Precision Operational Amplifier

DESCRIPTION

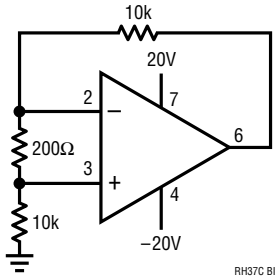
The RH37C combines very low noise with excellent precision and high speed specifications. The low 1/f noise corner frequency of 2.7Hz combined with 3.5nV$\sqrt{Hz}$ 10Hz noise and low offset voltage make the RH37C an excellent choice for low frequency military instrumentation applications. The wafer lots are processed to LTC's in-house Class S flow to yield circuits usable in stringent military applications.

For complete electrical specifications and performance curves see the OP-27/OP-37 data sheet.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage ..... ±22V
Internal Power Dissipation 500mW
Input Voltage ..... Equal to Supply Voltage
Output Short-Circuit Duration ..... Indefinite
Differential Input Current (Note 8) ..... ±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

BURN-IN CIRCUIT



PACKAGE/ORDER INFORMATION

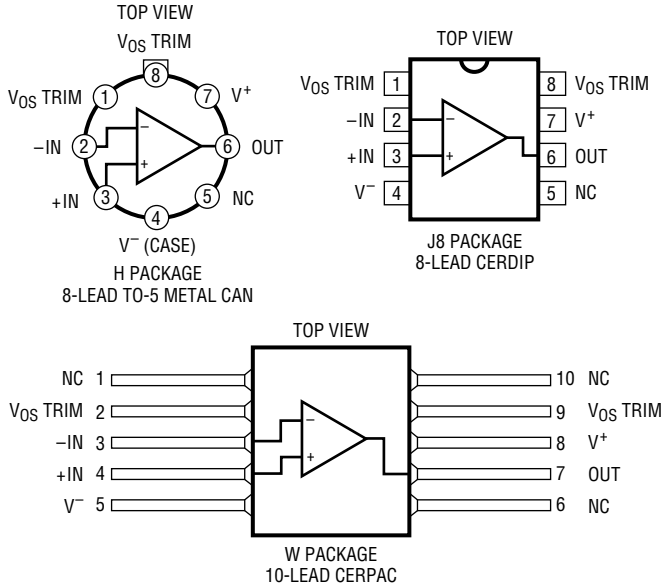


TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 9)

SYMBOL	PARAMETER	CONDITIONS	NOTES	T_A = 25°C MIN	TYP	MAX	SUB-GROUP	–55°C ≤ T_A ≤ 125°C MIN	TYP	MAX	SUB-GROUP	UNITS
V_{OS}	Input Offset Voltage		1			100	4			300	2, 3	µV
$\frac{\Delta V_{OS}}{\Delta Temp}$	Average Offset Drift		4, 7							1.8		µV/°C
$\frac{\Delta V_{OS}}{\Delta Time}$	Long-Term Input Offset Voltage Stability		2, 4			2						µV/Month
I_{OS}	Input Offset Current					75	1			135	2, 3	nA
I_B	Input Bias Current					±80	1			±150	2, 3	nA

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 9)

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 25°C$ MIN	TYP	MAX	SUB-GROUP	$-55°C \le T_A \le 125°C$ MIN	TYP	MAX	SUB-GROUP	UNITS
e_n	Input Noise Voltage	0.1Hz to 10Hz	4, 5			0.25						μV_{P-P}
	Input Noise Voltage Density	f_O = 10Hz f_O = 30Hz f_O = 1000Hz	3 4 4			8.0 5.6 4.5						nV/$\sqrt{Hz}$ nV/$\sqrt{Hz}$ nV/$\sqrt{Hz}$
i_n	Input Noise Current Density	f_O = 1000Hz	4, 6			0.6						pV/$\sqrt{Hz}$
	Input Resistance Common Mode				2							GΩ
	Input Voltage Range		4	±11				±10.2				V
CMRR	Common Mode Rejection Ratio	V_{CM} = ±11V V_{CM} = ±10V		100			1	94			2, 3	dB dB
PSRR	Power Supply Rejection Ratio	V_S = ±4V to ±18V V_S = ±4.5V to ±18V		94			1	86			2, 3	dB dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \ge 2k$, V_O = ±10V $R_L \ge 600\Omega$, V_O = ±1V V_S = ±4V	4	700 200			4	300			5, 6	V/mV V/mV
V_{OUT}	Maximum Output Voltage Swing	R_L = 2k R_L = 600Ω		±11.5 ±10.0			4 4	±10.5			5, 6	V V
SR	Slew Rate	R_L = 2k, $A_{VCL} \ge 5$		11			7					V/µs
GBW	Gain-Bandwidth Product	f_O = 10kHz ($A_{VCL} \ge 5$) f_O = 1MHz ($A_{VCL} \ge 5$)	4	45	40							MHz MHz
Z_O	Open-Loop Output Resistance	V_O = 0, I_O = 0			470							Ω
P_D	Power Dissipation					170	1					mW

