RH1021-5

Precision 5V Reference

DESCRIPTION

The RH1021-5 is a precision 5V reference with ultralow drift and noise, extremely good long-term stability and almost total immunity to input voltage variations. The reference output will source and sink up to 10mA. Unique circuit design makes the RH1021-5 the first IC reference to offer ultralow drift without the use of high power on-chip heaters.

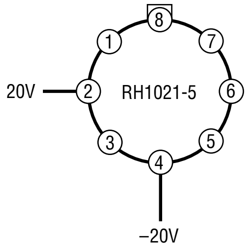
The wafer lots are processed to Analog Devices' in-house Class S flow to yield circuits usable in stringent military applications.

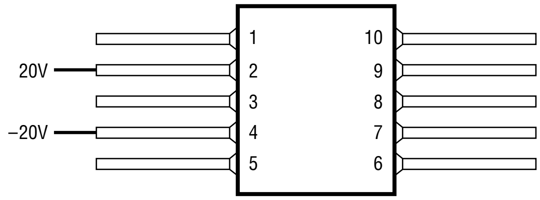
ABSOLUTE MAXIMUM RATINGS

(Note 9)

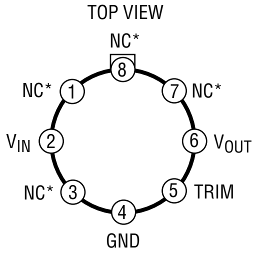
Input Voltage	40V
Input/Output Voltage Differential	35V
Output to Ground Voltage (Shunt Mode Current Limit)	10V
Trim Pin to Ground Voltage	
Positive	Equal to V_{OUT}
Negative	–20V
Output Short-Circuit Duration	
V_{IN} = 35V	10 sec
$V_{IN} \le 20V$	Indefinite
Operating Temperature Range	–55°C to 125°C
Maximum Junction Temperature	150°C
Storage Temperature Range	–65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

BURN-IN CIRCUITS

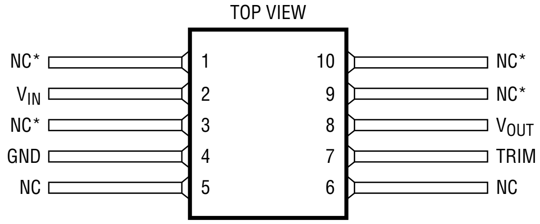




PIN CONFIGURATION



H PACKAGE
8-LEAD TO-5 METAL CAN
*CONNECTED INTERNALLY,
DO NOT CONNECT EXTERNAL
CIRCUITRY TO THESE PINS.



W PACKAGE
10-LEAD CERPAC
*CONNECTED INTERNALLY,
DO NOT CONNECT EXTERNAL
CIRCUITRY TO THESE PINS.

ORDER INFORMATION

LEAD BASED FINISH	TAPE AND REEL	PART MARKING	PACKAGE DESCRIPTION	TEMPERATURE RANGE
RH1021BMH-5	RH1021BMH-5#TR		8-Lead TO-5 Metal Can	–55°C to 125°C
RH1021CMH-5	RH1021CMH-5#TR		8-Lead TO-5 Metal Can	–55°C to 125°C
RH1021DMH-5	RH1021DMH-5#TR		8-Lead TO-5 Metal Can	–55°C to 125°C
RH1021CMW-5	RH1021CMW-5#TR		10-Lead CERPAC	–55°C to 125°C

Contact the factory for parts specified with wider operating temperature ranges.

Tape and reel specifications.

TABLE 1: ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 8)

				$T_A = 25°C$			SUB-	$–55°C \le T_A \le 125°C$			SUB-	
SYMBOL	PARAMETER	CONDITIONS	NOTES	MIN	TYP	MAX	GROUP	MIN	TYP	MAX	GROUP	UNITS
V_{OUT}	Output Voltage	RH1021CM-5	1	4.9975		5.0025	1					V
		RH1021BM-5, DM-5	1	4.95		5.05	1					V
TCV_{OUT}	Output Voltage Temperature Coefficient	RH1021BM-5	2							5	2, 3	ppm/°C
		RH1021CM-5, DM-5	2							20	2, 3	ppm/°C
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$7.2V \le V_{IN} \le 10V$	3			12	1			20	2, 3	ppm/V
		$10V \le V_{IN} \le 40V$	3			6	1			10	2, 3	ppm/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Sourcing Current)	$0 \le I_{OUT} \le 10mA$	3			20	1			35	2, 3	ppm/mA
	Load Regulation (Sinking Currrent)	$0 \le I_{OUT} \le 10mA$	3			100	1			150	2, 3	ppm/mA
I_S	Supply Current					1.2	1			1.5	2, 3	mA
	Output Voltage Noise	$0.1Hz \le f \le 10Hz$	4		3							μV_{P-P}
		$10Hz \le f \le 1kHz$	4			3.5	4					μV_{RMS}
	Long-Term Stability of V_{OUT}	$\Delta T = 1000$ Hrs Noncumulative	5		15							ppm
	Temperature Hysteresis of V_{OUT}	$\Delta T = \pm 25°C$			10							ppm

