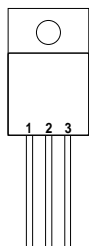


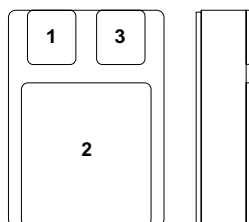
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$   
Case –  $V_{OUT}$

**G Package – TO257**



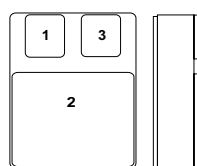
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$   
Case – Isolated

**IG Package – TO257**



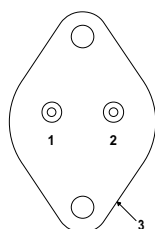
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$

**SMD1  
CERAMIC SURFACE  
MOUNT**



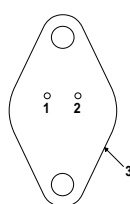
Pin 1 – ADJ.  
Pin 2 –  $V_{OUT}$   
Pin 3 –  $V_{IN}$

**SMD05  
CERAMIC SURFACE  
MOUNT**



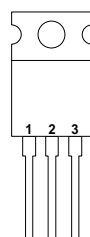
Pin 1 – ADJ.  
Pin 2 –  $V_{IN}$   
Case –  $V_{OUT}$

**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	40V
		– HV Series	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
	$I_{OUT} = 10\text{mA to } I_{MAX}$ $V_{IN} - V_{OUT} = 3\text{V to } V_{MAX}$ $P \leq P_{MAX}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	1.225	1.250	1.270	1.200	1.250	1.300	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ Line Regulation <sup>1</sup>	$V_{IN} - V_{OUT} = 3\text{V to } V_{MAX}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		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 <sup>1</sup>	$I_{OUT} = 10\text{mA to } I_{MAX}$ $V_{OUT} \leq 5\text{V}$		5	15		5	15	mV
	$I_{OUT} = 10\text{mA to } I_{MAX}$ $V_{OUT} \geq 5\text{V}$		0.1	0.3		0.1	0.3	%
	$I_{OUT} = 10\text{mA to } I_{MAX}$ $V_{OUT} \leq 5\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		15	50		20	50	mV
	$I_{OUT} = 10\text{mA to } I_{MAX}$ $V_{OUT} \geq 5\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		0.3	1		0.3	1	%
Thermal Regulation	$t_p = 20\text{ms}$		0.002	0.020		0.030	0.070	%/W
Ripple Rejection	$V_{OUT} = 10\text{V}$ $C_{ADJ} = 0$ $f = 120\text{Hz}$		65			65		dB
	$C_{ADJ} = 10\mu\text{F}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	66	80		66	80		dB
$I_{ADJ}$ Adjust Pin Current	$T_J = -55 \text{ to } +150^\circ\text{C}$		50	100		50	100	$\mu\text{A}$
$\Delta I_{ADJ}$ Adjust Pin Current Change	$I_{OUT} = 10\text{mA to } I_{MAX}$ $T_J = -55 \text{ to } +150^\circ\text{C}$ $V_{IN} - V_{OUT} = 2.5\text{V to } V_{MAX}$		0.2	5		0.2	5	$\mu\text{A}$
$I_{MIN}$ Minimum Load Current	$V_{IN} - V_{OUT} = 40\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		3.5	5		3.5	5	mA
	$V_{IN} - V_{OUT} = 60\text{V (HV SERIES)}$ $T_J = -55 \text{ to } +150^\circ\text{C}$		3.5	7		3.5	7	
$I_{CL}$ Current Limit	$V_{IN} - V_{OUT} \leq 15\text{V}$ $T_J = -55 \text{ to } +150^\circ\text{C}$	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		
$\frac{\Delta V_{OUT}}{\Delta T_{TEMP}}$ Temperature Stability	$T_J = -55 \text{ to } +150^\circ\text{C}$		1	2		1		%
$\frac{\Delta V_{OUT}}{\Delta TIME}$ Long Term Stability	$T_A = +125^\circ\text{C}$ $t = 1000 \text{ Hrs}$		0.3	1		0.3	1	%
$e_n$ RMS Output Noise (% of $V_{OUT}$ )	$f = 10 \text{ Hz to } 10 \text{ kHz}$		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.

