

Three-terminal 3 A adjustable voltage regulators

Features

- Output current: 3 A
- Internal current and thermal limiting
- Typical output impedance: 0.01 W
- Minimum input voltage: 7.5 V
- Power dissipation: 30 W

Description

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

The 3 A 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, 1 A regulator. An overall worst case specification for the combined effects of input voltage, load current, ambient temperature, and power dissipation ensure that the LM323 will perform satisfactorily as a system element.

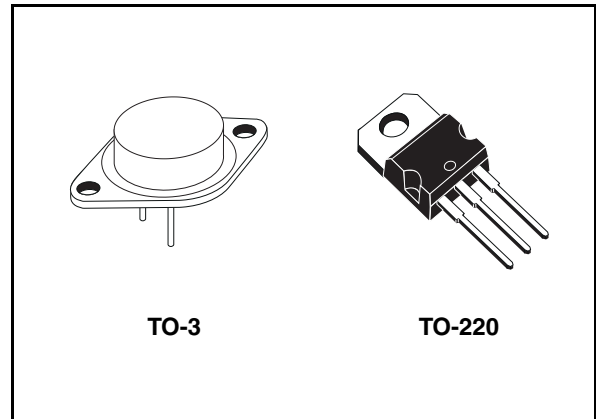


Table 1. Device summary

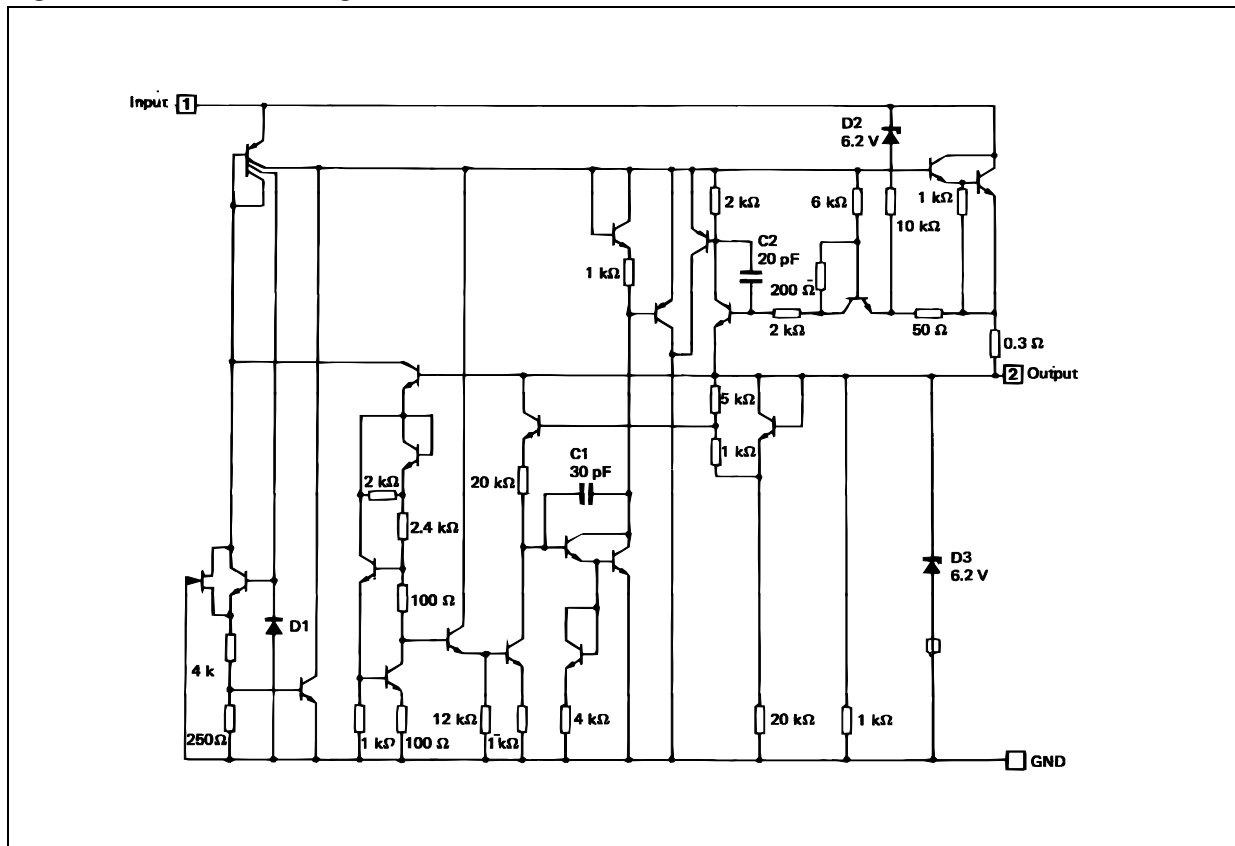
| Order codes | | Temperature range |
|-------------|--------|-------------------|
| TO-220 | TO-3 | |
| LM323T | LM323K | 0°C to 125°C |

