

GL78XX Series

POSITIVE VOLTAGE REGULATOR

Description

The GL78XX Series are monolithic integrated circuits designed as fixed-voltage regulator. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation.

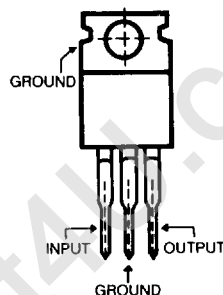
With adequate heatsinking they can deliver over 1.5A output currents. They are intended as fixed voltage regulators in a wide range of applications.

Features

- No External Components Required
- High Line Regulation
- High Load Regulation
- Good Ripple Rejection (70dB)
- Low Temperature Coefficient of Output (1.0mV/°C)
- Wide Range Input Voltage
- Low Input Bias Current
- Low Output Noise
- Output Current in Excess of 1.5A

Pin Configuration

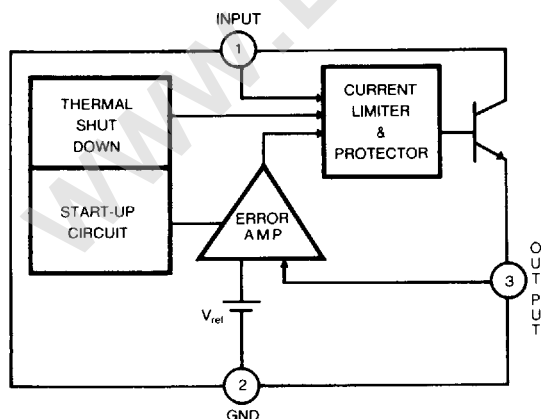
(Top View)



Type No/Voltage

GL7805	5.0 Volts
GL7806	6.0 Volts
GL7808	8.0 Volts
GL7809	9.0 Volts
GL7812	12.0 Volts
GL7815	15.0 Volts
GL7824	24.0 Volts

Block Diagram



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

- Input Voltage (5V Through 15V) 35V
- Input Voltage (24V) 40V
- Output Current 3.3A
- Power Dissipation 15W
- Operating Junction Temp. 0°C to $+125^\circ\text{C}$
- Storage Temp. -65°C to $+150^\circ\text{C}$
- Lead Temp. (Soldering, 10S) 230°C

GL7805 Electrical Characteristics ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN	MAX.		
Output Voltage (1)	V_{O1}	$T_J = 25^\circ\text{C}$, $V_{in} = 10\text{V}$, $I_o = 500\text{mA}$	4.8	5.2	V	
Output Voltage (2)	V_{O2}	$7\text{V} \leq V_{in} \leq 20\text{V}$, $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	4.75	5.25	V	
Line Regulation	ΔV_{O1}	$T_J = 25^\circ\text{C}$	$7 \leq V_{in} \leq 25\text{V}$, $I_o = 500\text{mA}$		50	mV
	ΔV_{O2}		$8\text{V} \leq V_{in} \leq 12\text{V}$, $I_o = 500\text{mA}$		25	mV
Load Regulation	ΔV_{O3}	$T_J = 25^\circ\text{C}$	$5.0\text{mA} \leq I_o \leq 1.5\text{A}$, $V_{in} = 10\text{V}$		50	mV
	ΔV_{O4}		$250\text{mA} \leq I_o \leq 750\text{mA}$, $V_{in} = 10\text{V}$		25	mV
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$, $V_{in} = 10\text{V}$, $I_o = 500\text{mA}$		8	mA	
Quiescent Current Change	ΔI_{Q1}	$7\text{V} \leq V_{in} \leq 25\text{V}$, $I_o = 500\text{mA}$		1.3	mA	
	ΔI_{Q2}	$5.0\text{mA} \leq I_o \leq 1.0\text{A}$, $V_{in} = 10\text{V}$		0.5	mA	
Output Noise Voltage	N_o	$V_{in} = 10\text{V}$, $I_o = 500\text{mA}$, $10\text{Hz} \leq f \leq 100\text{KHz}$	40(TYP)		μV	
Ripple Rejection	R_R	$T_J = 25^\circ\text{C}$, $V_i = 1\text{V}_{(rms)}$, 120Hz , $I_o = 20\text{mA}$, $8\text{V} \leq V_{in} \leq 18\text{V}$	62		dB	
Input-Output Voltage Differential	V_d	$T_J = 25^\circ\text{C}$, $I_o = 1.0\text{A}$	2(TYP)		V	
Short-Circuit Limit	I_{sc}	$V_{in} = 35\text{V}$, Output-GND		1.0	A	
Peak Output Current	I_{peak}	$T_J = 25^\circ\text{C}$, $V_{in} = 12\text{V}$, $V_o = 4.75\text{V}$	1.5	3.3	A	

