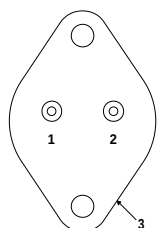
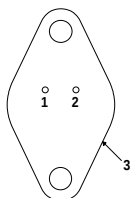


1.5 AMP NEGATIVE VOLTAGE REGULATOR



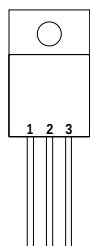
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO-3



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

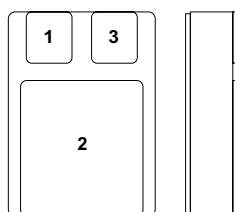
R Package – TO-66



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

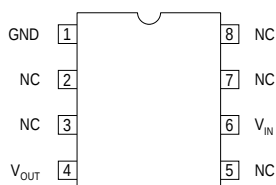
- OUTPUT VOLTAGES OF -5, -12, -15V
- 0.01% / V LINE REGULATION
- 0.3% / A LOAD REGULATION
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION
- 1% VOLTAGE TOLERANCE OPTION
(-A VERSIONS)

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 $V_O = -5, -12, -15V$)	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	IP7905A IP120A-05			IP7905 , IP120-05 LM120-05			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} V _{IN} = -7.5V to -20V P _D ≤ P _{MAX} T _J = -55 to 150°C	-4.85		-5.15	-4.8		-5.2	
V _O Low Supply	I _O = 5mA to I _{MAX} P _D ≤ P _{MAX} V _{IN} = -7V to -20V	-4.75		-5.15	-4.75		-5.25	V
ΔV _O Line Regulation	I _O = 0.5 I _{MAX} V _{IN} = -7V to -25V		3	10		3	25	mV
			3	10		3	50	
	V _{IN} = -8V to -12V		1	4		1	25	
	I _O ≤ I _{MAX} T _J = -55 to 150°C		1	12		2	50	
ΔV _O Load Regulation	V _{IN} = -10V I _O = 5mA to 1.5A		10	25		10	75	mV
	I _O = 250mA to 750mA		4	15		4	25	
	V _{IN} = -10V I _O = 5mA to I _{MAX} T _J = -55 to 150°C		7	25		7	50	
I _Q Quiescent Current	I _O ≤ 0.5 I _{MAX} V _{IN} = -10V		1	1.9		1	1.9	mA
	T _J = -55 to 150°C		1	2		1	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	
	I _O ≤ 0.5 I _{MAX} V _{IN} = -7V to -25V		0.1	0.4		0.1	0.4	
	V _{IN} = -8V to -25V 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} = -10V		40	400		40	400	μV
ΔV _{IN} / ΔV _O Ripple Rejection	f = 120Hz I _O ≤ I _{MAX}	66	80		54	80		dB
	V _{IN} = -8V to -18V I _O ≤ 0.5 I _{MAX} T _J = -55 to 150°C	66	80		54	80		
Dropout Voltage	I _O = I _{MAX}		1.1	2.3		1.1	2.3	V
R _O Output Resistance	f = 1 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	V _{IN} = -10V		2.4	3.3		2.4	3.3	
Average Temperature Coefficient of V _O	I _O = 5mA		0.2	2		0.2	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 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_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 TO-220SM, P_{MAX} = 1W for Cerdip, P_{MAX} = 20W for all other package devices
I_{MAX} = 1.0A, T_J = 25°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 = 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		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} V _{IN} = -16V to -22V	T _J = -55 to 150°C		1	4	1	25	
		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} V _{IN} = -19V	T _J = -55 to 150°C		0.2	0.4	0.2	0.4	mA
		T _J = -55 to 150°C		1	2	1	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
		T _J = -55 to 150°C		0.2	0.5	0.2	0.5	
	I _O ≤ 0.5 I _{MAX}	V _{IN} = -14.5V to -30V		0.1	0.4	0.1	0.4	
		V _{IN} = -15V 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} = -19V			75	960	75	960	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	f = 120Hz V _{IN} = -15V to -25V	I _O ≤ I _{MAX}		58	72	56	72	dB
		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 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 0.22μF and a capacitor across the output of 0.1μF.

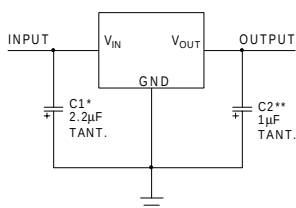
All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_p ≤ 10ms, δ ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

2) Test Conditions unless otherwise stated: P_{MAX} = 10W for TO-220SM, P_{MAX} = 1W for Cerdip, P_{MAX} = 20W for all other package devices
I_{MAX} = 1.0A, T_J = 25°C

Parameter		Test Conditions		IP7915A IP120A–15			IP7915 , IP120–15 LM120–15			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	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		1.9		1		1.9	mA
		V _{IN} = -23V T _J = -55 to 150°C	1		2		1		2		
ΔI _Q	Quiescent Current Change	I _O = 5mA to I _{MAX}		0.2		0.4		0.2		0.4	mA
		V _{IN} = -23V	T _J = -55 to 150°C	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		
		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 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 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_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 TO-220SM, P_{MAX} = 1W for Cerdip, P_{MAX} = 20W for all other package devices
 I_{MAX} = 1.0A, T_J = 25°C

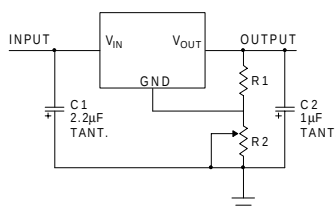
APPLICATIONS INFORMATION



Fixed Output Regulator

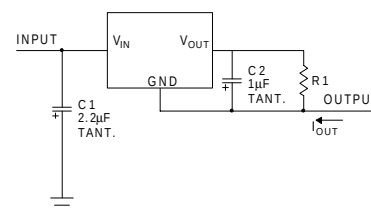
* Required if the regulator is located far from the power supply.

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



Adjustable Output Regulator

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



Current Regulator

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

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	Note: To order, add the package identifier to the part number. eg. IP7900AK IP120SG
IP7900A	✓	✓	✓	✓	✓	-55 to +150°C	
IP7900	✓	✓	✓	✓	✓	"	
IP120A	✓	✓	✓	✓	✓	"	
IP120	✓	✓	✓	✓	✓	"	
LM120	✓	✓	✓	✓	✓	"	