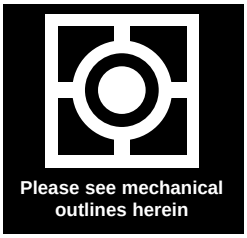
OMR7905SR	**OMR7905ST**	**OMR7905NM**	**OMR7905NH**
OMR7912SR	**OMR7912ST**	**OMR7912NM**	**OMR7912NH**
OMR7915SR	**OMR7915ST**	**OMR7915NM**	**OMR7915NH**

300 kRAD RADIATION TOLERANT 1.5 AMP NEGATIVE FIXED VOLTAGE REGULATORS



Please see mechanical outlines herein

300K Rad Tolerant Three Terminal, Negative Fixed Voltage Regulators In Hermetic Packages

FEATURES

- Isolated & Non-Isolated Hermetic Packages
- Output Voltages: -5V, -12V, -15V (Other Voltages Available)
- Output Voltages Set Internally To ±1% or ±2%
- Built-In Thermal Overload Protection
- Short Circuit Current Limiting
- Radiation Tolerant up to 450 K Rad (Si)
- Available Hi-Rel Screened, Class B and Class S, MIL-STD-883

DESCRIPTION

These three terminal negative regulators are supplied in a high density hermetically sealed metal package and are 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 1.5 amps of output current. These units feature internally trimmed output voltages to ±1% or 2% of nominal voltage. Standard voltages are -5V, -12V, and -15V. However, other voltages are available up to -24 volts. 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 ..... -35 V
Operating Junction Temperature Range..... - 55°C to + 150°C
Storage Temperature Range..... - 65°C to + 150°C
Power Dissipation: TO-205 ..... 1.1 W
TO-257/SMD/ D^2 Pac ..... 20 W
Lead Temperature (Soldering 10 seconds) ..... 300°C
Surface Mount Package Soldering Temperature ..... 250°C
Thermal Resistance, Junction to Case:
- TO-205 ..... 17°C/W
- TO-257(Isolated), D^2 Pac (Isolated) ..... 4.2°C/W
- SMD-1 ..... 3.5°C/W

Thermal Resistance, (Junction Ambient):
- TO-205 ..... 90°C/W
- TO-257(Isolated), D^2 Pac (Isolated) SMD-1 ..... 42°C/W

Maximum Output Current: TO-205..... 0.5 A
- Case-All Others 3.3A

Radiation Tolerant - Total Dose ..... 300 K Rad (Si)

Omnirel

OMR7905SR OMR7905ST OMR7905NM OMR7905NH
OMR7912SR OMR7912ST OMR7912NM OMR7912NH
OMR7915SR OMR7915ST OMR7915NM OMR7915NH

ELECTRICAL CHARACTERISTICS -5 Volt

V_{IN} = -10V, I_o = 500mA, -55°C ≤ T_A ≤ 125°C (unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Output Voltage	V_{OUT}	T_A = 25°C		-4.95	-5.05	V
		V_{IN} = -7.5V to -20V	•	-4.85	-5.15	V
Line Regulation	V_{RLINE}	V_{IN} = -7.5V to -20V			12	mV
(Note 1)			•		25	mV
		V_{IN} = -8.0V to -12V			5	mV
			•		12	mV
Load Regulation	V_{RLOAD}	I_O = 5mA to 1.5 Amp			20	mV
(Note 1)			•		25	mV
		I_O = 250mA to 750 mA			15	mV
			•		30	mV
Standby Current Drain	I_{SCD}				2.5	mA
			•		3.0	mA
Standby Current Drain	ΔI_{SCD}	V_{IN} = -7.0V to -20V	•		0.4	mA
Change With Line	(Line)					
Standby Current Drain	ΔI_{SCD}	I_O = 5mA to 1000mA	•		0.4	mA
Change With Load	(Load)					
Dropout Voltage	V_{DO}	ΔV_{OUT} = 100mV, I_O = 1.0A	•		2.5	V
Peak Output Current	$I_{O\ (pk)}$	T_A = 25°C		1.5	3.3	A
Short Circuit Current	I_{DS}	V_{IN} = -35V			1.2	A
(Note 2)			•		2.8	A
Ripple Rejection	$\frac{\Delta V_{IN}}{\Delta V_{OUT}}$	f =120 Hz, ΔV_{IN} = -10V		63		dB
		(Note 3)	•	60		dB
Output Noise Voltage	N_O	T_A = 25°C, f =10 Hz to 100KHz			40	µV/V
(Note 3)						RMS
Long Term Stability	$\frac{\Delta V_{OUT}}{\Delta t}$	T_A = 25°C, t = 1000 hrs.			75	mV
(Note 3)						

