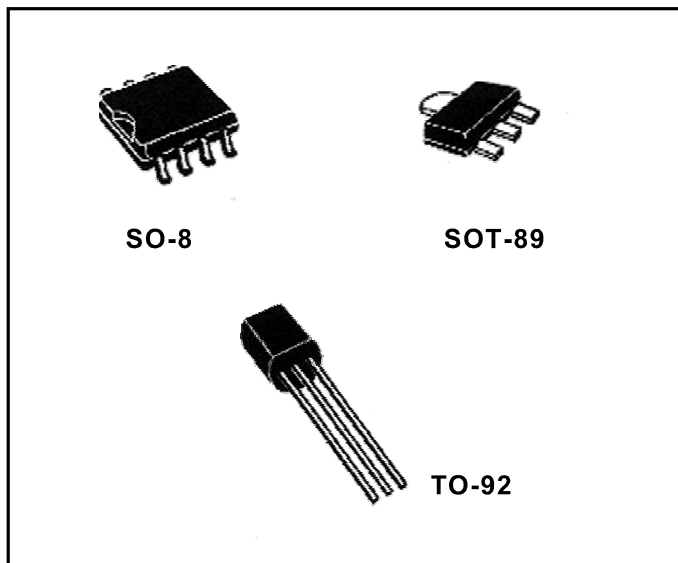


The LM78L00 Series of positive voltage regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100mA. Like their higher powered LM7800 Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the LM78L00 devices in many applications.

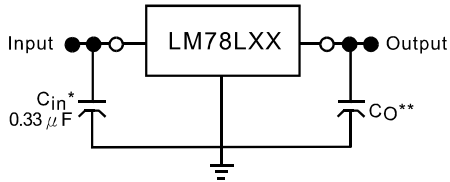
These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.



FEATURES

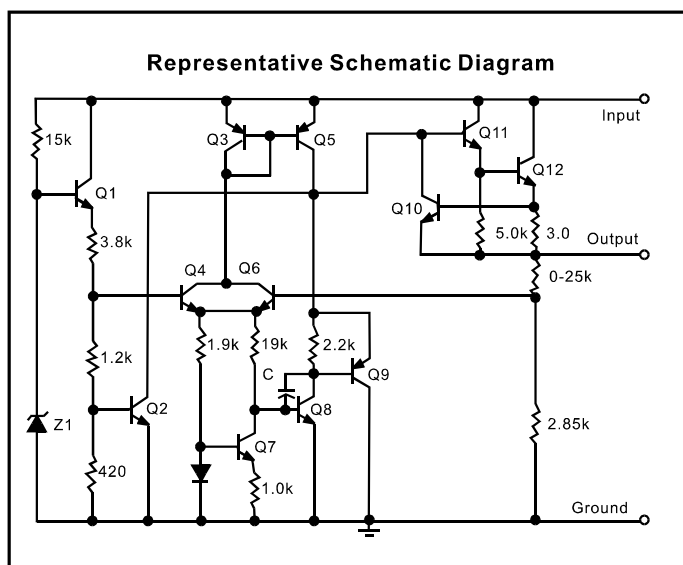
- Wide Range of Available, Fixed Output Voltage.
- Low Cost.
- Internal Short Circuit Current Limiting.
- Internal Thermal Overload Protection.
- No External Components Required.
- Complementary Negative Regulators Offered. (LM79L00 Series)

Standard Application



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

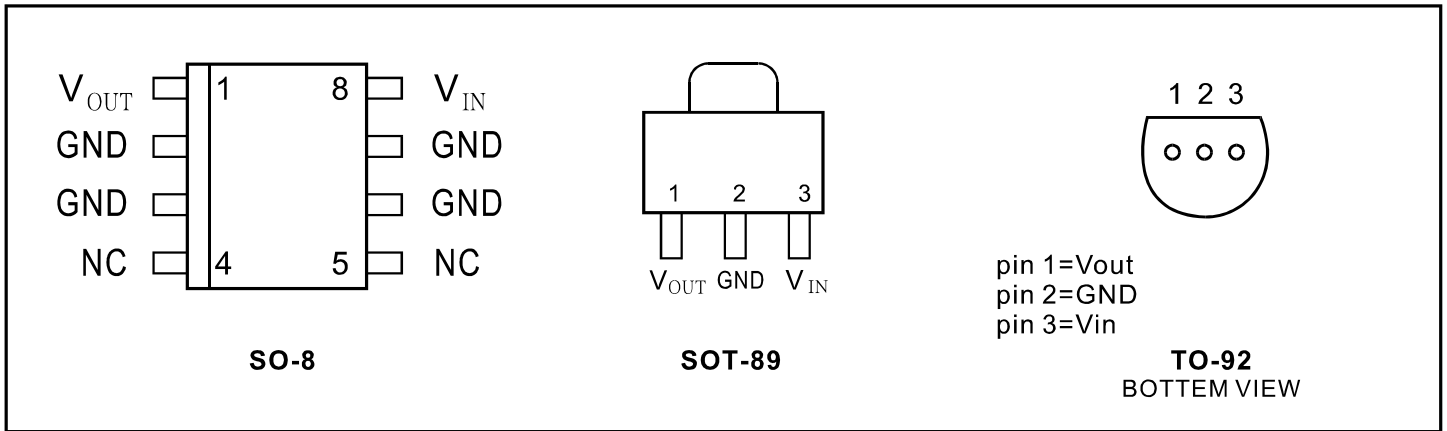
* C_{in} is required if regulator is located in appreciable distance from power supply filter.
 ** C_O is not needed for stability; however, it does improve transient response.



