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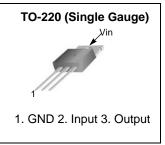
LM79XX 3-Terminal 1A Negative Voltage Regulator

Features

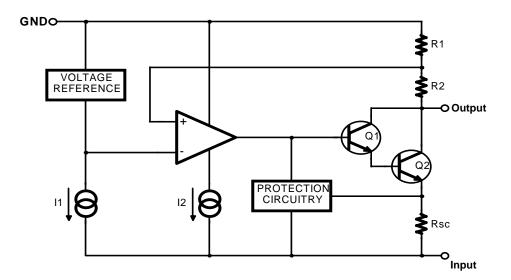
- Output Current in Excess of 1A
- Output Voltages of -5, -6, -8 , -9, -10, -12, -15, -18 and 24V
- Internal Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Compensation

Description

The LM79XX series of three terminal negative regulators are available in TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible.



Internal Block Digram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	VI	-35	V
Thermal Resistance Junction-Case (Note1)	R _θ JC	5	°C/W
Thermal Resistance Junction-Air (Note1, 2)	R _θ JA	65	C/W
Operating Temperature Range	TOPR	0 ~ +125	°C
Storage Temperature Range	TSTG	-65 ~ +150	°C

Note:

1. Thermal resistance test board Size: 76.2mm * 114.3mm * 1.6mm(1S0P) JEDEC standard: JESD51-3, JESD51-7

2. Assume no ambient airflow

Electrical Characteristics (LM7905)

(VI = -10V, IO = 500mA, $0^{\circ}C \le T_J \le +125^{\circ}C$, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C		-4.8	-5.0	-5.2	
Output Voltage	Vo	$VO \qquad IO = 5mA \text{ to } 1A, PO \le 15W \\ VI = -7V \text{ to } -20V \qquad \qquad$		-4.75	-5.0	-5.25	V
Line Regulation (Note2)	41/0		VI = -7V to -25V	-	35	100	m\/
Line Regulation (Note3)		$\Delta V_{O} \qquad T_{J} = +25^{\circ}C \qquad V_{I} = -8^{V}$		-	8	50	mV
Load Regulation (Note3)		$T_{J} = +25^{\circ}C$ IO = 5mA to 1.5A		-	10	100	mV
	In (Note3) ΔV_O T _J =+25°C I_O = 250mA to 750mA		750mA	-	3	50	IIIV
Quiescent Current	lQ	TJ =+25°C		-	3	6	mA
Quiescent Current Change	410	$I_{O} = 5mA$ to 1A		-	0.05	0.5	٣٨
Quiescent Current Change	ΔlQ	VI = -8V to -25V	1	-	0.1	0.8	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	- 0.4	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T _A =+25°C	кНz	-	40	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	$T_{J} = +25^{\circ}C$ $I_{O} = 1A$		-	2	-	V
Short Circuit Current	Isc	TJ =+25°C, VI = -35V		-	300	-	mA
Peak Current	IPK	TJ =+25°C		-	2.2	-	А

Note

Electrical Characteristics (LM7906) (Continued)

(VI = -11V, IO = 500mA, 0°C \leq TJ \leq +125°C, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		Vo $\begin{array}{c} T_J = +25^{\circ}C\\ I_O = 5mA \text{ to } 1A, P_O \leq 15W\\ V_I = -9V \text{ to } -21V \end{array}$		-5.75	-6	-6.25	
Output Voltage	Vo			-5.7	-6	-6.3	V
Line Regulation (Note1)	4)/0	TJ = +25°C	VI = -8V to -25V	-	10	120	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -9V to -13V	-	5	60	mv
Load Pagulation (Note1)		$\Delta V_{O} \qquad \begin{array}{c} T_{J} = +25^{\circ}C \\ I_{O} = 5mA \text{ to } 1.5A \\ T_{J} = +25^{\circ}C \\ I_{O} = 250mA \text{ to } 750mA \end{array}$		-	10	120	mV
Load Regulation (Note1)				-	3	60	
Quiescent Current	IQ	TJ =+25°C		-	3	6	mA
Quiecoant Current Change		IO = 5mA to 1A		-	0.05	0.5	mA
Quiescent Current Change	ΔlQ	VI = -8V to -25V		-	0.1	1.3	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.5	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100k T _A =+25°C	Hz	-	130	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	TJ = +25°C, VI = -35V		-	300	-	mA
Peak Current	IPK	TJ = +25°C		-	2.2	-	A