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 10)

SYMBOL	PARAMETER	CONDITIONS	NOTES	10KRAD(Si) MIN	MAX	20KRAD(Si) MIN	MAX	50KRAD(Si) MIN	MAX	100KRAD(Si) MIN	MAX	200KRAD(Si) MIN	MAX	UNITS
V_{OS}	Input Offset Voltage		1		100		130		180		280		400	µV
I_{OS}	Input Offset Current				75		75		90		120		180	nA
I_B	Input Bias Current				±80		±80		±125		±200		±400	nA
	Input Resistance Common Mode			2 (Typ)		2 (Typ)		2 (Typ)		2 (Typ)		2 (Typ)		GΩ
	Input Voltage Range		4	±11		±11		±11		±11		±11		V
CMRR	Common Mode Rejection Ratio	V_{CM} = ±11V		100		100		97		94		90		dB
PSRR	Power Supply Rejection Ratio	V_S = ±4V to ±18V		94		94		92		90		86		dB
A_{VOL}	Large-Signal Voltage Gain	$R_L \ge 2k$, V_O = ±10V		700		700		700		700		400		V/mV
V_{OUT}	Maximum Output Voltage Swing	$R_L \ge 10k$ $R_L \ge 600\Omega$		±11.5 ±10.0		±11.5 ±10.0		±11.5 ±10.0		±11.5 ±10.0		±11.5 ±10.0		V V
SR	Slew Rate	$R_L \ge 2k$		1.7		1.7		1.7		1.5		1		V/µs
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			170		170		170		170		170		mW

TABLE 1A: ELECTRICAL CHARACTERISTICS

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 average trend line of offset voltage vs time over the first 30 days of operation. Excluding the initial hour of operation, changes in V_{OS} during the first 30 days are typically 2.5μV. Refer to the typical performance curves.

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.

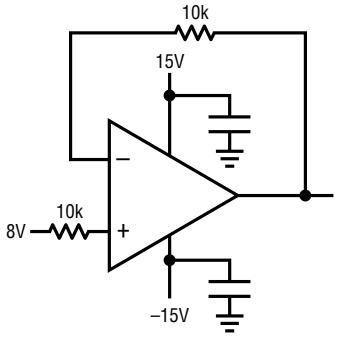
Note 7: The average input offset drift performance is within the specifications unnulled or when nulled with a pot having a range 8kΩ to 20kΩ.

Note 8: The RH37C'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.

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

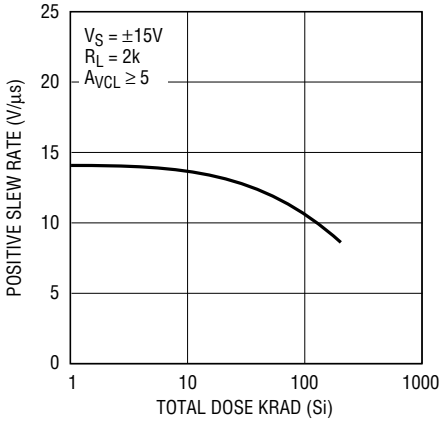
Note 10: $T_A = 25°C$, $V_S = \pm 15V$, $V_{CM} = 0V$, unless otherwise noted.

