**Standard Products**

# VRG8660
# Adjustable Regulator Positive Voltage Radiation Tolerant

**www.aeroflex.com/voltreg**

**April 12, 2012**


## FEATURES

- Manufactured using LINEAR TECHNOLOGY Space Qualified RH117 die
- Radiation performance
  - Total dose: ≥100 krads(Si), Dose rate = 50 - 300 rads(Si)/s
  - ELDRS: ≥ 50 krads(Si), Dose rate = 0.01 rads(Si)/s
- Thermal shutdown
- Output voltage adjustable: 1.25V to 37V
- 3-Terminal
- Output current: 1.5A
- Voltage reference: 1.25V ±4%
- Load regulation: 1.9% max
- Line regulation: 0.06%/V 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

- **Aeroflex Plainview's Radiation Hardness Assurance Plan is DLA Certified to MIL-PRF-38534, Appendix G.**

## DESCRIPTION

The Aeroflex Plainview VRG8660 consists of a Positive Adjustable (RH117) voltage regulator capable of supplying 1.5Amps over the output voltage range as defined under recommended operating conditions. The VRG8660 offers excellent line and load regulation specifications and ripple rejection. The VRG8660 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 VRG8660 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 VRG8660 is ideal for demanding military and space applications.

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

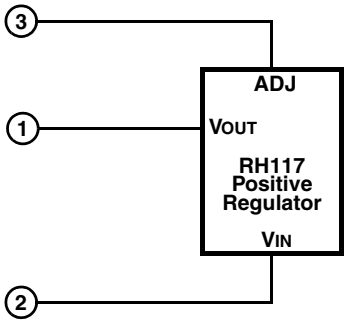



**FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC**

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | RANGE | UNITS |
|---|---|---|
| Lead temperature (soldering 10 Sec)DC | 300 | °C |
| Input-Output Voltage Differential | 40 | $V_{DC}$ |
| ESD | 1.999 1/ | 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 1C.
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

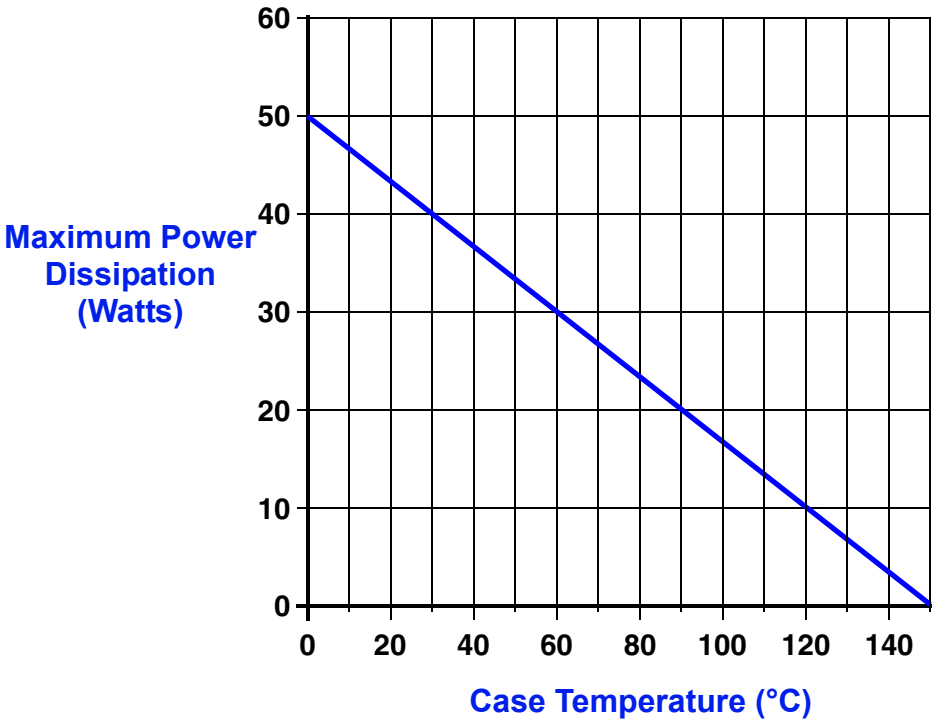
| PARAMETER | RANGE | UNITS |
|---|---|---|
| Output Voltage Range | 1.25 to 37 | $V_{DC}$ |
| Case Operating Temperature Range | -55 to +125 | °C |

