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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## Three-terminal 3 A adjustable voltage regulators

### Features

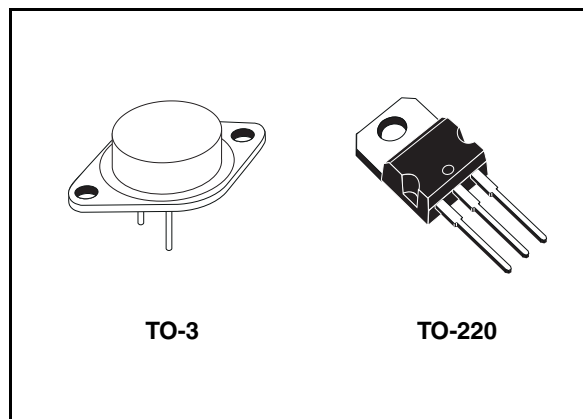
- Output current: 3 A
- Internal current and thermal limiting
- Typical output impedance: 0.01 W
- Minimum input voltage: 7.5 V
- Power dissipation: 30 W

### 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**

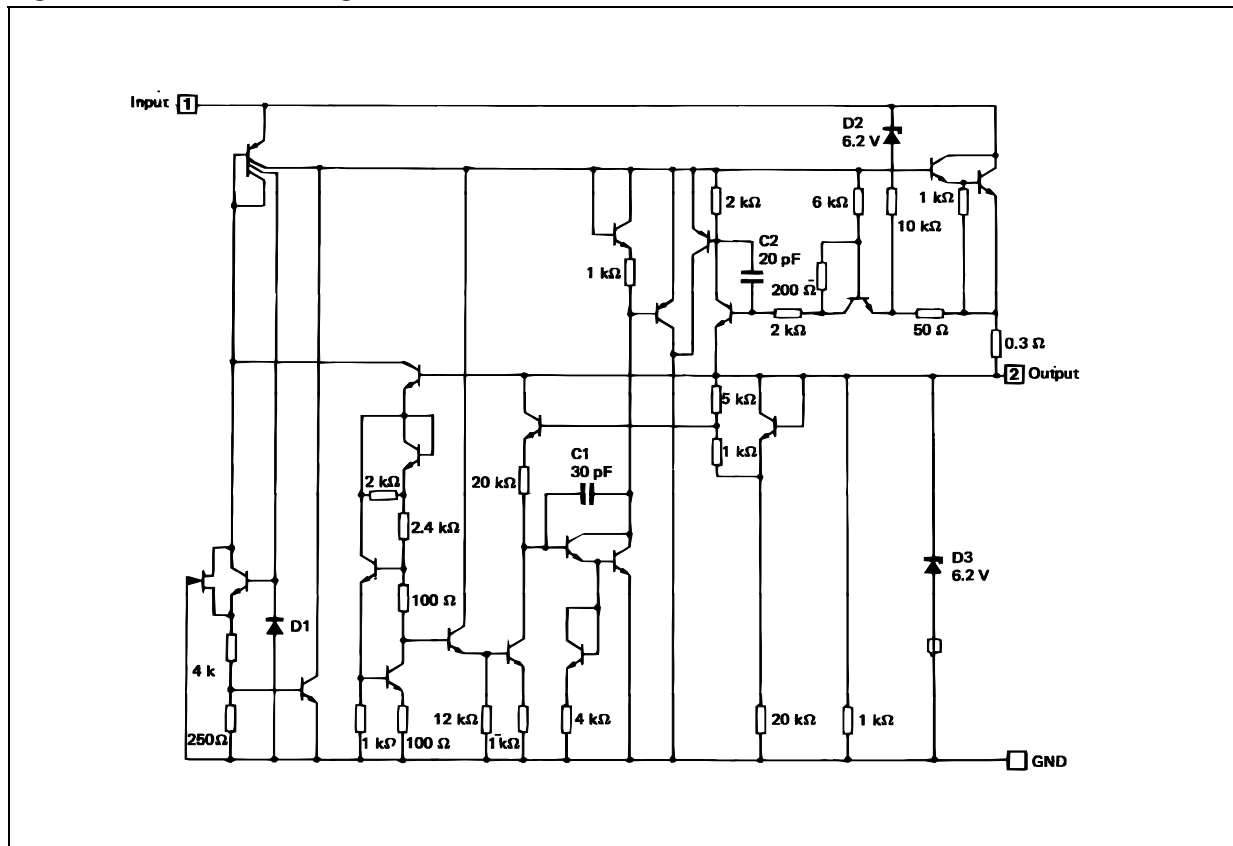
Order codes		Temperature range
TO-220	TO-3	
LM323T	LM323K	0°C to 125°C