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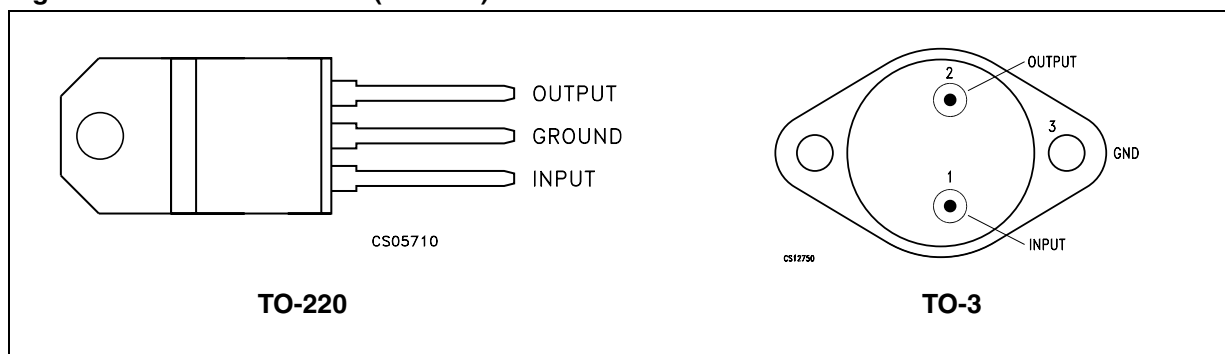
1 Diagram

Figure 1. Schematic diagram



2 Pin configuration

Figure 2. Pin connections (tot view)



3 Maximum ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|--------------------------------------|--------------------|------|
| V_I | Input voltage | 20 | V |
| I_O | Output current | Internally limited | |
| P_D | Power dissipation | Internally limited | |
| T_{STG} | Storage temperature range | -65 to 150 | °C |
| T_{OP} | Operating junction temperature range | 0 to 125 | °C |

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied

Table 3. Thermal data

| Symbol | Parameter | TO-220 | TO-3 | Unit |
|------------|-------------------------------------|--------|------|------|
| R_{thJC} | Thermal resistance junction-case | 3 | 2 | °C/W |
| R_{thJA} | Thermal resistance junction-ambient | 50 | 35 | °C/W |

4 Electrical characteristics

Table 4. Electrical characteristics ($T_J = 0$ to 150 °C, unless otherwise specified ⁽¹⁾)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------|-------------------------------------|---|------|------|------|----------------------------|
| V_O | Output voltage rang ⁽²⁾ | $T_J = 25^\circ\text{C}$, $V_I = 7.5$ V, $I_O = 0$ | 4.8 | 5 | 5.2 | V |
| V_O | Output voltage range ⁽²⁾ | $T_J = T_{\min}$ to T_{\max} , $P \leq P_{\max}$ $V_I = 7.5$ to 15 V, $I_O = 0$ to 3 A | 4.75 | | 5.25 | V |
| K_{VI} | Line regulation ⁽³⁾ | $V_I = 7.5$ to 15 V, $T_J = 25^\circ\text{C}$ | | 5 | 25 | mV |
| K_{VO} | Load regulation (Note 3) | $I_O = 0$ to 3 A, $V_I = 7.5$ V, $T_J = 25^\circ\text{C}$ | | 25 | 100 | mV |
| I_{IB} | Quiescent current | $V_I = 7.5$ to 15 V, $I_O = 0$ to 3 A | | 12 | 20 | mA |
| V_{NO} | Output noise voltage | $T_J = 25^\circ\text{C}$, $f = 10$ Hz to 100 kHz | | 40 | | μV_{RMS} |
| I_{OS} | Short circuit current limit | $V_I = 15$ V, $T_J = 25^\circ\text{C}$ | | 3 | 4.5 | A |
| | | $V_I = 7.5$ V, $T_J = 25^\circ\text{C}$ | | 4 | 5 | |
| K_{VH} | Long term stability | | | | 35 | mV |

1. Although power dissipation is internally limited, specifications apply only for $P \leq 30$ 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 ≤ 1 ms and duty cycle ≤ 5 %.