ORDERING INFORMATION

<i>Device</i>	<i>Operating Temperature Range</i>	<i>Package</i>
LM78LxxLP	0° ~ +125 °C	TO-92
LM78LxxD	0° ~ +125 °C	SOP-8
LM78LxxH	0° ~ +125 °C	SOT-89

CONNECTION DIAGRAM (top view)



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

Characteristics	LM78L05 THRU LM78L10	LM78L12 THRU LM78L18	LM78L24	UNIT
Input voltage	30	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	0 to 150	°C
Storage temperature range	-65 to 150	-65 to 150	-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260	260	260	

RECOMMENDED OPERATING CONDITIONS

PARAMETER		MIN	MAX	UNIT
Input voltage, V_I	LM78L05	7	20	V
	LM78L06	8	20	
	LM78L08	10.5	23	
	LM78L09	11.5	24	
	LM78L10	12.5	25	
	LM78L12	14.5	27	
	LM78L15	17.5	30	
	LM78L18	20.5	33	
	LM78L24	26.5	39	
Output current, I_O			100	mA
Operating virtual junction temperature, T_J		0	125	°C

LM78L05 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=10V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L05			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	4.8	5	5.2	V
	$I_O = 1mA$ to 40 mA, $V_I = 7V$ to 20V	0°C to 125°C	4.75	5	5.25	
	$I_O = 1mA$ to 70mA,		4.75	5	5.25	
Input regulation	$V_I = 7V$ to 20V	25°C		32	150	mV
	$V_I = 8V$ to 20V			26	100	
Ripple rejection	$V_I = 8V$ to 18V, $f = 120Hz$	25°C	41	49		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		15	60	mV
	$I_O = 1mA$ to 40mA			8	30	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		42		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.8 ^{2.5} 6 ^{5.0}		mA
		125°C			5.5	
Bias current change	$V_I = 8V$ to 20V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L06 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=11V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L06			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	5.75	6	6.25	V
	$I_O = 1mA$ to 40 mA, $V_I = 8V$ to 20V	0°C to 125°C	5.7	6	6.3	
	$I_O = 1mA$ to 70mA,		7.6	6	6.3	
Input regulation	$V_I = 8V$ to 20V	25°C		35	175	mV
	$V_I = 9V$ to 20V			29	125	
Ripple rejection	$V_I = 9V$ to 19V, $f = 120Hz$	25°C	40	48		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		16	80	mV
	$I_O = 1mA$ to 40mA			9	40	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		46		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		3.9	6	mA
		125°C			5.5	
Bias current change	$V_I = 9V$ to 20V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L08 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=14V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L08			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	7.7	8	8.3	V
	$I_O = 1mA$ to 40 mA, $V_I = 10.5V$ to 23V	0°C to 125°C	7.6	8	8.4	
	$I_O = 1mA$ to 70mA,		7.6	8	8.4	
Input regulation	$V_I = 10.5V$ to 23V	25°C		42	175	mV
	$V_I = 11V$ to 23V			36	125	
Ripple rejection	$V_I = 13V$ to 23V, $f = 120Hz$	0°C to 125°C	37	46		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		18	80	mV
	$I_O = 1mA$ to 40mA			10	40	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		54		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4	6	mA
		125°C			5.5	
Bias current change	$V_I = 11V$ to 13V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L09 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=16V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L09			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	8.6	9	9.4	V
	$I_O = 1mA$ to 40 mA, $V_I = 12V$ to 24V	0°C to 125°C	8.55	9	9.45	
	$I_O = 1mA$ to 70mA,		8.55	9	9.45	
Input regulation	$V_I = 12V$ to 24V	25°C		45	175	mV
	$V_I = 13V$ to 24V			40	125	
Ripple rejection	$V_I = 15V$ to 25V, $f = 120Hz$	0°C to 125°C	38	45		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		19	90	mV
	$I_O = 1mA$ to 40mA			11	40	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		58		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.1	6	mA
		125°C			5.5	
Bias current change	$V_I = 13V$ to 24V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L10 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=17V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L10			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	9.6	10	10.4	V
	$I_O = 1mA$ to 40 mA, $V_I = 13V$ to 25V	0°C to 125°C	9.5	10	10.5	
	$I_O = 1mA$ to 70mA,		9.5	10	10.5	
Input regulation	$V_I = 13V$ to 25V	25°C		51	175	mV
	$V_I = 14V$ to 25V			42	125	
Ripple rejection	$V_I = 15V$ to 25V, $f = 120Hz$	0°C to 125°C	37	44		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		20	90	mV
	$I_O = 1mA$ to 40mA			11	40	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		62		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.2	6	mA
		125°C			5.5	
Bias current change	$V_I = 14V$ to 25V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L12 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=19V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L12			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	11.5	12	12.5	V
	$I_O = 1mA$ to 40 mA, $V_I = 14V$ to 27V	0°C to 125°C	11.4	12	12.6	
	$I_O = 1mA$ to 70mA,		11.4	12	12.6	
Input regulation	$V_I = 14.5V$ to 27V	25°C		55	250	mV
	$V_I = 16V$ to 27V			49	200	
Ripple rejection	$V_I = 15V$ to 25V, $f = 120Hz$	0°C to 125°C	37	42		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		22	100	mV
	$I_O = 1mA$ to 40mA			13	50	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		70		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.3	6.5	mA
		125°C			6	
Bias current change	$V_I = 16V$ to 27V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L15 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=23V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L15			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	14.4	15	15.6	V
	$I_O = 1mA$ to 40 mA, $V_I = 17.5V$ to 30V	0°C to 125°C	14.25	15	15.75	
	$I_O = 1mA$ to 70mA,		14.25	15	15.75	
Input regulation	$V_I = 17.5V$ to 30V	25°C		65	300	mV
	$V_I = 19V$ to 30V			58	250	
Ripple rejection	$V_I = 18.5V$ to 28.5V, $f = 120Hz$	0°C to 125°C	34	39		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		25	150	mV
	$I_O = 1mA$ to 40mA			15	75	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		82		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.6	6.5	mA
		125°C			6	
Bias current change	$V_I = 19V$ to 30V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