Note

Electrical Characteristics (LM7908) (Continued)

(VI = -14V, IO = 500mA, $0^{\circ}C \leq T_J \leq +125^{\circ}C$, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C		-7.7	-8	-8.3	
Output Voltage	Vo	$I_{O} = 5mA \text{ to } 1A, P_{O} \le 15W$ VI = -10V to -23V		-7.6	-8	-8.4	V
Line Regulation (Note1)		T 25°C	VI = -10.5V to -25V	-	10	160	mV
Line Regulation (Note1)	ΔVo	TJ = +25°C	VI = -11V to -17V	-	5	80	mv
Load Regulation (Note1)	ΔVο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	12	160	mV
				-	4	80	IIIV
Quiescent Current	IQ	TJ =+25°C		-	3	6	mA
Quiescent Current Change		$I_{O} = 5mA$ to $1A$	4	-	0.05	0.5	٣A
Quiescent Current Change	ΔlQ	VI = -10.5V to	-25V	-	0.1	1	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.6	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100 T _A =+25°C	0kHz	-	175	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	TJ = +25°C, VI = -35V		-	300	-	mA
Peak Current	lрк	TJ = +25°C		-	2.2	-	А

Note

Electrical Characteristics (LM7909) (Continued)

(VI = -15V, IO = 500mA, 0°C \leq TJ \leq +125°C, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C	-8.7	-9.0	-9.3		
Output Voltage	Vo	$\begin{array}{l} IO = 5mA \text{ to } 1A, \text{ PO} \leq 15W \\ V_I = -1.5V \text{ to } -23V \end{array}$		-8.6	-9.0	-9.4	V
Line Regulation (Note1)		ТJ = +25°С	VI = -11.5V to -26V	-	10	180	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -12V to -18V	-	5	90	mv
Load Regulation (Note1)		$\Delta V_{O} = \frac{T_{J} = +25^{\circ}C}{I_{O} = 5mA \text{ to } 1.5A}$ $T_{J} = +25^{\circ}C}{I_{O} = 250mA \text{ to } 750mA}$		-	12	180	mV
				-	4	90	
Quiescent Current	IQ	TJ = +25°C		-	3	6	mA
Quiescent Current Change	ΔlQ	$I_{O} = 5mA$ to 1A		-	0.05	0.5	mA
Quescent Current Change	ΔIQ	VI = -11.5V to -2	26V	-	0.1	1	
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.6	-	mV/°C
Output Noise Voltage	V _N	f = 10Hz to 100k T _A = +25°C	(Hz	-	175	-	μV
Ripple Rejection	RR	f = 120Hz ∆VI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	T _J = +25°C, V _I = -35V		-	300	-	mA
Peak Current	IPK	TJ = +25°C		-	2.2	-	Α

Note:

Electrical Characteristics (LM7910) (Continued)

(VI = -17V, IO = 500mA, 0°C \leq TJ \leq +125°C, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		Vo $T_J = +25^{\circ}C$ $I_O = 5mA \text{ to } 1A, P_d \le 15W$ $V_I = -12V \text{ to } -28$		-9.6	-10	-10.4	
Output Voltage	Vo			-9.5	-10	-10.5	V
Line Regulation (Note1)		TJ = +25°C	VI = -12.5V to -28V	-	12	200	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -14V to -20V	-	6	100	mv
Lood Pogulation (Noto1)		$\Delta VO \qquad \begin{array}{l} T_J = +25^{\circ}C \\ I_O = 5mA \text{ to } 1.5A \\ T_J = +25^{\circ}C \\ I_O = 250mA \text{ to } 750mA \end{array}$		-	12	200	mV
Load Regulation (Note1)	740			-	4	100	
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiecoant Current Change		IO = 5mA to 1A		-	0.05	0.5	m۸
Quiescent Current Change	ΔlQ	VI = -12.5V to -2	28V	-	0.1	1	mA 1
Temperature Coefficient of VO	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	10Hz ≤ f ≤ 100kł T _A =+25°C	Hz	-	280	-	μV
Ripple Rejection	RR	f = 120Hz ∆VI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	T _J = +25°C, V _I = -35V		-	300	-	mA
Peak Current	lьk	TJ = +25°C		-	2.2	-	Α

Note:

Electrical Characteristics (LM7912) (Continued)

