

Standard Products  
**VRG8691/92**  
**Adjustable 7.5A Positive LDO Regulator**  
**Radiation Tolerant**

[www.aeroflex.com/voltreg](http://www.aeroflex.com/voltreg)

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**FEATURES**

- ❑ Radiation performance
  - Total dose: 100 krad(Si),  
Dose rate = 50 - 300 rad(Si)/s
- ❑ Output voltage adjustable: 1.0V to 3.3V
- ❑ Output current: 7.5A
- ❑ Dropout voltage: 0.8V at 7.5Amps
- ❑ Voltage reference: 1.0V  $\pm$ 0.5%
- ❑ Load regulation: 0.5% max
- ❑ Line regulation: 0.2% max
- ❑ Ripple rejection: >66dB
- ❑ Enable Input
- ❑ Slow-Start capability
- ❑ Packaging – Hermetic metal
  - Thru-hole or Surface mount
  - 12 Leads, 1.0"W x .9"L x .250"Ht
  - Power package
  - Weight - TBD gm max
- ❑ Designed for aerospace and high reliability space applications
- ❑ DSCC SMD 5962-09237 Pending

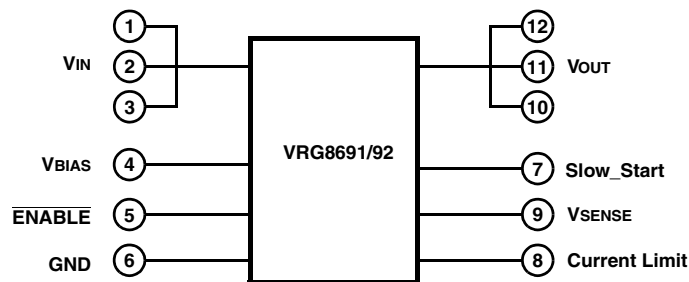
*NOTE: Aeroflex Plainview does not currently have a DSCC certified Radiation Hardened Assurance Program*

**DESCRIPTION**

The Aeroflex Plainview VRG8691/92 is capable of supplying in excess of 7.5Amps over the output voltage range as defined under recommended operating conditions. The regulator is exceptionally easy to set-up, requiring only 2 external resistors to set the output voltage. The module design has been optimized for excellent regulation and low drop-out voltage.

Further, the VRG8691/92 features internal current limiting making them virtually blowout-proof against overloads. The limit is nominally 11.5A, but may be increased or decreased with the addition of one more external resistor. Figure 2 illustrates setting voltage and current limits as well as choosing a slow-start capacitor. The VRG8691/92 serves a wide variety of applications including local on-card regulation, programmable output voltage regulation or precision current regulation.

The VRG8691/92 has been specifically designed to meet exposure to radiation environments. The VRG8691 is configured for a Thru-Hole 12 lead metal power package and the VRG8692 is configured for a Surface Mount 12 lead metal power package. It is guaranteed operational from -55°C to +125°C. Available screened to MIL-STD-883, the VRG8691/92 is ideal for demanding military and space applications.



**FIGURE 1 – BLOCK DIAGRAM / SCHEMATIC**

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	RANGE	UNITS
Operating (Junction) Temperature Range	-55 to +150	°C
Lead Temperature (soldering, 10 sec)	300	°C
Storage Temperature Range	-65 to +150	°C
VBIAS, VIN	7	V
Thermal Resistance (Junction to case $\Theta_{JC}$ )	1	°C/W
ESD Rating	TBD <sup>1/</sup>	KV
Power	25 <sup>2/</sup>	W

<sup>1/</sup> Meets ESD testing per MIL-STD-883, method 3015, Class TBD.

<sup>2/</sup> Based on pass transistor limitations of  $(V_{IN} - V_O) \times I_O$  and  $\Theta_{JC} \leq 1^\circ\text{C/W}$  with  $25^\circ\text{C}$  max  $T_J$  rise and  $T_C = +125^\circ\text{C}$ .

