

## SCD8669

2.5A ULDO Adjustable Positive Voltage Regulator

## VRG8669

## Features

- Manufactured using Space Qualified RH3083 die
- Radiation performance
  - Total dose: 100 krad(Si), Dose rate = 50 rad(Si)/s
  - ELDRS: 100 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 18V
- Outputs may be paralleled for higher current
- Post irradiated Dropout voltage @ +25°C,  $V_{\text{CONTROL}} \geq 2$  Volts:
  - 0.66V @ 2.5Amps
  - 0.225V @ 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. Dropout ( $V_{\text{IN}} - V_{\text{OUT}}$ ) decreases at lower load currents.

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°C. Available screened to MIL-STD-883, the VRG8669 is ideal for demanding military and space applications.

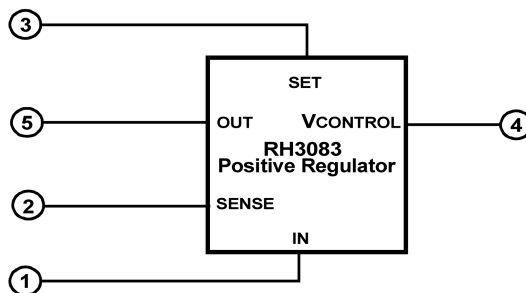


Figure 1 - Block Diagram / Schematic

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## Absolute Maximum Ratings

Parameter (Voltages are Relative to $V_{OUT}$ )	Rating	Units
Input Voltage	+18, -0.3	$V_{DC}$
Input Voltage (No Overload or Short Circuit)	+23, -0.3	$V_{DC}$
$V_{CONTROL}$	$\pm 28$	$V_{DC}$
SET Pin Current	$\pm 25$	mA
SET Pin Voltage	$\pm 10$	$V_{DC}$
Output Short Circuit Duration	Indefinite	-
Lead temperature (soldering 10 Sec)	300	$^{\circ}C$
ESD <u>1</u> /	2,000 - 3,999	V
Operating Junction Temperature Range	-55 to +150	$^{\circ}C$
Storage Temperature Range	-65 to +150	$^{\circ}C$
Thermal Resistance (Junction to Case) $\Theta_{JC}$	2.5	$^{\circ}C/W$

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 affect device reliability.

## Recommended Operating Conditions

Parameter	Range	Units
Input Voltage (Voltages are Relative to $V_{OUT}$ )	1 to 23	$V_{DC}$
$V_{CONTROL}$ (Voltages are Relative to $V_{OUT}$ )	1.6 to 25	$V_{DC}$
Input Output Differential	0.5 to 18	$V_{DC}$
Case Operating Temperature Range	-55 to +125	$^{\circ}C$

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## Electrical Performance Characteristics

