

Negative Adjustable Regulator

DESCRIPTION

The **RH137** negative adjustable regulator will deliver up to 1.5A output current over an output voltage range of -1.2V to -22V.

Every effort has been made to make these devices easy to use and difficult to damage. Internal current and power limiting coupled with true thermal limiting prevents device damage due to overloads or shorts, even if the regulator is not fastened to a heat sink.

Maximum reliability is attained with Analog Device's advanced processing techniques combined with a 100% burn-in in the thermal limit mode. This assures that all device protection circuits are working and eliminates field failures experienced with other regulators that receive only standard electrical testing.

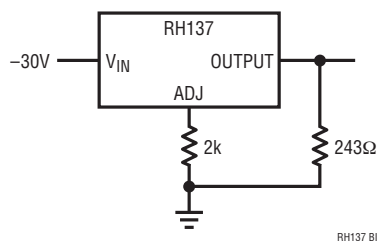
The wafer lots are processed to Analog Device's in-house Class S flow to yield circuits usable in stringent military applications.

ABSOLUTE MAXIMUM RATINGS

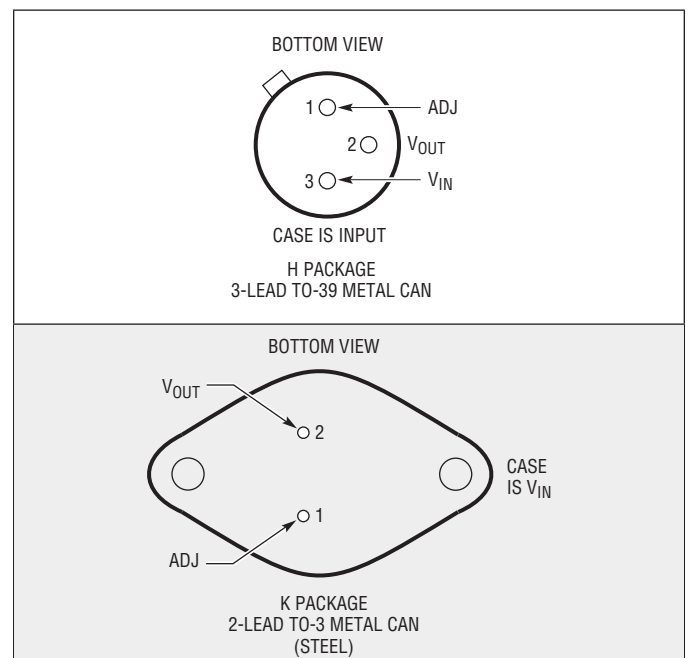
Power Dissipation	Internally Limited
Input-to-Output Voltage Differential	30V
Operating Junction Temperature Range	-55°C to 150°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec).....	300°C

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BURN-IN CIRCUIT



PACKAGE/ORDER INFORMATION



Note: Obsolete K Package – For Reference Only.

TABLE 1. ELECTRICAL CHARACTERISTICS (Preirradiation) (Note 1)
Device is characterized at the TID levels below. Device is production tested at 100kRad(Si).

SYMBOL	PARAMETER	CONDITIONS	NOTES	T _A = 25°C			SUB-GROUP	-55°C ≤ T _A ≤ 150°C			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V _{REF}	Reference Voltage	V _{IN} - V _{OUT} = 5V, I _{OUT} = 10mA		-1.225	-1.275		1					V
		3V ≤ V _{IN} - V _{OUT} ≤ 30V, 10mA ≤ I _{OUT} ≤ I _{MAX} , P ≤ P _{MAX}		-1.200	-1.300		1	-1.200		-1.300	2, 3	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	3V ≤ V _{IN} - V _{OUT} ≤ 30V	2		0.02		1			0.05	2, 3	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	10mA ≤ I _{OUT} ≤ I _{MAX} , V _{OUT} ≤ 5V	2		25		1			50	2, 3	mV
		10mA ≤ I _{OUT} ≤ I _{MAX} , V _{OUT} ≥ 5V	2		0.5		1			1	2, 3	%
	Thermal Regulation	10ms Pulse			0.02		1					%/W
	Ripple Rejection	V _{OUT} = -10V, f = 120Hz, C _{ADJ} = 0			60							dB
		V _{OUT} = -10V, f = 120Hz, C _{ADJ} = 10μF	3	66				66				dB
I _{ADJ}	Adjust Pin Current				100		1			100	2, 3	μA
ΔI _{ADJ}	Adjust Pin Current Change	10mA ≤ I _{OUT} ≤ I _{MAX} 3V ≤ V _{IN} - V _{OUT} ≤ 30V			5		1			5	2, 3	μA
					5		1			5	2, 3	μA
I _{MIN}	Minimum Load Current	V _{IN} - V _{OUT} = 30V V _{IN} - V _{OUT} ≤ 10V			5		1			5	2, 3	mA
					3		1			3	2, 3	mA
	Current Limit	V _{IN} - V _{OUT} ≤ 15V H Package K Package	5 5	0.5 1.5			1 1	0.5 1.5			2, 3 2, 3	A A
		V _{IN} - V _{OUT} = 30V H Package K Package	5 5	0.15 0.24			1 1					A A
$\frac{\Delta V_{OUT}}{\Delta Temp}$	Temperature Stability	-55°C ≤ T _J ≤ 125°C	3						0.6			%
$\frac{\Delta V_{OUT}}{\Delta Time}$	Long Term Stability	T _A = 125°C	3							1		%
e _n	RMS Output Noise	10Hz ≤ f ≤ 10kHz			0.003							%
θ _{JC}	Thermal Resistance (Junction to Case)	H Package K Package	3 3		15 3							°C/W °C/W

