

Voltage Regulator VRG8669

2.5A ULDO Adjustable Positive Voltage Regulator

Released Datasheet


Cobham.com/HiRel

June 21, 2016

COBHAM

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FEATURES

- ❑ Manufactured using  Space Qualified RH3083 die
- ❑ Radiation performance
 - Total dose: 100 krad(Si), Dose rate = 50 - 300 rad(Si)/s
 - ELDRS: 50 krad(Si), Dose rate \leq 0.01 rad(Si)/s
- ❑ Current Limit with Foldback and Over-temperature protection
- ❑ Input voltage range: 1.2V to 23V
- ❑ Output voltage adjustable: 0V to 22V
- ❑ Outputs may be paralleled for higher current
- ❑ Post Radiated Dropout voltage, $V_{CONTROL} \geq 2$ Volts:
 - 0.75V @ 2.5Amps
 - 0.28V @ 1.0Amps
- ❑ Output current: 2.5Amps
- ❑ Packaging – Hermetic Ceramic
 - Hermetic Surface Mount Power
 - 5 Pads, .550"L x .301"W x .127"Ht
 - Weight - 2.0 gm max
- ❑ Designed for aerospace and high reliability space applications
- ❑ **Radiation Hardness Assurance Plan: DLA Certified to MIL-PRF-38534, Appendix G.**

DESCRIPTION

The VRG8669 consists of a Positive Adjustable (RH3083) ULDO voltage regulator capable of supplying 2.5Amps over the output voltage range as defined under recommended operating conditions. The VRG8669 offers excellent line and load regulation specifications and ripple rejection.

The VRG8669 serves a wide variety of applications including SCSI-2 Active Terminator, High Efficiency Linear Regulators, Post Regulators for Switching Supplies, Constant Current Regulators, Battery Chargers and Microprocessor Supply.

The VRG8669 has been specifically designed to meet exposure to radiation environments and is configured for an SMD power package. It is guaranteed operational with a case operating temperature from -55°C to $+125^{\circ}\text{C}$. Available screened to MIL-STD-883, the VRG8669 is ideal for demanding military and space applications.

Dropout ($V_{IN} - V_{OUT}$) decreases at lower load currents.

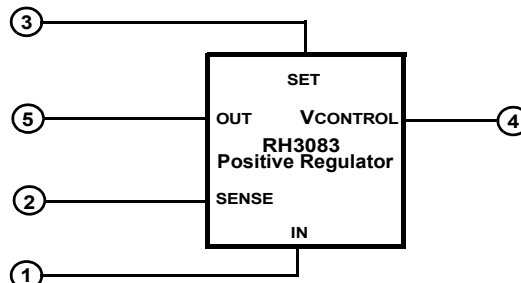


FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC

ABSOLUTE MAXIMUM RATINGS

Parameter (Voltages are Relative to VOUT)	Rating	Units
Input Voltage (No Overload or Short Circuit)	+23	VDC
VCONTROL	+28	VDC
Output Short Circuit Duration	Indefinite	-
Lead temperature (soldering 10 Sec)	300	°C
Input Output Differential	18	VDC
ESD ^{1/}	2,000 - 3,999	V
Operating Junction Temperature Range	-55 to +150	°C
Storage Temperature Range	-65 to +150	°C
Thermal Resistance (Junction to Case) Θ_{JC}	2.5	°C/W

^{1/} Meets ESD testing per MIL-STD-883, method 3015, Class 2.

NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress rating only; functional operation beyond the "Operation Conditions" is not recommended and extended exposure beyond the "Operation Conditions" may effect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Range	Units
Output Voltage Range	0 to 22	VDC
Input Output Differential	0.5 to 18	VDC
Case Operating Temperature Range	-55 to +125	°C
Input Voltage (Voltages are Relative to VOUT)	1 to 23	V
VCONTROL (Voltages are Relative to VOUT)	1.6 to 28	V

ELECTRICAL PERFORMANCE CHARACTERISTICS

Unless otherwise specified: $-55^{\circ}\text{C} \leq T_c \leq +125^{\circ}\text{C}$.

