

# SCD8661

Adjustable Negative Voltage Regulator

# VRG8661

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## Features

- Manufactured using Linear Technologies Space Qualified RH137 die
- Radiation performance
  - Total dose:  $\geq 100$  krad(Si), Dose rate = 50-300 rad(Si)/s
  - ELDRS:  $\geq 50$  krad(Si), Dose rate = 0.01 rad(Si)/s
- Thermal shutdown
- Output voltage adjustable: -1.25V to -27V
- 3-Terminal
- Output current: 1.5A
- Voltage reference: -1.25V  $\pm$ 4%
- Load regulation: 1.0% max
- Line regulation: 0.05% max
- Ripple rejection: >66dB
- Packaging – Hermetic ceramic
  - SMD-0.5 Surface mount
  - 3 Pads, .400"L x .296"W x .120"Ht
  - Power package
  - Weight - 2 gm max
- Designed for aerospace and high reliability space applications
- **Radiation Hardness Assurance Plan: DLA Certified to MIL-PRF-38534, Appendix G.**

## Description

The VRG8661 consists of a Negative Adjustable (RH137) voltage regulator capable of supplying 1.5Amps over the output voltage range as defined under recommended operating conditions. The VRG8661 offers excellent line and load regulation specifications and ripple rejection. Dropout ( $V_{in} - V_{out}$ ) decreases at lower load currents.

The VRG8661 serves a wide variety of applications including High Efficiency Linear Regulators, Post Regulators for Switching Supplies, Constant Current Regulators, Battery Chargers and Microprocessor Supply.

The VRG8661 has been specifically designed to meet exposure to radiation environments and is configured for a SMD-0.5 SMT power package. It is guaranteed operational from -55°C to +125°C. Available screened to MIL-STD-883, the VRG8661 is ideal for demanding military and space applications.

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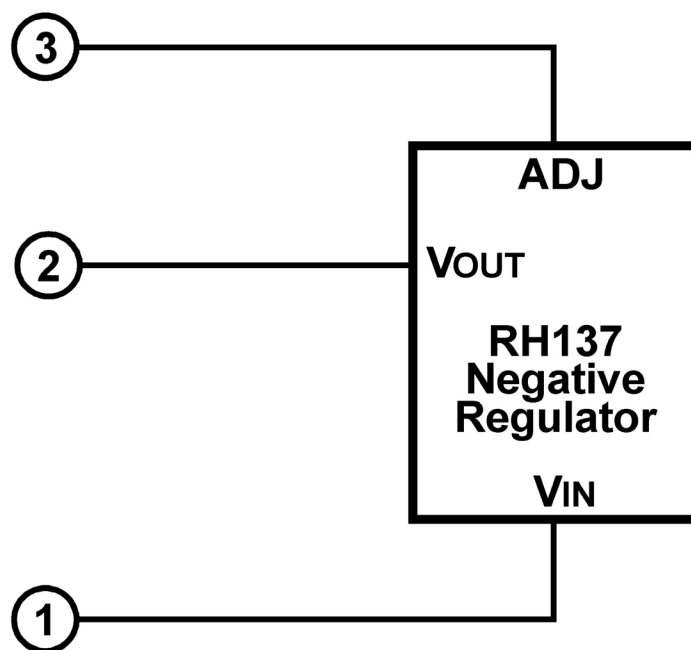


Figure 1 – Block Diagram / Schematic

## Absolute Maximum Ratings

Parameter	Range	Units
Lead temperature (soldering 10 Sec)	300	°C
Input-Output Voltage Differential	-30	V <sub>DC</sub>
ESD	2.000-3.999 <u>1/</u>	KV
Operating Junction Temperature Range	-55 to +150	°C
Storage Temperature Range	-65 to +150	°C

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
Output Voltage Range	-1.25 to -27	V <sub>DC</sub>
Case Operating Temperature Range	-55 to +125	°C

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## Electrical Performance Characteristics

Unless otherwise specified  $-55^{\circ}\text{C} \leq T_c \leq +125^{\circ}\text{C}$  &  $(V_{IN} - V_{OUT}) = -5\text{V}$ ,  $I_{OUT} = 0.5\text{A}$

