OMR117AHVSR OMR117AHVST OMR117AHVNM OMR117AHVNH

100 kRAD RADIATION TOLERANT 1.5 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATOR

Please see mechanical outlines herein

100K Rad Tolerant Three Terminal, Precision Adjustable Positive Voltage Regulator In Hermetic Packages

FEATURES
- Electrically Similar To Industry Standard LM117AHV
- Adjustable Output Voltage
- Built In Thermal Overload Protection
- Short Circuit Current Limiting
- Available In Four Hermetic Package Styles
- Maximum Output Voltage Tolerance Is Guaranteed to $\pm$ 1%
- Radiation Tolerant up to 150 K Rad (Si)
- Available Hi-Rel Screened, Class B and Class S, MIL-STD-883

DESCRIPTION
These three terminal positive regulators are supplied in high density hermetically sealed packages and available Hi-Rel screened. All protective features are designed into the circuit, including thermal shutdown, current-limiting, and safe-area control. With heat sinking, these devices can deliver up to 1.5 amps of output current. These units also feature output voltages that can be fixed from 1.2 volts to 57 volts using external resistors. These devices are ideally suited for Space applications where small size, high reliability, and radiation tolerance is required. The high level of Radiation Tolerance of these devices makes them a desirable choice for LEO and many MEO and GEO communication satellites. Radiation testing is performed on a single wafer by wafer basis. Random die samples per wafer are selected, packaged and radiation tested to qualify each individual semiconductor wafer-by-wafer.

ABSOLUTE MAXIMUM RATINGS T_c @ 25°C
Power Dissipation: TO-205 . . . . 1.1 W
   TO-257/SMD/ D^2 Pac . . . . 20 W
Input - Output Voltage Differential . . . . 60 V
Operating Junction Temperature Range . . . . - 55°C to + 150°C
Storage Temperature Range . . . . - 65°C to + 150°C
Lead Temperature (Soldering 10 seconds) . . . . 300°C
Thermal Resistance, Junction to Case:
   TO-205 . . . . 17°C/W
   TO-257(Isolated), D^2 Pac (Isolated). . . . . 4.2°C/W
   TO-257 (Non-Isolated) and SMD-1 . . . . 3.5°C/W
Maximum Output Current: TO-205. . . . . .5 A
   Case-All Others 1.5A
Recommended Operating Conditions:
   Output Voltage Range . . . . .1.2 to 57 VDC
   Input Voltage Range .   . . . 4.25 to 61.25 VDC
Radiation Tolerant - Total Dose . . . . 100 K Rad (Si)
Surface Mount Package Soldering Temperature . . . . .250°C

