

THREE-TERMINAL 3A-5V POSITIVE VOLTAGE REGULATORS

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

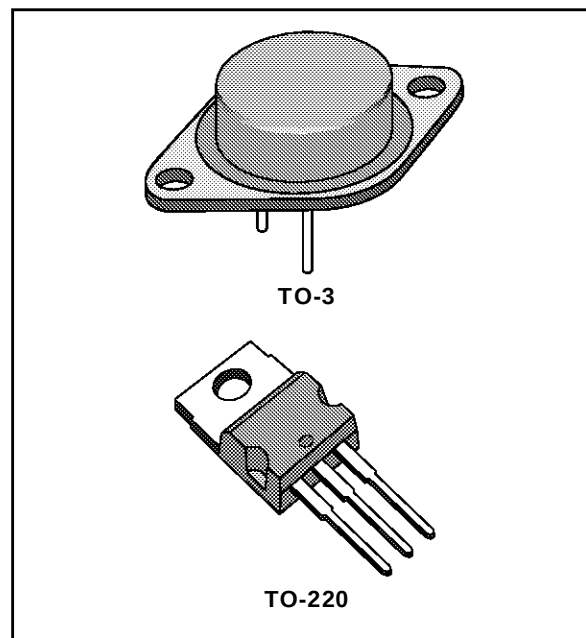
DESCRIPTION

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.

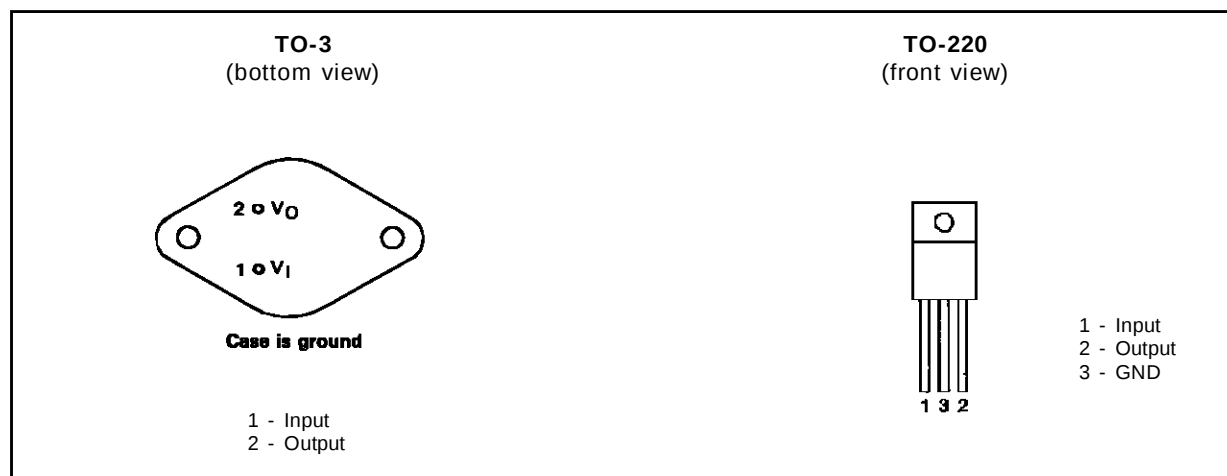
An overall worst case specification for the combined effects of input voltage, load current, ambient temperature, and power dissipation ensure that the LM123, LM223, LM323 will perform satisfactorily as a system element.



ORDER CODES

Part Number	Temperature Range	Package	
		K	T
LM123	-55 °C to 150 °C	•	
LM223	-25 °C to 150 °C	•	
LM323	0 °C to 125 °C	•	•

