

μ A7800 SERIES POSITIVE-VOLTAGE REGULATORS

SLVS056E – MAY 1976 – REVISED JULY 1999

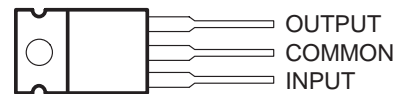
- 3-Terminal Regulators
- Output Current up to 1.5 A
- Internal Thermal-Overload Protection
- High Power-Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Direct Replacements for Fairchild μ A7800 Series

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. Each of these regulators can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators.

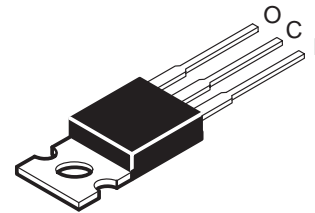
The μ A7800C series is characterized for operation over the virtual junction temperature range of 0°C to 125°C.

KC PACKAGE
(TOP VIEW)

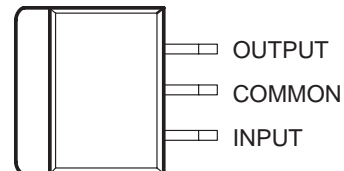


The COMMON terminal is in electrical contact with the mounting base.

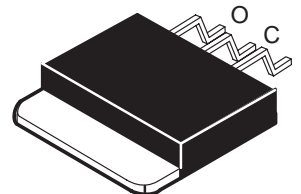
TO-220AB



KTE PACKAGE
(TOP VIEW)



The COMMON terminal is in electrical contact with the mounting base.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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.

 **TEXAS
INSTRUMENTS**

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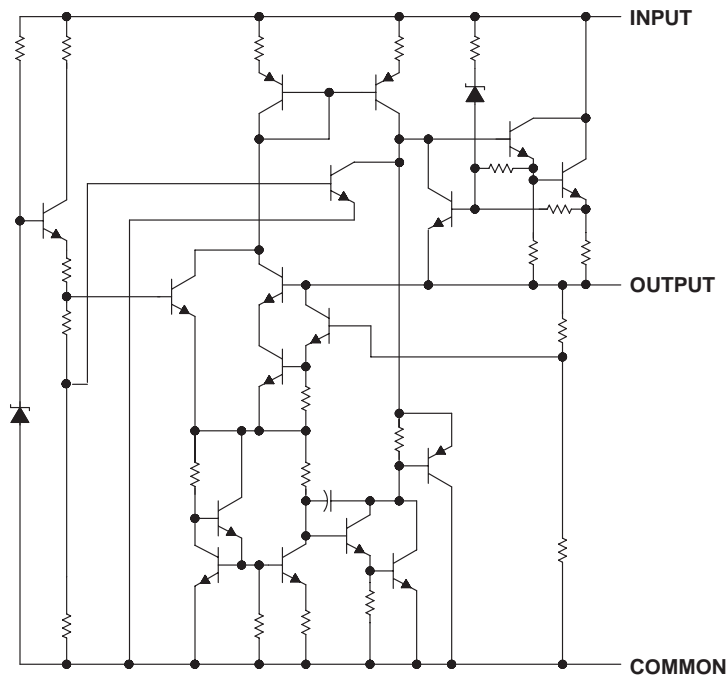
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AVAILABLE OPTIONS

T _J	V _{O(NOM)} (V)	PACKAGED DEVICES		CHIP FORM (Y)
		PLASTIC FLANGE-MOUNT (KC)	HEAT-SINK MOUNTED (KTE)	
0°C to 125°C	5	μA7805CKC	μA7805CKTE	μA7805Y
	6	μA7806CKC	μA7806CKTE	μA7806Y
	8	μA7808CKC	μA7808CKTE	μA7808Y
	8.5	μA7885CKC	μA7885CKTE	μA7885Y
	10	μA7810CKC	μA7810CKTE	μA7810Y
	12	μA7812CKC	μA7812CKTE	μA7812Y
	15	μA7815CKC	μA7815CKTE	μA7815Y
	18	μA7818CKC	μA7818CKTE	μA7818Y
	24	μA7824CKC	μA7824CKTE	μA7824Y

The KTE package is only available taped and reeled. Add the suffix R to the device type (e.g., μA7805CKTER). Chip forms are tested at 25°C.

schematic



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absolute maximum ratings over operating temperature ranges (unless otherwise noted)†

