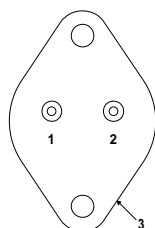
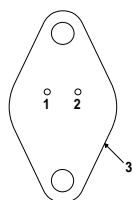


## 1.5 AMP NEGATIVE VOLTAGE REGULATOR



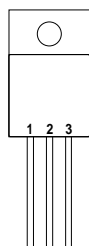
Pin 1 – Ground  
Pin 2 –  $V_{OUT}$   
Case –  $V_{IN}$

**K Package – TO-3**



Pin 1 – Ground  
Pin 2 –  $V_{OUT}$   
Case –  $V_{IN}$

**R Package – TO-66**

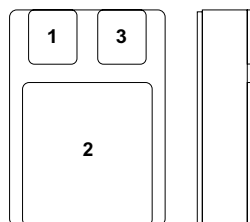


Pin 1 – Ground  
Pin 2 –  $V_{IN}$   
Pin 3 –  $V_{OUT}$   
Case –  $V_{IN}^*$

**G Package – TO-257**

**IG Package– TO-257\***

\* isolated Case on IG package



Pin 1 – Ground  
Pin 2 –  $V_{IN}$   
Pin 3 –  $V_{OUT}$

**SMD PACKAGE – SMD1**

Ceramic Surface Mount

### FEATURES

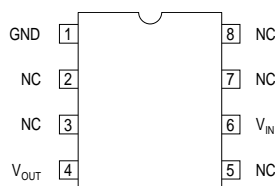
- OUTPUT VOLTAGES OF -12, -15V
- 0.01% / V LINE REGULATION
- 0.3% / A LOAD REGULATION
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION
- 1% VOLTAGE TOLERANCE  
(–A VERSIONS)

### DESCRIPTION

The IP120A / LM120 / IP7900A / IP7900 series of 3 terminal regulators is available with several fixed output voltage making them useful in a wide range of applications.

The A suffix devices provide 0.01% / V line regulation, 0.3% / A load regulation and  $\pm 1\%$  output voltage tolerance at room temperature.

Protection features include Safe Operating Area current limiting and thermal shutdown.



**J Package – 8 Pin Cerdip**

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

$V_I$	DC Input Voltage (for $V_O = -12, -15V$ )	35V
$P_D$	Power Dissipation	Internally limited
$T_j$	Operating Junction Temperature Range	$-55$ to $150^{\circ}C$
$T_{stg}$	Storage Temperature	$-65$ to $150^{\circ}C$

