



**THE DATASHEET OF  
SGR117AIG-883B**



# Rad Hard 1.5 Amp Three Terminal Adjustable Voltage Regulator

## Description

The RAD HARD SGR117A 3-terminal positive adjustable regulators have been designed to meet the most stringent space and strategic level radiation requirements while meeting the industry standard LM117A and LM117 electrical specifications.

In addition to the features of the standard SGR117A, these devices are capable of meeting the attached data sheet electricals after the following radiation events:

TOTAL DOSE.....300 k RAD  
 NEUTRON FLUENCE..... $5 \times 10^{12}$  N/cm<sup>2</sup>

## Features

- Full Electrical Performance After Radiation  
 Exposure 300 k Rad Total Dose  $5 \times 10^{12}$  N/cm<sup>2</sup>
- 1% Output Voltage Tolerance
- 0.01%/V Line Regulation
- 0.3% Load Regulation
- Min. 1.5 A Output Current
- Available in TO-257 Package (Hermetic TO-220)

## High Reliability Features

- Available to MIL-STD-883, ¶ 1.2.1
- Radiation Data Available
- MSC-AMS level "S" Processing Available

## Block Diagram

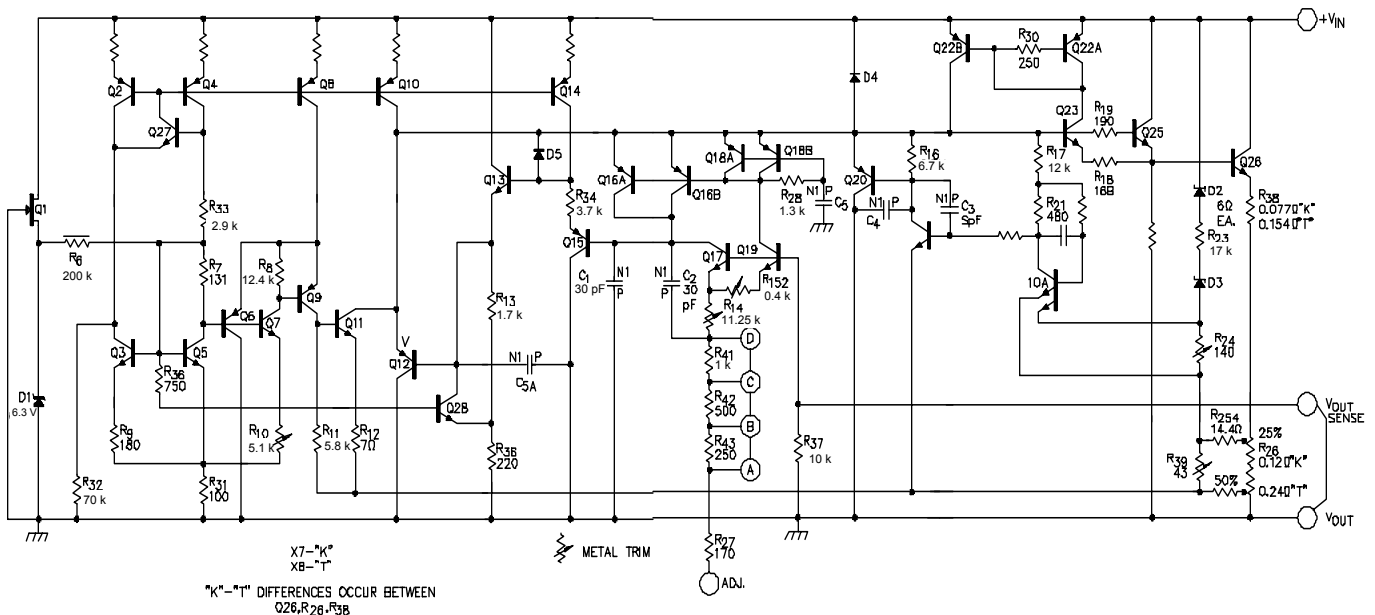


Figure 1 • Block Diagram

## Absolute Maximum Ratings (Note 1)

Power Dissipation ..... Internally Limited  
 Input to Output Voltage Differential ..... 40 V  
 Storage Temperature Range ..... -65°C to 150°C

Operating Junction Temperature  
 Hermetic (K, T, IG-Packages) ..... 150°C  
 Lead Temperature (Soldering, 10 Seconds) ..... 300°C

Note 1. Exceeding these ratings could cause damage to the device.

