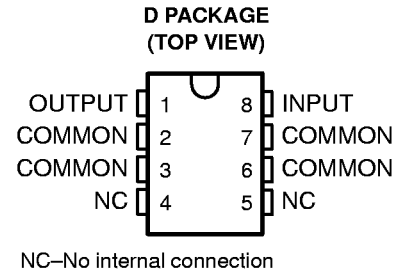


# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

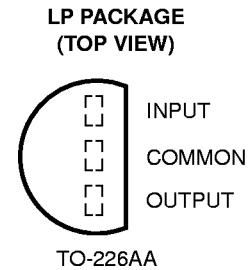
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- 3-Terminal Regulators
- Output Current up to 100 mA
- No External Components
- Internal Thermal-Overload Protection
- Internal Short-Circuit Current Limiting
- Direct Replacements for Fairchild μA78L00 Series



## description

This series of fixed-voltage monolithic integrated-circuit voltage regulators is 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. In addition, they can be used with power-pass elements to make high-current voltage regulators. One of these regulators can deliver up to 100 mA of output current. The internal limiting and thermal-shutdown features of these regulators make them essentially immune to overload. When used as a replacement for a zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower bias current.



### AVAILABLE OPTIONS

T <sub>J</sub>	V <sub>O(NOM)</sub> (V)	PACKAGED DEVICES				CHIP FORM (Y)
		SMALL OUTLINE (D)		PLASTIC CYLINDRICAL (LP)		
		OUTPUT VOLTAGE TOLERANCE				
		5%	10%	5%	10%	
0°C to 125°C	2.6	μA78L02ACD	μA78L02CD	μA78L02ACL	μA78L02CLP	μA78L02Y
	5	μA78L05ACD	μA78L05CD	μA78L05ACL	μA78L05CLP	μA78L05Y
	6.2	μA78L06ACD	μA78L06CD	μA78L06ACL	μA78L06CLP	μA78L06Y
	8	μA78L08ACD	μA78L08CD	μA78L08ACL	μA78L08CLP	μA78L08Y
	9	μA78L09ACD	μA78L09CD	μA78L09ACL	μA78L09CLP	μA78L09Y
	10	μA78L10ACD	μA78L10CD	μA78L10ACL	μA78L10CLP	μA78L10Y
	12	μA78L12ACD	μA78L12CD	μA78L12ACL	μA78L12CLP	μA78L12Y
-40°C to 125°C	5	μA78L05AQD	μA78L05QD	μA78L05QLP	μA78L05QLP	—
	12	μA78L12AQD	μA78L12QD	μA78L12QLP	μA78L12QLP	—

D and LP packages are available taped and reeled. Add R suffix to device type (e.g., μA78L05ACDR).

