GL78XX Series

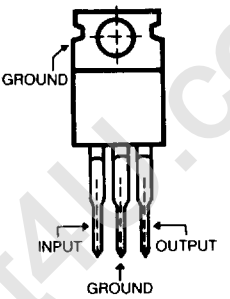
POSITIVE VOLTAGE REGULATOR

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.

Pin Configuration

(Top View)



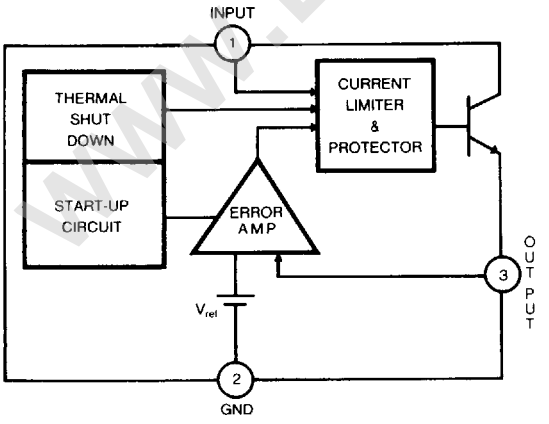
Features

- 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 Exess of 1.5A

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°C)

• Input Voltage (5V Through 15V)	35V
(24V)	40V
• Output Current	3.3A
• Power Dissipation	15W
• Operating Junction Temp.	0°C to +125°C
• Storage Temp.	−65°C to +150°C
• Lead Temp. (Soldering, 10S)	230°C

GL7805 Electrical Characteristics ($T_A = 25°C$)

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN	VALUES MAX.	UNIT
Output Voltage (1)	V_{01}	$T_J = 25°C$, $V_{in} = 10V$, $I_o = 500mA$		4.8	5.2	V
Output Voltage (2)	V_{02}	$7V \leq V_{in} \leq 20V$, $5\ 0mA \leq I_o \leq 1\ 0A$		4 75	5.25	V
Line Regulation	ΔV_{01}	$T_J = 25°C$	$7 \leq V_{in} \leq 25V$, $I_o = 500mA$		50	mV
	ΔV_{02}		$8V \leq V_{in} \leq 12V$, $I_o = 500mA$		25	mV
Load Regulation	ΔV_{03}	$T_J = 25°C$	$5\ 0mA \leq I_o \leq 1\ 5A$, $V_{in} = 10V$		50	mV
	ΔV_{04}		$250mA \leq I_o \leq 750mA$, $V_{in} = 10V$		25	mV
Quiescent Current	I_Q	$T_J = 25°C$, $V_{in} = 10V$, $I_o = 500mA$			8	mA
Quiescent Current Change	ΔI_{Q1}	$7V \leq V_{in} \leq 25V$, $I_o = 500mA$			1.3	mA
	ΔI_{Q2}	$5.0mA \leq I_o \leq 1.0A$, $V_{in} = 10V$			0.5	mA
Output Noise Voltage	No	$V_{in} = 10V$, $I_o = 500mA$, $10Hz \leq f \leq 100KHz$		40(TYP)		μV
Ripple Rejection	R_R	$T_J = 25°C$, $V_I = 1V_{(rms)}$ 120Hz, $I_o = 20mA$, $8V \leq V_{in} \leq 18V$		62		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}	$T_J = 25°C$, $V_{in} = 12V$, $V_O = 4\ 75V$		1.5	3.3	A

GL7806 Electrical Characteristics ($T_A = 25°C$)