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

Parameter	Symbol	Conditions ( $P \leq P_{MAX}$ )	TEMP	MIN	MAX	Units
Set Pin Current	$I_{REF}$	$V_{IN} = 2V, V_{CONTROL} = 3V, V_{OUT} = 1V$ $1\text{ mA} \leq I_{LOAD} \leq 2.5A,$ <u>2/</u>	All	49.0	51.5	$\mu\text{A}$
		$V_{IN} = 1V, V_{CONTROL} = 2V, I_{LOAD} = 1\text{mA}$ <u>1/ 3/</u>	25°C	49	51.5	
Output Offset Voltage ( $V_{OUT} - V_{SET}$ )	$V_{OS}$	$V_{IN} = 2V, V_{CONTROL} = 3V, V_{OUT} = 1V, I_{LOAD} = 1\text{mA}$ <u>2/</u>	All	-6.0	6.0	mV
		$V_{IN} = 1V, V_{CONTROL} = 2V, I_{LOAD} = 1\text{mA}$ <u>1/ 3/</u>	25°C	-4.5	4.5	
Line Regulation	$\Delta V_{OS}$	$2V \leq V_{IN} \leq 24V, 3V \leq V_{CONTROL} \leq 26V, V_{OUT} = 1V, I_{LOAD} = 1\text{mA}$ <u>2/</u>	25°C	-0.05	0.05	mV/V
		$2V \leq V_{IN} \leq 24V, 3V \leq V_{CONTROL} \leq 26V, V_{OUT} = 1V, I_{LOAD} = 5\text{mA}$ <u>2/</u>	-55°C +125 °C	-0.08	0.08	
			25°C	-	-	
Load Regulation	$\Delta V_{OS}$	$V_{IN} = 2V, V_{CONTROL} = 3V, V_{OUT} = 1V,$ $I_{LOAD} = 5\text{mA to } 2.5A$ <u>2/</u>	All	-10.0	10.0	mV
		$I_{LOAD} = 5\text{mA to } 2.5A$ <u>1/ 3/</u>	25°C	-3.5	3.5	
$V_{CONTROL}$ Dropout Voltage <u>5/</u>	$V_{CDROP}$	$I_{LOAD} = 2.5A, V_{IN} = 2V$ <u>2/</u>	All	-	1.65	V
		$I_{LOAD} = 2.5A, V_{IN} = 1V$ <u>1/ 3/</u>	25°C	-	1.53	
		$I_{LOAD} = 1A, V_{IN} = 1V$ <u>1/ 3/ 4/</u>	25°C	-	1.48	
$V_{IN}$ Dropout Voltage <u>5/</u>	$V_{INDROP}$	$I_{LOAD} = 2.5A, V_{CONTROL} = 3V$ <u>2/</u>	All	-	0.75	V
		$I_{LOAD} = 2.5A, V_{CONTROL} = 2V$ <u>1/ 3/</u>	25°C	-	0.66	
		$I_{LOAD} = 1.0A, V_{CONTROL} = 2V$ <u>1/ 3/ 4/</u>	25°C		0.225	
Current Limit	$I_{MAX}$	$V_{IN} = V_{CONTROL} = +5V, V_{OUT} = 1V, 30\text{msec pulsed } \underline{2/ 6/}$	25°C	2.8	-	A
		$V_{IN} = V_{CONTROL} = +5V, V_{SET} = 0V, V_{OUT} = -0.1V \underline{1/ 3/ 4/}$	25°C			
Minimum Load Current <u>1/ 3/ 4/</u>	$I_{MIN}$	$V_{CONTROL} = 25V, V_{IN} = 23V$	All	-	1.0	mA
Ripple Rejection <u>2/</u>	-	$V_{IN} = 13V, V_{OUT} = 10V, V_{CONTROL} = 3V, V_{AC} = 1V_{P-P},$ $I_{LOAD} = 0.2A, f = 120\text{Hz}, C_{OUT} = 10\mu\text{F}, C_{SET} = 0.1\mu\text{F}$	All	60	-	dB

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**Notes:**

- 1) Specification reflects Total Dose exposure to 100 krad(Si) @ +25°C.
- 2) Production test conditions:  $V_{IN}$  and  $V_{CONTROL}$  are the supply voltages applied during testing, referenced to ground.
- 3) Irradiation test conditions:  $V_{IN}$  and  $V_{CONTROL}$  are relative to  $V_{OUT}$ . See the Linear Technology (RH3083) datasheet for +25°C limits to determine deviations due to irradiation.
- 4) Not production tested. Shall be guaranteed by design, characterization, or correlation to other tested parameters.
- 5) Dropout results from either minimum control voltage,  $V_{CONTROL}$ , or minimum input voltage,  $V_{IN}$ , both specified with respect to  $V_{OUT}$ . These specifications represent the minimum input-to-output differential voltage required to maintain regulation.
- 6) Pulsed @ <10% duty cycle @ +25°C for characterization only.

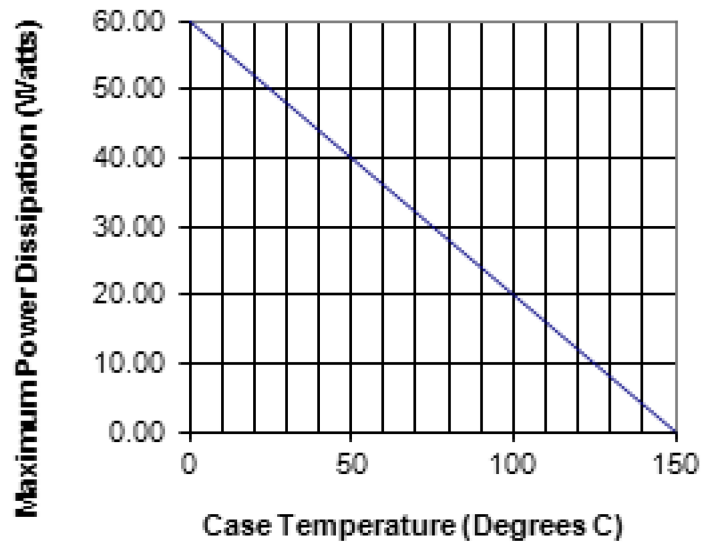
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Figure 2 - Maximum Power vs Case Temperature

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 ( $\Theta_{JC}$ ) of 2.5°C/W.

