

Voltage Comparator

DESCRIPTION

The **RH1011** is a general purpose comparator with significantly better input characteristics than the LM111. Although pin compatible with the LM111, it offers four times lower bias current, six times lower offset voltage and five times higher voltage gain.

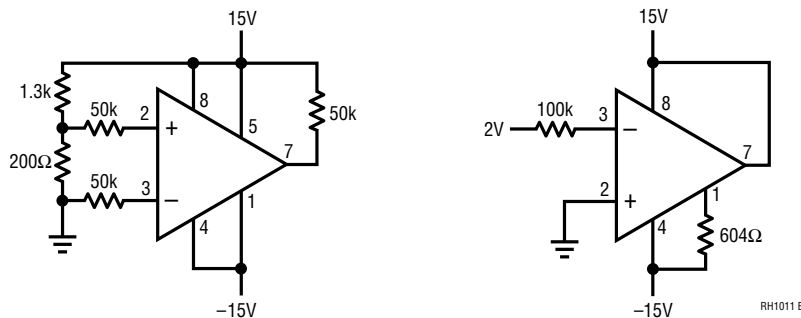
The wafer lots are processed to Analog Devices' in-house Class S flow to yield circuits usable in stringent military applications.

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ABSOLUTE MAXIMUM RATINGS

Supply Voltage (Pin 8 to Pin 4)	36V
Output to Negative Supply (Pin 7 to Pin 4)	35V
Ground to Negative Supply (Pin 1 to Pin 4)	30V
Differential Input Voltage	±35V
Voltage at STROBE Pin (Pin 6 to Pin 8)	5V
Input Voltage (Note 1)	Equal to Supplies
Output Short-Circuit Duration	10 sec
Operating Temperature Range	
(Note 2)	-55°C to 125°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

BURN-IN CIRCUIT



PACKAGE INFORMATION

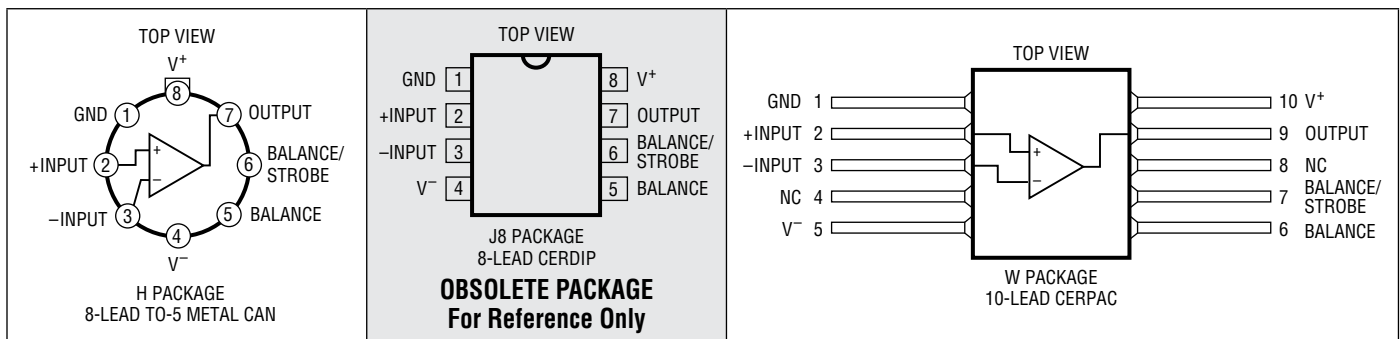


TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 10)

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	$R_S \leq 50\text{k}\Omega$	3		1.5	1		3.0	2,3	mV		
			4		2.0	1	3.0	2,3	mV			
I_{OS}	Input Offset Current		3,4		4	1		20	2,3	nA		
I_B	Input Bias Current		3		50	1		80	2,3	nA		
			4		65	1	80	2,3	nA			
$\frac{\Delta V_{OS}}{\Delta T}$	Input Offset Voltage Drift	$T_{MIN} \leq T \leq T_{MAX}$	5,9					25		$\mu\text{V}/^\circ\text{C}$		
A_{VOL}	Large Signal Voltage Gain	$V_S = \pm 15\text{V}$, $R_L = 1\text{k}\Omega$, $-10\text{V} \leq V_{OUT} \leq 14.5\text{V}$		200		4				V/mV		
		$V_S = 5\text{V}$, $R_L = 500\Omega$, $0.5\text{V} \leq V_{OUT} \leq 4.5\text{V}$		50		4				V/mV		
CMRR	Common Mode Rejection Ratio			90		1				dB		
	Input Voltage Range	$V_S = \pm 15\text{V}$ $V_S = \text{Single } 5\text{V}$	8,9 8,9	-14.5 0.5	13 3.0		-14.5 0.5	13 3.0		V V		
t_d	Response Time		6,9		250					ns		
V_{OL}	Output Saturation Voltage	$V_{IN} = -5\text{mV}$, $I_{SINK} = 8\text{mA}$ $I_{SINK} = 50\text{mA}$	11		0.4 1.5	1 1		0.5 1.5	2,3 2,3	V V		
	Output Leakage Current	$V_{IN} = 5\text{mV}$, $V_{GND} = -15\text{V}$, $V_{OUT} = 20\text{V}$			10	1		500	2,3	nA		
	Positive Supply Current		11		4.0	1				mA		
	Negative Supply Current		11		2.5	1				mA		
	Strobe Current	Minimum to Ensure Output Transistor is Turned Off	7,9,11	500						μA		
	Input Capacitance				6					pF		

