

# GL79XX Series

## NEGATIVE VOLTAGE REGULATOR

### Description

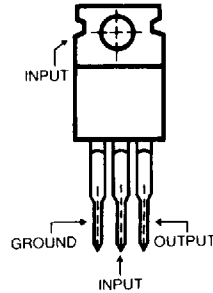
The GL79XX series of fixed output negative voltage regulators are intended as complements to the popular GL78XX series devices. Available in fixed output voltage options from  $-5$  to  $-24$  Volts, these regulators employ internal current limiting, thermal shutdown, and safe-area compensation-making them remarkably rugged under most operating conditions. With adequate heat-sinking they can deliver output currents in excess of 1.0A.

### Features

- High Line Regulation
- High Load Regulation
- Good Ripple Rejection (70dB)
- Low Temperature Coefficient of Output\* ( $-1.0\text{mV}/^\circ\text{C}$ )
- Wide Range Input Voltage
- Low Input Bias Current
- Low Output Noise
- Output Current in Excess of 1A

### Pin Configuration

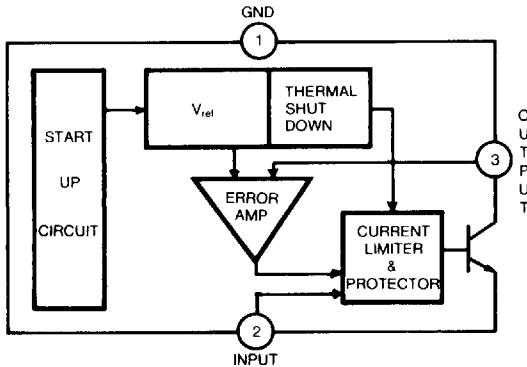
(Top View)



### Type No/Voltage

GL7905	-5.0 Volts
GL7909	-9.0 Volts
GL7912	-12.0 Volts
GL7915	-15.0 Volts
GL7924	-24.0 Volts

### Block Diagram



### Maximum Ratings (T<sub>A</sub> = 25°C)

- Input Voltage  
( $-5\text{V}$  Through  $-15\text{V}$ )       $-35\text{V}$   
( $-24\text{V}$ )       $-40\text{V}$
- Output Current       $2.2\text{A}$
- Power Dissipation      Internally Limited
- Operating Junction Temp.       $0^\circ\text{C}$  to  $+150^\circ\text{C}$
- Storage Temp.       $-65^\circ\text{C}$  to  $+150^\circ\text{C}$
- Lead Temp.       $230^\circ\text{C}$   
(Soldering, 10S)

## GL7905 Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN.	MAX.		
Output Voltage (1)	$V_{O1}$	$T_J = 25^\circ\text{C}$ , $V_{in} = -10\text{V}$ , $I_o = 500\text{mA}$	-5.2	-4.8	V	
Output Voltage (2)	$V_{O2}$	$-20\text{V} \leq V_{in} \leq -7\text{V}$ , $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	-5.25	-4.75	V	
Line Regulation	$\Delta V_{O1}$	$T_J = 25^\circ\text{C}$	$-25\text{V} \leq V_{in} \leq -7\text{V}$ , $I_o = 100\text{mA}$		50	mV
	$\Delta V_{O2}$		$-12\text{V} \leq V_{in} \leq -8\text{V}$ , $I_o = 100\text{mA}$		25	mV
	$\Delta V_{O3}$		$-25\text{V} \leq V_{in} \leq -7\text{V}$ , $I_o = 500\text{mA}$		100	mV
	$\Delta V_{O4}$		$-12\text{V} \leq V_{in} \leq -8\text{V}$ , $I_o = 500\text{mA}$		50	mV
Load Regulation	$\Delta V_{O5}$	$T_J = 25^\circ\text{C}$	$5.0\text{mA} \leq I_o \leq 1.5\text{A}$ , $V_{in} = -10\text{V}$		100	mV
	$\Delta V_{O6}$		$250\text{mA} \leq I_o \leq 750\text{mA}$ , $V_{in} = -10\text{V}$		50	mV
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$ , $V_{in} = -10\text{V}$ , $I_o = 500\text{mA}$		2.0	mA	
Quiescent Current Change	$\Delta I_{Q1}$	$-25\text{V} \leq V_{in} \leq -17\text{V}$ , $I_o = 500\text{mA}$		1.3	mA	
	$\Delta I_{Q2}$	$V_{in} = -10\text{V}$ , $5\text{mA} \leq I_o \leq 1.5\text{A}$		0.5	mA	
Output Noise Voltage	$N_o$	$V_{in} = -10\text{V}$ , $I_o = 500\text{mA}$ $10\text{Hz} \leq f \leq 100\text{kHz}$		80	$\mu\text{V}$	
Ripple Rejection	$R_R$	$T_J = 25^\circ\text{C}$ , $V_i = 1V_{(rms)}$ , $120\text{Hz}$ , $I_o = 20\text{mA}$ , $-18\text{V} \leq V_{in} \leq -8\text{V}$	54		dB	
Input-Output Voltage Differential	$V_d$	$T_J = 25^\circ\text{C}$ , $I_o = 1.0\text{A}$		1.1(TYP)	V	

