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Jameco Part Number 23667ST



# LM123/LM223 LM323

## THREE-TERMINAL 3A-5V POSITIVE VOLTAGE REGULATORS

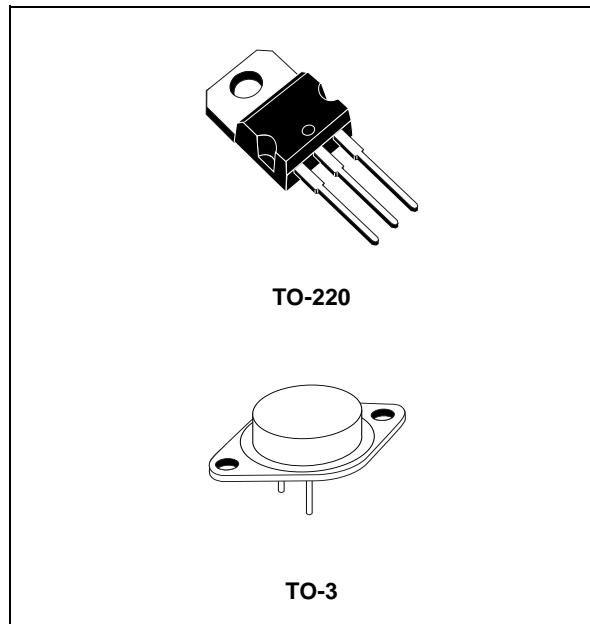
- OUTPUT CURRENT: 3A
- INTERNAL CURRENT AND THERMAL LIMITING
- TYPICAL OUTPUT IMPEDANCE:  $0.01\Omega$
- MINIMUM INPUT VOLTAGE: 7.5V
- POWER DISSIPATION: 30W

### DESCRIPTION

The LM123, LM223, LM323 are three-terminal positive voltage regulators with a preset 5V output and a load driving capability of 3A. New circuit design and processing techniques are used to provide the high output current without sacrificing the regulation characteristics of lower current devices.

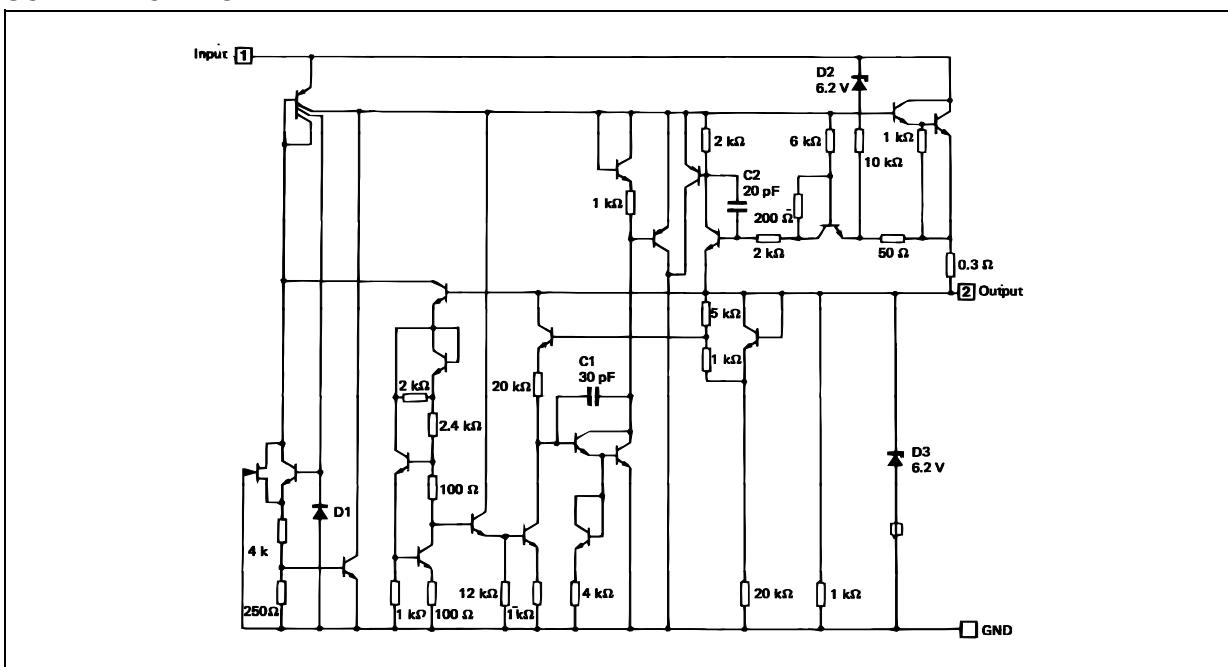
The 3A regulator is virtually blowout proof.

