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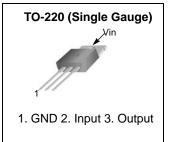
# LM79XX 3-Terminal 1A Negative Voltage Regulator

### Features

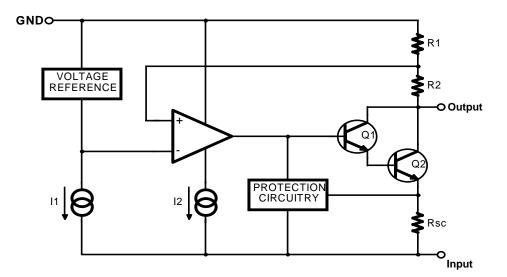
- Output Current in Excess of 1A
- Output Voltages of -5, -6, -8 , -9, -10, -12, -15, -18 and 24V
- Internal Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Compensation

### 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 <sub>θ</sub> JC	5	°C/W
Thermal Resistance Junction-Air (Note1, 2)	RθJA	65	C/VV
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	Con	ditions	Min.	Тур.	Max.	Unit
		TJ = +25°C		-4.8	-5.0	-5.2	
Output Voltage	Vo	IO = 5mA to 1A, PO $\leq$ 15W VI = -7V to -20V		-4.75	-5.0	-5.25	V
Line Regulation (Note2)		$\Delta V_{O}$ T <sub>J</sub> = +25°C VI =	VI = -7V to -25V	-	35	100	mV
Line Regulation (Note3)	200	1J = +25 C	VI = -8V to -12V	-	8	50	ΠIV
Load Regulation (Note3)		$V_{O} = \frac{T_{J} = +25^{\circ}C}{T_{J} = +25^{\circ}C}$ $T_{J} = +25^{\circ}C$ $T_{J} = +25^{\circ}C$ $T_{J} = 250$ mA to 750 mA		-	10	100	mV
	200			-	3	50	111 V
Quiescent Current	lQ	TJ =+25°C		-	3	6	mA
Quiescent Current Change		$I_{O} = 5mA \text{ to } 1A$	-	0.05	0.5	mA	
Quiescent Current Change	ΔlQ	VI = -8V to -25V		-	0.1	0.8	ШA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	- 0.4	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T <sub>A</sub> =+25°C	κHz	-	40	-	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	TJ =+25°C		-	2.2	-	А

#### Note

### Electrical Characteristics (LM7906) (Continued)

(VI = -11V, 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
		Vo $T_J = +25^{\circ}C$ $I_O = 5mA \text{ to } 1A, P_O \le 15W$ $V_I = -9V \text{ to } -21V$		-5.75	-6	-6.25	
Output Voltage	Vo			-5.7	-6	-6.3	V
Line Regulation (Note1)	ΔVο	TJ = +25°C	VI = -8V to -25V	-	10	120	mV
Line Regulation (Note1)	200	1 J = +25 C	VI = -9V to -13V	-	5	60	IIIV
Load Regulation (Note1)	Δνο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	10	120	mV
	200			-	3	60	IIIV
Quiescent Current	lQ	TJ =+25°C		-	3	6	mA
Quiescent Current Change	ΔΙΟ	$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Questent Current Change		VI = -8V to -25V		-	0.1	1.3	
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.5	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T <sub>A</sub> =+25°C	κHz	-	130	-	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	Iрк	TJ = +25°C		-	2.2	-	А

#### Note

### Electrical Characteristics (LM7908) (Continued)

(VI = -14V, 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 $I_{O} = 5mA \text{ to } 1A P_{O} < 15W$		-7.7	-8	-8.3	
Output Voltage	Vo			-7.6	-8	-8.4	V
Line Degulation (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)	Δνο	TJ = +25°C IO = 5mA to 1.8	5A	-	12	160	mV
	200	TJ =+25°C IO = 250mA to 750mA		-	4	80	IIIV
Quiescent Current	lQ	TJ =+25°C		-	3	6	mA
Quiescent Current Change	410	IO = 5mA to 1A	-	0.05	0.5	mA	
Quiescent Current Change	ΔlQ	VI = -10.5V to -	-25V	-	0.1	1	IIIA
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.6	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100 T <sub>A</sub> =+25°C	)kHz	-	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,  $0^{\circ}C \le T_J \le +125^{\circ}C$ , CI =2.2µF, CO =1µF, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Тур.	Max.	Unit
		$V_{O} = 5mA \text{ to } 1A, P_{O} \le 15W$ $V_{I} = -1.5V \text{ to } -23V$		-8.7	-9.0	-9.3	
Output Voltage	Vo			-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)	Δνο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	12	180	mV
	740			$T_J = +25^{\circ}C$	-	4	90
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiescent Current Change	ΔlQ	$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Questent 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	VN	f = 10Hz to 100k T <sub>A</sub> = +25°C	⟨Hz	-	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	Iрк	TJ = +25°C		-	2.2	-	Α