## GL7909 Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN.	MAX.		
Output Voltage (1)	$V_{O1}$	$T_J = 25^\circ\text{C}$ , $V_{in} = -15\text{V}$ , $I_o = 500\text{mA}$	-9.35	-8.65	V	
Output Voltage (2)	$V_{O2}$	$-24\text{V} \leq V_{in} \leq -11.5\text{V}$ , $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	-9.55	-8.55	V	
Line Regulation	$\Delta V_{O1}$	$T_J = 25^\circ\text{C}$	$-26\text{V} \leq V_{in} \leq -11.5\text{V}$ , $I_o = 100\text{mA}$		90	mV
	$\Delta V_{O2}$		$-18\text{V} \leq V_{in} \leq -12\text{V}$ , $I_o = 100\text{mA}$		45	mV
	$\Delta V_{O3}$		$-26\text{V} \leq V_{in} \leq -11.5\text{V}$ , $I_o = 500\text{mA}$		180	mV
	$\Delta V_{O4}$		$-18\text{V} \leq V_{in} \leq -12\text{V}$ , $I_o = 500\text{mA}$		90	mV
Load Regulation	$\Delta V_{O5}$	$T_J = 25^\circ\text{C}$	$5.0\text{mA} \leq I_o \leq 1.5\text{A}$ , $V_{in} = -15\text{V}$		180	mV
	$\Delta V_{O6}$		$250\text{mA} \leq I_o \leq 750\text{mA}$ , $V_{in} = -15\text{V}$		90	mV
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$ , $V_{in} = -15\text{V}$ , $I_o = 500\text{mA}$		3	mA	
Quiescent Current Change	$\Delta I_{Q1}$	$-26\text{V} \leq V_{in} \leq -11.5\text{V}$ , $I_o = 500\text{mA}$		1.0	mA	
	$\Delta I_{Q2}$	$V_{in} = -15\text{V}$ , $5\text{mA} \leq I_o \leq 1.5\text{A}$		0.5	mA	
Output Noise Voltage	$N_o$	$V_{in} = -15\text{V}$ , $I_o = 500\text{mA}$ $10\text{Hz} \leq f \leq 100\text{kHz}$		120	$\mu\text{V}$	
Ripple Rejection	$R_R$	$T_J = 25^\circ\text{C}$ , $V_i = 1V_{(rms)}$ , $120\text{Hz}$ , $I_o = 20\text{mA}$ , $-22\text{V} \leq V_{in} \leq -12\text{V}$	54		dB	
Input-Output Voltage Differential	$V_d$	$T_J = 25^\circ\text{C}$ , $I_o = 1.0\text{A}$		1.1(TYP)	V	