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			1.5		1.5		1.5		2.5		4		mV
I_{OS}	Input Offset Current			4		4		4		20		50		nA
I_B	Input Bias Current			50		100		150		200		300		nA
A_{VOL}	Large-Signal Voltage Gain	$R_L = 1k\Omega$, $-10V \leq V_{OUT} \leq 14.5V$		200		200		150		100		50		V/mV
CMRR	Common Mode Rejection Ratio			90		90		90		90		86		dB
	Input Voltage Range	$V_S = \pm 15V$ $V_S = \text{Single } 5V$	8,9	-14.5 0.5	13 3.0	-14.5 0.5	13 3.0	-14.5 0.5	13 3.0	-14.5 0.5	13 3.0	-14.5 0.5	13 3.0	V V
V_{OL}	Output Saturation Voltage	$V_{IN} = -5mV$, $I_{SINK} = 8mA$ $I_{SINK} = 50mA$	11	0.4 1.5		0.4 1.5		0.4 1.5		0.4 1.5		0.4 1.5		V V
	Output Leakage Current	$V_{IN} = 5mV$, $V_{GND} = -15V$ $V_{OUT} = 20V$		10		10		100		100		100		nA
	Positive Supply Current		11	4.0		4.0		4.0		4.0		4.0		mA
	Negative Supply Current		11	2.5		2.5		2.5		2.5		2.5		mA
	Strobe Current	Minimum to Ensure Output Transistor is Turned Off	7,9,11	500		500		500		500		500		μA
	Input Capacitance			6 (Typ)		6 (Typ)		6 (Typ)		6 (Typ)		6 (Typ)		pF

Note 1: Inputs may be clamped to supplies with diodes so that maximum input voltage actually exceeds supply voltage by one diode drop. See Input Protection discussion in the LT[®]1011 data sheet.

Note 2: $T_{JMAX} = 150^\circ C$.

Note 3: Output is sinking 1.5mA with $V_{OUT} = 0V$.

Note 4: These specifications apply for all supply voltages from a single 5V to $\pm 15V$, the entire input voltage range and for both high and low output states. The high state is $I_{SINK} = 100\mu A$, $V_{OUT} = (V^+ - 1V)$ and the low state is $I_{SINK} = 8mA$, $V_{OUT} = 0.8V$. Therefore, this specification defines a worst-case error band that includes effects due to common mode signals, voltage gain and output load.

Note 5: Drift is calculated by dividing the offset difference measured at minimum and maximum temperatures by the temperature difference.

Note 6: Response time is measured with a 100mV step and 5mV overdrive. The output load is a 500 Ω resistor tied to 5V. Time measurement is taken when the output crosses 1.4V.

Note 7: Do not short the STROBE pin to ground. It should be current driven at 3mA to 5mA for the shortest strobe time. Currents as low as 500 μA will strobe the RH1011 if speed is not important. External leakage on the STROBE pin in excess of 0.2 μA when the strobe is "off" can cause offset voltage shifts.

Note 8: See graph, Input Offset Voltage vs Common Mode Voltage on the LT1011 data sheet.

Note 9: Guaranteed by design, characterization or correlation to other tested parameters.

Note 10: $V_S = \pm 15V$, $V_{CM} = 0V$, $R_S = 0\Omega$, $T_A = 25^\circ C$, $V_{GND} = V^-$, output at Pin 7, unless otherwise noted.

Note 11: $V_{GND} = 0V$.

TABLE 2: ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUP
Final Electrical Test Requirements (Method 5004)	1*,2,3,4
Group A Test Requirements (Method 5005)	1,2,3,4
Group B and D End Point Electrical Parameters (Method 5005)	1,2,3

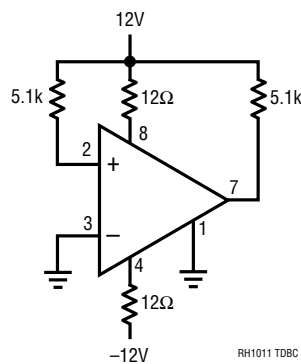
* PDA applies to subgroup 1. See PDA Test Notes.

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 (including Delta parameters) 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.

