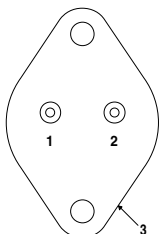
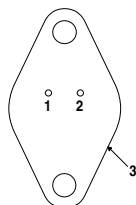


1.5 AMP NEGATIVE VOLTAGE REGULATOR



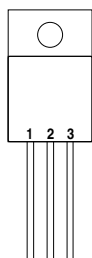
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO-3



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

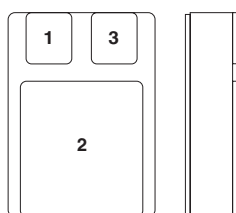
R Package – TO-66



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

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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 _O	Output Voltage	I _O = 500mA	V _{IN} = -10V	-4.95	-5	-5.05	-4.9	-5	-5.1	V	
		I _O = 5mA to I _{MAX} P _D ≤ P _{MAX}	V _{IN} = -7.5V to -20V T _J = -55 to 150°C	-4.85		-5.15	-4.8		-5.2		
ΔV _O	Line Regulation	I _O = 0.5 I _{MAX}	V _{IN} = -7V to -25V		3	10		3	25	mV	
			V _{IN} = -7.5V to -20V T _J = -55 to 150°C		3	10		3	50		
		V _{IN} = -8V to -12V			1.0	4		1.0	25		
		I _O ≤ I _{MAX}	T _J = -55 to 150°C		1.0	12		2	50		
ΔV _O	Load Regulation	V _{IN} = -10V	I _O = 5mA to 1.5A		25	35		25	100	mV	
			I _O = 5mA to I _{MAX} T _J = -55 to 150°C		25	35		25	100		
I _Q	Quiescent Current	I _O ≤ 0.5 I _{MAX} V _{IN} = -10V			1.0	1.9		1.0	1.9	mA	
		T _J = -55 to 150°C			1.0	2		1.0	2		
ΔI _Q	Quiescent Current Change	I _O = 5mA to I _{MAX} V _{IN} = -10V			0.2	0.4		0.2	0.4	mA	
		T _J = -55 to 150°C			0.2	0.5		0.2	0.5		
V _N	Output Noise Voltage	f = 10Hz to 100kHz V _{IN} = -10V			100			100		μV	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120Hz	I _O ≤ I _{MAX}	58				54			dB
		V _{IN} = -8V to -18V	I _O ≤ 0.5 I _{MAX} T _J = -55 to 150°C	58				54			
Dropout Voltage		I _O = I _{MAX}			1.4			1.4		V	
R _O	Output Resistance	f = 1.0 kHz			5			5		mΩ	
I _{sc}	Short Circuit Current	V _{IN} = -35V			0.6	1.2		0.6	1.2	A	
I _{pk}	Peak Output Current Average	V _{IN} = -10V			2.4	3.3		2.4	3.3		
Temperature Coefficient of V _O		I _O = 5mA			0.2			0.2		mV / °C	
Input Voltage required to maintain line regulation		I _O ≤ I _{MAX}			-7.3			-7.3		V	

- 1) All characteristics are measured with a capacitor across the input of $2.2\mu\text{F}$ and a capacitor across the output of $1.0\mu\text{F}$.
 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 SMD, $P_{MAX} = 20\text{W}$ for all other package devices