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ELECTRICAL CHARACTERISTICS $-55°C \leq T_A \leq 125°C$, I_L = 8mA (unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Reference Voltage	V_{REF}	V_{DIFF} = 3.0V, T_A = 25°C		1.238	1.262	
(Note 4)		V_{DIFF} = 3.3V	•	1.225	1.270	V
		V_{DIFF} = 40V	•	1.225	1.270	
		V_{DIFF} = 60V	•	1.225	1.270	
Line Regulation	R_{LINE}	$3.0V \leq V_{DIFF} \leq 40V$, V_{out} = V_{ref}, T_A = 25°C			4.5	
(Note 1, 4)		$3.3V \leq V_{DIFF} \leq 40V$, V_{out} = V_{ref}	•		9	mV
		$40V \leq V_{DIFF} \leq 60V$, V_{out} = V_{ref}, T_A = 25°C			5	
		$40V \leq V_{DIFF} \leq 60V$, V_{out} = V_{ref}	•		10	
Load Regulation	R_{LOAD}	V_{DIFF} = 3.0V, $10mA \leq I_L \leq 1.5A$, T_A = 25°C			15	
(Note 1, 4)		V_{DIFF} = 3.3V, $10mA \leq I_L \leq 1.5A$	•		15	mV
		V_{DIFF} = 40V, $10mA \leq I_L \leq 300mA$, T_A = 25°C			15	
		V_{DIFF} = 40V, $10mA \leq I_L \leq 195mA$	•		15	
		V_{DIFF} = 60V, $10mA \leq I_L \leq 30mA$	•		15	
Thermal Regulation	V_{RTH}	V_{in} = 14.6V, I_L = 1.5A			5	mV
		P_d = 20 Watts, t = 20 ms, T_A = 25°C				
Ripple Rejection	R_N	f = 120 Hz, V_{out} = V_{ref}	•	66		dB
		C_{Adj} = 10 µF, I_{out} = 100 mA				
Adjustment Pin	I_{Adj}	V_{DIFF} = 3.0V, T_A = 25°C			100	
Current		V_{DIFF} = 3.3V	•		100	µA
		V_{DIFF} = 40V	•		100	
(Note 4)		V_{DIFF} = 60V	•		100	
Adjustment Pin	ΔI_{Adj}	V_{DIFF} = 3.0V, $10mA \leq I_L \leq 1.5A$, T_A = 25°C			5	
Current Change		V_{DIFF} = 3.3V, $10mA \leq I_L \leq 1.5A$	•		5	
		V_{DIFF} = 40V, $10mA \leq I_L \leq 300mA$, T_A = 25°C			5	
		V_{DIFF} = 40V, $10mA \leq I_L \leq 195mA$	•		5	µA
		$3.0V \leq V_{DIFF} \leq 40V$, T_A = 25°C			5	
		$3.3V \leq V_{DIFF} \leq 40V$	•		5	
		$3.3V \leq V_{DIFF} \leq 60V$	•		5	
Minimum Load Current	I_{Lmin}	V_{DIFF} = 3.0V, V_{out} = 1.4V (forced)			10	
		V_{DIFF} = 3.3V, V_{out} = 1.4V (forced)	•			mA
		V_{DIFF} = 40V, V_{out} = 1.4V (forced)	•			
		V_{DIFF} = 60V, V_{out} = 1.4V (forced)	•			
Current Limit	I_{CL}	V_{DIFF} = 5V	•	1.5	3.5	
(Note 2, 4)		V_{DIFF} = 40V, T_A = 25°C		0.3	1.5	A
		V_{DIFF} = 60V, T_A = 25°C		0.05	0.5	

Notes:
1. Load and Line Regulation are measured at a constant junction temperature using a low duty cycle pulse technique. Changes in output voltage due to heating effects must be taken into account separately.
2. If not tested, shall be guaranteed to the specified limits.
3. The • denotes the specifications which apply over the full temperature range.
4. Refer to curves for typical characteristics versus Total Dose Radiation Levels.

RADIATION TEST PROGRAM

The following chart is a summary of the test data collected on Radiation Tolerant OMR117AHV at various doses. The chart depicts the Total Radiation Dose that each device was exposed to on a step stress irradiation basis prior to failure. Failure is defined as any electrical test that does not meet the limits of the device per the published data sheet specifications after radiation testing.

Omnirel P/N	5K	10K	20K	30K	50K	60K	70K	80K	100K	150K	200K RAD
OMR117AHV	██										
Test Points				X	X				X	X	

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OMNIREL'S RADIATION TEST PROCEDURE