Parameter	Symbol	Conditions ($P \leq P_{MAX}$)	Min	Max	Units
Set Pin Current	I_{REF1}	$5.0\text{mA} \leq I_{LOAD} \leq 2.5\text{A}$, $V_{IN} \geq 2\text{V}$, $V_{CONTROL} \geq 3\text{V}$	49.0	51.5	μA
Set Pin Current ^{1/}	I_{REF2}	$V_{IN} = 2\text{V}$, $V_{CONTROL} = 3\text{V}$, $I_{LOAD} = 1\text{mA}$, $T_c = 25^{\circ}\text{C}$	49	51	μA
Output Offset Voltage (VOUT - VSET) ^{1/}	VOS	$V_{IN} = 2\text{V}$, $V_{CONTROL} = 3\text{V}$, $I_{LOAD} = 1\text{mA}$,	-6.0	6.0	mV
Line Regulation ^{1/}	ΔV_{OS}	$1\text{V} \leq V_{IN} \leq 23\text{V}$, $2\text{V} \leq V_{CONTROL} \leq 25\text{V}$, $I_{LOAD} = 1\text{mA}$, $T_c = +25^{\circ}\text{C}$	-0.07	0.07	mV/V
Load Regulation ^{1/} ^{5/}	ΔV_{OS}	$(V_{IN} - V_{OUT}) = 3\text{V}$, $I_{LOAD} = 5\text{mA}$ to 1A , $T_c = 25^{\circ}\text{C}$	-10.0	10.0	mV
VCONTROL Dropout Voltage	VCDROP	$I_{LOAD} = 2.5\text{A}$	-	1.65	V
		$I_{LOAD} = 1.0\text{A}$ ^{1/}	-	1.6	
VIN Dropout Voltage	VINDROP	$I_{LOAD} = 2.5\text{A}$	-	0.75	V
		$I_{LOAD} = 1.0\text{A}$ ^{1/}	-	0.28	
Current Limit ^{1/} ^{3/}	IMAX	$V_{IN} = V_{CONTROL} = +5\text{V}$, $V_{SET} = 0\text{V}$, $V_{OUT} = 0.4\text{V}$	2.8	-	A
Minimum Load Current ^{1/} ^{4/}	IMIN	$V_{CONTROL} = 25\text{V}$, $V_{IN} = 23\text{V}$	-	1.0	mA
Ripple Rejection	-	$I_{LOAD} = 0.2\text{A}$, $(V_{IN} - V_{OUT}) = 3\text{V}$, $f = 120\text{Hz}$, $C_{OUT} = 2.2\mu\text{F}$, $C_{SET} = 0.1\mu\text{F}$	60	-	dB

Notes:

^{1/} Specification derated to reflect Total Dose exposure to 100 krad(Si) @+25°C.

^{2/} Dropout results from either minimum control voltage, VCONTROL, or minimum input voltage, VIN, both specified with respect to VOUT. These specifications represent the minimum input-to-output differential voltage required to maintain regulation.

^{3/} Pulsed @ <10% duty cycle @ +25°C for characterization only.

^{4/} Not tested. Shall be guaranteed to the specified limits.

^{5/} Load Regulation guaranteed up to 2.5A but only tested to 1.0A.

