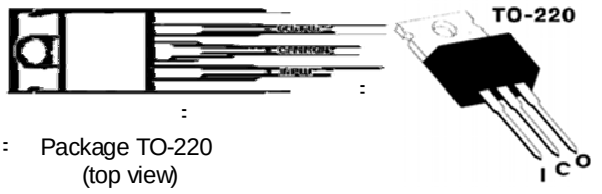
78XX

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. Each of these regulators can deliver up to1.5 A of output current. The internal limiting and termal shutdown features of these regulators make them essentially immune to overload.

Features

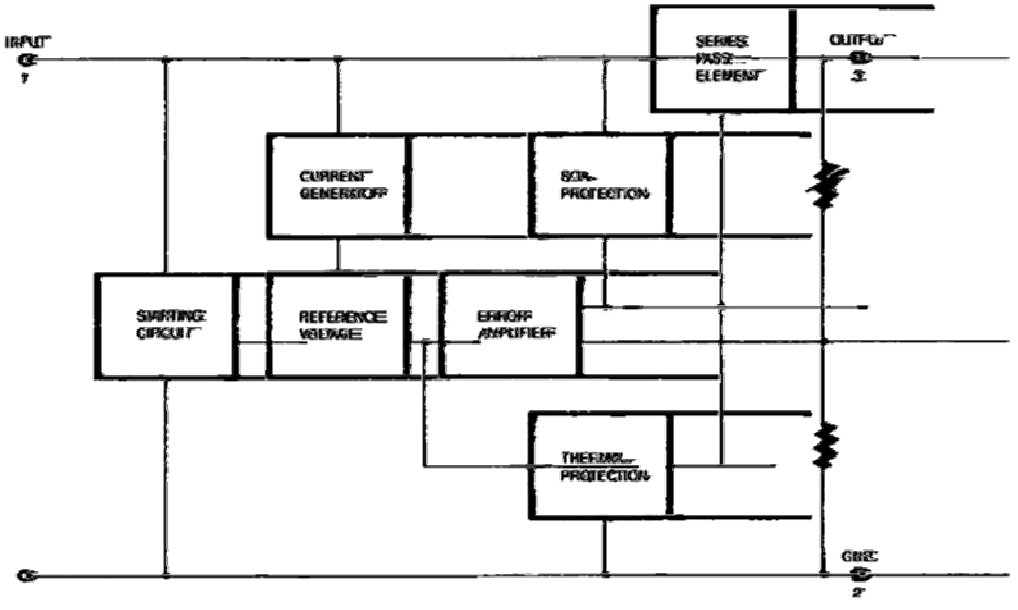
3-Terminal Regulators
Output Current Up to 1.5 A
No External Components
Internal Thermal Overload Protection
High Power Dissipation Capability
Internal Short-Circuit Current Limiting
Output Transistor Safe-Area Compensation



Package TO-220
(top view)

Package

Internal Block Digram



Absolute Maximum Ratings

over operating temperature range (unless otherwise noted)

Parameter		Maximum	Units
Input voltage	7824 7827	40	V
	All others	35	
Continuous total dissipation at 25 C free-air temperature		2	W
Continuous total dissipation at (or below) 25 C case temperature		15	
Operating free-air, case, or virtual junctions temperature range		0 to 150	C
Storage temperature range		-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds		260	

Recommended Operating Conditions

Parameter		Min	Max	Units
Input voltage V_I	7805	7	25	V
	7806	8	25	
	7808	10.5	25	
	7885	10.5	25	
	7809	11.5	27	
	7810	12.5	28	
	7812	14.5	30	
	7815	17.5	30	
	7818	21	33	
	7820	23	36	
	7824	27	38	
	7827	30	40	
Output current, I_O			1.5	A
Operating virtual junction temperature, T_J		0	125	C

Device Selection Guide

Device	Output Voltage
7805	5V
7806	6V
7808	8V
7885	8.5V
7809	9V
7810	10V
7812	12V
7815	15V
7818	18V
7820	20V
7824	24V
7827	27V

Electrical characteristics 7805

Electrical characteristics at specified virtual junction temperature, V_I= 10V, I_O =500mA (unless otherwise noted)