GL7806 Electrical Characteristics ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN.	MAX.		
Output Voltage (1)	V_{O1}	$T_J = 25^\circ\text{C}$, $V_{in} = 11\text{V}$, $I_o = 500\text{mA}$	5.75	6.25	V	
Output Voltage (2)	V_{O2}	$8\text{V} \leq V_{in} \leq 21\text{V}$, $5.0\text{mA} \leq I_o \leq 1.0\text{A}$	5.7	6.3	V	
Line Regulation	ΔV_{O1}	$T_J = 25^\circ\text{C}$	$8 \leq V_{in} \leq 25\text{V}$, $I_o = 500\text{mA}$		60	mV
	ΔV_{O2}		$9\text{V} \leq V_{in} \leq 13\text{V}$, $I_o = 500\text{mA}$		30	mV
Load Regulation	ΔV_{O3}	$T_J = 25^\circ\text{C}$	$5\text{mA} \leq I_o \leq 1.5\text{A}$, $V_{in} = 11\text{V}$		60	mV
	ΔV_{O4}		$250\text{mA} \leq I_o \leq 750\text{mA}$, $V_{in} = 11\text{V}$		30	mV
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$, $V_{in} = 11\text{V}$, $I_o = 500\text{mA}$		8.0	mA	
Quiescent Current Change	ΔI_{Q1}	$8\text{V} \leq V_{in} \leq 25\text{V}$, $I_o = 500\text{mA}$		1.3	mA	
	ΔI_{Q2}	$V_{in} = 11\text{V}$, $5\text{mA} \leq I_o \leq 1.0\text{A}$		0.5	mA	
Output Noise Voltage	N_o	$V_{in} = 11\text{V}$, $I_o = 500\text{mA}$, $10\text{Hz} \leq f \leq 100\text{KHz}$	45(TYP)		μV	
Ripple Rejection	R_R	$T_J = 25^\circ\text{C}$, $V_i = 1\text{V}_{(rms)}$, 120Hz , $I_o = 20\text{mA}$, $9\text{V} \leq V_{in} \leq 19\text{V}$	57		dB	
Input-Output Voltage Differential	V_d	$T_J = 25^\circ\text{C}$, $I_o = 1.0\text{A}$	2(TYP)		V	
Short-Circuit Limit	I_{sc}	$V_{in} = 35\text{V}$, Output-GND		1.0	A	
Peak Output Current	I_{peak}	$T_J = 25^\circ\text{C}$, $V_{in} = 13\text{V}$, $V_o = 5.7\text{V}$	1.5	3.3	A	

GL7808 Electrical Characteristics (T_A = 25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT
			MIN.	MAX.	
Output Voltage (1)	V _{O1}	T _J =25°C, V _{in} =14V, I _o =500mA	7.7	8.3	V
Output Voltage (2)	V _{O2}	10.5V ≤ V _{in} ≤ 23V, 5.0mA ≤ I _o ≤ 1.0A	7.6	8.4	V
Line Regulation	ΔV _{O1}	T _J =25°C 10.5V ≤ V _{in} ≤ 25V, I _o =500mA		80	mV
	ΔV _{O2}		11V ≤ V _{in} ≤ 17V, I _o =500mA	40	mV
Load Regulation	ΔV _{O3}	T _J =25°C 5.0mA ≤ I _o ≤ 1.5A, V _{in} =14V		80	mV
	ΔV _{O4}		250mA ≤ I _o ≤ 750mA, V _{in} =14V	40	mV
Quiescent Current	I _Q	T _J =25°C, V _{in} =14V, I _o =500mA		8.0	mA
Quiescent Current Change	ΔI _{Q1}	10.5V ≤ V _{in} ≤ 25V, I _o =500mA		1.0	mA
	ΔI _{Q2}	5mA ≤ I _o ≤ 1.0A, V _{in} =14V		0.5	mA
Output Noise Voltage	N _o	V _{in} =14V, I _o =500mA, 10Hz ≤ f ≤ 100KHz	52(TYP)		μV
Ripple Rejection	R _R	T _J =25°C, V _i =1V _(rms) , 120Hz, I _o =20mA, 11.5V ≤ V _{in} ≤ 21.5V	55		dB
Input-Output Voltage Differential	V _d	T _J =25°C, I _o =1.0A	2(TYP)		V
Short-Circuit Limit	I _{sc}	V _{in} =35V, Output-GND		1.0	A
Peak Output Current	I _{peak}	T _J =25°C, V _{in} =15V, V _O =7.6V	1.5	3.3	A