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 6, 10)

				10Krad(Si)		20Krad(Si)		50Krad(Si)		100Krad(Si)		200Krad(Si)		
SYMBOL	**PARAMETER**	**CONDITIONS**	**NOTES**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**UNITS**
V_{OUT}	Output Voltage	RH1021CM-5	1	4.9945	5.0055	4.993	5.007	4.991	5.009	4.9875	5.0125	4.984	5.016	V
		RH1021BM-5, DM-5	1	4.95	5.05	4.945	5.055	4.942	5.058	4.94	5.06	4.935	5.065	V
TCV_{OUT}	Output Voltage Temperature Coefficient	RH1021BM-5	2		5		5		5		7		10	ppm/°C
		RH1021CM-5, DM-5	2		20		20		20		22		25	ppm/°C
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$7.2V \le V_{IN} \le 10V$	3		12		12		13.5		15		18	ppm/V
		$10V \le V_{IN} \le 40V$	3		6		6		6		7		9	ppm/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Sourcing Current)	$0 \le I_{OUT} \le 10mA$	3, 7		20		20		20		20		20	ppm/mA
	Load Regulation (Sinking Current)	$0 \le I_{OUT} \le 10mA$	3		100		100		100		100		150	ppm/mA
I_S	Supply Current				1.2		1.2		1.2		1.2		1.2	mA

Note 1: Output voltage is measured immediately after turn-on. Changes due to chip warm-up are typically less than 0.005%.

Note 2: Temperature coefficient is measured by dividing the change in output voltage over the temperature range by the change in temperature. Separate tests are done for hot and cold; T_{MIN} to 25°C and 25°C to T_{MAX}. Incremental slope is also measured at 25°C.

Note 3: Line and load regulation are measured on a pulse basis. Output changes due to die temperature change must be taken into account separately. Package thermal resistance is 150°C/W for the TO-5 (H) package and 170°C/W for the 10-lead flatpack (W) package.

Note 4: RMS noise is measured with a 2-pole highpass filter at 10Hz and a 2-pole lowpass filter at 1kHz. The resulting output is full wave rectified and then integrated for a fixed period, making the final reading an average as opposed to RMS. Correction factors are used to convert from average to RMS and to correct for the nonideal bandpass of the filters. Peak-to-peak noise is measured with a single highpass filter at 0.1Hz and a 2-pole lowpass filter at 10Hz. The unit is enclosed in a still-air environment to eliminate thermocouple effects on the leads. Test time is 10 seconds.

Note 5: Consult factory for units with long term stability data.

Note 6: V_{IN} = 10V, I_{OUT} = 0, T_A = 25°C, unless otherwise noted.

Note 7: $I_{OUT(MAX)}$ (Sourcing) is 5mA for exposures greater than 100Krad (Si).

Note 8: V_{IN} = 10V, I_{OUT} = 0, unless otherwise noted.

Note 9: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 10: Device is characterized at 10Krad, 20Krad, 50Krad, 100Krad, and 200Krad; and is production tested at 100Krad only.

TABLE 2: ELECTRICAL TEST REQUIREMENTS

MIL-PRF-38535 TEST REQUIREMENTS	SUBGROUP
Final Electrical Test Requirements	1*, 2, 3, 4
Group A Test Requirements	1, 2, 3, 4
Group C End Point Electrical Parameters	1, 2, 3
Group D End Point Electrical Parameters	1, 2, 3
Group E End Point Electrical Parameters	1

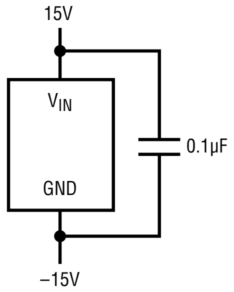
*PDA Applies to subgroup 1. See PDA Test Notes.

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. 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.

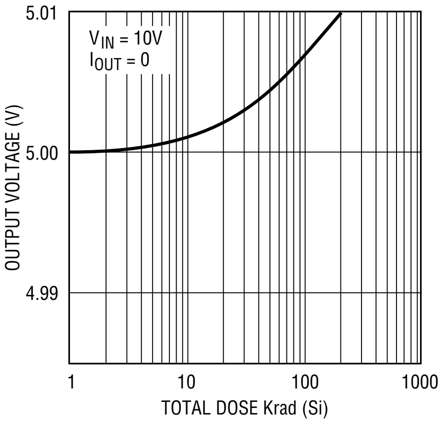
Analog Devices, Inc., reserves the right to test to tighter limits than those given.

