

DESCRIPTION

The RH27 combines very low noise with excellent precision and high speed specifications. The low $1/f$ noise corner frequency of 2.7Hz combined with $3.5\text{nV}/\sqrt{\text{Hz}}$ 10Hz noise and low offset voltage make the RH27 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.

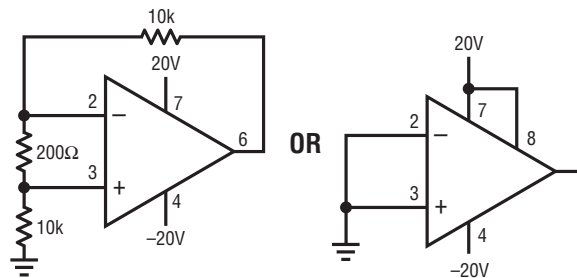
For complete electrical specifications and performance curves see the OP-27/OP-37 data sheet.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	$\pm 22\text{V}$
Internal Power Dissipation	500mW
Input Voltage.....	Equal to Supply Voltage
Output Short-Circuit Duration	Indefinite
Differential Input Current (Note 8)	$\pm 25\text{mA}$
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

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BURN-IN CIRCUIT



PACKAGE INFORMATION

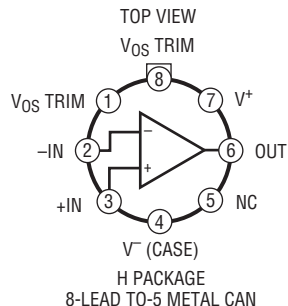
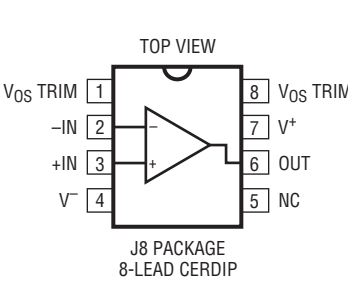
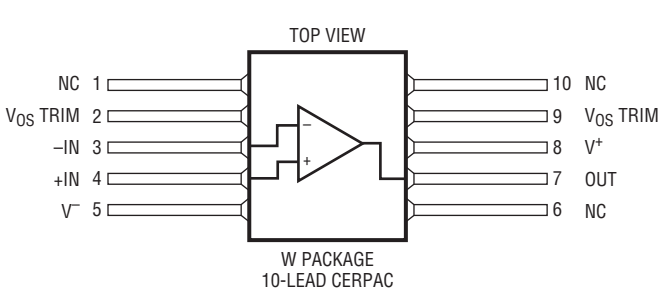
<p>TOP VIEW V_{OS} TRIM</p>  <p>V_{OS} TRIM (1) -IN (2) +IN (3) V⁻ (CASE) (4) H PACKAGE 8-LEAD TO-5 METAL CAN</p>	<p>TOP VIEW</p>  <p>V_{OS} TRIM (1) -IN (2) +IN (3) V⁻ (4) J8 PACKAGE 8-LEAD CERDIP</p>	<p>TOP VIEW</p>  <p>NC (1) V_{OS} TRIM (2) -IN (3) +IN (4) V⁻ (5) W PACKAGE 10-LEAD CERPAC</p>
ORDER PART NUMBER	ORDER PART NUMBER	ORDER PART NUMBER
RH27EH RH27CH	RH27CJ8	RH27AEW (Note 11) RH27EW RH27CW

TABLE 1: ELECTRICAL CHARACTERISTICS

(Preirradiation) (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	2, 4			1						$\mu\text{V}/\text{Month}$	
		RH27C	2, 4			2							
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							$\text{nV}/\sqrt{\text{Hz}}$
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				3						G Ω	
		RH27C				2						G Ω	
	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			1				2, 3	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		1					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			1				2, 3	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		
		$R_L \geq 2\text{k}\Omega$, $V_O = \pm 10\text{V}$ (RH27C)	4		700		4		300		5, 6	V/mV	
		$R_L \geq 600\Omega$, $V_O = \pm 1\text{V}$ (RH27C)		200							V/mV		
V_{OUT}	Maximum Output Voltage Swing	$R_L \geq 2\text{k}\Omega$ (RH27E)			± 12		4		± 11.5		5, 6	V	
		$R_L \geq 600\Omega$ (RH27E)			± 10		4				5, 6	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	