GL7809 Electrical Characteristics (T_A = 25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT
			MIN.	MAX.	
Output Voltage (1)	V _{O1}	T _J =25°C, V _{in} =15V, I _o =500mA	8.64	9.36	V
Output Voltage (2)	V _{O2}	11.5V ≤ V _{in} ≤ 24V, 5.0mA ≤ I _o ≤ 1.0A	8.55	9.45	V
Line Regulation	ΔV _{O1}	T _J =25°C 11.5V ≤ V _{in} ≤ 26V, I _o =500mA		90	mV
	ΔV _{O2}		12V ≤ V _{in} ≤ 18V, I _o =500mA	45	mV
Load Regulation	ΔV _{O3}	T _J =25°C 5.0mA ≤ I _o ≤ 1.5A, V _{in} =15V		90	mV
	ΔV _{O4}		250mA ≤ I _o ≤ 750mA, V _{in} =15V	45	mV
Quiescent Current	I _Q	T _J =25°C, V _{in} =15V, I _o =500mA		8	mA
Quiescent Current Change	ΔI _{Q1}	11.5V ≤ V _{in} ≤ 26V, I _o =500mA		1.0	mA
	ΔI _{Q2}	V _{in} =15V, 5mA ≤ I _o ≤ 1.5A		0.5	mA
Output Noise Voltage	N _o	V _{in} =15V, I _o =500mA, 10Hz ≤ f ≤ 100KHz	60(TYP)		μV
Ripple Rejection	R _R	T _J =25°C, V _i =1V _(rms) , 120Hz, I _o =20mA, 12.5V ≤ V _{in} ≤ 22.5V	55		dB
Input-Output Voltage Differential	V _d	T _J =25°C, I _o =1.0A	2(TYP)		V
Short-Circuit Limit	I _{sc}	V _{in} =35V, Output-GND		1.0	A
Peak Output Current	I _{peak}	T _J =25°C, V _{in} =16V, V _O =8.55V	1.5	3.3	A

GL7812 Electrical Characteristics (T_A = 25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT
			MIN.	MAX.	
Output Voltage (1)	V _{O1}	T _J = 25°C, V _{in} = 19V, I _o = 500mA	11.5	12.5	V
Output Voltage (2)	V _{O2}	14.5V ≤ V _{in} ≤ 27.0V, 5.0mA ≤ I _o ≤ 1.0A	11.4	12.6	V
Line Regulation	ΔV _{O1}	T _J = 25°C 14.5V ≤ V _{in} ≤ 30V, I _o = 500mA		120	mV
	ΔV _{O2}		16.0V ≤ V _{in} ≤ 22V, I _o = 500mA	60	mV
Load Regulation	ΔV _{O3}	T _J = 25°C 5.0mA ≤ I _o ≤ 1.5A, V _{in} = 19V		120	mV
	ΔV _{O4}		250mA ≤ I _o ≤ 750mA, V _{in} = 19V	60	mV
Quiescent Current	I _Q	T _J = 25°C, V _{in} = 19V, I _o = 500mA		8.0	mA
Quiescent Current Change	ΔI _{Q1}	14.5V ≤ V _{in} ≤ 30V, I _o = 500mA		1.0	mA
	ΔI _{Q2}	5.0mA ≤ I _o ≤ 1.0A, V _{in} = 19V		0.5	mA
Output Noise Voltage	No	V _{in} = 19V, I _o = 500mA, 10Hz ≤ f ≤ 100KHz	75(TYP)		μV
Ripple Rejection	R _R	T _J = 25°C, V _i = 1V _(rms) , 120Hz, I _o = 20mA, 15V ≤ V _{in} ≤ 25V	55		dB
Input-Output Voltage Differential	V _d	T _J = 25°C, I _o = 1.0A	2(TYP)		V
Short-Circuit Limit	I _{sc}	V _{in} = 35V, Output-GND		1.0	A
Peak Output Current	I _{peak}	T _J = 25°C, V _{in} = 19V, V _O = 11.4V	1.5	3.3	A