		μA78xx	UNIT
Input voltage, V_I	μA7824C	40	V
	All others	35	
Virtual junction temperature range, T_J		0 to 150	°C
Package thermal impedance, θ_{JA} (see Notes 1 and 2)	KC package	22	°C
	KTE package	23	
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		260	°C
Storage temperature range, T_{stg}		-65 to 150	°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can impact reliability. 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.
2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

		MIN	MAX	UNIT
Input voltage, V_I	μA7805C	7	25	V
	μA7806C	8	25	
	μA7808C	10.5	25	
	μA7885C	10.5	25	
	μA7810C	12.5	28	
	μA7812C	14.5	30	
	μA7815C	17.5	30	
	μA7818C	21	33	
	μA7824C	27	38	
Output current, I_O		1.5		A
Operating virtual junction temperature, T_J		0		125
				°C



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electrical characteristics at specified virtual junction temperature, $V_I = 10\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7805C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	4.8	5	5.2	V
		0°C to 125°C	4.75		5.25	
Input voltage regulation	$V_I = 7\text{ V to }25\text{ V}$	25°C		3	100	mV
	$V_I = 8\text{ V to }12\text{ V}$			1	50	
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	62	78		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C		15	100	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			5	50	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C		0.017		Ω
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C		-1.1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		40		μV
Dropout voltage	$I_O = 1\text{ A}$	25°C		2		V
Bias current		25°C		4.2	8	mA
Bias current change	$V_I = 7\text{ V to }25\text{ V}$	0°C to 125°C			1.3	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C		750		mA
Peak output current		25°C		2.2		A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 11\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7806C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	5.75	6	6.25	V
		0°C to 125°C	5.7		6.3	
Input voltage regulation	$V_I = 8\text{ V to }25\text{ V}$	25°C		5	120	mV
	$V_I = 9\text{ V to }13\text{ V}$			1.5	60	
Ripple rejection	$V_I = 9\text{ V to }19\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	59	75		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C		14	120	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			4	60	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C		0.019		Ω
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C		-0.8		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		45		μV
Dropout voltage	$I_O = 1\text{ A}$	25°C		2		V
Bias current		25°C		4.3	8	mA
Bias current change	$V_I = 8\text{ V to }25\text{ V}$	0°C to 125°C			1.3	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C		550		mA
Peak output current		25°C		2.2		A

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electrical characteristics at specified virtual junction temperature, $V_I = 14\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7808C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	7.7	8	8.3	V
		0°C to 125°C	7.6		8.4	
Input voltage regulation	$V_I = 10.5\text{ V to }25\text{ V}$	25°C		6	160	mV
	$V_I = 11\text{ V to }17\text{ V}$			2	80	
Ripple rejection	$V_I = 11.5\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	55	72		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C		12	160	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			4	80	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.016			Ω
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-0.8			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	52			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.3	8		mA
Bias current change	$V_I = 10.5\text{ V to }25\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	450			mA
Peak output current		25°C	2.2			A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 15\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7885C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	8.15	8.5	8.85	V
		0°C to 125°C	8.1		8.9	
Input voltage regulation	$V_I = 10.5\text{ V to }25\text{ V}$	25°C		6	170	mV
	$V_I = 11\text{ V to }17\text{ V}$			2	85	
Ripple rejection	$V_I = 11.5\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	54	70		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C		12	170	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			4	85	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.016			Ω
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-0.8			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	55			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.3	8		mA
Bias current change	$V_I = 10.5\text{ V to }25\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	450			mA
Peak output current		25°C	2.2			A

† Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 17\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J †	μA7810C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $V_I = 12.5\text{ V to }25\text{ V}$, $P_D \leq 15\text{ W}$	25°C	9.6	10	10.4	V
		0°C to 125°C	9.5	10	10.5	
Input voltage regulation	$V_I = 12.5\text{ V to }28\text{ V}$	25°C	7		200	mV
	$V_I = 14\text{ V to }20\text{ V}$		2		100	
Ripple rejection	$V_I = 13\text{ V to }23\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	55	71		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C	12		200	mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		100	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.018			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	70			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.3		8	mA
Bias current change	$V_I = 12.5\text{ V to }28\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	400			mA
Peak output current		25°C	2.2			A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 19\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J †	μA7812C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $V_I = 14.5\text{ V to }27\text{ V}$, $P_D \leq 15\text{ W}$	25°C	11.5	12	12.5	V
		0°C to 125°C	11.4		12.6	
Input voltage regulation	$V_I = 14.5\text{ V to }30\text{ V}$	25°C	10		240	mV
	$V_I = 16\text{ V to }22\text{ V}$		3		120	
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	55	71		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C	12		240	mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		120	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.018			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	75			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.3		8	mA
Bias current change	$V_I = 14.5\text{ V to }30\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	350			mA
Peak output current		25°C	2.2			A

† Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 23\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7815C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	14.4	15	15.6	V
		0°C to 125°C	14.25		15.75	
Input voltage regulation	$V_I = 17.5\text{ V to }30\text{ V}$	25°C	11		300	mV
	$V_I = 20\text{ V to }26\text{ V}$		3		150	
Ripple rejection	$V_I = 18.5\text{ V to }28.5\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	54	70		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C	12		300	mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		150	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.019			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	90			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.4	8		mA
Bias current change	$V_I = 17.5\text{ V to }30\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	230			mA
Peak output current		25°C	2.1			A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 27\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	$T_{J\ddagger}$	μA7818C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $P_D \leq 15\text{ W}$	25°C	17.3	18	18.7	V
		0°C to 125°C	17.1		18.9	
Input voltage regulation	$V_I = 21\text{ V to }33\text{ V}$	25°C	15		360	mV
	$V_I = 24\text{ V to }30\text{ V}$		5		180	
Ripple rejection	$V_I = 22\text{ V to }32\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	53	69		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C	12		360	mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		180	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C	0.022			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C	110			μV
Dropout voltage	$I_O = 1\text{ A}$	25°C	2			V
Bias current		25°C	4.5	8		mA
Bias current change	$V_I = 21\text{ V to }33\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C	200			mA
Peak output current		25°C	2.1			A

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electrical characteristics at specified virtual junction temperature, $V_I = 33\text{ V}$, $I_O = 500\text{ mA}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J †	μA7824C			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }1\text{ A}$, $V_I = 27\text{ V to }38\text{ V}$, $P_D \leq 15\text{ W}$	25°C	23	24	25	V
		0°C to 125°C	22.8		25.2	
Input voltage regulation	$V_I = 27\text{ V to }38\text{ V}$	25°C		18	480	mV
	$V_I = 30\text{ V to }36\text{ V}$			6	240	
Ripple rejection	$V_I = 28\text{ V to }38\text{ V}$, $f = 120\text{ Hz}$	0°C to 125°C	50	66		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	25°C		12	480	mV
	$I_O = 250\text{ mA to }750\text{ mA}$			4	240	
Output resistance	$f = 1\text{ kHz}$	0°C to 125°C		0.028		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	0°C to 125°C		-1.5		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	25°C		170		μV
Dropout voltage	$I_O = 1\text{ A}$	25°C		2		V
Bias current		25°C		4.6	8	mA
Bias current change	$V_I = 27\text{ V to }38\text{ V}$	0°C to 125°C			1	mA
	$I_O = 5\text{ mA to }1\text{ A}$				0.5	
Short-circuit output current		25°C		150		mA
Peak output current		25°C		2.1		A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 10\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)†

PARAMETER	TEST CONDITIONS	μA7805Y			UNIT
		MIN	TYP	MAX	
Output voltage			5		V
Input voltage regulation	$V_I = 7\text{ V to }25\text{ V}$		3		mV
	$V_I = 8\text{ V to }12\text{ V}$		1		
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$		78		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		15		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		5		
Output resistance	$f = 1\text{ kHz}$		0.017		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-1.1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		40		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.2		mA
Short-circuit output current			750		mA
Peak output current			2.2		A

† Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 11\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)†

PARAMETER	TEST CONDITIONS	μA7806Y			UNIT
		MIN	TYP	MAX	
Output voltage			6		V
Input voltage regulation	$V_I = 8\text{ V to }25\text{ V}$		5		mV
	$V_I = 9\text{ V to }13\text{ V}$		1.5		
Ripple rejection	$V_I = 9\text{ V to }19\text{ V}$, $f = 120\text{ Hz}$		75		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		14		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.019		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-0.8		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		45		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.3		mA
Short-circuit output current			550		mA
Peak output current			2.2		A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 14\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)†