PIN CONNECTION



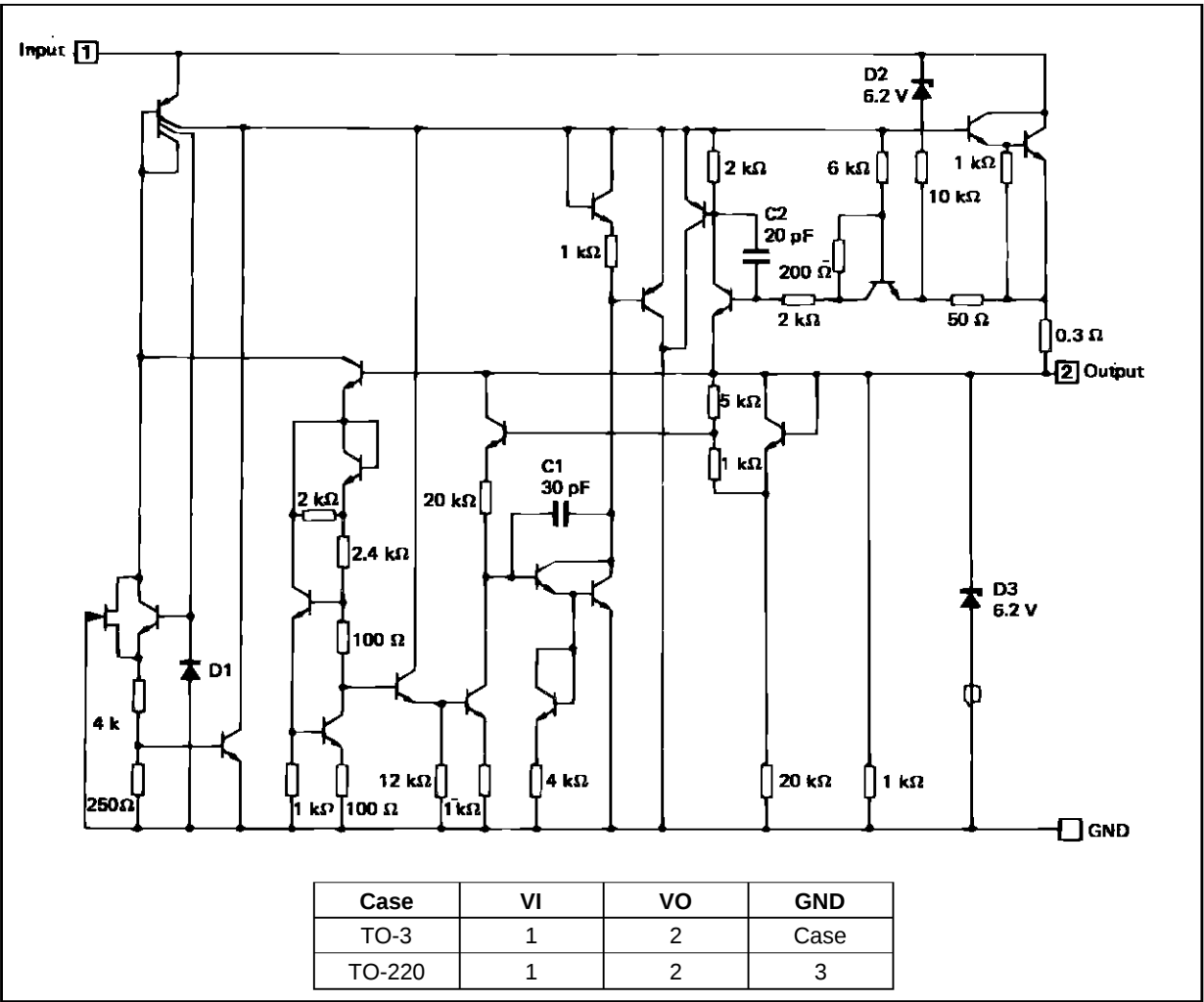
ABSOLUTE MAXIMUM RATING

Symbol	Parameter		Value	Unit
V _I	Input Voltage		20	V
I _O	Output Current		Internally Limited	
P _{tot}	Power Dissipation		Internally Limited	
T _{oper}	Operating Junction Temperature Range	LM123	-55 to 150	°C
		LM223	-25 to 150	
		LM323	0 to 125	
T _{stg}	Storage Temperature Range		-65 to 150	°C

THERMAL CHARACTERISTICS

Symbol	Parameter		Typ.	Max.	Unit
R _{thj-case}	Junction-case Thermal Resistance	TO-3	2		°C/W
		TO-220		3	
R _{thj-amb}	Junction-ambient Thermal Resistance	TO-3		35	°C/W
		TO-220		50	