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



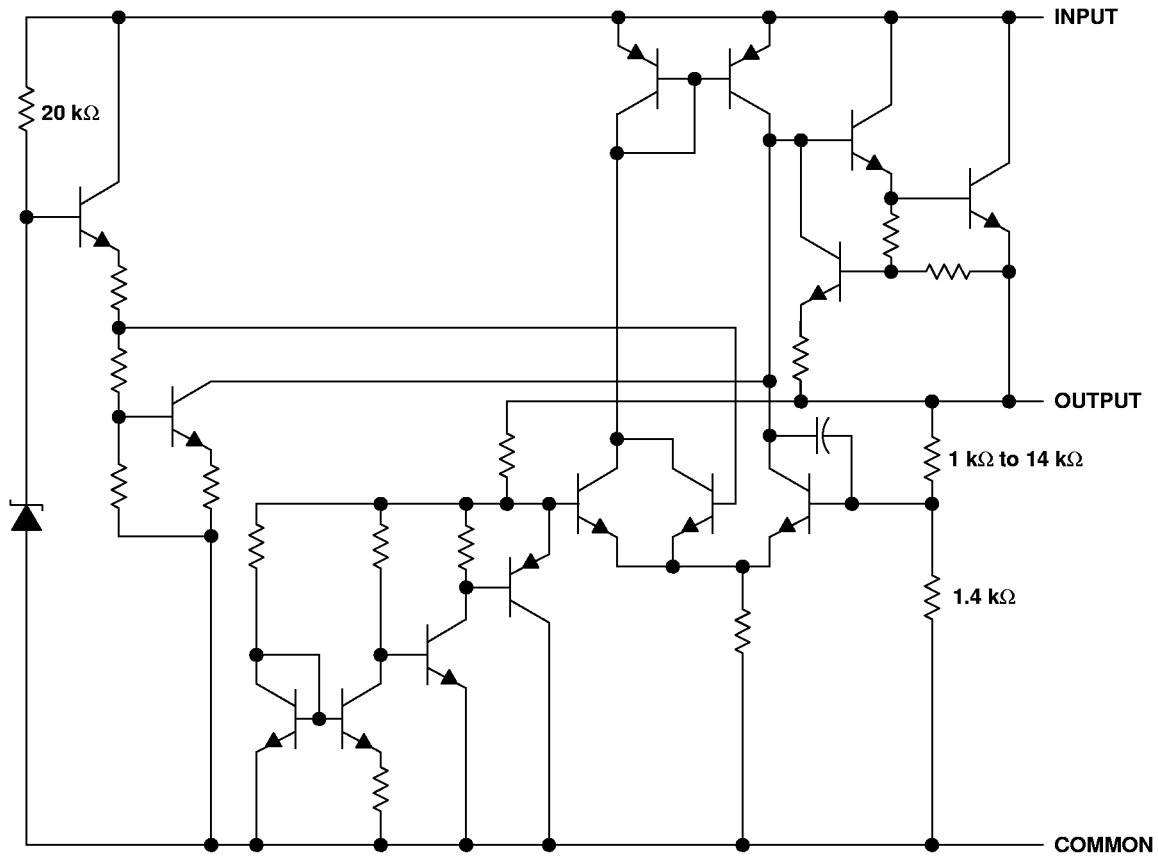
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# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