Parameter	SYM	Conditions (P ≤ P <sub>MAX</sub> )	MIN	MAX	Units
Reference Voltage <u>1/</u> <u>5/</u>	V <sub>REF</sub>	$-3\text{V} \leq (V_{IN} - V_{OUT}) \leq V_{DIFF\ MAX}$ , $10\text{mA} \leq I_{OUT} \leq I_{MAX}$	-1.200	-1.300	V
Line Regulation <u>1/</u> <u>2/</u>	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$-3\text{V} \leq (V_{IN} - V_{OUT}) \leq -27\text{V}$ ,	-	0.05	%/V
Load Regulation <u>1/</u> <u>2/</u>	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$10\text{mA} \leq I_{OUT} \leq I_{MAX}$ , $V_{OUT} \leq -5\text{V}$	-	50	mV
		$10\text{mA} \leq I_{OUT} \leq I_{MAX}$ , $V_{OUT} \geq -5\text{V}$	-	1.0	%
Thermal Regulation		$I_{OUT} = 1.5\text{A}$ , $(V_{IN} - V_{OUT}) = -13.3\text{V}$ , 20ms Pulse, 20W, $T_c = +25^{\circ}\text{C}$	-	0.02	%/W
Ripple Rejection		$V_{OUT} = -10\text{V}$ , $f = 120\text{Hz}$ , $C_{ADJ} = 10\mu\text{F}$	66	-	dB
Adjustment Pin Current <u>1/</u>	I <sub>ADJ</sub>		-	100	μA
Adjustment Pin Current <u>1/</u> Change	ΔI <sub>ADJ</sub>	$10\text{mA} \leq I_{OUT} \leq I_{MAX}$ $-3\text{V} \leq (V_{IN} - V_{OUT}) \leq -27\text{V}$	-	5	μA
Minimum Load Current <u>1/</u> <u>3/</u>	I <sub>MIN</sub>	$(V_{IN} - V_{OUT}) = -27\text{V}$	-	5	mA
		$(V_{IN} - V_{OUT}) \leq -10\text{V}$	-	3	
Current Limit <u>1/</u> <u>4/</u>	I <sub>MAX</sub>	$(V_{IN} - V_{OUT}) \leq -15\text{V}$	1.5	-	A
		$(V_{IN} - V_{OUT}) = -27\text{V}$ , $T_c = +25^{\circ}\text{C}$	0.24	-	
Long Term Stability <u>3/</u>	$\frac{\Delta V_{OUT}}{\Delta T_{IME}}$	$T_A = +125^{\circ}\text{C}$	-	1	%
Thermal Resistance (Junction to Case) <u>3/</u>	θ <sub>JC</sub>		-	3	°C/W

**Notes:**

- 1) Specification derated to reflect Total Dose exposure to 100 krad(Si) @25°C.
- 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. Measurements taken at the output lead must be adjusted for lead resistance.
- 3) Not tested. Shall be guaranteed to the specified limits.
- 4) Pulsed @ <10% duty cycle @ 25°C.
- 5) Testing over 12 watts is not performed over + 25°C.

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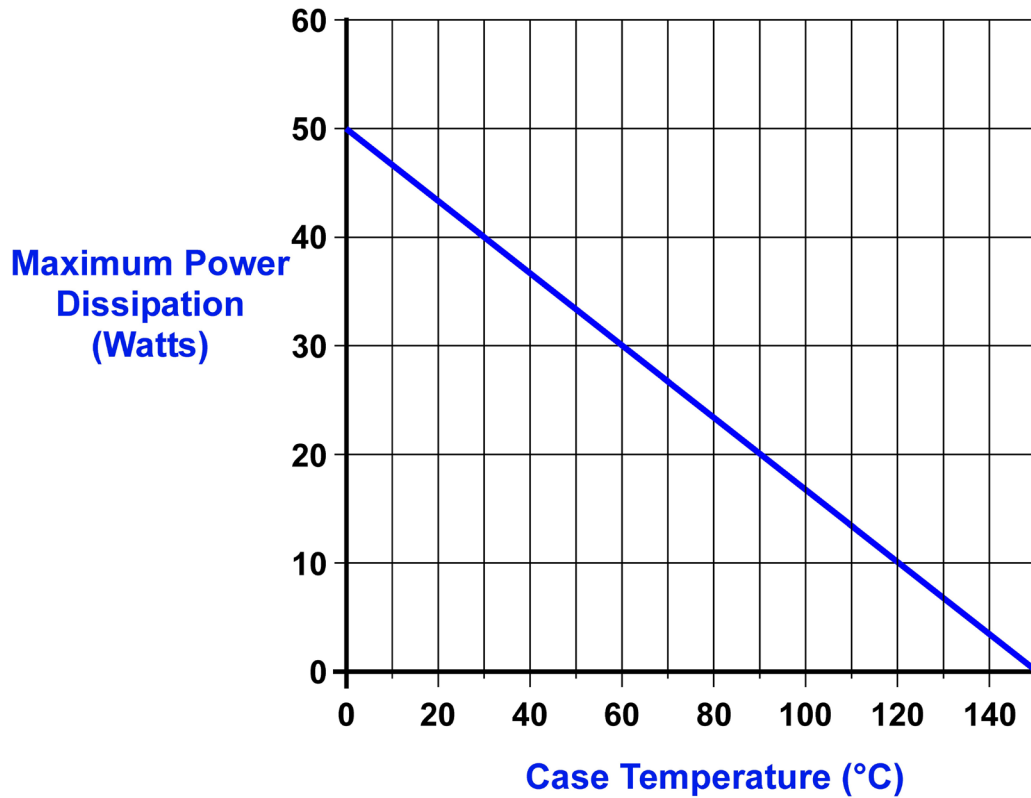