GL7815 Electrical Characteristics (T_A = 25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT
			MIN.	MAX.	
Output Voltage (1)	V _{O1}	T _J = 25°C, V _{in} = 23V, I _o = 500mA	14.4	15.6	V
Output Voltage (2)	V _{O2}	17.5V ≤ V _{in} ≤ 30V, 5.0mA ≤ I _o ≤ 1.0A	14.25	15.75	V
Line Regulation	ΔV _{O1}	T _J = 25°C 17.5V ≤ V _{in} ≤ 30V, I _o = 500mA		150	mV
	ΔV _{O2}		20V ≤ V _{in} ≤ 26V, I _o = 500mA	75	mV
Load Regulation	ΔV _{O3}	T _J = 25°C 5mA ≤ I _o ≤ 1.5A, V _{in} = 23V		150	mV
	ΔV _{O4}		250mA ≤ I _o ≤ 750mA, V _{in} = 23V	75	mV
Quiescent Current	I _Q	T _J = 25°C, V _{in} = 23V, I _o = 500mA		8.0	mA
Quiescent Current Change	ΔI _{Q1}	17.5V ≤ V _{in} ≤ 30V, I _o = 500mA		1.0	mA
	ΔI _{Q2}	5.0mA ≤ I _o ≤ 1.0A, V _{in} = 23V		0.5	mA
Output Noise Voltage	No	V _{in} = 23V, I _o = 500mA, 10Hz ≤ f ≤ 100KHz	90(TYP)		μV
Ripple Rejection	R _R	T _J = 25°C, V _i = 1V _(rms) , 120Hz, I _o = 20mA, 18.5V ≤ V _{in} ≤ 28.5V	54		dB
Input-Output Voltage Differential	V _d	T _J = 25°C, I _o = 1.0A	2(TYP)		V
Short-Circuit Limit	I _{sc}	V _{in} = 35V, Output-GND		1.0	A
Peak Output Current	I _{peak}	T _J = 25°C, V _{in} = 22V, V _O = 14.25V	1.5	3.3	A

GL78XX Series

GL7818 Electrical Characteristics ($T_A=25^\circ\text{C}$)

