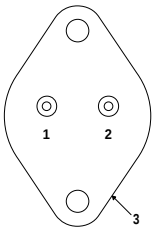
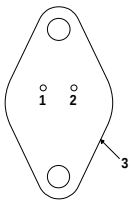
IP120A SERIES
IP120 SERIES
IP7900A SERIES
IP7900 SERIES
LM120 SERIES

1.5 AMP NEGATIVE VOLTAGE REGULATOR



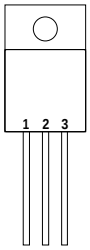
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO–3



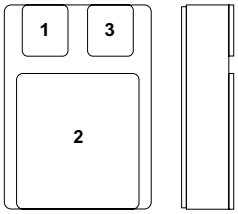
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

R Package – TO–66



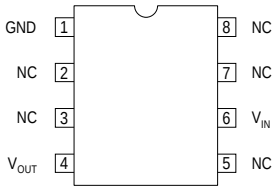
Pin 1 – Ground
Pin 2 – V_{IN}
Pin 3 – V_{OUT}
Case – V_{IN}

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



J Package – 8 Pin Cerdip

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 ±1% output voltage tolerance at room temperature.

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

ABSOLUTE MAXIMUM RATINGS (T_{case} = 25°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°C
T_{stg}	Storage Temperature		–65 to 150°C

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IP120A SERIES
IP120 SERIES
IP7900A SERIES
IP7900 SERIES
LM120 SERIES

Parameter		Test Conditions		IP7905A IP120A–05 Min.	IP7905A IP120A–05 Typ.	IP7905A IP120A–05 Max.	IP7905 , IP120–05 LM120–05 Min.	IP7905 , IP120–05 LM120–05 Typ.	IP7905 , IP120–05 LM120–05 Max.	Units
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} $P_D \le P_{MAX}$	V_{IN} = -7.5V to -20V T_J = -55 to 150°C	-4.85		-5.15	-4.8		-5.2	
V_O	Low Supply	I_O = 5mA to I_{MAX} V_{IN} = -7V to -20V	$P_D \le P_{MAX}$	-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
			V_{IN} = -7.5V to -20V T_J = -55 to 150°C		3	10		3	50	
		V_{IN} = -8V to -12V			1	4		1	25	
		$I_O \le I_{MAX}$	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	$I_O \le 0.5\ I_{MAX}$			1	1.9		1	1.9	mA
		V_{IN} = -10V	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} = -10V	T_J = -55 to 150°C		0.2	0.5		0.2	0.5	
		$I_O \le 0.5\ I_{MAX}$	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
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120Hz V_{IN} = -8V to -18V	$I_O \le I_{MAX}$	66	80		54	80		dB
			$I_O \le 0.5\ I_{MAX}$ 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		$I_O \le I_{MAX}$		-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 ($t_p \le 10$ms, $\delta \le 5\%$). 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

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IP120A SERIES
IP120 SERIES
IP7900A SERIES
IP7900 SERIES
LM120 SERIES

Parameter		Test Conditions		IP7912A IP120A–12 Min.	IP7912A IP120A–12 Typ.	IP7912A IP120A–12 Max.	IP7912 , IP120–12 LM120–12 Min.	IP7912 , IP120–12 LM120–12 Typ.	IP7912 , IP120–12 LM120–12 Max.	Units
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 I_O = 5mA to I_{MAX}	$P_D \le P_{MAX}$ T_J = -55 to 150°C	-11.64		-12.36	-11.52		-12.48	
V_O	Low Supply	I_O = 5mA to I_{MAX} V_{IN} = -14.5V to -27V	$P_D \le P_{MAX}$	-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	
		$I_O \le I_{MAX}$			1	4		1	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	$I_O \le 0.5\ I_{MAX}$			0.2	0.4		0.2	0.4	mA
		V_{IN} = -19V	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} = -19V	T_J = -55 to 150°C		0.2	0.5		0.2	0.5	
		$I_O \le 0.5\ I_{MAX}$	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	$I_O \le I_{MAX}$	58	72		56	72		dB
			$I_O \le 0.5\ I_{MAX}$ 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		$I_O \le I_{MAX}$		-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 ($t_p \le$ 10ms, $\delta \le$ 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

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Parameter		Test Conditions		IP7915A IP120A–15 Min.	IP7915A IP120A–15 Typ.	IP7915A IP120A–15 Max.	IP7915 , IP120–15 LM120–15 Min.	IP7915 , IP120–15 LM120–15 Typ.	IP7915 , IP120–15 LM120–15 Max.	Units
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 I_O = 5mA to I_{MAX}	$P_D \le P_{MAX}$ T_J = -55 to 150°C	-14.55		-15.45	-14.4		-15.6	
V_O	Low Supply	I_O = 5mA to I_{MAX} V_{IN} = -17.5V to -30V	$P_D \le P_{MAX}$	-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	
		$I_O \le I_{MAX}$			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	$I_O \le 0.5\ I_{MAX}$			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	
		$I_O \le 0.5\ I_{MAX}$	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	$I_O \le I_{MAX}$	56	70		54	70		dB
		V_{IN} = -18.5V to -28.5V	$I_O \le 0.5\ I_{MAX}$ 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		$I_O \le I_{MAX}$		-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 ($t_p \le 10$ms, $\delta \le 5\%$). 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

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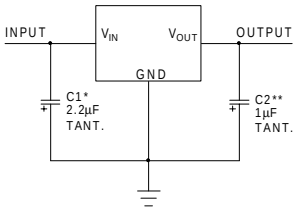
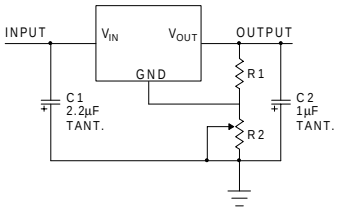
APPLICATIONS INFORMATION



Fixed Output Regulator

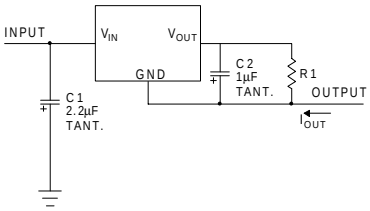
* Required if the regulator is located far from the power supply.

** 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
IP7900A	✔	✔	✔	✔	✔	-55 to +150°C
IP7900	✔	✔	✔	✔	✔	”
IP120A	✔	✔	✔	✔	✔	”
IP120	✔	✔	✔	✔	✔	”
LM120	✔	✔	✔	✔	✔	”

Note:
To order, add the package identifier to the part number.
eg. IP7900AK
IP120SG