TABLE 1A. ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 4)
Device is characterized at the TID levels below. Device is production tested at 100kRad(Si).

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 _{REF}	Reference Voltage	V _{IN} - V _{OUT} ≤ 5V, I _{OUT} = 10mA		-1.225	-1.275	-1.225	-1.275	-1.225	-1.275	-1.225	-1.275	-1.22	-1.28	V
		3V ≤ V _{IN} - V _{OUT} ≤ 30V, 10mA ≤ I _{OUT} ≤ I _{MAX} , P ≤ P _{MAX}		-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	-1.2	-1.3	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	3V ≤ V _{IN} - V _{OUT} ≤ 30V	2		0.02		0.02		0.02		0.02		0.02	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	10mA ≤ I _{OUT} ≤ I _{MAX} , V _{OUT} ≤ 5V	2		25		25		25		25		25	mV
		10mA ≤ I _{OUT} ≤ I _{MAX} , V _{OUT} ≥ 5V	2		0.5		0.5		0.5		0.5		0.5	%

TABLE 1A. ELECTRICAL CHARACTERISTICS (Postirradiation) (Note 4)
Device is characterized at the TID levels below. Device is production tested at 100kRad(Si).

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	
I_{ADJ}	Adjust Pin Current				100		100		100		100		100	μA
ΔI_{ADJ}	Adjust Pin Current Change	$10mA \leq I_{OUT} \leq I_{MAX}$ $3V \leq V_{IN} - V_{OUT} \leq 30V$			5 5		5 5		5 5		5 5		5 5	μA μA
I_{MIN}	Minimum Load Current	$ V_{IN} - V_{OUT} = 30V$ $ V_{IN} - V_{OUT} \leq 10V$			5 3		5 3		5 3		5 3		5 3	mA mA
	Current Limit H Package	$ V_{IN} - V_{OUT} \leq 15V$ $ V_{IN} - V_{OUT} = 30V$		0.5 0.15		0.5 0.15		0.5 0.15		0.5 0.15		0.5 0.15		A A
	K Package	$ V_{IN} - V_{OUT} \leq 15V$ $ V_{IN} - V_{OUT} = 30V$		1.5 0.24		1.5 0.24		1.5 0.24		1.5 0.24		1.5 0.24		A A

Note 1: Unless otherwise specified, these specifications apply for $|V_{IN} - V_{OUT}| = 5V$; and $I_{OUT} = 0.1A$ for the H Package (TO-39) and $I_{OUT} = 0.5A$ for the K Package (TO-3). Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2W for the TO-39 and 20W for the TO-3. I_{MAX} is 0.2A for the TO-39 and 1.5A for the TO-3 package.

Note 2: Regulation is measured at a constant junction temperature using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.

Note 3: Guaranteed by design, characterization or correlation to other tested parameters.

Note 4: $T_J = 25^\circ C$ unless otherwise noted.

Note 5: ISC is tested at the ambient temperatures of $25^\circ C$ and $-55^\circ C$. ISC cannot be tested at the maximum ambient temperature of $150^\circ C$ due to the high power level required. ISC specification at $150^\circ C$ ambient is guaranteed by characterization and correlation to $25^\circ C$ testing.

TABLE 2. ELECTRICAL TEST REQUIREMENTS

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

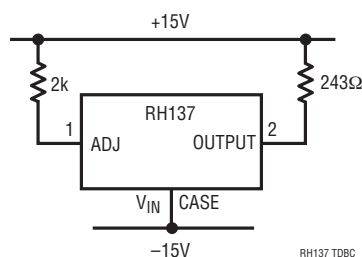
* PDA Applies to subgroup 1. See PDA Test Notes.