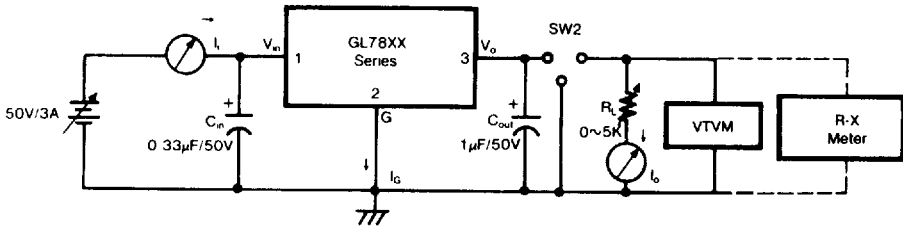
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN	MAX		
Output Voltage(1)	V_{O1}	$T_J=25^\circ\text{C}$, $V_{in}=25\text{V}$, $I_o=500\text{mA}$	17.3	18.7	V	
Output Voltage(2)	V_{O2}	$20.5\text{V}\leq V_{in}\leq 33\text{V}$, $5.0\text{mA}\leq I_o\leq 1.0\text{A}$	17.1	18.9	V	
Line Regulation	ΔV_{O1}	$T_J=25^\circ\text{C}$	$20.5\text{V}\leq V_{in}\leq 33\text{V}$, $I_o=500\text{mA}$		180	mV
	ΔV_{O2}		$24.0\text{V}\leq V_{in}\leq 30\text{V}$, $I_o=500\text{mA}$		90	mV
Load Regulation	ΔV_{O3}	$T_J=25^\circ\text{C}$	$5.0\text{mA}\leq I_o\leq 1.5\text{A}$, $V_{in}=21\text{V}$		180	mV
	ΔV_{O4}		$250\text{mA}\leq V_{I0}\leq 750\text{mA}$, $V_{in}=25\text{V}$		90	mV
Quiescent Current	I_Q	$T_J=25^\circ\text{C}$, $V_{in}=25\text{V}$, $I_o=50\text{mA}$		8.0	mA	
Quiescent Current Change	ΔI_{Q1}	$20.5\text{V}\leq V_{in}\leq 33\text{V}$, $I_o=500\text{mA}$		1.0	mA	
	ΔI_{Q2}	$5.0\text{mA}\leq I_o\leq 1.0\text{A}$, $V_{in}=25\text{V}$		0.5	mA	
Output Noise Voltage	N_o	$V_{in}=25\text{V}$, $I_o=500\text{mA}$, $10\text{Hz}\leq f\leq 100\text{KHz}$	110(TYP)		μV	
Ripple Rejection	R_R	$T_J=25^\circ\text{C}$, $V_i=1\text{V}_{(\text{rms})}$, 120Hz , $I_o=20\text{mA}$ $21\text{V}\leq V_{in}\leq 33\text{V}$	59		dB	
Input-Output Voltage Differential	V_d	$T_J=25^\circ\text{C}$, $I_o=1.0\text{A}$	2(TYP)		V	
Short-Circuit Limit	I_{sc}	$V_{in}=25\text{V}$, Output-GND		1.0	A	
Peak Output Current	I_{peak}	$T_J=25^\circ\text{C}$, $V_{in}=25\text{V}$, $V_o=17.1\text{V}$	15	33	A	

GL7824 Electrical Characteristics ($T_A=25^\circ\text{C}$)

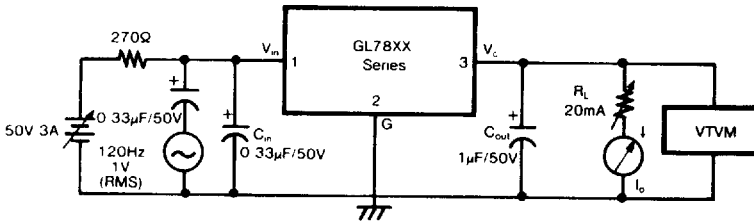
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNIT	
			MIN	MAX.		
Output Voltage (1)	V_{O1}	$T_J=25^\circ\text{C}$, $V_{in}=33\text{V}$, $I_o=500\text{mA}$	23	25	V	
Output Voltage (2)	V_{O2}	$27\text{V}\leq V_{in}\leq 38\text{V}$, $5.0\text{mA}\leq I_o\leq 1.0\text{A}$	22.8	25.2	V	
Line Regulation	ΔV_{O1}	$T_J=25^\circ\text{C}$	$27\text{V}\leq V_{in}\leq 38\text{V}$, $I_o=500\text{mA}$		240	mV
	ΔV_{O2}		$30\text{V}\leq V_{in}\leq 36\text{V}$, $I_o=500\text{mA}$		120	mV
Load Regulation	ΔV_{O3}	$T_J=25^\circ\text{C}$	$5\text{mA}\leq I_o\leq 1.5\text{A}$, $V_{in}=33\text{V}$		240	mV
	ΔV_{O4}		$250\text{mA}\leq I_o\leq 750\text{mA}$, $V_{in}=33\text{V}$		120	mV
Quiescent Current	I_Q	$T_J=25^\circ\text{C}$, $V_{in}=33\text{V}$, $I_o=500\text{mA}$		8.0	mA	
Quiescent Current Change	ΔI_{Q1}	$27\text{V}\leq V_{in}\leq 38\text{V}$, $I_o=500\text{mA}$		1.0	mA	
	ΔI_{Q2}	$5.0\text{mA}\leq I_o\leq 1.0\text{A}$, $V_{in}=33\text{V}$		0.5	mA	
Output Noise Voltage	N_o	$V_{in}=33\text{V}$, $I_o=500\text{mA}$, $10\text{Hz}\leq f\leq 100\text{KHz}$	170(TYP)		μV	
Ripple Rejection	R_R	$T_J=25^\circ\text{C}$, $V_i=1\text{V}_{(\text{rms})}$, 120Hz , $I_o=20\text{mA}$, $28\text{V}\leq V_{in}\leq 38\text{V}$	56		dB	
Input-Output Voltage Differential	V_d	$T_J=25^\circ\text{C}$, $I_o=1.0\text{A}$	2(TYP)		V	
Short-Circuit Limit	I_{sc}	$V_{in}=35\text{V}$, Output-GND		1.0	A	
Peak Output Current	I_{peak}	$T_J=25^\circ\text{C}$, $V_{in}=31\text{V}$, $V_o=22.8\text{V}$	15	33	A	