## ELECTRICAL PERFORMANCE CHARACTERISTICS

**Unless otherwise specified -55°C ≤ $T_C$ ≤ +125°C & ($V_{IN}$-$V_{OUT}$) = 5V, $I_{OUT}$ = 0.5A**

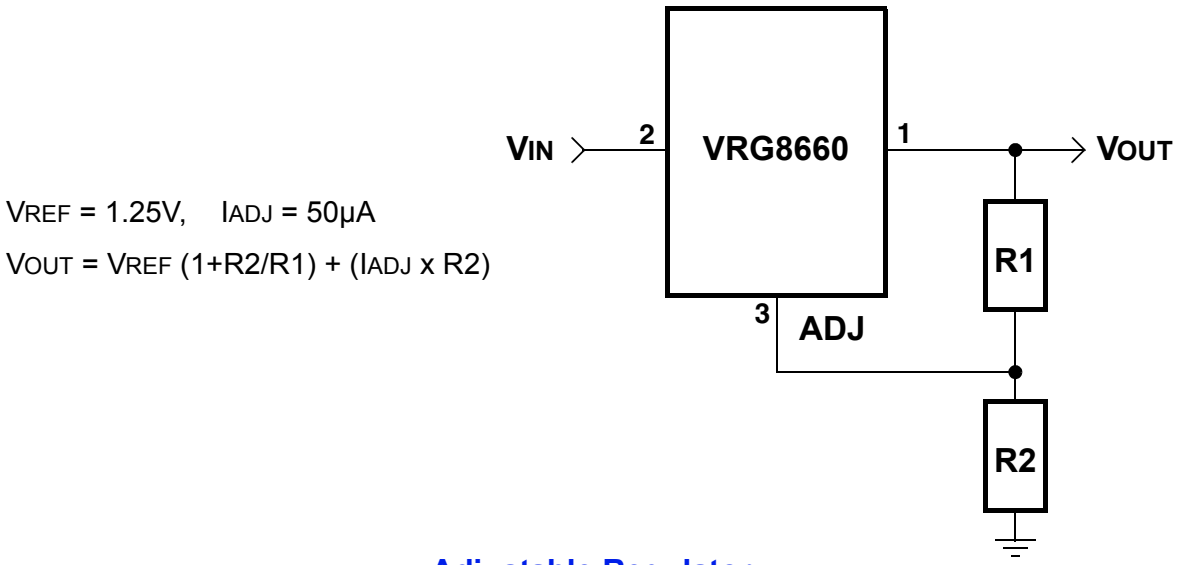
| PARAMETER | SYM | CONDITIONS ($P \leq P_{MAX}$) | MIN | MAX | UNITS |
|---|---|---|---|---|---|
| Reference Voltage 1/ 5/ | $V_{REF}$ | 3V ≤ ($V_{IN}$ - $V_{OUT}$) ≤ $V_{DIFF\ MAX}$, 10mA ≤ $I_{OUT}$ ≤ $I_{MAX}$ | 1.20 | 1.30 | V |
| Line Regulation 1/ 2/ | $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ | 3V ≤ ($V_{IN}$ - $V_{OUT}$) ≤ $V_{DIFF\ MAX}$, $I_{OUT}$ = 10mA | - | 0.06 | %/V |
| Load Regulation 1/ 2/ | $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ | 10mA ≤ $I_{OUT}$ ≤ $I_{MAX}$, $V_{OUT}$ ≤ 5V | - | 60 | mV |
| | | 10mA ≤ $I_{OUT}$ ≤ $I_{MAX}$, $V_{OUT}$ ≥ 5V | - | 1.2 | % |
| Thermal Regulation | - | $I_{OUT}$ = 1.5A, ($V_{IN}$ - $V_{OUT}$) = 13.3V, 20ms Pulse, 20W, $T_C$ = +25°C | - | 0.07 | %/W |
| Ripple Rejection Ratio | - | $V_{OUT}$ = 10V, f = 120Hz, $C_{ADJ}$ = 10µF | 66 | - | dB |
| Adjustment Pin Current 1/ | $I_{ADJ}$ | - | - | 100 | µA |
| Adjustment Pin Current Change 1/ | $\Delta I_{ADJ}$ | 10mA ≤ $I_{OUT}$ ≤ $I_{MAX}$ | - | 5 | µA |
| | | 3V ≤ ($V_{IN}$ - $V_{OUT}$) ≤ 40V, | | | |
| Minimum Load Current 1/ 3/ | $I_{MIN}$ | ($V_{IN}$ - $V_{OUT}$) = 40V | - | 5 | mA |
| Current Limit 1/ 4/ | $I_{MAX}$ | ($V_{IN}$ - $V_{OUT}$) ≤ 15V | 1.50 | - | A |
| | | ($V_{IN}$ - $V_{OUT}$) = 40V, $T_C$ = +25°C | 0.30 | - | |
| Long Term Stability 3/ | $\frac{\Delta V_{OUT}}{\Delta Time}$ | $T_A$ = +125°C | - | 1 | % |
| Thermal Resistance (Junction to Case) 3/ | $\Theta_{JC}$ | - | - | 3 | °C/W |

