

# 1.5 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATOR APPROVED TO DESC DRAWING 7703402



## Three Terminal, Precision Adjustable Positive Voltage Regulator In Hermetic Style Packages (LM117HV)

### FEATURES

- Similar To Industry Standard LM117HV
- Approved To DESC Standardized Military Drawing Number 7703402
- Built In Thermal Overload Protection
- Short Circuit Current Limiting
- Available In Six Package Styles

### DESCRIPTION

These three terminal positive regulators are supplied in hermetically sealed packages. 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. The LCC-20 device is limited to .5 amps. The unit also features output voltages that can be fixed from 1.2 volts to 57 volts using external resistors.

### ABSOLUTE MAXIMUM RATINGS $T_c @ 25^{\circ}\text{C}$

Power Dissipation

|                  |       |
|------------------|-------|
| Case 2           | 1.1 W |
| Case-All Others. | 20 W  |

Input - Output Voltage Differential 40 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:

|                                       |         |
|---------------------------------------|---------|
| Case 2, LCC-20                        | 17°C/W  |
| Case U & M, TO-257 (Isol) and SMD-3   | 4.2°C/W |
| Case T&N, TO-257 (Non-Isol) and SMD-1 | 3.5°C/W |
| Case Y, TO-3.                         | 3.0°C/W |

Maximum Output Current:

|                  |       |
|------------------|-------|
| Case 2           | .5 A  |
| Case-All Others. | 1.5 A |

Recommended Operating Conditions:

|                                                |                   |
|------------------------------------------------|-------------------|
| Output Voltage Range                           | 1.2 to 37 VDC     |
| Ambient Operating Temperature Range ( $T_A$ ). | - 55°C to + 125°C |
| Input Voltage Range                            | 4.25 to 41.25 VDC |

3.5

**ELECTRICAL CHARACTERISTICS**  $-55^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ ,  $I_L = 8\text{mA}$  (unless otherwise specified)**OM1321NTM, OM1321STM, OM1321NKM, OM1321SMM, OM1321NMM**