# Contents

1	Diagram .....	3
2	Pin configuration .....	4
3	Maximum ratings .....	5
4	Electrical characteristics .....	6
5	Typical characteristics .....	7
6	Typical application .....	9
7	Package mechanical data .....	11
8	Revision history .....	14

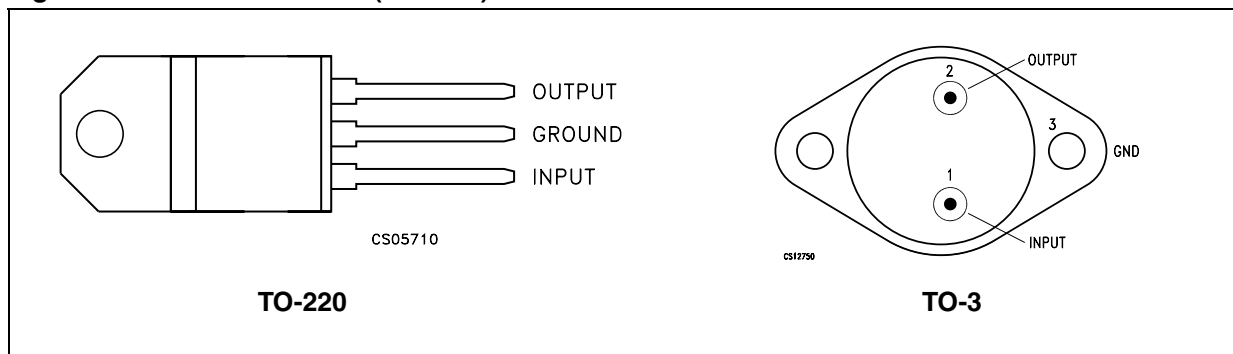
# 1 Diagram

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

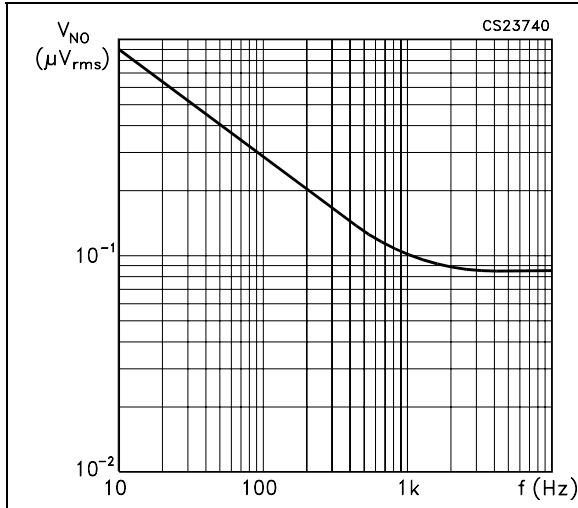
**Table 4. Electrical characteristics** ( $T_J = 0$  to  $150$  °C, unless otherwise specified <sup>(1)</sup>)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_O$	Output voltage rang <sup>(2)</sup>	$T_J = 25^\circ\text{C}$ , $V_I = 7.5$ V, $I_O = 0$	4.8	5	5.2	V
$V_O$	Output voltage range <sup>(2)</sup>	$T_J = T_{\min}$ 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 <sup>(3)</sup>	$V_I = 7.5$ 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		$\mu\text{V}_{\text{RMS}}$
$I_{OS}$	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

