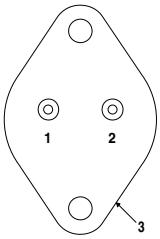
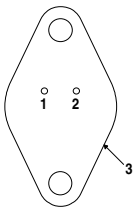
IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

1.5 AMP NEGATIVE VOLTAGE REGULATOR



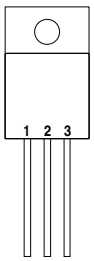
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

K Package – TO–3



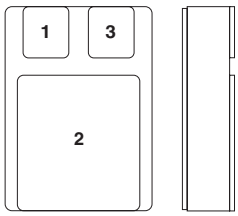
Pin 1 – Ground
Pin 2 – V_{OUT}
Case – V_{IN}

R Package – TO–66



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

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 ±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°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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Issue: 2

IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

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} $P_D \le P_{MAX}$	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	
		$I_O \le I_{MAX}$	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	$I_O \le 0.5\ I_{MAX}$			1.0	1.9		1.0	1.9	mA
		V_{IN} = -10V	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} = -10V	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	$I_O \le I_{MAX}$	58			54			dB
		V_{IN} = -8V to -18V	$I_O \le 0.5\ I_{MAX}$ 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		$I_O \le I_{MAX}$		-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 ($t_p \le$ 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 SMD , P_{MAX} = 20W for all other package devices

I_{MAX} = 1.0A , T_J = 25°C

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IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

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 $P_D \le P_{MAX}$ 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} $P_D \le P_{MAX}$ 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	
		$I_O \le I_{MAX}$			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 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		1.0	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	
		$I_O \le 0.5\ I_{MAX}$	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	$I_O \le I_{MAX}$	58	72		56	72		dB
		V_{IN} = -15V to -25V	$I_O \le 0.5\ I_{MAX}$ 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 = 1.0 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		$I_O \le I_{MAX}$		-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 ($t_p \le$ 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 SMD , P_{MAX} = 20W for all other package devices, I_{MAX} = 1.0A , T_J = 25°C

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IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

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 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	$I_O \le 0.5\ I_{MAX}$			1.0	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}			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 = 1.0 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		$I_O \le I_{MAX}$		-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 ($t_p \le 10$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 SMD , P_{MAX} = 20W for all other package devices, I_{MAX} = 1.0A , T_J = 25°C

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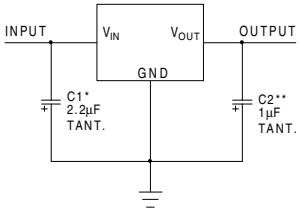
IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

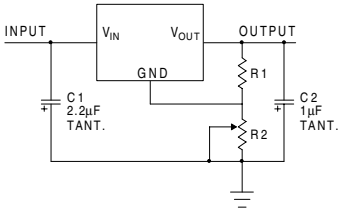
APPLICATIONS INFORMATION



Fixed Output Regulator

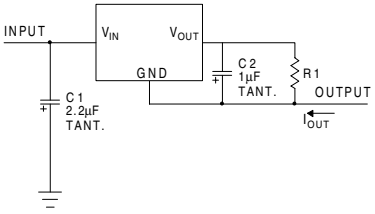
* Required if the regulator is located far from the power supply.