| Parameter                        | Symbol           | Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Min.                                   | Max.                            | Unit          |
|----------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------|---------------|
| Reference Voltage                | $V_{REF}$        | $V_{DIFF} = 3.0\text{V}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 3.3\text{V}$ •<br>$V_{DIFF} = 40\text{V}$ •<br>$V_{DIFF} = 60\text{V}$ •                                                                                                                                                                                                                                                                                                                                                                                    | 1.20<br>1.20<br>1.20<br>1.20           | 1.30<br>1.30<br>1.30<br>1.30    | V             |
| Line Regulation<br>(Note 1)      | $R_{LINE}$       | $3.0\text{V} \leq V_{DIFF} \leq 40\text{V}$ , $V_{out} = V_{ref}$ , $T_A = 25^{\circ}\text{C}$<br>$3.3\text{V} \leq V_{DIFF} \leq 40\text{V}$ , $V_{out} = V_{ref}$ •<br>$40\text{V} \leq V_{DIFF} \leq 60\text{V}$ , $V_{out} = V_{ref}$ , $T_A = 25^{\circ}\text{C}$<br>$40\text{V} \leq V_{DIFF} \leq 60\text{V}$ , $V_{out} = V_{ref}$ •                                                                                                                                                                                     | -9<br>-23<br>-5<br>-10                 | 9<br>23<br>5<br>10              | mV            |
| Load Regulation<br>(Note 1)      | $R_{LOAD}$       | $V_{DIFF} = 3.0\text{V}$ , $10\text{mA} \leq I_L \leq 1.5\text{A}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 3.3\text{V}$ , $10\text{mA} \leq I_L \leq 1.5\text{A}$ •<br>$V_{DIFF} = 40\text{V}$ , $10\text{mA} \leq I_L \leq 300\text{mA}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 40\text{V}$ , $10\text{mA} \leq I_L \leq 195\text{mA}$ •<br>$V_{DIFF} = 60\text{V}$ , $10\text{mA} \leq I_L \leq 30\text{mA}$ •                                                                                                        | -15<br>-15<br>-15<br>-15<br>-15        | 15<br>15<br>15<br>15<br>15      | mV            |
| Thermal Regulation               | $V_{RTH}$        | $V_{in} = 14.6\text{V}$ , $I_L = 1.5\text{A}$<br>$P_d = 20\text{ Watts}$ , $t = 20\text{ ms}$ , $T_A = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                       | -16                                    | 16                              | mV            |
| Ripple Rejection<br>(Note 2)     | $R_N$            | $f = 120\text{ Hz}$ , $V_{out} = V_{ref}$ •<br>$C_{adj} = 10\text{ }\mu\text{F}$ , $I_{out} = 100\text{ mA}$                                                                                                                                                                                                                                                                                                                                                                                                                     | 66                                     |                                 | dB            |
| Adjustment Pin Current           | $I_{Adj}$        | $V_{DIFF} = 3.0\text{V}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 3.3\text{V}$ •<br>$V_{DIFF} = 40\text{V}$ •<br>$V_{DIFF} = 60\text{V}$ •                                                                                                                                                                                                                                                                                                                                                                                    |                                        | 100<br>100<br>100<br>100        | $\mu\text{A}$ |
| Adjustment Pin<br>Current Change | $\Delta I_{Adj}$ | $V_{DIFF} = 3.0\text{V}$ , $10\text{mA} \leq I_L \leq 1.5\text{A}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 3.3\text{V}$ , $10\text{mA} \leq I_L \leq 1.5\text{A}$ •<br>$V_{DIFF} = 40\text{V}$ , $10\text{mA} \leq I_L \leq 300\text{mA}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 40\text{V}$ , $10\text{mA} \leq I_L \leq 195\text{mA}$ •<br>$3.0\text{V} \leq V_{DIFF} \leq 40\text{V}$ , $T_A = 25^{\circ}\text{C}$<br>$3.3\text{V} \leq V_{DIFF} \leq 40\text{V}$ •<br>$3.3\text{V} \leq V_{DIFF} \leq 60\text{V}$ • | -5<br>-5<br>-5<br>-5<br>-5<br>-5<br>-5 | 5<br>5<br>5<br>5<br>5<br>5<br>5 | $\mu\text{A}$ |
| Minimum Load Current             | $I_{Lmin}$       | $V_{DIFF} = 3.0\text{V}$ , $V_{out} = 1.4\text{V}$ (forced)<br>$V_{DIFF} = 3.3\text{V}$ , $V_{out} = 1.4\text{V}$ (forced) •<br>$V_{DIFF} = 40\text{V}$ , $V_{out} = 1.4\text{V}$ (forced) •<br>$V_{DIFF} = 60\text{V}$ , $V_{out} = 1.4\text{V}$ (forced) •                                                                                                                                                                                                                                                                     |                                        | 5.0<br>5.0<br>5.0<br>7.0        | mA            |
| Current Limit<br>(Note 2)        | $I_{CL}$         | $V_{DIFF} = 5\text{V}$ •<br>$V_{DIFF} = 40\text{V}$ , $T_A = 25^{\circ}\text{C}$<br>$V_{DIFF} = 60\text{V}$ , $T_A = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                                                                                                                                                         | 1.5<br>0.3<br>0.05                     | 3.5<br>1.5<br>0.50              | A             |

**Notes:**

- 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.
- If not tested, shall be guaranteed to the specified limits.
- The • denotes the specifications which apply over the full operating temperature range.

## 3.5

| PART NUMBER DESIGNATOR                                               |                                                                             |                                                                                |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Standard Military Drawing Number                                     | Omnirel Part Number                                                         | Omnirel Package Designation                                                    |
| 7703402M<br>7703402U<br>7703402T<br>7703402Y<br>7703402N<br>7703402Z | OM1321SMM<br>OM1321STM<br>OM1321NTM<br>OM1321 NKM<br>OM1321NMM<br>OM1321N2M | SMD-3<br>TO-257 (Isolated)<br>TO-257 (non-Isolated)<br>TO-3<br>SMD-1<br>LCC-20 |