ELECTRICAL CHARACTERISTICS -12 Volt

V_{IN} = -19V, I_o = 500mA, -55°C ≤ T_A ≤ 125°C (unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Output Voltage	V_{OUT}	T_A = 25°C		-11.88	-12.12	V
		V_{IN} = -14.5V to -27V	•	-11.64	-12.36	V
Line Regulation	V_{RLINE}	V_{IN} = -14.5V to -27V			20	mV
(Note 1)			•		50	mV
		V_{IN} = -16V to -22V			10	mV
			•		30	mV
Load Regulation	V_{RLOAD}	I_O = 5mA to 1.5 Amp			32	mV
(Note 1)			•		60	mV
		I_O = 250mA to 750 mA			16	mV
			•		30	mV
Standby Current Drain	I_{SCD}				3.5	mA
			•		4.0	mA
Standby Current Drain	ΔI_{SCD}	V_{IN} = -14.5V to -27V	•		0.8	mA
Change With Line	(Line)					
Standby Current Drain	ΔI_{SCD}	I_O = 5mA to 1000mA	•		0.5	mA
Change With Load	(Load)					
Dropout Voltage	V_{DO}	ΔV_{OUT} = 100mV, I_O = 1.0A	•		1.8	V
Peak Output Current	$I_{O\ (pk)}$	T_A = 25°C, I_O = 5mA to 1A		1.5	3.3	A
Short Circuit Current	I_{DS}	V_{IN} = -35V			1.2	A
(Note 2)			•		2.8	A
Ripple Rejection	$\frac{\Delta V_{IN}}{\Delta V_{OUT}}$	f =120 Hz, ΔV_{IN} = -10V		56		dB
		(Note 3)	•	53		dB
Output Noise Voltage	N_O	T_A = 25°C, f =10 Hz to 100KHz			40	µV/V
(Note 3)						RMS
Long Term Stability	$\frac{\Delta V_{OUT}}{\Delta t}$	T_A = 25°C, t = 1000 hrs.			120	mV
(Note 3)						

Notes:

1. Load and Line Regulation are specified at a constant junction temperature. Pulse testing with low duty cycle is used. Changes in output voltage due to heating effects must be taken into account separately.
2. Short Circuit protection is only assured up to V_{IN} = -35V.
3. If not tested, shall be guaranteed to the specified limits.
4. The • denotes the specifications which apply over the full operating temperature range.
5. Refer to curves for typical characteristics versus Total Dose Radiation Levels.

OMR7905SR OMR7905ST OMR7905NM OMR7905NH
OMR7912SR OMR7912ST OMR7912NM OMR7912NH
OMR7915SR OMR7915ST OMR7915NM OMR7915NH

ELECTRICAL CHARACTERISTICS -15 Volt V_{IN} = -23V, I_o = 500mA, -55°C ≤ T_A ≤ 125°C (unless otherwise specified)