Current limiting, power limiting and thermal shut-down provide the same high level of reliability obtained with these techniques in the LM209, 1A regulator. An overall worst case specification for the combined effects of input voltage, load current, ambient temperature, and power



dissipation ensure that the LM123, LM223, LM323 will perform satisfactorily as a system element.

### SCHEMATIC DIAGRAM



## LM123-LM223-LM323

### ABSOLUTE MAXIMUM RATINGS

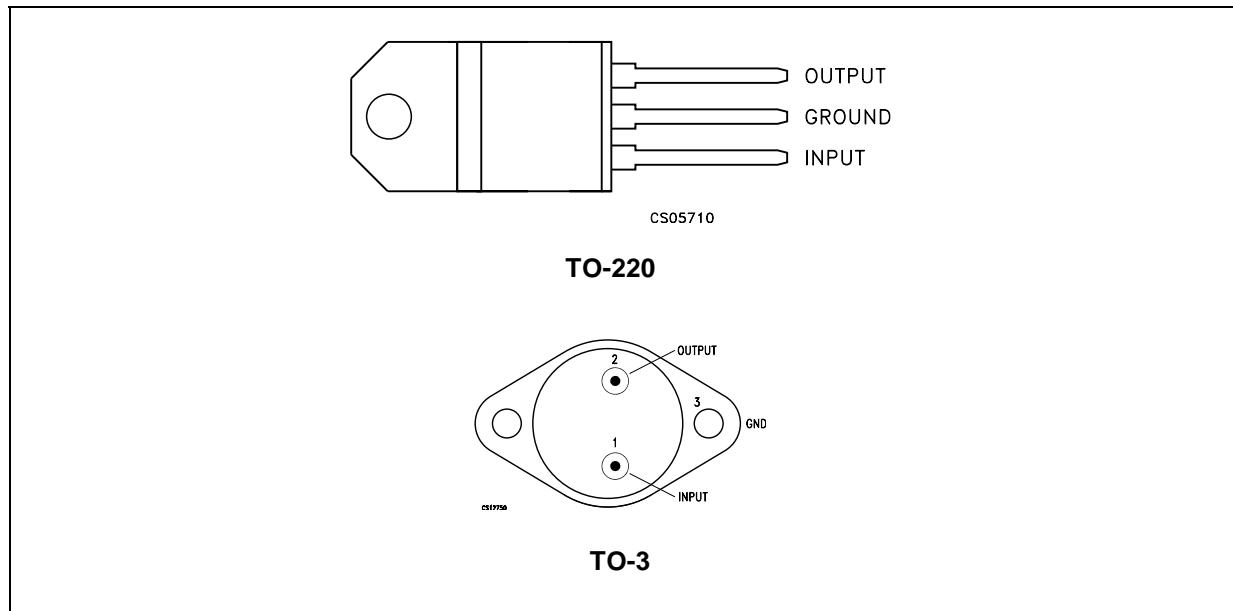
| Symbol     | Parameter <sup>2</sup>               | Value              | Unit       |
|------------|--------------------------------------|--------------------|------------|
| $V_I$      | Input Voltage                        | 20                 | V          |
| $I_O$      | Output Current                       | Internally Limited |            |
| $P_{tot}$  | Power Dissipation                    | Internally Limited |            |
| $T_{stg}$  | Storage Temperature Range            | -65 to 150         | °C         |
| $T_{oper}$ | Operating Junction Temperature Range | LM123              | -55 to 150 |
|            |                                      | LM223              | -25 to 125 |
|            |                                      | LM323              | 0 to 125   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

### THERMAL DATA

| Symbol         | Parameter                               | TO-220 | TO-3 | Unit |
|----------------|---|--------|------|------|
| $R_{thj-case}$ | Thermal Resistance Junction-case Max    | 3      | 2    | °C/W |
| $R_{thj-amb}$  | Thermal Resistance Junction-ambient Max | 50     | 35   | °C/W |

### CONNECTION DIAGRAM (top view)



### ORDERING CODES

| TYPE  | TO-220 | TO-3   | TEMPERATURE RANGE |
|-------|--------|--------|-------------------|
| LM123 |        | LM123K | -55°C to 150°C    |
| LM223 |        | LM223K | -25°C to 150°C    |
| LM323 | LM323T | LM323K | 0°C to 125°C      |

