

POSITIVE ADJUSTABLE VOLTAGE REGULATOR

IP117R / LM117R
IP117AR / LM117AR
IP117HVR / LM117HVR
IP117AHVR / LM117AHVR



FEATURES

- 1.5A Output Current Guaranteed
- Internal Thermal Overload Protection
- Output Short Circuit Protected
- Hermetic Metal TO66 Package
- Screening Options Available

APPLICATIONS

- Adjustable Power Supplies
- System Power Supplies
- Precision Voltage / Current Regulators

DESCRIPTION

The 117 Series regulators are adjustable 3 terminal voltage regulators capable of supplying in excess of 1.5A over an output voltage range of 1.25V to 40V (HV Series, 60V). The regulators are exceptionally easy to apply requiring only 2 external resistors to set the output voltage.

Every effort has been made to make these devices easy to use and difficult to damage. Internal current limiting and power limiting coupled with true thermal limiting prevents damage due to overloads or shorts, even if the regulators are not fastened to a heat sink.

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise stated)

V _I - V _O	Input – Output Voltage Differential	Standard	40V
		HV Series	60V
I _O	Output Current	Internally Limited	
P _D	Power Dissipation	Internally Limited	
T _J	Operating Junction Temperature Range	-55 to +150°C	
T _{stg}	Storage Temperature Range	-65 to +150°C	

THERMAL PROPERTIES

Symbols	Parameters	Min.	Typ.	Max.	Units
R _{θJC}	Thermal Resistance, Junction To Case			7	°C/W

** This datasheet supersedes document 2829

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POSITIVE ADJUSTABLE VOLTAGE REGULATOR

ELECTRICAL CHARACTERISTICS(1)(3) ($T_C = 25^\circ\text{C}$ unless otherwise stated)

LM117, IP117, LM117HV, IP117HV								
Symbols	Parameters	Test Conditions		Min.	Typ	Max.	Units	
V _{REF}	Reference Voltage	I _{OUT} = 10mA			1.200	1.250	1.300	V
		10mA ≤ I _{OUT} ≤ I _{MAX} , P ≤ P _{MAX} , 3V ≤ (V _{IN} -V _{OUT}) ≤ V _{MAX}		•	1.200	1.250	1.300	
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation (2)	3V ≤ (V _{IN} -V _{OUT}) ≤ V _{MAX} , I _{OUT} = 10mA				0.010	0.020	% / V
				•		0.020	0.050	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (2)(3)	10mA ≤ I _{OUT} ≤ I _{MAX}	V _{OUT} ≤ 5V			5	15	mV
			V _{OUT} ≥ 5V			0.1	0.3	%
			V _{OUT} ≤ 5V	•		20	50	mV
			V _{OUT} ≥ 5V	•		0.3	1.0	%
	Thermal Regulation	V _{IN} = 14.58V, I _{OUT} = 1.5A, P _D = 20W, T _A = 25°C, 20ms Pulse				0.030	0.070	% / W
	Ripple Rejection	V _{OUT} = 10V f = 120Hz	C _{ADJ} = 0			65		dB
			C _{ADJ} = 10μF	•	66	80		
I _{ADJ}	Adjust Pin Current			•		50	100	μA
ΔI _{ADJ}	Adjust Pin Current Change	10mA ≤ I _{OUT} ≤ I _{MAX} , 2.5V ≤ (V _{IN} -V _{OUT}) ≤ V _{MAX}		•		0.2	5	
I _{MIN}	Minimum Load Current	(V _{IN} - V _{OUT}) = 40V		•		3.5	5	mA
		(V _{IN} - V _{OUT}) = 60V (HV Series)		•		3.5	7	
I _{CL}	Current Limit	(V _{IN} - V _{OUT}) ≤ 15V		•	1.5	2.2		A
		(V _{IN} - V _{OUT}) = 40V		•	0.3	0.5		
		(V _{IN} - V _{OUT}) = 60V (HV Series)		•		0.1		
$\frac{\Delta V_{OUT}}{\Delta TEMP}$	Temperature Stability			•		1.0		%
$\frac{\Delta V_{OUT}}{\Delta TIME}$	Long Term Stability	T _A = 125°C, 1000Hrs				0.3	1.0	
e _n	RMS Output Noise (% of V _{OUT})	T _A = 25°C, 10Hz ≤ f ≤ 10KHz				0.001		

Notes

The • denotes the specifications which apply over the full operating temperature range.