PDA Test Notes

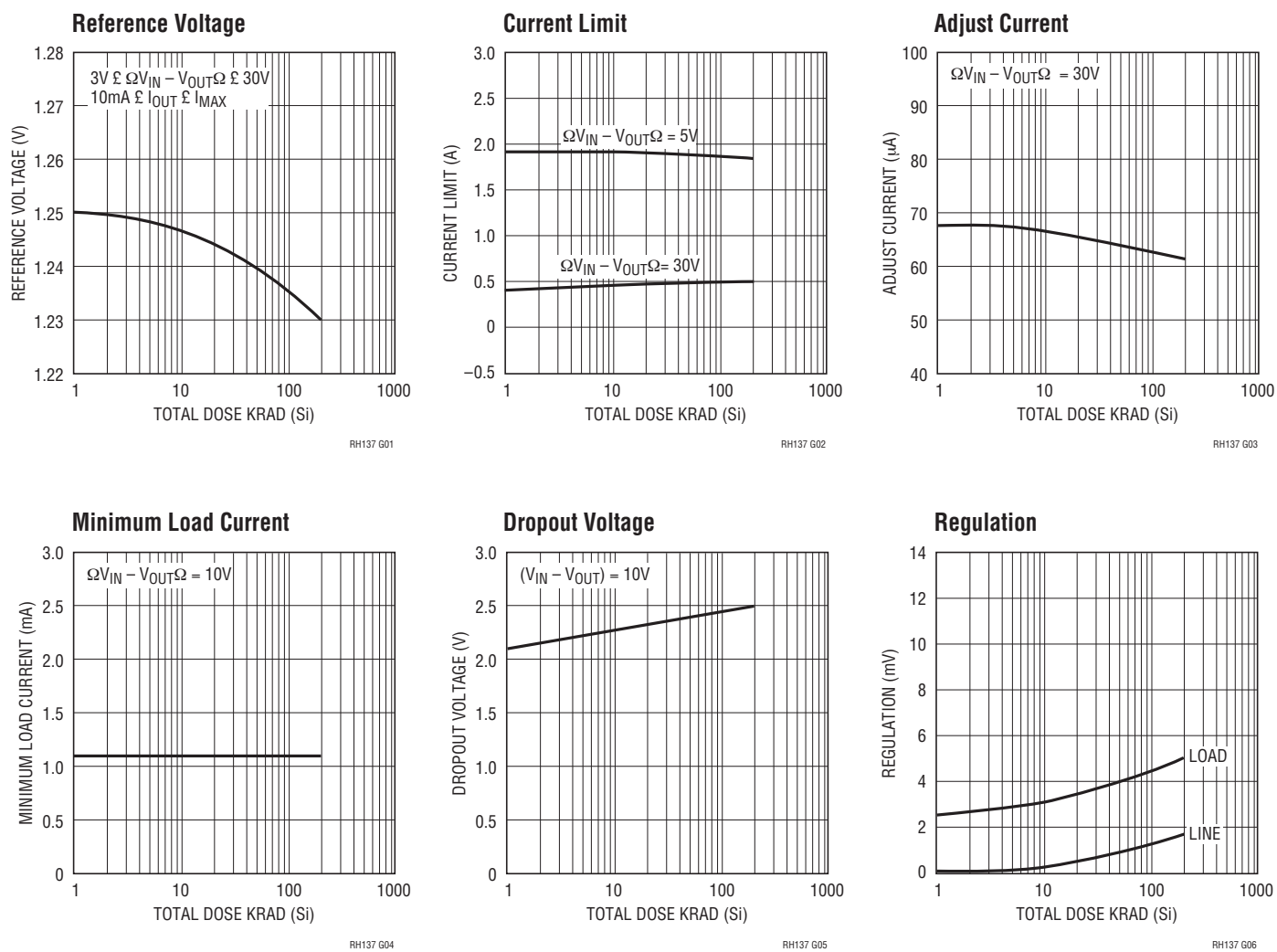
The PDA is specified as 5% based on failures from group A, subgroup 1, tests after cooldown as the final electrical test in accordance with method 5004 of MIL-STD-883. The verified failures of group A, subgroup 1, after burn-in divided by the total number of devices submitted for burn-in in that lot shall be used to determine the percent for the lot.

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

TOTAL DOSE BIAS CIRCUIT



TYPICAL PERFORMANCE CHARACTERISTICS



REVISION HISTORY (Revision history begins at Rev D)

REV	DATE	DESCRIPTION	PAGE NUMBER
D	01/19	Obsolete K (TO-3 Metal Can) Package	1
E	07/23	Updated art title in the Electrical Characteristics section	2