** 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)	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

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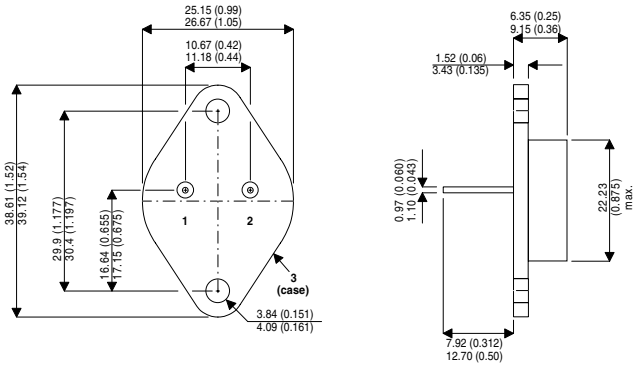
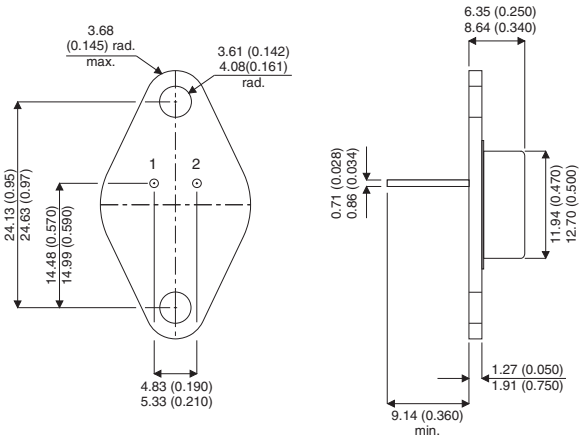
IP120 SERIES
IP7900 SERIES
LM120 SERIES
LM7900 SERIES

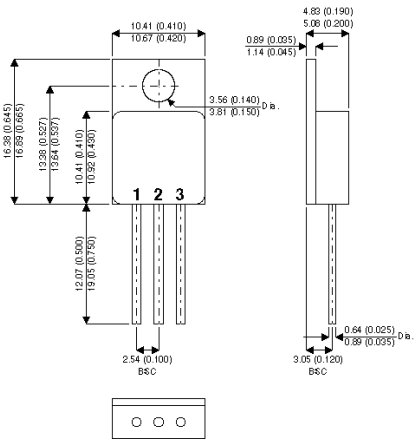
MECHANICAL INFORMATION



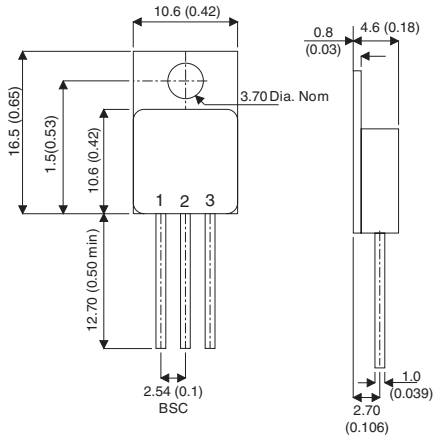
K-Package
(TO-3)



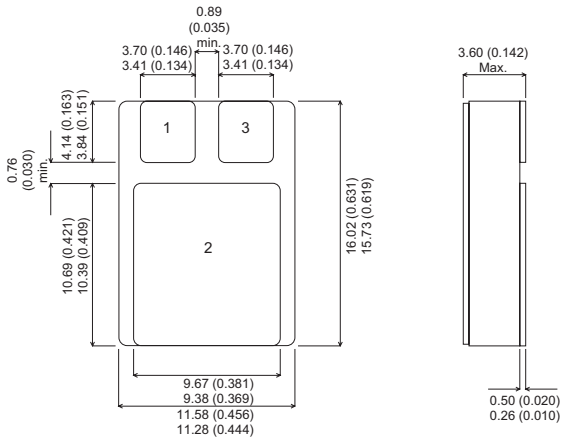
R-Package
(TO-66)



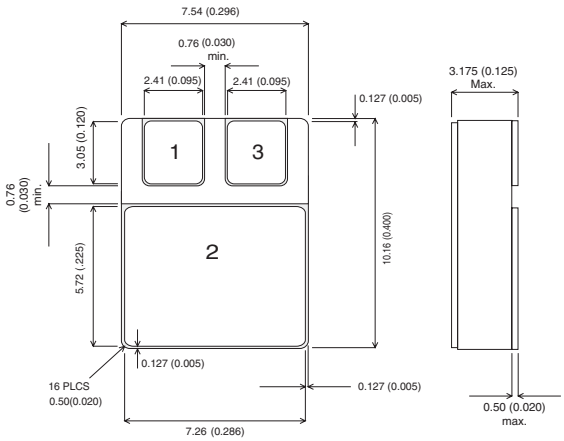
G/IG-Package
(TO-257)



220M-Package
(TO-220)



SMD
(SMD 1)



SMD-05
(SMD 0.5)

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