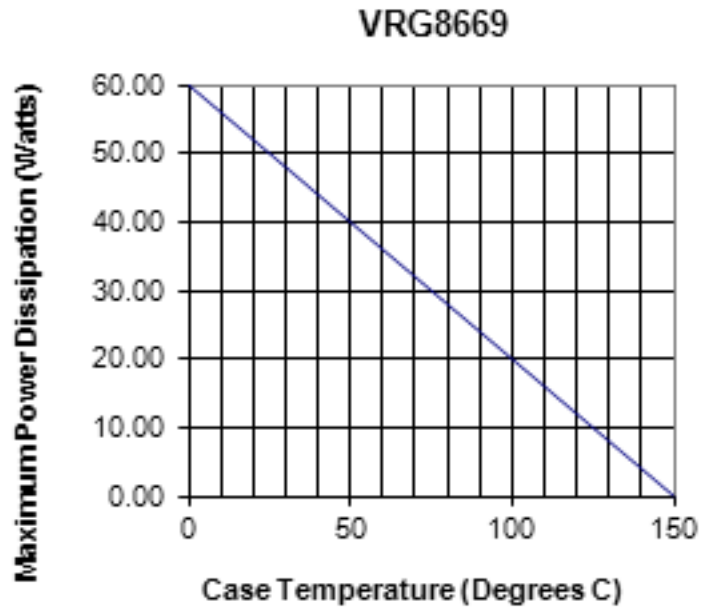


FIGURE 2 – MAXIMUM POWER vs CASE TEMPERATURE

The maximum Power dissipation is limited by the thermal shutdown function of the regulator chip in the VRG8669. The graph above represents the achievable power before the chip shuts down. The line in the graph represents the maximum power dissipation of the VRG8669. This graph is based on the maximum junction temperature of 150°C and a thermal resistance (Θ_{JC}) of 2.5°C/W.

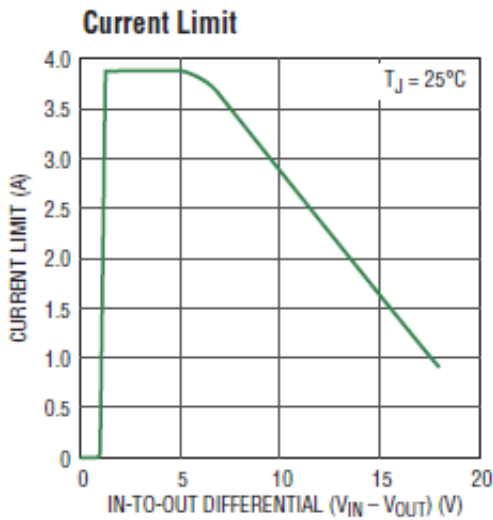


FIGURE 3 – RH3083 TYPICAL CURRENT LIMIT

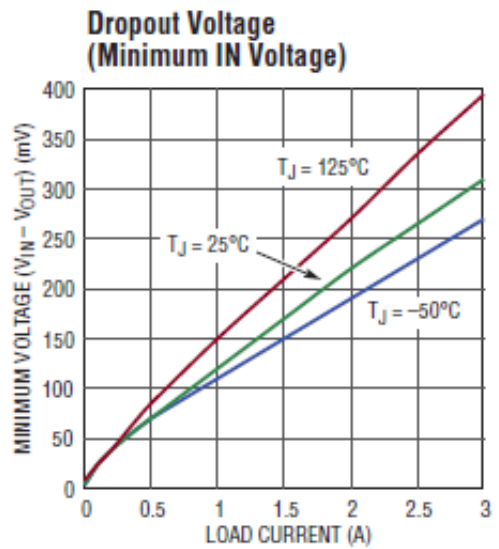


FIGURE 4 – RH3083 TYPICAL DROPOUT VOLTAGE CURVE ($V_{CONTROL} \geq 1.6V$)