5 Typical characteristics

Figure 3. Output noise voltage

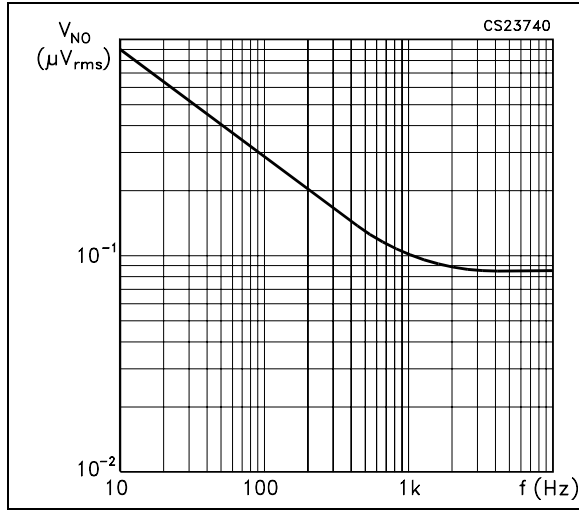


Figure 4. Output impedance

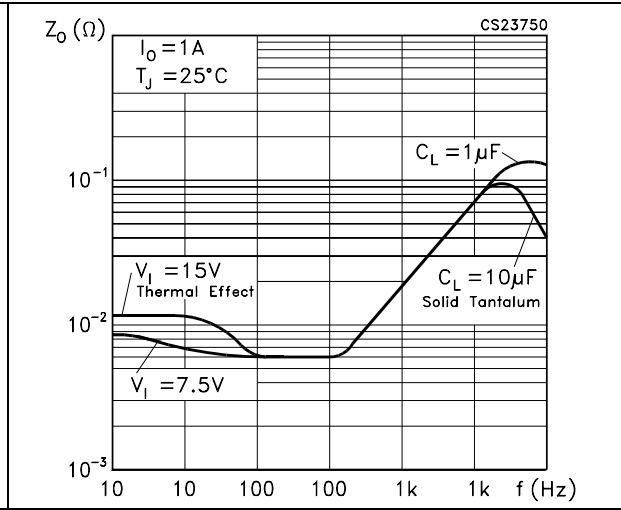


Figure 5. Peak available output current

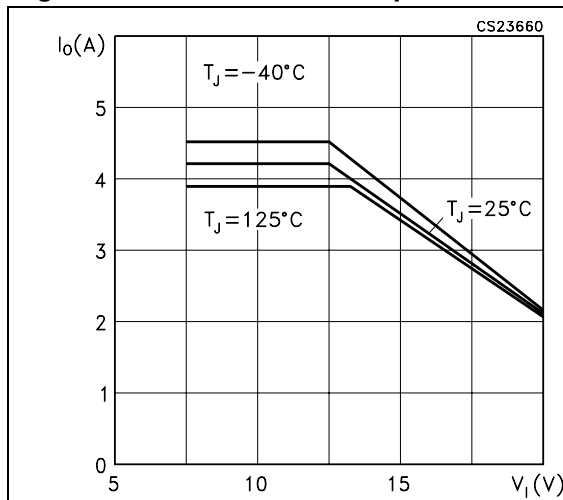


Figure 6. Short circuit current

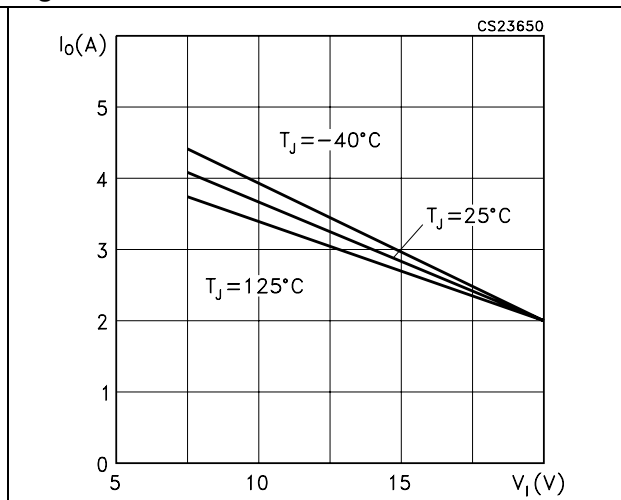