TOTAL DOSE BIAS CIRCUIT

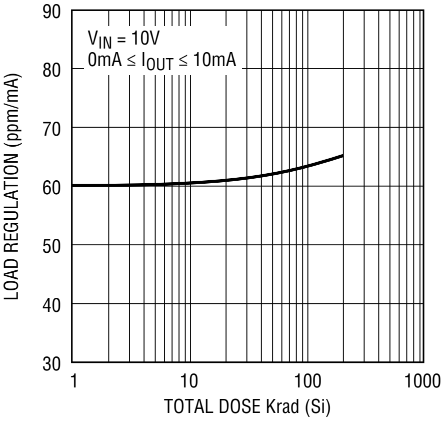


TYPICAL PERFORMANCE CHARACTERISTICS

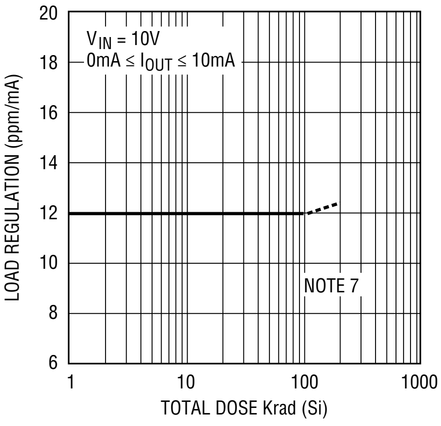
Output Voltage



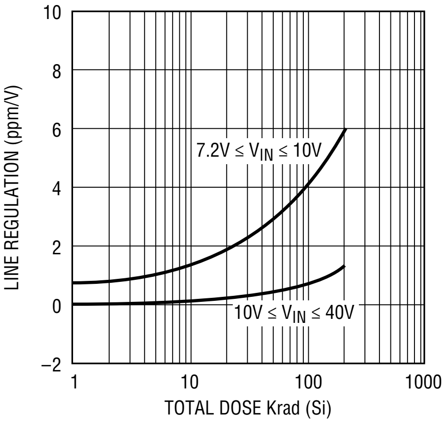
Load Regulation (Sinking)



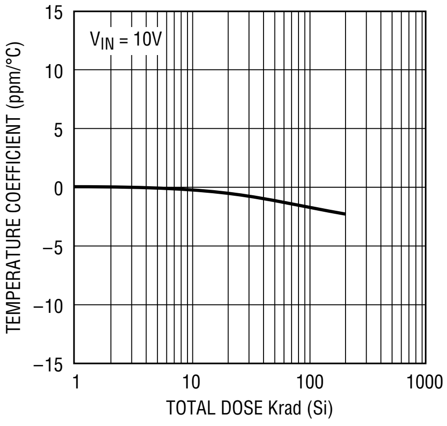
Load Regulation (Sourcing)