(VI = -19V, IO = 500mA, $0^{\circ}C \le TJ \le +125^{\circ}C$, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		VO $I_{O} = 5mA$ to I_{A} PO $\leq 15W$		-11.5	-12	-12.5	
Output Voltage	Vo			-11.4	-12	-12.6	V
Line Regulation (Note1)	4)/0	TJ = +25°C	VI = -14.5V to -30V	-	12	240	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -16V to -22V	-	6	120	IIIV
Load Regulation (Note1)	ΔVο	TJ = +25°C IO = 5mA to 1.5/	$T_{J} = +25^{\circ}C$ IO = 5mA to 1.5A		12	240	mV
Load Regulation (Note1)	ΔνΟ	T _J = +25°C IO = 250mA to 750mA		-	4	120	mv
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiacoant Current Change		$I_{O} = 5 \text{mA to } 1 \text{A}$	-	0.05	0.5	m /	
Quiescent Current Change	ΔlQ	VI = -14.5V to -3	80V	-	0.1	1	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.8	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T _A = +25°C	Hz	-	200	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	TJ = +25°C, VI = -35V		-	300	-	mA
Peak Current	IPK	TJ = +25°C		-	2.2	-	А

Note:

Electrical Characteristics (LM7915) (Continued)

(VI = -23V, IO = 500mA, 0°C \leq TJ \leq +125°C, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C		-14.4	-15	-15.6	
Output Voltage	Vo	I_{O} = 5mA to 1A, $P_{O} \leq$ 15W $$V_{I}$$ = -18V to -30V $$-$		-14.25	-15	-15.75	V
Line Regulation (Note1)		TJ = +25°C	VI = -17.5V to -30V	-	12	300	mV
Line Regulation (Note1)	ΔVo	$1J = +25^{\circ}C$	VI = -20V to -26V	-	6	150	mv
Load Pogulation (Nota1)	ΔVο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	12	300	m\/
Load Regulation (Note1)	200			-	4	150	mV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiescont Current Change		$\Delta IQ \qquad \frac{IO = 5mA \text{ to } 1A}{VI = -17.5V \text{ to } -30V}$	-	0.05	0.5	mA	
Quiescent Current Change	ΔIQ		30V	-	0.1	1	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.9	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T _A =+25°C	кНz	-	250	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	ISC	TJ = +25°C, VI = -35V		-	300	-	mA
Peak Current	IPK	TJ = +25°C		-	2.2	-	А

Note:

Electrical Characteristics (LM7918) (Continued)

(VI = -27V, IO = 500mA, $0^{\circ}C \le TJ \le +125^{\circ}C$, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C		-17.3	-18	-18.7	
Output Voltage	Vo	$\begin{array}{c} \text{IO} = 5\text{mA to 1A, PO} \leq 15\text{W} \\ \text{VI} = -22.5\text{V to } -33\text{V} \end{array}$		-17.1	-18	-18.9	V
Line Regulation (Note1)	4)/0	ТJ = +25°С	VI = -21V to -33V	-	15	360	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -24V to -30V	-	8	180	mv
Lood Pogulation (Noto1)		$T_{J} = +25^{\circ}C$ IO = 5mA to 1.5A		-	15	360	mV
Load Regulation (Note1)	ΔV_{O} $T_{J} = +25^{\circ}C$ $I_{O} = 250 \text{mA to } 750 \text{mA}$		750mA	-	5	180	ΠV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiecoant Current Change		$I_{O} = 5mA$ to $1A$		-	0.05	0.5	m ^
Quiescent Current Change	ΔlQ	VI = -21V to -33	V	-	0.1	1	– mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100 T _A = +25°C	кНz	-	300	-	μV
Ripple Rejection	RR	f = 120Hz ΔVI = 10V		54	60	-	dB
Dropout Voltage	VD	$T_{J} = +25^{\circ}C$ $I_{O} = 1A$		-	2	-	V
Short Circuit Current	ISC	$T_J = +25^{\circ}C, V_I = -35V$		-	300	-	mA
Peak Current	IPK	TJ = +25°C		-	2.2	-	А

Note:

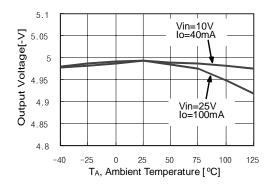
Electrical Characteristics (LM7924) (Continued)

