

Negative-Voltage Regulators



Rev.2. Jan. 2010.

 VSP MIKRON	<h2>79XX</h2>
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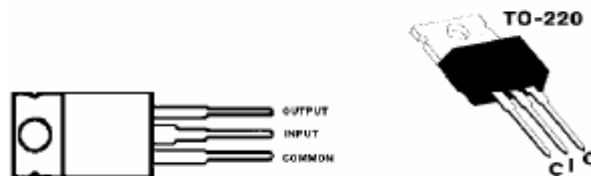
- 3-Terminal Regulators
- Output Current Up to 1.5 A
- No External Components
- Internal Thermal Overload Protection
- High Power Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

DESCRIPTION

This series of fixed-negative voltage monolithic integrated circuit voltage regulators is designed to complement Series μ A7800 in a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5A of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and current and also as the power pass element in precision regulators.

Nominal output voltage	Regulator
-5V	7905
-6V	7906
-8V	7908
-12V	7912
-15V	7915
-18V	7918
-24V	7924

KC PACKAGE (TOP VIEW)



Absolute maximum ratings over operating temperature range (unless otherwise noted)

	79--	UNIT
Input voltage	7924	-40
	All others	-35
Continuous total dissipation at 25 °C free-air temperature	2	W
Continuous total dissipation at (or below) 25 °C case temperature	15	
Operating free-air, case, or virtual junctions temperature range	0 to 150	°C
Storage temperature range	-65 to 150	
Lead temperature 3.2 mm (1/8 inch) from case for 10 seconds	260	

Recommended operating conditions

PARAMETER		MIN	MAX	UNIT
Input voltage V_I	7905	-7	-25	V
	7906	-8	-25	
	7908	-10.5	-25	
	7912	-14.5	-30	
	7915	-17.5	-30	
	7918	-21	-33	
	7924	-27	-38	
Output current, I_O			1.5	A
Operating virtual junction temperature, T_J		0	125	°C

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7905 electrical characteristics at specified virtual junction temperature, $V_I = -10V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7905			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-4.8	-5	-5.2	V
	$I_O = 5mA$ to 1A, $V_I = -7V$ to -20V, $P \leq 15W$	0°C to 125°C	-4.75	-5	-5.25	
Input regulation	$V_I = -7V$ to -25V	25°C		12.5	50	mV
	$V_I = -8V$ to -12V			4	15	
Ripple rejection	$V_I = -8V$ to -18V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		15	100	mV
	$I_O = 250mA$ to 750mA			5	50	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-0.4		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C		125		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -7V$ to -25V	0°C to 125°C		0.15	0.5	
	$I_O = 5mA$ to 1A			0.08	0.5	
Peak output current		25°C		2.1		A

7906 electrical characteristics at specified virtual junction temperature, $V_I = -11V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7906			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-5.75	-6	-6.25	V
	$I_O = 5mA$ to 1A, $V_I = -8V$ to -21V, $P \leq 15W$	0°C to 125°C	-5.7	-6	-6.3	
Input regulation	$V_I = -8V$ to -25V	25°C		12.5	120	mV
	$V_I = -9V$ to -13V			4	60	
Ripple rejection	$V_I = -9V$ to -19V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		15	120	mV
	$I_O = 250mA$ to 750mA			5	60	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-0.4		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C		150		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -8V$ to -25V	0°C to 125°C		0.15	1.3	
	$I_O = 5mA$ to 1A			0.08	0.5	
Peak output current		25°C		2.1		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

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7908 electrical characteristics at specified virtual junction temperature, $V_I = -14V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7908			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-7.7	-8	-8.3	V
	$I_O = 5mA$ to 1A, $V_I = -10.5V$ to -23V, $P \leq 15W$	0°C to 125°C	-7.6	-8	-8.4	
Input regulation	$V_I = -10.5V$ to -25V	25°C		12.5	160	mV
	$V_I = -11V$ to -17V			4	80	
Ripple rejection	$V_I = -11.5V$ to -21.5V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		15	160	mV
	$I_O = 250mA$ to 750mA			5	80	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-0.0		mV/°C
Output noise voltage	$f = 10Hz$ to 100 KHz	25°C		200		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		1.5	2	mA
Bias current change	$V_I = -10.5V$ to -25V	0°C to 125°C		0.15	1	
	$I_O = 5mA$ to 1A			0.08	0.5	
Peak output current		25°C		2.1		A

7912 electrical characteristics at specified virtual junction temperature, $V_I = -19V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7912			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-11.5	-12	-12.5	V
	$I_O = 5mA$ to 1A, $V_I = -14.5V$ to -27V, $P \leq 15W$	0°C to 125°C	-11.4	-12	-12.6	
Input regulation	$V_I = -14.5V$ to -30V	25°C		5	80	mV
	$V_I = -16V$ to -22V			3	30	
Ripple rejection	$V_I = -15V$ to -25V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		15	200	mV
	$I_O = 250mA$ to 750mA			5	75	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-0.8		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C		300		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -14.5V$ to -30V	0°C to 125°C		0.04	0.5	
	$I_O = 5mA$ to 1A			0.06	0.5	
Peak output current		25°C		2.1		A

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7915 electrical characteristics at specified virtual junction temperature, $V_I = -23V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7915			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-14.4	-15	-15.6	V
	$I_O = 5mA$ to 1A, $V_I = -17.5V$ to -30V, $P \leq 15W$	0°C to 125°C	-14.25	-15	-15.75	
Input regulation	$V_I = -17.5V$ to -30V	25°C		5	100	mV
	$V_I = -20V$ to -26V			3	50	
Ripple rejection	$V_I = -18.5V$ to -28.5V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		15	200	mV
	$I_O = 250mA$ to 750mA			5	75	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-1		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C		375		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -17.5V$ to -30V	0°C to 125°C		0.04	0.5	
	$I_O = 5mA$ to 1A			0.06	0.5	
Peak output current		25°C		2.1		A

