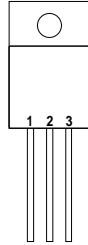


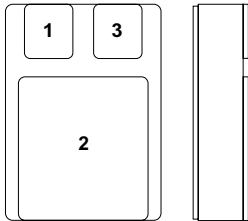
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$   
Case –  $V_{OUT}$

**G Package – TO257**



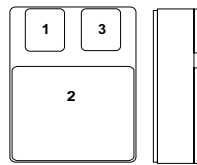
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$   
Case – Isolated

**IG Package – TO257**



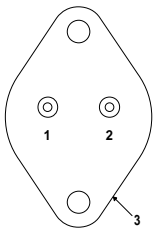
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$

**SMD1  
CERAMIC SURFACE  
MOUNT**



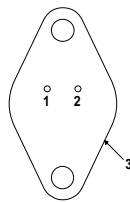
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$

**SMD05  
CERAMIC SURFACE  
MOUNT**



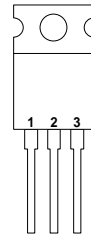
Pin 1 – ADJ.  
Pin 2 –  $V_{IN}$   
Case –  $V_{OUT}$

**K Package – TO3**



Pin 1 – ADJ.  
Pin 2 –  $V_{IN}$   
Case –  $V_{OUT}$

**R Package – TO66**



Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$

**T Package – TO220 Plastic**

## 1.5 AMP POSITIVE ADJUSTABLE VOLTAGE REGULATOR FOR HI-REL APPLICATIONS

### FEATURES

- Output voltage range of:
  - 1.25 to 40V for standard version
  - 1.25 to 60V for HV version
- Output voltage tolerance 1%
- Load regulation 0.3%
- Line regulation 0.01%/V
- Complete series of protections:
  - current limiting
  - thermal shutdown
  - soa control
- Also available in TO220 metal isolated package (1mm pins)

### ABSOLUTE MAXIMUM RATINGS ( $T_{case} = 25^{\circ}C$ unless otherwise stated)

$V_{I-O}$	Input - Output Differential Voltage	– Standard – HV Series	40V 60V
$I_O$	Output Current		Internally limited
$P_D$	Power Dissipation		Internally limited
$T_J$	Operating Junction Temperature Range		See Table Above
$T_{STG}$	Storage Temperature		–65 to 150°C

Parameter	Test Conditions	IP117A, IP117AHV LM117A, LM117AHV			IP117, IP117HV LM117, LM117HV			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_{REF}$ Reference Voltage	$I_{OUT} = 10\text{mA}$	1.238	1.25	1.262				V
	$I_{OUT} = 10\text{mA}$ to $I_{MAX}$ $V_{IN} - V_{OUT} = 3\text{V}$ to $V_{MAX}$ $P \leq P_{MAX}$ $T_J = -55$ to $+150^\circ\text{C}$	1.225	1.250	1.270	1.200	1.250	1.300	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ Line Regulation 1	$V_{IN} - V_{OUT} = 3\text{V}$ to $V_{MAX}$ $T_J = -55$ to $+150^\circ\text{C}$		0.005	0.010		0.010	0.020	% / V
			0.010	0.020		0.020	0.050	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	$I_{OUT} = 10\text{mA}$ to $I_{MAX}$	$V_{OUT} \leq 5\text{V}$	5	15		5	15	mV
		$V_{OUT} \geq 5\text{V}$	0.1	0.3		0.1	0.3	%
	$I_{OUT} = 10\text{mA}$ to $I_{MAX}$ $T_J = -55$ to $+150^\circ\text{C}$	$V_{OUT} \leq 5\text{V}$	15	50		20	50	mV
		$V_{OUT} \geq 5\text{V}$	0.3	1		0.3	1	%
Thermal Regulation	$t_p = 20\text{ms}$		0.002	0.020		0.030	0.070	%/W
Ripple Rejection	$V_{OUT} = 10\text{V}$ $f = 120\text{Hz}$	$C_{ADJ} = 0$		65		65		dB
		$C_{ADJ} = 10\mu\text{F}$ $T_J = -55$ to $+150^\circ\text{C}$	66	80		66	80	dB
$I_{ADJ}$ Adjust Pin Current	$T_J = -55$ to $+150^\circ\text{C}$		50	100		50	100	$\mu\text{A}$
$\Delta I_{ADJ}$ Adjust Pin Current Change	$I_{OUT} = 10\text{mA}$ to $I_{MAX}$ $T_J = -55$ to $+150^\circ\text{C}$ $V_{IN} - V_{OUT} = 2.5\text{V}$ to $V_{MAX}$		0.2	5		0.2	5	$\mu\text{A}$
$I_{MIN}$ Minimum Load Current	$V_{IN} - V_{OUT} = 40\text{V}$ $T_J = -55$ to $+150^\circ\text{C}$		3.5	5		3.5	5	mA
	$V_{IN} - V_{OUT} = 60\text{V}$ (HV SERIES) $T_J = -55$ to $+150^\circ\text{C}$		3.5	7		3.5	7	
$I_{CL}$ Current Limit	$V_{IN} - V_{OUT} \leq 15\text{V}$ $T_J = -55$ to $+150^\circ\text{C}$		1.5	2.2		1.5	2.2	A
	$V_{IN} - V_{OUT} = 40\text{V}$	0.30	0.50		0.30	0.50		A
	$V_{IN} - V_{OUT} = 60\text{V}$ (HV SERIES)		0.10			0.10		
$\frac{\Delta V_{OUT}}{\Delta \text{TEMP}}$ Temperature Stability	$T_J = -55$ to $+150^\circ\text{C}$		1	2		1		%
$\frac{\Delta V_{OUT}}{\Delta \text{TIME}}$ Long Term Stability	$T_A = +125^\circ\text{C}$ $t = 1000$ Hrs		0.3	1		0.3	1	%
$e_n$ RMS Output Noise (% of $V_{OUT}$ )	$f = 10$ Hz to $10$ kHz		0.001			0.001		%
$R_{\theta JC}$ Thermal Resistance Junction to Case	K Package		2.3	3		2.3	3	$^\circ\text{C/W}$
	R Package		5	7		5	7	
	G, IG Packages		3	5		3	5	