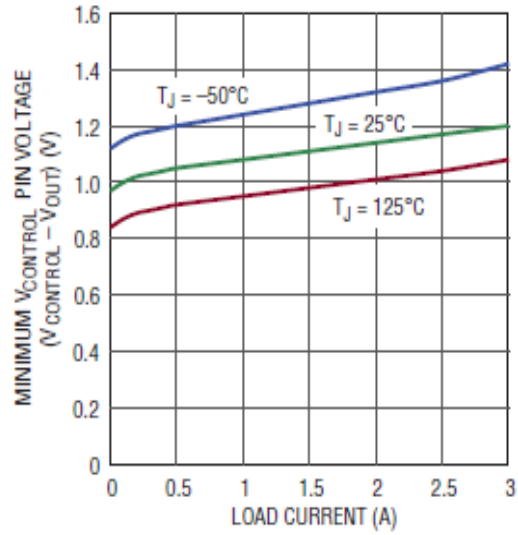


FIGURE 5 – RH3083 TYPICAL V_{CONTROL} DROPOUT

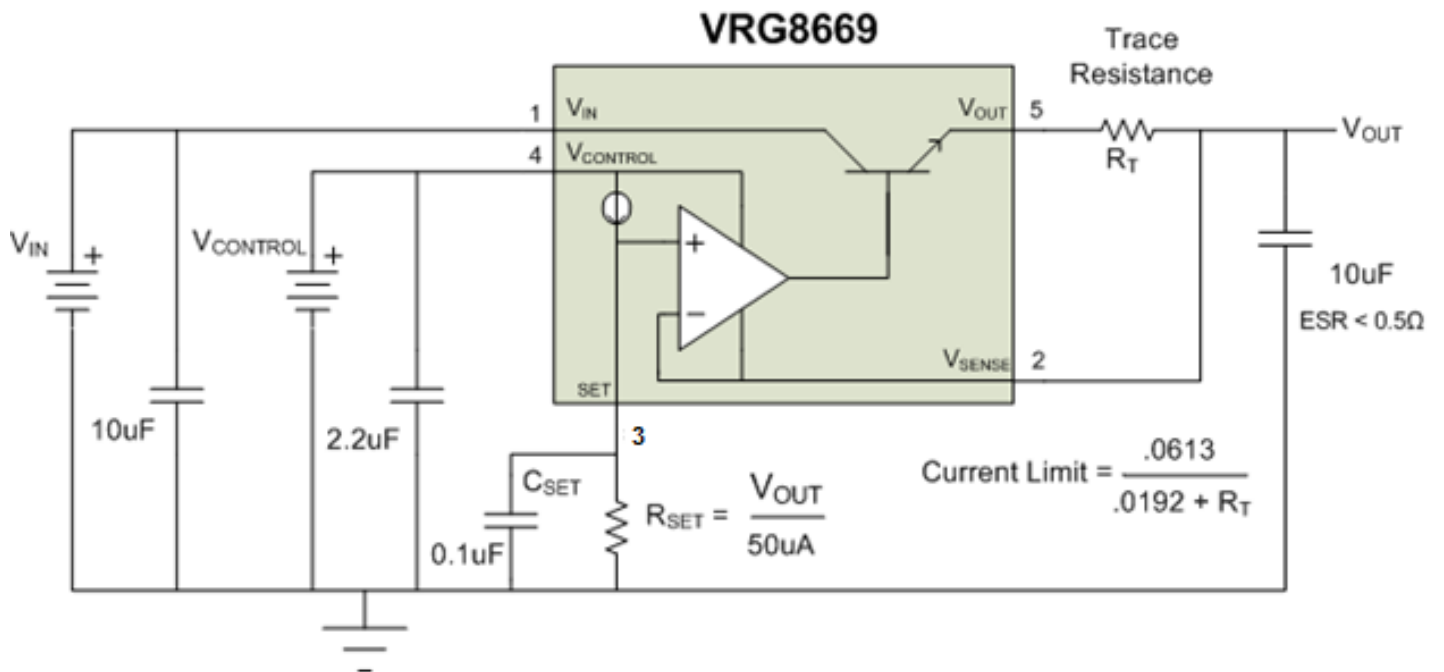
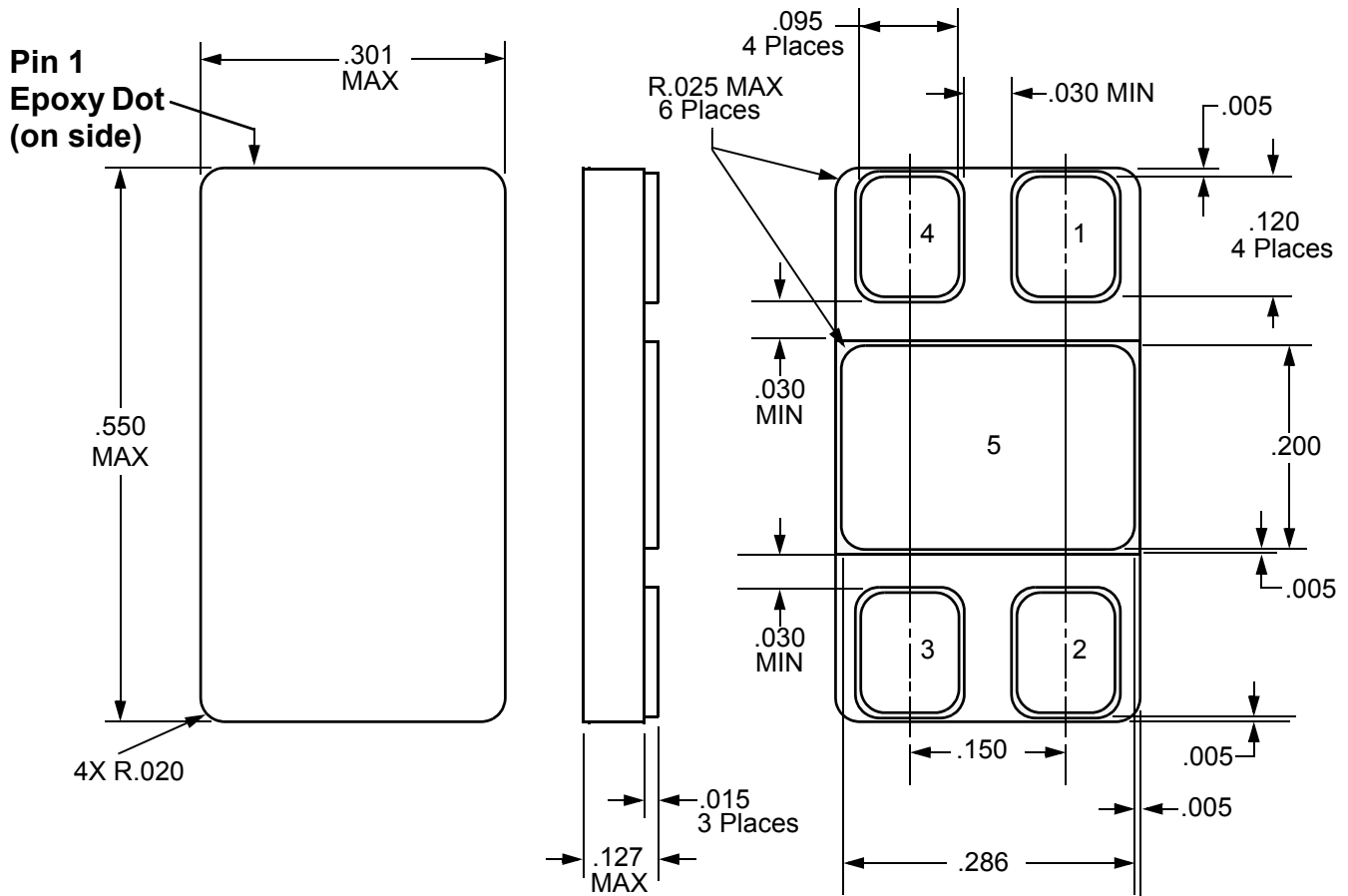


FIGURE 6 – BASIC VRG8669 ADJUSTABLE REGULATOR APPLICATION



NOTES:

1. Package & Lid are electrically isolated from signal pads

FIGURE 7 – PACKAGE OUTLINE — SURFACE MOUNT

ORDERING INFORMATION

Model	DLA SMD #	Screening	Package
VRG8669-7	-	Commercial Flow, +25°C testing only	SMD Power Pkg
VRG8669-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
VRG8669-901-1S	5962R1420101KYC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8669-901-2S	5962R1420101KYA		

REVISION HISTORY

Date	Revision	Change Description
03/31/2016	G	Import into Cobham format
06/21/2016	H	Add note <u>5/</u> to Load Regulation in the Electrical Performance Characteristics Table. Change Load Reg Iload to 1.0 to align with Note 5. Align Dimensions in Features with Package Outline.


Datasheet Definition

Advanced Datasheet - Product In Development

Preliminary Datasheet - Shipping Prototype

Datasheet - Shipping QML & Reduced Hi-Rel



For detailed performance characteristic curves, applications information and typical applications, see the latest  datasheet for their RH3083, which is available on-line at www.linear.com.

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