T-58-11-13

SERIES uA78L00 POSITIVE-VOLTAGE REGULATORS

D2203, JANUARY 1976—REVISED FEBRUARY 1988

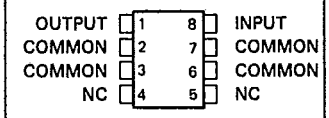
- 3-Terminal Regulators
- Output Current Up to 100 mA
- No External Components
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Direct Replacement for Fairchild μA78L00 Series

NOMINAL OUTPUT VOLTAGE	5% OUTPUT VOLTAGE TOLERANCE	10% OUTPUT VOLTAGE TOLERANCE
2.6 V	uA78L02AC	uA78L02C
5 V	uA78L05AC	uA78L05C
6.2 V	UA78L06AC	uA78L06C
8 V	uA78L08AC	uA78L08C
9 V	uA78L09AC	uA78L09C
10 V	uA78L10AC	uA78L10C
12 V	uA78L12AC	uA78L12C
15 V	uA78L15AC	uA78L15C

2 Data Sheets

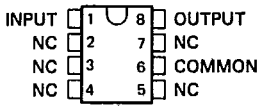
D
"SMALL OUTLINE" PACKAGE

(TOP VIEW)



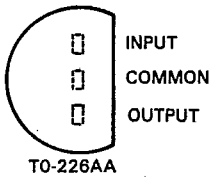
JG
DUAL-IN-LINE PACKAGE

(TOP VIEW)



LP
SILECT PACKAGE

(TOP VIEW)



TO-226AA

OCI

NC—No internal connection

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.

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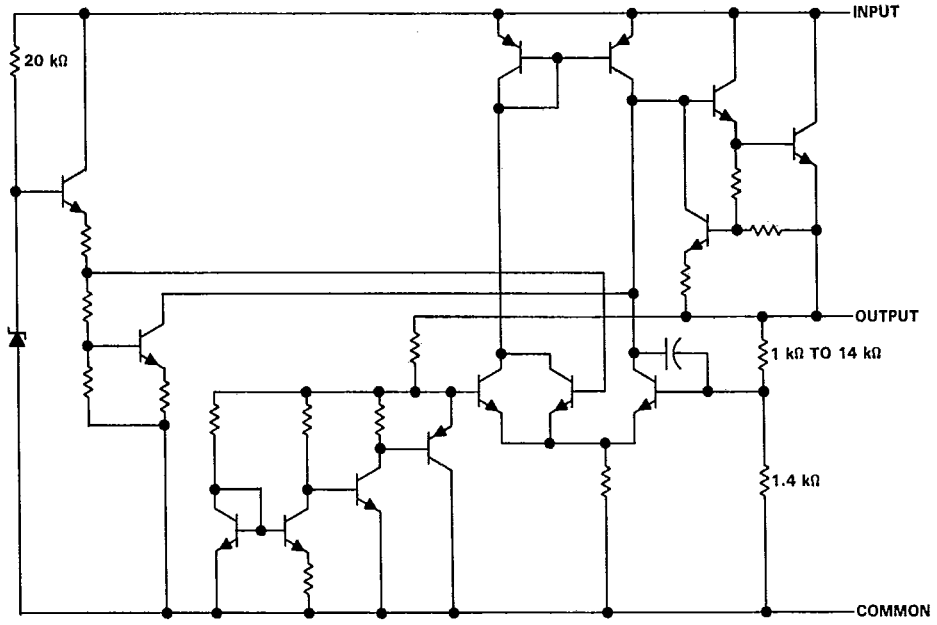
schematic



Resistor values shown are nominal.

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

	uA78L02AC, uA78L02C THRU uA78L10AC, uA78L10C	uA78L12AC, uA78L12C uA78L15AC, uA78L15C	UNIT
Input voltage	30	35	V
Continuous total dissipation (see Note 1)	See Dissipation Rating Tables 1 and 2		
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	°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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70°C$ POWER RATING
D	825 mW	5.8 mW/°C	25°C	464 mW
JG	825 mW	6.6 mW/°C	25°C	528 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 was 10 mm (0.375 in) above the socket.