**ELECTRICAL CHARACTERISTICS** -55°C ≤ T<sub>A</sub> ≤ 125°C, I<sub>L</sub> = 8mA (unless otherwise specified)

**OM1321N2M**

| Parameter                        | Symbol            | Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                       | Min.                                   | Max.                            | Unit |
|----------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------|------|
| Reference Voltage                | V <sub>REF</sub>  | V <sub>DIFF</sub> = 3.0V, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 3.3V<br>V <sub>DIFF</sub> = 40V<br>V <sub>DIFF</sub> = 60V                                                                                                                                                                                                                                                                                     | 1.20<br>1.20<br>1.20<br>1.20           | 1.30<br>1.30<br>1.30<br>1.30    | V    |
| Line Regulation<br>(Note 1)      | R <sub>LINE</sub> | 3.0V ≤ V <sub>DIFF</sub> ≤ 40V, V <sub>out</sub> = V <sub>ref</sub> , T <sub>A</sub> = 25°C<br>3.3V ≤ V <sub>DIFF</sub> ≤ 40V, V <sub>out</sub> = V <sub>ref</sub><br>40V ≤ V <sub>DIFF</sub> ≤ 60V, V <sub>out</sub> = V <sub>ref</sub> , T <sub>A</sub> = 25°C<br>40V ≤ V <sub>DIFF</sub> ≤ 60V, V <sub>out</sub> = V <sub>ref</sub>                                                                                | -9<br>-23<br>-5<br>-10                 | 9<br>23<br>5<br>10              | mV   |
| Load Regulation<br>(Note 1)      | R <sub>LOAD</sub> | V <sub>DIFF</sub> = 3.0V, 10mA ≤ I <sub>L</sub> ≤ 500 mA, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 3.3V, 10mA ≤ I <sub>L</sub> ≤ 500 mA<br>V <sub>DIFF</sub> = 40V, 10mA ≤ I <sub>L</sub> ≤ 150 mA, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 40V, 10mA ≤ I <sub>L</sub> ≤ 100 mA<br>V <sub>DIFF</sub> = 60V, 10mA ≤ I <sub>L</sub> ≤ 20 mA                                                                    | -15<br>-15<br>-15<br>-15<br>-15        | 15<br>15<br>15<br>15<br>15      | mV   |
| Thermal Regulation               | V <sub>RTH</sub>  | V <sub>in</sub> = 14.6V, I <sub>L</sub> = 300 mA<br>P <sub>d</sub> = 4.0 Watts, t = 20 ms, T <sub>A</sub> = 25°C                                                                                                                                                                                                                                                                                                      | -3.1                                   | 3.1                             | mV   |
| Ripple Rejection<br>(Note 2)     | R <sub>N</sub>    | f = 120 Hz, V <sub>out</sub> = V <sub>ref</sub><br>C <sub>Adj</sub> = 10 μF, I <sub>out</sub> = 100 mA                                                                                                                                                                                                                                                                                                                | 66                                     |                                 | dB   |
| Adjustment Pin Current           | I <sub>Adj</sub>  | V <sub>DIFF</sub> = 3.0V, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 3.3V<br>V <sub>DIFF</sub> = 40V<br>V <sub>DIFF</sub> = 60V                                                                                                                                                                                                                                                                                     |                                        | 100<br>100<br>100<br>100        | μA   |
| Adjustment Pin<br>Current Change | ΔI <sub>Adj</sub> | V <sub>DIFF</sub> = 3.0V, 10mA ≤ I <sub>L</sub> ≤ 500 mA, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 3.3V, 10mA ≤ I <sub>L</sub> ≤ 500 mA<br>V <sub>DIFF</sub> = 40V, 10mA ≤ I <sub>L</sub> ≤ 150 mA, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 40V, 10mA ≤ I <sub>L</sub> ≤ 100 mA<br>3.0V ≤ V <sub>DIFF</sub> ≤ 40V, T <sub>A</sub> = 25°C<br>3.3V ≤ V <sub>DIFF</sub> ≤ 40V<br>3.3V ≤ V <sub>DIFF</sub> ≤ 60V | -5<br>-5<br>-5<br>-5<br>-5<br>-5<br>-5 | 5<br>5<br>5<br>5<br>5<br>5<br>5 | μA   |
| Minimum Load Current             | I <sub>Lmin</sub> | V <sub>DIFF</sub> = 3.0V, V <sub>out</sub> = 1.4V (forced)<br>V <sub>DIFF</sub> = 3.3V, V <sub>out</sub> = 1.4V (forced)<br>V <sub>DIFF</sub> = 40V, V <sub>out</sub> = 1.4V (forced)<br>V <sub>DIFF</sub> = 60V, V <sub>out</sub> = 1.4V (forced)                                                                                                                                                                    |                                        | 5.0<br>5.0<br>5.0<br>7.0        | mA   |
| Current Limit<br>(Note 2)        | I <sub>CL</sub>   | V <sub>DIFF</sub> = 5V<br>V <sub>DIFF</sub> = 40V, T <sub>A</sub> = 25°C<br>V <sub>DIFF</sub> = 60V, T <sub>A</sub> = 25°C                                                                                                                                                                                                                                                                                            | 0.5<br>0.15<br>0.02                    | 1.65<br>0.65<br>0.28            | A    |

Notes: Please see previous page.

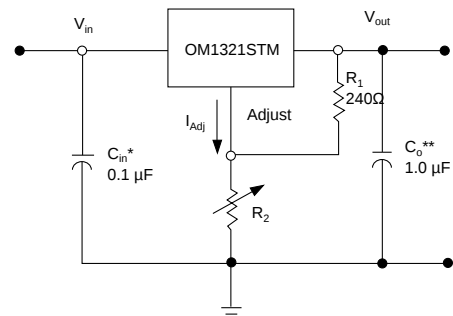
## STANDARD APPLICATION

\* C<sub>in</sub> is required if regulator is located an appreciable distance from power supply filter.

