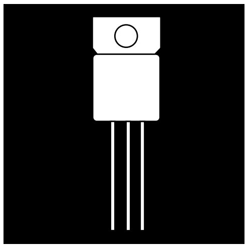
OMR1033SR OMR1033ST OMR1033NM

20 kRAD RADIATION TOLERANT 3 AMP NEGATIVE ADJUSTABLE VOLTAGE REGULATORS



Three Terminal, Adjustable Voltage, 3.0 Amp Precision Negative Regulators In Hermetic JEDEC TO-257AA Package

FEATURES

- Available in Three Hermetic Package Styles
- Radiation Tolerant up to 30 k Rad (Si)
- Reference Voltage Set Internally to ±2%
- Built-In Thermal Overload Protection
- Short Circuit Current Limiting
- Product Is Available Screened To Class B and Class S, MIL-STD-883

DESCRIPTION

These three terminal negative 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, they can deliver over 3.0 amps of output current. These units feature 2% initial voltage tolerance, with 1.0% load regulation and .015% line regulation. 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 @ 25°C

Input Voltage	-35V
Operating Junction Temperature Range	-55°C to +150°C
Storage Temperature Range	-65° to +150°C
Thermal Resistance, Junction to Case	
TO-257 (Isolated), D^2 Pac (Isolated)	4.2°C/W
SMD-1	3.5°C/W
Power Dissipation: TO-257/SMD/D^2 Pac	20W

0 04 R1
Supersedes 0 01 R0

Omnirel

ELECTRICAL CHARACTERISTICS -55°C ≤ T_A ≤ +125°C (unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Reference Voltage	V_{REF}	$ÁV_{IN} - V_{OUT}Í = 5$ V, $I_{OUT} = 5$ mA, $T_A = 25$° C		-1.238	-1.262	V
		3 V ≤ $ÁV_{IN} - V_{OUT}Í$ ≤ 35 V	•	-1.215	-1.285	
Line Regulation (Note 1)	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	3 V ≤ $ÁV_{IN} - V_{OUT}Í$ ≤ 35 V			0.015	%/V
			•		0.04	
Load Regulation (Note 1)	$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$ÁV_{OUT}Í$ ≤ 5 V, $T_A = 25$° C 10 mA ≤ I_{OUT} ≤ $I_{MAX.}$			50	mV
			•		75	
		$ÁV_{OUT}Í$≥ 5.0 V 10 mA ≤ I_{OUT} ≤ $I_{MAX.}$			1.0	%
			•		1.5	
Thermal Regulation	-	30 ms pulse, $T_A = 25$° C			0.02	%/W
Ripple Rejection (Note 2)	$\frac{\Delta V_{IN}}{\Delta V_{REF}}$	$ÁV_{OUT}Í$= -10 V, f = 120 Hz, $C_{Adj} = 0$		56		dB
			•	53		
		$ÁV_{OUT}Í$= -10 V, f = 120 Hz, $C_{Adj} = 10$ µF		70		dB
			•	60		
Adjust Pin Current	I_{Adj}	$V_{DIFF} = 35$ V, $I_L = 10$ mA	•		100	µA
Adjust Pin Current Change	ΔI_{Adj}	10 mA ≤ I_{OUT} ≤ $I_{MAX.}$	•		2.0	µA
		3 V ≤ $ÁV_{IN} - V_{OUT}Í$ ≤ 35 V	•		5.0	
Minimum Load Current	I_{Min}	$ÁV_{IN} - V_{OUT}Í$ ≤ 35 V	•		5.0	mA
		$ÁV_{IN} - V_{OUT}Í$ ≤ 10 V	•		3.0	
Current Limit	I_{Lim}	$ÁV_{IN} - V_{OUT}Í$ ≤ 10 V		3.0	6.0	A
			•	3.0		
		$ÁV_{IN} - V_{OUT}Í = 35$ V		0.5	2.5	A
			•	0.5		
Temperature Stability (Note 2)	$\frac{\Delta V_{OUT}}{\Delta T}$	-55° C ≤ T_J ≤ +125° C	•		1.5	%
Long Term Stability (Note 2)	$\frac{\Delta V_{OUT}}{\Delta T}$	$T_A = +125$° C, t = 1000 hrs			1.0	%

Notes:

1. Line and Load Regulation are measured at a constant junction temperature using a low duty cycle pulse technique. Although power dissipation is internally limited, regulation is guaranteed up to the maximum power dissipation of 30 W. Power dissipation is determined by the input/output differential voltage and the output current. Guaranteed maximum power dissipation will not be available over the full input/output voltage range.
2. Guaranteed by design, characterization or correlation to other tested parameters.
3. The • denotes the specifications which apply over the full operating 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 OMR1033 at various dose rates. The chart depicts the Total Radiation Dose that each device was exposed to 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
OMR1033SR	■	■	■	■							
Test Points			X	X							

OMNIREL'S RADIATION TEST PROCEDURE

Note: Sample die from each wafer were tested at each kRAD increment shown above.

- 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 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.

AVAILABLE PRODUCT SCREENING

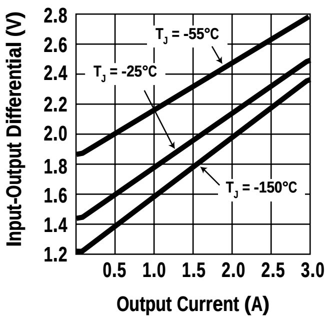
Standard Class Level Screening MIL-PRF-38535				
Screen	**Level B***		**Level S***	
	Test Method	**Required**	**Test Method**	**Required**
Wafer Lot Acceptance	-----	-----	5007	100%
Non-destructive Bond Pull	-----	-----	-----	-----
Pre-Cap Visual Inspection	2010	100%	2010	100%
Temperature Cycle	1010	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	100%	GR A	100%
Final Visual Inspection	2009	Sample	2009	Sample

***** For "B" Level Screening add "M" to part number, for "S" Level Screening add "S" to part number, see part number designator.

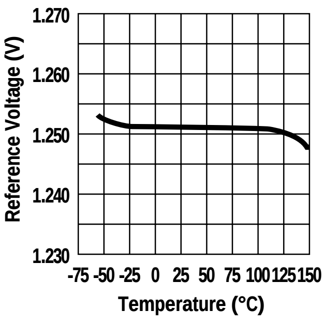
******Additional conformance inspection testing, i.e. Group B, C, & D optional.

