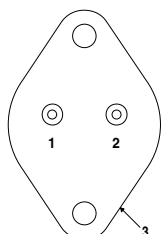
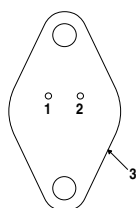


## 1.5 AMP NEGATIVE VOLTAGE REGULATOR



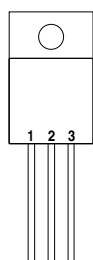
Pin 1 – Ground  
Pin 2 –  $V_{OUT}$   
Case –  $V_{IN}$

**K Package – TO-3**



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

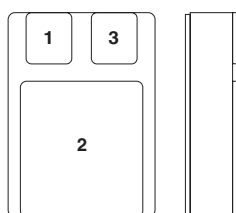
**R Package – TO-66**



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

**TO-257  
TO-220**

Isolated Case Option on  
IG Package



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

**SMD Packages**

Ceramic Surface Mount

### FEATURES

- **OUTPUT VOLTAGE OF -5V, -12V and -15V**
- **0.7% / V LINE REGULATION AVAILABLE**
- **0.5% / A LOAD REGULATION AVAILABLE**
- **THERMAL OVERLOAD PROTECTION**
- **SHORT CIRCUIT PROTECTION**
- **OUTPUT TRANSISTOR SOA PROTECTION**
- **1.0% VOLTAGE TOLERANCE OPTION ('A' VERSIONS)**

### DESCRIPTION

The IP120 / LM120 / IP7900 / LM7900 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 0.7% / V line regulation, 0.5% / A load regulation and  $\pm 1.0\%$  output voltage tolerance at room temperature.

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

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

$V_I$	DC Input Voltage	35V
$P_D$	Power Dissipation	Internally limited
$T_j$	Operating Junction Temperature Range	-55 to 150°C
$T_{stg}$	Storage Temperature	-65 to 150°C

Semelab Plc 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.

Parameter	Test Conditions	IP/LM 7905A Series IP/LM 120A Series			IP/LM 7905 Series IP/LM 120 Series			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V <sub>O</sub> Output Voltage	I <sub>O</sub> = 500mA V <sub>IN</sub> = -10V	-4.95	-5	-5.05	-4.9	-5	-5.1	V
	I <sub>O</sub> = 5mA to I <sub>MAX</sub> P <sub>D</sub> ≤ P <sub>MAX</sub> V <sub>IN</sub> = -7.5V to -20V T <sub>J</sub> = -55 to 150°C	-4.85		-5.15	-4.8		-5.2	
ΔV <sub>O</sub> Line Regulation	I <sub>O</sub> = 0.5 I <sub>MAX</sub> V <sub>IN</sub> = -7V to -25V V <sub>IN</sub> = -7.5V to -20V T <sub>J</sub> = -55 to 150°C		3	10		3	25	mV
			3	10		3	50	
	V <sub>IN</sub> = -8V to -12V I <sub>O</sub> ≤ I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C	1.0	4	1.0	25			
ΔV <sub>O</sub> Load Regulation	V <sub>IN</sub> = -10V I <sub>O</sub> = 5mA to 1.5A I <sub>O</sub> = 5mA to I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C		25	35		25	100	mV
			25	35		25	100	
I <sub>Q</sub> Quiescent Current	I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> V <sub>IN</sub> = -10V T <sub>J</sub> = -55 to 150°C		1.0	1.9		1.0	1.9	mA
			1.0	2		1.0	2	
ΔI <sub>Q</sub> Quiescent Current Change	I <sub>O</sub> = 5mA to I <sub>MAX</sub> V <sub>IN</sub> = -10V 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	
V <sub>N</sub> Output Noise Voltage	f = 10Hz to 100kHz V <sub>IN</sub> = -10V		100			100	μV	
ΔV <sub>IN</sub> / ΔV <sub>O</sub> Ripple Rejection	f = 120Hz V <sub>IN</sub> = -8V to -18V I <sub>O</sub> ≤ I <sub>MAX</sub>	58			54			dB
	I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C	58			54			
Dropout Voltage	I <sub>O</sub> = I <sub>MAX</sub>		1.4			1.4	V	
R <sub>O</sub> Output Resistance	f = 1.0 kHz		5			5	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 Average	V <sub>IN</sub> = -10V		2.4	3.3		2.4	3.3	
Temperature Coefficient of V <sub>O</sub>	I <sub>O</sub> = 5mA		0.2			0.2	mV / °C	
Input Voltage required to maintain line regulation	I <sub>O</sub> ≤ I <sub>MAX</sub>	-7.3			-7.3		V	