- Radiation Testing is performed on a single wafer by wafer basis.
- Each wafer is identified and a random sample of 5 die per wafer is selected.
- The die are then individually assembled in a hermetic package, data logged, electrically tested, hi-rel screened and then submitted to radiation testing.
- The packaged die are submitted to Steady State Total Dose radiation per Method 1019, Condition A, at a dose rate of 50 RAD/sec biased at maximum supply voltage.
- Final electrical test is performed within two hours of both Total Dose Radiation level from a Cobalt 60 source and 168 hr, 100°C annealing process. Read and record data including two non-radiated control samples.
- The wafer is then qualified only if samples from wafers meet full electrical specifications after 150% of total dose rating as specified in each product data sheet.
- Omnirel's controlling specifications are as follows: For Voltage Regulators the controlling specification is MIL-PRF- 38534/MIL-STD-883. For Rectifiers/Schottky the controlling specification is MIL-PRF-19500/MIL-STD-750.
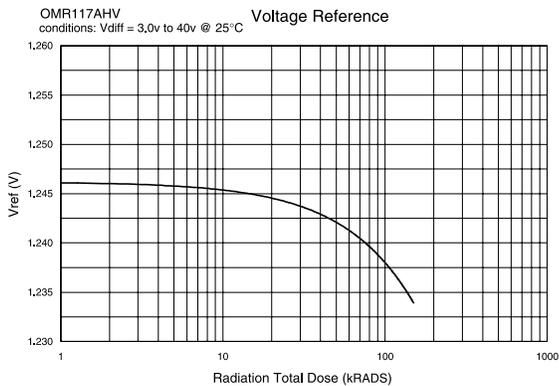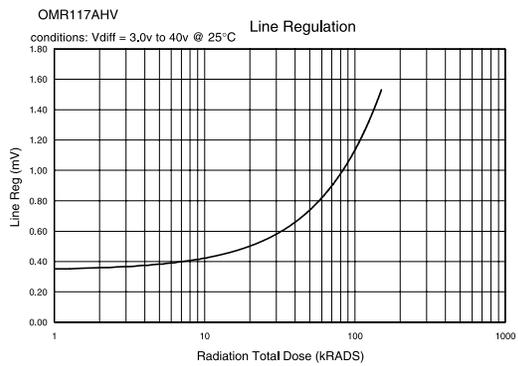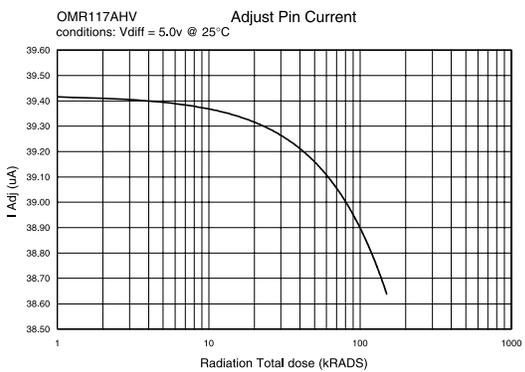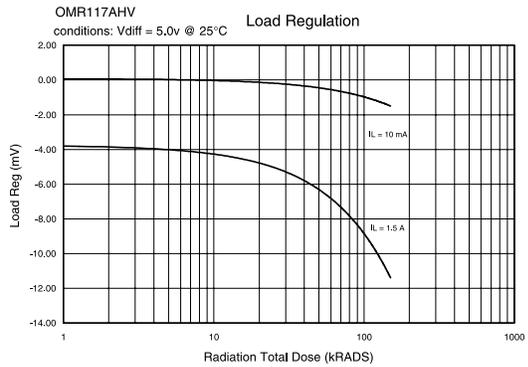
AVAILABLE PRODUCT SCREENING

Standard Class Level Screening Per MIL-PRF-38535				
Screen	***Level B**		***Level S**	
	Test Method	**Required**	**Test Method**	**Required**
Wafer Lot Acceptance	-----	-----	5007	100%
Non-destructive Bond Pull	-----	-----	-----	-----
Pre-Cap Visual Inspection	2010	100%	2010	100%
Temperature Cycle	1010	100%	1010	100%
Constant Acceleration	2001	100%	2001	100%
Visual Inspection	-----	100%	-----	100%
PIND Test	-----	-----	2020	100%
Serialization	-----	-----	-----	100%
Pre-Burn-In Electrical	Data Sheet	100%	Data Sheet	100%
Burn-In	1015/160 hrs.	100%	1015/240hrs.	100%
Interim Electrical	-----	-----	Data Sheet	100%
PDA Calculations	5% Functional	Lot	5% Functional	Lot
Final Electrical	Data Sheet	100%	Data Sheet	100%
Fine & Gross Seal	1014	100%	1014	100%
Radiographic	-----	-----	2012/Two Views	100%
Conformance Inspection	GR A&B	Sample	GR A&B	Sample
Final Visual Inspection	2009	Sample	2009	Sample
*Note: For "B" Level Screening add "M" to part number, for "S" Level Screening add "S" to part number. See Part Number Designator.				