1) 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 from the bottom of the package for the TO-3 and TO-66 packages, at the junction of the wide and narrow portion of the output lead for the TO-220 package, and  $\frac{1}{8}$ " below the base of the package on the output pin of the TO-257 package.

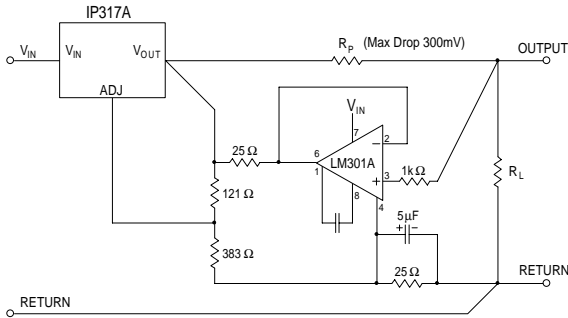
2) Test Conditions unless otherwise stated:  $V_{IN} - V_{OUT} = 5\text{V}$ ,  $T_J = 25^\circ\text{C}$ ,  $I_{OUT} = 0.5\text{A}$ ,  $I_{MAX} = 1.5\text{A}$ .  
 $P_{MAX} = 10\text{W}$  for SMD1, 20W for all other package styles.  
 $V_{MAX} = 40\text{V}$  for standard series, 60V for HV series.

Parameter	Test Conditions	IP317A IP317AHV			IP317 IP317HV			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V <sub>REF</sub> Reference Voltage	I <sub>OUT</sub> = 10mA	1.238	1.25	1.262				V
	I <sub>OUT</sub> = 10mA to I <sub>MAX</sub> V <sub>IN</sub> - V <sub>OUT</sub> = 3V to V <sub>MAX</sub> P ≤ P <sub>MAX</sub> T <sub>J</sub> = 0 to 125°C	1.225	1.25	1.270	1.200	1.250	1.300	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ Line Regulation 1	V <sub>IN</sub> - V <sub>OUT</sub> = 3V to V <sub>MAX</sub> T <sub>J</sub> = 0 to 125°C		0.005	0.010		0.010	0.040	% / V
			0.010	0.020		0.020	0.070	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ Load Regulation 1	I <sub>OUT</sub> = 10mA to I <sub>MAX</sub>	V <sub>OUT</sub> ≤ 5V	5	25		5	25	mV
		V <sub>OUT</sub> ≥ 5V	0.1	0.5		0.1	0.5	%
	I <sub>OUT</sub> = 10mA to I <sub>MAX</sub> T <sub>J</sub> = -55 to +150°C	V <sub>OUT</sub> ≤ 5V	15	50		20	70	mV
		V <sub>OUT</sub> ≥ 5V	0.3	1		0.3	1.5	%
Thermal Regulation	t <sub>p</sub> = 20ms		0.002	0.020		0.030	0.070	%/W
Ripple Rejection	V <sub>OUT</sub> = 10V f = 120Hz	C <sub>ADJ</sub> = 0		65		65		dB
		C <sub>ADJ</sub> = 10μF T <sub>J</sub> = 0 to 125°C	66	80		66	80	dB
I <sub>ADJ</sub> Adjust Pin Current	T <sub>J</sub> = 0 to 125°C		50	100		50	100	μA
ΔI <sub>ADJ</sub> Adjust Pin Current Change	I <sub>OUT</sub> = 10mA to I <sub>MAX</sub> T <sub>J</sub> = 0 to 125°C V <sub>IN</sub> - V <sub>OUT</sub> = 2.5V to V <sub>MAX</sub>		0.2	5		0.2	5	μA
I <sub>MIN</sub> Minimum Load Current	V <sub>IN</sub> - V <sub>OUT</sub> = 40V T <sub>J</sub> = 0 to 125°C		3.5	10		3.5	10	mA
	V <sub>IN</sub> - V <sub>OUT</sub> = 60V (HV SERIES) T <sub>J</sub> = 0 to 125°C		3.5	12		3.5	12	
I <sub>CL</sub> Current Limit	V <sub>IN</sub> - V <sub>OUT</sub> ≤ 15V T <sub>J</sub> = 0 to 125°C		1.5	2.2		1.5	2.2	A
	V <sub>IN</sub> - V <sub>OUT</sub> = 40V		0.15	0.40		0.15	0.40	A
	V <sub>IN</sub> - V <sub>OUT</sub> = 60V (HV SERIES)			0.10			0.10	
$\frac{\Delta V_{OUT}}{\Delta T_{TEMP}}$ Temperature Stability	T <sub>J</sub> = 0 to 125°C		1	2		1		%
$\frac{\Delta V_{OUT}}{\Delta TIME}$ Long Term Stability	t = 1000 Hrs		0.3	1		0.3	1	%
e <sub>n</sub> RMS Output Noise (% of V <sub>OUT</sub> )	f = 10 Hz to 10 kHz		0.003			0.003		%
R <sub>θJC</sub> Thermal Resistance Junction to Case	K Package		2.3	3		2.3	3	°C/W
	T Package		4	5		5	7	