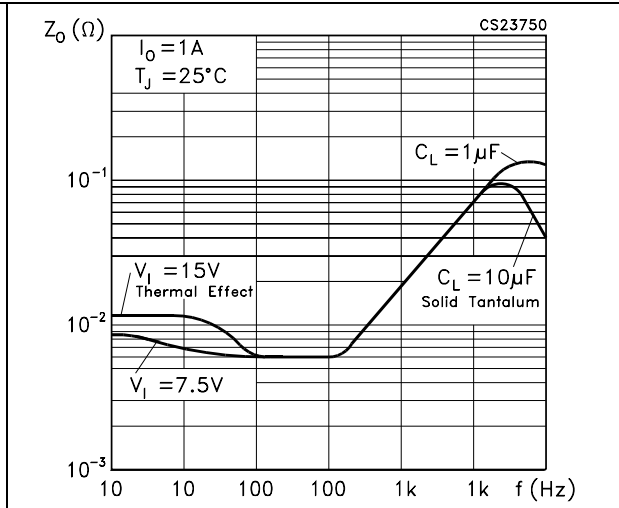
1. Although power dissipation is internally limited, specifications apply only for  $P \leq 30$  W.
2. Selected devices with tightened tolerance output voltage available.
3. Load and line regulation are specified at constant junction temperature. Pulse testing is required with a pulse width  $\leq 1$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

# 5 Typical characteristics

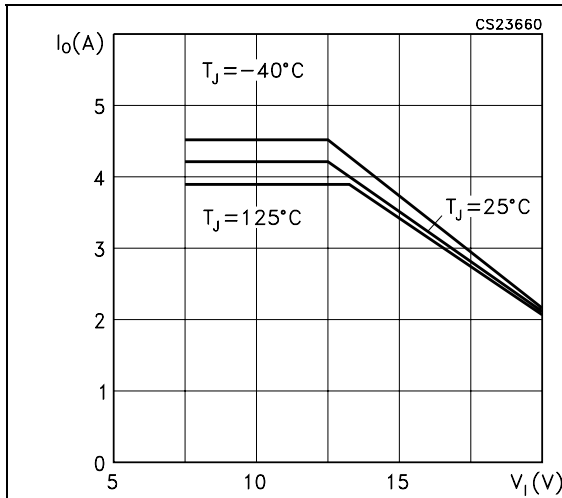
**Figure 3. Output noise voltage**



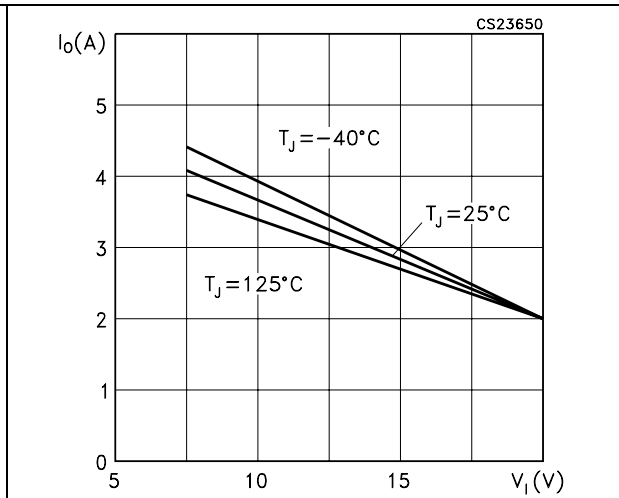
**Figure 4. Output impedance**



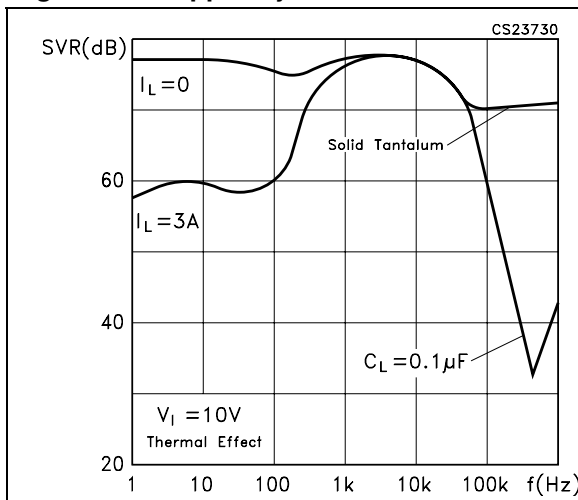
**Figure 5. Peak available output current**