## GL7912 Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN.	MAX.		
Output Voltage (1)	$V_{O1}$	$T_J = 25^\circ\text{C}$ , $V_{in} = -19\text{V}$ , $I_o = 500\text{mA}$	-12.5	-11.5	V	
Output Voltage (2)	$V_{O2}$	$-27\text{V} \leq V_{in} \leq -14.5\text{V}$ , $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	-12.5	-11.4	V	
Line Regulation	$\Delta V_{O1}$	$T_J = 25^\circ\text{C}$		$-30\text{V} \leq V_{in} \leq -14.5\text{V}$ , $I_o = 100\text{mA}$	120	mV
	$\Delta V_{O2}$			$-22\text{V} \leq V_{in} \leq -16\text{V}$ , $I_o = 100\text{mA}$	60	mV
	$\Delta V_{O3}$			$-30\text{V} \leq V_{in} \leq -14.5\text{V}$ , $I_o = 500\text{mA}$	240	mV
	$\Delta V_{O4}$			$-22\text{V} \leq V_{in} \leq -16\text{V}$ , $I_o = 500\text{mA}$	120	mV
Load Regulation	$\Delta V_{O5}$	$T_J = 25^\circ\text{C}$		$5.0\text{mA} \leq I_o \leq 1.5\text{A}$ , $V_{in} = -19\text{V}$	240	mV
	$\Delta V_{O6}$			$250\text{mA} \leq I_o \leq 750\text{mA}$ , $V_{in} = -19\text{V}$	120	mV
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$ , $V_{in} = -19\text{V}$ , $I_o = 500\text{mA}$		3	mA	
Quiescent Current Change	$\Delta I_{Q1}$	$-30\text{V} \leq V_{in} \leq -14.5\text{V}$ , $I_o = 500\text{mA}$			1.0	mA
	$\Delta I_{Q2}$				$V_{in} = -19\text{V}$ , $5\text{mA} \leq I_o \leq 1.5\text{A}$	0.5
Output Noise Voltage	$N_o$	$V_{in} = -19\text{V}$ , $I_o = 500\text{mA}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		150	$\mu\text{V}$	
Ripple Rejection	$R_R$	$T_J = 25^\circ\text{C}$ , $V_i = 1V_{(rms)}$ , $120\text{Hz}$ , $I_o = 20\text{mA}$ , $-25\text{V} \leq V_{in} \leq -15\text{V}$	54		dB	
Input-Output Voltage Differential	$V_d$	$T_J = 25^\circ\text{C}$ , $I_o = 1.0\text{A}$		1.1(TYP)	V	

## GL7915 Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN	MAX		
Output Voltage (1)	$V_{O1}$	$T_J = 25^\circ\text{C}$ , $V_{in} = -23\text{V}$ , $I_o = 500\text{mA}$	-15.6	-14.4	V	
Output Voltage (2)	$V_{O2}$	$-30\text{V} \leq V_{in} \leq -17.5\text{V}$ , $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	-15.75	-14.25	V	
Line Regulation	$\Delta V_{O1}$	$T_J = 25^\circ\text{C}$		$-30\text{V} \leq V_{in} \leq -17.5\text{V}$ , $I_o = 100\text{mA}$	150	mV
	$\Delta V_{O2}$			$-26\text{V} \leq V_{in} \leq -20\text{V}$ , $I_o = 100\text{mA}$	75	mV
	$\Delta V_{O3}$			$-30\text{V} \leq V_{in} \leq -17.5\text{V}$ , $I_o = 500\text{mA}$	300	mV
	$\Delta V_{O4}$			$-26\text{V} \leq V_{in} \leq -20\text{V}$ , $I_o = 500\text{mA}$	150	mV
Load Regulation	$\Delta V_{O5}$	$T_J = 25^\circ\text{C}$		$5.0\text{mA} \leq I_o \leq 1.5\text{A}$ , $V_{in} = -23\text{V}$	300	mV
	$\Delta V_{O6}$			$250\text{mA} \leq I_o \leq 750\text{mA}$ , $V_{in} = -23\text{V}$	150	mV
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$ , $V_{in} = -23\text{V}$ , $I_o = 500\text{mA}$		3	mA	
Quiescent Current Change	$\Delta I_{Q1}$	$-30\text{V} \leq V_{in} \leq -17.5\text{V}$ , $I_o = 500\text{mA}$			1.0	mA
	$\Delta I_{Q2}$				$V_{in} = -23\text{V}$ , $5\text{mA} \leq I_o \leq 1.5\text{A}$	0.5
Output Noise Voltage	$N_o$	$V_{in} = -23\text{V}$ , $I_o = 500\text{mA}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		180	$\mu\text{V}$	
Ripple Rejection	$R_R$	$T_J = 25^\circ\text{C}$ , $V_i = 1V_{(rms)}$ , $120\text{Hz}$ , $I_o = 20\text{mA}$ , $-28.5\text{V} \leq V_{in} \leq -18.5\text{V}$	54		dB	
Input-Output Voltage Differential	$V_d$	$T_J = 25^\circ\text{C}$ , $I_o = 1.0\text{A}$		1.1(TYP)	V	