Parameter	Test Conditions*		7805			Units
			Min	Typ	Max	
Output voltage**		25℃	4.8	5	5.2	V
	I_O= 5mA to 1A, V_I= 7V to 20V, P≤ 15W	0℃ to 125℃	4.75	5	5.25	
Input regulation	V_I= 7V to 25V	25℃		3	100	mV
				1	50	
Ripple rejection	V_I= 8V to 18V, f= 120Hz	0℃ to 125℃	62	78		dB
Output regulation	I_O= 5mA to 1.5A	25℃		15	100	mV
	I_O= 250mA to 750mA			5	50	
Output resistance	f= 1KHz	0℃ to 125℃		0.017		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.1		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		40		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.2	8	mA
Bias current change	V_I= 7V to 25V	0℃ to 125℃			1.3	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		750		
Peak output current		25℃		2.2		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.

Electrical characteristics 7806

Electrical characteristics at specified virtual junction temperature, V_I= 11V, I_O =500mA (unless otherwise noted)

Parameter	Test Conditions*		7805			Units
			Min	Typ	Max	
Output voltage**		25℃	5.75	6	6.25	V
	I_O= 5mA to 1A, V_I= 8V to 21V, P≤	0℃ to 125℃	5.7	6	6.3	
Input regulation	V_I= 8V to 25V	25℃		5	120	mV
	V_I= 9V to 13V			1.5	60	
Ripple rejection	V_I= 9V to 19V, f= 120Hz	0℃ to 125℃	59	75		dB
Output regulation	I_O= 5mA to 1.5A	25℃		14	120	mV
	I_O= 250mA to 750mA			4	60	
Output resistance	f= 1KHz	0℃ to 125℃		0.019		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-0.8		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		45		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	V_I= 8V to 25V	0℃ to 125℃			1.3	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		550		
Peak output current		25℃		2.2		A

Electrical Characteristics 7808

Electrical characteristics at specified virtual junction temperature, V_I= 14V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		7808			Units
			Min	Typ	Max	
Output voltage**		25℃	7.7	8	8.3	V
	I_O= 5mA to 1A, V_I= 10.5V to 23V, P≤15W	0℃ to 125℃	7.6	8	8.4	
Input regulation	V_I= 10.5V to 25V	25℃		6	160	mV
	V_I= 11V to 17V			2	80	
Ripple rejection	V_I= 11.5V to 21.5V, f= 120Hz	0℃ to 125℃	55	72		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	160	mV
	I_O= 250mA to 750mA			4	80	
Output resistance	f= 1KHz	0℃ to 125℃		0.016		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-0.8		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		52		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	V_I= 10.5V to 25V	0℃ to 125℃			1	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		450		
Peak output current		25℃		2.2		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.

Electrical Characteristics 7885

Electrical characteristics at specified virtual junction temperature, V_I= 15V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		MIK7885			Units
			Min	Typ	Max	
Output voltage**		25℃	8.15	8.5	8.85	V
	I_O= 5mA to 1A, V_I= 11V to 23.5V, P≤15W	0℃ to 125℃	8.1	8.5	8.9	
Input regulation	V_I= 10.5V to 25V	25℃		6	170	mV
	V_I= 11V to 17V			2	85	
Ripple rejection	V_I= 11.5V to 21.5V, f= 120Hz	0℃ to 125℃	54	70		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	170	mV
	I_O= 250mA to 750mA			4	85	
Output resistance	f= 1KHz	0℃ to 125℃		0.016		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-0.8		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		55		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	V_I= 10.5V to 25V	0℃ to 125℃			1	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		450		
Peak output current		25℃		2.2		A

Electrical Characteristics 7809

Electrical characteristics at specified virtual junction temperature, V_I= 16V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		7809			Units
			Min	Typ	Max	
Output voltage**		25℃	8.65	9	9.35	V
	I_O= 5mA to 1A, V_I= 11.5V to 24V, P≤15W	0℃ to 125℃	8.55	9	9.45	
Input regulation	V_I= 11.5V to 27V	25℃		7	180	mV
	V_I= 13V to 19V			2	90	
Ripple rejection	V_I= 12V to 22V, f= 120Hz	0℃ to 125℃	55	70		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	180	mV
	I_O= 250mA to 750mA			4	90	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		60		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	V_I= 11.5V to 27V	0℃ to 125℃			1	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		400		
Peak output current		25℃		2.2		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.