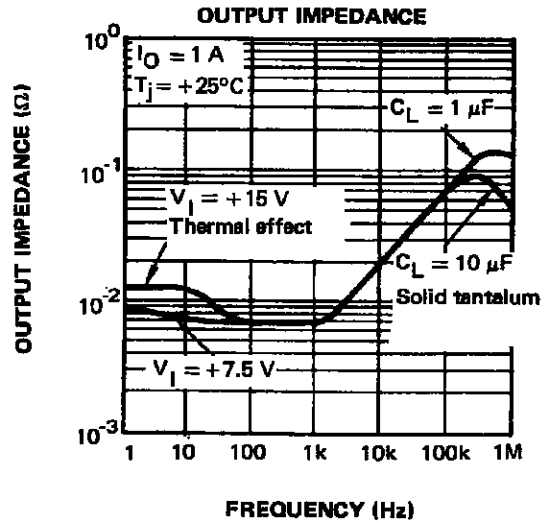
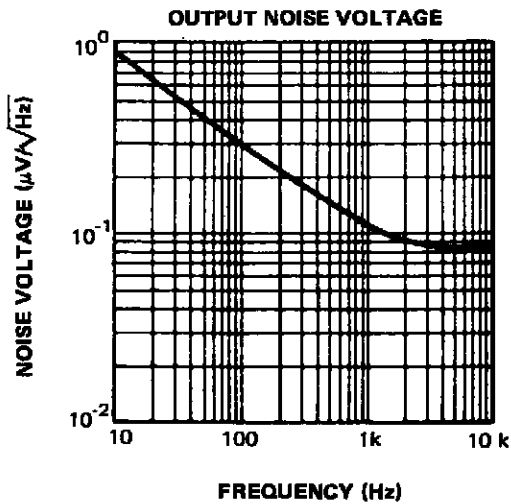
SCHEMATIC DIAGRAM

