGE 6, PARAGRAPH 4.4.3 CHANGE WAS DONE TO CLARIFY GROUP SAMPLING. 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. PAGES 8 THROUGH 18, ALL FIGURE TITLES CHANGED TO HAVE DEVICE OPTIONS AND PACKAGE TYPES AT TOP OF PAGE, AND HAVE ALL FIGURES AT BOTTOM OF PAGE. PAGE 9, CASE OUTLINE EDITED TO REFLECT ONLY THE 8 LEAD PACKAGE INFORMATION. FIGURE 2, SHOULDER OF LEAD WIDTH MAXIMUM INCREASED BY .003 INCHES. PAGE 10, CASE OUTLINE WAS UPDATED TO MEET MIL-STD-1835. FIGURE 3, PACKAGE THICKNESS MAXIMUM INCREASED BY .005 INCHES. PACKAGE WIDTH AND LENGTH MAXIMUMS INCREASED BY .01 AND .02 INCHES, RESPECTIVELY. PAGE 11, MOVED FIGURES 4, 5, 6 FOR BETTER FIT ON PAGE. PAGE 13, FIGURE 8, ADDED PACKAGE PINOUTS. PAGE 14, FIGURE 9, ADDED PACKAGE PINOUTS. PAGE 15, FIGURE 10, ADDED PACKAGE PINOUTS. PAGE 16, FIGURE 11, ADDED PACKAGE PINOUTS. PAGE 17, FIGURE 12, ADDED PACKAGE PINOUTS. PAGE 19, ADDED NOTE 8 AFTER TABLE II. 	11/07/02
L	<ul style="list-style-type: none"> PAGE 9, CHANGED OUTLINE DRAWING PIN 1 NOTCH MOVED TO INSIDE LEAD LOCATION. 	05/19/03
M	<ul style="list-style-type: none"> PAGE 4, CHANGED INITIAL RATE OF RADS TO 240 RADS/SEC. 	03/16/05
N	<ul style="list-style-type: none"> PAGE 5, CHANGED IN 4.2 & 4.3 PARAGRAPHS IN CONJUNCTION TO 3.3 CHANGED TO PARAGRAPH 3.4 	07/16/07
P	<ul style="list-style-type: none"> PAGE 5, PARAGRAPH 4.3 CHANGED 3.1.1 TO 3.1 AND 3.2.1 TO 3.1.1 	09/10/07
Q	<ul style="list-style-type: none"> PAGE 4, PARAGRAPH 3.10.3 ADDED OPTION 3 IS ALLOY 42 FOR FLATPACK. 	10/19/07

REVISION RECORD		
REV	DESCRIPTION	DATE
R	<ul style="list-style-type: none"> PAGE 6, PARAGRAPH 3.11.1 CHANGED VERBIAGE PAGE 5, PARAGRAPH 3.10.3 CHANGED OPTION 2 TO ALLOY 42 PACKAGE REQUIREMENT. 	04/29/08
S	<ul style="list-style-type: none"> PAGE 6, PARAGRAPH 4.4.2 CHANGED VERBIAGE. PAGE 10, FIGURE 3 NOTE 2 ADDED TO LEAD THICKNESS. 	05/27/08
T	<ul style="list-style-type: none"> ADDED OPTION 4 & OPTION 5 THROUGH OUT SPEC. Page 16, ADDED DYNAMIC BURN-IN CIRCUIT INFORMATION Removed the "C" from RH27 header. Page 19, 20, Added updated data sheet. 	01/23/09
U	<ul style="list-style-type: none"> PAGE 4, PARAGRAPH 3.2.6, ADDED OPTION 6, RH27AEW (GLASS SEAL FLATPACK, 10 LEADS). PAGE 5, PARAGRAPH 3.8.3, ADDED OPTION 6 TO BURN-IN REQUIREMENT. PAGE 5, PARAGRAPH 3.10.3, ADDED OPTION 6 TO LEAD MATERIAL AND FINISH. PAGE 10, FIGURE 3, ADDED DEVICE OPTION 6 TO W10 GLASS SEALED FLATPACK. PAGE 11, FIGURE 6, ADDED DEVICE OPTION 6 TO GLASS SEALED FLATPACK TERMINAL CONNECTIONS. PAGE 16, FIGURE 11, ADDED OPTION 6 TO STATIC BURN-IN CIRCUIT. PAGE 17, FIGURE 12, ADDED OPTION 6 TO DYNAMIC BURN-IN CIRCUIT. 	01/20/12
V	<ul style="list-style-type: none"> PAGE 5, PARAGRAPH 3.5, AMENDED ESD CLASSIFICATION FROM CLASS 1 TO CLASS 2. 	05/23/12

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 RH27 Precision Operational Amplifier, processed to space level manufacturing flow.

3.2 Part Number:

3.2.1 Option 1 – RH27CH (TO5 Metal Can, 8 Leads)

3.2.2 Option 2 – RH27CJ8 (Ceramic Dip, 8 Leads)

3.2.3 Option 3 – RH27CW (Glass Seal Flatpack, 10 Leads)

3.2.4 Option 4 – RH27EW (Glass Seal Flatpack, 10 Leads)

3.2.5 Option 5 – RH27EH (TO5 Metal Can, 8 Leads)

3.2.6 Option 6 – RH27AEW (Glass Seal Flatpack, 10 Leads)

Note: RH27AEW is marked and processed as RH27EW. Orders will be delivered with an additional screening at 25°C, –55°C to 125°C to the VOS specification shown on Table 1.

- 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:

Supply Voltage	. . . . .	±22V
Internal Power Dissipation	. . . . .	500mW
Input Voltage	. . . . .	Equal to Supply Voltage
Output Short Circuit Duration	. . . . .	Indefinite
Differential Input Current <u>1/</u>	. . . . .	±25mA
Operating Temperature Range	. . . . .	-55°C to +125°C
Junction Temperature Range	. . . . .	-55°C to +150°C
Storage Temperature Range	. . . . .	-65°C to +150°C
Lead Temperature (Soldering, 10 sec)	. . . . .	+300°C

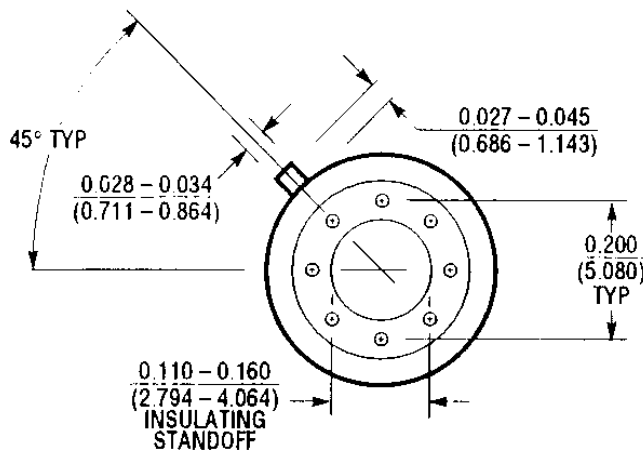
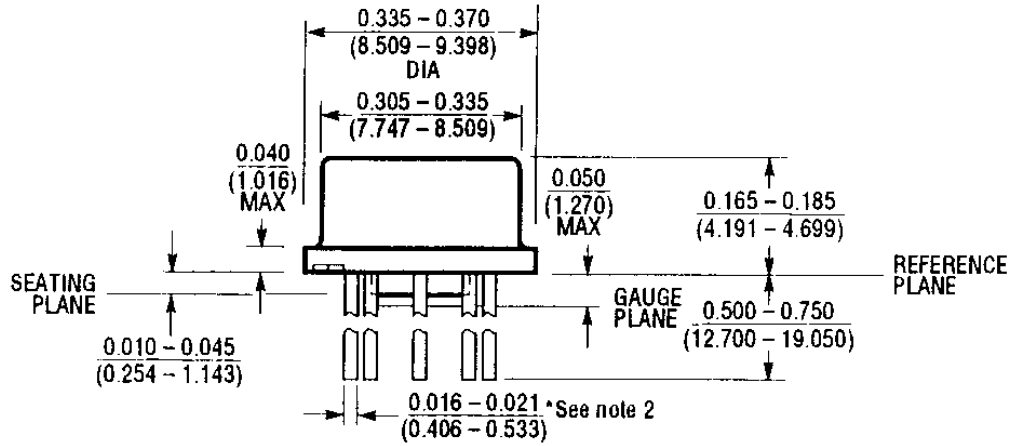
1/ The RH27's inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds ±0.7V, the input current should be limited to 25mA.