#### Note:

### Electrical Characteristics (LM7910) (Continued)

(VI = -17V, 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		-9.6	-10	-10.4	
Output Voltage	Vo	$\label{eq:IO} \begin{array}{l} \text{IO} = 5\text{mA to 1A}, \ \text{Pd} \leq 15\text{W} \\ \text{VI} = -12\text{V to } -28 \end{array}$		-9.5	-10	-10.5	V
Line Regulation (Note1)		Тј = +25°С	VI = -12.5V to -28V	-	12	200	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -14V to -20V	-	6	100	mv
Load Pogulation (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	200	mV
Load Regulation (Note1)	TJ = +2			$T_J = +25^{\circ}C$	-	4	100
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quisseent Current Change		$I_{O} = 5mA \text{ to } 1A$		-	0.05	0.5	mA
Quiescent Current Change	ΔlQ	VI = -12.5V to -2	28V	-	0.1	1	
Temperature Coefficient of VO	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	$\begin{array}{l} 10 Hz \leq f \leq 100 kH \\ T_A =+25^{\circ}C \end{array}$	Hz	-	280	-	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	T <sub>J</sub> = +25°C, V <sub>I</sub> = -35V		-	300	-	mA
Peak Current	Iрк	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
Line Regulation (Note1)	41/0	VI = -14.5V to -30V		-	12	240	mV
Line Regulation (Note1)	ΔVo	TJ = +25°C	VI = -16V to -22V	-	6	120	mv
Load Population (Noto1)	ΔVo	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	12	240	mV
Load Regulation (Note1)	200			-	4	120	mv
Quiescent Current	lq	TJ = +25°C		-	3	6	mA
Quiescent Current Change		$\Delta I_Q = 5mA \text{ to } 1A$ $V_I = -14.5V \text{ to } -30V$	-	0.05	0.5	mA	
Quiescent Current Change	ΔIQ		VI = -14.5V to -30V	-	0.1	1	ША
Temperature Coefficient of $V_D$	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.8	-	mV/∘C
Output Noise Voltage	VN	f = 10Hz to 100k T <sub>A</sub> = +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	lрк	TJ = +25°C		-	2.2	-	А

#### Note:

### Electrical Characteristics (LM7915) (Continued)

(VI = -23V, 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
		VQ $I_{O} = 5mA \text{ to } 1A \text{ PO} \le 15W$		-14.4	-15	-15.6	
Output Voltage	Vo					-14.25	-15
Line Pegulation (Note1)		$\Delta V_{O}$ T <sub>J</sub> = +25°C	VI = -17.5V to -30V	-	12	300	mV
Line Regulation (Note1)	ΔVo	1J = +25 C	VI = -20V to -26V	-	6	150	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	300	mV
				-	4	150	IIIV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiescent Current Change	410	$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Quiescent Current Change	ΔlQ	VI = -17.5V to -3	80V	-	0.1	1	
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-0.9	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T <sub>A</sub> =+25°C	κHz	-	250	-	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	Iрк	TJ = +25°C		-	2.2	-	А

#### Note:

### Electrical Characteristics (LM7918) (Continued)

(VI = -27V, 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
		VO $I_{O} = 5mA$ to 1A PO < 15W		-17.3	-18	-18.7	
Output Voltage	Vo			-17.1	-18	-18.9	V
Line Regulation (Note1)	ΔVο	ТJ = +25°С	VI = -21V to -33V	-	15	360	mV
Line Regulation (Note I)	ΔνΟ	1 J = +25 C	VI = -24V to -30V	-	8	180	IIIV
Load Regulation (Note1)	ΔVο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	15	360	mV
	740			-	5	180	IIIV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiescent Current Change	Ale	$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Quiescent Current Change	ΔlQ	VI = -21V to -33V	V	-	0.1	1	
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100k T <sub>A</sub> = +25°C	Ήz	-	300	-	μV
Ripple Rejection	RR	f = 120Hz ∆VI = 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	Iрк	TJ = +25°C		-	2.2	-	А

