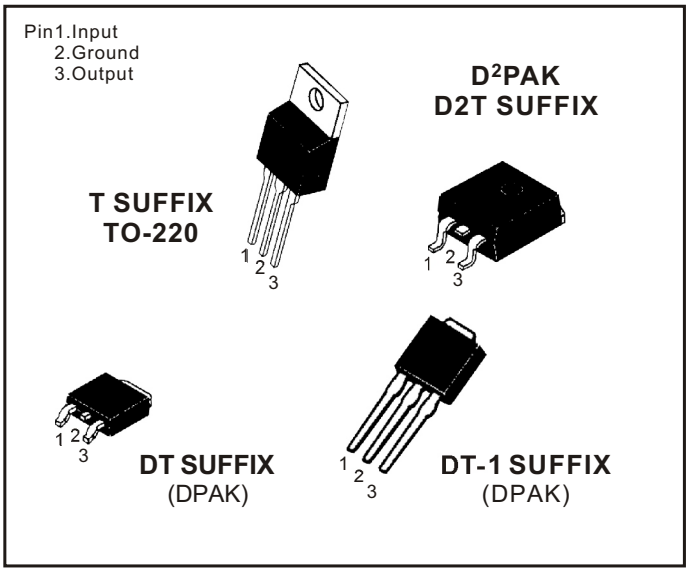
LM78M00Series-Terminal Low Current Positive Voltage Regulators

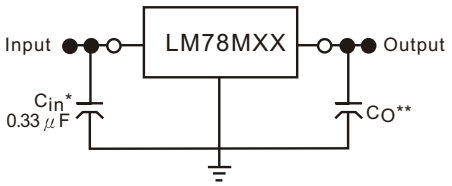
This series of fixed-voltage monolithic integrated-circuit voltage regulators designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 500 mA of output current. The internal current limiting and tamale shutdown features of these regulators make them essentially immune to overload.



FEATURES

- Terminal Regulators.
- Output Current Up to 500mA.
- No External Components.
- Internal Thermal Overload Protection.
- High Power Dissipation Capability.
- Internal Short-Circuit Current Limiting.
- Output Transistor Safe-Area Compensation.

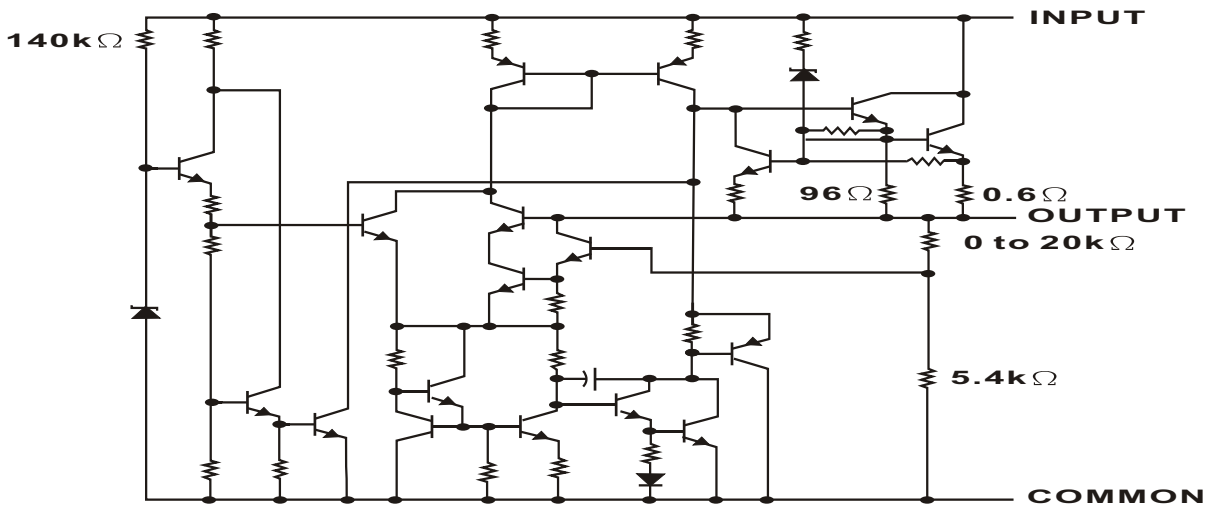
Standard Application



A common ground is required between the input and the output voltages. The input voltage must remain typicaly 2.0V above the output voltage even during the low point on the input ripple voltage.

*C_{in} is required if regulator is located in appreciable distance from power supply filter.
**C_O is not needed for stability; however, it does improve transient response.