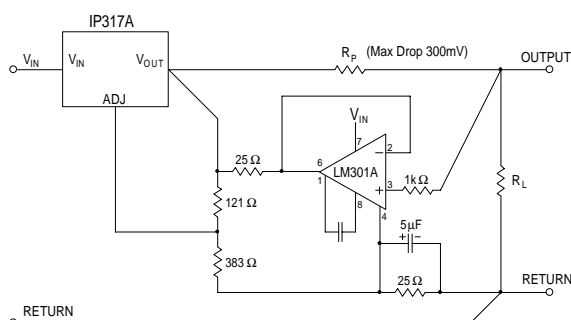
2) Test Conditions unless otherwise stated:  $V_{IN} - V_{OUT} = 5\text{V}$ ,  $T_J = 25^\circ\text{C}$ ,  $I_{OUT} = 0.5\text{A}$ ,  $I_{MAX} = 1.5\text{A}$ .  
 $P_{MAX} = 10\text{W}$  for SMD1, 20W for all other package styles.  
 $V_{MAX} = 40\text{V}$  for standard series, 60V for HV series.

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

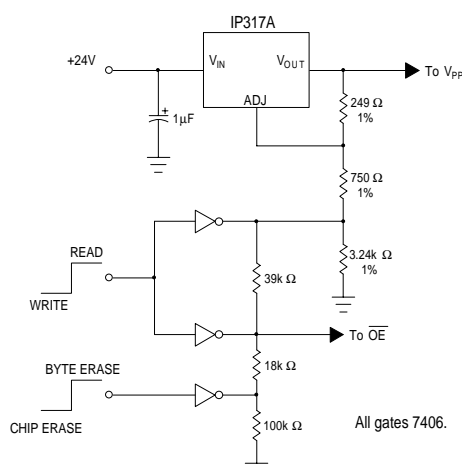
1) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects are covered under thermal regulation specifications. Load regulation is measured from the bottom of the package for the TO-3 and TO-66 packages, at the 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:  $V_{IN} - V_{OUT} = 5\text{V}$ ,  $T_J = 25^\circ\text{C}$ ,  $I_{OUT} = 0.5\text{A}$ ,  $P_{MAX} = 20\text{W}$ ,  $I_{MAX} = 1.5\text{A}$   
 $V_{MAX} = 40\text{V}$  for standard series, 60V for HV series.

## APPLICATIONS INFORMATION

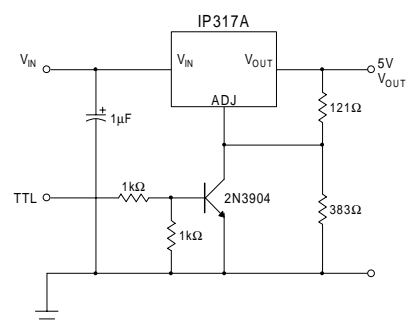


Remote Sensing

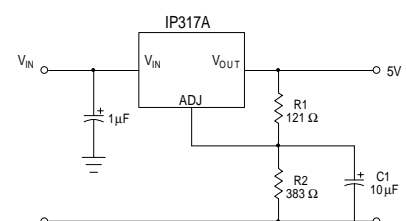


	$\overline{OE}$	$V_{PP}$
READ	0V	5V
WRITE		
BYTE ERASE	5V	21V
CHIP ERASE	12V	21V

2816 EEPROM Supply Programmer for  
Read/Write Control

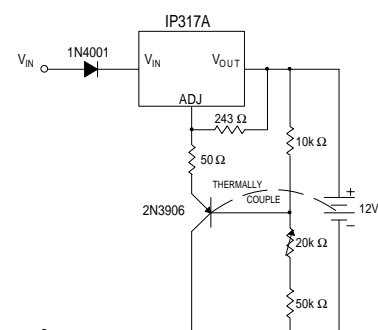


5V Regulator with Shut Down



C1 improves ripple rejection.  
 $X_C$  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 IP117SMD05 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				✓		✓	"	