#### Note:

### Electrical Characteristics (LM7924) (Continued)

(VI = -33V, 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
		$V_{O} = \frac{T_{J} = +25^{\circ}C}{I_{O} = 5mA \text{ to } 1A, P_{O} \le 15W}$ $V_{I} = -27V \text{ to } -38V$		-23	-24	-25	
Output Voltage	Vo			-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 Regulation (Note1)	ΔVο	$T_{J} = +25^{\circ}C$ $I_{O} = 5mA \text{ to } 1.5A$ $T_{J} = +25^{\circ}C$ $I_{O} = 250mA \text{ to } 750mA$		-	15	480	mV
				-	5	240	IIIV
Quiescent Current	lQ	TJ = +25°C		-	3	6	mA
Quiescent Current Change	ΔlQ	$I_{O} = 5mA$ to $1A$		-	0.05	0.5	mA
Quiescent Current Change	ΔIQ	VI = -27V to -38	V	-	0.1	1	
Temperature Coefficient of VD	$\Delta Vo/\Delta T$	IO = 5mA		-	-1	-	mV/°C
Output Noise Voltage	VN	f = 10Hz to 100 T <sub>A</sub> = +25°C	кНz	-	400	-	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	Iрк	TJ = +25°C		-	2.2	-	А

#### Note:

### **Typical Performance Characteristics**

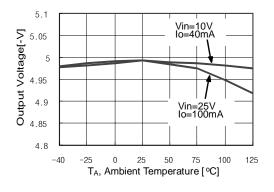


Figure 1. Output Voltage

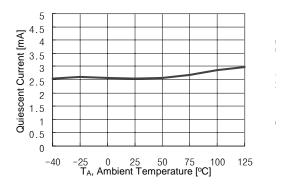


Figure 3. Quiescent Current

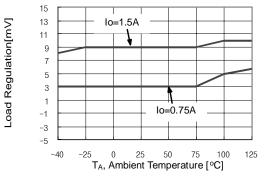


Figure 2. Load Regulation

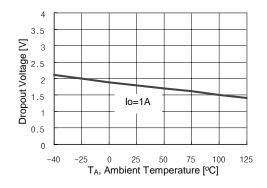


Figure 4. Dropout Voltage

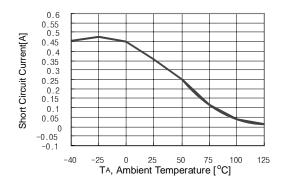


Figure 5. Short Circuit Current

### **Typical Applications**

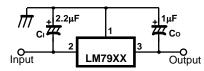


Figure 6. Negative Fixed output regulator

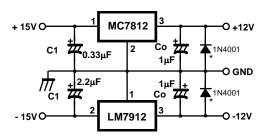


Figure 7. Split power supply (  $\pm$  12V/1A)

#### Notes:

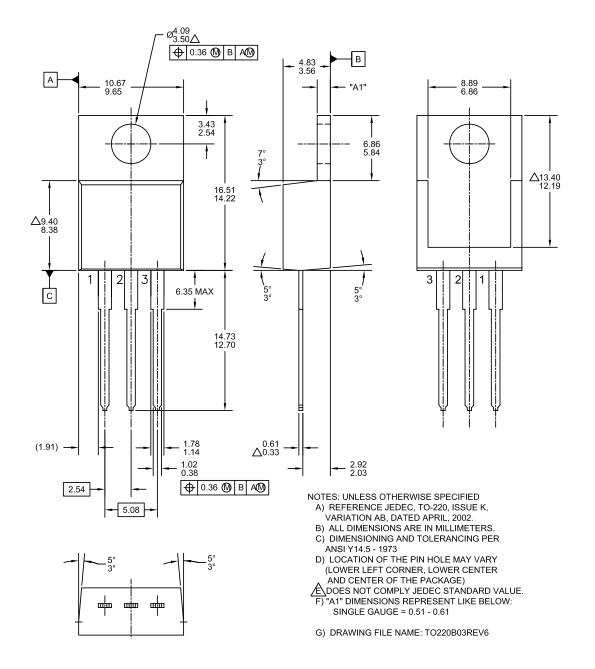
- (1) To specify an output voltage, substitute voltage value for "XX "
- (2) Required for stability. For value given, capacitor must be solid tantalum. If aluminium electronics are used, at least ten times value shown should be selected. CI is required if regulator is located an appreciable distance 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**

## TO-220 [ SINGLE GAUGE ]



## **Ordering Information**

Product Number	Output Voltage Tolerance	Package	Operating Temperature		
LM7905CT					
LM7906CT	±4%				
LM7908CT					
LM7909CT		<b>TO</b> 000			
LM7910CT		TO-220 (Single Gauge)	0 ~ +125°C		
LM7912CT		(enigie euuge)			
LM7915CT					
LM7918CT					
LM7924CT					

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