Representative Schematic Diagram



ABSOLUTE MAXIMUM RATINGS OVER OPERATING TEMPERATURE RANGE (unless otherwise noted)

Characteristics	LM78M05 THRU LM78M20	LM78M24	UNIT
Input voltage	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	
Storage temperature range	-65 to 150	-65 to 150	C
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	LM78M05	7	25	V
	LM78M06	8	25	
	LM78M08	10.5	25	
	LM78M09	11.5	26	
	LM78M10	12.5	28	
	LM78M12	14.5	30	
	LM78M15	17.5	30	
	LM78M18	20.5	33	
	LM78M20	23	35	
	LM78M24	26.5	39	
Output current, I_O			500	mA
Operating virtual junction temperature, T_J		0	125	C

LM78M05 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=10V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M05			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	4.8	5	5.2	V
	I_O = 5mA to 350mA, VI= 7V to 20V, P≦15W		0℃ to 125℃	4.75	5	5.25	
Input regulation	VI= 7V to 25V, I_O = 200mA		25℃		3	100	mV
	VI= 8V to 25V, I_O = 200mA				1	50	
Ripple rejection	VI= 8V to 18V, f= 120Hz	I_O = 100mA	0℃ to 125℃	62			dB
		I_O = 300mA	25℃	62	80		
Output regulation	I_O = 5mA to 500mA		25℃		15	100	mV
	I_O = 5mA to 200mA				5	50	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		40	200	μV
Dropout voltage			25℃		2.0	2.5	V
Bias current			25℃		4.2	6	mA
Bias current change	VI= 8V to 25V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		300		
Peak output current			25℃		0.7		A

LM78M06 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=11V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M06			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	5.75	6	6.25	V
	I_O = 5mA to 350mA, VI= 8V to 21V, P≦15W		0℃ to 125℃	5.7	6	6.3	
Input regulation	VI= 8V to 25V, I_O = 200mA		25℃		5	100	mV
	VI= 9V to 25V, I_O = 200mA				1.5	50	
Ripple rejection	VI= 9V to 19V, f= 120Hz	I_O = 100mA	0℃ to 125℃	59			dB
		I_O = 300mA	25℃	59	80		
Output regulation	I_O = 5mA to 500mA		25℃		18	120	mV
	I_O = 5mA to 200mA				10	60	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		45		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.3	6	mA
Bias current change	VI= 9V to 25V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		270		
Peak output current			25℃		0.7		A

LM78M08 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=14V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M08			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	7.7	8	8.3	V
	I_O = 5mA to 350mA, VI= 10.5V to 23V, P≦15W		0℃ to 125℃	7.6	8	8.4	
Input regulation	VI= 10.5V to 25V, I_O = 200mA		25℃		6	100	mV
	VI= 11V to 25V, I_O = 200mA				2	50	
Ripple rejection	VI= 11.5V to 21.5V, f= 120Hz	I_O = 100mA	0℃ to 125℃	56			dB
		I_O = 300mA	25℃	56	80		
Output regulation	I_O = 5mA to 500mA		25℃		20	160	mV
	I_O = 5mA to 200mA				10	80	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		52		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.6	6	mA
Bias current change	VI= 10.5V to 25V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		250		
Peak output current			25℃		0.7		A

LM78M09 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=16V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M09			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	8.65	9	9.35	V
	I_O = 5mA to 350mA, VI= 11.5V to 24V, P≦15W		0℃ to 125℃	8.55	9	9.45	
Input regulation	VI= 11.5V to 26V, I_O = 200mA		25℃		6	100	mV
	VI= 12V to 26V, I_O = 200mA				2	50	
Ripple rejection	VI= 13V to 23V,	I_O = 100mA	0℃ to 125℃	56			dB
	f= 120Hz	I_O = 300mA	25℃	56	80		
Output regulation	I_O = 5mA to 500mA		25℃		20	180	mV
	I_O = 5mA to 200mA				10	90	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		60		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.6	6	mA
Bias current change	VI= 11.5V to 26V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		250		
Peak output current			25℃		0.7		A

LM78M10 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=17V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M10			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	9.6	10	10.4	V
	I_O = 5mA to 350mA, VI= 12.5V to 25V, P≦15W		0℃ to 125℃	9.5	10	10.5	
Input regulation	VI= 12.5V to 28V, I_O = 200mA		25℃		7	100	mV
	VI= 14V to 20V, I_O = 200mA				2	50	
Ripple rejection	VI= 13V to 23V,	I_O = 100mA	0℃ to 125℃	59			dB
	f= 120Hz	I_O = 300mA	25℃	55	80		
Output regulation	I_O = 5mA to 500mA		25℃		20	200	mV
	I_O = 5mA to 200mA				10	100	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		70		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.6	6	mA
Bias current change	VI= 12.5V to 28V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		245		
Peak output current			25℃		0.7		A