# GL79XX Series

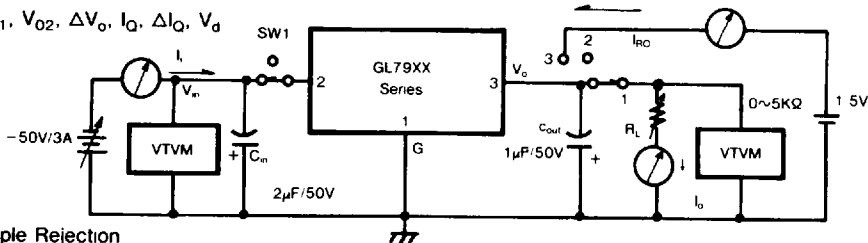
## GL7924 Electrical Characteristics ( $T_A = 25^\circ\text{C}$ )

$C_{in} = 2\mu\text{F}$ ,  $C_{out} = 1\mu\text{F}$

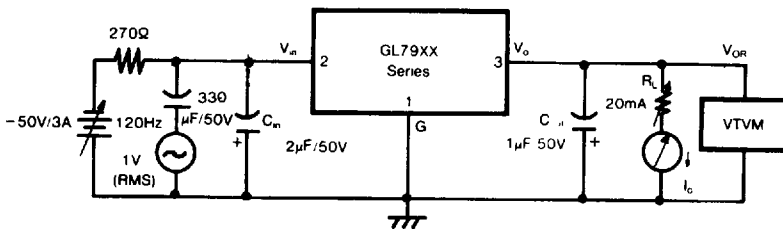
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN	MAX.		
Output Voltage (1)	$V_{O1}$	$T_J = 25^\circ\text{C}$ , $V_{in} = -33\text{V}$ , $I_o = 500\text{mA}$	-25	-23	V	
Output Voltage (2)	$V_{O2}$	$-38\text{V} \leq V_{in} \leq -27\text{V}$ , $50\text{mA} \leq I_o \leq 1.0\text{A}$	-25.2	-22.8	V	
Line Regulation	$\Delta V_{O1}$	$T_J = 25^\circ\text{C}$	$-38\text{V} \leq V_{in} \leq -27\text{V}$ , $I_o = 100\text{mA}$		240	mV
	$\Delta V_{O2}$		$-36\text{V} \leq V_{in} \leq -30\text{V}$ , $I_o = 100\text{mA}$		120	mV
	$\Delta V_{O3}$		$-38\text{V} \leq V_{in} \leq -27\text{V}$ , $I_o = 500\text{mA}$		480	mV
	$\Delta V_{O4}$		$-36\text{V} \leq V_{in} \leq -30\text{V}$ , $I_o = 500\text{mA}$		240	mV
Load Regulation	$\Delta V_{O5}$	$T_J = 25^\circ\text{C}$	$5.0\text{mA} \leq I_o \leq 1.5\text{A}$ , $V_{in} = -33\text{V}$		480	mV
	$\Delta V_{O6}$		$250\text{mA} \leq I_o \leq 750\text{mA}$ , $V_{in} = -33\text{V}$		240	mV
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$ , $V_{in} = -33\text{V}$ , $I_o = 500\text{mA}$			3	mA
Quiescent Current Change	$\Delta I_{Q1}$	$-38\text{V} \leq V_{in} \leq -27\text{V}$ , $I_o = 500\text{mA}$			1.0	mA
	$\Delta I_{Q2}$	$V_{in} = -33\text{V}$ , $5\text{mA} \leq I_o \leq 1.5\text{A}$			0.5	mA
Output Noise Voltage	$N_o$	$V_{in} = -33\text{V}$ , $I_o = 500\text{mA}$ $10\text{Hz} \leq f \leq 100\text{KHz}$			270	$\mu\text{V}$
Ripple Rejection	$R_R$	$T_J = 25^\circ\text{C}$ , $V_i = 1\text{V}_{(\text{rms})}$ , $120\text{Hz}$ , $I_o = 20\text{mA}$ , $-38\text{V} \leq V_{in} \leq -28\text{V}$	54			dB
Input-Output Voltage Differential	$V_d$	$T_J = 25^\circ\text{C}$ , $I_o = 1.0\text{A}$	1.1 (TYP)			V