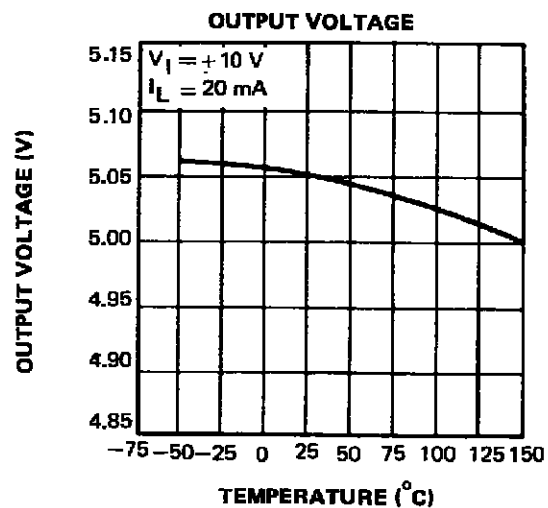
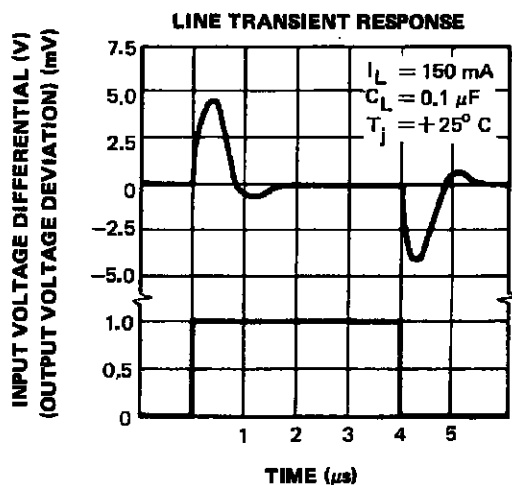
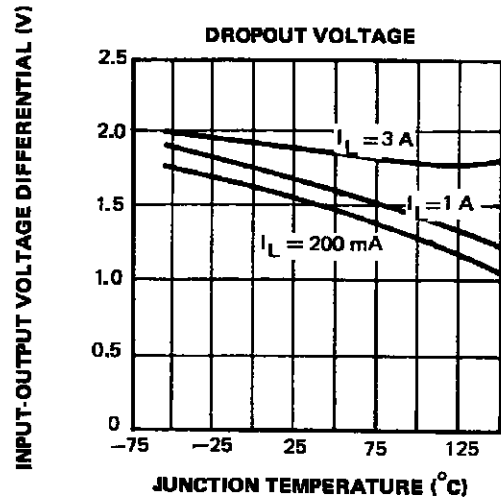
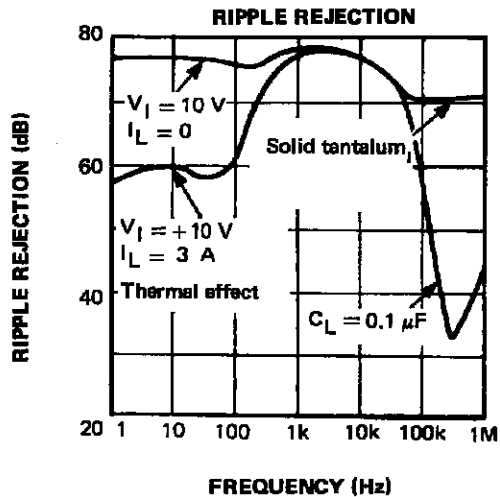
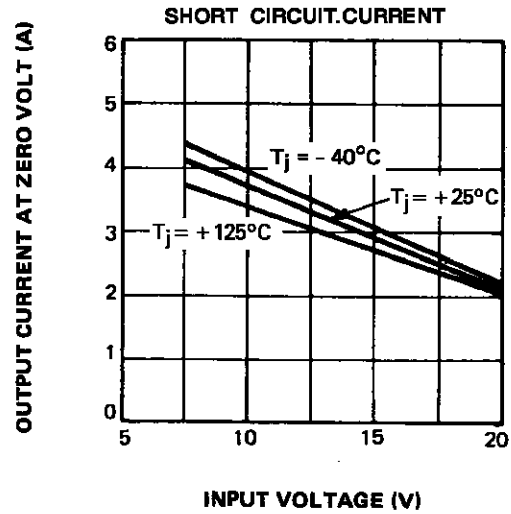
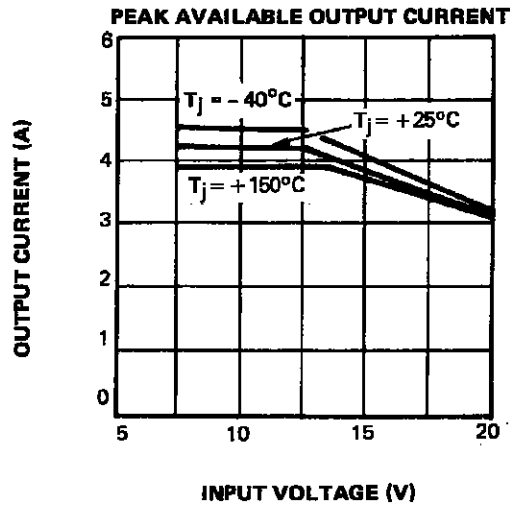


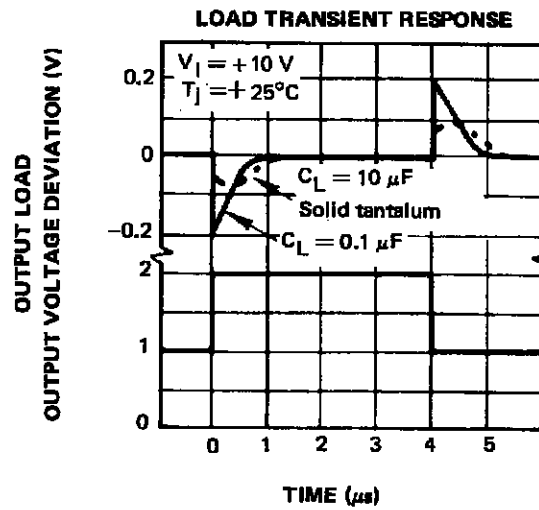
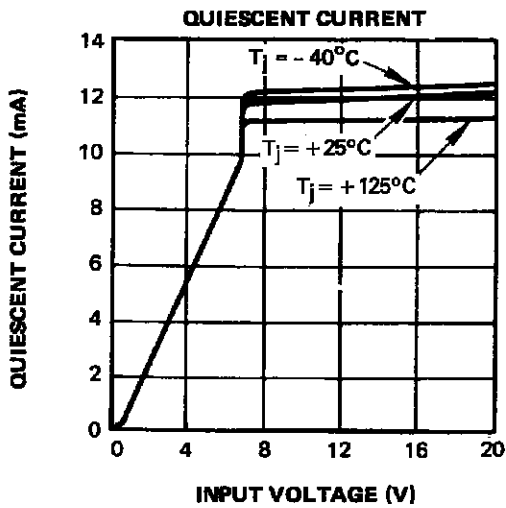
ELECTRICAL CHARACTERISTICS**LM123:** $-55^{\circ}\text{C} < T_j < 150^{\circ}\text{C}$ **LM223:** $-25^{\circ}\text{C} < T_j < 150^{\circ}\text{C}$ **LM323:** $0^{\circ}\text{C} < T_j < 150^{\circ}\text{C}$