Parameter	Symbol	Test Conditions		Min.	Max.	Unit
Output Voltage	V_{OUT}	T_A = 25°C		-14.85	-15.15	V
		V_{IN} = -17.5V to -30V	•	-14.55	-15.45	V
Line Regulation	V_{RLINE}	V_{IN} = -17.5V to -30V			25	mV
(Note 1)			•		50	mV
		V_{IN} = -20V to -26V			15	mV
			•		25	mV
Load Regulation	V_{RLOAD}	I_O = 5mA to 1.5 Amp			35	mV
(Note 1)			•		75	mV
		I_O = 250mA to 750 mA			21	mV
			•		45	mV
Standby Current Drain	I_{SCD}				6.0	mA
			•		6.5	mA
Standby Current Drain Change With Line	ΔI_{SCD} (Line)	V_{IN} = -17.5V to -30V	•		0.8	mA
Standby Current Drain Change With Load	ΔI_{SCD} (Load)	I_O = 5mA to 1000mA	•		0.5	mA
Dropout Voltage	V_{DO}	ΔV_{OUT} = 100mV, I_O = 1.0A	•		2.5	V
Peak Output Current	$I_{O\,(pk)}$	T_A = 25°C		1.5	3.3	A
Short Circuit Current	I_{DS}	V_{IN} = -35V			1.2	A
(Note 2)			•		2.8	A
Ripple Rejection	$\frac{\Delta V_{IN}}{\Delta V_{OUT}}$	f =120 Hz, ΔV_{IN} = -10V		53		dB
		(Note 3)	•	50		dB
Output Noise Voltage	N_O	T_A = 25°C, f =10 Hz to 100KHz			40	µV/V
(Note 3)						RMS
Long Term Stability	$\frac{\Delta V_{OUT}}{\Delta t}$	T_A = 25°C, t = 1000 hrs.			150	mV
(Note 3)						

Notes:
1. Load and Line Regulation are specified at a constant junction temperature. Pulse testing with low duty cycle is used. Changes in output voltage due to heating effects must be taken into account separately.
2. Short Circuit protection is only assured up to V_{IN} = -35V.
3. If not tested, shall be guaranteed to the specified limits.
4. The • denotes the specifications which apply over the full operating temperature range.
5. 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 OMR7905/12/15 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	200	250	300	350	400	450	KRAD
OMR7905/12/15																	
Test Points				X	X				X	X			X			X	

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OMR7905SR **OMR7905ST** **OMR7905NM** **OMR7905NH**
OMR7912SR **OMR7912ST** **OMR7912NM** **OMR7912NH**
OMR7915SR **OMR7915ST** **OMR7915NM** **OMR7915NH**

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

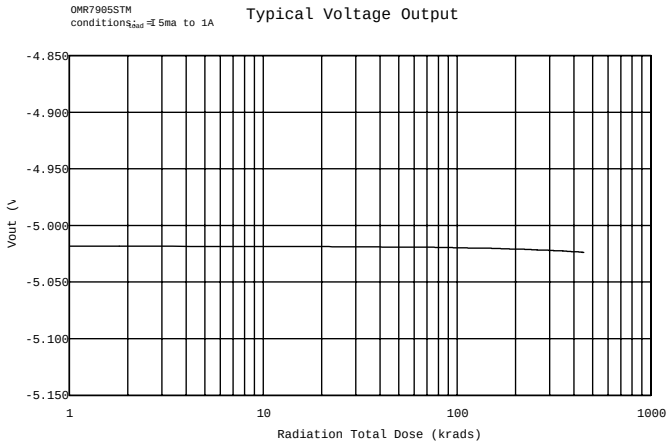
Screen	***Level B**		***Level S**	
	Test Method	**Required**	**Test Method**	**Required**
Wafer Lot Acceptance	-----	-----	5007	100%
Non-destructive Bond Pull	-----	-----	-----	-----
Pre-Cap Visual Inspection	2010	100%	2010	100%
Temperature Cycle	1010	100%	1010	100%
Constant Acceleration	2001	100%	2001	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	100%	GR A	100%
Final Visual Inspection	2009	Sample	2009	Sample