**ELECTRICAL CHARACTERISTICS OF LM123/LM223 ( $T_J = -55$  to  $150^\circ\text{C}$  for LM123,  $T_J = -25$  to  $150^\circ\text{C}$  for LM223 unless otherwise specified).**

| Symbol   | Parameter                     | Test Conditions   | Min. | Typ. | Max. | Unit                       |
|----------|-------------------------------|---|------|------|------|----------------------------|
| $V_O$    | Output Voltage Range (Note 2) | $T_a = 25^\circ\text{C}$ , $V_I = 7.5 \text{ V}$ , $I_O = 0$  | 4.7  | 5    | 5.3  | V                          |
| $V_O$    | Output Voltage Range (Note 2) | $T_J = T_{\min} \text{ to } T_{\max}$ $P \leq P_{\max}$<br>$V_I = 7.5 \text{ to } 15 \text{ V}$ $I_O = 0 \text{ to } 3 \text{ A}$ | 4.6  |      | 5.4  | V                          |
| $K_{VI}$ | Line Regulation (Note 3)      | $V_I = 7.5 \text{ to } 15 \text{ V}$ $T_J = 25^\circ\text{C}$   |      | 5    | 25   | mV                         |
| $K_{VO}$ | Load Regulation (Note 3)      | $I_O = 0 \text{ to } 3 \text{ A}$ $V_I = 7.5 \text{ V}$ $T_J = 25^\circ\text{C}$  |      | 25   | 100  | mV                         |
| $I_{IB}$ | Quiescent Current             | $V_I = 7.5 \text{ to } 15 \text{ V}$ $I_O = 0 \text{ to } 3 \text{ A}$  |      | 12   | 20   | mA                         |
| $V_{NO}$ | Output Noise Voltage          | $T_a = 25^\circ\text{C}$ $f = 10 \text{ Hz to } 100 \text{ KHz}$  |      | 40   |      | $\mu\text{V}_{\text{rms}}$ |
| $I_{OS}$ | Short Circuit Current Limit   | $V_I = 15 \text{ V}$ $T_J = 25^\circ\text{C}$   |      | 3    | 4.5  | A                          |
|          |                               | $V_I = 7.5 \text{ V}$ $T_J = 25^\circ\text{C}$  |      | 4    | 5    |                            |
| $K_{VH}$ | Long Term Stability           |   |      |      | 35   | mV                         |

Notes: 1. Although power dissipation is internally limited, specifications apply only for  $P \leq 30\text{W}$ .  
 2. Selected devices with tightened tolerance output voltage available.  
 3. Load and line regulation are specified at constant junction temperature. Pulse testing is required with a pulse width  $\leq 1\text{ms}$  and duty cycle  $\leq 5\%$ .

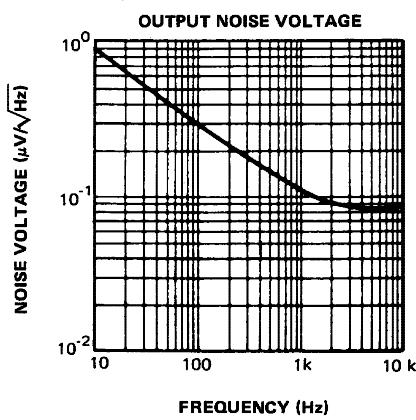
**ELECTRICAL CHARACTERISTICS OF LM323 ( $T_J = 0$  to  $150^\circ\text{C}$ , unless otherwise specified).**