LM78M12 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=19V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M12			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	11.5	12	12.5	V
	I_O = 5mA to 350mA, VI= 14.5V to 27V, P≦15W		0℃ to 125℃	11.4	12	12.6	
Input regulation	VI= 14.5V to 30V, I_O = 200mA		25℃		10	100	mV
	VI= 16V to 30V, I_O = 200mA				3	50	
Ripple rejection	VI= 15V to 25V,	I_O = 100mA	0℃ to 125℃	55			dB
	f= 120Hz	I_O = 300mA	25℃	55	80		
Output regulation	I_O = 5mA to 500mA		25℃		25	240	mV
	I_O = 5mA to 200mA				10	120	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		75		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.6	6	mA
Bias current change	VI= 14.5V to 30V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		240		
Peak output current			25℃		0.7		A

LM78M15 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=23V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M15			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	14.5	15	15.6	V
	I_O = 5mA to 350mA, VI= 17.5V to 30V, P≦15W		0℃ to 125℃	14.25	15	15.75	
Input regulation	VI= 17.5V to 30V, I_O = 200mA		25℃		12	100	mV
	VI= 20V to 30V, I_O = 200mA				3	50	
Ripple rejection	VI= 18.5V to 28.5V, f= 120Hz	I_O = 100mA	0℃ to 125℃	54			dB
		I_O = 300mA	25℃	54	70		
Output regulation	I_O = 5mA to 500mA		25℃		25	300	mV
	I_O = 5mA to 200mA				10	150	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		90		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.7	6	mA
Bias current change	VI= 17.5V to 30V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		240		
Peak output current			25℃		0.7		A

LM78M18 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=27V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M18			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	17.3	18	18.7	V
	I_O = 5mA to 350mA, VI= 21V to 33V, P≦15W		0℃ to 125℃	17.1	18	18.9	
Input regulation	VI= 21V to 33V, I_O = 200mA		25℃		15	100	mV
	VI= 24V to 33V, I_O = 200mA				5	50	
Ripple rejection	VI= 22V to 32V, f= 120Hz	I_O =100mA	0℃ to 125℃	53			dB
		I_O = 300mA	25℃	53	70		
Output regulation	I_O = 5mA to 500mA		25℃		25	360	mV
	I_O = 5mA to 200mA				10	180	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		110		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.8	6	mA
Bias current change	VI= 21V to 33V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		240		
Peak output current			25℃		0.7		A

LM78M20 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=29V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M20			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	19.2	20	20.8	V
	I_O = 5mA to 350mA, VI= 21V to 35V, P≦15W		0℃ to 125℃	19	20	21	
Input regulation	VI= 23V to 35V, I_O = 200mA		25℃		18	100	mV
	VI= 24V to 35V, I_O = 200mA				7	50	
Ripple rejection	VI= 24V to 34V, f= 120Hz	I_O = 100mA	0℃ to 125℃	53			dB
		I_O = 300mA	25℃	53	70		
Output regulation	I_O = 5mA to 500mA		25℃		25	400	mV
	I_O = 5mA to 200mA				10	200	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.2		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		110		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		4.9	6	mA
Bias current change	VI= 23V to 35V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		240		
Peak output current			25℃		0.7		A

LM78M24 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=33V,I_O =350mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*			LM78M24			UNIT
				MIN	TYP	MAX	
Output voltage**			25℃	23	24	25	V
	I_O = 5mA to 350mA, VI= 27V to 38V, P≦15W		0℃ to 125℃	22.8	24	25.2	
Input regulation	VI= 27V to 38V, I_O = 200mA		25℃		10	100	mV
	VI= 28V to 38V, I_O = 200mA				5	50	
Ripple rejection	VI= 28V to 38V, f= 120Hz	I_O = 100mA	0℃ to 125℃	50			dB
		I_O = 300mA	25℃	50	70		
Output regulation	I_O = 5mA to 500mA		25℃		25	480	mV
	I_O = 5mA to 200mA				10	240	
Temperature coefficient of output voltage	I_O = 5mA		0℃ to 125℃		-1.2		mV/℃
Output noise voltage	f=10Hz to 100KHz		25℃		170		μV
Dropout voltage			25℃		2.0		V
Bias current			25℃		5	6	mA
Bias current change	VI= 27V to 38V, I_O = 200mA		0℃ to 125℃			0.8	
	I_O = 5mA to 350mA					0.5	
Short-circuit output current			25℃		240		
Peak output current			25℃		0.7		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.

*** Pulse testing techniques are used to maintain the junction temperature as colse to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 μF 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.**