TOTAL DOSE BIAS CIRCUIT



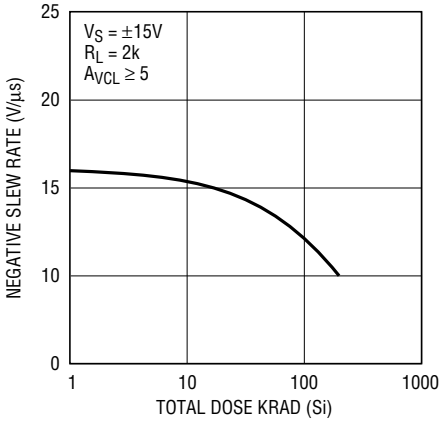
TYPICAL PERFORMANCE CHARACTERISTICS

Positive Slew Rate



RH37C G01

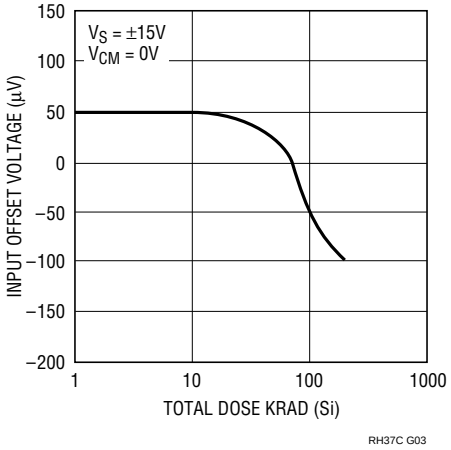
Negative Slew Rate



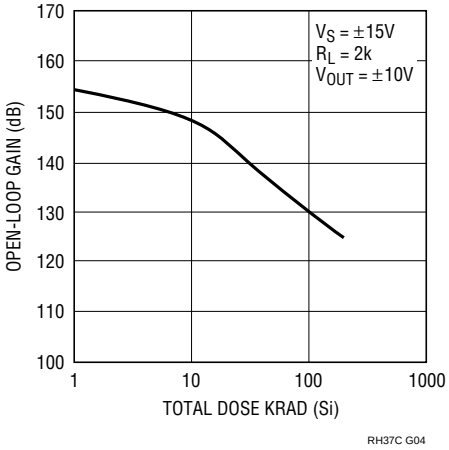
RH37C G02

TYPICAL PERFORMANCE CHARACTERISTICS

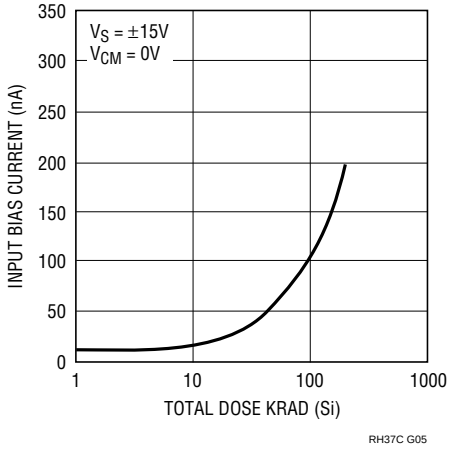
Input Offset Voltage



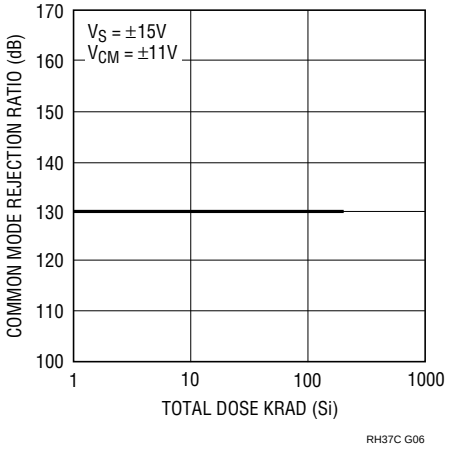
Open-Loop Gain



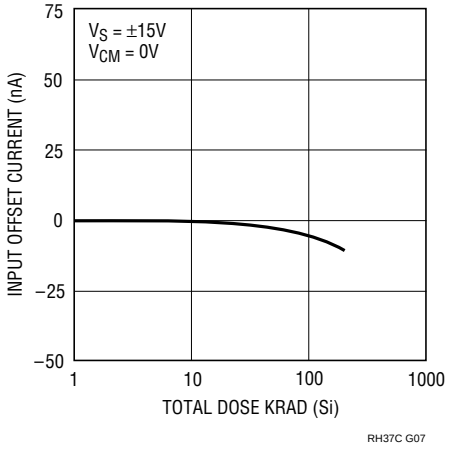
Input Bias Current



Common Mode Rejection Ratio



Input Offset Current



Power Supply Rejection Ratio

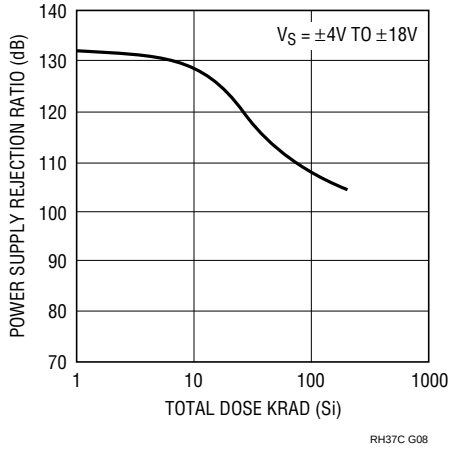


TABLE 2: ELECTRICAL TEST REQUIREMENTS

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, and Group C and D for Class B End Point Electrical Parameters (Method 5005)	1

* PDA applies to subgroup 1. See PDA Test Notes.

PDA Test Notes