Figure 2 – Maximum Power vs Case Temperature

The maximum Power dissipation is limited by the thermal shutdown function of the regulator chip in the VRG8661. The graph above represents the achievable power before the chip shuts down. The line in the graph represents the maximum power dissipation of the VRG8661 This graph is based on the maximum junction temperature of 150°C and a thermal resistance ( $\theta_{JC}$ ) of 3°C/W.

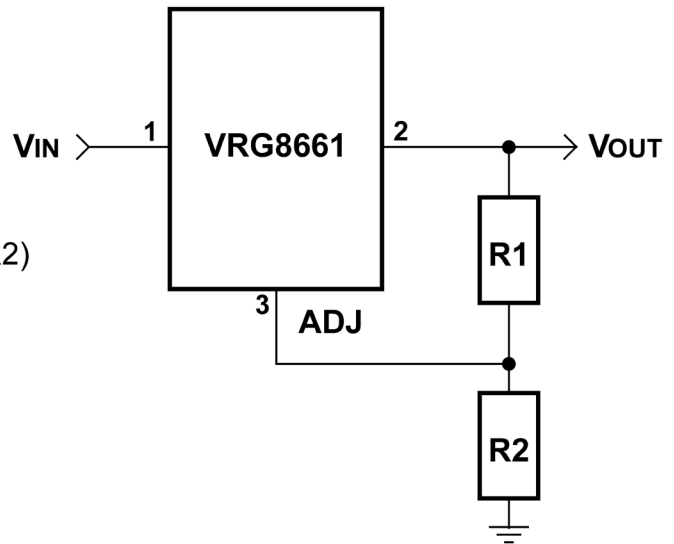
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$$V_{REF} = 1.25V, I_{ADJ} = 50\mu A$$