**Figure 6. Short circuit current**



**Figure 7. Ripple rejection**



**Figure 8. Dropout voltage**

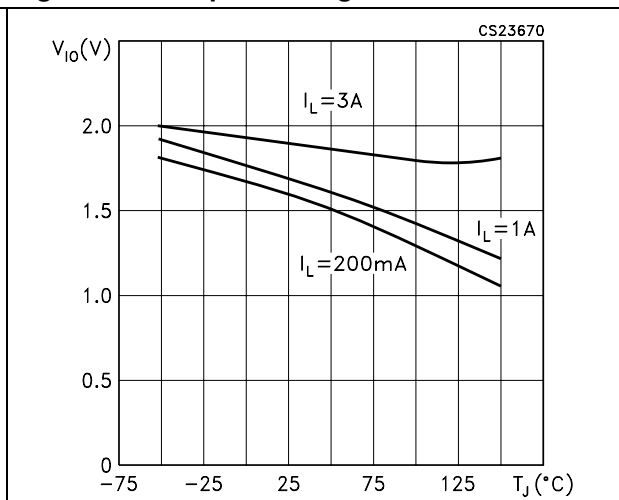




Figure 9. Line transient response

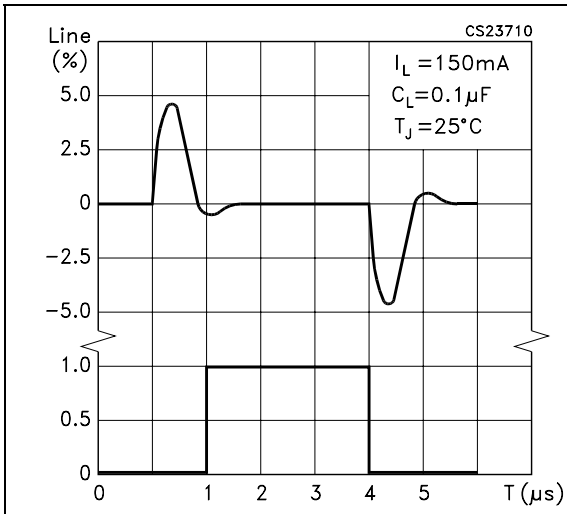