Figure 7. Ripple rejection

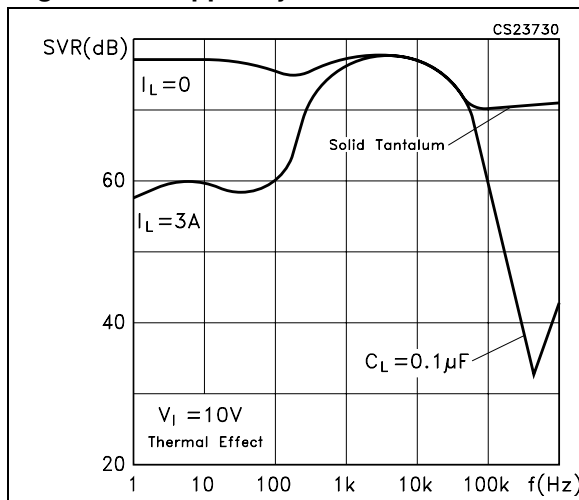


Figure 8. Dropout voltage

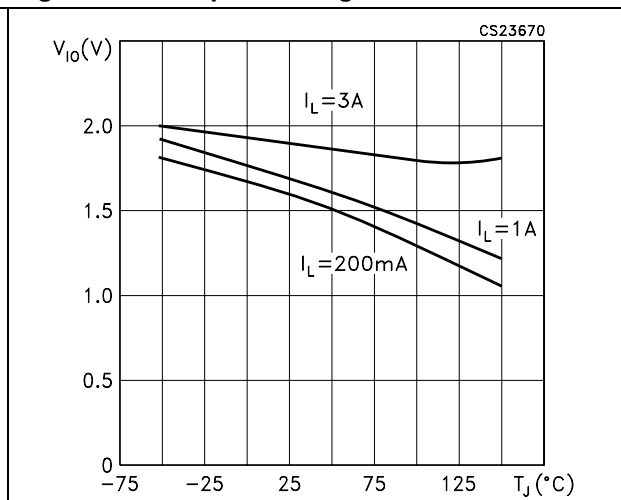


Figure 9. Line transient response

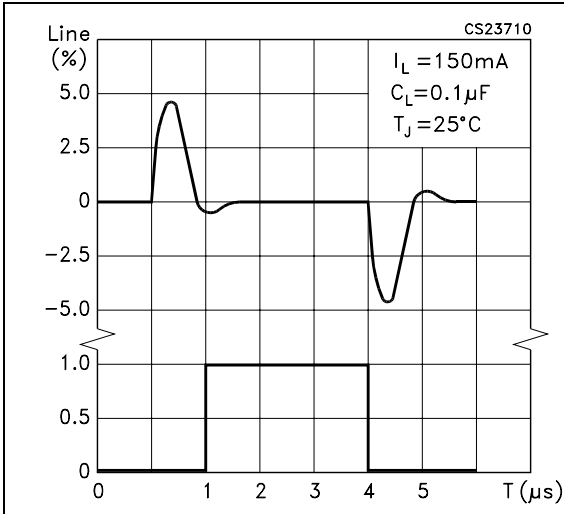


Figure 10. Output voltage

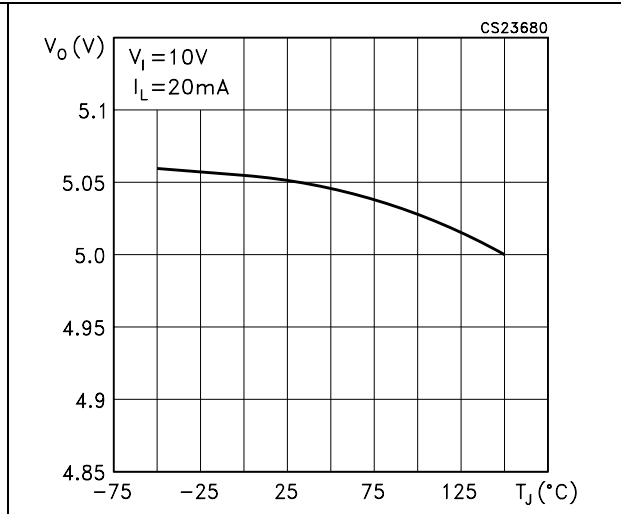