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TYPICAL RADIATION CURVES

OMR117AHV
conditions: Vdiff = 5.0v @ 25°C   Current Limit

I Limit (A) vs *Radiation Total Dose (kRADS)*

OMR117AHV
conditions: Vdiff = 5.0v @ 25°C   Load Regulation

Load Reg (mV) vs *Radiation Total Dose (kRADS)*

IL = 10 mA

IL = 1.5 A

OMR117AHV
conditions: Vdiff = 5.0v @ 25°C   Adjust Pin Current

I Adj (uA) vs *Radiation Total dose (kRADS)*

OMR117AHV
conditions: Vdiff = 3.0v to 40v @ 25°C   Line Regulation

Line Reg (mV) vs *Radiation Total Dose (kRADS)*

OMR117AHV
conditions: Vdiff = 3.0v to 40v @ 25°C   Voltage Reference

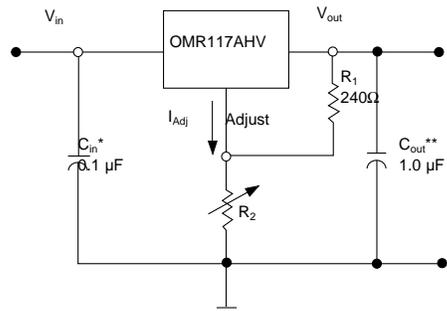*Vref (V)* vs *Radiation Total Dose (kRADS)*

STANDARD APPLICATION

* C_{in} is required if regulator is located an appreciable distance from the power supply.
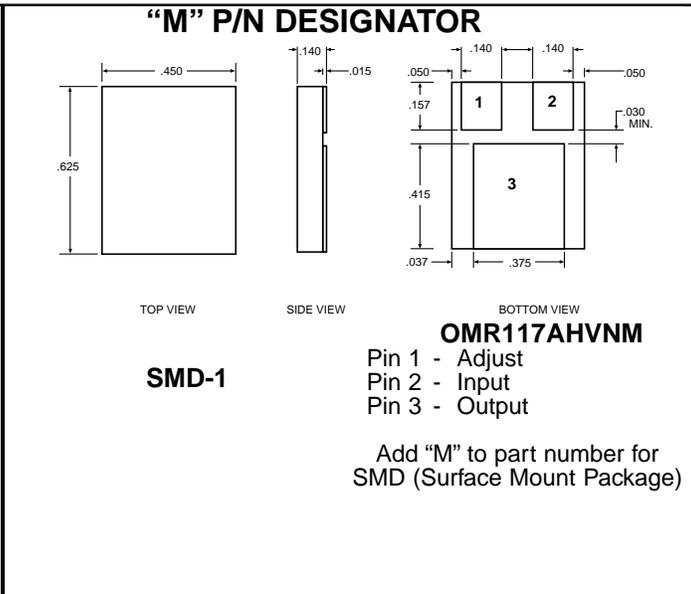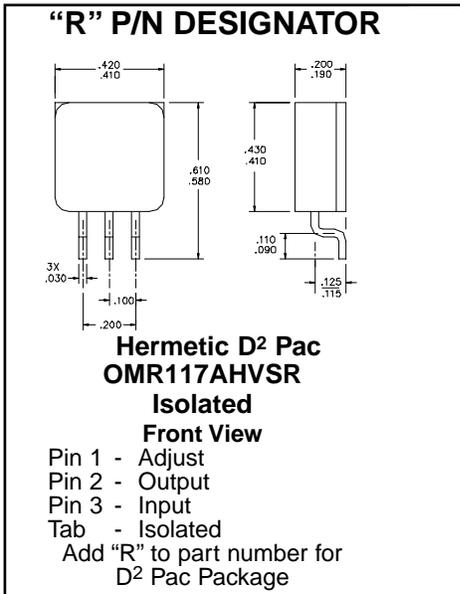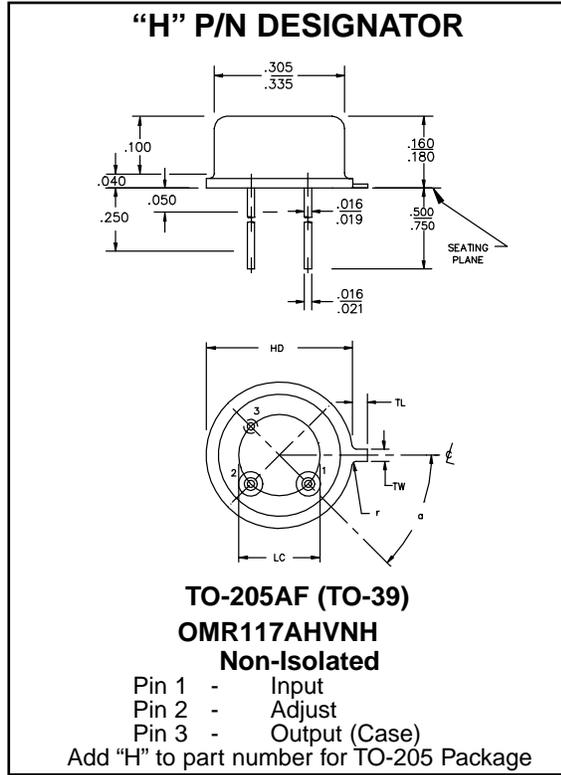
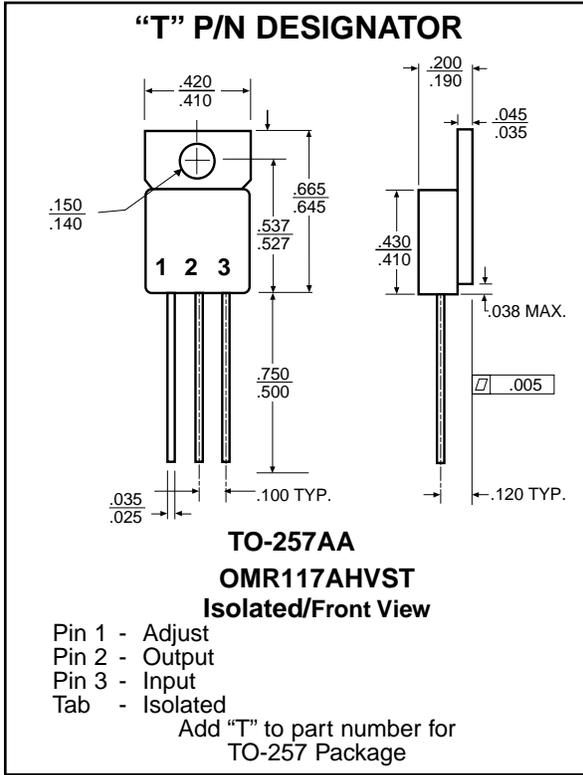** C_{out} is not needed for stability, however it does improve transient response.