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 Class B. The verified failures of group A, subgroup 1, 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.

Linear Technology Corporation reserves the right to test to tighter limits than those given.

I.D. No. 66-10-0172 Rev. B 0398

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- Radiation Hardened (Rad Hard) Op Amps and Comparators
- Radiation Hardened (Rad Hard) Regulators
- Radiation Hardened (Rad Hard) Voltage References
- Military JAN S Products

RH37C - Precision Operational Amplifier

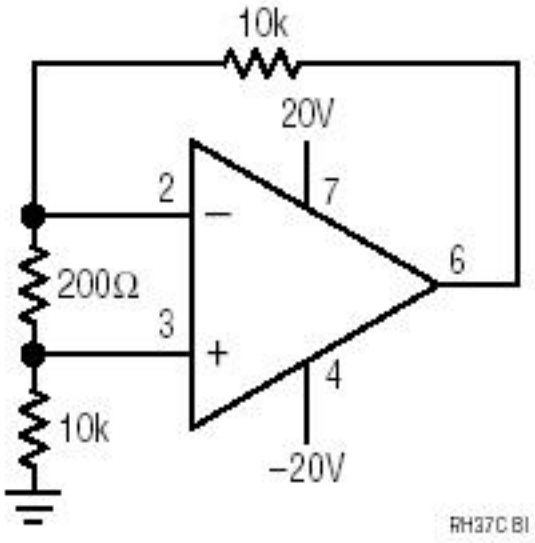
- FEATURES

Features

- ABSOLUTE MAXIMUM RATINGS
- Supply Voltage ±22V
- Internal Power Dissipation 500mW
- Input Voltage Equal to Supply Voltage
- Output Short-Circuit Duration Indefinite
- Differential Input Voltage (Note 8) ±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