Symbol	Parameter	LM123/LM223			LM323			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O	Output Voltage Range (Note 2) $T_{\text{amb}} = 25^{\circ}\text{C}$, $V_I = 7.5\text{ V}$, $I_O = 0$	4.7	5	5.3	4.8	5	5.2	V
V_O	Output Voltage Range (Note 2) $T_{\text{min}} \leq T_j \leq T_{\text{max}}$, $P \leq P_{\text{max}}$ $7.5\text{ V} \leq V_I \leq 15\text{ V}$, $0 \leq I_O \leq 3\text{ A}$	4.6		5.4	4.75		5.25	V
K_{VI}	Line Regulation (Note 3) $T_j = 25^{\circ}\text{C}$, $7.5\text{ V} \leq V_I \leq 15\text{ V}$		5	25		5	25	mV
K_{VO}	Load Regulation (Note 3) $T_j = 25^{\circ}\text{C}$, $V_I = 7.5\text{ V}$, $0 \leq I_O \leq 3\text{ A}$		25	100		25	100	mV
I_{IB}	Quiescent Current $7.5\text{ V} \leq V_I \leq 15\text{ V}$, $0 \leq I_O \leq 3\text{ A}$		12	20		12	20	mA
V_{NO}	Output Noise Voltage $T_{\text{amb}} = 25^{\circ}\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ KHz}$		40			40		μV_{rms}
I_{OS}	Short Circuit Current Limit ($T_j = 25^{\circ}\text{C}$) $V_I = 15\text{ V}$ $V_I = 7.5\text{ V}$		3 4	4.5 5		3 4	4.5 5	A A
K_{VH}	Long Term Stability			35			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 a duty cycle $\leq 5\%$.