1) All characteristics are measured with a capacitor across the input of 2.2μF and a capacitor across the output of 1.0μF.  
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 SMD, P<sub>MAX</sub> = 20W for all other package devices

$$I_{MAX} = 1.0A, T_J = 25^\circ C$$

Semelab Plc 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.

Parameter	Test Conditions	IP/LM 7912A Series IP/LM120A-12 Series			IP/LM 7912 Series IP/LM120-12 Series			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V <sub>O</sub> Output Voltage	I <sub>O</sub> = 500mA V <sub>IN</sub> = -19V	-11.88	-12	-12.12	-11.76	-12	-12.24	V
	V <sub>IN</sub> = -14.8V to -27V 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	-11.64		-12.36	11.52		-12.48	
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> = -14.5V to -27V	-11.40		-12.36	-11.40		-12.60	V
ΔV <sub>O</sub> Line Regulation	I <sub>O</sub> = 0.5 I <sub>MAX</sub> V <sub>IN</sub> = -14.5V to -30V V <sub>IN</sub> = -14.8V to -27V T <sub>J</sub> = -55 to 150°C	4		18	4		120	mV
		4		18	4		200	
	I <sub>O</sub> ≤ I <sub>MAX</sub> V <sub>IN</sub> = -16V to -22V T <sub>J</sub> = -55 to 150°C	1.0		4	1.0		25	
ΔV <sub>O</sub> Load Regulation	V <sub>IN</sub> = -19V I <sub>O</sub> = 5mA to 1.5A I <sub>O</sub> = 250mA to 750mA	12		32	12		80	mV
		4		19	4		60	
	V <sub>IN</sub> = -19V I <sub>O</sub> = 5mA to I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C	8		60	8		120	
I <sub>Q</sub> Quiescent Current	I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> V <sub>IN</sub> = -19V T <sub>J</sub> = -55 to 150°C	0.2		0.4	0.2		0.4	mA
	1.0		2	1.0		2		
ΔI <sub>Q</sub> Quiescent Current Change	I <sub>O</sub> = 5mA to I <sub>MAX</sub> V <sub>IN</sub> = -19V 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> = -14.5V to -30V V <sub>IN</sub> = -15V to -30V T <sub>J</sub> = -55 to 150°C	0.1		0.4	0.1		0.4	
V <sub>N</sub> Output Noise Voltage	f = 10Hz to 100kHz V <sub>IN</sub> = -19V		75	960		75	960	μV
	f = 120Hz V <sub>IN</sub> = -15V to -25V I <sub>O</sub> ≤ I <sub>MAX</sub> I <sub>O</sub> ≤ 0.5 I <sub>MAX</sub> T <sub>J</sub> = -55 to 150°C	58	72		56	72		dB
Dropout Voltage	I <sub>O</sub> = I <sub>MAX</sub>		1.1	2.3		1.1	2.3	
R <sub>O</sub> Output Resistance	f = 1.0 kHz		8			8		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> = -19V		2.4	3.3		2.4	3.3	
Average Temperature Coefficient of V <sub>O</sub>	I <sub>O</sub> = 5mA		0.5	4.8		0.5	4.8	mV/°C
Input Voltage required to maintain line regulation	I <sub>O</sub> ≤ I <sub>MAX</sub>	-14.5			-14.5			V

1) All characteristics are measured with a capacitor across the input of 2.2μF and a capacitor across the output of 1.0μF.

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 SMD, P<sub>MAX</sub> = 20W for all other package devices, I<sub>MAX</sub> = 1.0A, T<sub>J</sub> = 25°C

Semelab Plc 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.