- 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 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:
 - 3.8.1 Option 1, 5 (TO5): Static Burn-In, Figure 7; Dynamic Burn-In, Figure 8
 - 3.8.2 Option 2 (Ceramic Dip): Static Burn-In, Figure 9; Dynamic Burn-In, Figure 10
 - 3.8.3 Options 3, 4, 6: (Glass Sealed Flatpack) : Static Burn-In, Figure 11; Dynamic Burn-In, Figure 12
- 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, Figure 2, and Figure 3.
 - 3.10.2 Terminal Connections: The terminal connections shall be as specified in Figure 4, Figure 5, and Figure 6.

- 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.

DEVICE OPTION # 1, 5
(H) TO5 / 8 LEADS CASE OUTLINE

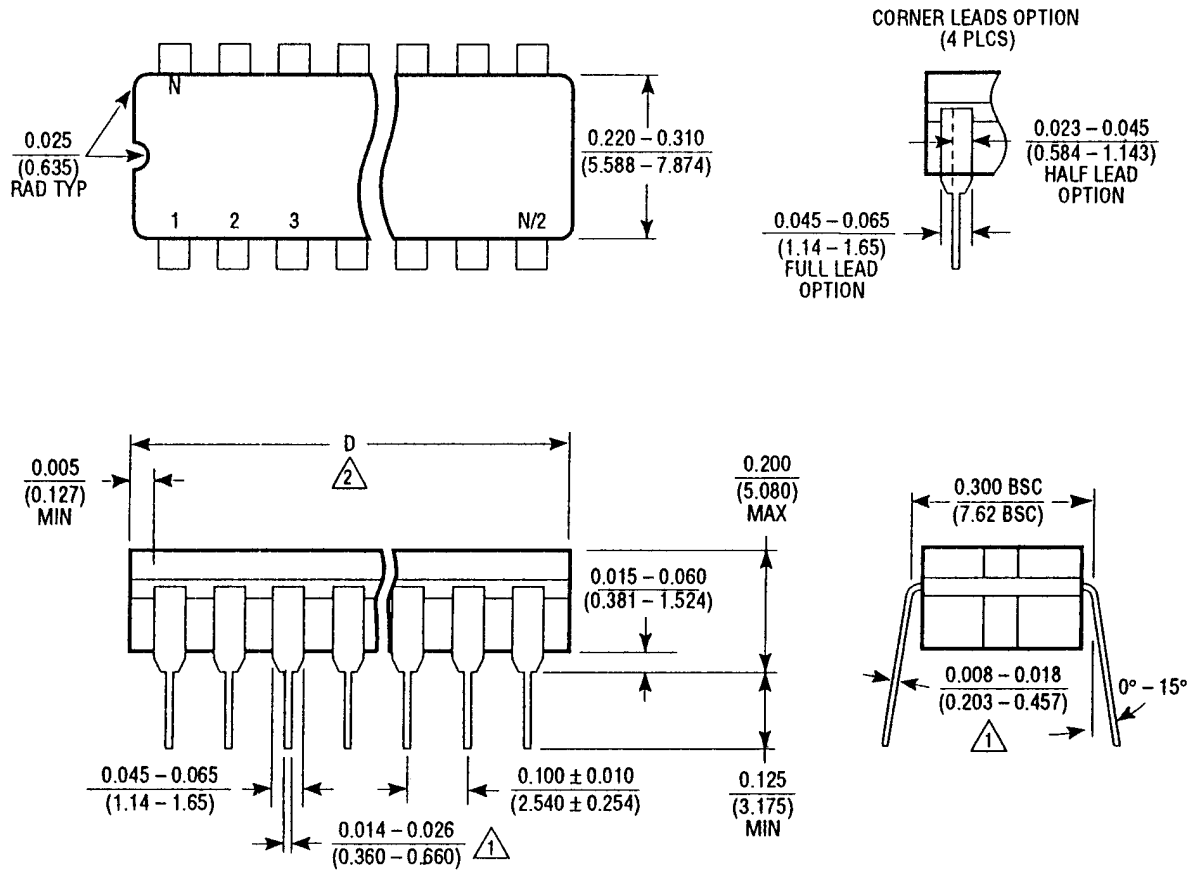


- NOTE: 1. LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND SEATING PLANE.
 2. FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS 0.016 - 0.024 (0.406 - 0.610)

$\theta_{ja} = +150^{\circ}\text{C/W}$
 $\theta_{jc} = +40^{\circ}\text{C/W}$

FIGURE 1

DEVICE OPTION # 2
(J8) CERAMIC DIP / 8 LEADS CASE OUTLINE

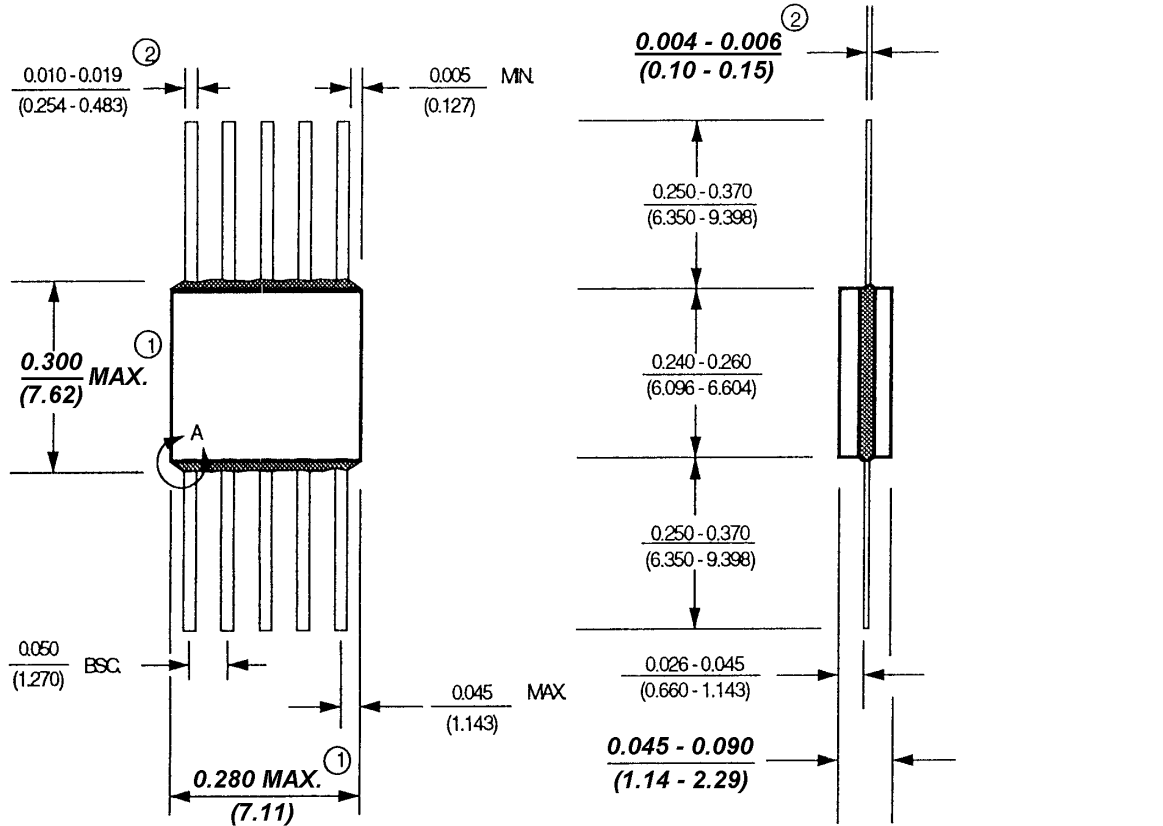


NOTE: 1. LEAD DIMENSIONS APPLY TO SOLDER DIP OR TIN PLATE LEADS.
 2. 8 LEAD D MAX = .405 (10.287)