| Symbol   | Parameter                     | Test Conditions   | Min. | Typ. | Max. | Unit                       |
|----------|-------------------------------|---|------|------|------|----------------------------|
| $V_O$    | Output Voltage Range (Note 2) | $T_a = 25^\circ\text{C}$ , $V_I = 7.5 \text{ V}$ , $I_O = 0$  | 4.8  | 5    | 5.2  | V                          |
| $V_O$    | Output Voltage Range (Note 2) | $T_J = T_{\min} \text{ to } T_{\max}$ $P \leq P_{\max}$<br>$V_I = 7.5 \text{ to } 15 \text{ V}$ $I_O = 0 \text{ to } 3 \text{ A}$ | 4.75 |      | 5.25 | V                          |
| $K_{VI}$ | Line Regulation (Note 3)      | $V_I = 7.5 \text{ to } 15 \text{ V}$ $T_J = 25^\circ\text{C}$   |      | 5    | 25   | mV                         |
| $K_{VO}$ | Load Regulation (Note 3)      | $I_O = 0 \text{ to } 3 \text{ A}$ $V_I = 7.5 \text{ V}$ $T_J = 25^\circ\text{C}$  |      | 25   | 100  | mV                         |
| $I_{IB}$ | Quiescent Current             | $V_I = 7.5 \text{ to } 15 \text{ V}$ $I_O = 0 \text{ to } 3 \text{ A}$  |      | 12   | 20   | mA                         |
| $V_{NO}$ | Output Noise Voltage          | $T_a = 25^\circ\text{C}$ $f = 10 \text{ Hz to } 100 \text{ KHz}$  |      | 40   |      | $\mu\text{V}_{\text{rms}}$ |
| $I_{OS}$ | Short Circuit Current Limit   | $V_I = 15 \text{ V}$ $T_J = 25^\circ\text{C}$   |      | 3    | 4.5  | A                          |
|          |                               | $V_I = 7.5 \text{ V}$ $T_J = 25^\circ\text{C}$  |      | 4    | 5    |                            |
| $K_{VH}$ | Long Term Stability           |   |      |      | 35   | mV                         |

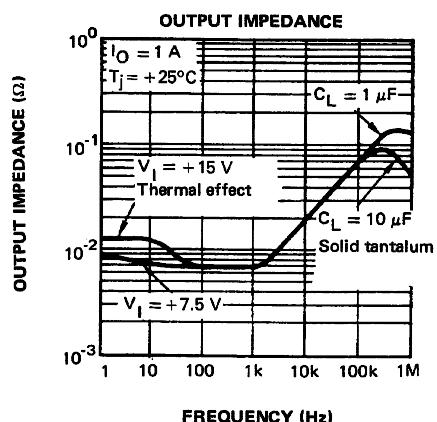
Notes: 1. Although power dissipation is internally limited, specifications apply only for  $P \leq 30\text{W}$ .  
 2. Selected devices with tightened tolerance output voltage available.  
 3. Load and line regulation are specified at constant junction temperature. Pulse testing is required with a pulse width  $\leq 1\text{ms}$  and duty cycle  $\leq 5\%$ .

## LM123-LM223-LM323

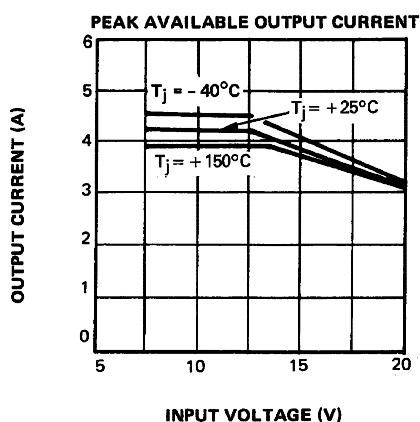
**Figure 1 : Output Noise Voltage**



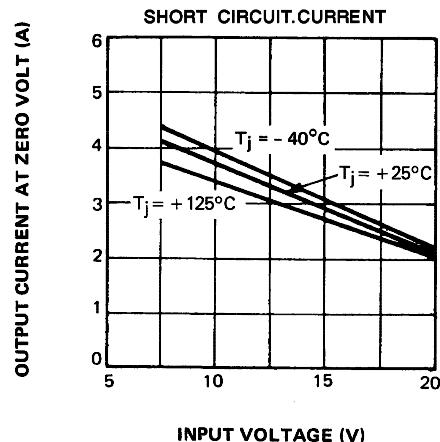
**Figure 2 : Output Impedance**



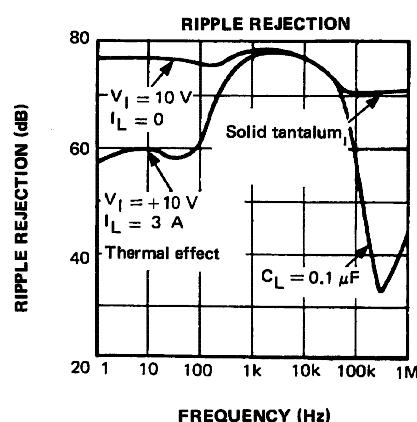
**Figure 3 : Peak Available Output Current**