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN.	VALUES MAX	UNIT
Output Voltage (1)	V_{01}	$T_J = 25°C$, $V_{in} = 11V$, $I_o = 500mA$		5.75	6.25	V
Output Voltage (2)	V_{02}	$8V \leq V_{in} \leq 21V$, $5.0mA \leq I_o \leq 1.0A$		5.7	6.3	V
Line Regulation	ΔV_{01}	$T_J = 25°C$	$8 \leq V_{in} \leq 25V$, $I_o = 500mA$		60	mV
	ΔV_{02}		$9V \leq V_{in} \leq 13V$, $I_o = 500mA$		30	mV
Load Regulation	ΔV_{03}	$T_J = 25°C$	$5mA \leq I_o \leq 1\ 5A$, $V_{in} = 11V$		60	mV
	ΔV_{04}		$250mA \leq I_o \leq 750mA$, $V_{in} = 11V$		30	mV
Quiescent Current	I_Q	$T_J = 25°C$, $V_{in} = 11V$, $I_o = 500mA$			8.0	mA
Quiescent Current Change	ΔI_{Q1}	$8V \leq V_{in} \leq 25V$, $I_o = 500mA$			1.3	mA
	ΔI_{Q2}	$V_{in} = 11V$, $5mA \leq I_o \leq 1.0A$			0.5	mA
Output Noise Voltage	N_o	$V_{in} = 11V$, $I_o = 500mA$, $10Hz \leq f \leq 100KHz$		45(TYP)		μV
Ripple Rejection	R_R	$T_J = 25°C$, $V_I = 1V_{(rms)}$ 120Hz, $I_o = 20mA$, $9V \leq V_{in} \leq 19V$		57		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}	$T_J = 25°C$, $V_{in} = 13V$, $V_O = 5.7V$		1.5	3.3	A

GL7808 Electrical Characteristics ($T_A = 25°C$)