PARAMETER	TEST CONDITIONS	μA7808Y			UNIT
		MIN	TYP	MAX	
Output voltage			8		V
Input voltage regulation	$V_I = 10.5\text{ V to }25\text{ V}$		6		mV
	$V_I = 11\text{ V to }17\text{ V}$		2		
Ripple rejection	$V_I = 11.5\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$		72		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		12		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.016		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-0.8		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		52		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.3		mA
Short-circuit output current			450		mA
Peak output current			2.2		A

† Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 15\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)[†]

PARAMETER	TEST CONDITIONS	μA7885Y			UNIT
		MIN	TYP	MAX	
Output voltage			8.5		V
Input voltage regulation	$V_I = 10.5\text{ V to }25\text{ V}$		6		mV
	$V_I = 11\text{ V to }17\text{ V}$		2		
Ripple rejection	$V_I = 11.5\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$		70		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		12		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.016		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-0.8		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		55		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.3		mA
Short-circuit output current			450		mA
Peak output current			2.2		A

[†] Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 17\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)[†]

PARAMETER	TEST CONDITIONS	μA7810Y			UNIT
		MIN	TYP	MAX	
Output voltage			10		V
Input voltage regulation	$V_I = 12.5\text{ V to }28\text{ V}$		7		mV
	$V_I = 14\text{ V to }20\text{ V}$		2		
Ripple rejection	$V_I = 13\text{ V to }23\text{ V}$, $f = 120\text{ Hz}$		71		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		12		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.018		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		70		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.3		mA
Short-circuit output current			400		mA
Peak output current			2.2		A

[†] Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 19\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)†

PARAMETER	TEST CONDITIONS	μA7812Y			UNIT
		MIN	TYP	MAX	
Output voltage		12			V
Input voltage regulation	$V_I = 14.5\text{ V to }30\text{ V}$	10			mV
	$V_I = 16\text{ V to }22\text{ V}$	3			
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$, $f = 120\text{ Hz}$	71			dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	12			mV
	$I_O = 250\text{ mA to }750\text{ mA}$	4			
Output resistance	$f = 1\text{ kHz}$	0.018			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	75			μV
Dropout voltage	$I_O = 1\text{ A}$	2			V
Bias current		4.3			mA
Short-circuit output current		350			mA
Peak output current		2.2			A

† Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 23\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)†

PARAMETER	TEST CONDITIONS	μA7815Y			UNIT
		MIN	TYP	MAX	
Output voltage		15			V
Input voltage regulation	$V_I = 17.5\text{ V to }30\text{ V}$	11			mV
	$V_I = 20\text{ V to }26\text{ V}$	3			
Ripple rejection	$V_I = 18.5\text{ V to }28.5\text{ V}$, $f = 120\text{ Hz}$	70			dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$	12			mV
	$I_O = 250\text{ mA to }750\text{ mA}$	4			
Output resistance	$f = 1\text{ kHz}$	0.019			W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$	-1			mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$	90			μV
Dropout voltage	$I_O = 1\text{ A}$	2			V
Bias current		4.4			mA
Short-circuit output current		230			mA
Peak output current		2.1			A

† Pulse-testing techniques 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.



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electrical characteristics at specified virtual junction temperature, $V_I = 27\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)[†]

PARAMETER	TEST CONDITIONS	μA7818Y			UNIT
		MIN	TYP	MAX	
Output voltage			18		V
Input voltage regulation	$V_I = 21\text{ V to }33\text{ V}$		15		mV
	$V_I = 24\text{ V to }30\text{ V}$		5		
Ripple rejection	$V_I = 22\text{ V to }32\text{ V}$, $f = 120\text{ Hz}$		69		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		12		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.022		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		110		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.5		mA
Short-circuit output current			200		mA
Peak output current			2.1		A

[†] Pulse-testing techniques 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.

electrical characteristics at specified virtual junction temperature, $V_I = 33\text{ V}$, $I_O = 500\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)[†]

PARAMETER	TEST CONDITIONS	μA7824Y			UNIT
		MIN	TYP	MAX	
Output voltage			24		V
Input voltage regulation	$V_I = 27\text{ V to }38\text{ V}$		18		mV
	$V_I = 30\text{ V to }36\text{ V}$		6		
Ripple rejection	$V_I = 28\text{ V to }38\text{ V}$, $f = 120\text{ Hz}$		66		dB
Output voltage regulation	$I_O = 5\text{ mA to }1.5\text{ A}$		12		mV
	$I_O = 250\text{ mA to }750\text{ mA}$		4		
Output resistance	$f = 1\text{ kHz}$		0.028		W
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$		-1.5		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		170		μV
Dropout voltage	$I_O = 1\text{ A}$		2		V
Bias current			4.6		mA
Short-circuit output current			150		mA
Peak output current			2.1		A

[†] Pulse-testing techniques 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.