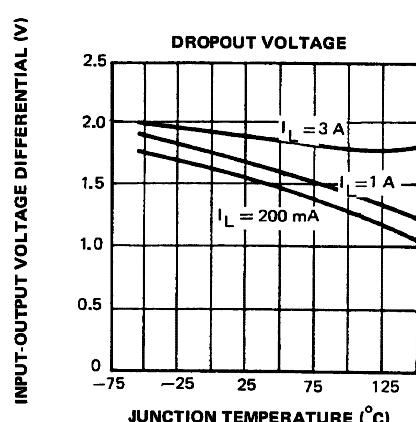
**Figure 4 : Short Circuit Current**

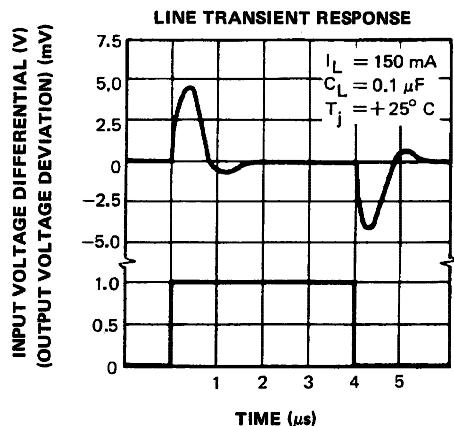
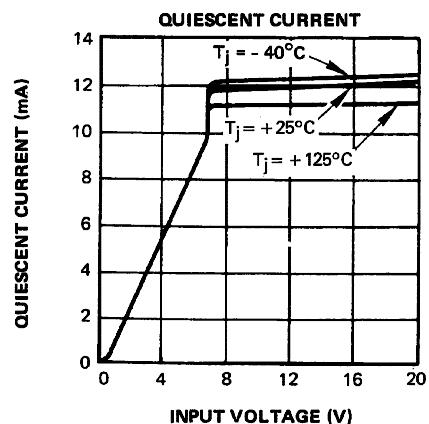
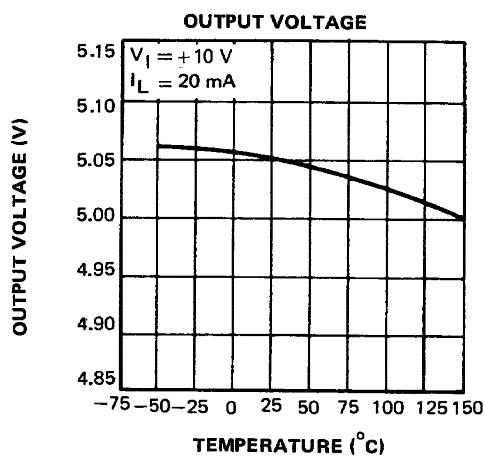
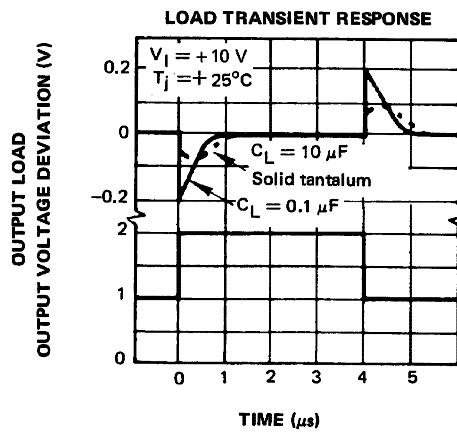


**Figure 5 : Ripple Rejection**



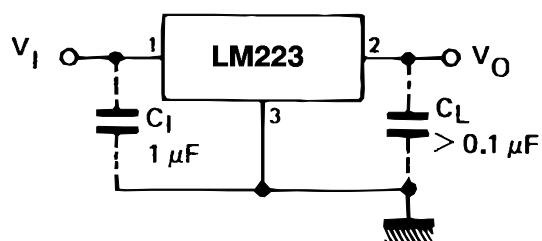
**Figure 6 : Dropout Voltage**



**Figure 7 : Line Transient Response****Figure 9 : Quiescent Current****Figure 8 : Output Voltage****Figure 10 : Load Transient Response**

## TYPICAL APPLICATION

### BASIC 3A REGULATOR

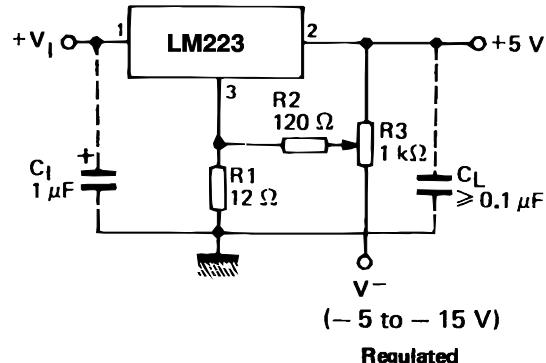


$C_1$  = Required if regulator is distant from filter capacitors.

