Negative-Voltage Regulators

Rev.1. Jul. 2010.

VSP MIKRON

79MXX

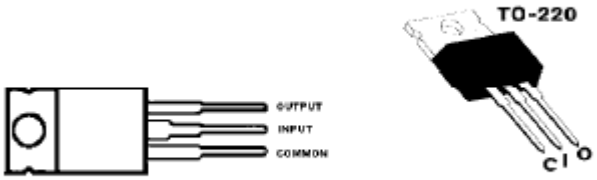
- 3-Terminal Regulators
- Output Current Up to 0.5 A
- No External Components
- Internal Thermal Overload Protection
- High Power Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

DESCRIPTION

This series of fixed-negative voltage monolithic integrated circuit voltage regulators is designed to complement Series µA78M00 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 0.5A 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	79M05
-6V	79M06
-8V	79M08
-9V	79M09
-12V	79M12
-15V	79M15
-18V	79M18
-20V	79M20
-24V	79M24

KC PACKAGE
(TOP VIEW)



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

	79M05 thru 79M20	79M24	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	79M05	-7	-25	V
	79M06	-8	-25	
	79M08	-10.5	-25	
	79M09	-11.5	-25	
	79M12	-14.5	-30	
	79M15	-17.5	-30	
	79M18	-21	-33	
	79M20	-23	-34	
	79M24	-27	-38	
Output current, Io			0.5	A
Operating virtual junction temperature, T_J		0	125	^{0}C

VSP MIKRON | 79MXX

79M05 electrical characteristics at specified virtual junction temperature, V_I=-10V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M05			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-4.8	-5.0	-5.2	V
	I_O=5mA to 350mA V_I=-7V to -20V P≤15W	0 to 125 °C	-4.75	-5.0	-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 to 125 °C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		15	100	mV
	I_O=5mA to 200mA			5	50	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-0.4		mV/°C
Output noise voltage	f=10Hz-100κHz	25°C		125		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		1.5	2.0	mA
Bias current change	V_I=-7V to -25V	0 to 125 °C		0.15	0.5	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.85		A

79M06 electrical characteristics at specified virtual junction temperature, V_I =-11V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M06			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-5.75	-6.0	-6.25	V
	I_O=5mA to 350mA V_I=-8V to -21V P≤15W	0 to 125 °C	-5.7	-6.0	-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 to 125 °C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		15	120	mV
	I_O=5mA to 200mA			5	60	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-0.4		mV/°C
Output noise voltage	f=10Hz-100κHz	25°C		150		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		1.5	2.0	mA
Bias current change	V_I=-8V to -25V	0 to 125 °C		0.15	1.0	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.85		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.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

VSP MIKRON | 79MXX

79M08 electrical characteristics at specified virtual junction temperature, V_I=-14V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M08			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-7.7	-8.0	-8.3	V
	I_O=5mA to 350mA V_I=-10.5V to -23V P≤15W	0 to 125 °C	-7.6	-8.0	-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 to 125 °C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		15	160	mV
	I_O=5mA to 200mA			5	80	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-0.6		mV/°C
Output noise voltage	f=10Hz-100κHz	25°C		200		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		1.5	2.0	mA
Bias current change	V_I=-10.5V to -25V	0 to 125 °C		0.15	1.0	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.85		A

79M09 electrical characteristics at specified virtual junction temperature, V_I=-15V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M09			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-8.64	-9	-9.36	V
	I_O=5mA to 350mA 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 500mA	25°C		15	180	mV
	I_O=5mA to 200mA			5	90	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-0.8		mV/°C
Output noise voltage	f=10Hz-100kHz	25°C		225		μV
Dropout voltage	I_O=350mA	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 350mA			0.08	0.5	
Peak output current		25°C		0.85		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.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

VSP MIKRON	79MXX

79M12 electrical characteristics at specified virtual junction temperature, V_I=-19 V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M12			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-11.5	-12.0	-12.5	V
	I_O=5mA to 350mA V_I=-14.5V to -27V P≤15W	0 to 125 °C	-11.4	-12.0	-12.6	
Input regulation	V_I=-14.5V to -30V	25°C		12.5	240	mV
	V_I=-16V to -22V			4	120	
Ripple rejection	V_I=-15V to -25V, f=120Hz	0 to 125 °C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		15	240	mV
	I_O=5mA to 200mA			5	120	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-0.8		mV/°C
Output noise voltage	f=10Hz-100κHz	25°C		300		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		2.0	3.0	mA
Bias current change	V_I=-14.5V to -30V	0 to 125 °C		0.15	1.0	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.85		A