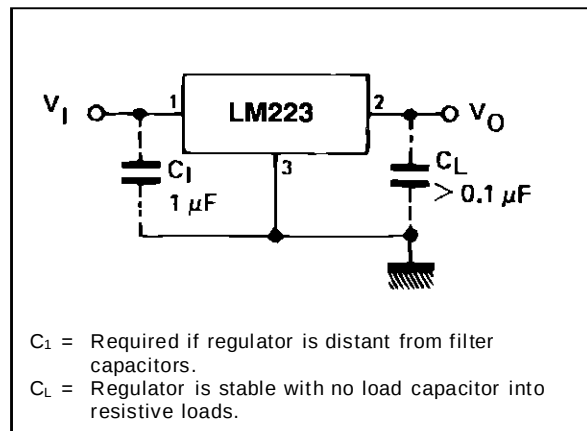




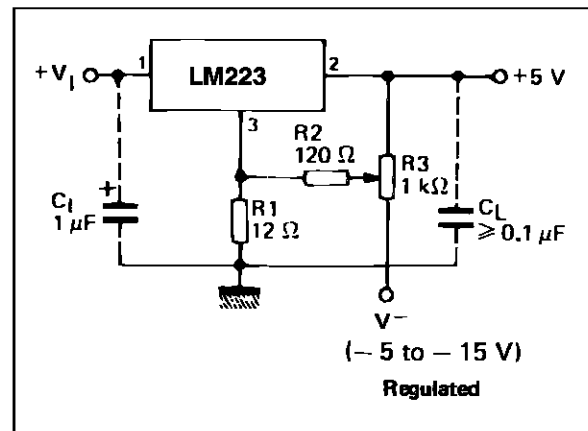


TYPICAL APPLICATIONS

BASIC 3A REGULATOR



TRIMMING OUTPUT TO 5V



The circuit diagram shows a precision current source. It features three LM223 comparators and two op-amp buffers (labeled 'A'). The input voltage $+V_I$ is connected to the non-inverting inputs of the comparators through resistors $R1$, $R2$, and $R3$ (all $1\ \Omega$, 2 W). A capacitor $C1$ ($1\ \mu\text{F}$) is connected to the input. The comparators are configured with their inverting inputs to ground. The outputs of the comparators are connected to the inputs of the op-amp buffers. The buffers are configured with their non-inverting inputs to ground. The outputs of the buffers are connected to the inputs of the comparators, forming a feedback loop. The output of the circuit is a current I_L flowing through a load resistor R_L . The current I_L is also labeled as $R4^*$ and $R5^*$ (20 mA). The circuit is powered by a $+5\text{ V}$ supply and a negative supply $-V_I$. A capacitor C_L^{**} ($4.7\ \mu\text{F}$) is connected to the output. The LM223 comparators are specified as $R4^*$ and $R5^*$ (20 mA).

* Selected for 20mA current from unregulated negative supply.
 ** Solid tantalum.
 A = LM101A, LM201A, LM301A.

The circuit diagram shows an LM223 operational amplifier configured as a precision current source. The non-inverting input (+) is connected to ground through resistor R5 (3.3 kΩ). The inverting input (-) is connected to the output through feedback resistor R1 (10 kΩ), to a reference voltage V₋ through resistor R6, and to a compensation capacitor C1 (30 pF). Resistor R2 (2 kΩ) connects the output to the inverting input, and resistor R3 (10 kΩ) connects the output to the non-inverting input. A load capacitor C_L (> 0.1 μF) is connected from the output to ground. The supply voltage is +12 V ≤ V_I ≤ +20 V. A note specifies that C1 is a solid tantalum capacitor.