$\theta_{ja} = +110^\circ\text{C/W}$
 $\theta_{jc} = +30^\circ\text{C/W}$

FIGURE 2

DEVICE OPTION # 3, 4, 6
(W10) GLASS SEALED FLATPACK / 10LEADS CASE OUTLINE



NOTE: 1. THIS DIMENSION ALLOWS FOR OFF-CENTER LID, MENISCUS AND GLASS OVER RUN.

NOTE: 2. INCREASE DIMENSION BY 0.003 INCH WHEN LEAD FINISH IS APPLIED (SOLDER DIPPED).

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

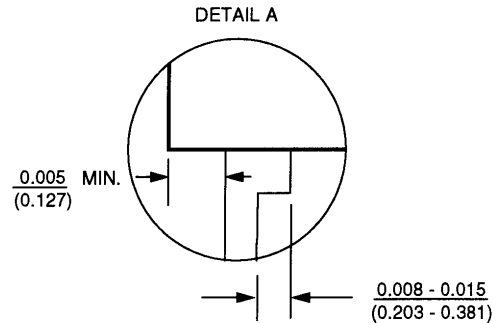
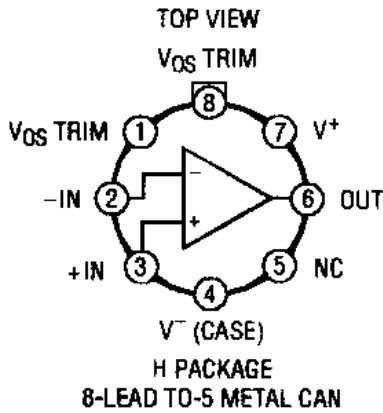


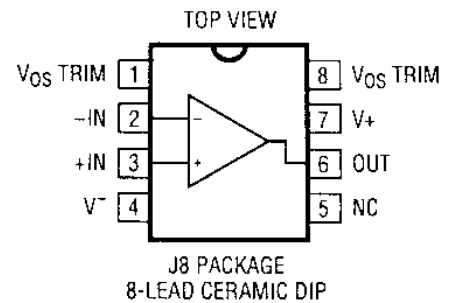
FIGURE 3

TERMINAL CONNECTIONS

DEVICE OPTION #1, 5 TO5 10 LEAD METAL CAN



DEVICE OPTION #2, 8 LEAD CERAMIC DIP



DEVICE OPTION #3, 4, 6 GLASS SEALED
 10 LEAD FLATPACK

FIGURE 5

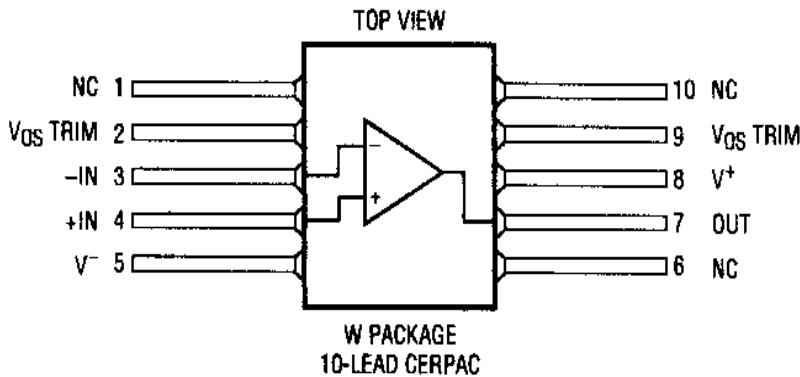
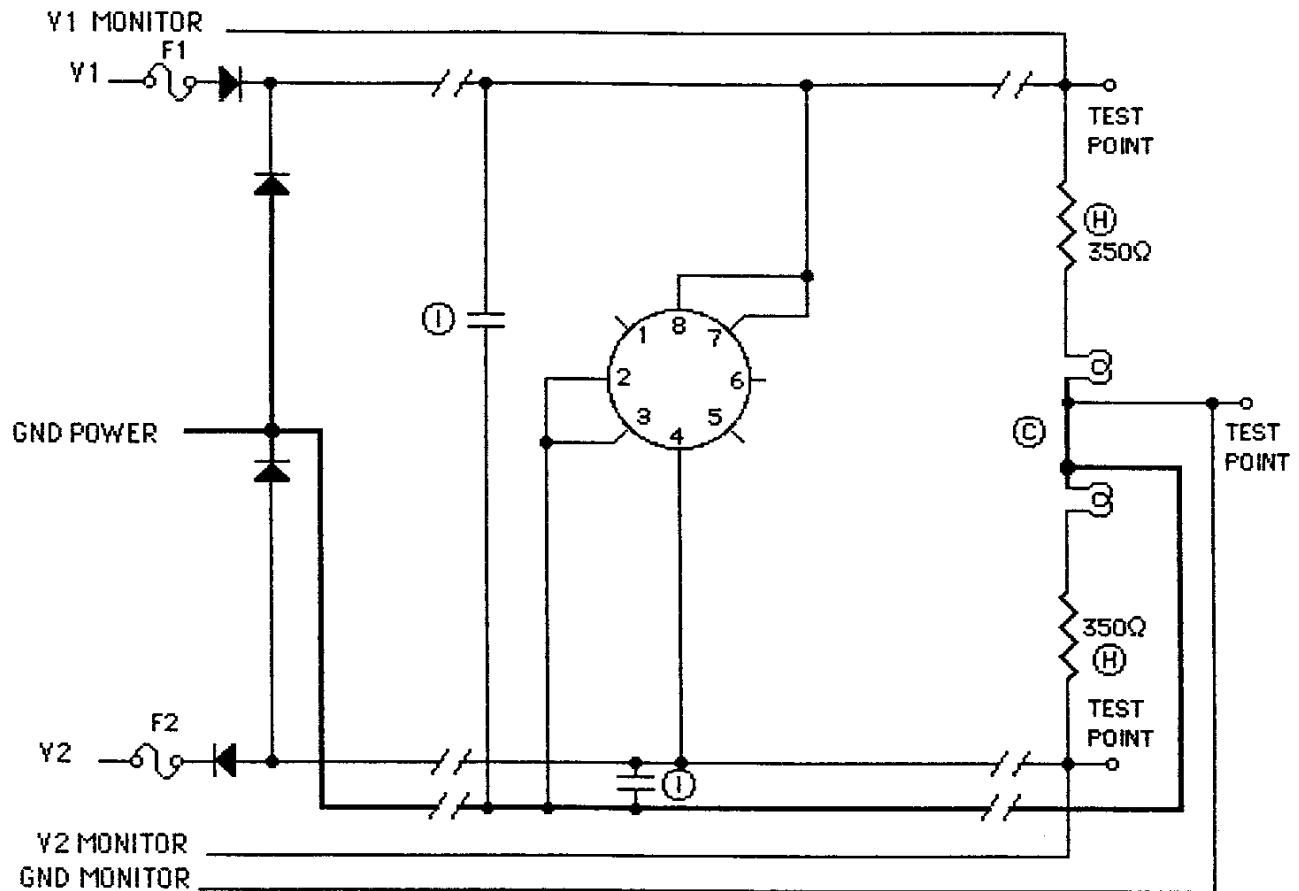