rh27fd

TABLE 1A: ELECTRICAL CHARACTERISTICS

(Postirradiation) (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	1	55	80	100	150	200	μ V					
		RH27C	1	100	130	180	280	400	μ V					
I_{OS}	Input Offset Current	RH27E		35	40	50	60	90	nA					
		RH27C		75	75	90	120	180	nA					
I_B	Input Bias Current	RH27E		\pm 40	\pm 50	\pm 80	\pm 100	\pm 200	nA					
		RH27C		\pm 80	\pm 80	\pm 125	\pm 200	\pm 400	nA					
	Input Resistance Common Mode	RH27E		3 (Typ)	3 (Typ)	3 (Typ)	3 (Typ)	3 (Typ)	G Ω					
		RH27C		2 (Typ)	2 (Typ)	2 (Typ)	2 (Typ)	2 (Typ)	G Ω					
	Input Voltage Range		4	\pm 11	\pm 11	\pm 11	\pm 11	\pm 11	V					
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 11V$ (RH27E)		114	114	110	105	100	dB					
		$V_{CM} = \pm 11V$ (RH27C)		100	100	97	94	90	dB					
PSRR	Power Supply Rejection Ratio	$V_S = \pm 4V$ to $\pm 18V$ (RH27E)		100	100	98	96	94	dB					
		$V_S = \pm 4V$ to $\pm 18V$ (RH27C)		94	94	92	90	86	dB					
A_{VOL}	Large-Signal Voltage Gain	$R_L \geq 2k\Omega$, $V_O = \pm 10V$ (RH27E)		1000	1000	1000	900	800	V/mV					
		$R_L \geq 2k\Omega$, $V_O = \pm 10V$ (RH27C)		700	700	700	700	400	V/mV					
V_{OUT}	Maximum Output Voltage Swing	$R_L \geq 2k\Omega$ (RH27E)		\pm 12	\pm 12	\pm 12	\pm 12	\pm 12	V					
		$R_L \geq 600\Omega$ (RH27E)		\pm 10	\pm 10	\pm 10	\pm 10	\pm 10	V					
		$R_L \geq 2k\Omega$ (RH27C)		\pm 11.5	\pm 11.5	\pm 11.5	\pm 11.5	\pm 11.5	V					
		$R_L \geq 600\Omega$ (RH27C)		\pm 10	\pm 10	\pm 10	\pm 10	\pm 10	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		140	140	140	140	140	mW					
		RH27C		170	170	170	170	170	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 μ 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 nullled with a pot having a range 8k Ω to 20k Ω .

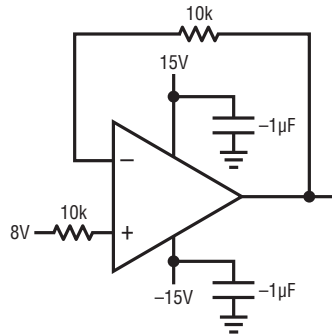
Note 8: The RH27's inputs are protected by back-to-back diodes. Current limiting resistors are not used in order to achieve low noise. If differential input voltage exceeds $\pm 0.7V$, the input current should be limited to 25mA.

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

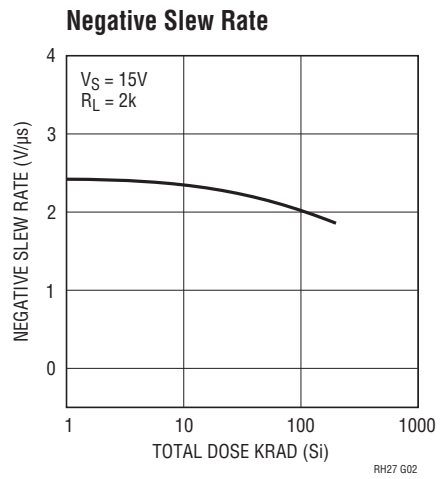
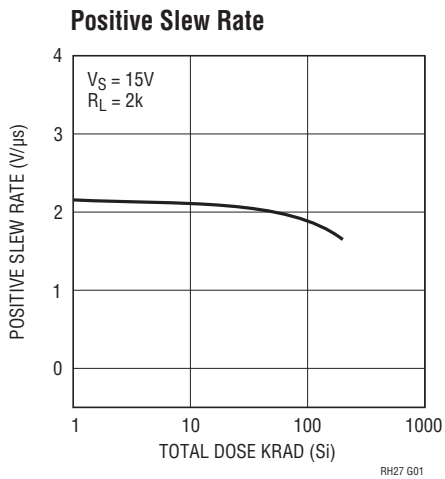
Note 10: $T_A = 25^\circ C$, $V_S = \pm 15V$, $V_{CM} = 0V$, unless otherwise noted.