****Solid tantalum**

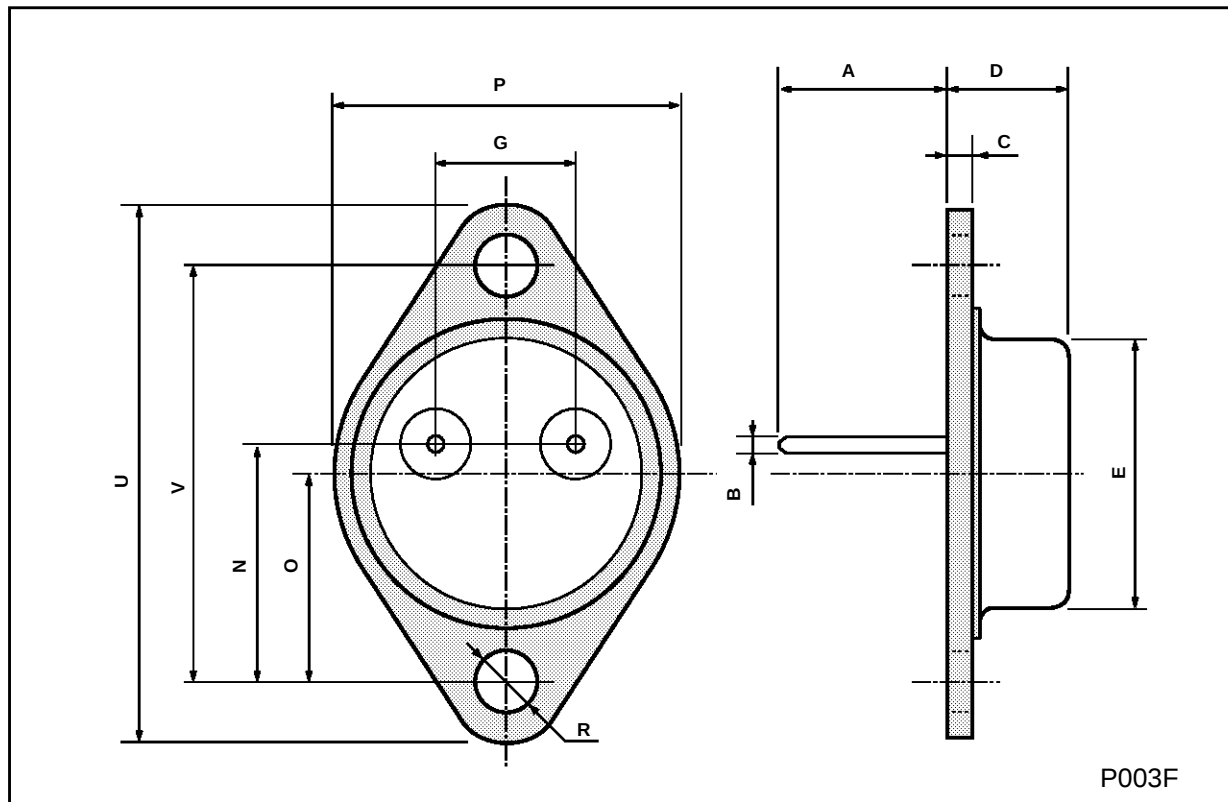
***R6 = $\frac{V^-}{12 \text{ mA}}$**

V₋ (-10 V to 20 V)
Unregulated

A1 = LM 101 A, LM 201 A, LM 301 A.
C1 = 2μF optional - improves ripple rejection, noise and transient response.

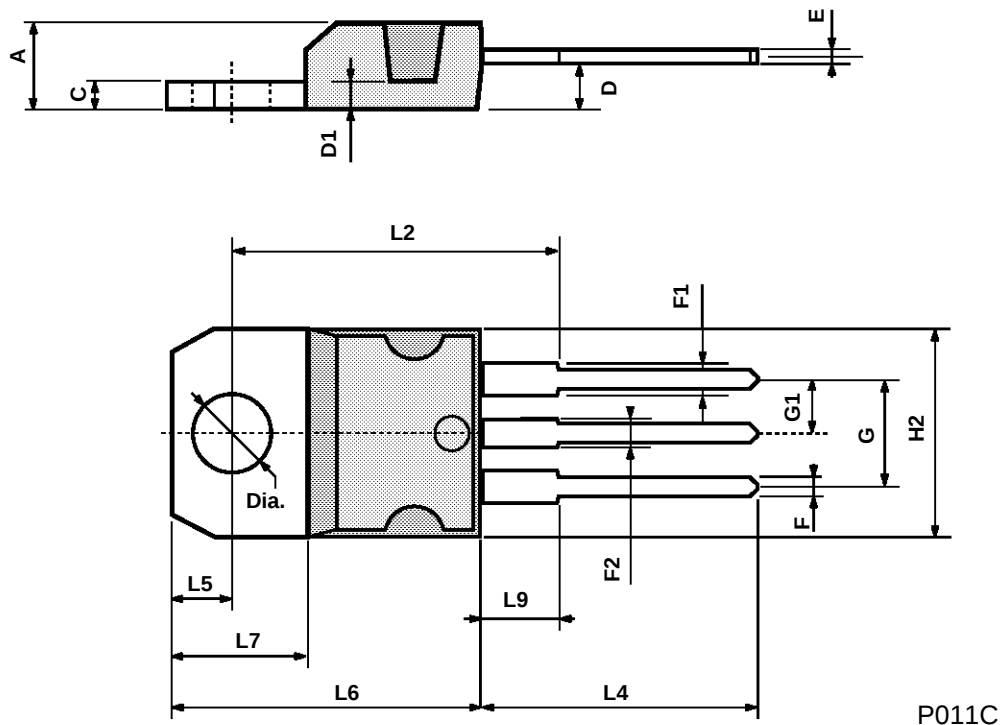
TO-3 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.00		13.10	0.433		0.516
B	0.97		1.15	0.038		0.045
C	1.50		1.65	0.059		0.065
D	8.32		8.92	0.327		0.351
E	19.00		20.00	0.748		0.787
G	10.70		11.10	0.421		0.437
N	16.50		17.20	0.649		0.677
P	25.00		26.00	0.984		1.023
R	4.00		4.09	0.157		0.161
U	38.50		39.30	1.515		1.547
V	30.00		30.30	1.187		1.193



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	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151



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