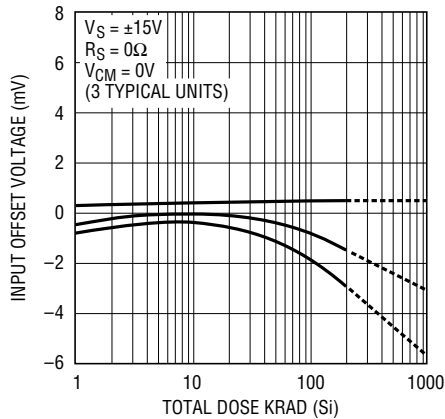
Analog Devices, Inc. reserves the right to test to tighter limits than those given.

TOTAL DOSE BIAS CIRCUIT



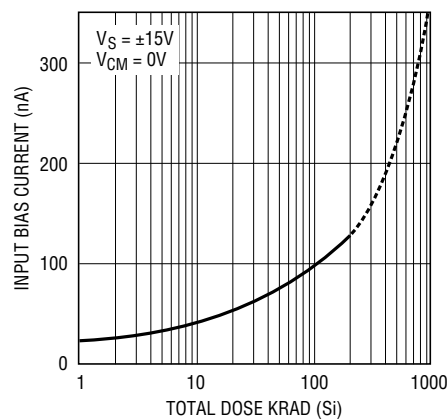
TYPICAL PERFORMANCE CHARACTERISTICS

Input Offset Voltage



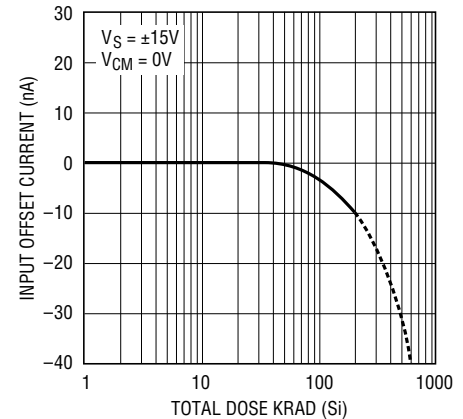
RH1011 G01

Input Bias Current



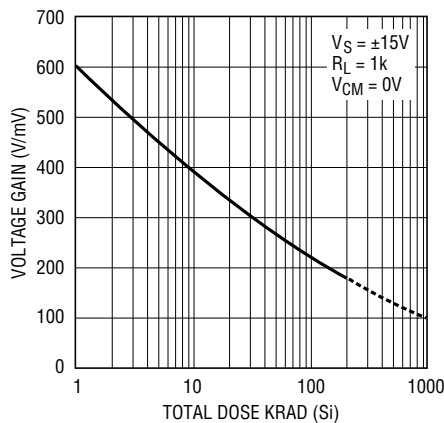
RH1011 G02

Input Offset Current



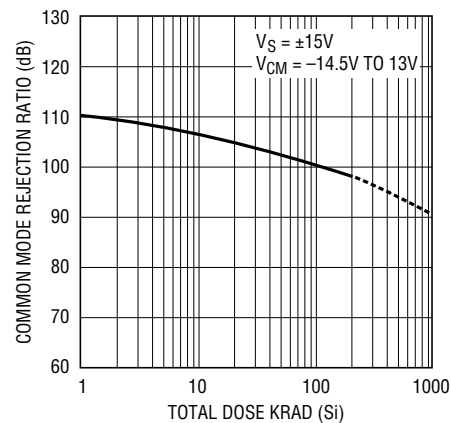
RH1011 G03

Voltage Gain



RH1011 G04

Common Mode Rejection Ratio



RH1011 G05

PIN FUNCTIONS

GND (PIN 1): Ground.

INPUT+ (PIN 2): Non-Inverting Input of Comparator

INPUT- (PIN 3): Inverting Input of Comparator

V⁻ (PIN 4): Negative Supply Voltage

OUT (PIN 7): Open-Collector Output of Comparator

BALANCE (PIN 5): Balance Input. This input can be used to adjust the input voltage offset or to add hysteresis. If offset balancing or hysteresis is not used, the BALANCE pins should be connected together with a 0.1 μ F capacitor.

BALANCE/STROBE (PIN 6): Strobe Input Pin. Using this pin, the output transistor can be forced to an "off" state, giving a "hi" output at the collector (Pin 7). This input can be used to adjust the input voltage offset or used to add hysteresis. If offset balancing or hysteresis is not used, the BALANCE pins should be connected together with a 0.1 μ F capacitor.

V⁺ (PIN 8): Positive Supply Voltage

REVISION HISTORY (Revision history begins at Rev E)

REV	DATE	DESCRIPTION	PAGE NUMBER
E	02/19	Obsoleting J8 package and updating document to ADI format.	All Pages
F	08/20	Adding Pin Functions.	5