## Thermal Data

K Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 3.0°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 35°C/W

T Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 15°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 120°C/W

IG Package:

Thermal Resistance-Junction to Case,  $\theta_{JC}$  ..... 3.5°C/W  
 Thermal Resistance-Junction to Ambient,  $\theta_{JA}$  ..... 42°C/W

Note A. Junction Temperature Calculation:  $T_J = T_A + (P_D \times \theta_{JA})$ .

Note B. The above numbers for  $\theta_{JC}$  are maximums for the limiting thermal resistance of the package in a standard mounting configuration. The  $\theta_{JA}$  numbers are meant to be guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

## Recommended Operating Conditions (Note 2 & 3)

Input Voltage Range ..... ( $V_{OUT} + 3.5 V$ ) to 37 V

Operating Junction Temperature Range

SGR117A ..... -55°C to 150°C

Note 2. Range over which the device is functional.

Note 3. These ratings are applicable for junction temperatures of less than 150°C.

## Electrical Characteristics

(Unless otherwise specified, these specifications apply over full operating ambient temperatures for SGR117A with  $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ ,  $V_{IN} - V_{OUT} = 5.0 V$ , and for  $I_{OUT} = 500 \text{ mA}$  (K and IG), and  $I_{OUT} = 100 \text{ mA}$  (T package). Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2 W for the T package, and 20 W for the K and IG packages.  $I_{MAX}$  is 1.5 A for the K and IG packages and 500 mA for the T package. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

Parameter	Test Conditions	PRE RAD			POST NEUTRON			Units
		SGR117A			SGR117A			
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Reference Voltage	$I_{OUT} = 10 \text{ mA}$ , $T_A = 25^\circ\text{C}$ $3 V \leq (V_{IN} - V_{OUT}) \leq 40 V$ , $P \leq P_{MAX}$	1.238	1.250	1.262	1.220		1.275	V
	$10 \text{ mA} \leq I_{OUT} \leq I_{MAX}$	1.225	1.250	1.270	1.220	1.25	1.275	V
Line Regulation (Note 4)	$3 V \leq (V_{IN} - V_{OUT}) \leq 40 V$ , $I_L = 10 \text{ mA}$ $T_A = 25^\circ\text{C}$		0.005	0.01		0.01	0.03	%/V
	$T_A = T_{MIN}$ to $T_{MAX}$		0.01	0.02		0.02	0.05	%/V
Load Regulation (Note 4)	$10 \text{ mA} \leq I_{OUT} \leq I_{MAX}$ $V_{OUT} \leq 5 V$ , $T_A = 25^\circ\text{C}$		5	15		5	50	mV
	$V_{OUT} \geq 5 V$ , $T_A = 25^\circ\text{C}$		0.1	0.3		0.1	1	%
	$V_{OUT} \leq 5 V$		20	50		20	50	mV
	$V_{OUT} \geq 5 V$		0.3	1		0.3	1	%
Thermal Regulation (Note 5)	$T_A = 25^\circ\text{C}$ , 20 ms pulse		0.002	0.02		0.03	0.07	%/W
Ripple Rejection	$V_{OUT} = 10 V$ , $f = 120 \text{ Hz}$ $C_{ADJ} = 1 \mu\text{F}$ , $T_A = 25^\circ\text{C}$		65			65		dB
	$C_{ADJ} = 10 \mu\text{F}$	66	80		66	80		dB
Adjust Pin Current			50	100		50	100	$\mu\text{A}$
Adjust Pin Current Change	$10 \text{ mA} \leq I_{OUT} \leq I_{MAX}$ , $2.5 V \leq (V_{IN} - V_{OUT}) \leq 40 V$		0.2	5		0.2	8	$\mu\text{A}$

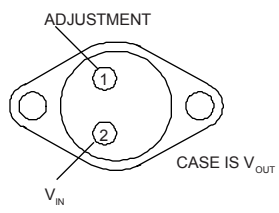
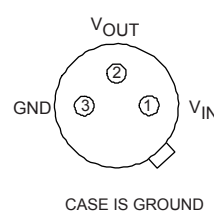
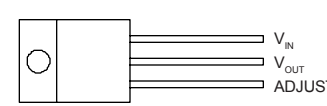
## Electrical Characteristics (Continued)