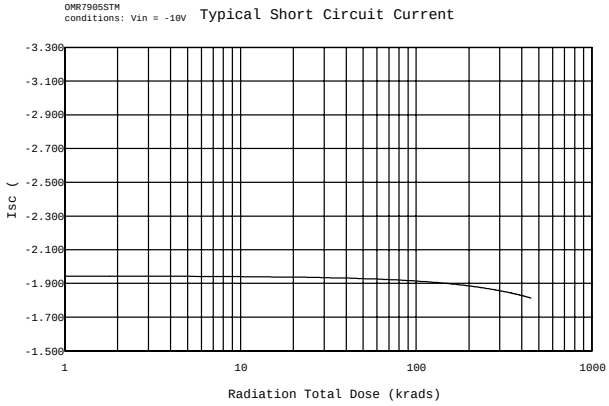
* For "B" Level Screening add "M" to part number, for "S" Level Screening add "S" to part number. See Part Number Designator.

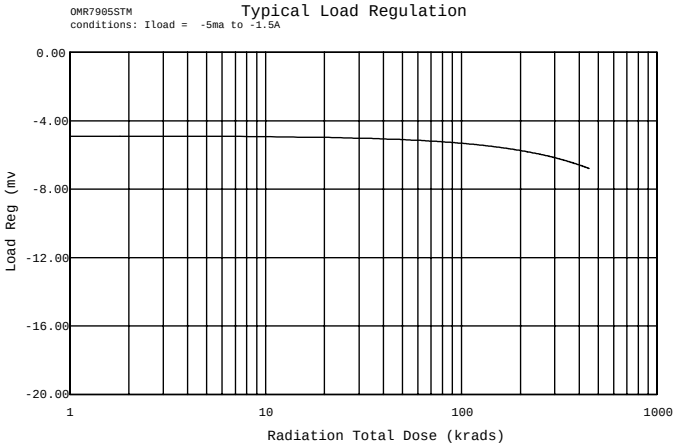
** Additional conformance inspection testing, i.e. Group B, C, & D, optional.

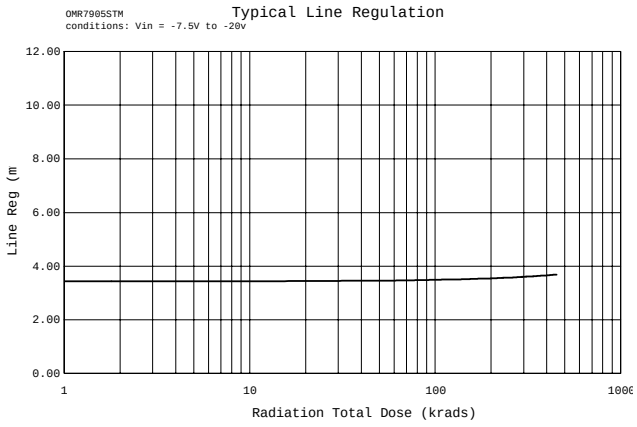
OMR7905SR OMR7905ST OMR7905NM OMR7905NH
OMR7912SR OMR7912ST OMR7912NM OMR7912NH
OMR7915SR OMR7915ST OMR7915NM OMR7915NH

TYPICAL RADIATION CURVES







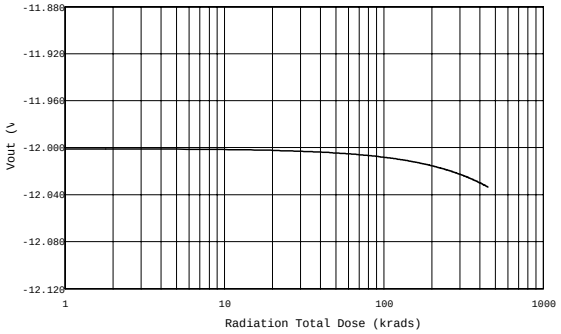


OMR7905SR OMR7905ST OMR7905NM OMR7905NH
OMR7912SR OMR7912ST OMR7912NM OMR7912NH
OMR7915SR OMR7915ST OMR7915NM OMR7915NH

TYPICAL RADIATION CURVES

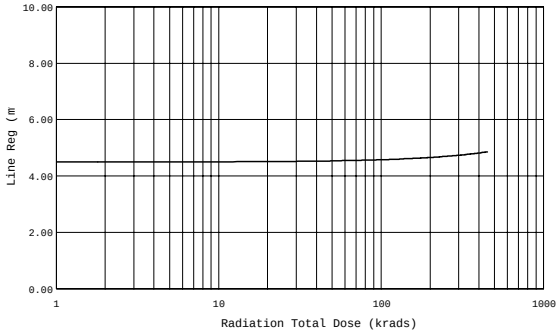
OMR7912STM
conditions: I_{load} = 5ma to 1A