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

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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 _O Output Voltage	I _O = 500mA V _{IN} = -19V		-11.88	-12	-12.12	-11.76	-12	-12.24	V		
	V _{IN} = -14.8V to -27V P _D ≤ P _{MAX}		-11.64		-12.36		11.52			-12.48	
	I _O = 5mA to I _{MAX} T _J = -55 to 150°C										
V _O Low Supply	I _O = 5mA to I _{MAX} P _D ≤ P _{MAX} V _{IN} = -14.5V to -27V		-11.40		-12.36		-11.40		-12.60		V
ΔV _O Line Regulation	I _O = 0.5 I _{MAX}	V _{IN} = -14.5V to -30V	4		18		4		120		mV
		V _{IN} = -14.8V to -27V T _J = -55 to 150°C	4		18		4		200		
	I _O ≤ I _{MAX}		1.0		4		1.0		25		
	V _{IN} = -16V to -22V T _J = -55 to 150°C		2		9		2		60		
ΔV _O Load Regulation	V _{IN} = -19V	I _O = 5mA to 1.5A	12		32		12		80		mV
		I _O = 250mA to 750mA	4		19		4		60		
	V _{IN} = -19V I _O = 5mA to I _{MAX} T _J = -55 to 150°C		8		60		8		120		
I _Q Quiescent Current	I _O ≤ 0.5 I _{MAX}		0.2		0.4		0.2		0.4		mA
	V _{IN} = -19V	T _J = -55 to 150°C	1.0		2		1.0		2		
ΔI _Q Quiescent Current Change	I _O = 5mA to I _{MAX}		0.2		0.4		0.2		0.4		mA
	V _{IN} = -19V	T _J = -55 to 150°C	0.2		0.5		0.2		0.5		
		V _{IN} = -14.5V to -30V		0.1		0.4		0.1		0.4	
	I _O ≤ 0.5 I _{MAX}		V _{IN} = -15V to -30V T _J = -55 to 150°C		0.1		0.5		0.1		
V _N Output Noise Voltage	f = 10Hz to 100kHz V _{IN} = -19V		75		960		75		960		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	f = 120Hz	I _O ≤ I _{MAX}	58	72			56	72			dB
	V _{IN} = -15V to -25V	I _O ≤ 0.5 I _{MAX} T _J = -55 to 150°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 = 1.0 kHz		8				8				mΩ
I _{sc} Short Circuit Current	V _{IN} = -35V		0.6		1.2		0.6		1.2		A
I _{pk} Peak Output Current	V _{IN} = -19V		2.4		3.3		2.4		3.3		
Average Temperature Coefficient of V _O	I _O = 5mA		0.5		4.8		0.5		4.8		mV/°C
Input Voltage required to maintain line regulation	I _O ≤ I _{MAX}		-14.5				-14.5				V

1) All characteristics are measured with a capacitor across the input of $2.2\mu\text{F}$ and a capacitor across the output of $1.0\mu\text{F}$.

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 SMD, $P_{MAX} = 20\text{W}$ for all other package devices, $I_{MAX} = 1.0\text{A}$, $T_J = 25^\circ\text{C}$

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

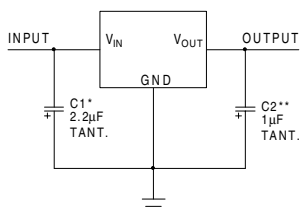
1) All characteristics are measured with a capacitor across the input of 2.2μF and a capacitor across the output of 1.0μF.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_p ≤ 10ms, δ ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

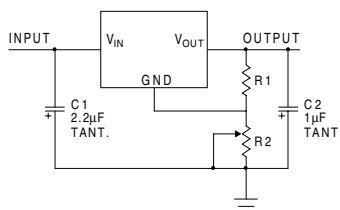
2) Test Conditions unless otherwise stated: P_{MAX} = 10W for SMD, P_{MAX} = 20W for all other package devices, I_{MAX} = 1.0A, T_J = 25°C