*GL78XX Series Test Circuit (AC & DC)

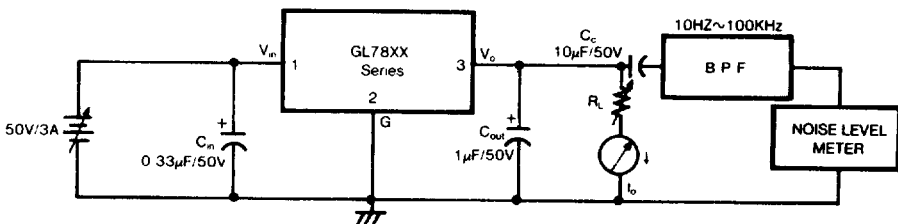
1 V_{O1} , V_{O2} , ΔV_o , I_Q , ΔI_Q , V_d , I_{SC} , I_{break}



2 Ripple Rejection



3 Output Noise Voltage



* C_{in} , C_{out} , C_c IS Tantalium Capacitor

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

FIGURE 1 - AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE

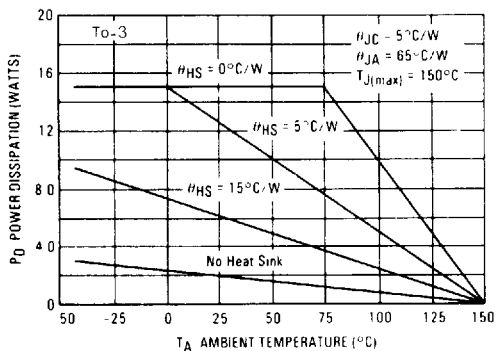


FIGURE 2 - INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

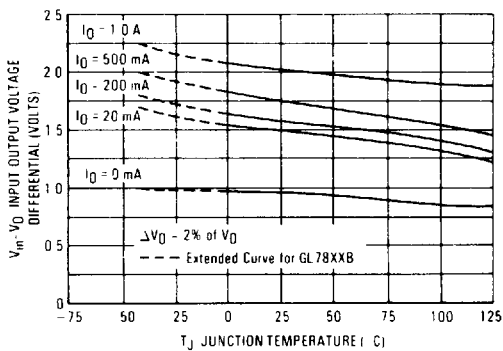


FIGURE 3 - INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

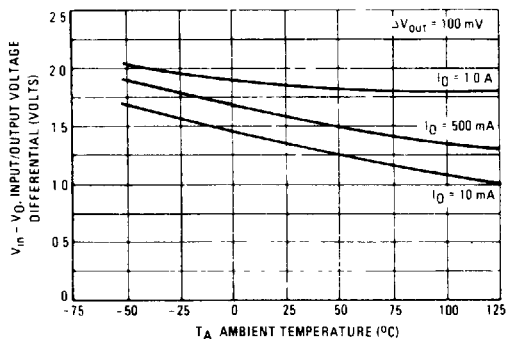


FIGURE 4 - PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

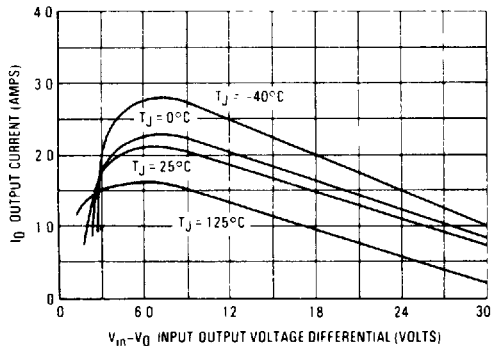