Typical Voltage Output



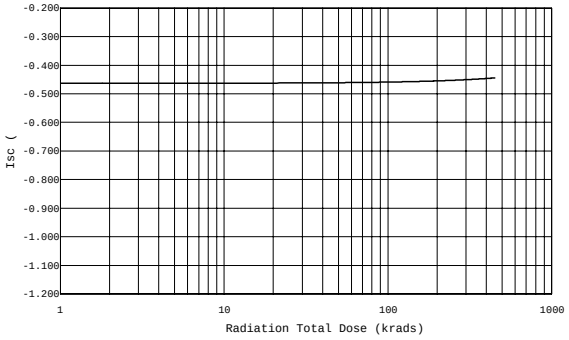
OMR7912STM
conditions: Vin = -14.5V to -24V

Typical Line regulation



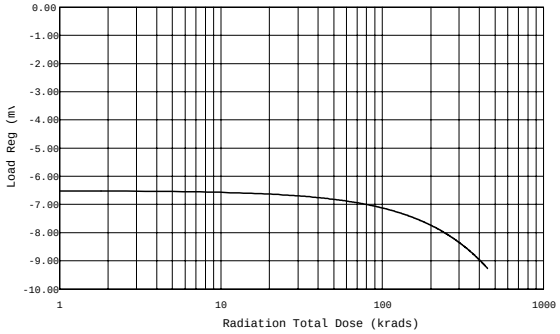
OMR7912STM
conditions: Vin = -35V

Typical Short Circuit Current



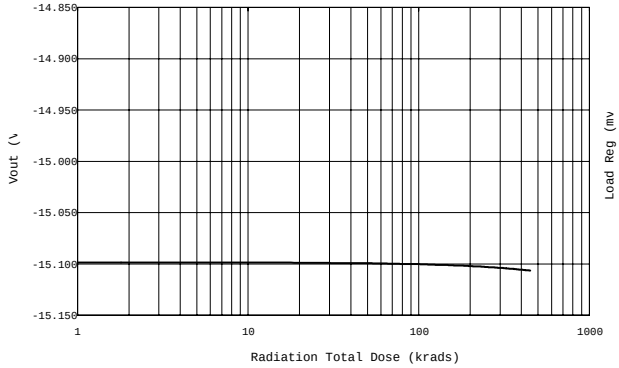
OMR7912STM
conditions: I_{load} = 5ma to 1.5A

Typical Load Regulation



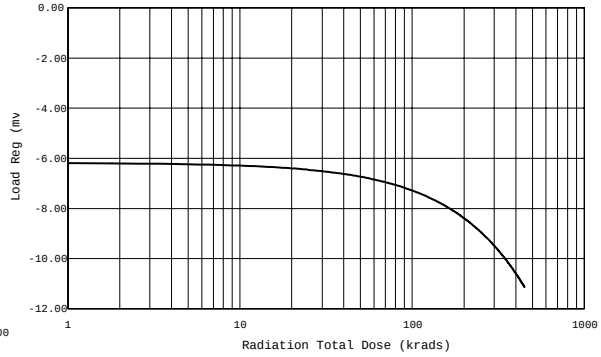
OMR7915STM
conditions: I_{load} = 5ma to 1A

