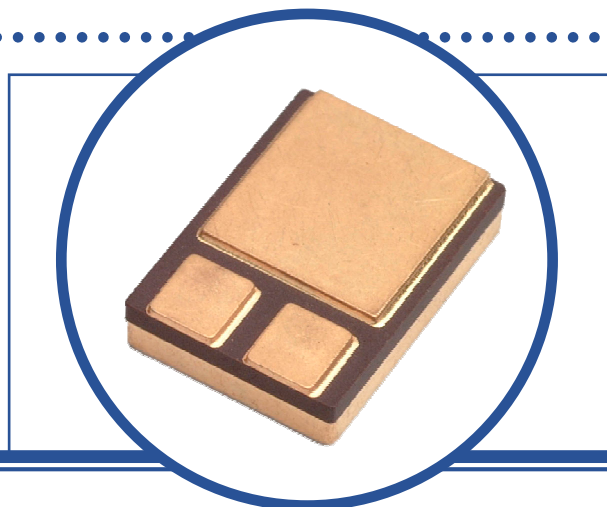


POSITIVE ADJUSTABLE VOLTAGE REGULATOR

IP117SMD / LM117SMD
IP117ASMD / LM117ASMD
IP117HVSMD / LM117HVSMD
IP117AHVSMD / LM117AHVSMD



FEATURES

- 1.5A Output Current Guaranteed
- Internal Thermal Overload Protection
- Output Short Circuit Protected
- Hermetic Ceramic Surface Mount 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 ($T_C = 25^\circ\text{C}$ 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
$R_{\theta JC}$	Thermal Resistance, Junction To Case			3.5	°C/W

** This datasheet supersedes document 2829

Semelab Limited reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Semelab is believed to be both accurate and reliable at the time of going to press. However Semelab assumes no responsibility for any errors or omissions discovered in its use. Semelab encourages customers to verify that datasheets are current before placing orders.

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	C _{ADJ} = 0			65		dB
		f = 120Hz	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 the junction of the wide and narrow portion of the output lead.
- $V_{MAX} = 40\text{V}$ for LM117, IP117, LM117A, IP117A
 $V_{MAX} = 60\text{V}$ for LM117HV, IP117HV, LM117AHV, IP117AHV

POSITIVE ADJUSTABLE VOLTAGE REGULATOR

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

LM117A, IP117A, LM117AHV, IP117AHV								
Symbols	Parameters	Test Conditions		Min.	Typ	Max.	Units	
V _{REF}	Reference Voltage	I _{OUT} = 10mA			1.238	1.250	1.262	V
		10mA ≤ I _{OUT} ≤ I _{MAX} , P ≤ P _{MAX} , 3V ≤ (V _{IN} -V _{OUT}) ≤ V _{MAX}		●	1.225	1.250	1.270	
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation (2)	3V ≤ (V _{IN} -V _{OUT}) ≤ V _{MAX} , I _{OUT} = 10mA				0.005	0.010	% / V
				●		0.010	0.020	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	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	●		15	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				0.002	0.020	% / W
	Ripple Rejection	V _{OUT} = 10V	C _{ADJ} = 0			65		dB
		f = 120Hz	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	2	%
$\frac{\Delta V_{OUT}}{\Delta TIME}$	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 the junction of the wide and narrow portion of the output lead.
- $V_{MAX} = 40\text{V}$ for LM117, IP117, LM117A, IP117A
 $V_{MAX} = 60\text{V}$ for LM117HV, IP117HV, LM117AHV, IP117AHV

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The circuit diagram shows a 5V TTL level shifter. It consists of an IP117 voltage divider, a 2N3904 transistor, and several resistors. The input V_{IN} is connected to the V_{IN} pin of the IP117. The output V_{OUT} is connected to the V_{OUT} pin of the IP117. The ADJ pin of the IP117 is connected to the base of the 2N3904 transistor. The emitter of the transistor is connected to ground. The collector of the transistor is connected to the V_{OUT} pin of the IP117. A 1kΩ resistor is connected between the V_{IN} pin and the base of the transistor. A 1kΩ resistor is connected between the base and the emitter. A 121Ω resistor is connected between the V_{OUT} pin and the collector. A 383Ω resistor is connected between the collector and the emitter. A 1μF capacitor is connected between the V_{IN} pin and ground. The output V_{OUT} is labeled as 5V.