Typical Application

BURN-IN CIRCUIT



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Description

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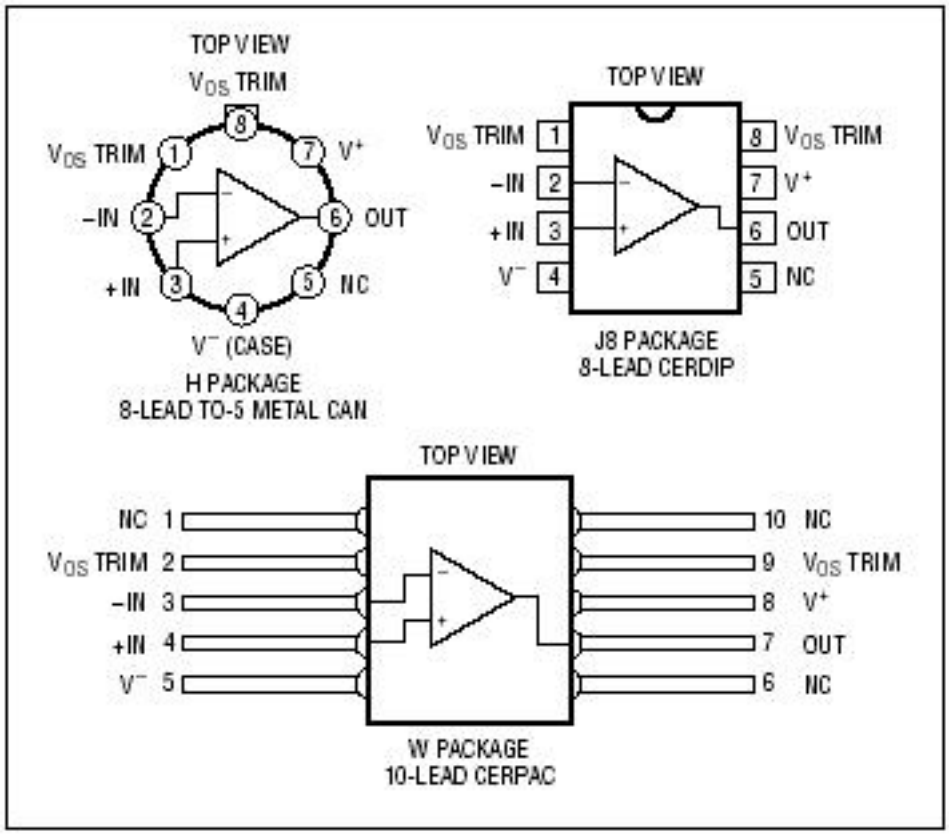
Packaging

TO-5, DIP-8, FLATPAK-10 (Glass Sealed)



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Order Info

- Part numbers ending in PBF are lead free. Please contact LTC marketing for information on lead based finish parts.
- Part numbers containing TR or TRM are shipped in tape and reel or 500 unit mini tape and reel, respectively
- Please refer to our general ordering information or the product datasheet for more details

Package Variations and Pricing

Part Number	Package	Pins	Temp	Price (1-99)	Price (1k)*	RoHS Data
OP37EN8	PDIP	8	C	$5.00	$4.05	View
OP37EN8#PBF	PDIP	8	C	$5.00	$4.05	View

OP37GN8	PDIP	8	C	$3.40	$2.75	View
OP37GN8#PBF	PDIP	8	C	$3.40	$2.75	View
OP37GS8	SO	8	C	$3.50	$2.85	View
OP37GS8#PBF	SO	8	C	$3.50	$2.85	View
OP37GS8#TR	SO	8	C		$2.91	View
OP37GS8#TRPBF	SO	8	C		$2.91	View
Buy Now						
Request Samples						

* The USA list pricing shown is for BUDGETARY USE ONLY, shown in United States dollars (FOB USA per unit for the stated volume), and is subject to change. International prices may differ due to local duties, taxes, fees and exchange rates. For volume-specific price or delivery quotes, please contact your local Linear Technology sales office or authorized distributor.

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Applications

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Simulate

To simulate selected Linear Technology products, please download LTSpice / SwitcherCAD III. This powerful schematic capture and simulation tool includes macro models for 80% of Linear Technology's switching regulators, over 200 op amp models, as well as resistors, transistors and MOSFET models.

For other simulation tools, visit our Design Simulation and Device Models page.

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This product is not currently available for order online. Please contact your local sales office or distributor for availability.

Documentation

Datasheet

- RH37C - Dice Data Sheet
- RH37C - Precision Operational Amplifier

Spec Notice

- RH37C - SPEC NO. 05-08-5030

Reliability Data

- R301 RH Reliability Data