Figure 11. Quiescent current

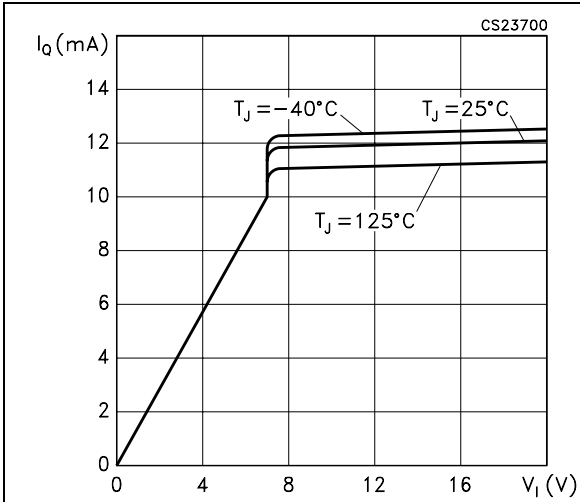
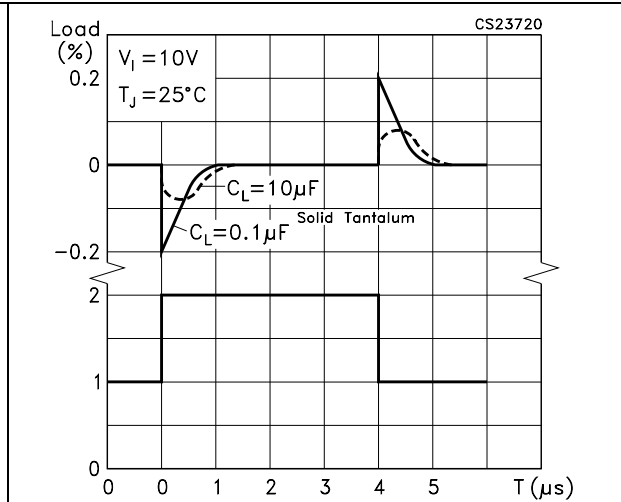
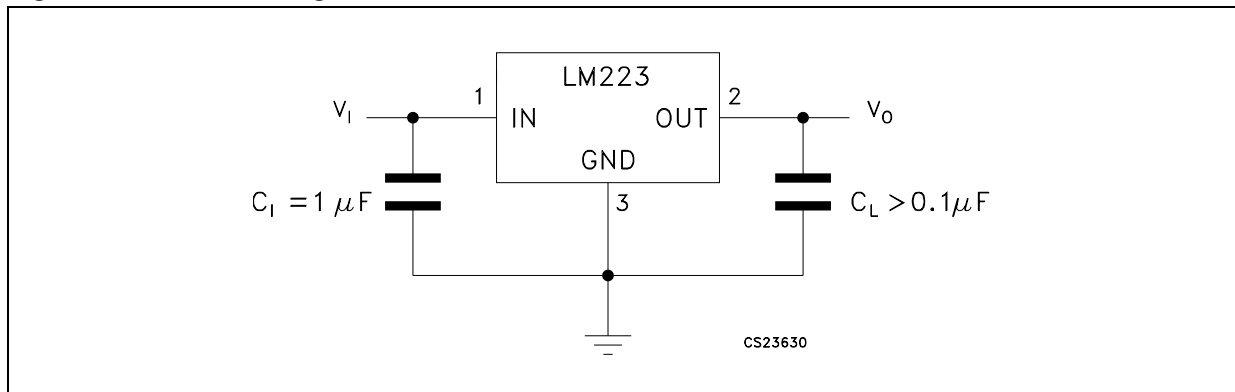


Figure 12. Load transient response



6 Typical application

Figure 13. Basic 3 A regulator



C_1 = Required if regulator is distant from filter capacitors.