Parameter	Test Conditions	IP/LM 7915A Series IP/LM120A-15 Series			IP/LM 7915 Series IP/LM120-15 Series			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 V <sub>IN</sub> = -17.9V to -30V T <sub>J</sub> = -55 to 150°C	4		22	4		150	mV
		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	
ΔV <sub>O</sub> Load Regulation	V <sub>IN</sub> = -23V I <sub>O</sub> = 5mA to 1.5A I <sub>O</sub> = 250mA to 750mA	12		35	12		80	mV
		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	1.0		1.9	1.0		1.9	mA
	1.0		2	1.0		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 V <sub>IN</sub> = -18.5V to -30V T <sub>J</sub> = -55 to 150°C	0.1		0.4	0.1		0.4	
		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
ΔV <sub>IN</sub> /ΔV <sub>O</sub> 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 = 1.0 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

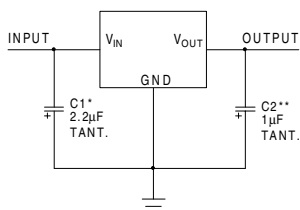
1) All characteristics are measured with a capacitor across the input of 2.2μF and a capacitor across the output of 1.0μF.

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.

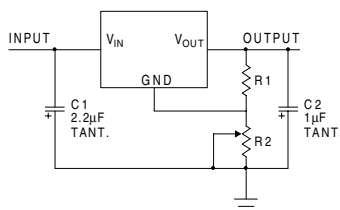
2) Test Conditions unless otherwise stated: P<sub>MAX</sub> = 10W for SMD, P<sub>MAX</sub> = 20W for all other package devices, I<sub>MAX</sub> = 1.0A, T<sub>J</sub> = 25°C

Semelab Plc 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.

## APPLICATIONS INFORMATION

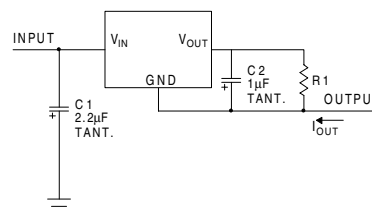


**Fixed Output Regulator**



**Adjustable Output Regulator**

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



**Current Regulator**

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

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

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

## Order Information

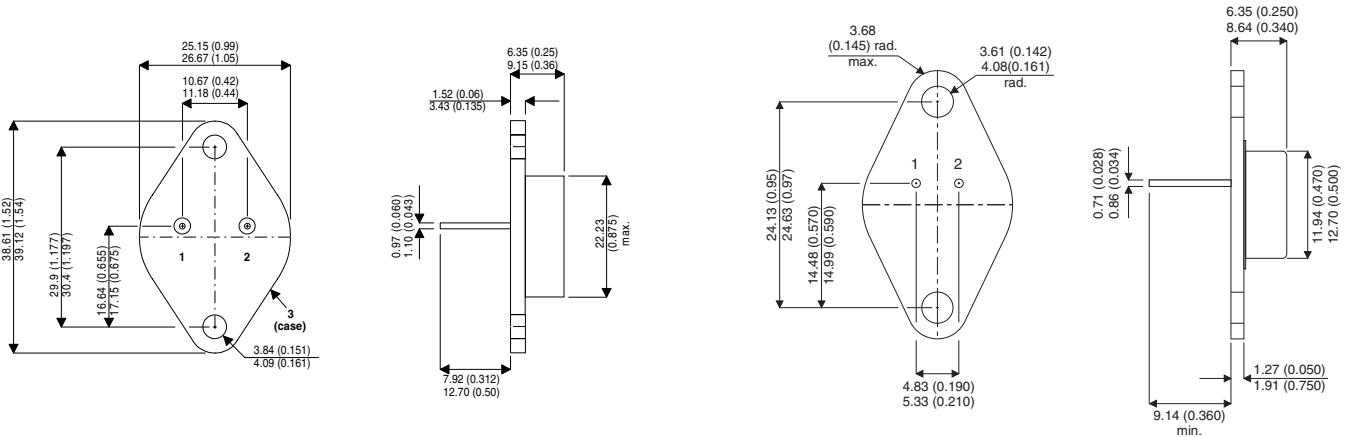
Part Number	K-Pack (TO-3)	R-Pack (TO-66)	G/IG-Pack (TO-257)	220M-Pack (TO-220)	SMD (SMD1)	SMD-05 (SMD 0.5)
IP7905	✓	✓	✓	✓	✓	✓
IP7912	✓	✓	✓	✓	✓	✓
IP7915	✓	✓	✓	✓	✓	✓
IP120-05	✓	✓	✓	✓	✓	✓
IP120-12	✓	✓	✓	✓	✓	✓
IP 120-15	✓	✓	✓	✓	✓	✓
LM7905	✓	✓	✓	✓	✓	✓
LM7912	✓	✓	✓	✓	✓	✓
LM7915	✓	✓	✓	✓	✓	✓
LM120-05	✓	✓	✓	✓	✓	✓
LM120-12	✓	✓	✓	✓	✓	✓
LM120-15	✓	✓	✓	✓	✓	✓