NOTICE: Stresses above those listed under "Absolute Maximums Rating" may cause permanent damage to the device. These are stress ratings 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	1.0 to 3.3	V <sub>DC</sub>
Case Operating Temperature Range	-55 to +125	°C
Output Current	0 to 7.5	A
VBIAS	3.3 to 5.5 <sup>1/</sup>	V <sub>DC</sub>
VIN	1.8 to 5.5	V <sub>DC</sub>

<sup>1/</sup> VBIAS must maintain a level equal or above VIN but not fall below 3.3V

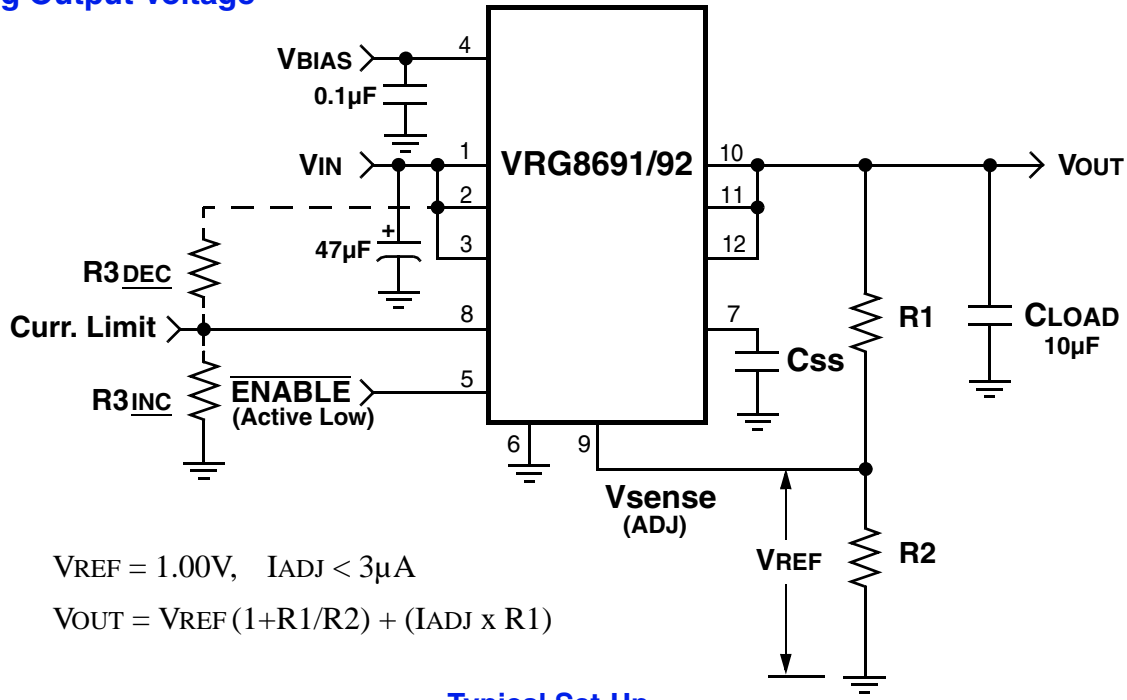
## ELECTRICAL PERFORMANCE CHARACTERISTICS <sup>1/</sup>

PARAMETER	SYM	CONDITIONS	MIN	MAX	UNITS
Reference Voltage	VREF	$V_{IN} = V_{BIAS} = 5V, \overline{EN} = 0, I_{OUT} = 7.5A$	0.995	1.005	V
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$4V \leq V_{IN} \leq 5V$	-	0.2	%/V
Load Regulation	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$0A \leq I_{OUT} \leq 7.5A$	-	0.5	%
Ripple Rejection Ratio		$f = 120\text{Hz}, C_{LOAD} = 47\mu\text{F}$	66	-	dB
Dropout Voltage	V <sub>DROP</sub>	$\Delta V_{OUT} = 1\%$	-	0.8	V
Adjustment Pin Current	I <sub>ADJ</sub>		-	3	μA
Minimum Load Current	I <sub>MIN</sub>		-	0	mA
Current Limit <sup>3/</sup>	I <sub>CL</sub>		9.5	13.5	A
Long Term Stability <sup>2/</sup>	$\frac{\Delta V_{OUT}}{\Delta \text{TIME}}$		-	1	%
Supply Current (VBIAS)	I <sub>BIAS</sub>		-	15	mA
Thermal Resistance (Junction to Case)	$\Theta_{JC}$		-	1	°C/W