Typical Voltage Output



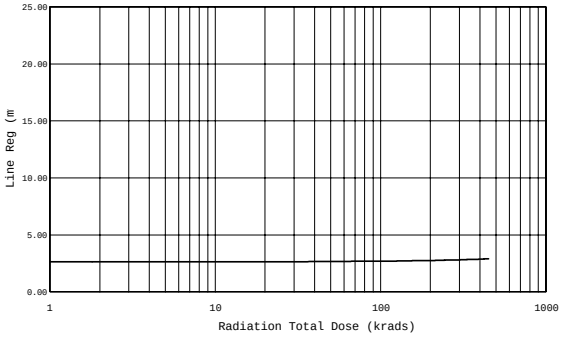
OMR7915STM
conditions: I_{load} = 5ma to 1.5A

Typical Load Regulation



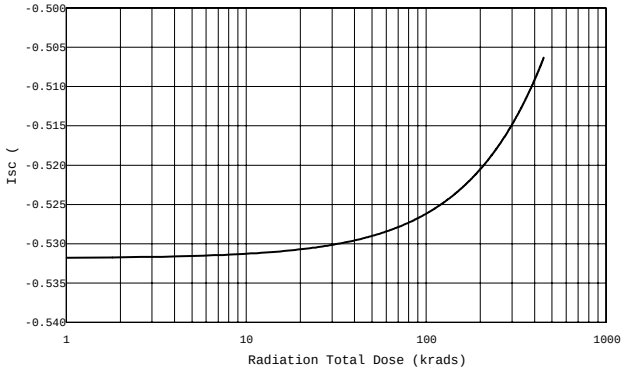
OMR7915STM
conditions: Vin = -17.5V to -35V

Typical Line Regulation



OMR7915STM
conditions: Vin = -35V

Typical Short Circuit Current



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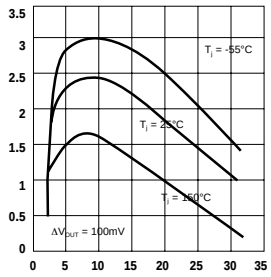
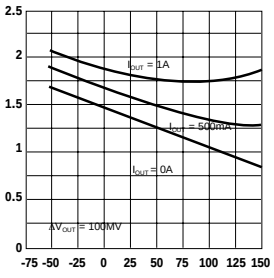
TYPICAL PERFORMANCE CHARACTERISTICS

PEAK OUTPUT CURRENT



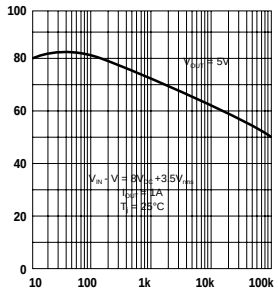
Input To Output Differential (V)

DROPOUT VOLTAGE



Junction Temperature (°C)

RIPPLE REJECTION



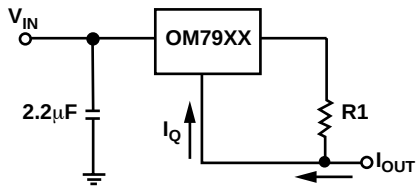
Frequency (Hz)

TYPICAL APPLICATIONS

Input bypass capacitors are recommended for stable operation of the OM7900 series of regulators over the input voltage and output current ranges. Output bypass capacitors will improve the transient response of the regulator.

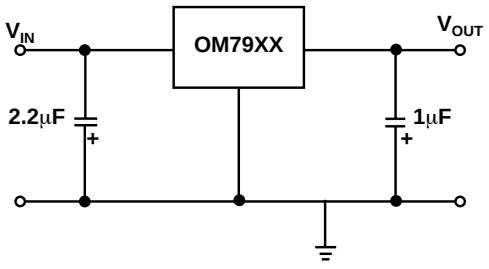
The bypass capacitors, (2.2µF on the input, 1µF on the output) should be ceramic or solid tantalum which have good high frequency characteristics. If aluminum electrolytics are used, their values should be 10µF or larger. The bypass capacitors should be mounted with the shortest leads, and if possible, directly across the regulator terminals.

