

Positive-Voltage Regulators



Rev.1. Jan. 2010.



VSP MIKRON

78MXX

- 3-Terminal Regulators
- Output current up to 500mA
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Output transistor safe operating area protection

Description

The 78MXX series of three terminal regulators are available in the TO-220 package with several fixed output voltages making it useful in a wide range of applications.

Nominal output voltage	Regulator
5V	78M05
6V	78M06
7.5V	78M75
8V	78M08
8.5V	78M85
9V	78M09
10V	78M10
12V	78M12
15V	78M15
18V	78M18
20V	78M20
24V	78M24
27V	78M27

KC PACKAGE (TOP VIEW)



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

	78M05 thru 78M18	78M24 thru 78M27	UNIT
Input voltage	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	°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 condition

PARAMETR		MIN	MAX	UNIT
Input voltage, V_I	78M05	7	25	V
	78M06	8	25	
	78M75	10	25	
	78M08	10.5	25	
	78M85	10.5	25	
	78M09	11.5	27	
	78M10	12.5	28	
	78M12	14.5	30	
	78M15	17.5	30	
	78M18	21	33	
Output current, I_O	78M20	23	36	A
	78M24	27	38	
	78M27	30	40	
Operating virtual junction temperature, T_J		0	125	°C

Positive-Voltage Regulators



VSP MIKRON

78MXX

78M05 electrical characteristics at specified virtual junction temperature, $V_I=10V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M05			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		4.8	5	5.2	V
	$I_O=5mA$ to 350mA	0 to 125 °C	4.75	5	5.25	
Input regulation	$I_O=200mA$	$V_I=7V$ to 25V	25°C		100	mV
		$V_I=8V$ to 25V			50	
Ripple rejection	$V_I=8V$ to 18V, $f=120Hz$		25°C	62	80	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		100	mV
	$I_O=5mA$ to 200mA				50	
Output noise voltage	$f=10Hz-100Hz$		25°C		40	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.6	mA
			125°C		7.5	
Bias current change	$V_I=7V$ to 25V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA				0.5	

78M06 electrical characteristics at specified virtual junction temperature, $V_I=11V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M06			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		5.75	6	6.25	V
	$I_O=5mA$ to 350mA	0 to 125 °C	5.7	6	6.3	
Input regulation	$I_O=200mA$	$V_I=8V$ to 25V	25°C		100	mV
		$V_I=9V$ to 25V			50	
Ripple rejection	$V_I=9V$ to 19V, $f=120Hz$		25°C	62	80	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		120	mV
	$I_O=5mA$ to 200mA				60	
Output noise voltage	$f=10Hz-100Hz$		25°C		45	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.6	mA
			125°C		7.5	
Bias current change	$V_I=8V$ to 25V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA				0.5	

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

78MXX

**78M75 electrical characteristics at specified virtual junction temperature, $V_I=13V$, $I_O=350mA$
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78M75			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	7.2	7.5	7.8	V
	$I_O=5mA$ to 350mA $V_I=10V$ to 22,5V	0 to 125 °C	7.12	7.5	7.88	
Input regulation	$I_O=200mA$	$V_I=10V$ to 25V	25°C		150	mV
		$V_I=10.5V$ to 25V			75	
Ripple rejection	$V_I=11V$ to 21V, $f=120Hz$	25°C	56	74		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			150	mV
	$I_O=5mA$ to 200mA				75	
Output noise voltage	$f=10Hz-100Hz$	25°C		50		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=10V$ to 25V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

**78M08 electrical characteristics at specified virtual junction temperature, $V_I=14V$, $I_O=350mA$
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78M08			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	7.7	8	8.3	V
	$I_O=5mA$ to 350mA $V_I=10.5V$ to 23V	0 to 125 °C	7.6	8	8.4	
Input regulation	$I_O=200mA$	$V_I=10.5V$ to 25V	25°C		150	mV
		$V_I=11V$ to 25V			75	
Ripple rejection	$V_I=11.5V$ to 21.5V, $f=120Hz$	25°C	62	80		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			160	mV
	$I_O=5mA$ to 200mA				80	
Output noise voltage	$f=10Hz-100Hz$	25°C		52		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=10.5V$ to 25V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