DISSIPATION RATING TABLE 2 — CASE TEMPERATURE

PACKAGE	$T_C \le 25°C$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_C	$T_C = 125°C$ POWER RATING
D	1600 mW	19.6 mW/°C	65°C	490 mW
JG	1600 mW	17.2 mW/°C	57°C	430 mW
LP	1600 mW	28.6 mW/°C	94°C	715 mW

recommended operating conditions

		MIN	MAX	UNIT
Input voltage, V_I	uA78L02C, uA78L02AC	4.75	20	V
	uA78L05C, uA78L05AC	7	20	
	uA78L06C, uA78L06AC	8.5	20	
	uA78L08C, uA78L08AC	10.5	23	
	uA78L09C, uA78L09AC	11.5	24	
	uA78L10C, uA78L10AC	12.5	25	
	uA78L12C, uA78L12AC	14.5	27	
	uA78L15C, uA78L15AC	17.5	30	
Output current, I_O			100	mA
Operating virtual junction temperature, T_J		0	125	°C

uA78L02AC, uA78L02C electrical characteristics at specified virtual junction temperature, V_I = 9 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L02AC			uA78L02C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	2.5	2.6	2.7	2.4	2.6	2.8	V
	V_I = 4.75 V to 20 V, I_O = 1 mA to 40 mA	0°C to	2.45		2.75	2.35		2.85	
	I_O = 1 mA to 70 mA	125°C	2.45		2.75	2.35		2.85	
Input regulation	V_I = 4.75 V to 20 V	25°C		20	100		20	125	mV
	V_I = 5 V to 20 V			16	75		16	100	
Ripple rejection	V_I = 6 V to 16 V, f = 120 Hz	25°C	43	51		42	51		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		12	50		12	50	mV
	I_O = 1 mA to 40 mA			6	25		6	25	
Output noise voltage	f = 10 Hz to 100 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 V to 20 V	0°C to			2.5			2.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

uA78L05AC, uA78L05C electrical characteristics at specified virtual junction temperature, V_I = 10 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L05AC			uA78L05C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	4.8	5	5.2	4.6	5	5.4	V
	V_I = 7 V to 20 V, I_O = 1 mA to 40 mA	0°C to	4.75		5.25	4.5		5.5	
	I_O = 1 mA to 70 mA	125°C	4.75		5.25	4.5		5.5	
Input regulation	V_I = 7 V to 20 V	25°C		32	150		32	200	mV
	V_I = 8 V to 20 V			26	100		26	150	
Ripple rejection	V_I = 8 V to 18 V, f = 120 Hz	25°C	41	49		40	49		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		15	60		15	60	mV
	I_O = 1 mA to 40 mA			8	30		8	30	
Output noise voltage	f = 10 Hz to 100 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 V to 20 V	0°C to			1.5			1.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

†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-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.

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uA78L06AC, uA78L06C electrical characteristics at specified virtual junction temperature, V_I = 12 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L06AC			uA78L06C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	5.95	6.2	6.45	5.7	6.2	6.7	V
	V_I = 8.5 V to 20 V, I_O = 1 mA to 40 mA	0°C to 125°C	5.9		6.5	5.6		6.8	
	I_O = 1 mA to 70 mA		5.9		6.5	5.6		6.8	
Input regulation	V_I = 8.5 V to 20 V	25°C		35	175		35	200	mV
	V_I = 9 V to 20 V			29	125		29	150	
Ripple rejection	V_I = 10 V to 20 V, f = 120 Hz	25°C	40	48		39	48		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		16	80		16	80	mV
	I_O = 1 mA to 40 mA			9	40		9	40	
Output noise voltage	f = 10 Hz to 100 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 V to 20 V	0°C to 125°C			1.5			1.5	mA
	I_O = 1 mA to 40 mA				0.1			0.2	

uA78L08AC, uA78L08C electrical characteristics at specified virtual junction temperature, V_I = 14 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L08AC			uA78L08C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	7.7	8	8.3	7.36	8	8.64	V
	V_I = 10.5 V to 23 V, I_O = 1 mA to 40 mA	0°C to 125°C	7.6		8.4	7.2		8.8	
	I_O = 1 mA to 70 mA		7.6		8.4	7.2		8.8	
Input regulation	V_I = 10.5 V to 23 V	25°C		42	175		42	200	mV
	V_I = 11 V to 23 V			36	125		36	150	
Ripple rejection	V_I = 13 V to 23 V, f = 120 Hz	25°C	37	46		36	46		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		18	80		18	80	mV
	I_O = 1 mA to 40 mA			10	40		10	40	
Output noise voltage	f = 10 Hz to 100 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 = 11 V to 23 V	0°C to 125°C			1.5			1.5	mA
	I_O = 1 mA to 40 mA				0.1			0.2	

†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-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.