FIGURE 5 - PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

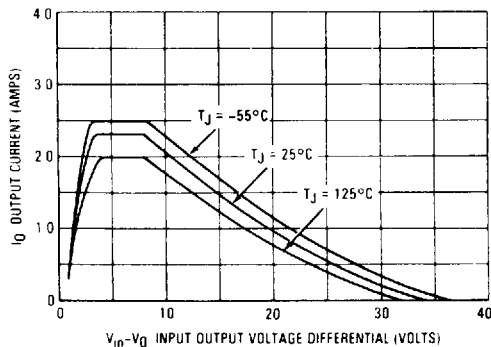
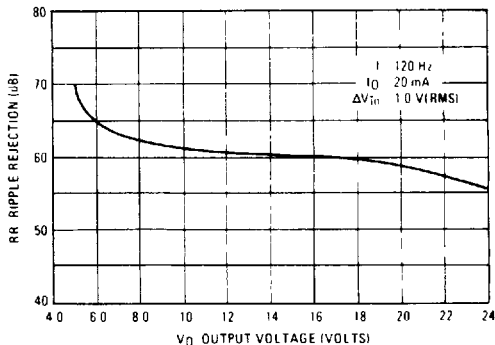


FIGURE 6 - RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES



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

FIGURE 7 – RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

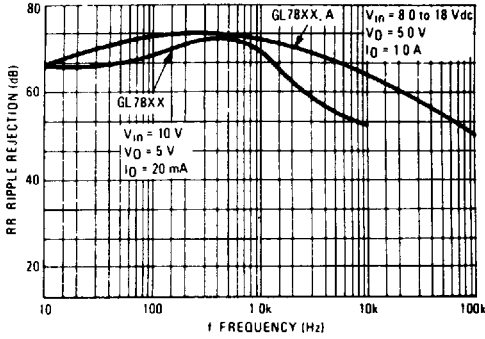


FIGURE 8 – OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

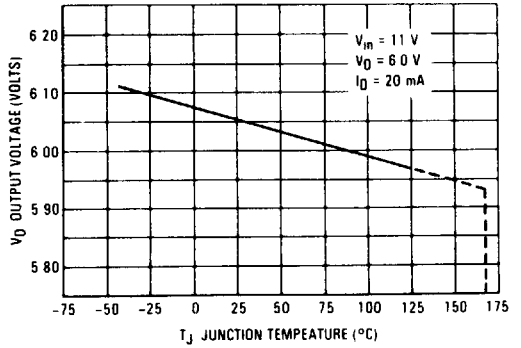


FIGURE 9 – OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

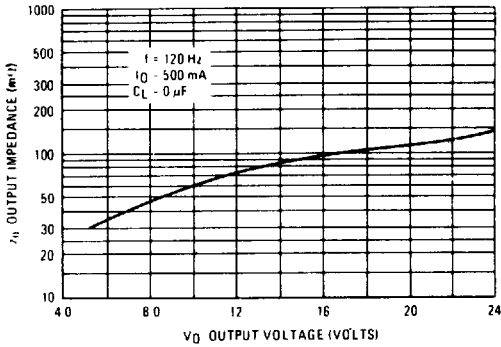


FIGURE 10 – QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

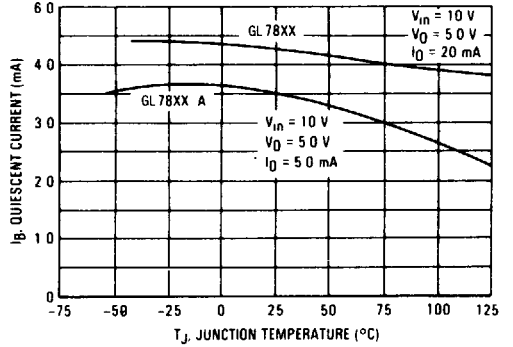


FIGURE 11 – DROPOUT CHARACTERISTICS