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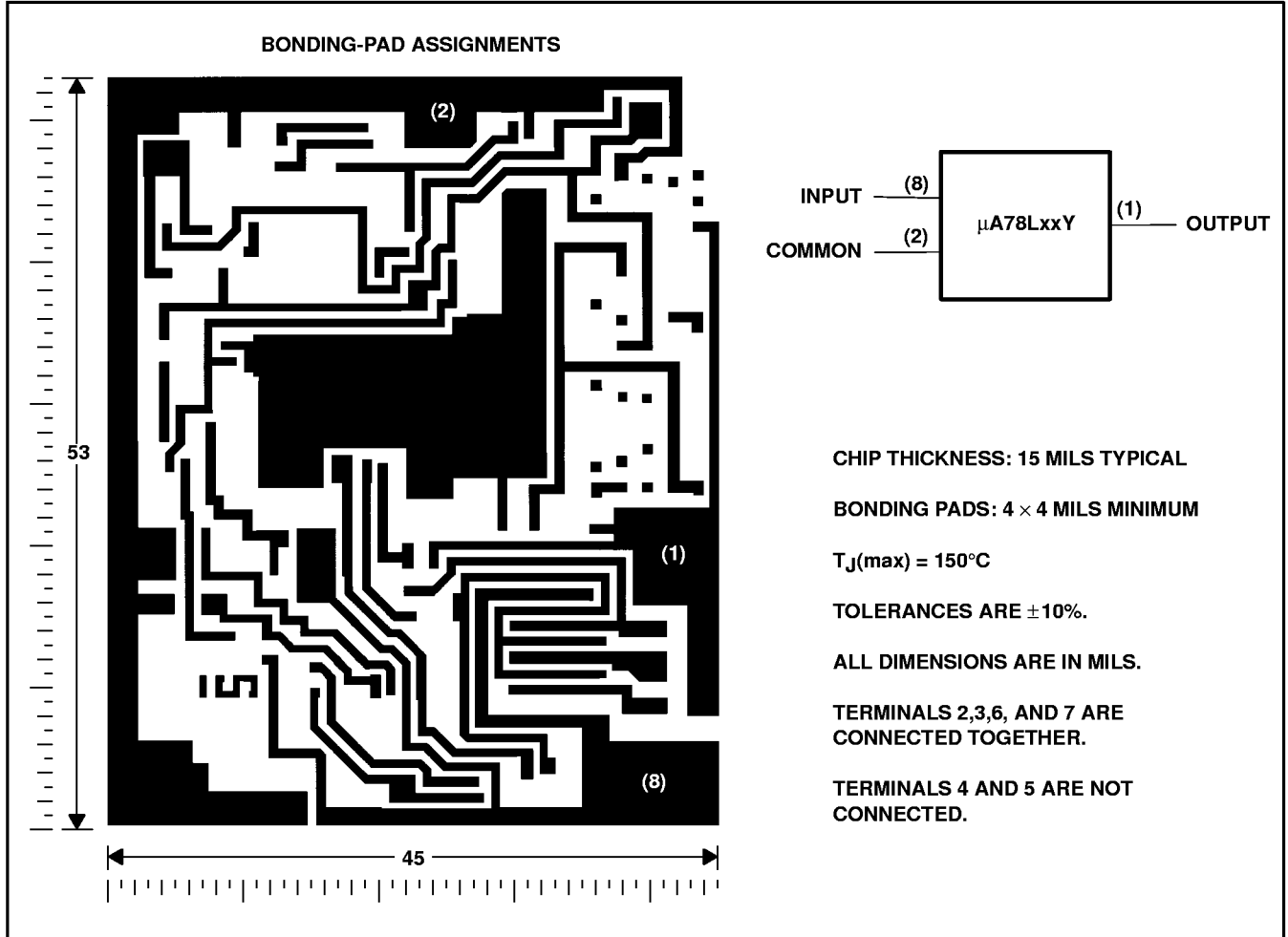
## schematic



NOTE: Resistor values shown are nominal.

**μA78LxxY chip information**

These chips, when properly assembled, have characteristics similar to the μA78LxxY. Thermal compression or ultrasonic bonding can be used on the doped-aluminum bonding pads. The chips can be mounted with conductive epoxy or a gold-silicon preform.



# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

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## μA78LxxC absolute maximum ratings over operating temperature range (unless otherwise noted)

	μA78L02C, μA78L02AC THROUGH μA78L10C, μA78L10AC	μA78L12C, μA78L12AC μA78L15C, μA78L15AC	UNIT
Input voltage	30	35	V
Continuous total power dissipation (see Note 1)	See Dissipation Rating Tables 1 and 2		
Virtual junction temperature range, $T_J$	0 to 150	0 to 150	°C
Storage temperature range, $T_{stg}$	-65 to 150	-65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260	260	°C

NOTE 1: To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

## μA78LxxQ absolute maximum ratings over operating temperature range (unless otherwise noted)

	μA78L05Q, μA78L05AQ	μA78L12Q, μA78L12AQ	UNIT
Input voltage	30	35	V
Continuous total power dissipation (see Note 1)	See Dissipation Rating Tables 1 and 2		
Virtual junction temperature range, $T_J$	-40 to 150	-40 to 150	°C
Storage temperature range, $T_{stg}$	-65 to 150	-65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260	260	°C

NOTE 1: To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

DISSIPATION RATING TABLE 1 – FREE-AIR TEMPERATURE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE $T_A$	$T_A = 70^\circ\text{C}$ POWER RATING
D	725 mW	5.8 mW/°C	25°C	464 mW
LP†	775 mW	6.2 mW/°C	25°C	496 mW

† The LP package dissipation rating is based on thermal resistance  $R_{\theta JA}$  measured in still air with the device mounted in an Augat socket. The bottom of the package is 10 mm (0.375 in) above the socket.

