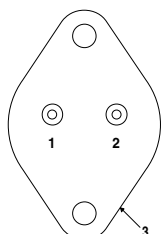
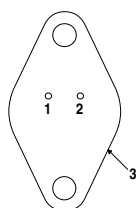


1.5 AMP NEGATIVE VOLTAGE REGULATOR



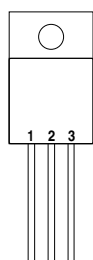
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO-3



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

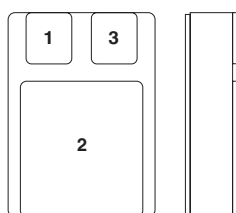
R Package – TO-66



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 V _{IN} = -7.5V to -20V T _J = -55 to 150°C		3	10		3	25	mV
			3	10		3	50	
	V _{IN} = -8V to -12V I _O ≤ I _{MAX} T _J = -55 to 150°C	1.0	4	1.0	25			
ΔV _O Load Regulation	V _{IN} = -10V I _O = 5mA to 1.5A I _O = 5mA to I _{MAX} T _J = -55 to 150°C		25	35		25	100	mV
			25	35		25	100	
I _Q Quiescent Current	I _O ≤ 0.5 I _{MAX} V _{IN} = -10V T _J = -55 to 150°C		1.0	1.9		1.0	1.9	mA
			1.0	2		1.0	2	
ΔI _Q Quiescent Current Change	I _O = 5mA to I _{MAX} V _{IN} = -10V T _J = -55 to 150°C		0.2	0.4		0.2	0.4	mA
			0.2	0.5		0.2	0.5	
V _N Output Noise Voltage	f = 10Hz to 100kHz V _{IN} = -10V		100			100	μV	
ΔV _{IN} / ΔV _O Ripple Rejection	f = 120Hz V _{IN} = -8V to -18V I _O ≤ I _{MAX}	58			54			dB
	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 2.2μF 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

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

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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} I _O = 5mA to I _{MAX} T _J = -55 to 150°C	-11.64		-12.36	11.52		-12.48	
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 V _{IN} = -14.8V to -27V T _J = -55 to 150°C	4		18	4		120	mV
		4		18	4		200	
	I _O ≤ I _{MAX} V _{IN} = -16V to -22V T _J = -55 to 150°C	1.0		4	1.0		25	
ΔV _O Load Regulation	V _{IN} = -19V I _O = 5mA to 1.5A I _O = 250mA to 750mA	12		32	12		80	mV
		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} V _{IN} = -19V T _J = -55 to 150°C	0.2		0.4	0.2		0.4	mA
	1.0		2	1.0		2		
ΔI _Q Quiescent Current Change	I _O = 5mA to I _{MAX} V _{IN} = -19V 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} = -14.5V to -30V V _{IN} = -15V to -30V T _J = -55 to 150°C	0.1		0.4	0.1		0.4	
V _N Output Noise Voltage	f = 10Hz to 100kHz V _{IN} = -19V		75	960		75	960	μV
	f = 120Hz V _{IN} = -15V to -25V I _O ≤ I _{MAX} I _O ≤ 0.5 I _{MAX} T _J = -55 to 150°C	58	72		56	72		dB
Dropout Voltage	I _O = I _{MAX}		1.1	2.3		1.1	2.3	
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 2.2μF 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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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} I _O = 5mA to I _{MAX} T _J = -55 to 150°C	-14.55		-15.45	-14.4		-15.6	
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 V _{IN} = -17.9V to -30V T _J = -55 to 150°C	4		22	4		150	mV
		4		22	4		250	
	I _O ≤ I _{MAX} V _{IN} = -20V to -26V T _J = -55 to 150°C	2		10	2		75	
ΔV _O Load Regulation	V _{IN} = -23V I _O = 5mA to 1.5A I _O = 250mA to 750mA	12		35	12		80	mV
		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} V _{IN} = -23V T _J = -55 to 150°C	1.0		1.9	1.0		1.9	mA
	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 V _{IN} = -18.5V to -30V T _J = -55 to 150°C	0.1		0.4	0.1		0.4	
		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
ΔV _{IN} /ΔV _O Ripple Rejection	f = 120Hz V _{IN} = -18.5V to -28.5V I _O ≤ I _{MAX}	56		70	54		70	dB
	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

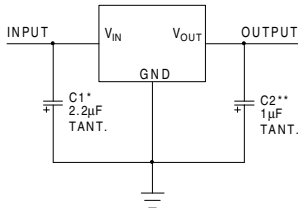
1) All characteristics are measured with a capacitor across the input of 2.2μF and a capacitor across the output of 1.0μF.

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.