78MXX

78M85 electrical characteristics at specified virtual junction temperature, $V_I=15.5V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M85			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	8.16	8.5	8.84	V
	$I_O=5mA$ to 350mA $V_I=10.5V$ to 23V	0 to 125 °C	8.07	8.5	8.93	
Input regulation	$I_O=200mA$	$V_I=10.5V$ to 25V			150	mV
		$V_I=11V$ to 25V			75	
Ripple rejection	$V_I=11.5V$ to 21.5V, $f=120Hz$	25°C	62	80		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			160	mV
	$I_O=5mA$ to 200mA				80	
Output noise voltage	$f=10Hz-100Hz$	25°C		52		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=10.5V$ to 25V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

78M09 electrical characteristics at specified virtual junction temperature, $V_I=16.5V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M09			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	0 to 125 °C	8.55	9	9.45	
Input regulation	$I_O=200mA$	$V_I=11V$ to 27V			150	mV
		$V_I=11.5V$ to 27V			75	
Ripple rejection	$V_I=12V$ to 23.5V, $f=120Hz$	25°C	62	80		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			180	mV
	$I_O=5mA$ to 200mA				90	
Output noise voltage	$f=10Hz-100Hz$	25°C		58		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=11V$ to 27V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

78MXX

78M10 electrical characteristics at specified virtual junction temperature, $V_I=15.5V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M10			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	9.6	10	10.4	V
	$I_O=5mA$ to 350mA $V_I=12.5V$ to 26V	0 to 125 °C	9.5	10	10.5	
Input regulation	$I_O=200mA$	$V_I=12V$ to 28V	25°C		150	mV
		$V_I=12.5V$ to 28V			75	
Ripple rejection	$V_I=13V$ to 23.5V, $f=120Hz$	25°C	62	80		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			200	mV
	$I_O=5mA$ to 200mA				90	
Output noise voltage	$f=10Hz-100Hz$	25°C		62		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=12V$ to 28V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

78M12 electrical characteristics at specified virtual junction temperature, $V_I=19V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M12			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	11.5	12	12.5	V
	$I_O=5mA$ to 350mA $V_I=14.5V$ to 27V	0 to 125 °C	11.4	12	12.6	
Input regulation	$I_O=200mA$	$V_I=14.5V$ to 30V	25°C		150	mV
		$V_I=16V$ to 30V			75	
Ripple rejection	$V_I=15V$ to 25V, $f=120Hz$	25°C	62	80		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			240	mV
	$I_O=5mA$ to 200mA				120	
Output noise voltage	$f=10Hz-100Hz$	25°C		75		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.6	8	mA
		125°C			7.5	
Bias current change	$V_I=14.5V$ to 30V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

78MXX

**78M15 electrical characteristics at specified virtual junction temperature, $V_I=23V$, $I_O=350mA$
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78M15			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		14.4	15	15.6	V
	$I_O=5mA$ to 350mA	0 to 125 °C	14.25	15	15.75	
Input regulation	$I_O=200mA$	$V_I=17.5V$ to 30V	25°C		150	mV
		$V_I=20V$ to 30V				
Ripple rejection	$V_I=18.5V$ to 28.5V, $f=120Hz$		25°C	60	70	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		300	mV
	$I_O=5mA$ to 200mA					
Output noise voltage	$f=10Hz-100Hz$		25°C		100	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.7	mA
			125°C		7.5	
Bias current change	$V_I=17.5V$ to 30V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA					

**78M18 electrical characteristics at specified virtual junction temperature, $V_I=26V$, $I_O=350mA$
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS*		78M18			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		17.3	18	18.7	V
	$I_O=5mA$ to 350mA	0 to 125 °C	17.1	18	18.9	
Input regulation	$I_O=200mA$	$V_I=21.5V$ to 33V	25°C		150	mV
		$V_I=24.5V$ to 33V				
Ripple rejection	$V_I=22.5V$ to 32V, $f=120Hz$		25°C	60	70	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		360	mV
	$I_O=5mA$ to 200mA					
Output noise voltage	$f=10Hz-100Hz$		25°C		100	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.7	mA
			125°C		7.5	
Bias current change	$V_I=21.5V$ to 33V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA					