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

Figure 14. Trimming output to 5 V

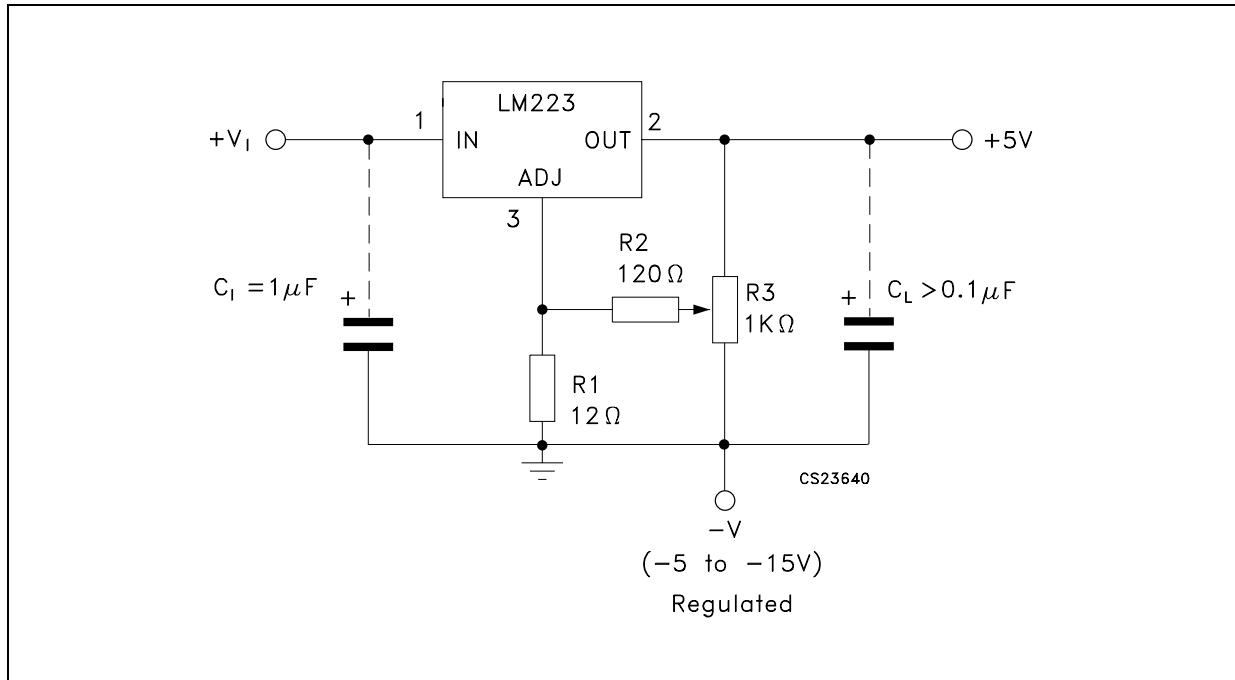
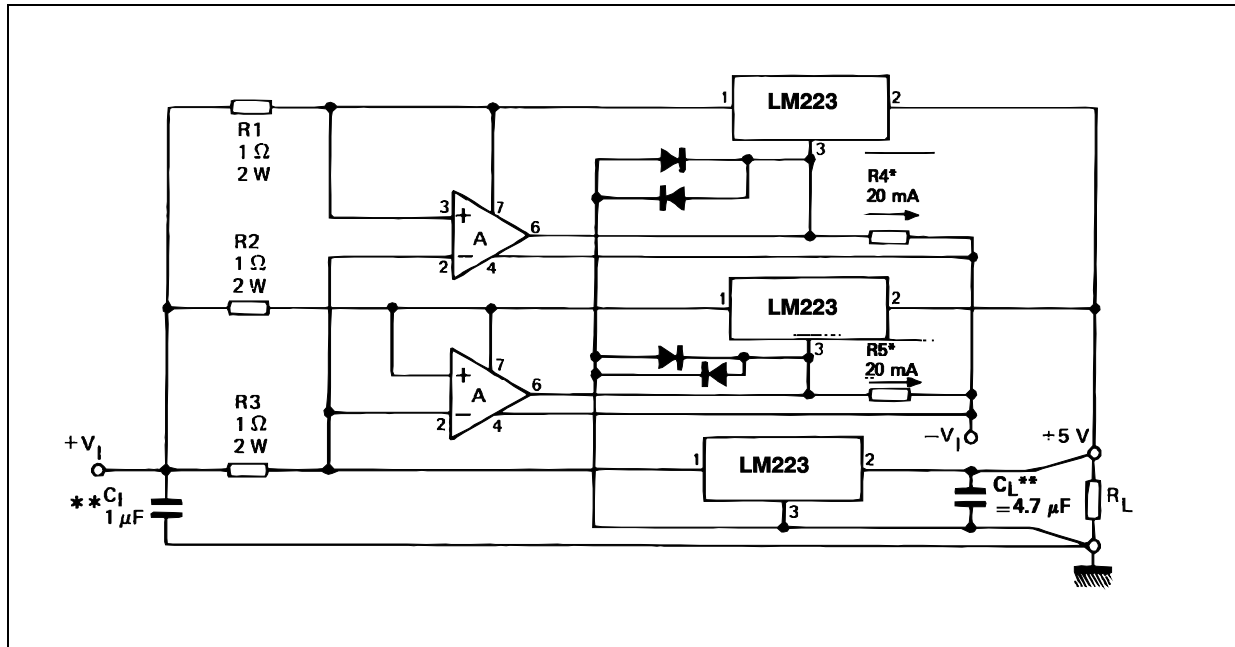