## Order Information

### Note:

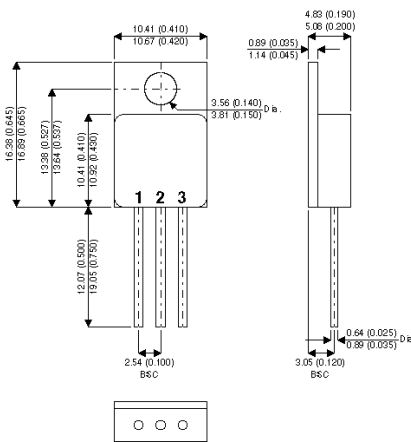
To order, add the package identifier to the part number.  
eg. IP7905AK  
LM120SMD-05

**MECHANICAL INFORMATION**

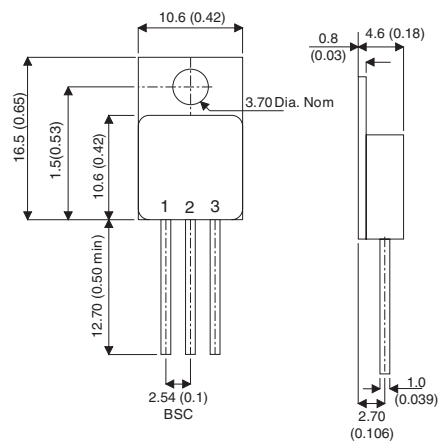


**K-Package  
(TO-3)**

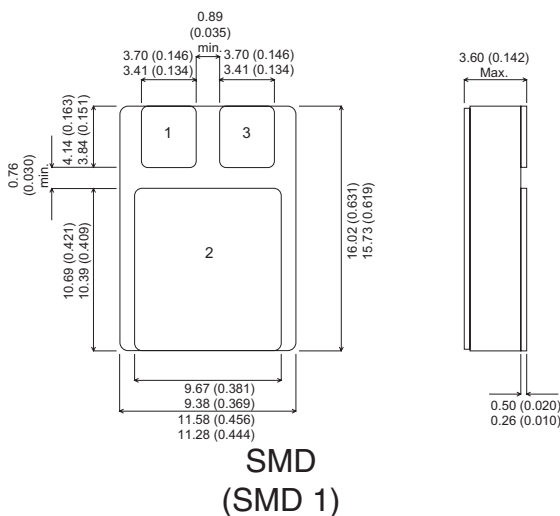
**R-Package  
(TO-66)**



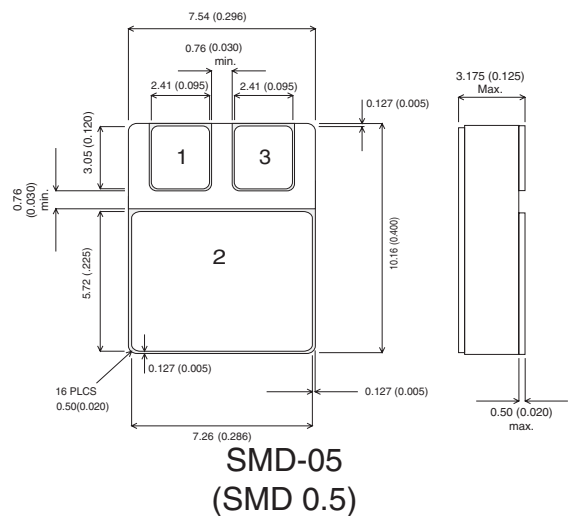
**G/IG-Package  
(TO-257)**



**220M-Package  
(TO-220)**



**SMD  
(SMD 1)**



**SMD-05  
(SMD 0.5)**

Semelab Plc 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.