DESCRIPTION

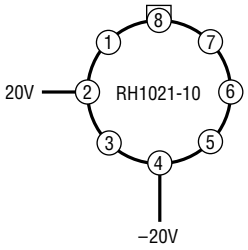
The RH1021-10 is a precision 10V reference with ultralow drift and noise, extremely good long-term stability and almost total immunity to input voltage variations. The reference output will source and sink up to 10mA. This reference can also be used as a shunt regulator (2-terminal Zener). Unique circuit design makes the RH1021-10 the first IC reference to offer ultralow drift without the use of high power on-chip heaters.

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

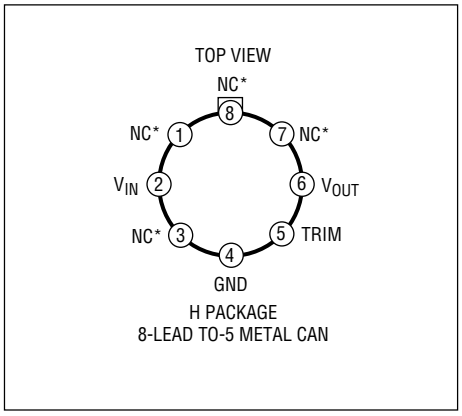
ABSOLUTE MAXIMUM RATINGS

Input Voltage 40V
Input/Output Voltage Differential 35V
Output to Ground Voltage
(Shunt Mode Current Limit) 16V
Trim Pin to Ground Voltage
Positive ..... Equal to V_{OUT}
Negative ..... –20V
Output Short-Circuit Duration
V_{IN} = 35V ..... 10 sec
$V_{IN} \leq$ 20V ..... Indefinite
Operating Temperature Range ..... –55°C to 125°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

BURN-IN CIRCUIT



PACKAGE/ORDER INFORMATION



* Connected internally. Do not connect external circuitry to these pins.

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_{OUT}	Output Voltage	RH1021CM-10	1	9.995		10.005	1					V
		RH1021BM-10, DM-10	1	9.95		10.05	1					V
TCV_{OUT}	Output Voltage Temperature Coefficient	RH1021BM-10	2							5	2,3	ppm/°C
		RH1021CM-10, DM-10	2							20	2,3	ppm/°C
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	11.5V ≤ V_{IN} ≤ 14.5V	3			4	1			6	2,3	ppm/V
		14.5V ≤ V_{IN} ≤ 40V	3			2	1			4	2,3	ppm/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Sourcing Current)	0 ≤ I_{OUT} ≤ 10mA	3			25	1			40	2,3	ppm/mA
	Load Regulation (Shunt Mode)	1.7mA ≤ I_{OUT} ≤ 10mA	3,4			100	1			150	2,3	ppm/mA
I_S	Supply Current (Series Mode)					1.7	1			2.0	2,3	mA
I_{MIN}	Minimum Current (Shunt Mode)	V_{IN} Is Open				1.5	1			1.7	2,3	mA
	Output Voltage Noise	0.1Hz ≤ f ≤ 10Hz	5		6							μV_{P-P}
		10Hz ≤ f ≤ 1kHz	5			6	4					μV_{RMS}
	Long-Term Stability of V_{OUT}	ΔT = 1000 Hrs Noncumulative	6		15							ppm
	Temperature Hysteresis of V_{OUT}	ΔT = ±25°C			5							ppm

TABLE 1A: ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 7)

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_{OUT}	Output Voltage	RH1021CM-10	1	9.995	10.005	9.99	10.01	9.987	10.013	9.985	10.015	9.98	10.02	V
		RH1021BM-10, DM-10	1	9.95	10.05	9.945	10.055	9.942	10.06	9.98	10.06	9.935	10.065	V
TCV_{OUT}	Output Voltage Temperature Coefficient	RH1021BM-10	2		5		5		5		7		10	ppm/°C
		RH1021CM-10, DM-10	2		20		20		20		22		25	ppm/°C
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	11.5V ≤ V_{IN} ≤ 14.5V	3		4		4		4.5		5		6	ppm/V
		14.5V ≤ V_{IN} ≤ 40V	3		2		2		2		2		3	ppm/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Sourcing Current)	0 ≤ I_{OUT} ≤ 10mA	3,8		25		25		25		25		25	ppm/mA
	Load Regulation (Shunt Mode)	1.7mA ≤ I_{OUT} ≤ 10mA	3,4		100		100		100		100		150	ppm/mA
I_{MIN}	Minimum Current (Shunt Mode)	V_{IN} Is Open			1.5		1.5		1.5		1.5		1.5	mA
I_S	Supply Current (Series Mode)				1.7		1.7		1.7		1.7		1.7	mA

TABLE 1A: ELECTRICAL CHARACTERISTICS

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.

Note 4: Shunt mode regulation is measured with the input open. With the input connected, shunt mode current can be reduced to 0mA. Load regulation will remain the same.

Note 5: 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 6: Consult factory for units with long term stability data.