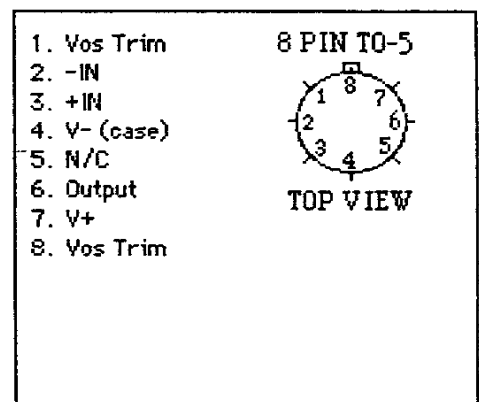
FIGURE 6

**STATIC BURN-IN CIRCUIT
OPTION 1, 5 TO5 METAL CAN / 8 LEADS**



NOTES:

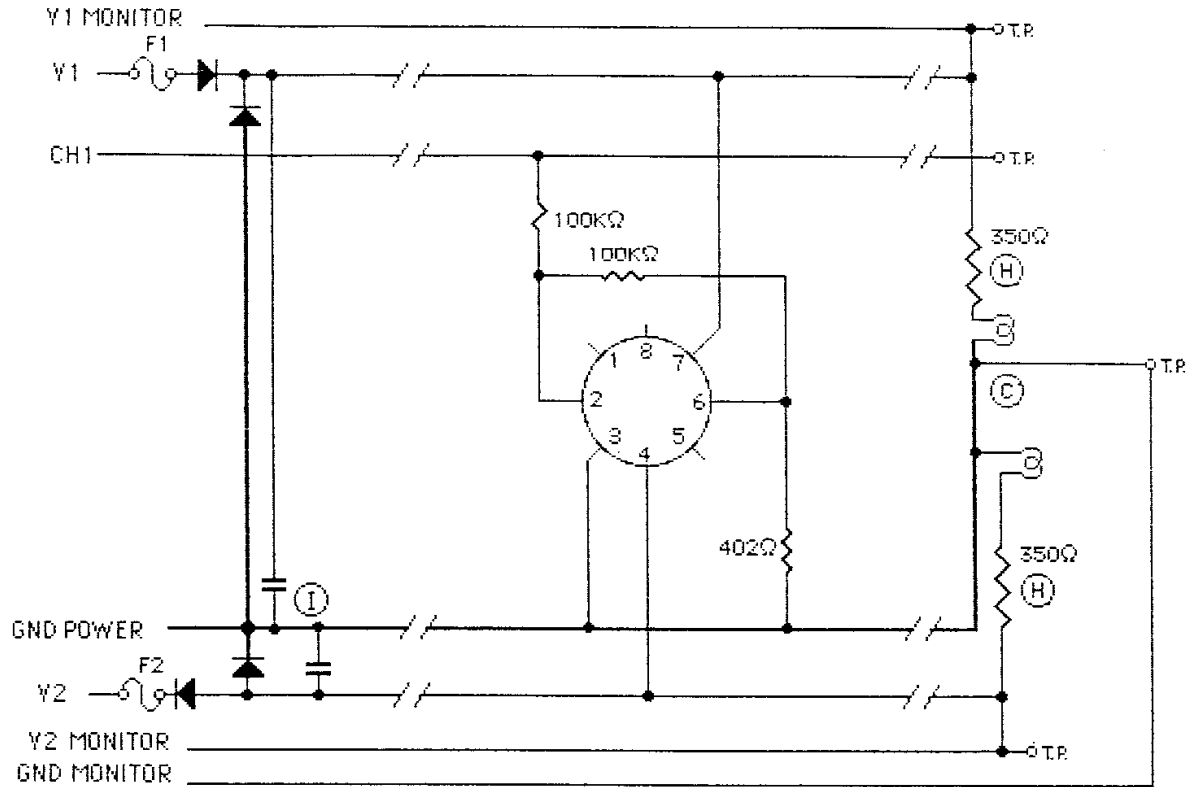
1. Unless otherwise specified, component tolerances shall be per military specification.
2. $T_j = +181\text{ }^\circ\text{C}$ maximum.
3. $T_a = +150\text{ }^\circ\text{C}$ to $+158\text{ }^\circ\text{C}$ maximum ambient.
4. Burn-in Voltages: $V_1 = +18\text{V}$ to $+19.8\text{V}$
 $V_2 = -18\text{V}$ to -19.8V



PACKAGE

FIGURE 7

**DYNAMIC BURN-IN CIRCUIT
OPTION 1, 5 TO5 METAL CAN / 8 LEADS**



NOTES:

1. Unless otherwise specified, component tolerances shall be per military specification.
2. $T_j = +175\text{ }^\circ\text{C}$ maximum.
3. $T_a = +125\text{ }^\circ\text{C}$ to $+133\text{ }^\circ\text{C}$ maximum ambient.
4. Burn-in Voltages: $Y1 = +18\text{V}$ to $+19.8\text{V}$
 $Y2 = -18\text{V}$ to -19.8V

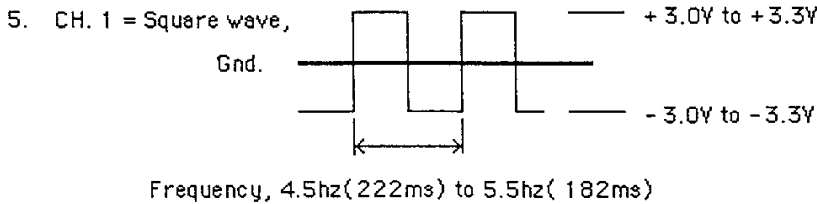
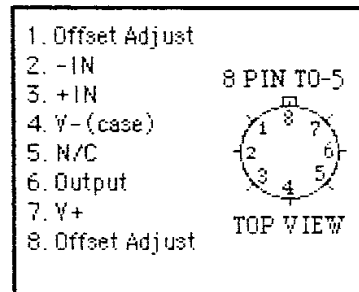
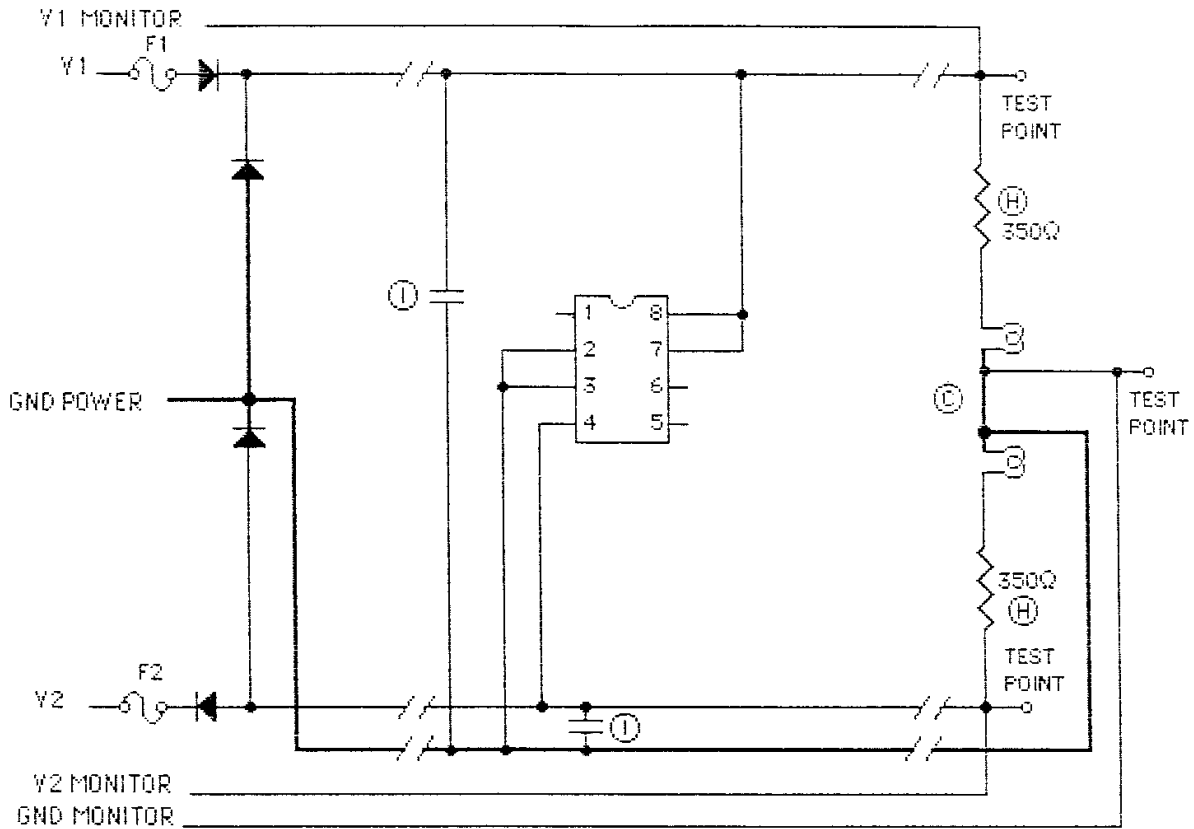