Lm78I18 Electrical Characteristics At Specified Virtual Junction Temperature, $V_I=26v, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L18			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	17.3	18	18.7	V
	$I_O = 1mA$ to 40 mA, $V_I = 20.5V$ to 33V	0°C to 125°C	17.1	18	18.9	
	$I_O = 1mA$ to 70mA,		17.1	18	18.9	
Input regulation	$V_I = 20.5V$ to 33V	25°C		70	360	mV
	$V_I = 22V$ to 33V			64	300	
Ripple rejection	$V_I = 21.5V$ to 31.5V, $f = 120Hz$	0°C to 125°C	32	36		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		27	180	mV
	$I_O = 1mA$ to 40mA			19	90	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		89		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.7	6.5	mA
		125°C			6	
Bias current change	$V_I = 22V$ to 33V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

LM78L24 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, $V_I=32V, I_O = 40mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM78L24			UNIT
			MIN	TYP	MAX	
Output voltage**		25°C	23	24	25	V
	$I_O = 1mA$ to 40 mA, $V_I = 26.5V$ to 39V	0°C to 125°C	22.8	24	25.2	
	$I_O = 1mA$ to 70mA,		22.8	24	25.2	
Input regulation	$V_I = 26.5V$ to 39V	25°C		95	480	mV
	$V_I = 29V$ to 39V			78	400	
Ripple rejection	$V_I = 27.5V$ to 37.5V, $f = 120Hz$	0°C to 125°C	30	33		dB
Output regulation	$I_O = 1mA$ to 100mA	25°C		41	240	mV
	$I_O = 1mA$ to 40mA			28	120	
Output noise voltage	$f = 10Hz$ to 100KHz	25°C		97		μV
Dropout voltage		25°C		1.7		V
Bias current		25°C		4.8	6.5	mA
		125°C			6	
Bias current change	$V_I = 28V$ to 39V	0°C to 125°C			1.5	
	$I_O = 1mA$ to 40mA				0.1	

* 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 $0.33 \mu\text{F}$ capacitor across the input and a $0.1 \mu\text{F}$ capacitor across the output.