Notes:

- Unless otherwise specified, these specifications apply for post radiation:  $V_{BIAS} = V_{IN} = 5V, V_{OUT} = 3.3V, I_{OUT} = 7.5A$  and  $-55^\circ\text{C} < T_c < +125^\circ\text{C}$ .
- Not tested. Shall be guaranteed to the specified limits after 1000hr life test.
- Current limit is adjustable as shown in Figure 2.

## Setting Output Voltage



### Typical Set-Up

## Setting Current Limit (ICL)

$$I_{CL\ NOM} = \frac{75 \times V_{IN}}{33} \frac{1}{\underline{R3}_{INC}}$$

To increase or decrease ICL:

$\underline{R3}_{INC}$  Increases ICL

$\underline{R3}_{DEC}$  Decreases ICL

Example

To increase ICL by  $\Delta+$

$$\underline{R3}_{INC} = \frac{75 \times V_{IN}}{\Delta+}$$

$$I_{CL} \cong I_{CL\ NOM} + \frac{75 \times V_{IN}}{\underline{R3}_{INC}}$$

or

$$I_{CL} \cong I_{CL\ NOM} - \frac{25 \times V_{IN}}{\underline{R3}_{DEC}}$$

Example

To decrease ICL by  $\Delta-$

$$\underline{R3}_{DEC} = \frac{25 \times V_{IN}}{\Delta-}$$

$V_{IN}$	$I_{CL\ NOM}$
5V	11.5A
3.3V	7.5A
2.5V	5.7A
1.8V	4.1A

Note:  $\underline{R3}_{XXX}$   
in KOHMS

## Application of Slow-Start Capacitor, CSS

A. CSS is effective only when VIN is ON prior to VBIAS or  $\overline{ENABLE}$ , i.e., VIN must be applied first, then VBIAS and ENABLE in any order including simultaneously.

B. CSS must be used when the load includes very large total capacitance (CLOAD).

$$\frac{C_{SS}}{C_{LOAD}} > \frac{V_{OUT\ NOM}}{I_{CL} - I_{LOAD\ NOM}} \times \frac{0.4 \times V_{BIAS}}{1300}$$