Basic Current Regulator



$$I_{OUT} = \frac{V_{OUT}}{R1} + I_Q$$

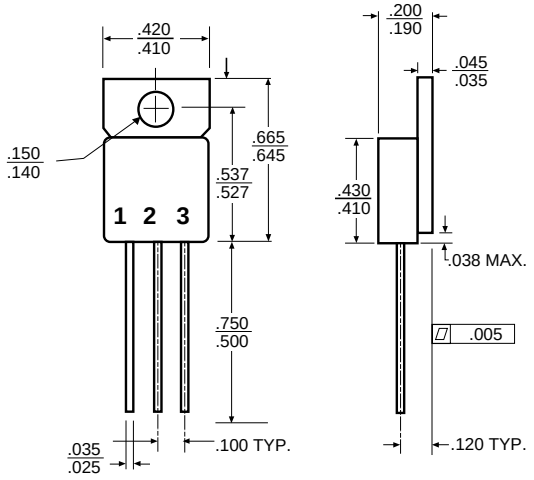
Fixed Output Regulator



OMR7905SR OMR7905ST OMR7905NM OMR7905NH
OMR7912SR OMR7912ST OMR7912NM OMR7912NH
OMR7915SR OMR7915ST OMR7915NM OMR7915NH

MECHANICAL OUTLINES

"T" P/N DESIGNATOR



TO-257AA

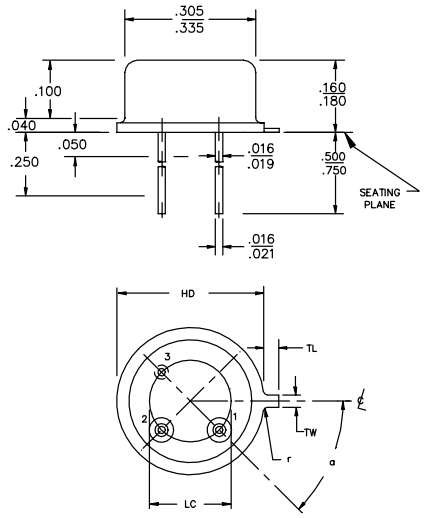
OMR79XXST

Isolated/Front View

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

Add "T" to part number for TO-257 Package

"H" P/N DESIGNATOR



TO-205AF (TO-39)

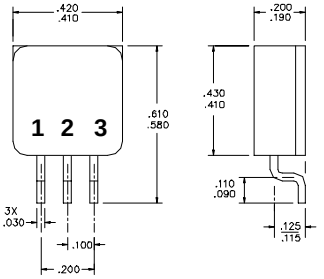
OMR79XXNH

Non-Isolated

Pin 1 - Ground
Pin 2 - Output
Pin 3 - Input(Case)

Add "H" to part number for TO-205 Package

"R" P/N DESIGNATOR



Hermetic D^2 Pac

OMR79XXSR

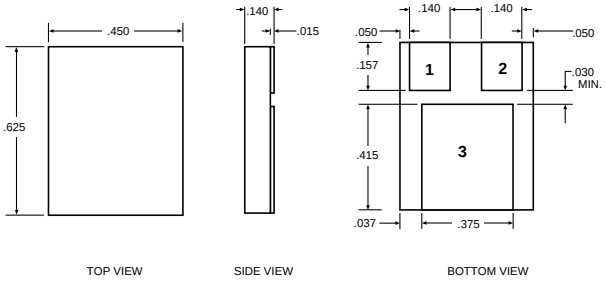
Isolated

Front View

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

Add "R" to part number for D^2 Pac Package

"M" P/N DESIGNATOR



SMD-1

OMR79XXNM

Pin 1 - Ground
Pin 2 - Output
Pin 3 - Input

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

PART NUMBER DESIGNATOR
(Example OMR7905STM

OMR	7905	S	T	M
Omnirel Rad-Tolerant	Device Type	Isolated Package	Package Style	Screening Level

Omnirel *205 Crawford Street, Leominster, MA 01453 USA (978) 534-5776 FAX (978) 537-4246*
Visit Our Web Site at www.omnirel.com