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

Figure 1. Dropout Characteristics

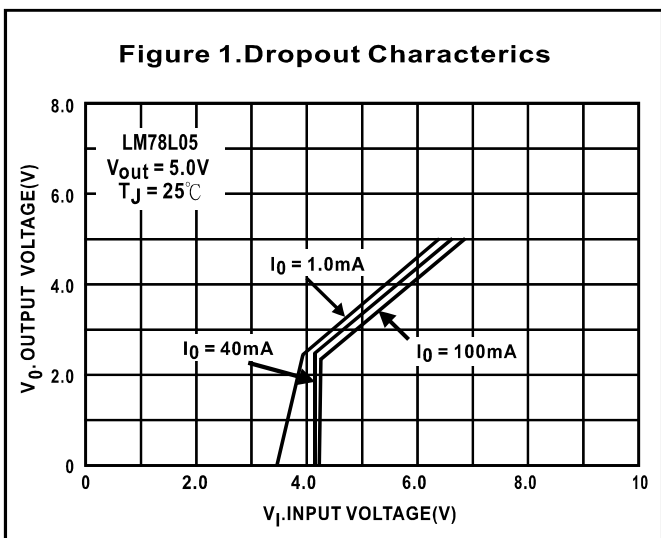


Figure 2. Dropout Voltage versus Junction Temperature

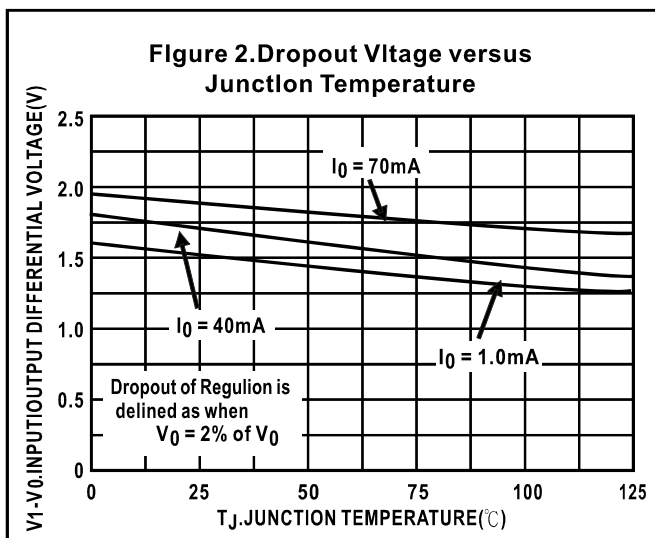


Figure 3. Input Bias Current versus Ambient Temperature

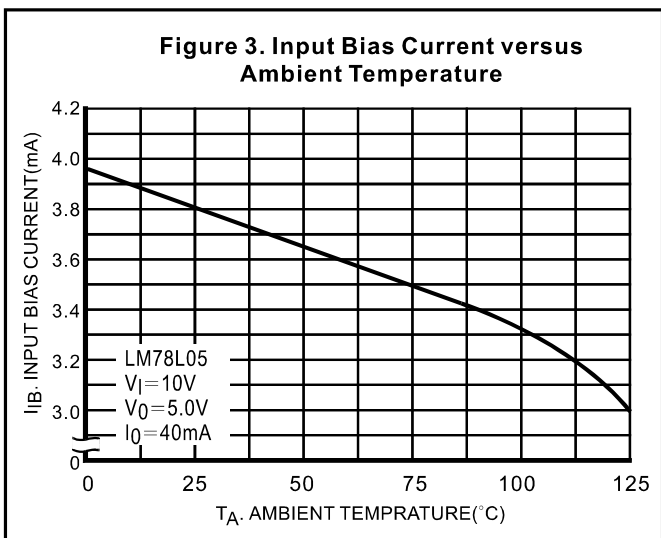


Figure 4. Input Bias Current versus Input Voltage

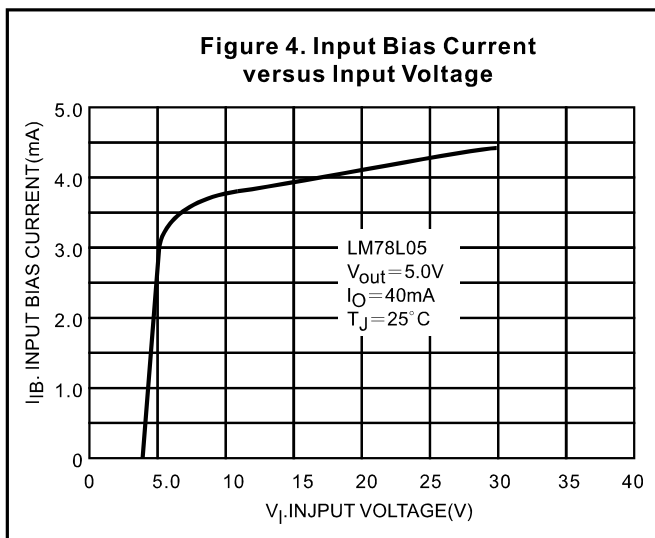


Figure 5. Maximum Average Power Dissipation versus Ambient Temperature-TO-92 Type Package