(VI = -33V, IO = 500mA, $0^{\circ}C \le TJ \le +125^{\circ}C$, CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		TJ = +25°C		-23	-24	-25	
Output Voltage	Vo	$\label{eq:IO} \begin{array}{l} IO = 5mA \text{ to } 1A, \ PO \leq 15W \\ VI = -27V \text{ to } -38V \end{array}$		-22.8	-24	-25.2	V
Line Regulation (Note1)		TJ = +25°C	VI = -27V to -38V	-	15	480	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -30V to -36V	-	8	180	mv
Load Pagulation (Noto1)	1)(0	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$		-	15	480	m)/
Load Regulation (Note1)	tion (Note1) ΔV_O $T_J = +25^{\circ}C$ IO = 250mA to 750mA		750mA	-	5	240	mV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quissant Current Change		$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Quiescent Current Change	ΔlQ	VI = -27V to -38	3V	-	0.1	1	mA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100 T _A = +25°C	kHz	-	400	-	μV
Ripple Rejection	RR	f = 120Hz ∆VI = 10V		54	60	-	dB
Dropout Voltage	VD	TJ = +25°C IO = 1A		-	2	-	V
Short Circuit Current	Isc	TJ = +25°C, VI = -35V		-	300	-	mA
Peak Current	IPK	T _J = +25°C		-	2.2	-	А

Note:

Typical Performance Characteristics



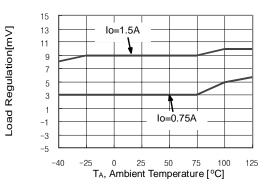
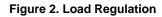


Figure 1. Output Voltage



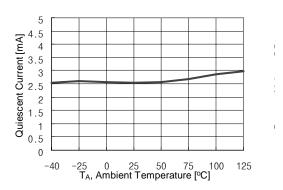


Figure 3. Quiescent Current

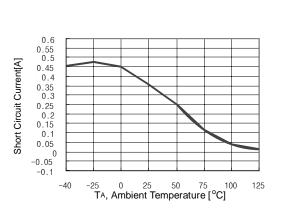


Figure 5. Short Circuit Current

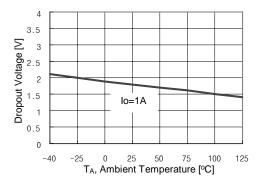


Figure 4. Dropout Voltage

Typical Applications

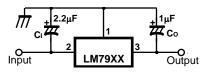


Figure 6. Negative Fixed output regulator

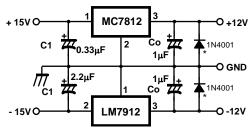


Figure 7. Split power supply (\pm 12V/1A)

Notes:

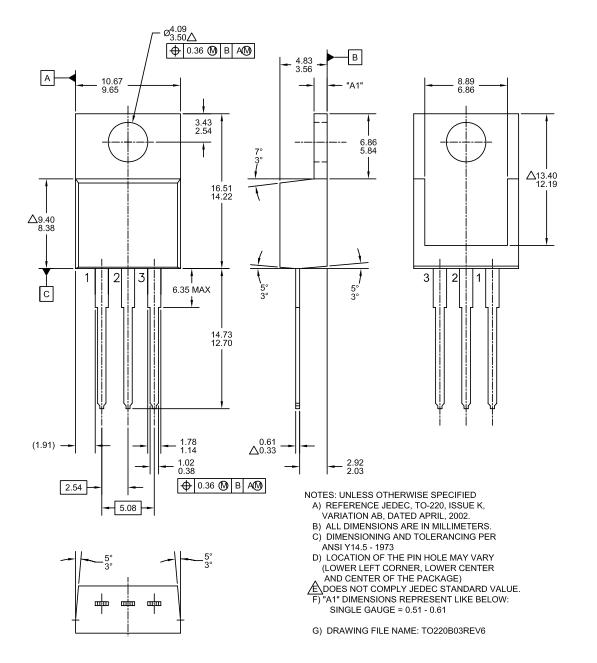
- (1) To specify an output voltage, substitute voltage value for "XX "
- (2) Required for stability. For value given, capacitor must be solid tantalum. If aluminium electronics are used, at least ten times value shown should be selected. CI is required if regulator is located an appreciable distance from power supply filter.
- (3) To improve transient response. If large capacitors are used, a high current diode from input to output (1N400l or similar) should be introduced to protect the device from momentary input short circuit.

Mechanical Dimensions

Package

Dimensions in millimeters





Ordering Information

Product Number	Output Voltage Tolerance	Package	Operating Temperature
LM7905CT			
LM7906CT	±4%		
LM7908CT			
LM7909CT		TO-220 (Single Gauge)	
LM7910CT			0 ~ +125°C
LM7912CT		(Onigie Gauge)	
LM7915CT			
LM7918CT			
LM7924CT			

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