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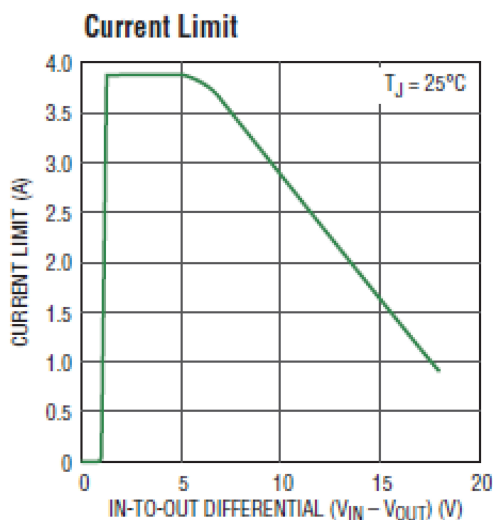


Figure 3 - RH3083 Typical Current Limit

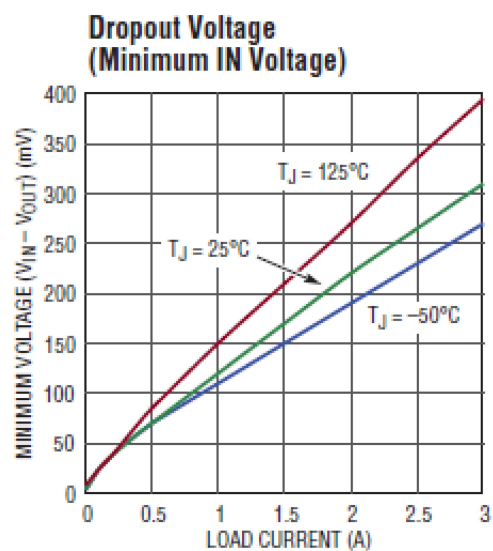


Figure 4 - RH3083 Typical Dropout Voltage Curve ( $V_{CONTROL} \geq 1.6V$ )

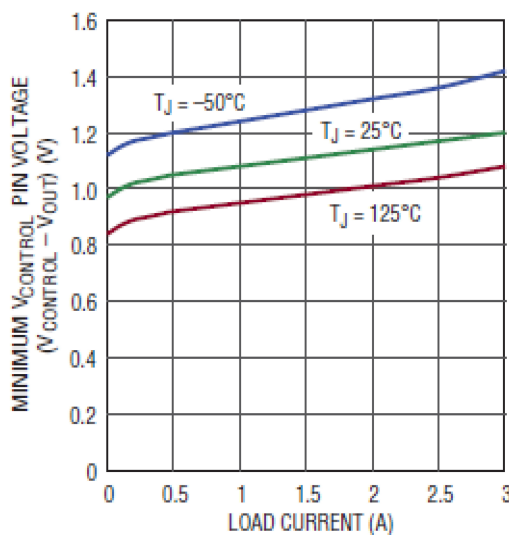


Figure 5 - RH3083 Typical  $V_{CONTROL}$  Dropout

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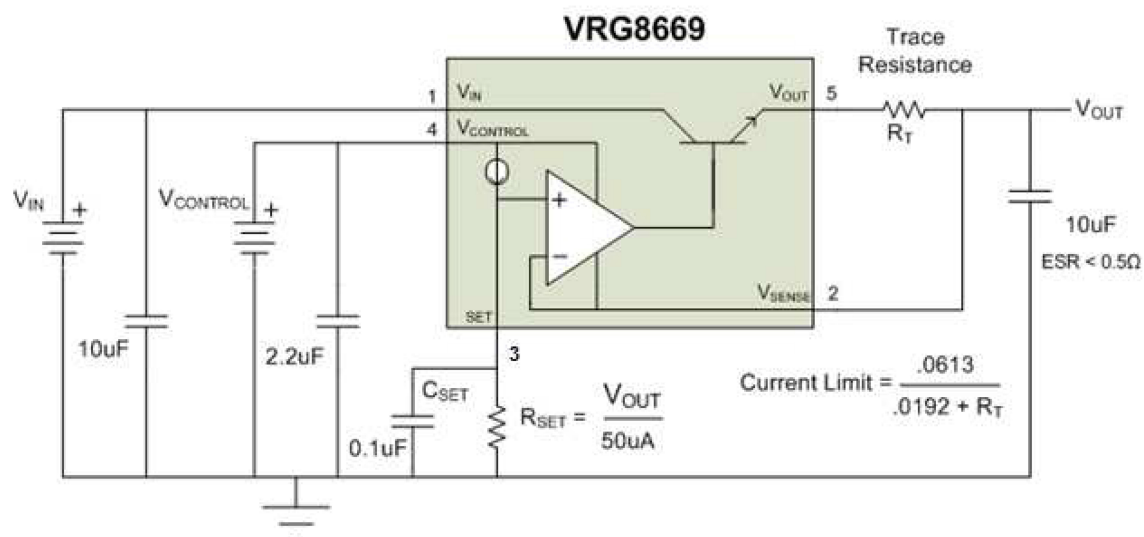