Figure 10. Output voltage

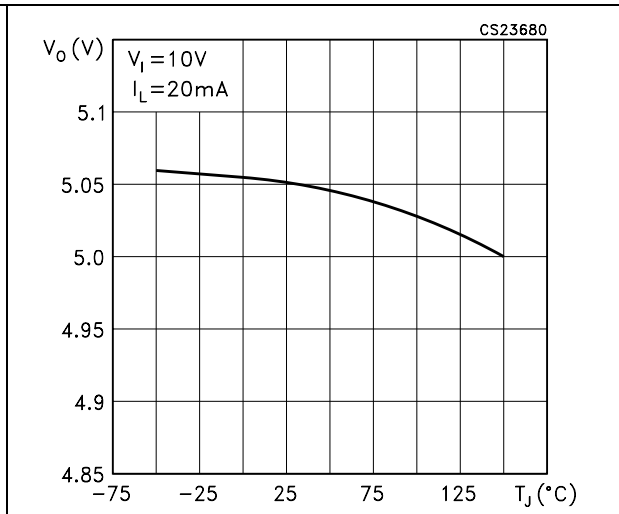


Figure 11. Quiescent current

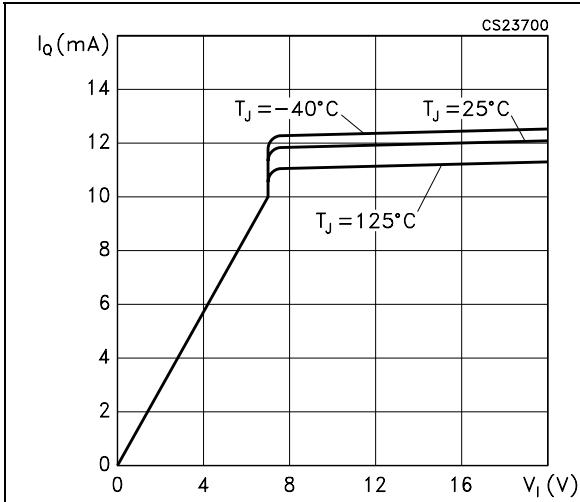
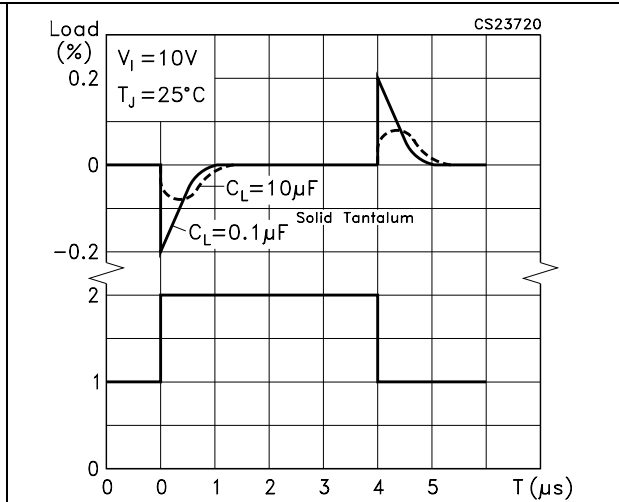
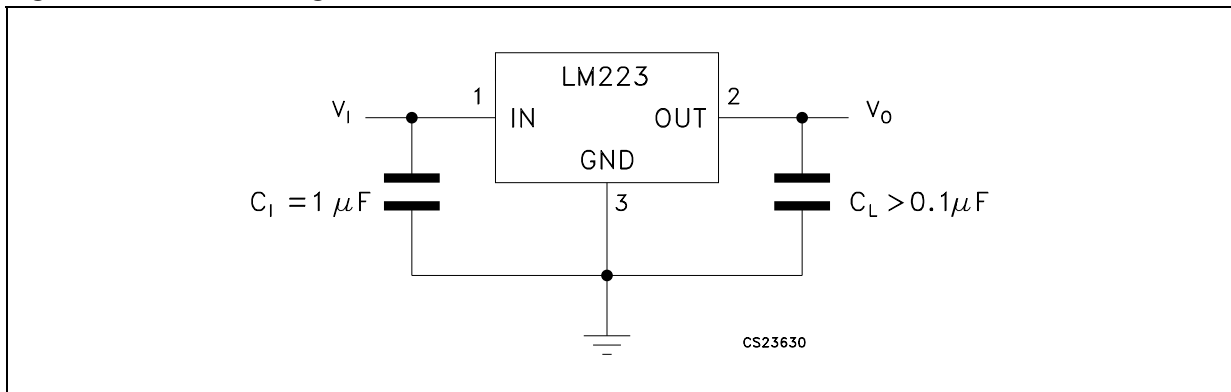