Note 7: V_{IN} = 12V, I_{OUT} = 0, T_A = 25°C, unless otherwise noted.

Note 8: $I_{OUT(MAX)}$ (Sourcing) is 5mA for exposures greater than 100Krad (Si).

Note 9: V_{IN} = 12V, I_{OUT} = 0, unless otherwise noted.

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

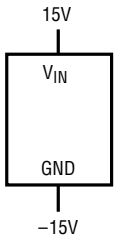
* PDA Applies to subgroup 1. See PDA Test Notes.

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. 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.

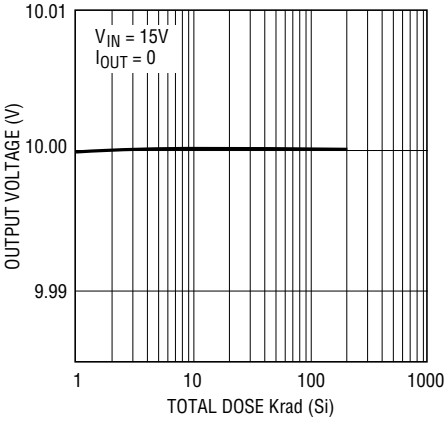
Linear Technology Corporation reserves the right to test to tighter limits than those given.

TOTAL DOSE BIAS CIRCUIT



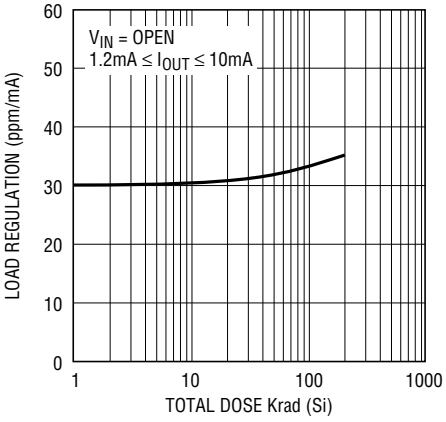
TYPICAL PERFORMANCE CHARACTERISTICS

Output Voltage



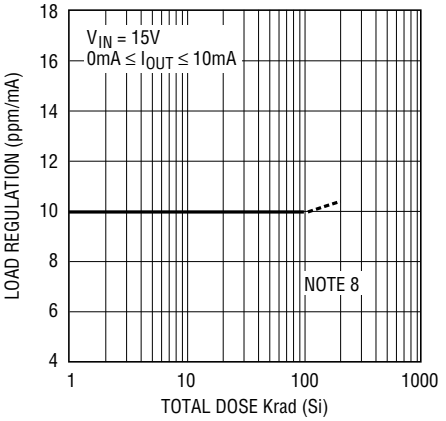
RH1021-10 G01

Load Regulation (Shunt Mode)



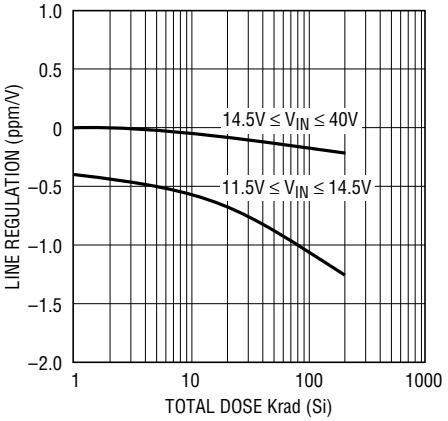
RH1021-10 G02

Load Regulation (Sourcing)



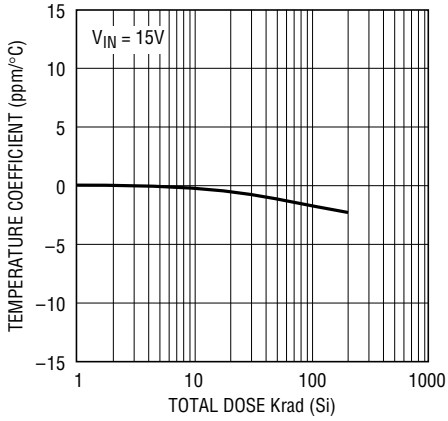
RH1021-10 G03

Line Regulation



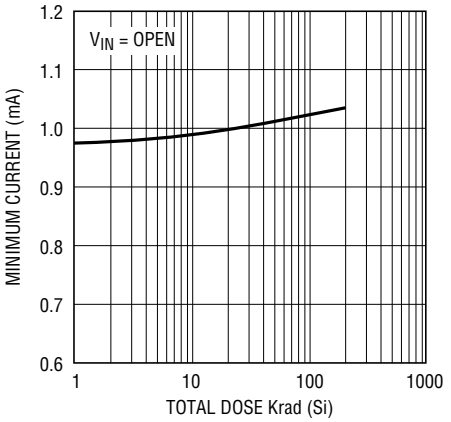
RH1021-10 G04

Temperature Coefficient



RH1021-10 G05

Minimum Current (Shunt Mode)



RH1021-10 G06

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