### \*GL79XX Series Test Circuit (AC & DC)

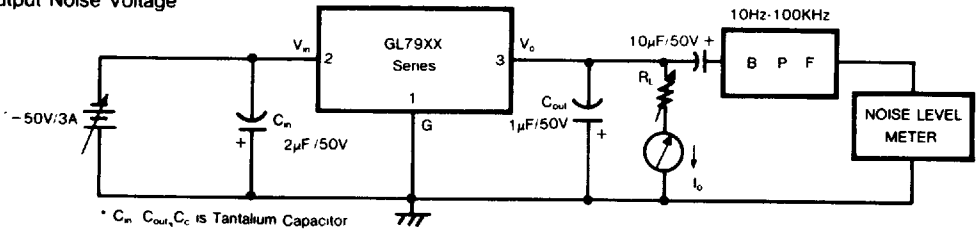
1.  $V_{O1}$ ,  $V_{O2}$ ,  $\Delta V_o$ ,  $I_Q$ ,  $\Delta I_Q$ ,  $V_d$



2. Ripple Rejection



3. Output Noise Voltage



\*  $C_{in}$ ,  $C_{out}$ ,  $C_c$  is Tantalum Capacitor

## TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ unless otherwise noted.)

FIGURE 1 – AVERAGE CASE POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE (TO-220)

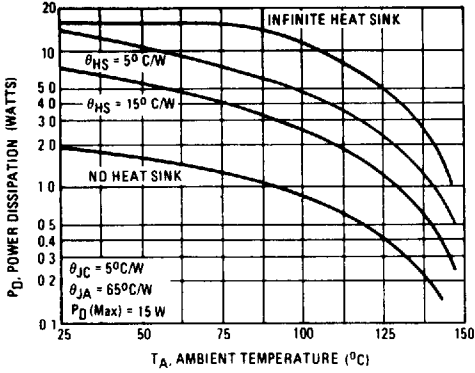


FIGURE 2 – PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

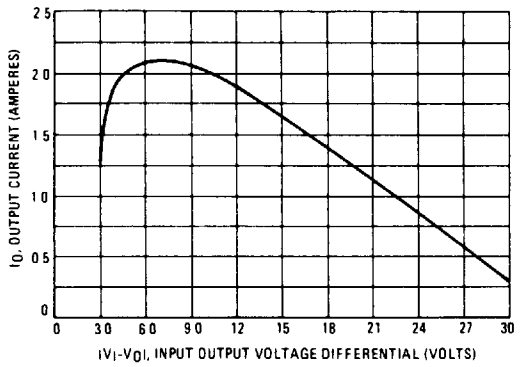


FIGURE 3 – RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

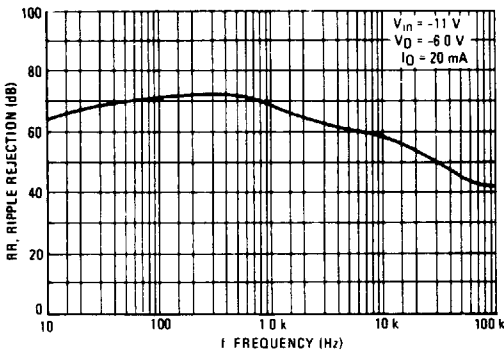


FIGURE 4 – RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES

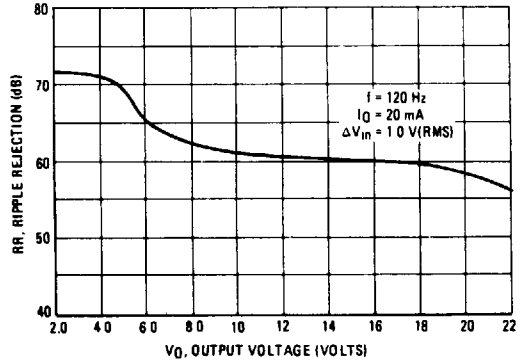


FIGURE 5 – OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