TYPICAL PERFORMANCE CHARACTERISTICS

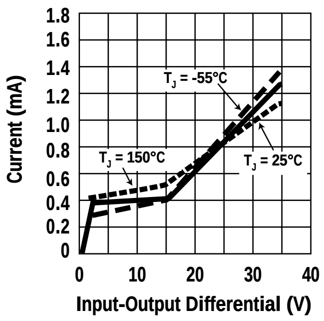
Dropout Voltage



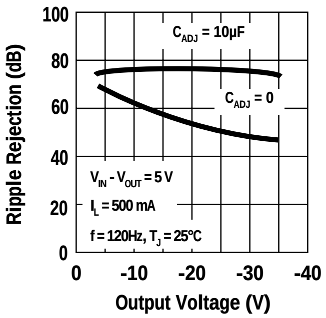
Temperature Stability



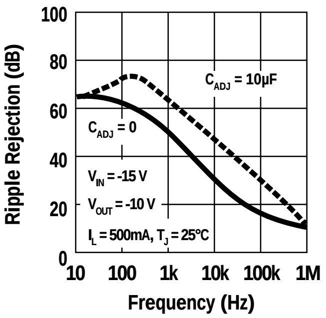
Minimum Load Current



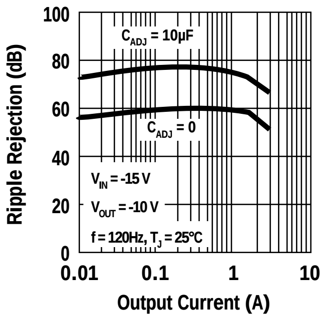
Ripple Rejection



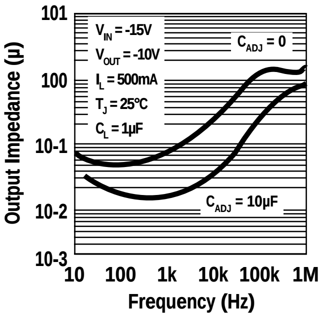
Ripple Rejection



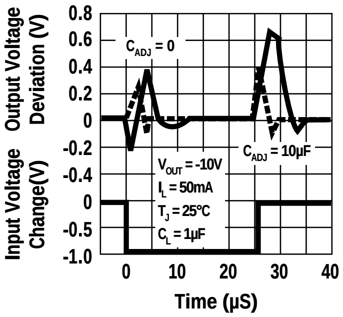
Ripple Rejection



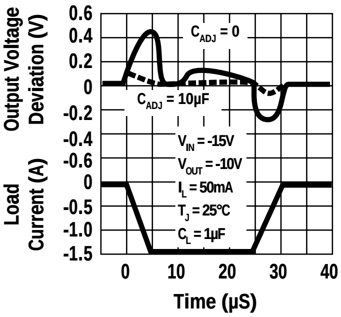
Output Impedance



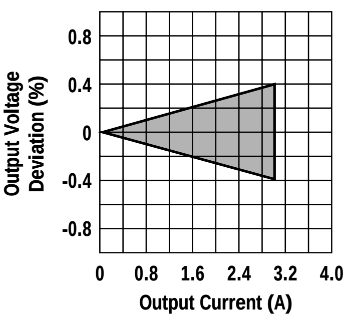
Line Transient Response



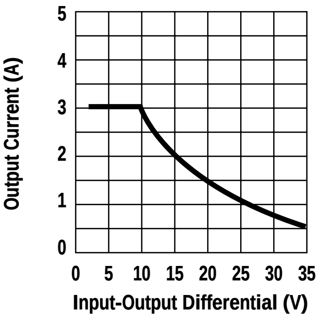
Load Transient Response



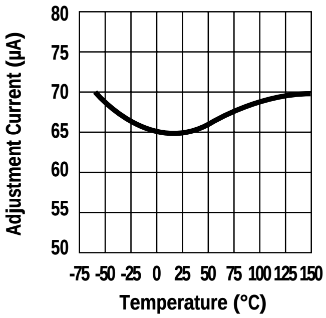
Load Regulation*

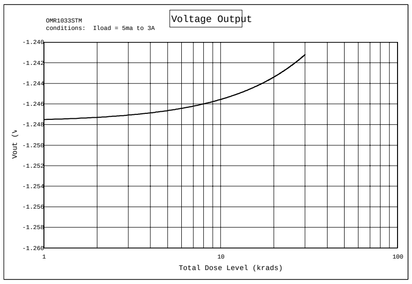


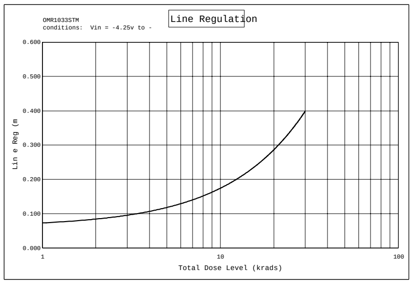
Guaranteed Minimum Output Current

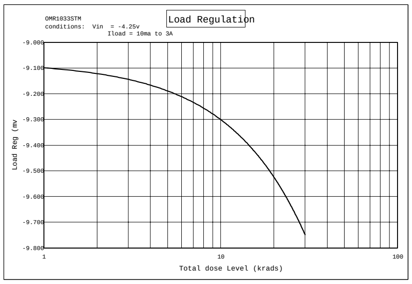


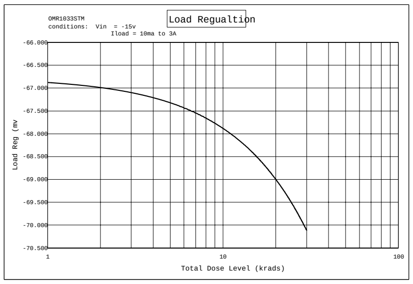
Adjustment Current

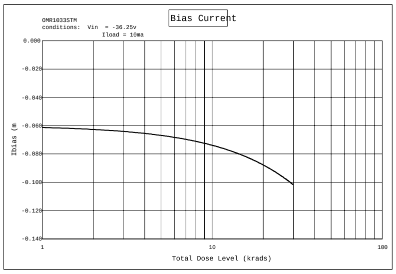


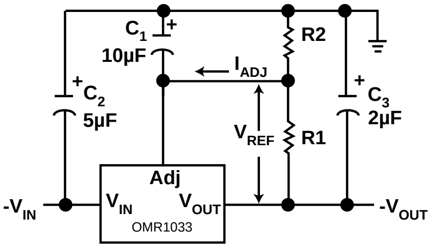






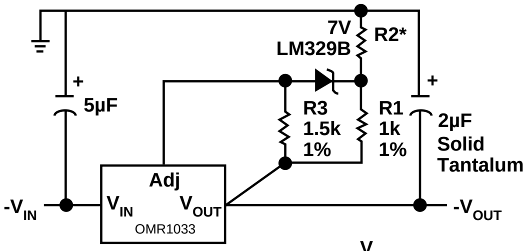