Electrical Characteristics 7810

Electrical characteristics at specified virtual junction temperature, V_I= 17V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		MIK7810			Units
			Min	Typ	Max	
Output voltage**		25℃	9.6	10	10.4	V
	I_O= 5mA to 1A, V_I= 12.5V to 25V, P≤15W	0℃ to 125℃	9.5	10	10.5	
Input regulation	V_I= 12.5V to 28V	25℃		7	200	mV
	V_I= 14V to 20V			2	100	
Ripple rejection	V_I= 13V to 23V, f= 120Hz	0℃ to 125℃	55	71		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	200	mV
	I_O= 250mA to 750mA			4	100	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		70		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	
						mA
Bias current change	V_I= 12.5V to 28V	0℃ to 125℃			1	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		400		
Peak output current		25℃		2.2		A

Electrical Characteristics 7812

Electrical characteristics at specified virtual junction temperature, V_I= 19V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		7812			Units
			Min	Typ	Max	
Output voltage**		25℃	11.5	12	12.5	V
	I_O= 5mA to 1A, V_I= 14.5V to 27V, P≤15W	0℃ to 125℃	11.4	12	12.6	
Input regulation	V_I= 14.5V to 30V	25℃		10	240	mV
	V_I= 16V to 22V			3	120	
Ripple rejection	V_I= 15V to 25V, f= 120Hz	0℃ to 125℃	55	71		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	240	mV
	I_O= 250mA to 750mA			4	120	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		75		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	
Bias current change	V_I= 14.5V to 30V	0℃ to 125℃			1	mA
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		350		
Peak output current		25℃		2.2		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.

Electrical Characteristics 7815

Electrical characteristics at specified virtual junction temperature, V_I= 23V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		MIK7815			Units
			Min	Typ	Max	
Output voltage**		25℃	14.4	15	15.6	V
	I_O= 5mA to 1A, V_I= 17.5V to 30V, P≤	0℃ to 125℃	14.25	15	15.75	
Input regulation	V_I= 17.5V to 30V	25℃		12	300	mV
	V_I= 20V to 26V			3	150	
Ripple rejection	V_I= 18.5V to 28.5V, f= 120Hz	0℃ to 125℃	54	70		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	300	mV
	I_O= 250mA to 750mA			4	150	
Output resistance	f= 1KHz	0℃ to 125℃		0.019		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		90		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.3	8	
Bias current change	V_I= 17.5V to 30V	0℃ to 125℃			1	mA
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		230		
Peak output current		25℃		2.1		A

Electrical Characteristics 7818

Electrical characteristics at specified virtual junction temperature, V= 27V, Io = 500mA (unless otherwise noted)

Parameter	Test Conditions*		7818			Units
			Min	Typ	Max	
Output voltage**		25	17.3	18	18.7	V
	Io= 5mA to 1A, V= 21V to 33V, P≤	0 to 125	17.1	18	18.9	
Input regulation	V= 21V to 33V	25		15	360	mV
	V= 24V to 30V			5	180	
Ripple rejection	V= 22V to 32V, f= 120Hz	0 to 125	53	69		dB
Output regulation	Io= 5mA to 1.5A	25		12	360	mV
	Io= 250mA to 750mA			4	180	
Output resistance	f= 1KHz	0 to 125		0.022		Ω
Temperature coefficient of output voltage	Io= 5mA	0 to 125		-1.0		mV/
Output noise voltage	f= 10 Hz to 100 KHz	25		110		μV
Dropout voltage	Io= 1A	25		2.0		V
Bias current		25		4.5	8	mA
Bias current change	V= 21V to 33V	0 to 125			1	
	Io= 5mA to 1A				0.5	
Short-circuit output current		25		200		
Peak output current		25		2.1		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.

Electrical Characteristics 7820

Electrical characteristics at specified virtual junction temperature, V= 29V, Io = 500mA (unless otherwise noted)

Parameter	Test Conditions*		MIK7820			Units
			Min	Typ	Max	
Output voltage**		25	19.2	20	20.8	V
	Io= 5mA to 1A, V= 23V to 35V, P≤	0 to 125	19	20	21	
Input regulation	V= 23V to 35V	25		18	400	mV
	V= 26V to 32V			7	200	
Ripple rejection	V= 24V to 34V, f= 120Hz	0 to 125	51	66		dB
Output regulation	Io= 5mA to 1.5A	25		15	400	mV
	Io= 250mA to 750mA			7	200	
Output resistance	f= 1KHz	0 to 125		0.027		Ω
Temperature coefficient of output voltage	Io= 5mA	0 to 125		-1.3		mV/
Output noise voltage	f= 10 Hz to 100 KHz	25		150		μV
Dropout voltage	Io= 1A	25		2.0		V
Bias current		25		4.5	8	mA
Bias current change	V= 23V to 35V	0 to 125			1	
	Io= 5mA to 1A				0.5	
Short-circuit output current		25		180		
Peak output current		25		2.1		A