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APPLICATIONS INFORMATION

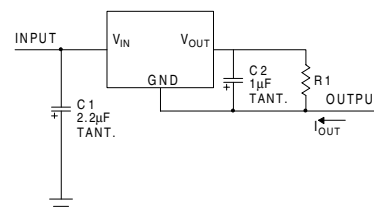


Fixed Output Regulator



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

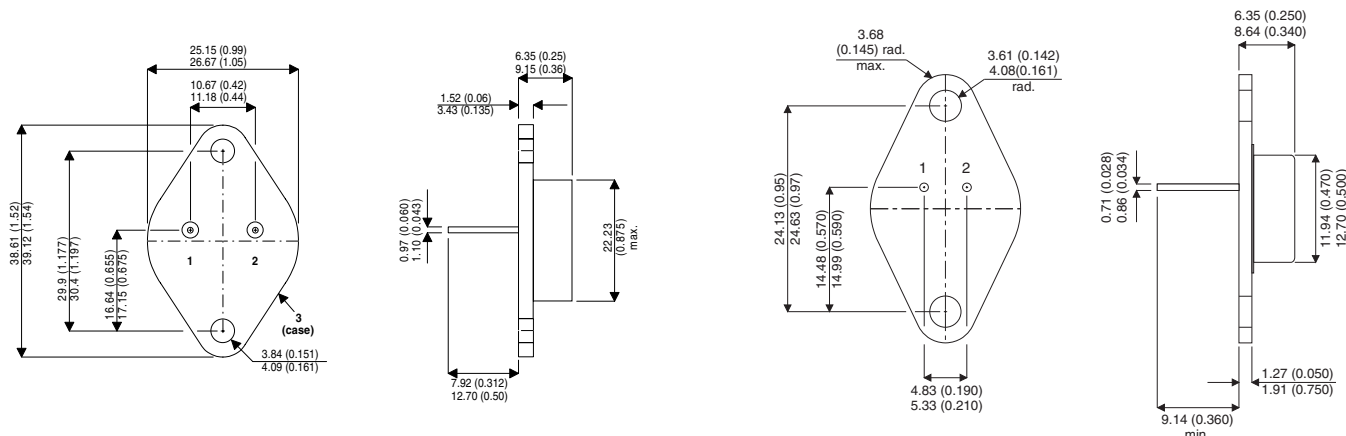
Part Number	K-Pack (TO-3)	R-Pack (TO-66)	G/IG-Pack (TO-257)	220M-Pack (TO-220)	SMD (SMD1)	SMD-05 (SMD 0.5)
IP7905	✓	✓	✓	✓	✓	✓
IP7912	✓	✓	✓	✓	✓	✓
IP7915	✓	✓	✓	✓	✓	✓
IP120-05	✓	✓	✓	✓	✓	✓
IP120-12	✓	✓	✓	✓	✓	✓
IP 120-15	✓	✓	✓	✓	✓	✓
LM7905	✓	✓	✓	✓	✓	✓
LM7912	✓	✓	✓	✓	✓	✓
LM7915	✓	✓	✓	✓	✓	✓
LM120-05	✓	✓	✓	✓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

Order Information

Note:

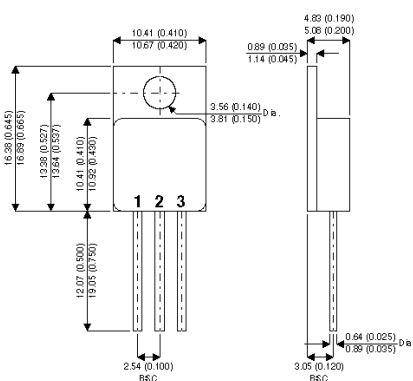
To order, add the package identifier to the part number.
eg. IP7905AK
LM120SMD-05

MECHANICAL INFORMATION



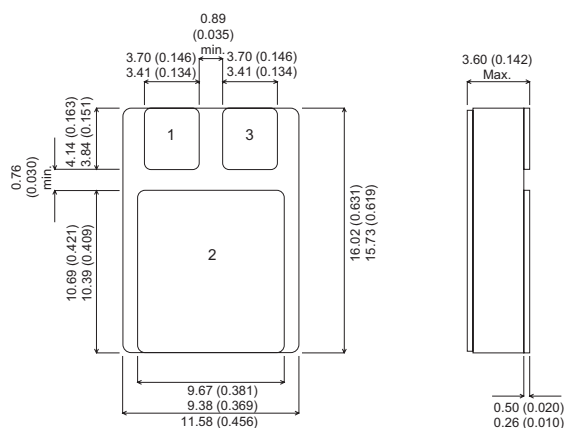
**K-Package
(TO-3)**

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



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

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



**SMD
(SMD 1)**

**SMD-05
(SMD 0.5)**

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