Figure 15. 10 A regulator with complete overload protection

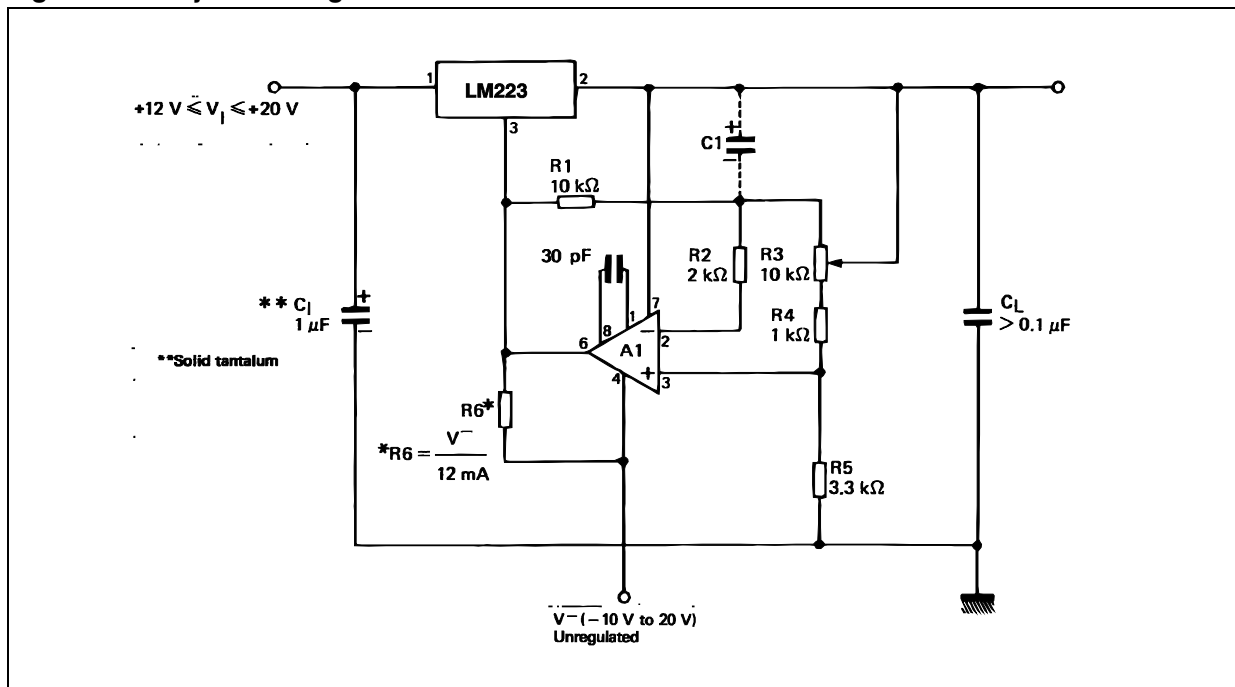


* Selected for 20 mA current from unregulated negative supply.

** Solid tantalum.

A = LM101A, LM201A, LM301A.

Figure 16. Adjustable regulator 0 - 10 V / 3 A



A1 = LM101A, LM201A, LM301A.

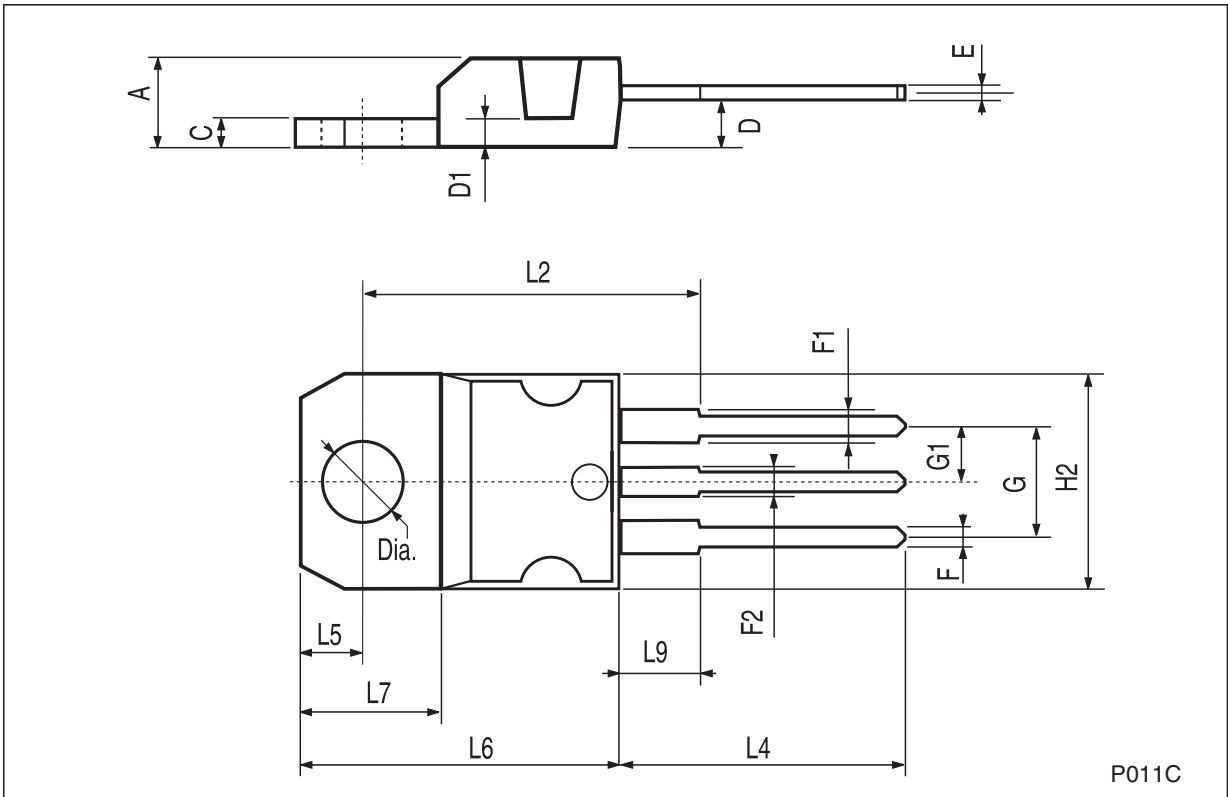
C1 = 2 μF optional - improves ripple rejection, noise and transient response.