Parameter	Test Conditions	PRE RAD			POST NEUTRON			Units
		SGR117A			SGR117A			
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Minimum Load Current	$(V_{IN} - V_{OUT}) = 40\text{ V}$		3.5	5		3.5	8	mA
Current Limit	$(V_{IN} - V_{OUT}) \leq 15\text{ V}$							
	K, IG Packages	1.5	2.2		1.5	2.2		A
	T Package	0.5	0.8		0.5	0.8		A
	$(V_{IN} - V_{OUT}) = 40\text{ V}, T_J = 25^\circ\text{C}$							
	K, IG Packages	0.3	0.4		0.3	0.4		A
	T Package	0.15	0.2		0.15	0.2		A
Temperature Stability (Note 5)			1	2				%
Long Term Stability (Note 5)	$T_A = 125^\circ\text{C}, 1000\text{ Hours}$		0.3	1				%
RMS Output Noise (% of $V_{OUT}$ )	$T_A = 25^\circ\text{C}, 10\text{ Hz} \leq f \leq 10\text{ kHz}$ (Note 5)		0.001					%

Note 4. Regulation is measured at 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.

Note 5. These parameters, although guaranteed, are not tested in production.

## Connection Diagrams and Ordering Information (See Notes Below)

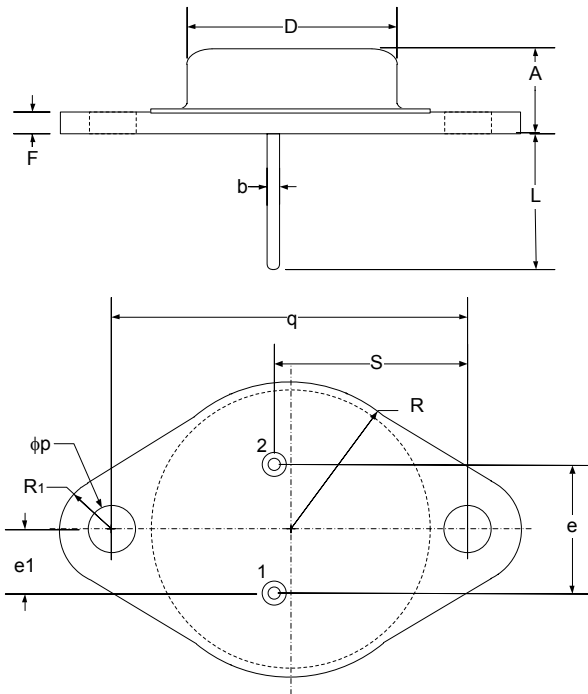
Package	Part No.	Ambient Temperature Range	Connection Diagram
3-TERMINAL TO-3 METAL CAN K-PACKAGE	SGR117AK SGR117AK-883B	-55°C to 125°C -55°C to 125°C	
3-PIN TO-39 METAL CAN T-PACKAGE	SGR117AT SGR117AT-883B	-55°C to 125°C -55°C to 125°C	
3-PIN HERMETIC TO-257 IG-PACKAGE (Isolated)	SGR117AIG-883B SGR117AIG	-55°C to 125°C -55°C to 125°C	

Note 1. Device leads are hot solder dipped with Sn63Pb37 solder.

Note 2. All parts are viewed from the top.

## Package Outline Dimensions

Controlling dimensions are in inches, metric equivalents are shown for general information.