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

TOTAL DOSE BIAS CIRCUIT

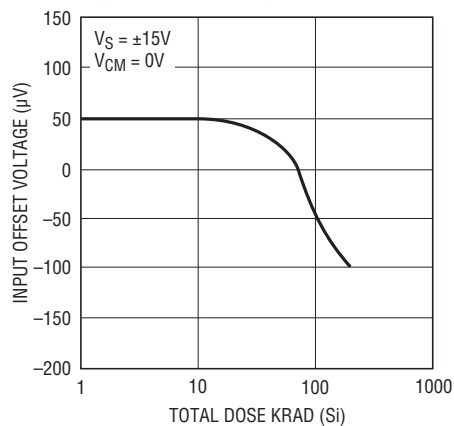


TYPICAL PERFORMANCE CHARACTERISTICS

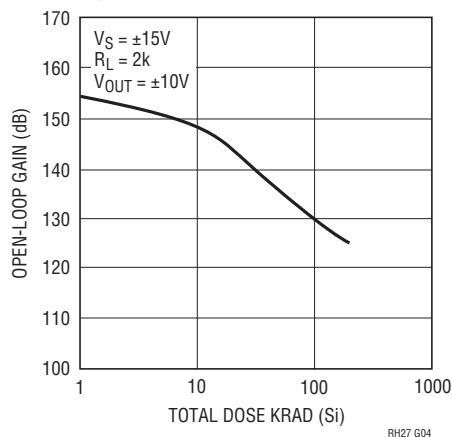


TYPICAL PERFORMANCE CHARACTERISTICS

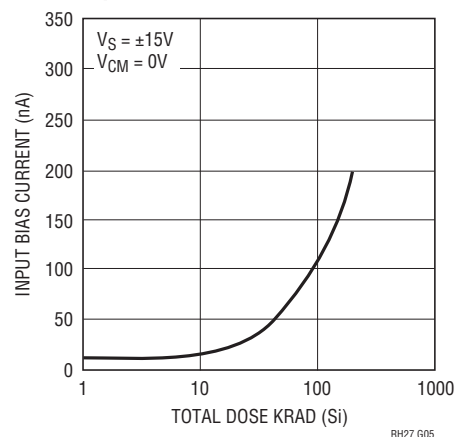
Input Offset Voltage



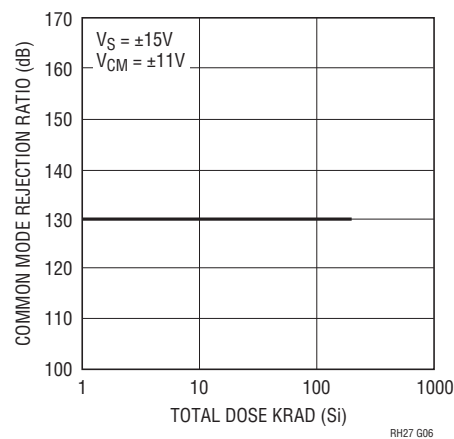
Open-Loop Gain



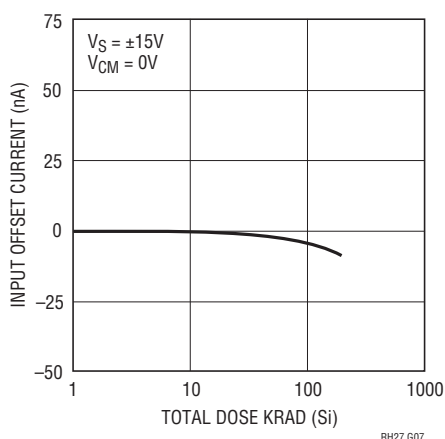
Input Bias Current



Common Mode Rejection Ratio



Input Offset Current



Power Supply Rejection Ratio

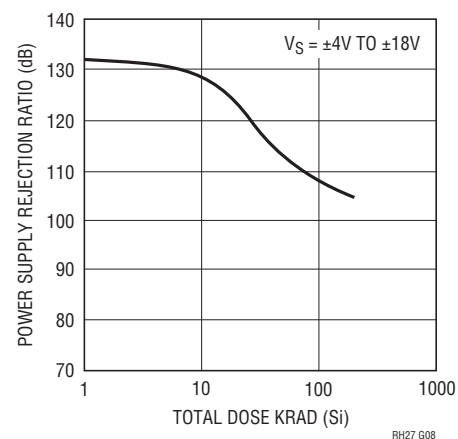


TABLE 2: ELECTRICAL TEST REQUIREMENTS

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.