Notes:
1/ Specification derated to reflect Total Dose exposure to 100Krad (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 at <10% duty cycle @ 25°C.
5/ Testing over 12 watts is not performed over + 25°C.




The maximum Power dissipation is limited by the thermal shutdown function of the regulator chip in the VRG8660. The graph above represents the achievable power before the chip shuts down. The line in the graph represents the maximum power dissipation of the VRG8660 This graph is based on the maximum junction temperature of 150°C and a thermal resistance ($\Theta_{JC}$) of 3°C/W.

**FIGURE 2 – MAXIMUM POWER vs CASE TEMPERATURE**




$V_{REF}$ = 1.25V, $I_{ADJ}$ = 50µA

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

**Adjustable Regulator**

**FIGURE 3 - TYPICAL APPLICATIONS**

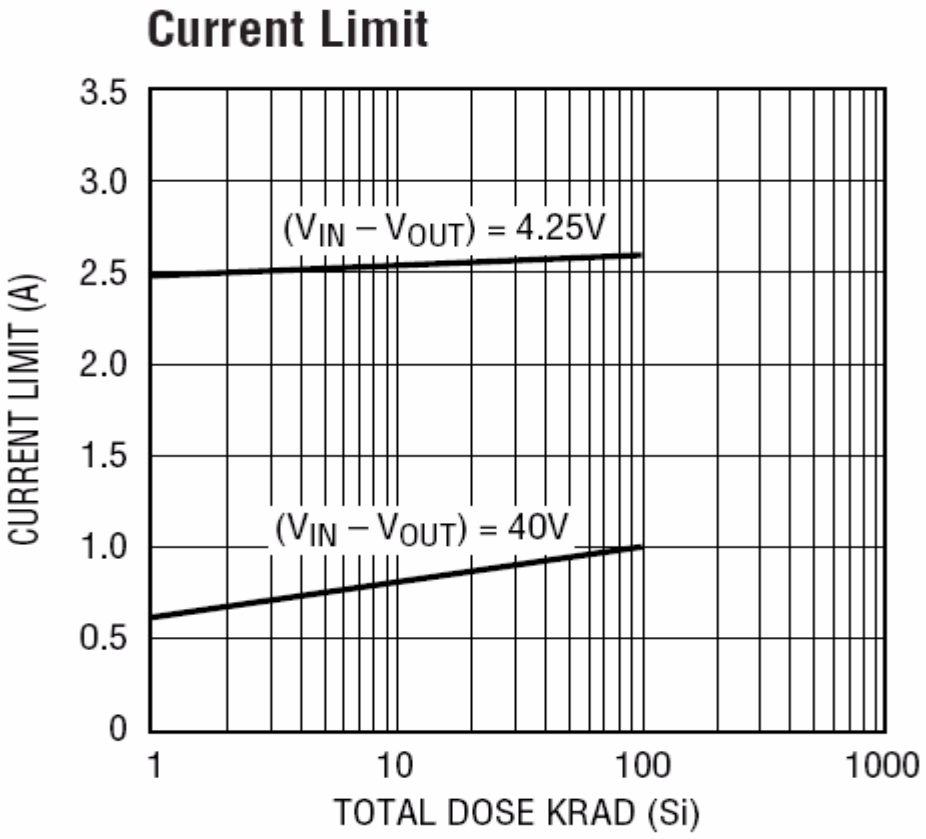
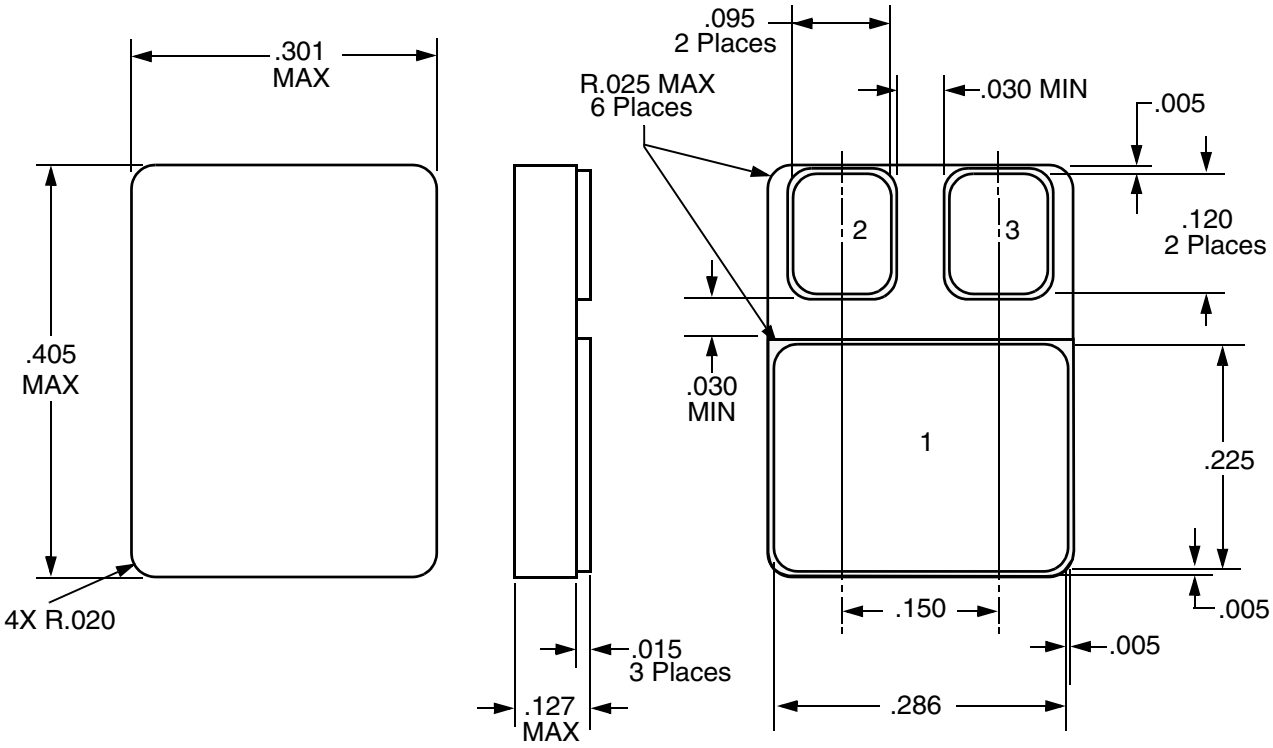



**FIGURE 4 - TYPICAL CURRENT LIMIT**




NOTE: 1. Package And Lid are electrically isolated from signal pads

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**FIGURE 5 – PACKAGE OUTLINE– SURFACE MOUNT**

## ORDERING INFORMATION

| MODEL | DLA SMD # | SCREENING | PACKAGE |
|---|---|---|---|
| VRG8660-7 | - | Commercial Flow, +25°C testing only | SMD-0.5 Power Pkg |
| VRG8660-S | - | Military Temperature, -55°C to +125°C Screened in accordance with the individual Test Methods of MIL-STD-883 for Space Applications | |
| VRG8660-201-1S | 5962-0920601KXC | In accordance with DLA SMD | |
| VRG8660-201-2S | 5962-0920601KXA | | |
| VRG8660-901-1S | 5962R0920601KXC | In accordance with DLA Certified RHA Program Plan to RHA Level "R", 100krads(Si) | |
| VRG8660-901-2S | 5962R0920601KXA | | |

For detailed performance characteristic curves, applications information and typical applications see the latest LINEAR TECHNOLOGY datasheet for their RH117, which is available on-line at www.linear.com.

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