Figure 12. Load transient response



## 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

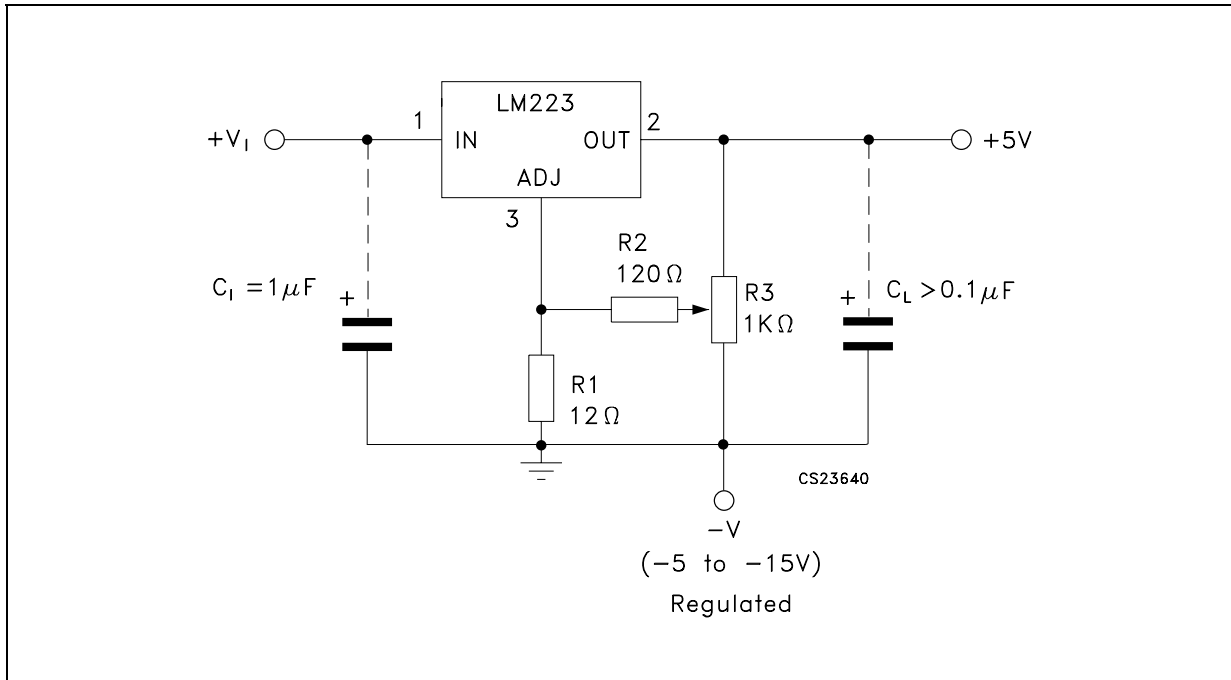
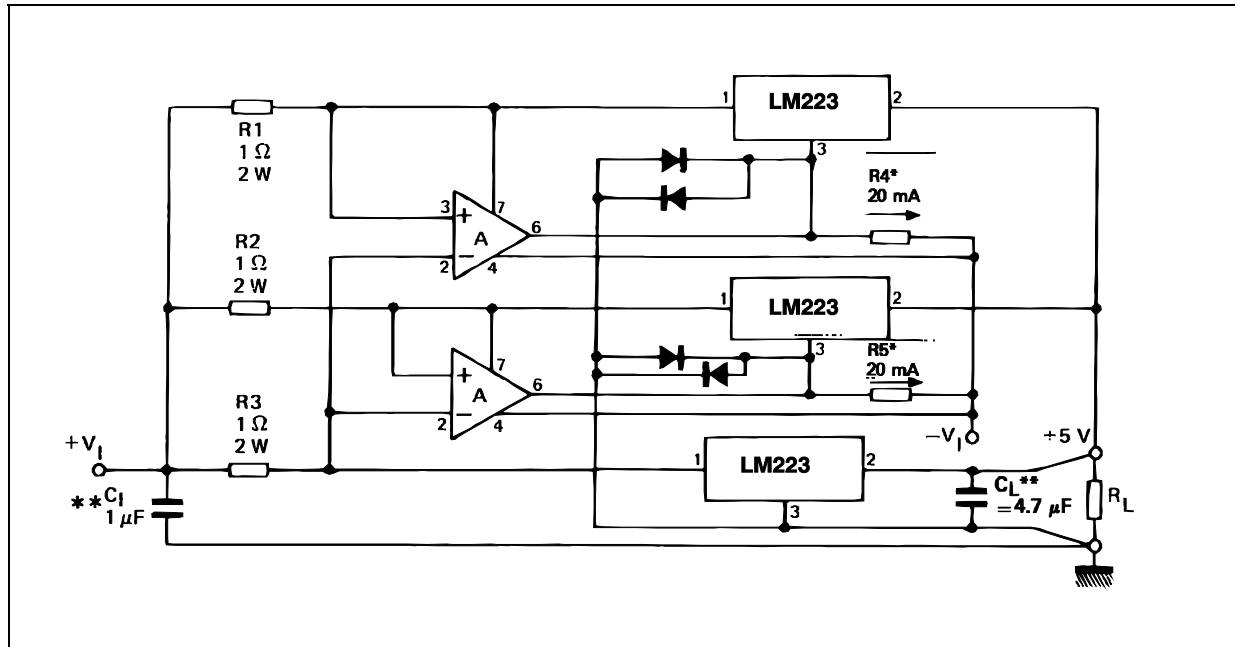