DISSIPATION RATING TABLE 2 – CASE TEMPERATURE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE $T_C$	$T_C = 125^\circ\text{C}$ POWER RATING
D	1600 mW	19.6 mW/°C	65°C	424 mW
LP	1600 mW	28.6 mW/°C	94°C	713 mW



# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

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## recommended operating conditions

		MIN	MAX	UNIT
Input voltage, $V_I$	μA78L02C, μA78L02AC	4.75	20	V
	μA78L05C, μA78L05AC, μA78L05Q, μA78L05AQ	7	20	
	μA78L06C, μA78L06AC	8.5	20	
	μA78L08C, μA78L08AC	10.5	23	
	μA78L09C, μA78L09AC	11.5	24	
	μA78L10C, μA78L10AC	12.5	25	
	μA78L12C, μA78L12AC, μA78L12Q, μA78L12AQ	14.5	27	
	μA78L15C, μA78L15AC	17.5	30	
Output current, $I_O$			100	mA
Operating virtual junction temperature, $T_J$	μA78LxxC through μA78LxxAC	0	125	°C
	μA78LxxQ and μA78LxxAQ	-40	125	



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electrical characteristics at specified virtual junction temperature,  $V_I = 9\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L02C			μA78L02AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	2.4	2.6	2.8	2.5	2.6	2.7	V
	$V_I = 4.75\text{ V to }20\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	2.35		2.85	2.45		2.75	
	$I_O = 1\text{ mA to }70\text{ mA}$		2.35		2.85	2.45		2.75	
Input voltage regulation	$V_I = 4.75\text{ V to }20\text{ V}$	25°C	20		125	20		100	mV
	$V_I = 5\text{ V to }20\text{ V}$		16		100	16		75	
Ripple rejection	$V_I = 6\text{ V to }20\text{ V}$ , $f = 120\text{ Hz}$	25°C	42	51		43	51	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	12		50	12		50	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		6		25	6		25	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	30			30			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	3.6		6	3.6		6	mA
		125°C			5.5			5.5	
Bias current change	$V_I = 5\text{ V to }20\text{ V}$	Full range§			2.5			2.5	mA
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2			0.1	

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L02, μA78L02AC, μA78L05C, and μA78L05AC and -40°C to 125°C for μA78L05Q and μA78L05AQ.

electrical characteristics at specified virtual junction temperature,  $V_I = 10\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L05C, μA78L05Q			μA78L05AC, μA78L05AQ			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	4.6	5	5.4	4.8	5	5.2	V
	$V_I = 7\text{ V to }20\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	4.5		5.5	4.75		5.25	
	$I_O = 1\text{ mA to }70\text{ mA}$		4.5		5.5	4.75		5.25	
Input voltage regulation	$V_I = 7\text{ V to }20\text{ V}$	25°C	32		200	32		150	mV
	$V_I = 8\text{ V to }20\text{ V}$		26		150	26		100	
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$ , $f = 120\text{ Hz}$	25°C	40	49		41	49	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	15		60	15		60	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		8		30	8		30	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	42			42			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	3.8		6	3.8		6	mA
		125°C			5.5			5.5	
Bias current change	$V_I = 8\text{ V to }20\text{ V}$	Full range§			1.5			1.5	mA
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2			0.1	

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L02, μA78L02AC, μA78L05C, and μA78L05AC and -40°C to 125°C for μA78L05Q and μA78L05AQ.



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**electrical characteristics at specified virtual junction temperature,  $V_I = 12\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L06C			μA78L06AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	5.7	6.2	6.7	5.95	6.2	6.45	V
	$V_I = 8.5\text{ V to }20\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	5.6		6.8	5.9		6.5	
	$I_O = 1\text{ mA to }70\text{ mA}$		5.6		6.8	5.9		6.5	
Input voltage regulation	$V_I = 8.5\text{ V to }20\text{ V}$	25°C		35	200		35	175	mV
	$V_I = 9\text{ V to }20\text{ V}$			29	150		29	125	
Ripple rejection	$V_I = 10\text{ V to }20\text{ V}$ , $f = 120\text{ Hz}$	25°C	39	48		40	48		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C		16	80		16	80	mV
	$I_O = 1\text{ mA to }40\text{ mA}$			9	40		9	40	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		46			46		μV
Dropout voltage		25°C		1.7			1.7		V
Bias current		25°C		3.9	6		3.9	6	mA
		125°C			5.5			5.5	
Bias current change	$V_I = 9\text{ V to }20\text{ V}$	Full range§			1.5			1.5	mA
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2			0.1	

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L06C, μA78L06AC, μA78L08C, and μA78L08AC.