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APPLICATION INFORMATION

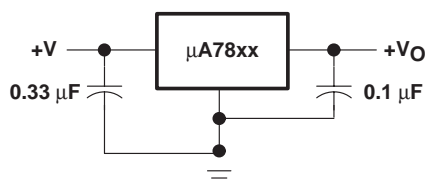


Figure 1. Fixed-Output Regulator

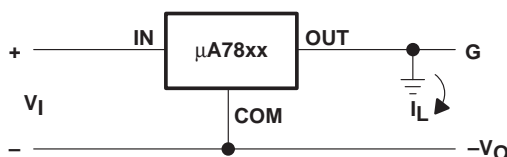
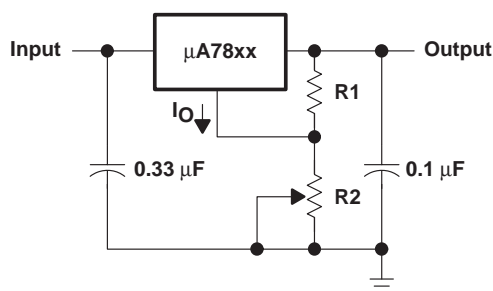


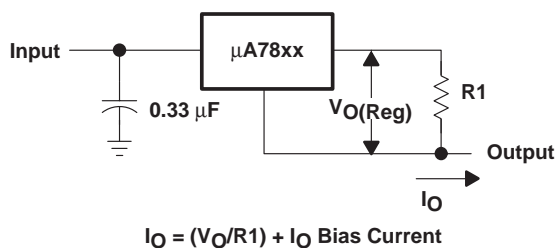
Figure 2. Positive Regulator in Negative Configuration (V_I Must Float)



NOTE A: The following formula is used when V_{xx} is the nominal output voltage (output to common) of the fixed regulator:

$$V_O = V_{xx} + \left(\frac{V_{xx}}{R1} + I_Q \right) R2$$

Figure 3. Adjustable-Output Regulator



$$I_O = (V_O/R1) + I_O \text{ Bias Current}$$

Figure 4. Current Regulator

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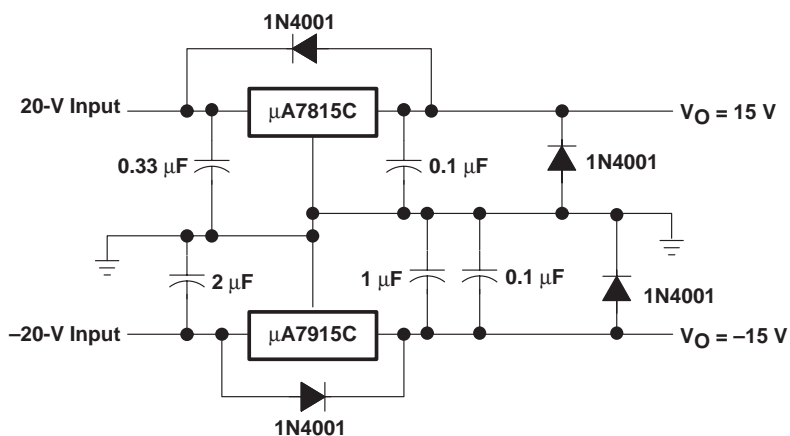


Figure 5. Regulated Dual Supply

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.

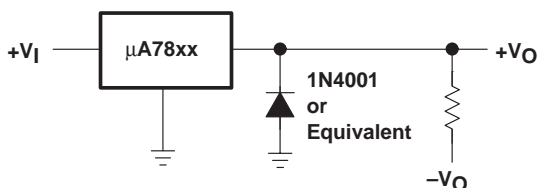


Figure 6. Output Polarity-Reversal-Protection Circuit

reverse-bias protection

Occasionally, the input voltage to the regulator can collapse faster than the output voltage. This can 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 used as shown in Figure 7.

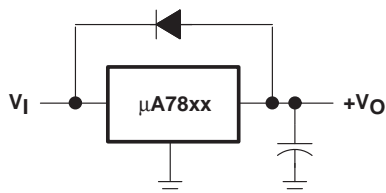


Figure 7. Reverse-Bias-Protection Circuit



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