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uA78L09AC, uA78L09C electrical characteristics at specified virtual junction temperature, V_I = 16 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L09AC			uA78L09C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	8.6	9	9.4	8.3	9	9.7	V
	V_I = 12 V to 24 V, I_O = 1 mA to 40 mA	0°C to	8.55		9.45	8.1		9.9	
	I_O = 1 mA to 70 mA	125°C	8.55		9.45	8.1		9.9	
Input regulation	V_I = 12 V to 24 V	25°C		45	175		45	225	mV
	V_I = 13 V to 24 V			40	125		40	175	
Ripple rejection	V_I = 15 V to 25 V, f = 120 Hz	25°C	38	45		36	45		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		19	90		19	90	mV
	I_O = 1 mA to 40 mA			11	40		11	40	
Output noise voltage	f = 10 Hz to 100 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 V to 24 V	0°C to			1.5			1.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

uA78L10AC, uA78L10C electrical characteristics at specified virtual junction temperature, V_I = 17 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L10AC			uA78L10C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	9.6	10	10.4	9.2	10	10.8	V'
	V_I = 13 V to 25 V, I_O = 1 mA to 40 mA	0°C to	9.5		10.6	9		11	
	I_O = 1 mA to 70 mA	125°C	9.5		10.5	9		11	
Input regulation	V_I = 13 V to 25 V	25°C		51	175		51	225	mV
	V_I = 14 V to 25 V			42	125		42	175	
Ripple rejection	V_I = 15 V to 25 V, f = 120 Hz	25°C	37	44		36	44		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		20	90		20	90	mV
	I_O = 1 mA to 40 mA			11	40		11	40	
Output noise voltage	f = 10 Hz to 100 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 V to 25 V	0°C to			1.5			1.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

†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-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.

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uA78L12AC, uA78L12C electrical characteristics at specified virtual junction temperature, V_I = 19 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L12AC			uA78L12C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	11.5	12	12.5	11.1	12	12.9	V
	V_I = 14 V to 27 V, I_O = 1 mA to 40 mA	0°C to	11.4		12.6	10.8		13.2	
	I_O = 1 mA to 70 mA	125°C	11.4		12.6	10.8		13.2	
Input regulation	V_I = 14.5 V to 27 V	25°C		55	250		55	250	mV
	V_I = 16 V to 27 V			49	200		49	200	
Ripple rejection	V_I = 15 V to 25 V, f = 120 Hz	25°C	37	42		36	42		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		22	100		22	100	mV
	I_O = 1 mA to 40 mA			13	50		13	50	
Output noise voltage	f = 10 Hz to 100 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 V to 27 V	0°C to			1.5			1.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

uA78L15AC, uA78L15C electrical characteristics at specified virtual junction temperature, V_I = 23 V, I_O = 40 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		uA78L15AC			uA78L15C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Output voltage‡		25°C	14.4	15	15.6	13.8	15	16.2	V
	V_I = 17.5 V to 30 V, I_O = 1 mA to 40 mA	0°C to	14.25		15.75	13.5		16.5	
	I_O = 1 mA to 70 mA	125°C	14.25		15.75	13.5		16.5	
Input regulation	V_I = 17.5 V to 30 V	25°C		65	300		65	300	mV
	V_I = 20 V to 30 V			58	250		58	250	
Ripple rejection	V_I = 18.5 V to 28.5 V, f = 120 Hz	25°C	34	39		33	39		dB
Output regulation	I_O = 1 mA to 100 mA	25°C		25	150		25	150	mV
	I_O = 1 mA to 40 mA			15	75		15	75	
Output noise voltage	f = 10 Hz to 100 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 V to 30 V	0°C to			1.5			1.5	mA
	I_O = 1 mA to 40 mA	125°C			0.1			0.2	

†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-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.