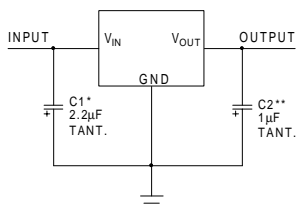
Parameter	Test Conditions	IP7912A IP120A-12			IP7912, IP120-12 LM120-12			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_O$ Output Voltage	$I_O = 500\text{mA}$ $V_{IN} = -19\text{V}$	-11.88	-12	-12.12	-11.76	-12	-12.24	V
	$V_{IN} = -14.8\text{V to } -27\text{V}$ $P_D \leq P_{MAX}$ $I_O = 5\text{mA to } I_{MAX}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	-11.64		-12.36	11.52		-12.48	
$V_O$ Low Supply	$I_O = 5\text{mA to } I_{MAX}$ $P_D \leq P_{MAX}$ $V_{IN} = -14.5\text{V to } -27\text{V}$	-11.40		-12.36	-11.40		-12.60	V
$\Delta V_O$ Line Regulation	$I_O = 0.5 I_{MAX}$	$V_{IN} = -14.5\text{V to } -30\text{V}$		4	18	4	120	mV
		$V_{IN} = -14.8\text{V to } -27\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	18	4	200	
	$I_O \leq I_{MAX}$ $V_{IN} = -16\text{V to } -22\text{V}$	$T_J = -55 \text{ to } 150^\circ\text{C}$		1	4	1	25	
				2	9	2	60	
$\Delta V_O$ Load Regulation	$V_{IN} = -19\text{V}$	$I_O = 5\text{mA to } 1.5\text{A}$		12	32	12	80	mV
		$I_O = 250\text{mA to } 750\text{mA}$		4	19	4	60	
	$V_{IN} = -19\text{V}$	$I_O = 5\text{mA to } I_{MAX}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		8	60	8	120	
$I_Q$ Quiescent Current	$I_O \leq 0.5 I_{MAX}$ $V_{IN} = -19\text{V}$	$T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.4	0.2	0.4	mA
				1	2	1	2	
$\Delta I_Q$ Quiescent Current Change	$I_O = 5\text{mA to } I_{MAX}$ $V_{IN} = -19\text{V}$	$T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.4	0.2	0.4	mA
				0.2	0.5	0.2	0.5	
	$I_O \leq 0.5 I_{MAX}$	$V_{IN} = -14.5\text{V to } -30\text{V}$		0.1	0.4	0.1	0.4	
		$V_{IN} = -15\text{V to } -30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.1	0.5	0.1	1.0	
$V_N$ Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$ $V_{IN} = -19\text{V}$			75	960	75	960	$\mu\text{V}$
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = -15\text{V to } -25\text{V}$	$I_O \leq I_{MAX}$		58	72	56	72	dB
		$I_O \leq 0.5 I_{MAX}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		58	72	56	72	
Dropout Voltage	$I_O = I_{MAX}$			1.1	2.3	1.1	2.3	V
$R_O$ Output Resistance	$f = 1 \text{ kHz}$			8		8		$\text{m}\Omega$
$I_{sc}$ Short Circuit Current	$V_{IN} = -35\text{V}$			0.6	1.2	0.6	1.2	A
$I_{pk}$ Peak Output Current	$V_{IN} = -19\text{V}$			2.4	3.3	2.4	3.3	
Average Temperature Coefficient of $V_O$	$I_O = 5\text{mA}$			0.5	4.8	0.5	4.8	$\text{mV}/^\circ\text{C}$
Input Voltage required to maintain line regulation	$I_O \leq I_{MAX}$			-14.5		-14.5		V

- 1) All characteristics are measured with a capacitor across the input of  $0.22\mu\text{F}$  and a capacitor across the output of  $0.1\mu\text{F}$ .  
All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ( $t_p \leq 10\text{ms}$ ,  $\delta \leq 5\%$ ). Output voltage changes due to changes in internal temperature must be taken into account separately.
- 2) Test Conditions unless otherwise stated:  $P_{MAX} = 10\text{W}$  for TO-220SM,  $P_{MAX} = 1\text{W}$  for Cerdip,  $P_{MAX} = 20\text{W}$  for all other package devices  
 $I_{MAX} = 1.0\text{A}$ ,  $T_J = 25^\circ\text{C}$