Figure 15. 10 A regulator with complete overload protection

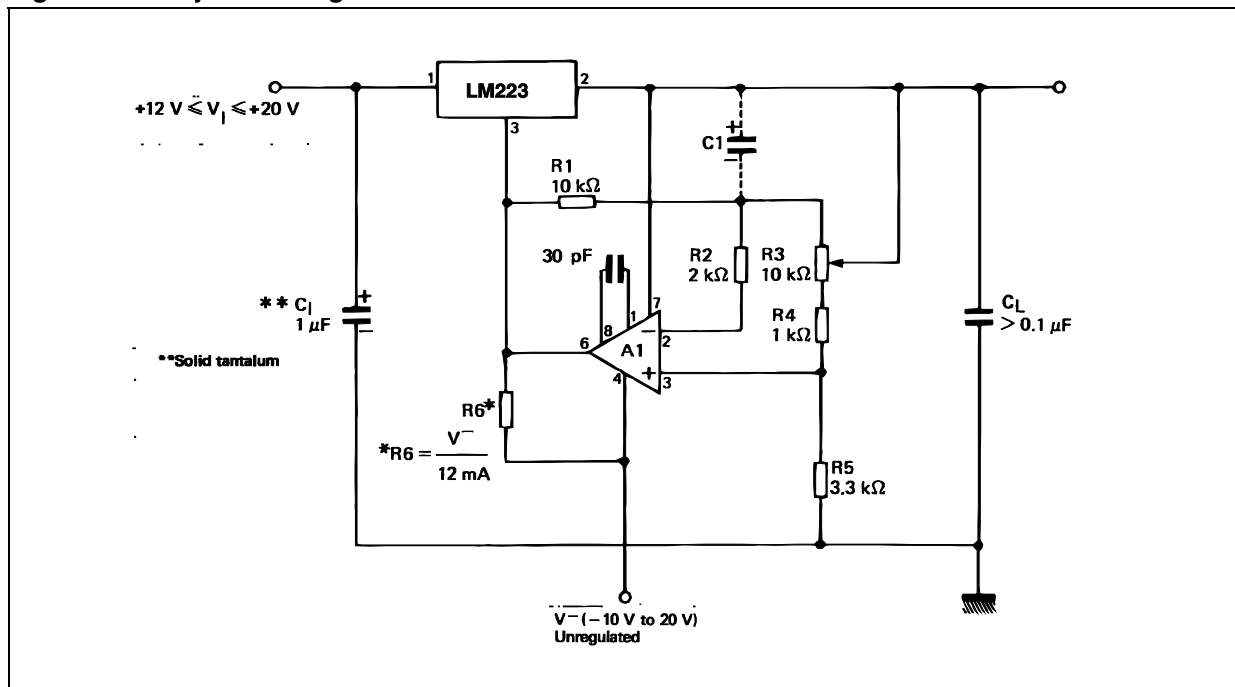


\* Selected for 20 mA current from unregulated negative supply.

\*\* Solid tantalum.

A = LM101A, LM201A, LM301A.

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



A1 = LM101A, LM201A, LM301A.

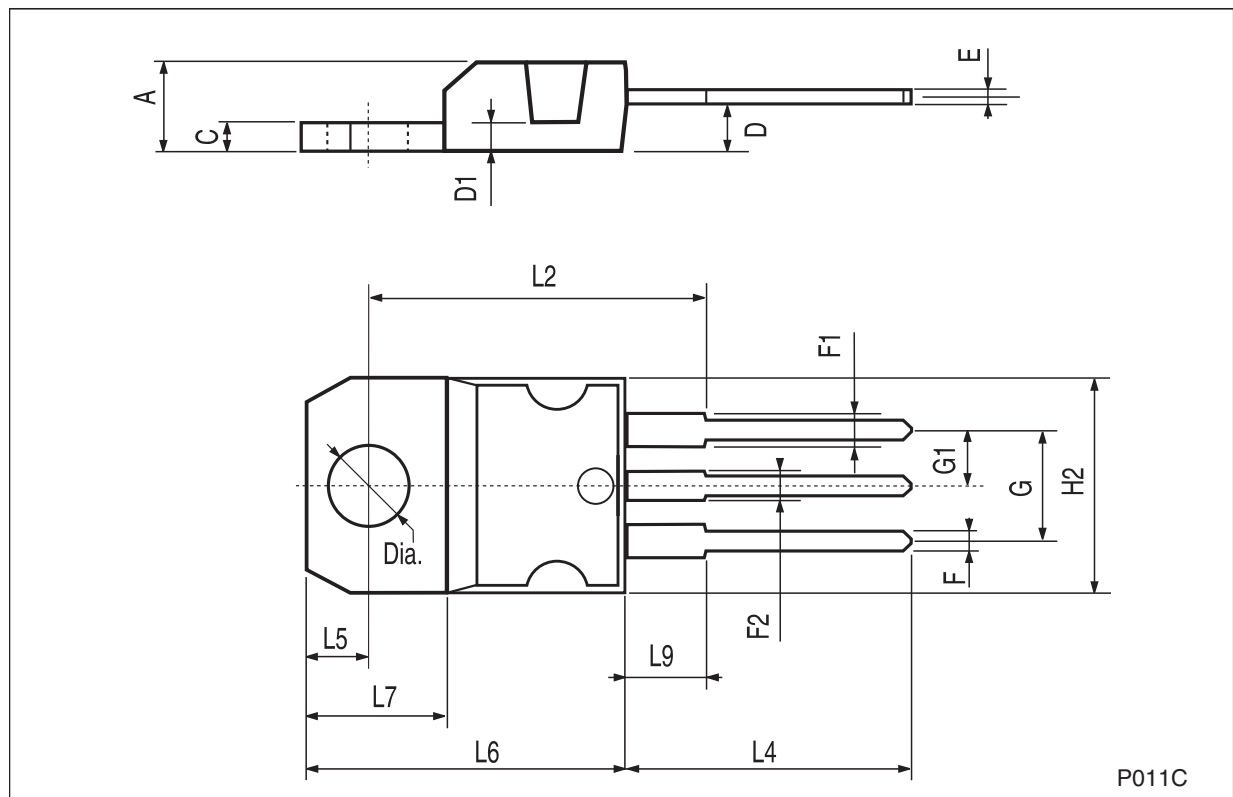
C1 = 2 μF optional - improves ripple rejection, noise and transient response.

## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK<sup>®</sup> 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](http://www.st.com).

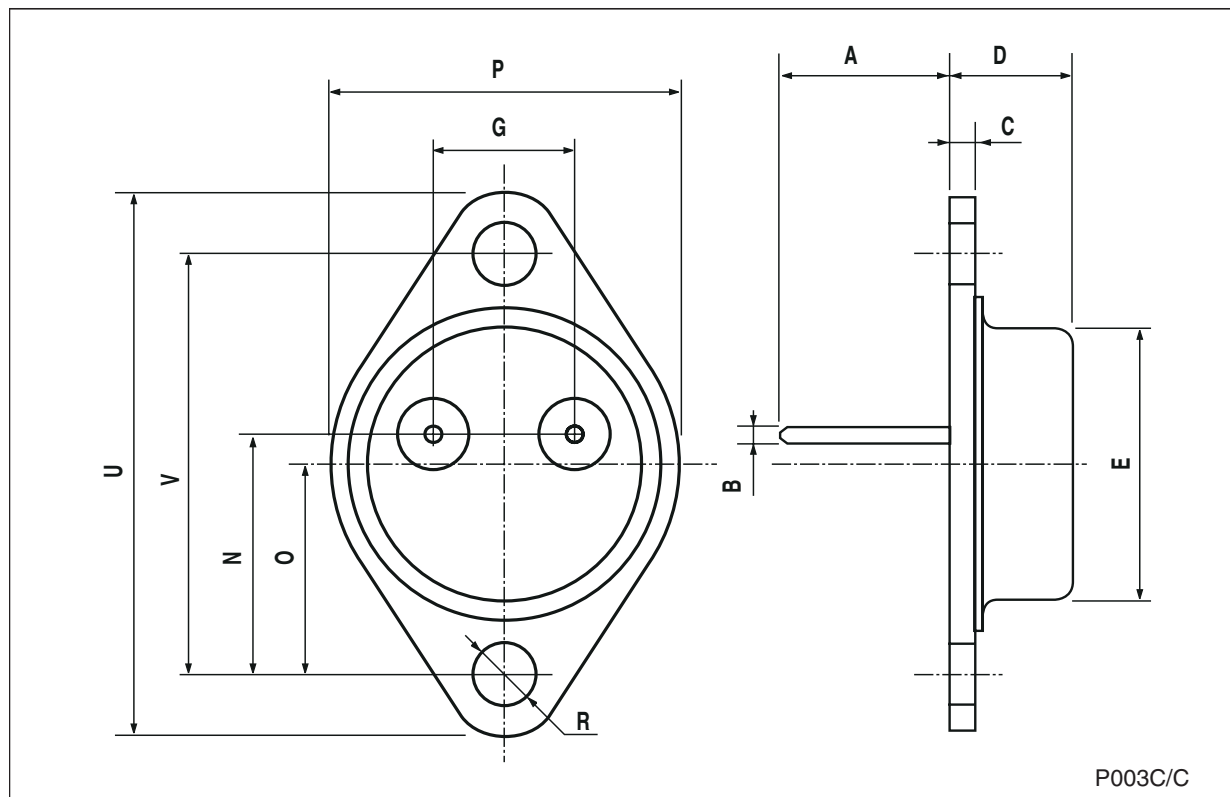
**TO-220 mechanical data**

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



## 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: <a href="#">Table 1 on page 1</a> .

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