Negative-Voltage Regulators

Rev.1. Jan. 2010.

VSP MIKRON

79XXnd

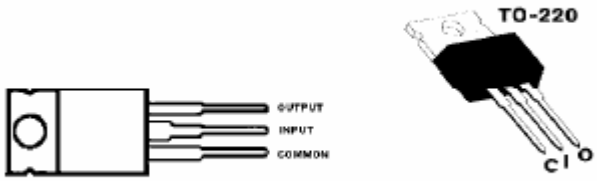
- 3-Terminal Regulators
- Output Current Up to 1.5 A
- No External Components
- Internal Thermal Overload Protection
- High Power Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

DESCRIPTION

This series of fixed-negative voltage monolithic integrated circuit voltage regulators is designed to complement Series μA7800 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 termal 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	7905nd
-6V	7906nd
-8V	7908nd
-9V	7909nd
-12V	7912nd
-15V	7915nd
-18V	7918nd
-20V	7920nd
-24V	7924nd

KC PACKAGE
(TOP VIEW)



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

	7905nd thru 7920nd	7924nd	UNIT
Input voltage	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	^{0}C
Storage temperature range	-65 to 150	-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260	260	

Recommended operating conditions

Parameter		MIN	MAX	UNIT
Input voltage, V_I	7905nd	-7	-25	V
	7906nd	-8	-25	
	7908nd	-10.5	-25	
	7909nd	-11.5	-25	
	7912nd	-14.5	-30	
	7915nd	-17.5	-30	
	7918nd	-21	-33	
	7920nd	-23	-34	
	7924nd	-27	-38	
Output current, Io			1.5	A
Operating virtual junction temperature, T_J		0	125	^{0}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≤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.E		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≤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.E		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 MIN	7908 TYP	7908 MAX	UNIT
Output voltage**		25°C	-7.7	-8	-8.3	V
	I_O= 5mA to 1A, V_I= -10.5V to -23V, P≤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		-0.8		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

7909 electrical characteristics at specified virtual junction temperature, V_I=-15V, I_O=500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7909 MIN	7909 TYP	7909 MAX	UNIT
Output voltage**		25°C	-8.64	-9	-9.36	V
	I_O=5mA to 1A V_I=-11.5V to -25V P≤15W	0 to 125 °C	-8.55	-9	-9.45	
Input regulation	V_I=-11.5V to -25V	25°C		12.5	180	mV
	V_I=-14.5V to -22V			4	90	
Ripple rejection	V_I=-12.5V to -24V, f=120Hz	25°C	54	60		dB
Output regulation	I_O=5mA to 1.5A	25°C		15	180	mV
	I_O=250mA to 750mA			5	90	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100Hz	25°C		225		µV
Dropout voltage	I_O=1A	25°C		1.6		V
Bias current		25°C		1.5	2	mA
Bias current change	V_I=-11.5V to -25V	0 to 125 °C		0.15	1	
	I_O=5mA to 1A			0.08	0.5	
Peak output current		25°C		2.1		A

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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≤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

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≤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

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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≤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

7920 electrical characteristics at specified virtual junction temperature, V_I=-31V, I_O=500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		7920			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-19.2	-20	-20.8	V
	I_O=5mA to 1A V_I=-23V to -34V P≤15W	0 to 125 °C	-19	-20	-21	
Input regulation	V_I=-23V to -34V	25°C		5	400	mV
	V_I=-26V to -31V			3	200	
Ripple rejection	V_I=-24V to -33V, f=120Hz	25°C	54	60		dB
Output regulation	I_O=5mA to 1.5A	25°C		50	400	mV
	I_O=250mA to 750mA			15	120	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100Hz	25°C		500		μV
Dropout voltage	I_O=1A	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	V_I=-23V to -34V	0 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≤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

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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.

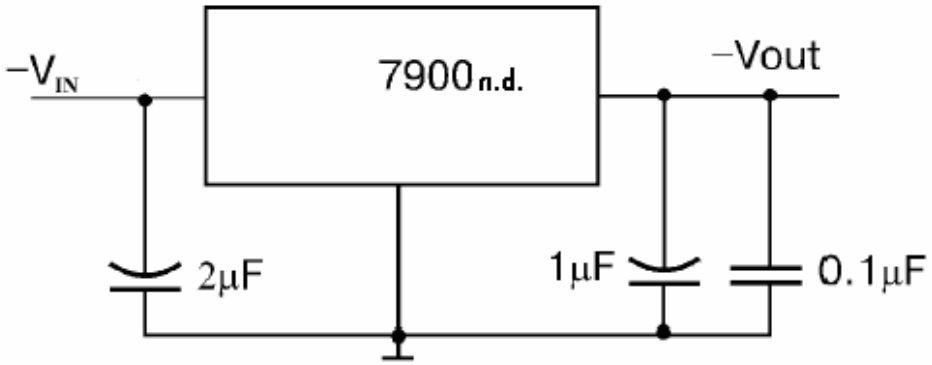

Fig. 1. Negative Regulator

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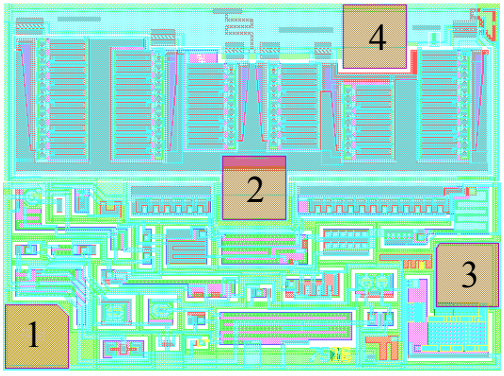
Pad Location 7900 n.d.



Chip size: 2,0 x 1,5 mm

Wafer size: 100 mm
Wafer Thickness: 460±30µm (or 350±30µm, 280±30µm)
Backside metal: - (or Ti-Ni (V)-Ag)
Top metal: AlSi

PAD_LOCATION COORDINATES

Pad №	Function	Pad size, µm	Coordinates , µm	
			X	Y
1	GROUND	240 x 240	185	185
2	OUTPUT	240 x 240	1005	745
3	OUTPUT	240 x 240	1815	415
4	INPUT	240 x 240	1465	1315