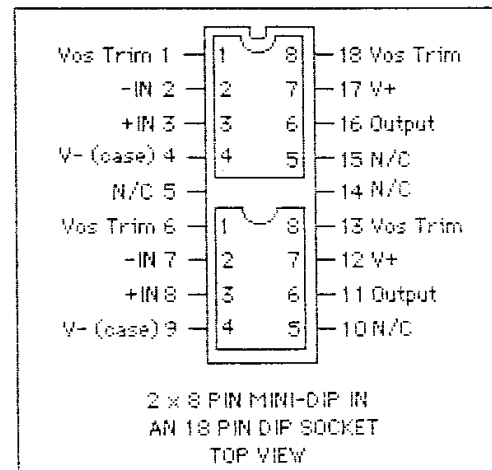
FIGURE 8

**STATIC BURN-IN CIRCUIT
OPTION #2, Cerdip / 8 LEADS**



NOTES:

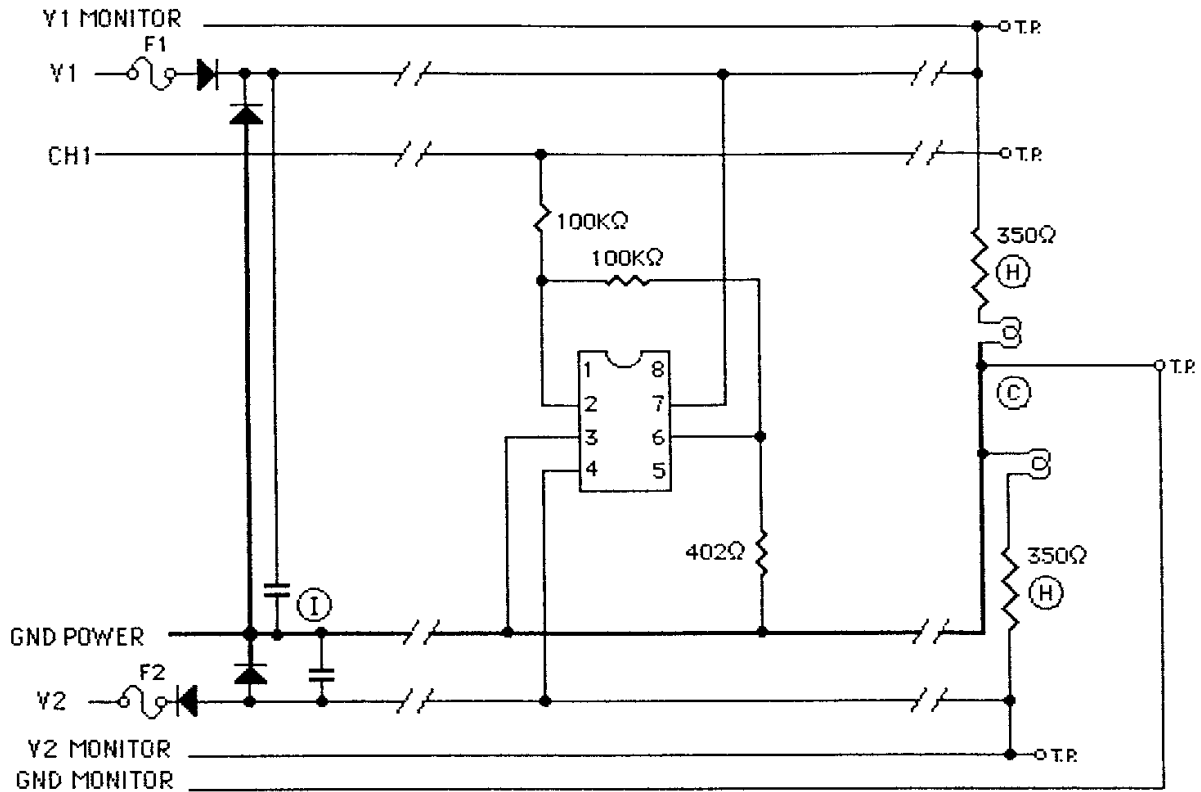
1. Unless otherwise specified, component tolerances shall be per military specification.
2. $T_j = +175\text{ }^\circ\text{C}$ maximum.
3. $T_a = +150\text{ }^\circ\text{C}$ to $+158\text{ }^\circ\text{C}$ maximum ambient.
4. Burn-in Voltages: $Y1 = +18\text{V}$ to $+19.8\text{V}$
 $Y2 = -18\text{V}$ to -19.8V



PACKAGE

FIGURE 9

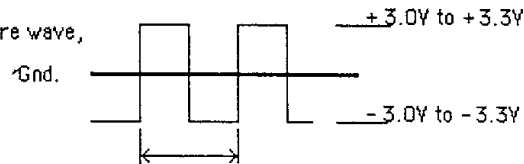
**DYNAMIC BURN-IN CIRCUIT
OPTION 2, CERDIP / 8 LEADS**



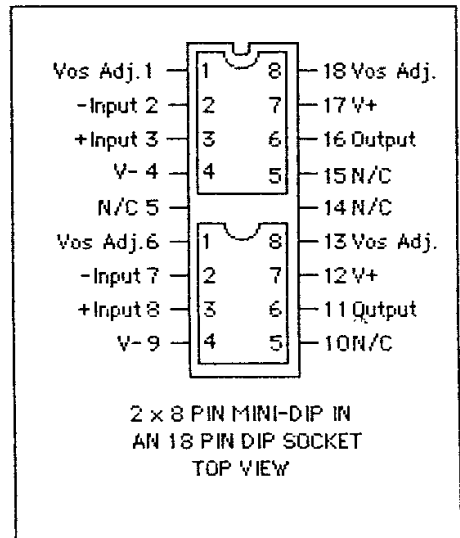
NOTES:

1. Unless otherwise specified, component tolerances shall be per military specification.
2. $T_j = +163^\circ\text{C}$ maximum.
3. $T_a = +125^\circ\text{C}$ to $+133^\circ\text{C}$ maximum ambient.
4. Burn-in Voltages: $V_1 = +18\text{V}$ to $+19.8\text{V}$
 $V_2 = -18\text{V}$ to -19.8V

5. CH. 1 = Square wave,



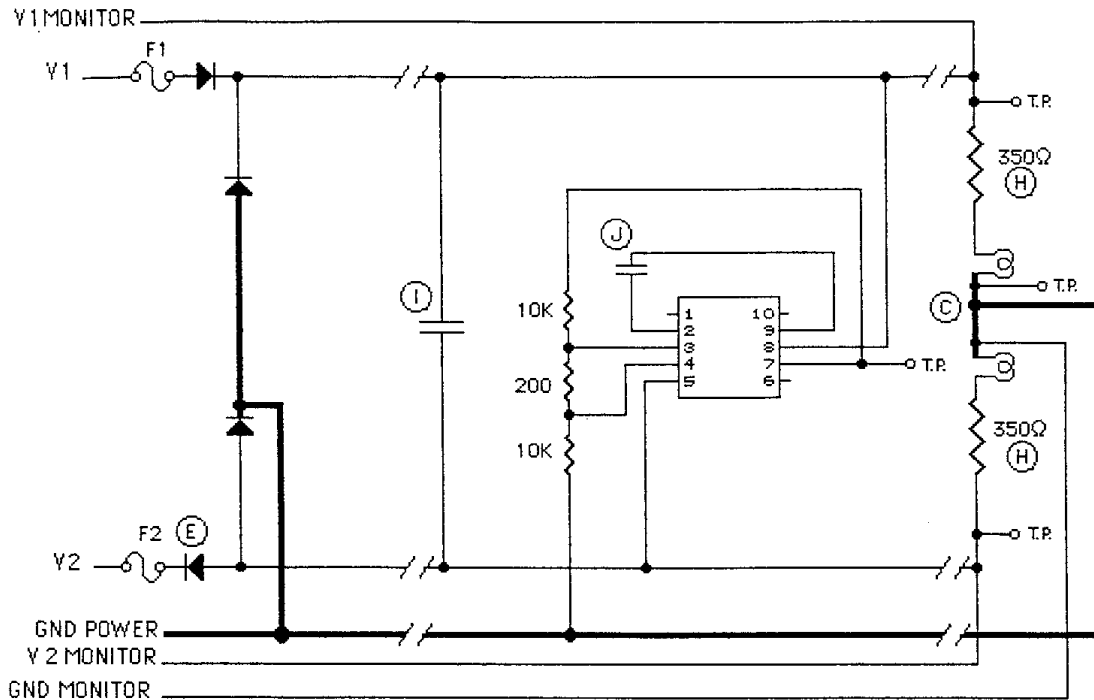
Frequency, 4.5hz(222ms) to 5.5hz(182ms)



PACKAGE

FIGURE 10

STATIC BURN-IN CIRCUIT
OPTION 3, 4, 6 GLASS SEALED FLATPACK / 10 LEAD

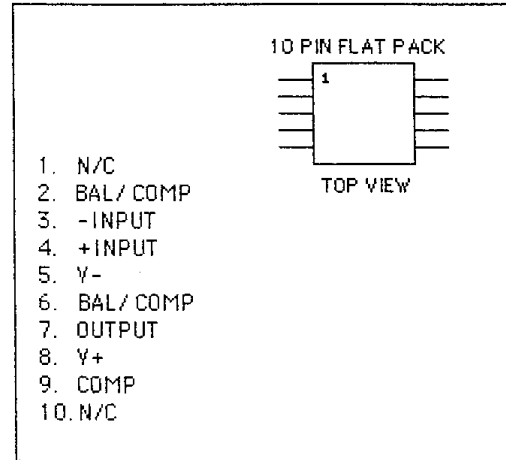


Notes:

1. Unless otherwise specified, components tolerances shall be per military specification.
2. $T_j = 150^\circ\text{C}$ maximum *
3. $T_a = 125^\circ\text{C}$
4. Burn-in Voltages: $V_1 = +18\text{V}$ to $+19.8\text{V}$
 $V_2 = -18\text{V}$ to -19.8V

* T_j Calculation is based on:

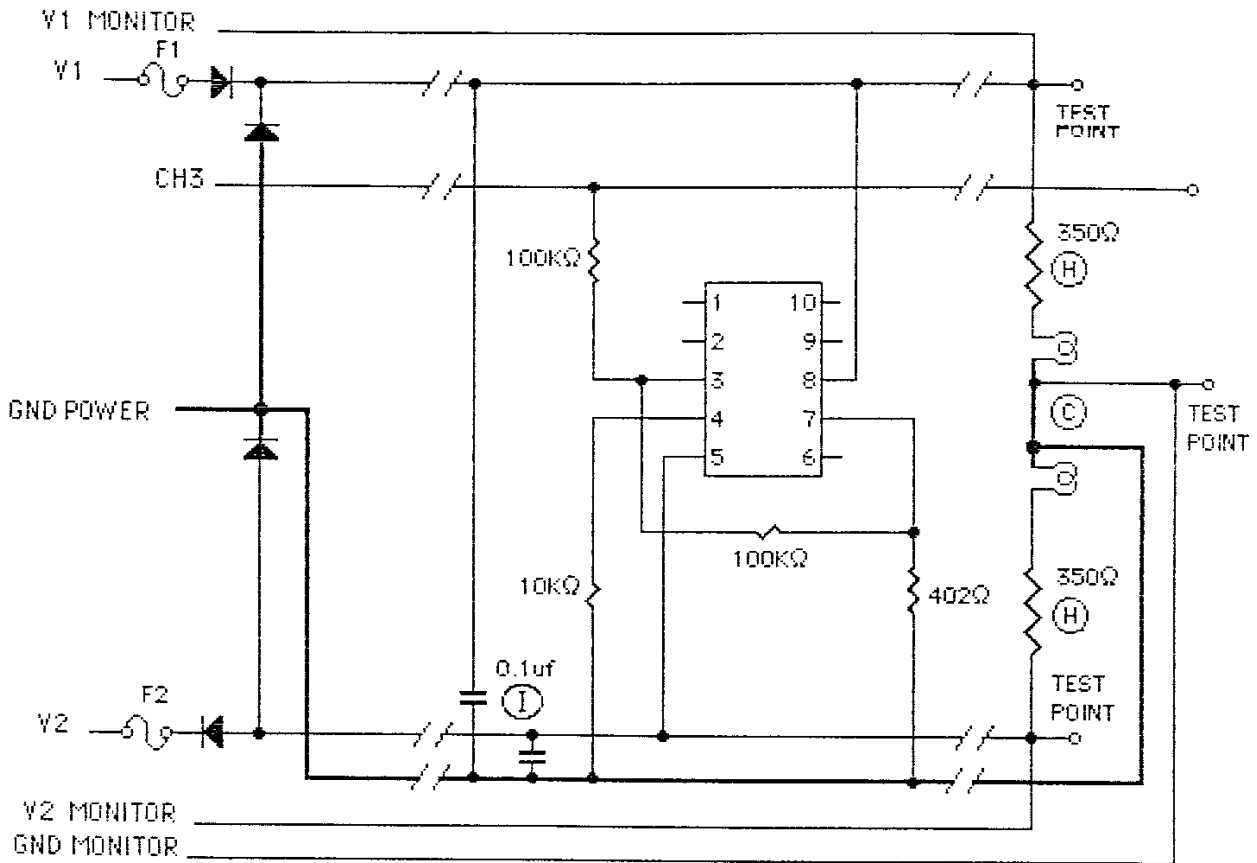
- a) $I_{cc} = 3.85\text{mA}$ maximum @ $\pm 19.8\text{V}$
- b) θ_{ja} of 112°C/W as supplied by customer