7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK[®] packages. These packages have a lead-free second level interconnect. The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

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 |

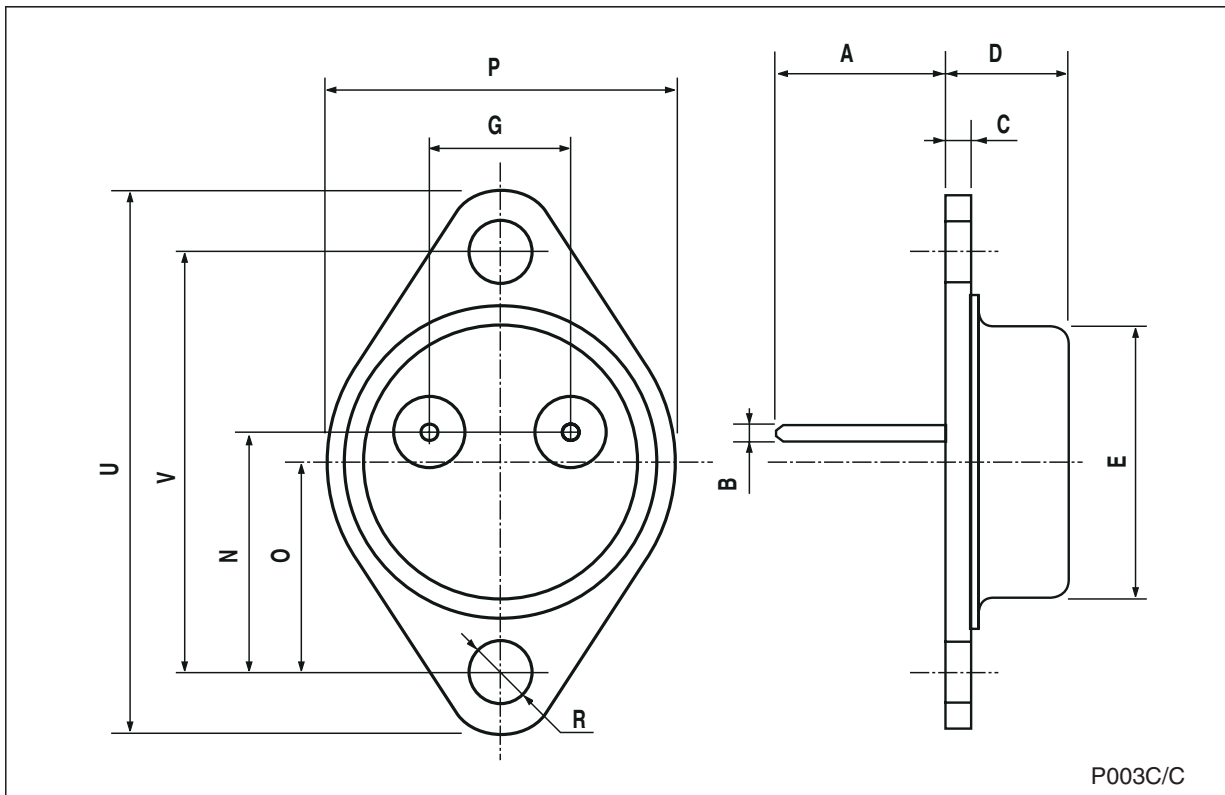


P011C



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



8 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 04-Nov-2005 | 3 | Updated curves, no content change. |
| 12-Feb-2008 | 4 | Added: Table 1 on page 1 . |

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