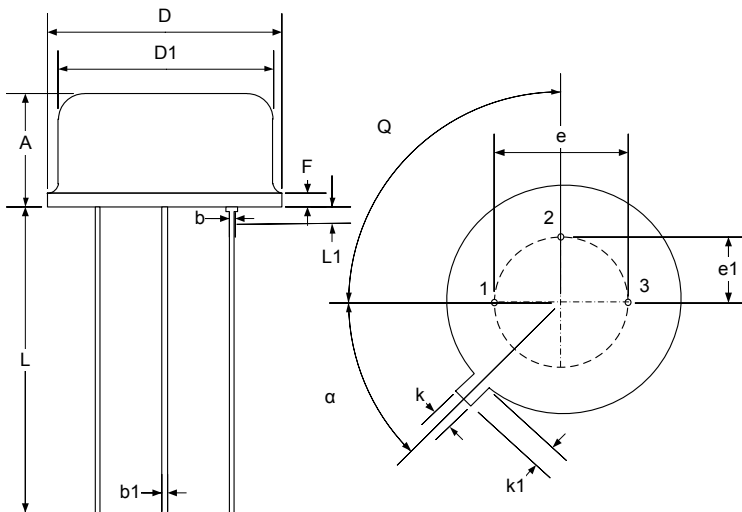


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.86	7.62	0.270	0.300
q	29.90	30.40	1.177	1.197
b	0.97	1.09	0.038	0.043
D	19.43	19.68	0.765	0.775
S	16.64	17.14	0.655	0.675
e	10.67	11.18	0.420	0.440
e1	5.21	5.72	0.205	0.225
F	1.52	2.03	0.060	0.080
$\phi_p$	3.84	4.09	0.151	0.161
L	10.79	12.19	0.425	0.480
R1	3.33	4.78	0.131	0.188
R	12.57	13.34	0.495	0.525

**Note:**

Dimensions do not include protrusions; these shall not exceed 0.155mm (.006") on any side. Lead dimension shall not include solder coverage.

**Figure 2** - K 3-Pin Metal Can TO-3 Package Dimensions



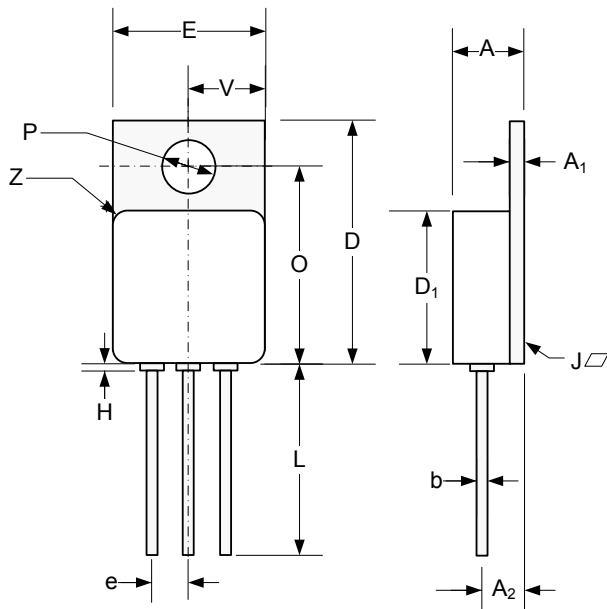
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.19	4.70	0.165	0.185
b	0.41	0.48	0.016	0.019
b1	0.41	0.53	0.016	0.021
D	8.89	9.40	0.350	0.370
D1	8.13	8.51	0.320	0.335
e	5.08 BSC		0.200 BSC	
e1	2.54 TYP		0.100 TYP	
F	-	1.02	-	0.040
k	0.71	0.86	0.028	0.034
k1	0.74	1.14	0.029	0.045
L	12.70	14.48	0.500	0.570
L1	-	1.27	-	0.050
Q	90° TYP		90° TYP	
$\alpha$	45° TYP		45° TYP	

**Note:**

Dimensions do not include protrusions; these shall not exceed 0.155mm (.006") on any side. Lead dimension shall not include solder coverage.

**Figure 3** - T 3-Pin Metal Can TO-39 Package Dimensions

## Package Outline Dimensions (continued)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.70	5.21	0.185	0.205
A <sub>1</sub>	0.89	1.14	0.035	0.045
A <sub>2</sub>	2.92	3.18	0.115	0.125
b	0.71	.081	0.027	0.032
D	16.38	16.76	0.645	0.660
D <sub>1</sub> *	10.41	10.92	0.410	0.430
e	2.54 BSC		0.100 BSC	
E*	10.41	10.67	0.410	0.420
H	-	0.50	-	0.020
L	12.70	-	0.500	-
O	13.39	13.64	0.527	0.537
P	3.56	3.81	0.140	0.150
J	-	0.10	-	0.004
V	5.13	5.38	0.202	0.212
Z	1.40 TYP		0.055 TYP	

\*Excludes Weld Fillet Around Lid.

**Note:**

Dimensions do not include protrusions; these shall not exceed 0.155mm (.006") on any side. Lead dimension shall not include solder coverage.

Figure 4 • IG 3-Pin Hermetic TO-257 Package Dimensions



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