PACKAGE AND PINOUT

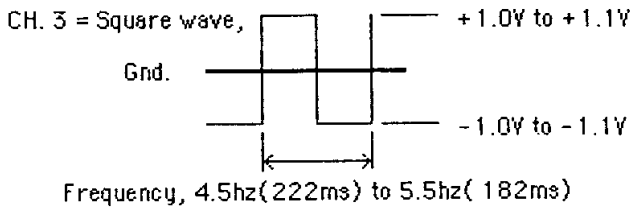
FIGURE 11

**DYNAMIC BURN-IN CIRCUIT
OPTION 3, 4, 6 GLASS SEALED FLATPACK / 10 LEAD**



NOTES:

1. Unless otherwise specified, component tolerances shall be per military specification.
2. $T_j = 156^\circ\text{C}$ maximum. *
3. $T_a = 125^\circ\text{C}$.
4. Burn-in Voltages: $V1 = +18\text{V}$ to $+19.8\text{V}$
 $V2 = -18\text{V}$ to -19.8V



* T_j Calculation is based on:
 a) $I_{cc} = 3.85\text{mA}$ maximum @ $\pm 19.8\text{V}$
 b) θ_{ja} of 112°C/W as supplied by customer.

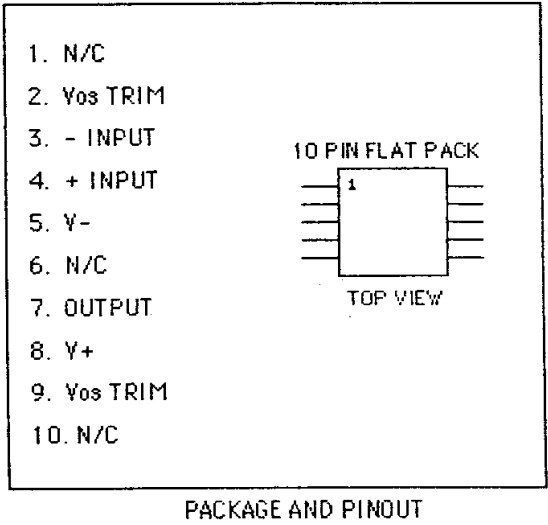


FIGURE 12

TOTAL DOSE BIAS CIRCUIT

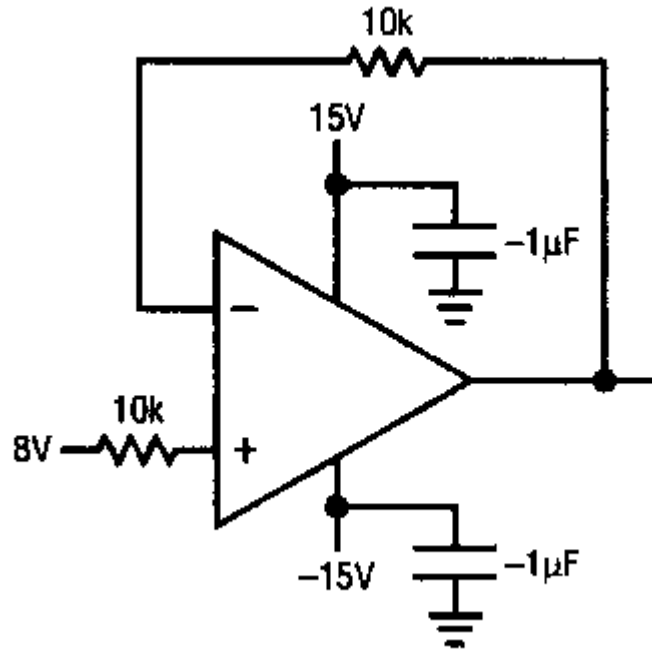


FIGURE 13

TABLE I: ELECTRICAL CHARACTERISTICS (PRE-IRRADIATION) NOTE 9

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25^\circ\text{C}$			SUB-GROUP	$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{OS}	Input Offset Voltage	RH27AE	11			35	4			60	2, 3	μV
		RH27E	1			55	4			100	2, 3	μV
		RH27C	1			100	4			300	2, 3	μV
$\frac{\Delta V_{OS}}{\Delta \text{Temp}}$	Average Offset Drift	RH27E	4, 7							1		$\mu\text{V}/^\circ\text{C}$
		RH27C	4, 7							1.8		$\mu\text{V}/^\circ\text{C}$
$\frac{\Delta V_{OS}}{\Delta \text{Time}}$	Long-Term Input Offset Voltage Stability	RH27E RH27C	2, 4 2, 4			1 2						$\mu\text{V}/\text{Month}$
I_{OS}	Input Offset Current	RH27E				35	1			50	2, 3	nA
		RH27C				75	1			135	2, 3	nA
I_B	Input Bias Current	RH27E				± 40	1			± 60	2, 3	nA
		RH27C				± 80	1			± 150	2, 3	nA
e_n	Input Noise Voltage	0.1Hz to 10Hz (RH27E)	4, 5			0.18						μV_{P-P}
		0.1Hz to 10Hz (RH27C)	4, 5			0.25						μV_{P-P}
	Input Noise Voltage Density	$f_0 = 10\text{Hz}$ (RH27E)	3			5.5						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 30\text{Hz}$ (RH27E)	4			4.5						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 1000\text{Hz}$ (RH27E)	4			3.8						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 10\text{Hz}$ (RH27C)	3			8						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 30\text{Hz}$ (RH27C)	4			5.6						$\text{nV}/\sqrt{\text{Hz}}$
		$f_0 = 1000\text{Hz}$ (RH27C)	4			4.5						
i_n	Input Noise Current Density	$f_0 = 1000\text{Hz}$	4, 6			0.6						$\text{pA}/\sqrt{\text{Hz}}$
		Input Resistance Common Mode	RH27E RH27C			3 2						$\text{G}\Omega$ $\text{G}\Omega$
	Input Voltage Range	RH27E	4			± 11				± 10.3		V
		RH27C	4			± 11				± 10.2		V
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 11\text{V}$ (RH27E)				114	1					dB
		$V_{CM} = \pm 10\text{V}$ (RH27E)								108	2, 3	dB
		$V_{CM} = \pm 11\text{V}$ (RH27C)				100						dB
		$V_{CM} = \pm 10\text{V}$ (RH27C)								94	2, 3	dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4\text{V}$ to $\pm 18\text{V}$ (RH27E)				100						dB
		$V_S = \pm 4.5\text{V}$ to $\pm 18\text{V}$ (RH27E)								96	2, 3	dB
		$V_S = \pm 4\text{V}$ to $\pm 18\text{V}$ (RH27C)				94						dB
		$V_S = \pm 4.5\text{V}$ to $\pm 18\text{V}$ (RH27C)								86	2, 3	dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$ (RH27E)	4			1000	4			600	5, 6	V/mV
		$R_L \geq 600\Omega$, $V_O = \pm 1\text{V}$ (RH27E)				250				V/mV		
		$V_S = \pm 4\text{V}$	4			700	4			300	5, 6	V/mV
		$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$ (RH27C)				200				V/mV		
V_{OUT}	Maximum Output Voltage Swing	$R_L \geq 2\text{k}\Omega$ (RH27E)				± 12	4			± 11.5		V
		$R_L \geq 600\Omega$ (RH27E)				± 10	4					V
		$R_L \geq 2\text{k}\Omega$ (RH27C)				± 11.5	4			± 10.5		V
		$R_L \geq 600\Omega$ (RH27C)				± 10	4					V
SR	Slew Rate	$R_L \geq 2\text{k}\Omega$			1.7		7				V/ μs	
GBW	Gain-Bandwidth Product	$f_0 = 100\text{kHz}$	4		5						MHz	
Z_O	Open-Loop Output Resistance	$V_O = 0$, $I_O = 0$			70						Ω	
P_D	Power Dissipation	RH27E				140	1					mW
		RH27C				170	1					mW

NOTES ARE ON THE NEXT PAGE.

