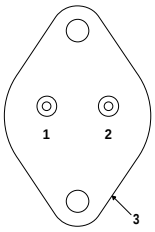
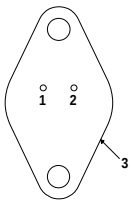
IP120A SERIES
IP120 SERIES
IP7900A SERIES
IP7900 SERIES
LM120 SERIES

1.5 AMP NEGATIVE VOLTAGE REGULATOR



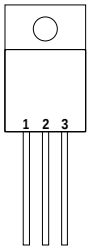
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO–3



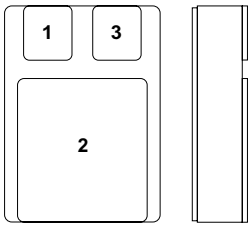
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

R Package – TO–66



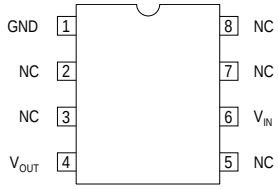
Pin 1 – Ground
Pin 2 – V_{IN}
Pin 3 – V_{OUT}
Case – V_{IN}*

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 -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 (–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 = -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		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 to1.5A		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 ($t_p \le 10$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		IP7915A IP120A–15 Min.	Typ.	Max.	IP7915, IP120–15 LM120–15 Min.	Typ.	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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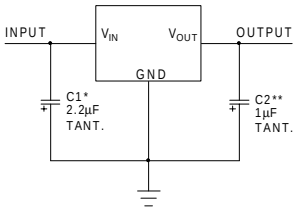
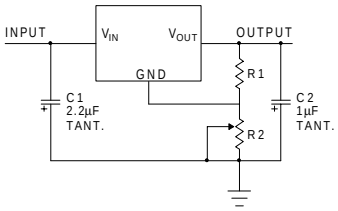
Prelim. 6/01

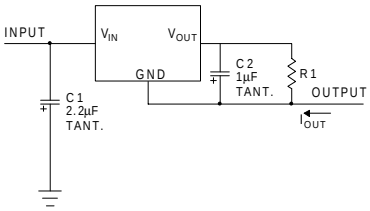
APPLICATIONS INFORMATION



Fixed Output Regulator



Adjustable Output Regulator



Current Regulator

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

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

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

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

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	4	4	4	4	4	-55 to +150°C
IP7900	4	4	4	4	4	”
IP120A	4	4	4	4	4	”
IP120	4	4	4	4	4	”
LM120	4	4	4	4	4	”

Note:
To order, add the package identifier to the part number.
eg. IP7912AK
IP120SMD-15