\*\* C<sub>o</sub> is not needed for stability, however it does improve transient response.

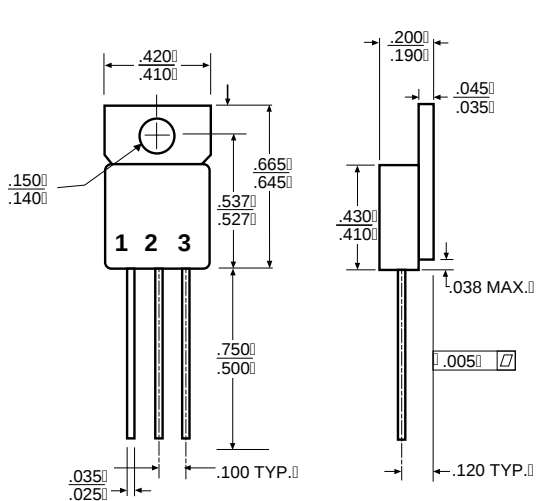
$$V_{out} = 1.25 V \left( 1 + \frac{R_2}{R_1} \right) + I_{Adj} R_2$$

Since I<sub>Adj</sub> is controlled to less than 100 μA, the error associated with this term is negligible in most applications.



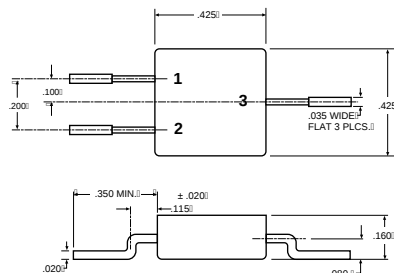
3.5

## MECHANICAL OUTLINE

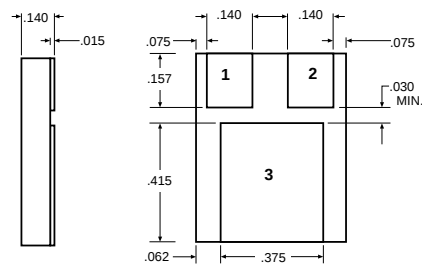


**OM1321STM**  
Isolated  
Front View  
Pin 1 - Adjust  
Pin 2 - Output  
Pin 3 - Input  
Tab - Isolated

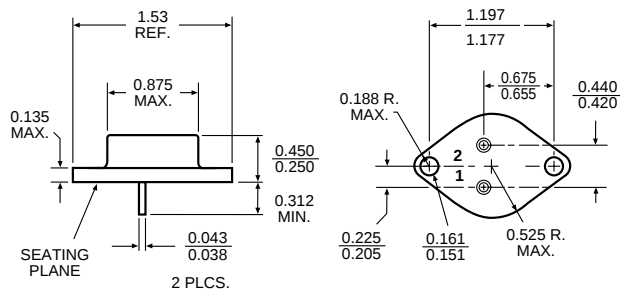
**OM1321NTM**  
Non-Isolated  
Front View  
Pin 1 - Adjust  
Pin 2 - Output  
Pin 3 - Input  
Tab - Output



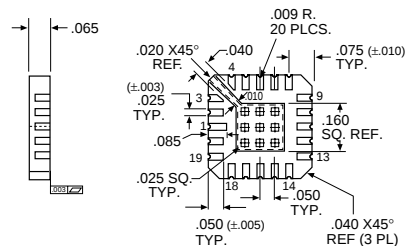
**OM1321SMM**  
Front View  
Pin 1 - Adjust  
Pin 2 - Input  
Pin 3 - Output  
Tab - Isolated



**OM1321NMM**  
Pin 1 - Adjust  
Pin 2 - Input  
Pin 3 - Output



**OM1321NKM**  
Pin 1 - Adjust  
Pin 2 - Input  
Case - Output



**OM1321N2M**

|        |    |        |                          |
|--------|----|--------|--------------------------|
| Pin 1  | NC | Pin 11 | V <sub>IN</sub>          |
| Pin 2  | NC | Pin 12 | V <sub>OUT</sub>         |
| Pin 3  | NC | Pin 13 | V <sub>OUT</sub>         |
| Pin 4  | NC | Pin 14 | V <sub>OUT</sub> (Sense) |
| Pin 5  | NC | Pin 15 | NC                       |
| Pin 6  | NC | Pin 16 | NC                       |
| Pin 7  | NC | Pin 17 | NC                       |
| Pin 8  | NC | Pin 18 | Adjust                   |
| Pin 9  | NC | Pin 19 | NC                       |
| Pin 10 | NC | Pin 20 | V <sub>IN</sub>          |