TABLE II: ELECTRICAL CHARACTERISTICS (POST-IRRADIATION) NOTE 10

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	RH27E RH27C	1 1	55 100	80 130	100 180	150 280	200 400						μV μV
I_{OS}	Input Offset Current	RH27E RH27C		35 75	40 75	50 90	60 120	90 180						nA nA
I_B	Input Bias Current	RH27E RH27C		± 40 ± 80	± 50 ± 80	± 80 ± 125	± 100 ± 200	± 200 ± 400						nA nA
	Input Resistance Common Mode	RH27E RH27C		3 (Typ) 2 (Typ)	3 (Typ) 2 (Typ)	3 (Typ) 2 (Typ)	3 (Typ) 2 (Typ)	3 (Typ) 2 (Typ)						$\text{G}\Omega$ $\text{G}\Omega$
	Input Voltage Range		4	± 11	± 11	± 11	± 11	± 11						V
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 11\text{V}$ (RH27E) $V_{CM} = \pm 11\text{V}$ (RH27C)		114 100	114 100	110 97	105 94	100 90						dB dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4\text{V}$ to $\pm 18\text{V}$ (RH27E) $V_S = \pm 4\text{V}$ to $\pm 18\text{V}$ (RH27C)		100 94	100 94	98 92	96 90	94 86						dB dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$ (RH27E) $R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$ (RH27C)		1000 700	1000 700	1000 700	900 700	800 400						V/mV V/mV
V_{OUT}	Maximum Output Voltage Swing	$R_L \geq 2\text{k}\Omega$ (RH27E) $R_L \geq 600\Omega$ (RH27E) $R_L \geq 2\text{k}\Omega$ (RH27C) $R_L \geq 600\Omega$ (RH27C)		± 12 ± 10 ± 11.5 ± 10	± 12 ± 10 ± 11.5 ± 10	± 12 ± 10 ± 11.5 ± 10	± 12 ± 10 ± 11.5 ± 10	± 12 ± 10 ± 11.5 ± 10						V V V V
Z_O	Open-Loop Output Resistance	$V_O = 0$, $I_O = 0$		70 (Typ)	70 (Typ)	70 (Typ)	70 (Typ)	70 (Typ)						Ω
P_D	Power Dissipation	RH27E RH27C		140 170	140 170	140 170	140 170	140 170						mW mW

Note 1: Input offset voltage measurements are performed by automatic test equipment approximately 0.5 seconds after application of power.

Note 2: Long-term input offset voltage stability refers to the averaged trend line of offset voltage vs time over extended periods after the first 30 days of operation. Excluding the initial hour of operation, changes in V_{OS} during the first 30 days are typically $2.5\mu\text{V}$. Refer to the typical performance curve.

Note 3: Sample tested to an LTPD of 15 on every lot. Contact factory for 100% testing of 10Hz voltage density noise.

Note 4: Parameter is guaranteed by design, characterization, or correlation to other tested parameters.

Note 5: See test circuit and frequency response curve for 0.1Hz to 10Hz tester on OP-27/OP-37 data sheet.

Note 6: See test circuit for current noise measurement on OP-27/OP-37 data sheet.

Note 7: The average input offset drift performance is within the specifications unnullled or when nulled with a pot having a range $8\text{k}\Omega$ to $20\text{k}\Omega$.

Note 8: The RH27's inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds $\pm 0.7\text{V}$, the input current should be limited to 25mA.

Note 9: $V_S = \pm 15\text{V}$, $V_{CM} = 0\text{V}$ unless otherwise noted.

Note 10: $T_A = 25^\circ\text{C}$, $V_S = \pm 15\text{V}$, $V_{CM} = 0\text{V}$, unless otherwise noted.

Note 11: RH27AEW is marked and processed as RH27EW. Orders will be delivered through box stock screening at 25°C , -55°C to 125°C to the V_{OS} specification shown on Table 1.

0.1Hz TO 10Hz NOISE TEST CIRCUIT

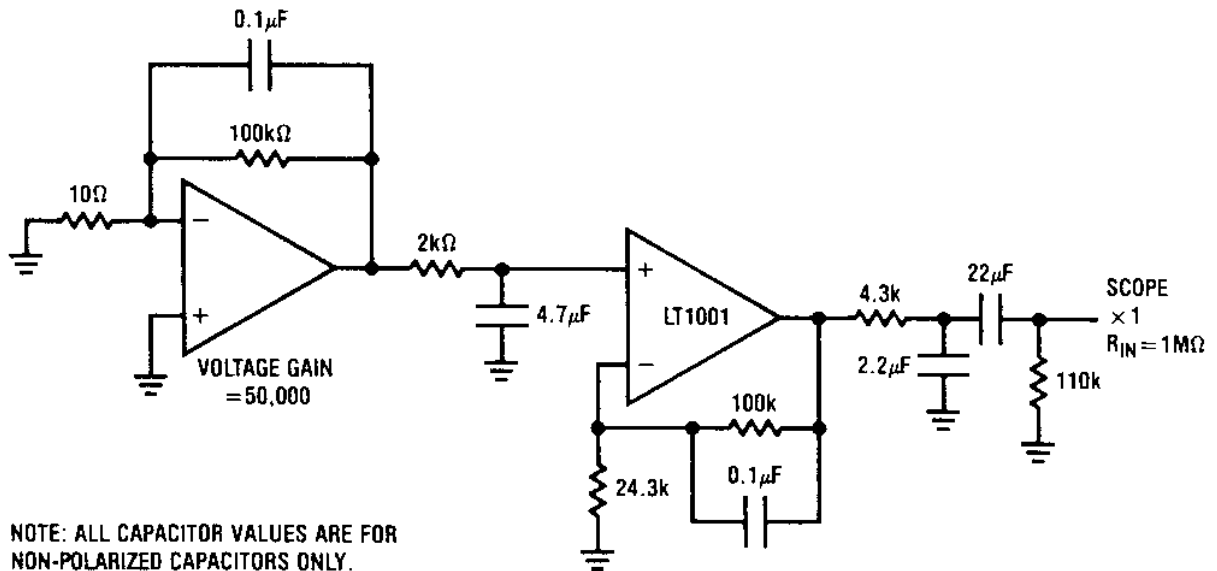


FIGURE 14

CURRENT NOISE MEASUREMENT

Current Noise is measured and calculated by the following formula:

$$i_n = \frac{[e^2_{no} - (130nV)^2]^{1/2}}{1M\Omega \times 100}$$

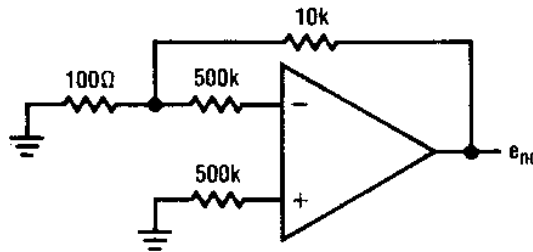


FIGURE 15

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

PARAMETER	ENDPOINT LIMIT		DELTA		UNITS
	MIN	MAX	MIN	MAX	
V_{OS}	-100	100	-75	75	μV
$+I_B$	-80	80	-30	30	nA
$-I_B$	-80	80	-30	30	nA

TABLE IV: ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUP
FINAL ELECTRICAL TEST REQUIREMENTS (METHOD 5004)	1*, 2, 3, 4, 5, 6, 7
GROUP A TEST REQUIREMENTS (METHOD 5005)	1, 2, 3, 4, 5, 6, 7
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.