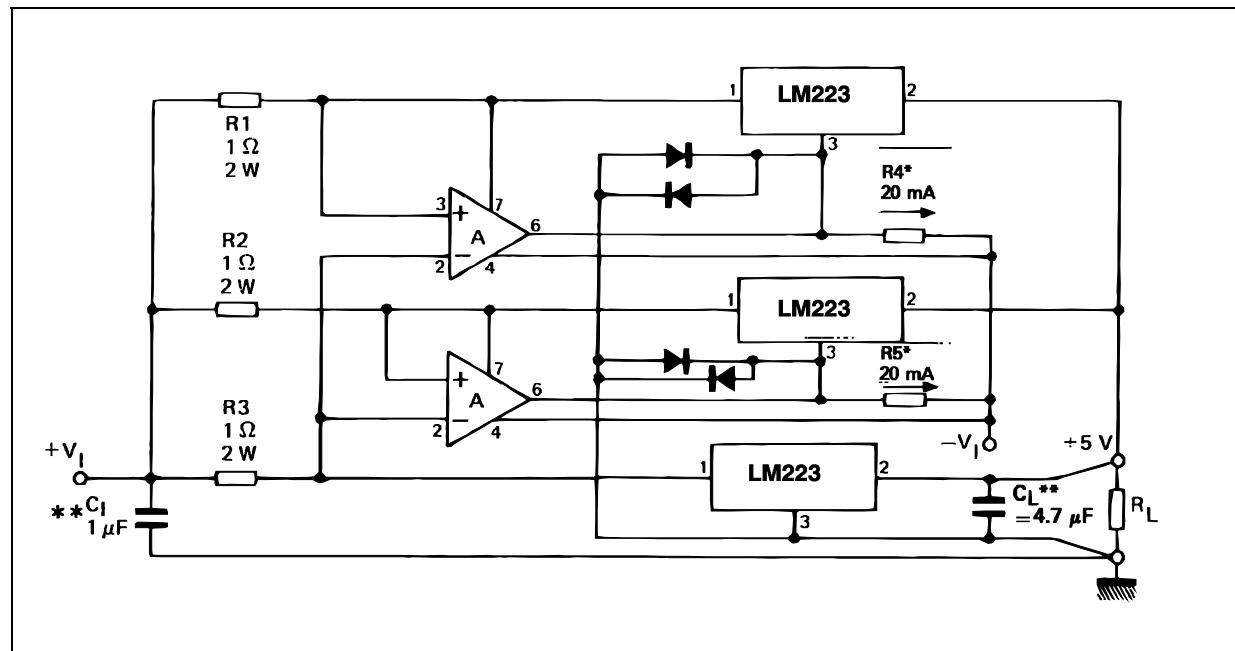
$C_L$  = Regulator is stable with no load capacitor into resistive loads.