79M15 electrical characteristics at specified virtual junction temperature, V_I=-23V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M15			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-14.4	-15.0	-15.6	V
	I_O=5mA to 350mA V_I=-17.5V to -30V P≤15W	0 to 125 °C	-14.25	-15.0	-15.75	
Input regulation	V_I=-17.5V to -30V	25°C		12.5	300	mV
	V_I=-20V to -26V			4	150	
Ripple rejection	V_I=-18.5Vto -28.5V, f=120Hz	25°C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		15	300	mV
	I_O=5mA to 200mA			5	150	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100kHz	25°C		375		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		2.0	3.0	mA
Bias current change	V_I=-17.5V to -30V	0 to 125 °C		0.15	1	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.95		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.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings

VSP MIKRON | 79MXX

79M18 electrical characteristics at specified virtual junction temperature, V_I=-27V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M18			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-17.3	-18.0	-18.7	V
	I_O=5mA to 350mA V_I=-21V to -33V P≤15W	0 to 125 °C	-17.1	-18.0	-18.9	
Input regulation	V_I=-21V to -33V	25°C		12.5	360	mV
	V_I=-24V to -30V			4	180	
Ripple rejection	V_I=-22V to -32V, f=120Hz	25°C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		30	360	mV
	I_O=5mA to 200mA			10	180	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100kHz	25°C		450		µV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		2.0	3.0	mA
Bias current change	V_I=-21V to -33V	0 to 125 °C		0.15	1	
	I_O=5mA to 350mA			0.08	0.5	
Peak output current		25°C		0.85		A

79M20 electrical characteristics at specified virtual junction temperature, V_I=-31V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M20			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-19.2	-20	-20.8	V
	I_O=5mA to 350mA 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 500mA	25°C		50	400	mV
	I_O=5mA to 200mA			15	200	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100kHz	25°C		500		µV
Dropout voltage	I_O=350mA	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 350mA			0.06	0.5	
Peak output current		25°C		0.85		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.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

VSP MIKRON	79MXX

79M24 electrical characteristics at specified virtual junction temperature, V_I=-33V, I_O=350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		79M24			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	-23.0	-24.0	-25.0	V
	I_O=5mA to 350mA V_I=-27V to -38V P≤15W	0 to 125 °C	-22.8	-24.0	-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	25°C	54	60		dB
Output regulation	I_O=5mA to 500mA	25°C		75	480	mV
	I_O=5mA to 200mA			20	240	
Temperature coefficient of output voltage	I_O=5mA	0 to 125 °C		-1.0		mV/°C
Output noise voltage	f=10Hz-100kHz	25°C		600		μV
Dropout voltage	I_O=350mA	25°C		1.6		V
Bias current		25°C		2	3	mA
Bias current change	V_I=-27V to -38V	0 to 125 °C		0.04	1	
	I_O=5mA to 350mA			0.06	0.5	
Peak output current		25°C		0.75		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.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings

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.

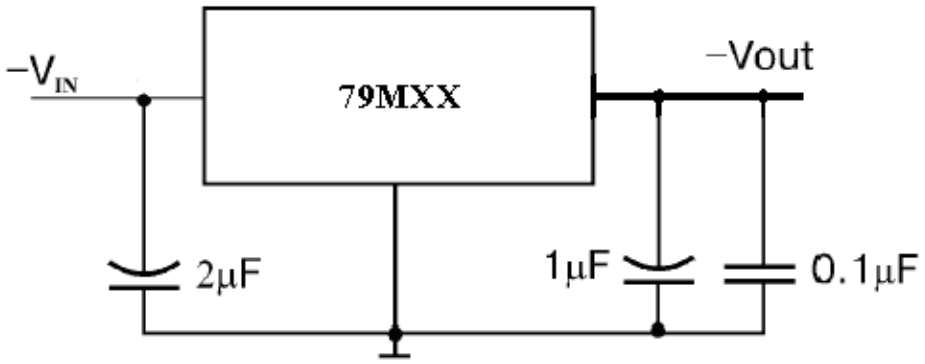
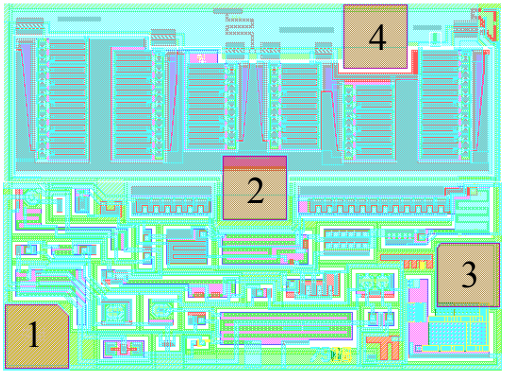


Fig. 1. Negative Regulator

VSP MIKRON	79MXX

Pad location 79MXX



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