Electrical Characteristics 7824

Electrical characteristics at specified virtual junction temperature, V_I= 33V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		7824			Units
			Min	Typ	Max	
Output voltage**		25℃	23	24	25	V
	I_O= 5mA to 1A, V_I= 27V to 38V, P≤	0℃ to 125℃	22.8	24	25.2	
Input regulation	V_I= 27V to 38V	25℃		18	480	mV
	V_I= 30V to 36V			6	240	
Ripple rejection	V_I= 28V to 38V, f= 120Hz	0℃ to 125℃	50	66		dB
Output regulation	I_O= 5mA to 1.5A	25℃		12	480	mV
	I_O= 250mA to 750mA			4	240	
Output resistance	f= 1KHz	0℃ to 125℃		0.028		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.5		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		170		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.6	8	mA
Bias current change	V_I= 27V to 38V	0℃ to 125℃			1	mA
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		150		
Peak output current		25℃		2.1		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.

Electrical Characteristics 7827

Electrical characteristics at specified virtual junction temperature, V_I= 36V, I_O = 500mA (unless otherwise noted)

Parameter	Test Conditions*		MIK7827			Units
			Min	Typ	Max	
Output voltage**		25℃	25.9	27	28.1	V
	I_O= 5mA to 1A, V_I= 30V to 40V, P≤15W	0℃ to 125℃	25.7	27	28.3	
Input regulation	V_I= 30V to 40V	25℃		25	540	mV
	V_I= 33V to 39V			10	270	
Ripple rejection	V_I= 30V to 40V, f= 120Hz	0℃ to 125℃	50	64		dB
Output regulation	I_O= 5mA to 1.5A	25℃		20	540	mV
	I_O= 250mA to 750mA			9	270	
Output resistance	f= 1KHz	0℃ to 125℃		0.030		Ω
Temperature coefficient of output voltage	I_O= 5mA	0℃ to 125℃		-1.6		mV/℃
Output noise voltage	f= 10 Hz to 100 KHz	25℃		200		μV
Dropout voltage	I_O= 1A	25℃		2.0		V
Bias current		25℃		4.8	8	mA
Bias current change	V_I= 30V to 40V	0℃ to 125℃			1	
	I_O= 5mA to 1A				0.5	
Short-circuit output current		25℃		120		
Peak output current		25℃		2.1		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.

Typical Applications Circuit

For a positive regulator, a 0.33-|iF bypass capacitor should be used on the input terminals. While not necessary for stability, an output capacitor of O.ljiF may be used to improve the transient response of the regulator. These capaci- tors should be on or as near as possible to the regulator terminals. See Fig.1.

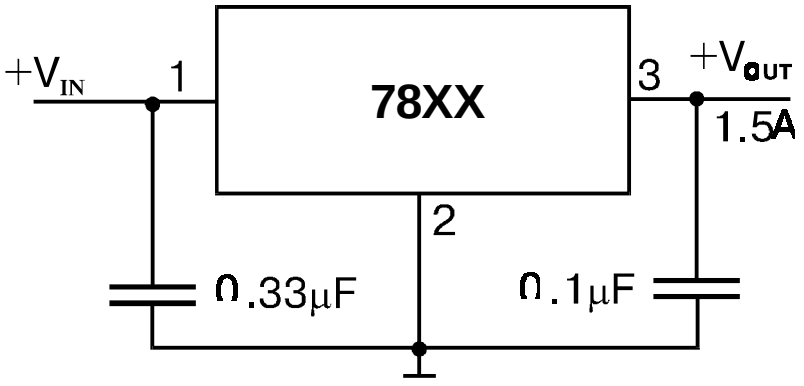


Fig. 1. Positive Regulator

Ordering Information

ORDERING NUMBER	PACKAGE	MARKING
78XX	TO - 220	ET78XX / ESTEK7805

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