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

78MXX

78M20 electrical characteristics at specified virtual junction temperature, $V_I=28V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M20			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		19.2	20	20.8	V
	$I_O=5mA$ to 350mA	0 to 125 °C	19	20	21	
Input regulation	$I_O=200mA$	$V_I=23.5V$ to 36V	25°C		150	mV
		$V_I=26.5V$ to 36V			75	
Ripple rejection	$V_I=24.5V$ to 35V, $f=120Hz$		25°C	55	65	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		400	mV
	$I_O=5mA$ to 200mA				200	
Output noise voltage	$f=10Hz-100Hz$		25°C		120	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.7	mA
			125°C		7.5	
Bias current change	$V_I=23.5V$ to 36V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA				0.5	

78M24 electrical characteristics at specified virtual junction temperature, $V_I=31V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M24			UNIT
			MIN	TYP	MAX	
Output voltage**	25°C		23.04	24	24.96	V
	$I_O=5mA$ to 350mA	0 to 125 °C	22.8	24	25.2	
Input regulation	$I_O=200mA$	$V_I=27.5V$ to 38V	25°C		150	mV
		$V_I=30V$ to 38V			75	
Ripple rejection	$V_I=28.5V$ to 37V, $f=120Hz$		25°C	55	65	dB
Output regulation	$I_O=5mA$ to 500mA		25°C		480	mV
	$I_O=5mA$ to 200mA				240	
Output noise voltage	$f=10Hz-100Hz$		25°C		140	µV
Dropout voltage			25°C		2	V
Bias current			25°C		5.7	mA
			125°C		7.5	
Bias current change	$V_I=27.5V$ to 38V		0 to 125 °C		1.0	
	$I_O=5mA$ to 350mA				0.5	

* 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. All characteristics are measured with a 0.33µF capacitor across the input and a 0.1 µF capacitor across the output.

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

Positive-Voltage Regulators



VSP MIKRON

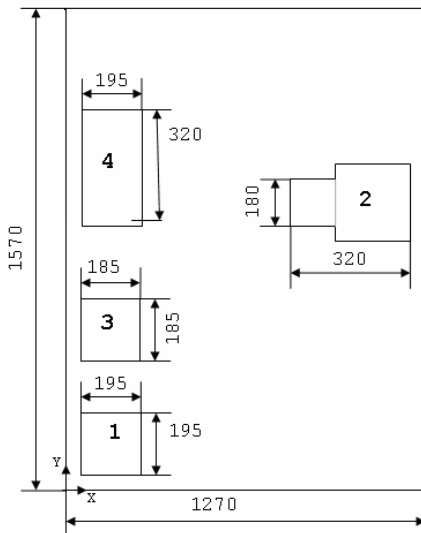
78MXX

78M27 electrical characteristics at specified virtual junction temperature, $V_I=34V$, $I_O=350mA$

(unless otherwise noted)

PARAMETER	TEST CONDITIONS*		78M27			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	25.92	27	28.08	V
	$I_O=5mA$ to 350mA $V_I=30V$ to 40V	0 to 125 °C	25.65	27	28.35	
Input regulation	$I_O=200mA$	$V_I=30.5V$ to 40V			150	mV
		$V_I=34V$ to 40V			75	
Ripple rejection	$V_I=31V$ to 39V, $f=120Hz$	25°C	55	65		dB
Output regulation	$I_O=5mA$ to 500mA	25°C			540	mV
	$I_O=5mA$ to 200mA				270	
Output noise voltage	$f=10Hz-100Hz$	25°C		170		µV
Dropout voltage		25°C		2		V
Bias current		25°C		5.7	8	mA
		125°C			7.5	
Bias current change	$V_I=30.5V$ to 40V	0 to 125 °C			1.0	
	$I_O=5mA$ to 350mA				0.5	

Pad Location



Wafer size: 100 mm
 Wafer Thickness: $460\pm 30\mu m$ (or $350\pm 30\mu m$, $280\pm 30\mu m$)
 Top metal: AlSi
 Backside metal: - (or Ti-Ni (V)-Ag)

Pad Location Coordinates

Pad N	Pad Name	X (µm)	Y (µm)
1	Ground	155	155
2	Input	1185	1030
3	Output	155	565
4	Output	155	1030