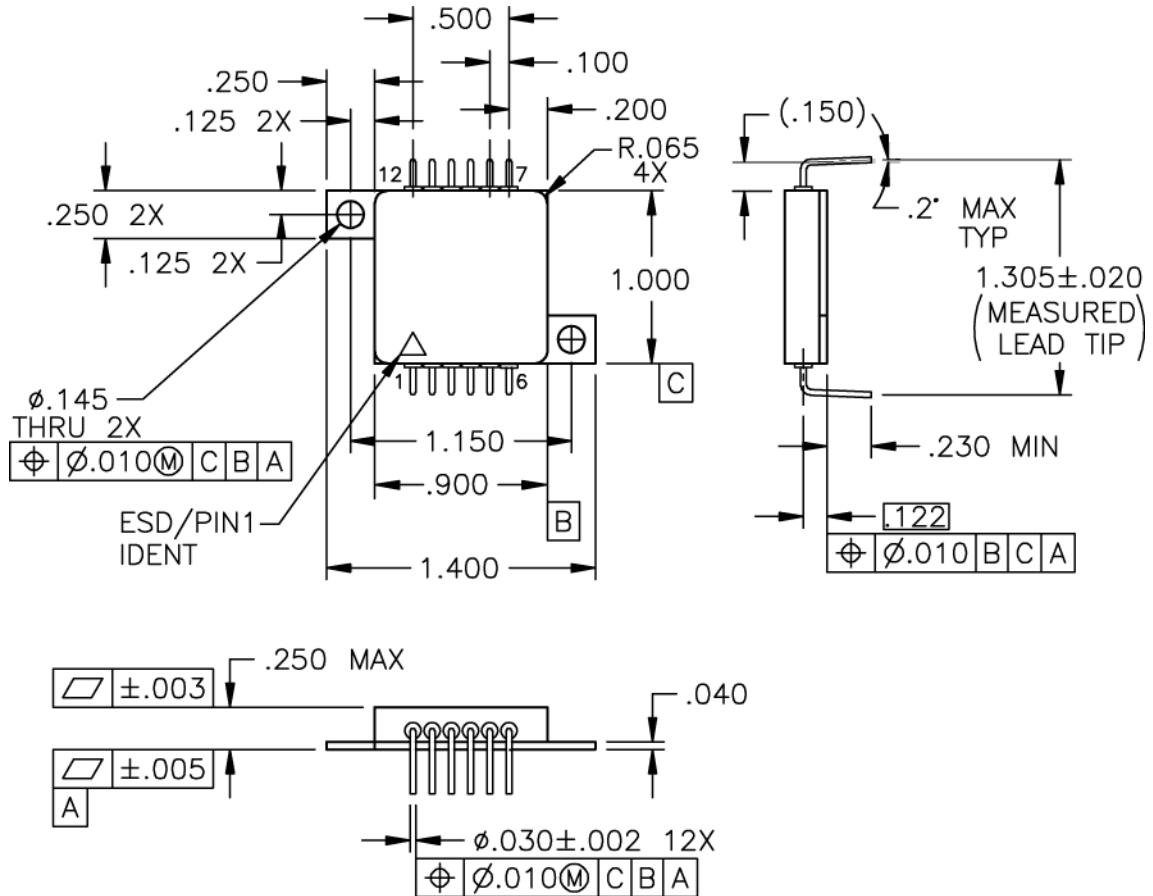
C. CSS may be used just to control VOUT RISE TIME (TR), when CLOAD is not an issue.

$$TR = C_{SS} \times 1300 \times \ln \left( \frac{V_{BIAS}}{V_{BIAS} - 2.5} \right) \quad \text{Note: } C_{SS} \text{ in Farads and } TR \text{ in seconds}$$

FIGURE 2 – TYPICAL APPLICATIONS AND NOTES

## PIN NUMBERS vs FUNCTION

PIN	FUNCTION	PIN	FUNCTION
1	VIN	7	Slow_Start
2	VIN	8	Current Limit
3	VIN	9	VSENSE
4	VBIAS	10	VOUT
5	$\overline{\text{ENABLE}}$	11	VOUT
6	GROUND	12	VOUT