## LM123-LM223-LM323

### TRIMMING OUTPUT TO 5V



### 10A REGULATOR WITH COMPLETE OVERLOAD PROTECTION

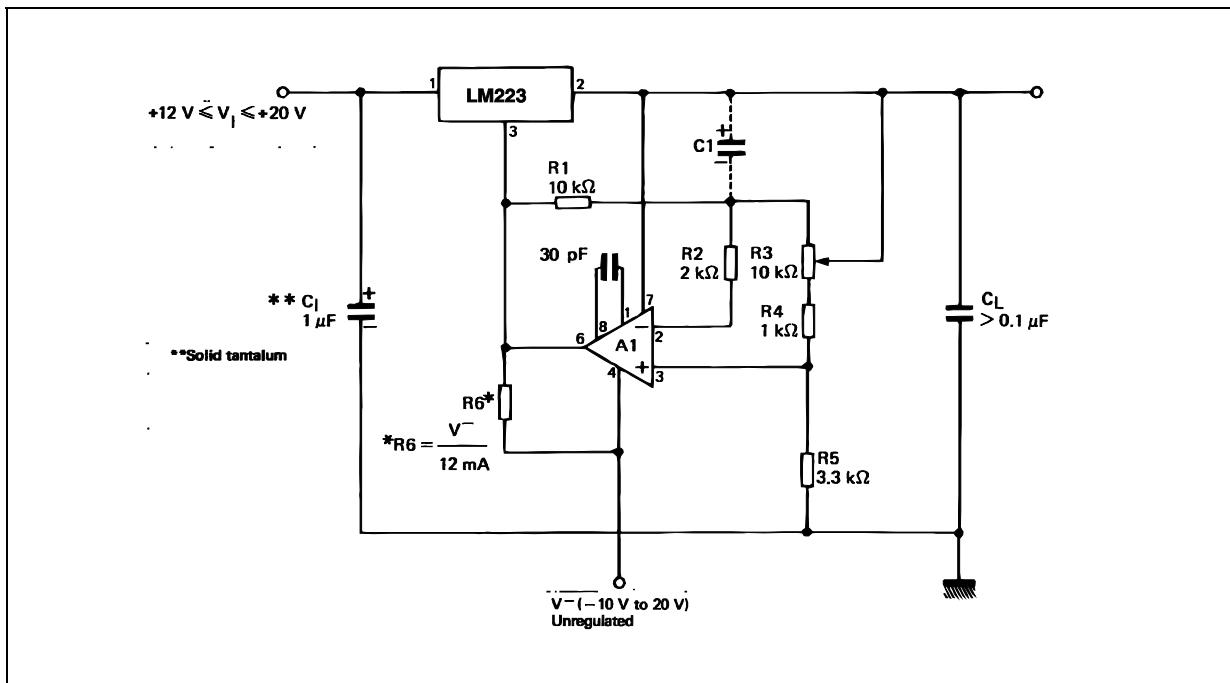


\* Selected for 20 mA current from unregulated negative supply.

\*\* Solid tantalum.

A = LM101A, LM201A, LM301A.

## ADJUSTABLE REGULATOR 0 - 10V/3A

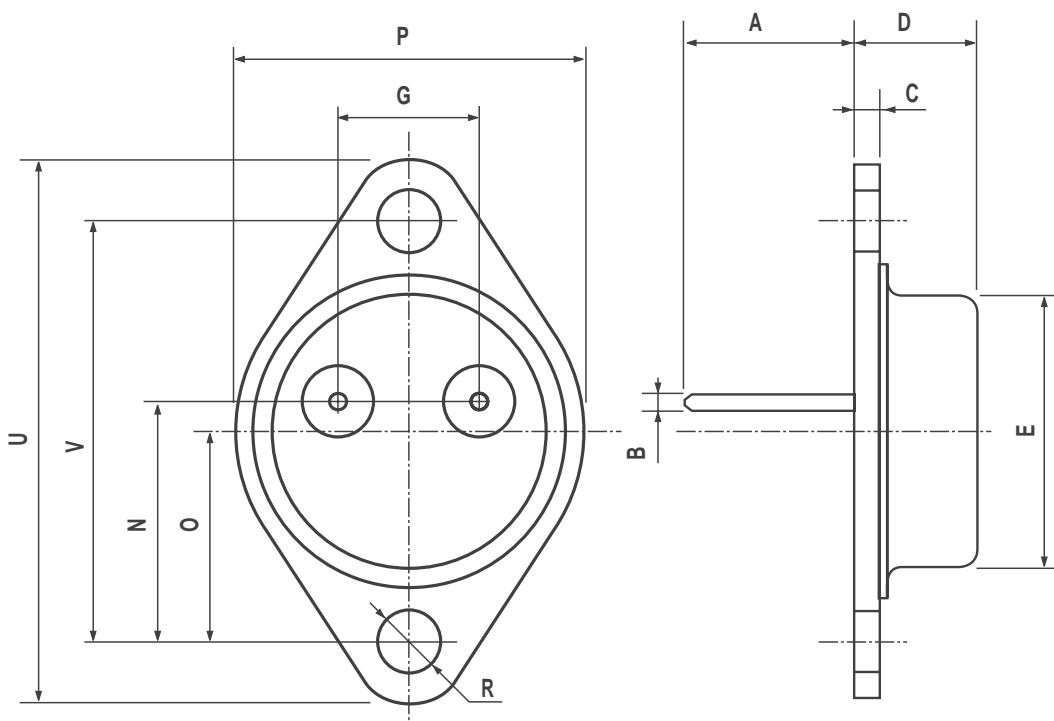


A1 = LM101A, LM201A, LM301A.

C1 = 2 $\mu$ F optional - improves ripple rejection, noise and transient response.