Figure 6 - Basic VRG8669 Adjustable Regulator Application

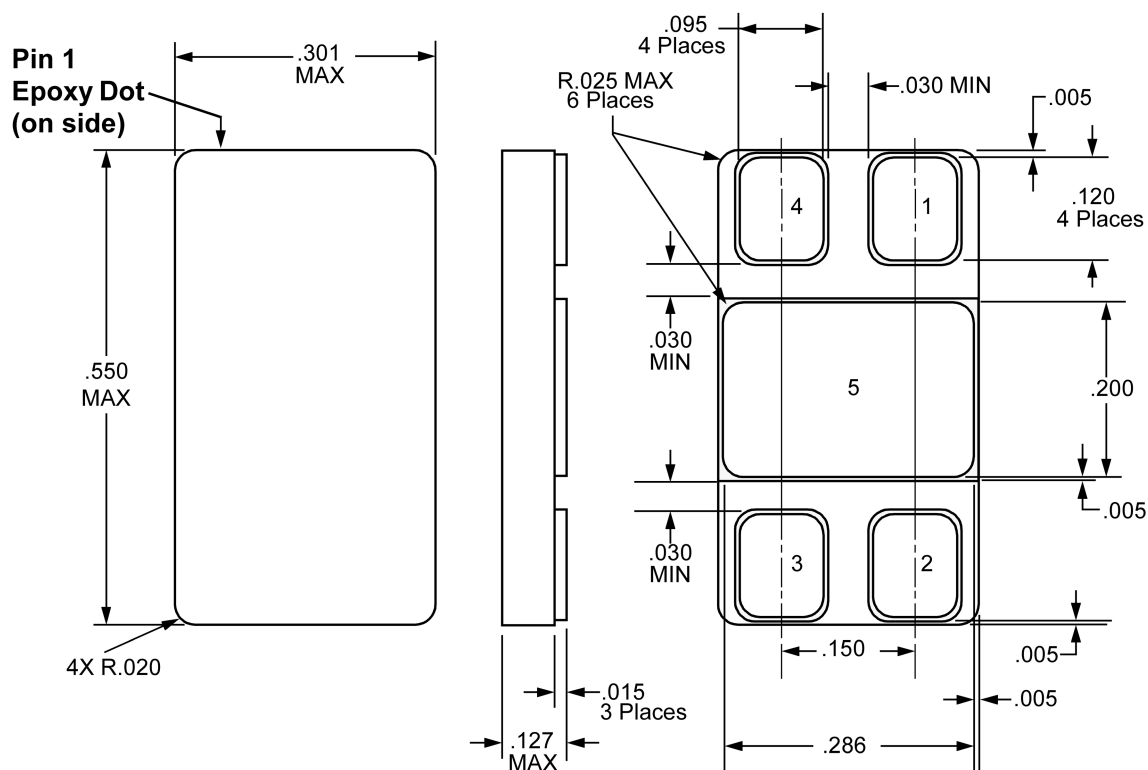


Figure 7 - Package Outline — Surface Mount

**Note:**

- 1) Package & Lid are electrically isolated from signal pads



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## 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 CAES format
06/21/2016	H	Add note 5/ 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.
11/2/2017	J	Change the heading from 'Released Datasheet' to 'Datasheet', Change the Features items to match LT publication for TID, ELDRS and Output, Revise the Absolute Max table, the Recommended table and the Electrical Performance Table to break out the irradiation conditions and apply the actual production test conditions. Update the Notes section.
02/18/2021	L	REVISED PER ECN 23515



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**Datasheet Definitions**

	DEFINITION
Advanced Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the datasheet <b>is subject to change</b> . Specifications can be <b>TBD</b> and the part package and pinout are <b>not final</b> .
Preliminary Datasheet	CAES reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

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