**electrical characteristics at specified virtual junction temperature,  $V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L08C			μA78L08AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	7.36	8	8.64	7.7	8	8.3	V
	$V_I = 10.5\text{ V to }23\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	7.2		8.8	7.6		8.4	
	$I_O = 1\text{ mA to }70\text{ mA}$		7.2		8.8	7.6		8.4	
Input voltage regulation	$V_I = 10.5\text{ V to }23\text{ V}$	25°C		42	200		42	175	mV
	$V_I = 11\text{ V to }23\text{ V}$			36	150		36	125	
Ripple rejection	$V_I = 13\text{ V to }23\text{ V}$ , $f = 120\text{ Hz}$	25°C	36	46		37	46		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C		18	80		18	80	mV
	$I_O = 1\text{ mA to }40\text{ mA}$			10	40		10	40	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		54			54		μV
Dropout voltage		25°C		1.7			1.7		V
Bias current		25°C		4	6		4	6	mA
		125°C			5.5			5.5	
Bias current change	$V_I = 5\text{ V to }20\text{ V}$	Full range§			1.5			1.5	mA
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2			0.1	

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L06C, μA78L06AC, μA78L08C, and μA78L08AC.



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electrical characteristics at specified virtual junction temperature,  $V_I = 16\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L09C			μA78L09AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage ‡		25°C	8.3	9	9.7	8.6	9	9.4	V
	$V_I = 12\text{ V to }24\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	8.1		9.9	8.55		9.45	
	$I_O = 1\text{ mA to }70\text{ mA}$		8.1		9.9	8.55		9.45	
Input voltage regulation	$V_I = 12\text{ V to }24\text{ V}$	25°C	45		225	45		175	mV
	$V_I = 13\text{ V to }24\text{ V}$		40		175	40		125	
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$	25°C	36	45		38	45	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	19		90	19		90	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		11		40	11		40	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	58			58			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	4.1		6	4.1		6	mA
		125°C			5.5	5.5			
Bias current change	$V_I = 13\text{ V to }24\text{ V}$	Full range§			1.5	1.5		mA	
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2	0.1			

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L09C, μA78L09AC, μA78L10C, and μA78L10AC.

electrical characteristics at specified virtual junction temperature,  $V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L10C			μA78L10AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage ‡		25°C	9.2	10	10.8	9.6	10	10.4	V
	$V_I = 13\text{ V to }25\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	9		11	9.5		10.5	
	$I_O = 1\text{ mA to }70\text{ mA}$		9		11	9.5		10.5	
Input voltage regulation	$V_I = 13\text{ V to }25\text{ V}$	25°C	51		225	51		175	mV
	$V_I = 14\text{ V to }25\text{ V}$		42		175	42		125	
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$	25°C	36	44		37	44	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	20		90	20		90	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		11		40	11		40	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	62			62			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	4.2		6	4.2		6	mA
		125°C			5.5	5.5			
Bias current change	$V_I = 14\text{ V to }25\text{ V}$	Full range§			1.5	1.5		mA	
	$I_O = 1\text{ mA to }40\text{ mA}$				0.2	0.1			

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L09C, μA78L09AC, μA78L10C, and μA78L10AC.