**TO-3 MECHANICAL DATA**

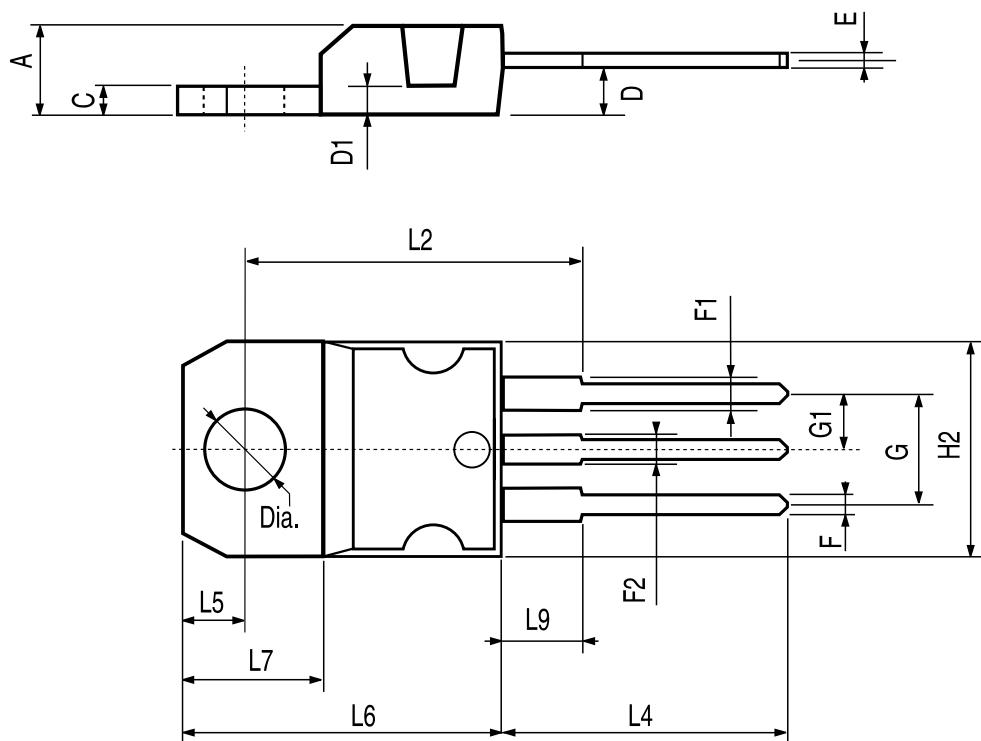
| DIM. | mm.  |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      | 11.85 |      |       | 0.466 |       |
| B    | 0.96 | 1.05  | 1.10 | 0.037 | 0.041 | 0.043 |
| C    |      |       | 1.70 |       |       | 0.066 |
| D    |      |       | 8.7  |       |       | 0.342 |
| E    |      |       | 20.0 |       |       | 0.787 |
| G    |      | 10.9  |      |       | 0.429 |       |
| N    |      | 16.9  |      |       | 0.665 |       |
| P    |      |       | 26.2 |       |       | 1.031 |
| R    | 3.88 |       | 4.09 | 0.152 |       | 0.161 |
| U    |      |       | 39.5 |       |       | 1.555 |
| V    |      | 30.10 |      |       | 1.185 |       |



P003C/C

## TO-220 MECHANICAL DATA

| DIM. | mm.   |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| C    | 1.23  |      | 1.32  | 0.048 |       | 0.051 |
| D    | 2.40  |      | 2.72  | 0.094 |       | 0.107 |
| D1   |       | 1.27 |       |       | 0.050 |       |
| E    | 0.49  |      | 0.70  | 0.019 |       | 0.027 |
| F    | 0.61  |      | 0.88  | 0.024 |       | 0.034 |
| F1   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| F2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| G    | 4.95  |      | 5.15  | 0.194 |       | 0.203 |
| G1   | 2.4   |      | 2.7   | 0.094 |       | 0.106 |
| H2   | 10.0  |      | 10.40 | 0.393 |       | 0.409 |
| L2   |       | 16.4 |       |       | 0.645 |       |
| L4   | 13.0  |      | 14.0  | 0.511 |       | 0.551 |
| L5   | 2.65  |      | 2.95  | 0.104 |       | 0.116 |
| L6   | 15.25 |      | 15.75 | 0.600 |       | 0.620 |
| L7   | 6.2   |      | 6.6   | 0.244 |       | 0.260 |
| L9   | 3.5   |      | 3.93  | 0.137 |       | 0.154 |
| DIA. | 3.75  |      | 3.85  | 0.147 |       | 0.151 |



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