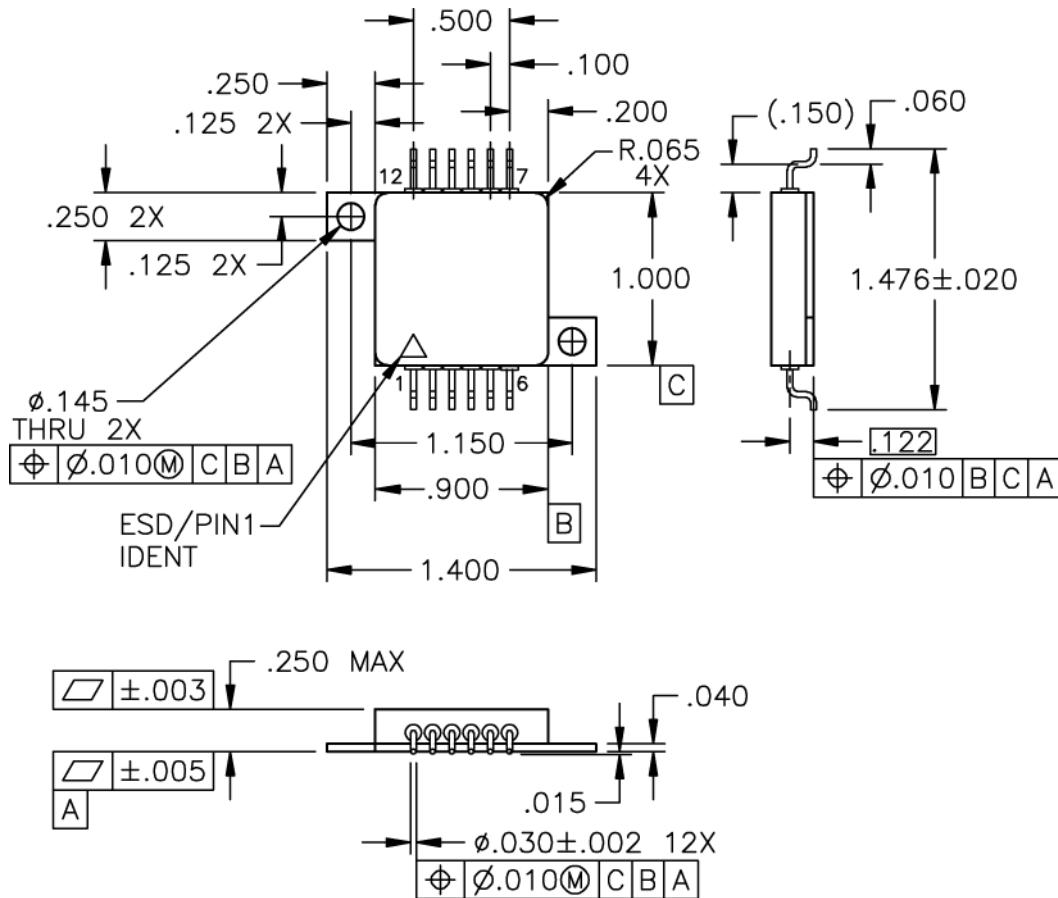
**Notes:**

1. Dimension Tolerance:  $\pm .005$  inches
2. Package contains BeO substrate
3. Case electrically isolated

**FIGURE 3 – PACKAGE OUTLINE — VRG8691 THRU-HOLE POWER PACKAGE**

## PIN NUMBERS vs FUNCTION

PIN	FUNCTION	PIN	FUNCTION
1	V <sub>IN</sub>	7	Slow_Start
2	V <sub>IN</sub>	8	Current Limit
3	V <sub>IN</sub>	9	V <sub>SENSE</sub>
4	V <sub>BIAS</sub>	10	V <sub>OUT</sub>
5	$\overline{\text{ENABLE}}$	11	V <sub>OUT</sub>
6	GROUND	12	V <sub>OUT</sub>



**Notes:**

1. Dimension Tolerance:  $\pm .005$  inches
2. Package contains BeO substrate
3. Case electrically isolated

**FIGURE 4 – PACKAGE OUTLINE — VRG8692 SURFACE MOUNT POWER PACKAGE**

## ORDERING INFORMATION

MODEL	DSCC SMD #	SCREENING	PACKAGE
VRG8691-S	-	Military Temperature, -55°C to +125°C Screened in accordance with MIL-PRF-38534, Class K	12 Lead Thru-Hole Power Pkg
VRG8691-7	-	Commercial Flow, +25°C testing only	
VRG8692-S	-	Military Temperature, -55°C to +125°C Screened in accordance with MIL-PRF-38534, Class K	12 Lead Surface Mount Power Pkg
VRG8692-7	-	Commercial Flow, +25°C testing only	
VRG8691-201-1S VRG8691-201-2S	5962-0923701KXC 5962-0923701KXA	In accordance with DSCC SMD	12 Lead Thru-Hole Power Pkg
VRG8692-201-1S VRG8692-201-2S	5962-0923701KYC 5962-0923701KYA	In accordance with DSCC SMD	12 Lead Surface Mount Power Pkg

### EXPORT CONTROL:

*This product is controlled for export under the International Traffic in Arms Regulations (ITAR). A license from the U.S. Department of State is required prior to the export of this product from the United States.*

### EXPORT WARNING:

*Aeroflex's military and space products are controlled for export under the International Traffic in Arms Regulations (ITAR) and may not be sold or proposed or offered for sale to certain countries. (See ITAR 126.1 for complete information.)*

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