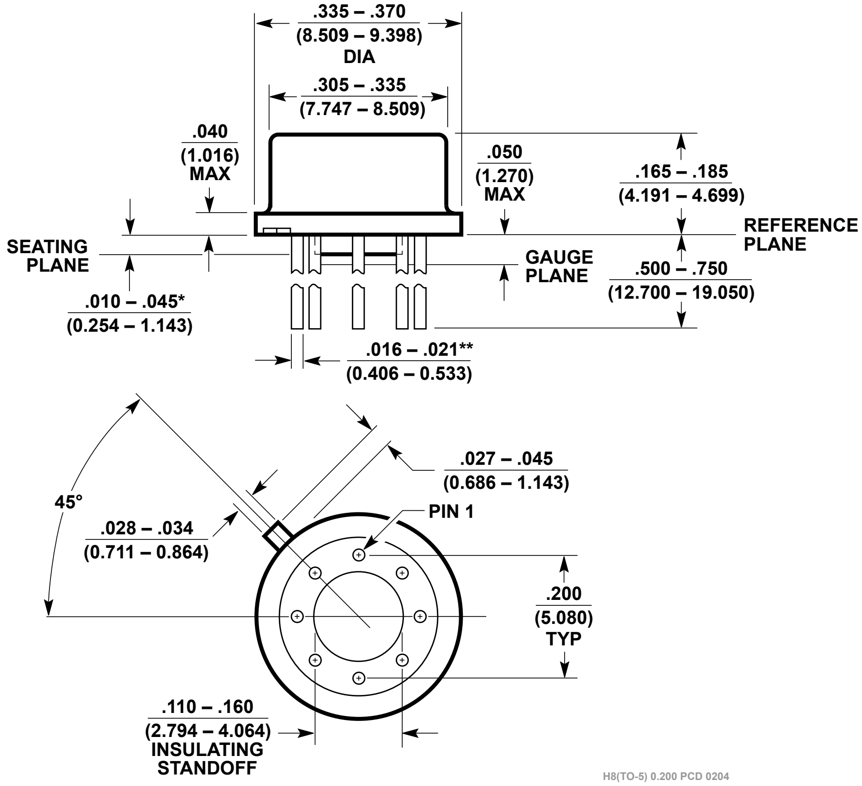
Line Regulation



Temperature Coefficient



PACKAGE OUTLINE DRAWINGS

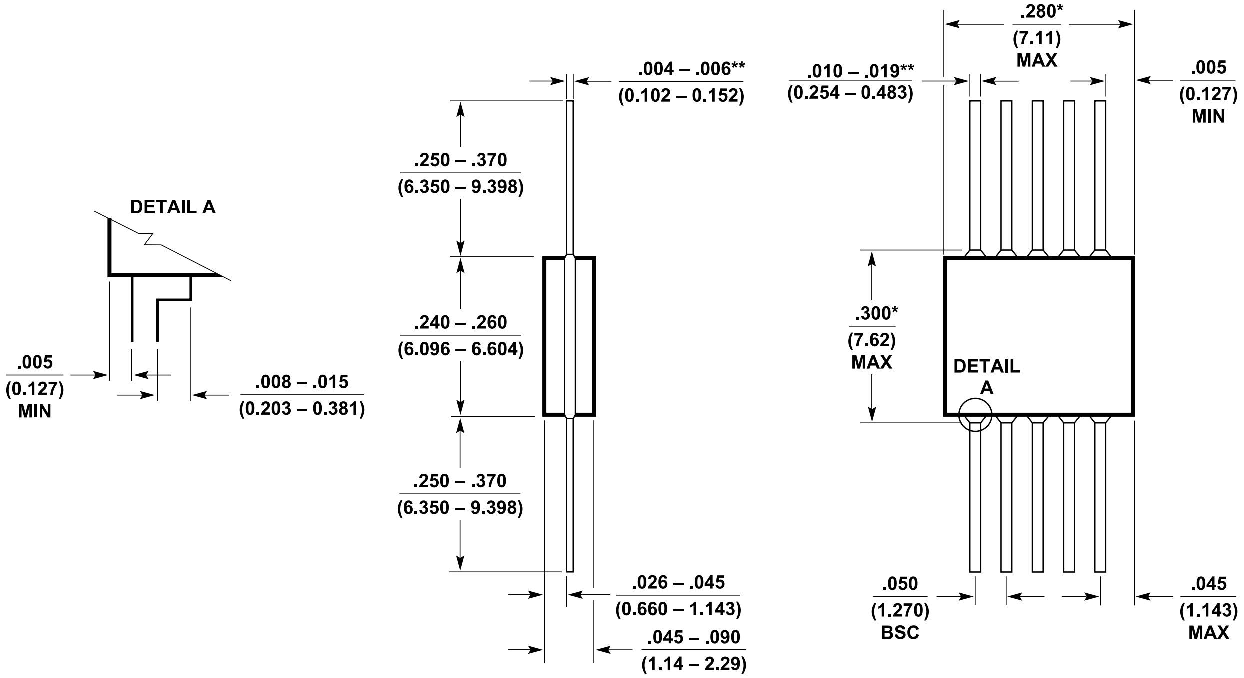


*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND THE SEATING PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS .016 – .024 (0.406 – 0.610)

H Package
8-Lead TO-5 Metal Can (.200 Inch PCD)
(Reference LTC DWG # 05-08-1320)

PACKAGE OUTLINE DRAWINGS



NOTES:

*THIS DIMENSION ALLOWS FOR OFF-CENTER LID, MENISCUS AND GLASS OVERRUN

**INCREASE DIMENSIONS BY 0.003 INCHES (0.076 mm) WHEN LEAD FINISH A IS APPLIED (SOLDER DIPPED)

W Package
10-Lead Flatpak Glass Sealed (Hermetic)
(Reference LTC DWG # 05-08-1130)

REVISION HISTORY (Revision history begins at Rev F)

REV	DATE	DESCRIPTION	PAGE NUMBER
F	10/18	Maximum Junction Temperature added.	1
G	07/24	Changes to Table 2: Electrical Test Requirements	4
H	07/25	Changes to Table 1A: Electrical Characteristics	3
		Added Package Outline Drawings	6–7
		Reorganized Layout	Global