$$V_{OUT} = -V_{REF} (1 + R2/R1) + (-I_{ADJ} \times R2)$$



Adjustable Regulator  
Figure 3 – Typical Applications

## Current Limit

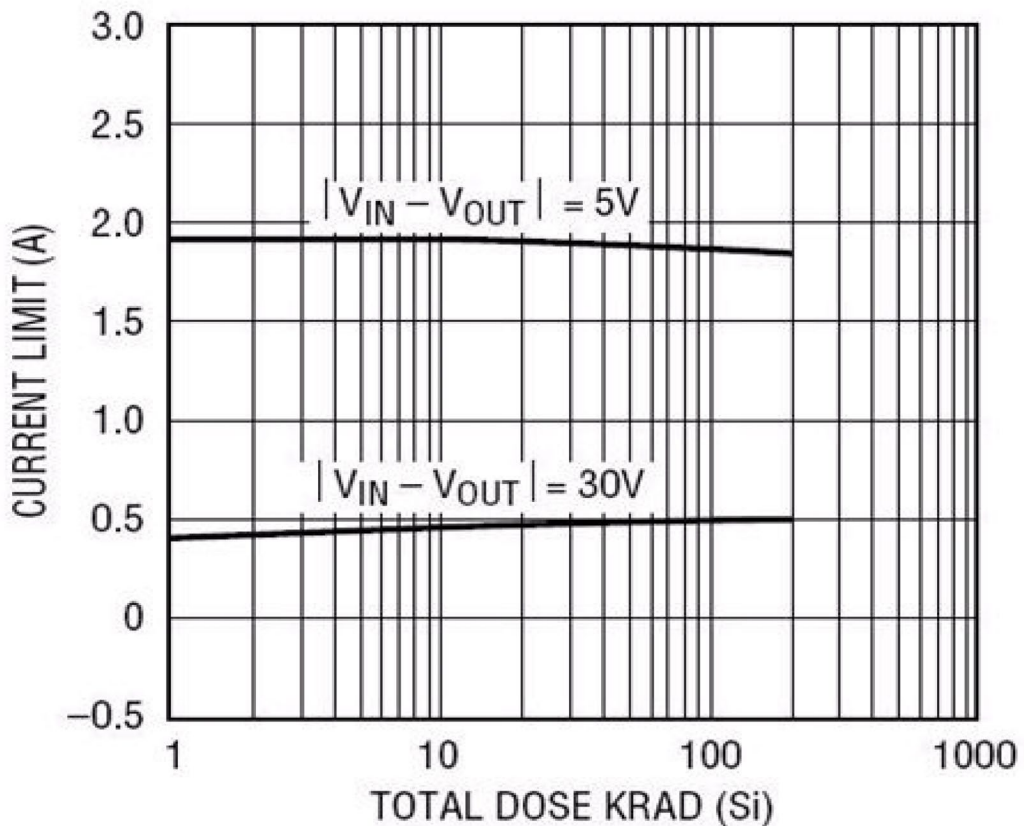


Figure 4 – Typical Current Limit

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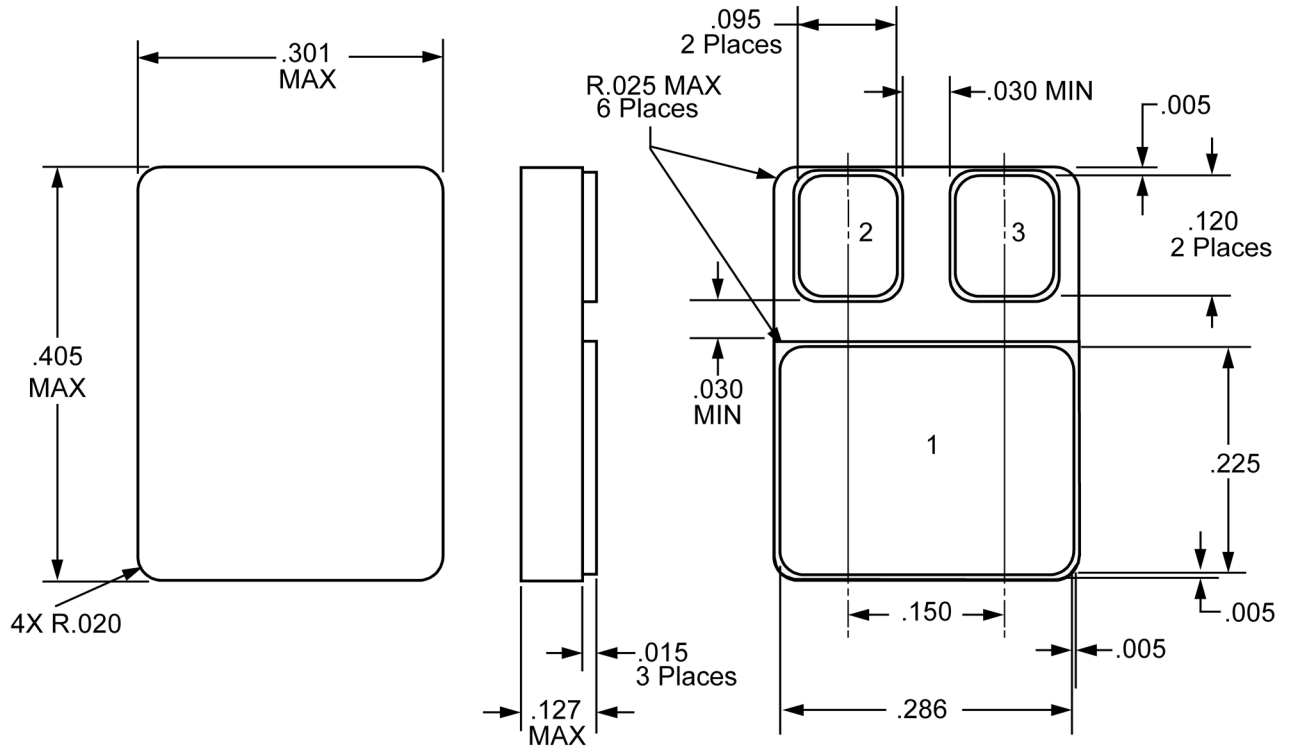


Figure 5 – Package Outline — Surface Mount

**Notes:**

- 1) Package & Lid are electrically isolated from signal pads.
- 2) ESD symbol denotes Pin 1.

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## Ordering Information

Model	DLA SMD #	Screening	Package
VRG8661-7	-	Commercial Flow, +25°C testing only	SMD-0.5 Power Pkg
VRG8661-S	-	Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications	
VRG8661-201-1S	5962-0920602KXC	In accordance with DLA SMD	
VRG8661-201-2S	5962-0920602KXA		
VRG8661-901-1S	5962R0920602KXC	In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100 krad(Si)	
VRG8661-901-2S	5962R0920602KXA		

## Revision History

Date	Revision	Change Description
03/24/2016	G	Import into CAES format
03/26/2021	J	Revised per ECN 23566.



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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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