$$V_{out} = 1.25 \text{ V } (1 + R_2/R_1) + I_{Adj} R_2$$
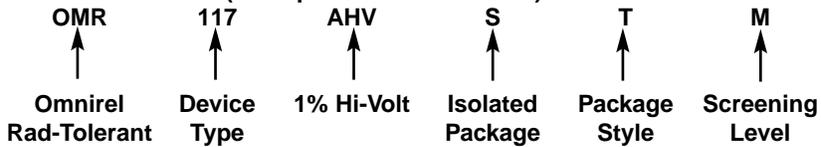
Since I_{Adj} is controlled to less than 100 µA, the error associated with this term is negligible in most applications.

V_{in} OMR117AHV V_{out}

I_{Adj} Adjust

R_1
240Ω

C_{in}*
0.1 µF

C_{out}**
1.0 µF

R_2

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MECHANICAL OUTLINES

"T" P/N DESIGNATOR

TO-257AA
OMR117AHVST
Isolated/Front View

Pin 1 - Adjust
Pin 2 - Output
Pin 3 - Input
Tab   - Isolated
Add "T" to part number for
TO-257 Package

"H" P/N DESIGNATOR

TO-205AF (TO-39)
OMR117AHVNH
Non-Isolated

Pin 1 -   Input
Pin 2 -   Adjust
Pin 3 -   Output (Case)
Add "H" to part number for TO-205 Package

"R" P/N DESIGNATOR

Hermetic D² Pac
OMR117AHVSR
Isolated
Front View

Pin 1 - Adjust
Pin 2 - Output
Pin 3 - Input
Tab   - Isolated
Add "R" to part number for
D² Pac Package

"M" P/N DESIGNATOR

TOP VIEW   SIDE VIEW   BOTTOM VIEW

SMD-1

OMR117AHVNM
Pin 1 - Adjust
Pin 2 - Input
Pin 3 - Output

Add "M" to part number for
SMD (Surface Mount Package)

PART NUMBER DESIGNATOR
(Example OMR117AHVSTM)

OMR	117	AHV	S	T	M
Omnirel Rad-Tolerant	Device Type	1% Hi-Volt	Isolated Package	Package Style	Screening Level

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THANK YOU FOR YOUR INTEREST IN
OMNIREL'S PRODUCTS!