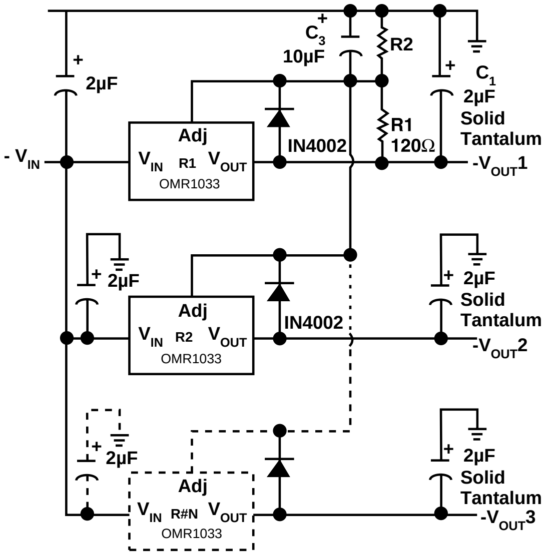
$$V_{OUT} = V_{REF}\left(1+\frac{R2}{R1}\right)+I_{ADJ}\,(R2)$$

High Stability Regulator



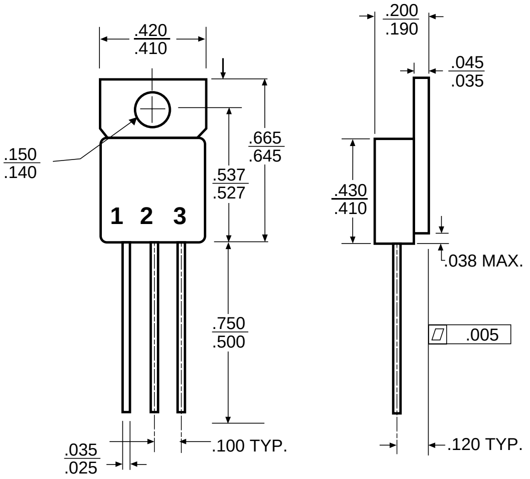
$$*R2 = \frac{V_{OUT}}{9.08 \times 10^{-3}} - 908\Omega$$

Multiple Tracking Regulators



MECHANICAL OUTLINES

“T” P/N DESIGNATOR



TO-257AA

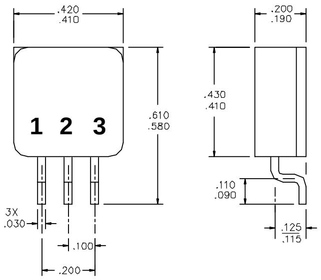
OMR1033ST

Isolated/Front View

Pin 1 - Adjust
Pin 2 - Input
Pin 3 - Output
Tab - Isolated

Add “T” to part number for
TO-257 Package

“R” P/N DESIGNATOR



Hermetic D² Pac

OMR1033SR

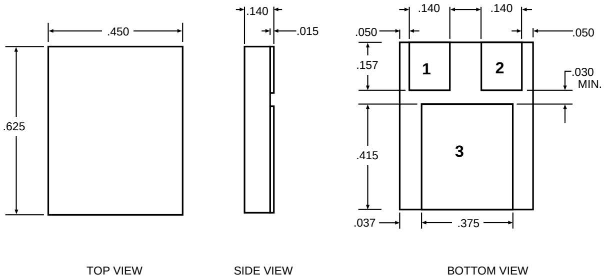
Isolated

Front View

Pin 1 - Adjust
Pin 2 - Input
Pin 3 - Output
Tab - Isolated

Add “R” to part number for
D² Pac Package

“M” P/N DESIGNATOR



SMD-1

OMR1033NM

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

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

PART NUMBER DESIGNATOR

(Example OMR1033STM)

OMR	1033	S	T	M
Omnirel Rad-Tolerant	Device Type	Isolated Package	Package Style	Hi-Rel Level