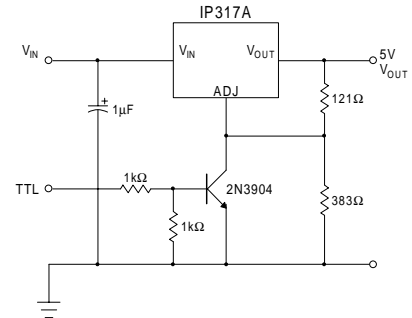
1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured from the bottom of the package for the TO-3 and TO-66 packages, at the junction of the wide and narrow portion of the output lead for the TO-220 package, and 1/8" below the base of the package on the output pin of the TO-257 package.

2) Test Conditions unless otherwise stated: V<sub>IN</sub> - V<sub>OUT</sub> = 5V, T<sub>J</sub> = 25°C, I<sub>OUT</sub> = 0.5A, P<sub>MAX</sub> = 20W, I<sub>MAX</sub> = 1.5A  
V<sub>MAX</sub> = 40V for standard series, 60V for HV series.

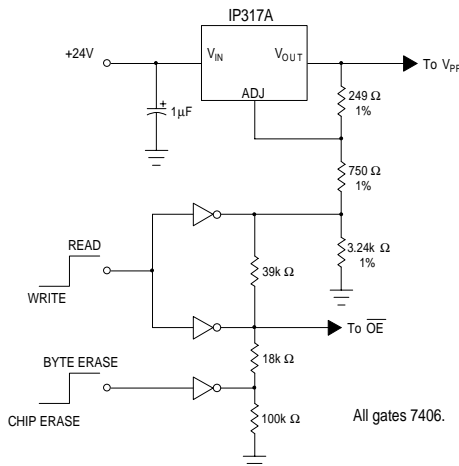
APPLICATIONS INFORMATION



Remote Sensing

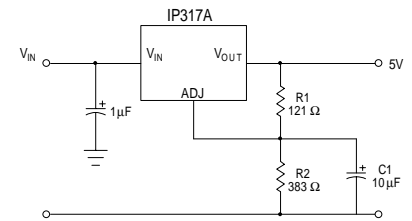


5V Regulator with Shut Down



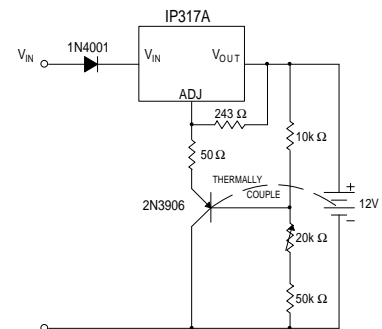
	OE	V <sub>PP</sub>
READ	0V	5V
WRITE		
BYTE ERASE	5V	21V
CHIP ERASE	12V	21V

2816 EEPROM Supply Programmer for Read/Write Control



C1 improves ripple rejection.  
X<sub>C</sub> should be small compared to R2.

Improving Ripple Rejection



Temperature Compensated Lead-Acid Battery Charger

Order Information

Part Number	IG-Pack G-Pack (TO257)	SMD1	SMD05	K-Pack (TO3)	R-Pack (TO66)	T-Pack (TO220)	Temp. Range	<b>Note:</b> To order, add the package identifier to the part number. eg. IP117AHVK IP1175SMD05 IP317T
LM117	✓	✓	✓	✓	✓		-55 to +150°C	
LM117HV	✓	✓	✓	✓	✓		"	
LM117A	✓	✓	✓	✓	✓		"	
LM117AHV	✓	✓	✓	✓	✓		"	
IP117	✓	✓	✓	✓	✓		-55 to +150°C	
IP117HV	✓	✓	✓	✓	✓		"	
IP117A	✓	✓	✓	✓	✓		"	
IP117AHV	✓	✓	✓	✓	✓		"	
LM317				✓		✓	0 to 125°C	
LM317HV				✓		✓	"	
IP317				✓		✓	"	
IP317HV				✓		✓	"	
IP317A				✓		✓	"	
IP317AHV				✓		✓	"	