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**electrical characteristics at specified virtual junction temperature,  $V_I = 19\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L12C, μA78L12Q			μA78L12AC, μA78L12AQ			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	11.1	12	12.9	11.5	12	12.5	V
	$V_I = 14\text{ V to }27\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	10.8		13.2	11.4		12.6	
	$I_O = 1\text{ mA to }70\text{ mA}$		10.8		13.2	11.4		12.6	
Input voltage regulation	$V_I = 14.5\text{ V to }27\text{ V}$	25°C	55		250	55		250	mV
	$V_I = 16\text{ V to }27\text{ V}$		49		200	49		200	
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$	25°C	36	42		37	42	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	22		100	22		100	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		13		50	13		50	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	70			70			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	4.3		6.5	4.3		6.5	mA
		125°C	6			6			
Bias current change	$V_I = 16\text{ V to }27\text{ V}$	Full range§	1.5			1.5			mA
	$I_O = 1\text{ mA to }40\text{ mA}$		0.2			0.1			

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L12C, μA78L12AC, μA78L15C, and μA78L15AC and -40°C to 125°C for μA78L12Q and μA78L12AQ.

**electrical characteristics at specified virtual junction temperature,  $V_I = 23\text{ V}$ ,  $I_O = 40\text{ mA}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	$T_J$ †	μA78L15C			μA78L15AC			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	13.8	15	16.2	14.4	15	15.6	V
	$V_I = 17.5\text{ V to }30\text{ V}$ , $I_O = 1\text{ mA to }40\text{ mA}$	Full range§	13.5		16.5	14.25		15.75	
	$I_O = 1\text{ mA to }70\text{ mA}$		13.5		16.5	14.25		15.75	
Input voltage regulation	$V_I = 17.5\text{ V to }30\text{ V}$	25°C	65		300	65		300	mV
	$V_I = 20\text{ V to }30\text{ V}$		58		250	58		250	
Ripple rejection	$V_I = 18.5\text{ V to }28.5\text{ V}$ , $f = 120\text{ Hz}$	25°C	33	39		34	39	dB	
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$	25°C	25		150	25		150	mV
	$I_O = 1\text{ mA to }40\text{ mA}$		15		75	15		75	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	82			82			μV
Dropout voltage		25°C	1.7			1.7			V
Bias current		25°C	4.6		6.5	4.6		6.5	mA
		125°C	6			6			
Bias current change	$V_I = 10\text{ V to }30\text{ V}$	Full range§	1.5			1.5			mA
	$I_O = 1\text{ mA to }40\text{ mA}$		0.2			0.1			

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

§ Full range virtual junction temperature is 0°C to 125°C for μA78L12C, μA78L12AC, μA78L15C, and μA78L15AC.



# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

SLVS010F – JANUARY 1976 – REVISED NOVEMBER 1998

## electrical characteristics at specified virtual junction temperature, $V_I = 9\text{ V}$ , $I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	μA78L02Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			2.6		V
Input voltage regulation	$V_I = 4.75\text{ V to }20\text{ V}$		20		mV
	$V_I = 5\text{ V to }20\text{ V}$		16		
Ripple rejection	$V_I = 6\text{ V to }20\text{ V}$ , $f = 120\text{ Hz}$		51		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		12		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		6		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		30		μV
Dropout voltage			1.7		V
Bias current			3.6		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

## electrical characteristics at specified virtual junction temperature, $V_I = 10\text{ V}$ , $I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	μA78L05Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			5		V
Input voltage regulation	$V_I = 7\text{ V to }20\text{ V}$		32		mV
	$V_I = 8\text{ V to }20\text{ V}$		26		
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$ , $f = 120\text{ Hz}$		49		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		15		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		8		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		42		μV
Dropout voltage			1.7		V
Bias current			3.8		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

## electrical characteristics at specified virtual junction temperature, $V_I = 12\text{ V}$ , $I_O = 40\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	μA78L06Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			6.2		V
Input voltage regulation	$V_I = 8.5\text{ V to }20\text{ V}$		35		mV
	$V_I = 9\text{ V to }20\text{ V}$		29		
Ripple rejection	$V_I = 10\text{ V to }20\text{ V}$ , $f = 120\text{ Hz}$		48		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		16		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		9		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		46		μV
Dropout voltage			1.7		V
Bias current			3.9		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.



# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

SLVS010F – JANUARY 1976 – REVISED NOVEMBER 1998

**electrical characteristics at specified virtual junction temperature,  $V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $T_J = 25^\circ\text{C}$   
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS†	μA78L08Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			8		V
Input voltage regulation	$V_I = 10.5\text{ V to }23\text{ V}$		42		mV
	$V_I = 11\text{ V to }23\text{ V}$		36		
Ripple rejection	$V_I = 13\text{ V to }23\text{ V}$ , $f = 120\text{ Hz}$		46		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		18		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		10		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		54		μV
Dropout voltage			1.7		V
Bias current			4		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

**electrical characteristics at specified virtual junction temperature,  $V_I = 16\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $T_J = 25^\circ\text{C}$   
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS†	μA78L09Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			9		V
Input voltage regulation	$V_I = 12\text{ V to }24\text{ V}$		45		mV
	$V_I = 13\text{ V to }24\text{ V}$		40		
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$		45		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		19		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		11		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		58		μV
Dropout voltage			1.7		V
Bias current			4.1		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

**electrical characteristics at specified virtual junction temperature,  $V_I = 14\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $T_J = 25^\circ\text{C}$   
(unless otherwise noted)**

PARAMETER	TEST CONDITIONS†	μA78L10Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			10		V
Input voltage regulation	$V_I = 13\text{ V to }25\text{ V}$		51		mV
	$V_I = 14\text{ V to }25\text{ V}$		42		
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$		44		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		20		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		11		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		62		μV
Dropout voltage			1.7		V
Bias current			4.2		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.



# μA78L00 SERIES POSITIVE-VOLTAGE REGULATORS

SLVS010F – JANUARY 1976 – REVISED NOVEMBER 1998

**electrical characteristics at specified virtual junction temperature,  $V_I = 19\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $T_J = 25^\circ\text{C}$  (unless otherwise noted)**

PARAMETER	TEST CONDITIONS†	μA78L12Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			12		V
Input voltage regulation	$V_I = 14.5\text{ V to }27\text{ V}$		55		mV
	$V_I = 16\text{ V to }27\text{ V}$		49		
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$ , $f = 120\text{ Hz}$		42		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		22		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		13		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		70		μV
Dropout voltage			1.7		V
Bias current			4.3		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

**electrical characteristics at specified virtual junction temperature,  $V_I = 23\text{ V}$ ,  $I_O = 40\text{ mA}$ ,  $T_J = 25^\circ\text{C}$  (unless otherwise noted)**

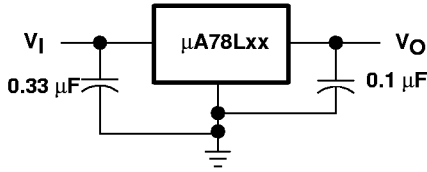
PARAMETER	TEST CONDITIONS†	μA78L15Y			UNIT
		MIN	TYP	MAX	
Output voltage‡			15		V
Input voltage regulation	$V_I = 17.5\text{ V to }30\text{ V}$		65		mV
	$V_I = 20\text{ V to }30\text{ V}$		58		
Ripple rejection	$V_I = 18.5\text{ V to }28.5\text{ V}$ , $f = 120\text{ Hz}$		39		dB
Output voltage regulation	$I_O = 1\text{ mA to }100\text{ mA}$		25		mV
	$I_O = 1\text{ mA to }40\text{ mA}$		15		
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		82		μV
Dropout voltage			1.7		V
Bias current			4.6		mA

† Pulse-testing techniques maintain  $T_J$  as close to  $T_A$  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.

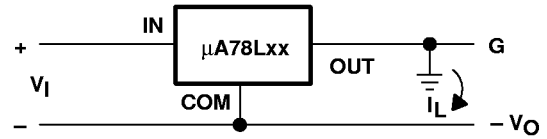
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.