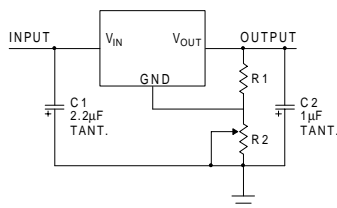
Parameter	Test Conditions	IP7915A IP120A-15			IP7915, IP120-15 LM120-15			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V <sub>O</sub> Output Voltage	I <sub>O</sub> = 500mA V <sub>IN</sub> = -23V	-14.85	-15	-15.15	-14.7	-15	-15.3	V
	V <sub>IN</sub> = -17.9V to -30V P <sub>D</sub> ≤ P <sub>MAX</sub> I <sub>O</sub> = 5mA to I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C	-14.55		-15.45	-14.4		-15.6	
V <sub>O</sub> Low Supply	I <sub>O</sub> = 5mA to I <sub>MAX</sub> P <sub>D</sub> ≤ P <sub>MAX</sub> V <sub>IN</sub> = -17.5V to -30V	-14.25		-15.45	-14.25		-15.75	V
ΔV <sub>O</sub> Line Regulation	I <sub>O</sub> = 0.5 I <sub>MAX</sub>	V <sub>IN</sub> = -17.5V to -30V		4	22	4	150	mV
		V <sub>IN</sub> = -17.9V to -30V T <sub>J</sub> = -55 to 150°C		4	22	4	250	
	I <sub>O</sub> ≤ I <sub>MAX</sub> V <sub>IN</sub> = -20V to -26V	T <sub>J</sub> = -55 to 150°C		2	10	2	75	
				5	30	5	150	
ΔV <sub>O</sub> Load Regulation	V <sub>IN</sub> = -23V	I <sub>O</sub> = 5mA to 1.5A		12	35	12	80	mV
		I <sub>O</sub> = 250mA to 750mA		4	21	4	75	
	V <sub>IN</sub> = -23V	I <sub>O</sub> = 5mA to I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C		9	75	9	150	
I <sub>Q</sub> Quiescent Current	I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> V <sub>IN</sub> = -23V	T <sub>J</sub> = -55 to 150°C		1	1.9	1	1.9	mA
				1	2	1	2	
ΔI <sub>Q</sub> Quiescent Current Change	I <sub>O</sub> = 5mA to I <sub>MAX</sub> V <sub>IN</sub> = -23V	T <sub>J</sub> = -55 to 150°C		0.2	0.4	0.2	0.4	mA
				0.2	0.5	0.2	0.5	
	I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub>	V <sub>IN</sub> = -17.5V to -30V		0.1	0.4	0.1	0.4	
		V <sub>IN</sub> = -18.5V to -30V T <sub>J</sub> = -55 to 150°C		0.1	0.5	0.1	1.0	
V <sub>N</sub> Output Noise Voltage	f = 10Hz to 100kHz V <sub>IN</sub> = -23V		90	1200		90	1200	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	f = 120Hz V <sub>IN</sub> = -18.5V to -28.5V	I <sub>O</sub> ≤ I <sub>MAX</sub>		56	70	54	70	dB
		I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C		56	70	54	70	
Dropout Voltage	I <sub>O</sub> = I <sub>MAX</sub>		1.1	2.3		1.1	2.3	V
R <sub>O</sub> Output Resistance	f = 1 kHz		9			9		mΩ
I <sub>sc</sub> Short Circuit Current	V <sub>IN</sub> = -35V		0.6	1.2		0.6	1.2	A
I <sub>pk</sub> Peak Output Current	V <sub>IN</sub> = -23V		2.4	3.3		2.4	3.3	
Average Temperature Coefficient of V <sub>O</sub>	I <sub>O</sub> = 5mA		0.6	6		0.6	6	mV/°C
Input Voltage required to maintain line regulation	I <sub>O</sub> ≤ I <sub>MAX</sub>		-17.5			-17.5		V

- 1) All characteristics are measured with a capacitor across the input of 0.22μF and a capacitor across the output of 0.1μF.  
All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t<sub>p</sub> ≤ 10ms, δ ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.
- 2) Test Conditions unless otherwise stated: P<sub>MAX</sub> = 10W for TO-220SM, P<sub>MAX</sub> = 1W for Cerdip, P<sub>MAX</sub> = 20W for all other package devices  
I<sub>MAX</sub> = 1.0A, T<sub>J</sub> = 25°C

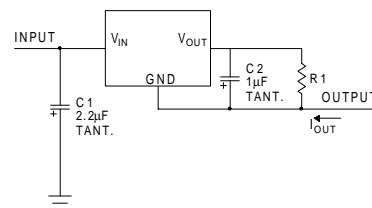
## APPLICATIONS INFORMATION



**Fixed Output Regulator**



**Adjustable Output Regulator**



**Current Regulator**

\* Required if the regulator is located far from the power supply.

\*\* Required for stability. 25mF electrolytic may be substituted.

$$V_{OUT} \approx V_{REG} \frac{(R1+R2)}{R1}$$

$$I_{OUT} = \frac{V_{REG}}{R1} + I_Q$$

## Order Information

Part Number	K-Pack (TO-3)	R-Pack (TO-66)	G/IG-Pack (TO-257)	SG-Pack SMD1	J-Pack 8 Pin Cerdip	Temp. Range	<b>Note:</b> To order, add the package identifier to the part number. eg. IP7912AK IP120SMD-15
IP7900A	4	4	4	4	4	-55 to +150°C	
IP7900	4	4	4	4	4	"	
IP120A	4	4	4	4	4	"	
IP120	4	4	4	4	4	"	
LM120	4	4	4	4	4	"	