- Test conditions unless otherwise stated: $V_{IN} - V_{OUT} = 5\text{V}$, $I_{OUT} = 0.5\text{A}$, $P_{MAX} = 20\text{W}$, $I_{MAX} = 1.5\text{A}$
- Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured at $\frac{1}{8}$ " below the bottom of the package.
- $V_{MAX} = 40\text{V}$ for LM117, IP117, LM117A, IP117A
 $V_{MAX} = 60\text{V}$ for LM117HV, IP117HV, LM117AHV, IP117AHV

The circuit diagram shows an IP117 precision centration circuit connected to an LM301A op-amp configured as a current source. The IP117 has inputs V_{IN} and V_{OUT} , and an output labeled ADJ. The ADJ output is connected to the non-inverting input (pin 3) of the LM301A. The LM301A's inverting input (pin 2) is connected to a voltage divider consisting of a $25\ \Omega$ resistor and a $121\ \Omega$ resistor, which is connected to V_{IN} . The output of the LM301A (pin 1) is connected to the output of the IP117 (V_{OUT}). The LM301A's pin 4 is connected to a $5\ \mu\text{F}$ capacitor to ground (pin 8) and a $25\ \Omega$ resistor to the RETURN line. The output of the current source is taken from the node between the $121\ \Omega$ resistor and the $383\ \Omega$ resistor, which is connected to the RETURN line. A load resistor R_L is connected between the output node and the RETURN line. A resistor R_P (labeled "Max Drop 300mV") is connected between the output node and the ADJ input of the IP117.

The circuit diagram shows an IP117 voltage translator connected between a V_{IN} input and a $5V_{OUT}$ output. The IP117 has an V_{IN} pin, an V_{OUT} pin, and an ADJ pin. A $1\mu F$ capacitor is connected between V_{IN} and ground. The ADJ pin is connected to the base of a 2N3904 transistor. The emitter of the transistor is connected to ground. The collector of the transistor is connected to the $5V_{OUT}$ output and also to a 121Ω resistor connected to ground. A $1k\Omega$ resistor is connected between the TTL input and the base of the transistor. Another $1k\Omega$ resistor is connected between the base of the transistor and ground. A 383Ω resistor is connected between the $5V_{OUT}$ output and ground.

C1 improves ripple rejection
 X_c should be small compared to R_2

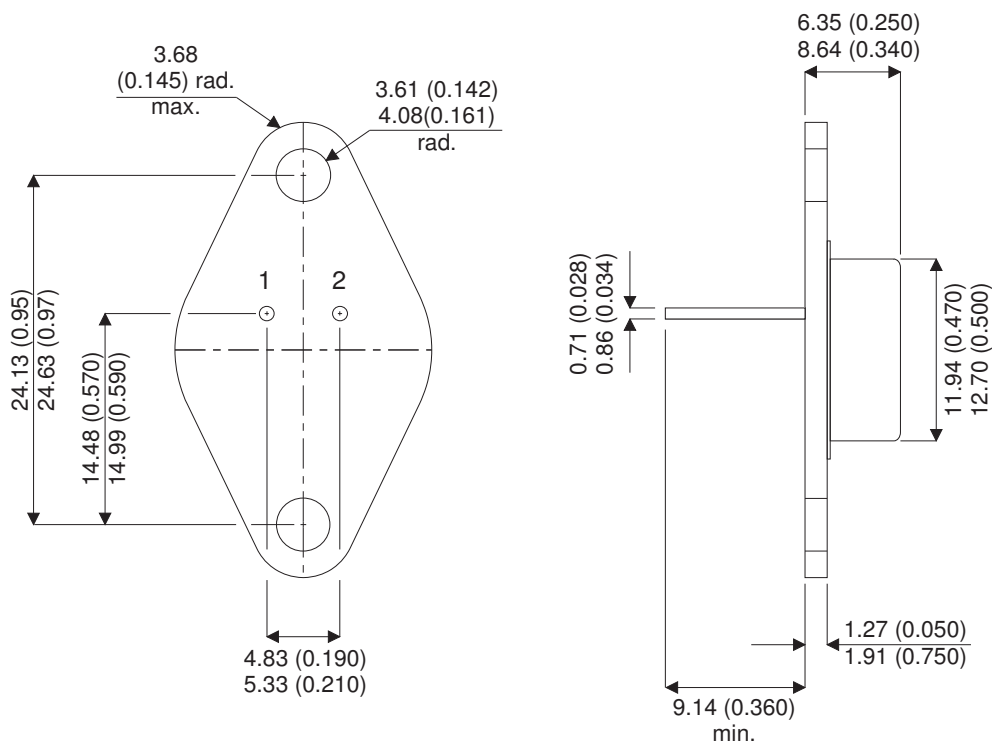
The circuit diagram shows a precision current source. An input voltage V_{IN} is connected to the non-inverting input of an IP117 precision centrabuck converter. The output of the IP117, V_{OUT} , is connected to the base of a 2N3906 NPN transistor. The emitter of the transistor is connected to ground. The collector of the transistor is connected to a 10k Ω resistor, which is in series with a 20k Ω resistor connected to ground. A 243 Ω resistor is connected between the output of the IP117 and the collector of the transistor. A 50 Ω resistor is connected between the ADJ pin of the IP117 and the collector of the transistor. A thermally coupled diode is connected between the collector of the transistor and ground. A 12V battery is connected to the collector of the transistor.

	OE	Vpp
READ	0V	5V
WRITE		
BYTE	5V	21V
CHIP ERASE	12V	21V

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MECHANICAL DATA

Dimensions in mm (inches)



TO66 (TO-213AA)

Pin 1 = ADJ. Pin 2 = V_{IN} Case = V_{OUT}