7918 electrical characteristics at specified virtual junction temperature, $V_I = -27V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7918			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-17.3	-18	-18.7	V
	$I_O = 5mA$ to 1A, $V_I = -21V$ to -33V, $P \leq 15W$	0°C to 125°C	-17.1	-18	-18.9	
Input regulation	$V_I = -21V$ to -33V	25°C		5	360	mV
	$V_I = -24V$ to -30V			3	180	
Ripple rejection	$V_I = -22V$ to -32V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		30	360	mV
	$I_O = 250mA$ to 750mA			10	180	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-1.0		mV/°C
Output noise voltage	$f = 10Hz$ to 100 KHz	25°C		450		µV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -21V$ to -33V	0°C to 125°C		0.04	1	
	$I_O = 5mA$ to 1A			0.06	0.5	
Peak output current		25°C		2.1		A

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7924 electrical characteristics at specified virtual junction temperature, $V_I = -33V$, $I_O = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7924			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-23	-24	-25	V
	$I_O = 5mA$ to 1A, $V_I = -27V$ to -38V, $P \leq 15W$	0°C to 125°C	-22.8	-24	-25.2	
Input regulation	$V_I = -27V$ to -38V	25°C		5	480	mV
	$V_I = -30V$ to -36V			3	240	
Ripple rejection	$V_I = -28V$ to -38V, $f = 120Hz$	0°C to 125°C	54	60		dB
Output regulation	$I_O = 5mA$ to 1.5A	25°C		85	480	mV
	$I_O = 250mA$ to 750mA			25	240	
Temperature coefficient of output voltage	$I_O = 5mA$	0°C to 125°C		-1		mV/°C
Output noise voltage	$f = 10Hz$ to 100 KHz	25°C		600		μV
Dropout voltage	$I_O = 1A$	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	$V_I = -27V$ to -38V	0°C to 125°C		0.04	1	
	$I_O = 5mA$ to 1A				0.06	0.5
Peak output current		25°C		2.1		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

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When using a negative regulator, bypass capacitors are a must on both the input and output. Recommended values are 2 μF on the input and 1 μF on the output. It is considered good practice to include a 0.1 μF capacitor on the output to improve the transient response (Fig. 1). These capacitors may mylar, ceramic, or tantalum, provided that they have good high frequency characteristics.

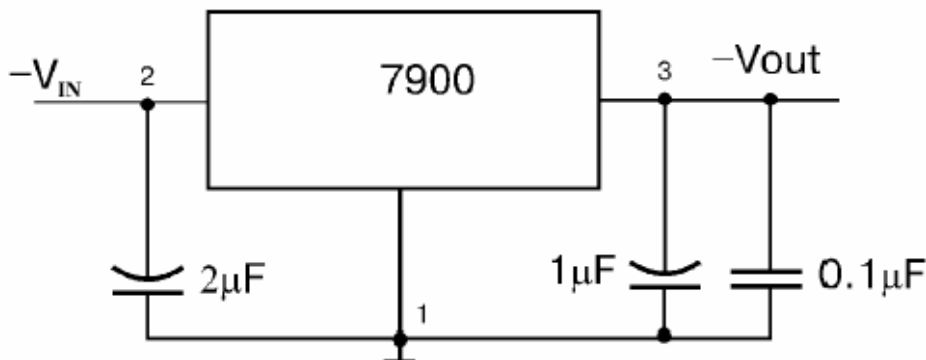


Fig. 1. Negative Regulator

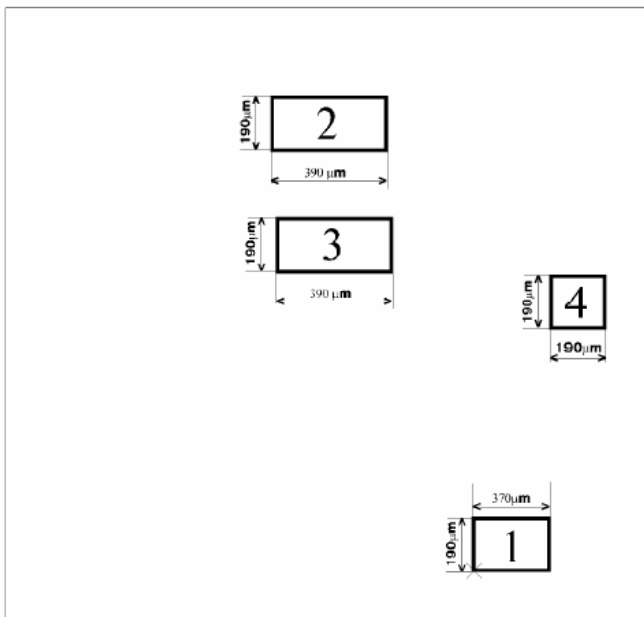
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Pad Location 7900



Chip size 2.0 x 2.0 mm

Wafer size: 100 mm

Wafer Thickness: $460 \pm 30 \mu\text{m}$ (or $350 \pm 30 \mu\text{m}$,
 $280 \pm 30 \mu\text{m}$)

Top metal: AlSi

Backside metal: - (or Ti-Ni (V)-Ag)

Pad Location Coordinates

Pad N	Pad Name	X(μm)	Y(μm)
1	Ground	1715	195
2	Input	920	1805
3	Output	920	1085
4	Output	1795	840