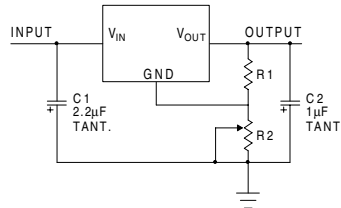
2) Test Conditions unless otherwise stated: P_{MAX} = 10W for SMD, P_{MAX} = 20W for all other package devices, I_{MAX} = 1.0A, T_J = 25°C

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APPLICATIONS INFORMATION

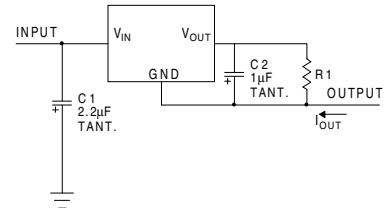


Fixed Output Regulator



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

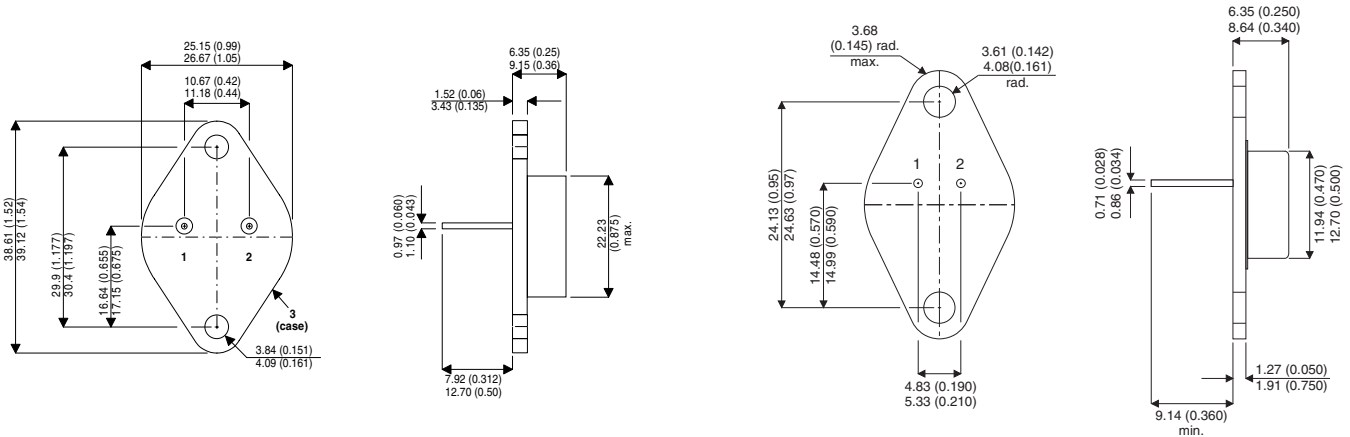
Note:

To order, add the package identifier to the part number.

eg. IP7905AK

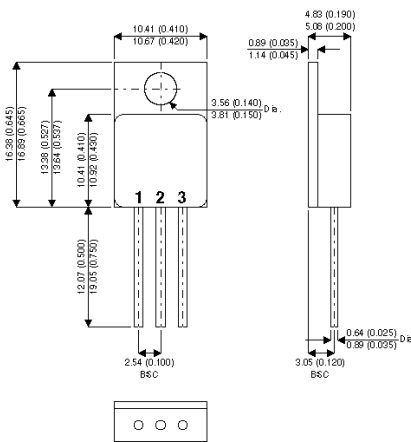
LM120SMD-05

MECHANICAL INFORMATION



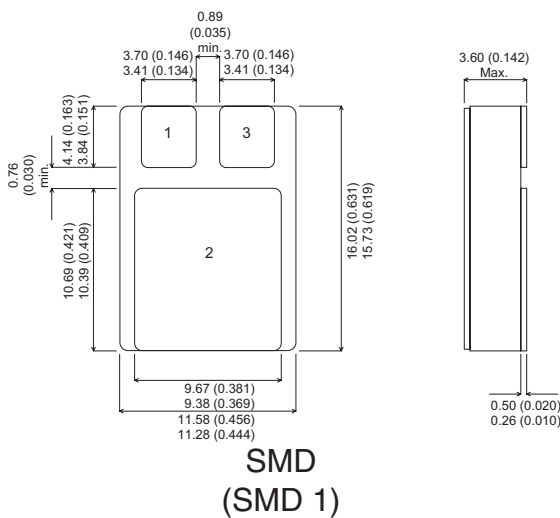
K-Package
(TO-3)

R-Package
(TO-66)

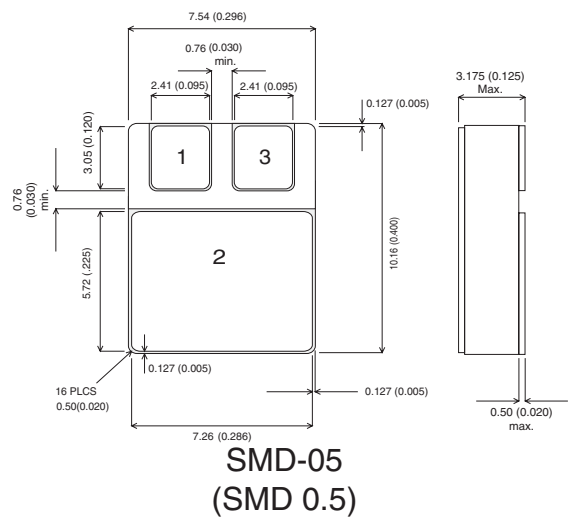


G/IG-Package
(TO-257)

220M-Package
(TO-220)



SMD
(SMD 1)



SMD-05
(SMD 0.5)

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