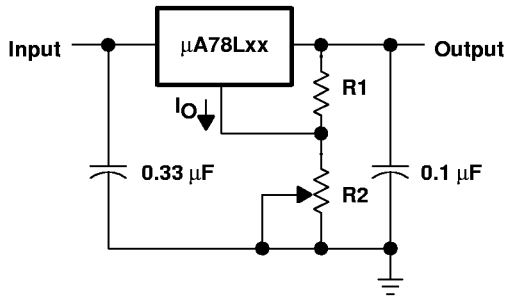
**APPLICATION INFORMATION**



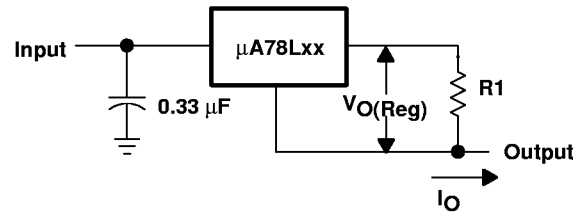
**Figure 1. Fixed Output Regulator**



**Figure 2. Positive Regulator in Negative Configuration (V<sub>1</sub> Must Float)**

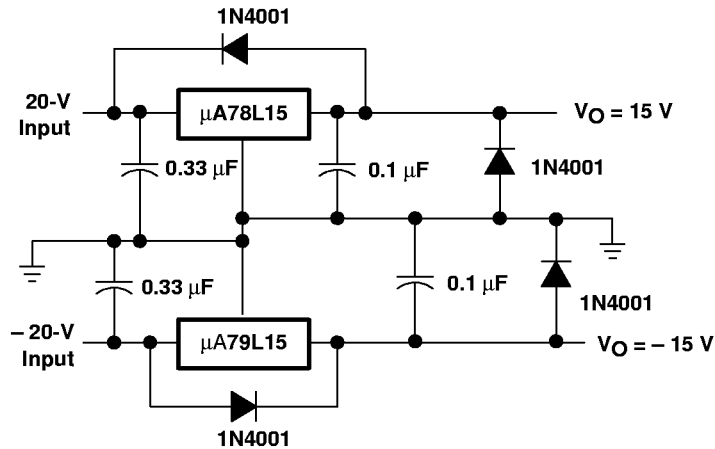


**Figure 3. Adjustable Output Regulator**



$$I_O = (V_O/R_1) + I_O \text{ Bias Current}$$

**Figure 4. Current Regulator**



**Figure 5. Regulated Dual Supply**

## APPLICATION INFORMATION

### operation with a load common to a voltage of opposite polarity

In many cases, a regulator powers a load that is not connected to ground but, instead, is connected to a voltage source of opposite polarity (e.g., operational amplifiers, level-shifting circuits, etc.). In these cases, a clamp diode should be connected to the regulator output as shown in Figure 6. This protects the regulator from output polarity reversals during startup and short-circuit operation.

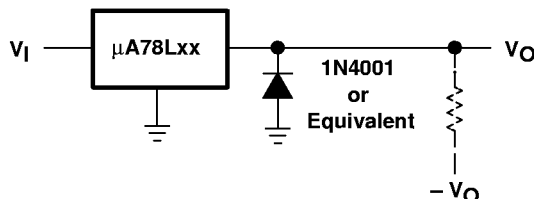


Figure 6. Output Polarity-Reversal Protection Circuit

### reverse-bias protection

Occasionally, the possibility exists that the input voltage to the regulator can collapse faster than the output voltage. This could occur, for example, when the input supply is crowbarred during an output overvoltage condition. If the output voltage is greater than approximately 7 V, the emitter-base junction of the series-pass element (internal or external) could break down and be damaged. To prevent this, a diode shunt can be employed as shown in Figure 7.

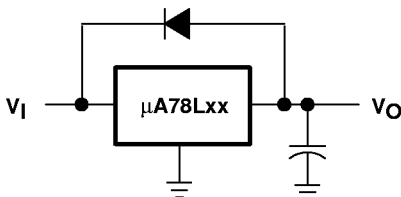


Figure 7. Reverse-Bias Protection Circuit