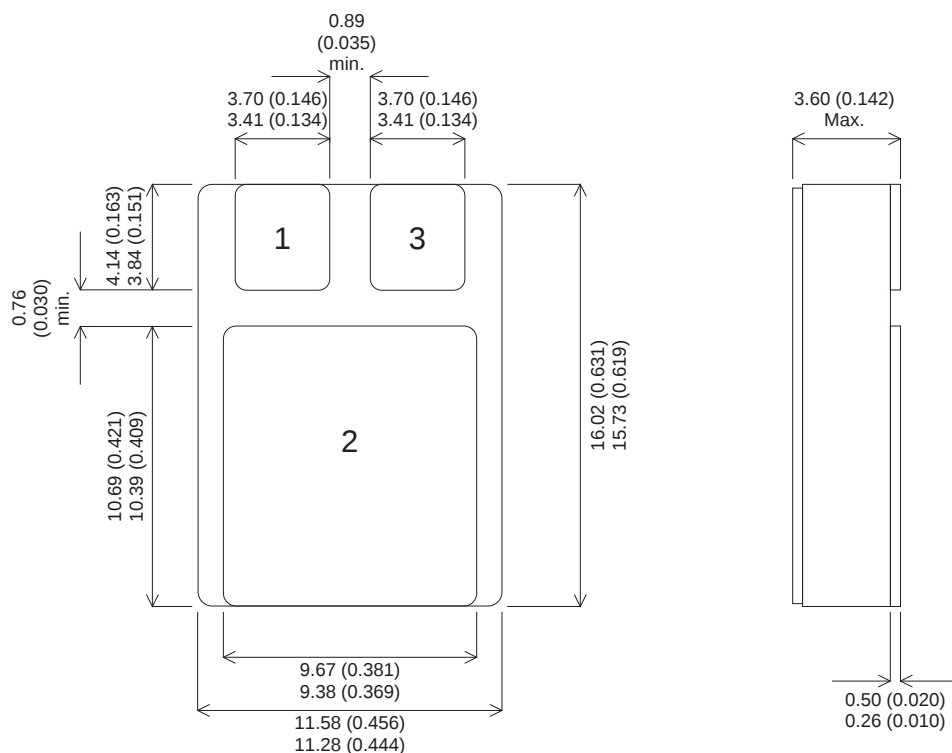
The circuit diagram shows a precision current source. An input voltage V_{IN} is connected to the non-inverting input of an IP117 precision centrerange op-amp. The inverting input of the op-amp is connected to the emitter of a 2N3906 NPN transistor. The op-amp's output, labeled V_{OUT} , is connected to the collector of the 2N3906 transistor. A feedback network consisting of a 243 Ω resistor and a 50 Ω resistor is connected between the output and the inverting input. The 243 Ω resistor is connected to the output, and the 50 Ω resistor is connected to the inverting input. A thermally coupled diode is connected between the collector and the emitter. The diode's anode is connected to the collector, and its cathode is connected to the emitter. The diode is labeled "THERMALLY COUPLE". A 10k Ω resistor is connected between the collector and a 12V supply. A 20k Ω resistor is connected between the diode's cathode and the 12V supply. A 50k Ω resistor is connected between the emitter and ground. The 12V supply is connected to the collector and the diode's anode.

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

POSITIVE ADJUSTABLE VOLTAGE REGULATOR

MECHANICAL DATA

Dimensions in mm (inches)



SMD1 (TO276AB)

Pin 1 = ADJ. Pin 2 = V_{OUT} Pin 3 = V_{IN}