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN.	VALUES MAX	UNIT
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}	$10.5V \leq V_{in} \leq 23V$, $5\ 0mA \leq I_o \leq 1.0A$		7.6	8.4	V
Line Regulation	ΔV_{O1}	$T_j=25°C$	$10.5V \leq V_{in} \leq 25V$, $I_o=500mA$		80	mV
	ΔV_{O2}		$11V \leq V_{in} \leq 17V$, $I_o=500mA$		40	mV
Load Regulation	ΔV_{O3}	$T_j=25°C$	$5.0mA \leq I_o \leq 1.5A$, $V_{in}=14V$		80	mV
	ΔV_{O4}		$250mA \leq I_o \leq 750mA$, $V_{in}=14V$		40	mV
Quiescent Current	I_Q	$T_j=25°C$, $V_{in}=14V$, $I_o=500mA$			8.0	mA
Quiescent Current Change	ΔI_{Q1}	$10.5V \leq V_{in} \leq 25V$, $I_o=500mA$			1.0	mA
	ΔI_{Q2}	$5mA \leq I_o \leq 1.0A$, $V_{in}=14V$			0.5	mA
Output Noise Voltage	N_o	$V_{in}=14V$, $I_o=500mA$, $10Hz \leq f \leq 100KHz$		52(TYP)		μV
Ripple Rejection	R_R	$T_j=25°C$, $V_i=1V_{(rms)}$, 120Hz, $I_o=20mA$, $11.5V \leq V_{in} \leq 21.5V$		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 MIN.	VALUES MAX.	UNIT
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}	$11\ 5V \leq V_{in} \leq 24V$, $5\ 0mA \leq I_o \leq 1.0A$		8 55	9.45	V
Line Regulation	ΔV_{O1}	$T_j=25°C$	$11\ 5V \leq V_{in} \leq 26V$, $I_o=500mA$		90	mV
	ΔV_{O2}		$12V \leq V_{in} \leq 18V$, $I_o=500mA$		45	mV
Load Regulation	ΔV_{O3}	$T_j=25°C$	$5\ 0mA \leq I_o \leq 1.5A$, $V_{in}=15V$		90	mV
	ΔV_{O4}		$250mA \leq I_o \leq 750mA$, $V_{in}=15V$		45	mV
Quiescent Current	I_Q	$T_j=25°C$, $V_{in}=15V$, $I_o=500mA$			8	mA
Quiescent Current Change	ΔI_{Q1}	$11.5V \leq V_{in} \leq 26V$, $I_o=500mA$			1 0	mA
	ΔI_{Q2}	$V_{in}=15V$, $5mA \leq I_o \leq 1.5A$			0.5	mA
Output Noise Voltage	N_o	$V_{in}=15V$, $I_o=500mA$, $10Hz \leq f \leq 100KHz$		60(TYP)		μV
Ripple Rejection	R_R	$T_j=25°C$, $V_i=1V_{(rms)}$ 120Hz, $I_o=20mA$, $12\ 5V \leq V_{in} \leq 22\ 5V$		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_{01}	$T_j=25°C$, $V_{in}=19V$, $I_o=500mA$		11 5	12 5	V
Output Voltage (2)	V_{02}	$14\ 5V \leq V_{in} \leq 27\ 0V$, $5\ 0mA \leq I_o \leq 1.0A$		11 4	12.6	V
Line Regulation	ΔV_{01}	$T_j=25°C$	$14\ 5V \leq V_{in} \leq 30V$, $I_o=500mA$		120	mV
	ΔV_{02}		$16.0V \leq V_{in} \leq 22V$, $I_o=500mA$		60	mV
Load Regulation	ΔV_{03}	$T_j=25°C$	$5\ 0mA \leq I_o \leq 1.5A$, $V_{in}=19V$		120	mV
	ΔV_{04}		$250mA \leq I_o \leq 750mA$, $V_{in}=19V$		60	mV
Quiescent Current	I_Q	$T_j=25°C$, $V_{in}=19V$, $I_o=500mA$			8.0	mA
Quiescent Current Change	ΔI_{Q1}	$14\ 5V \leq V_{in} \leq 30V$, $I_o=500mA$			1 0	mA
	ΔI_{Q2}	$5\ 0mA \leq I_o \leq 1.0A$, $V_{in}=19V$			0 5	mA
Output Noise Voltage	No	$V_{in}=19V$, $I_o=500mA$, $10Hz \leq f \leq 100KHz$		75(TYP)		μV
Ripple Rejection	R_R	$T_j=25°C$, $V_i=1V_{(rms)}$, 120Hz, $I_o=20mA$, $15V \leq V_{in} \leq 25V$		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_{01}	$T_j=25°C$, $V_{in}=23V$, $I_o=500mA$		14.4	15.6	V
Output Voltage (2)	V_{02}	$17.5V \leq V_{in} \leq 30V$, $5.0mA \leq I_o \leq 1\ 0A$		14.25	15 75	V
Line Regulation	ΔV_{01}	$T_j=25°C$	$17.5V \leq V_{in} \leq 30V$, $I_o=500mA$		150	mV
	ΔV_{02}		$20V \leq V_{in} \leq 26V$, $I_o=500mA$		75	mV
Load Regulation	ΔV_{03}	$T_j=25°C$	$5mA \leq I_o \leq 1.5A$, $V_{in}=23V$		150	mV
	ΔV_{04}		$250mA \leq I_o \leq 750mA$, $V_{in}=23V$		75	mV
Quiescent Current	I_Q	$T_j=25°C$, $V_{in}=23V$, $I_o=500mA$			8.0	mA
Quiescent Current Change	ΔI_{Q1}	$17.5V \leq V_{in} \leq 30V$, $I_o=500mA$			1.0	mA
	ΔI_{Q2}	$5.0mA \leq I_o \leq 1.0A$, $V_{in}=23V$			0.5	mA
Output Noise Voltage	No	$V_{in}=23V$, $I_o=500mA$, $10Hz \leq f \leq 100KHz$		90(TYP)		μV
Ripple Rejection	R_R	$T_j=25°C$, $V_i=1V_{(rms)}$, 120Hz, $I_o=20mA$, $18.5V \leq V_{in} \leq 28.5V$		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

GL7818 Electrical Characteristics(T_A=25°C)

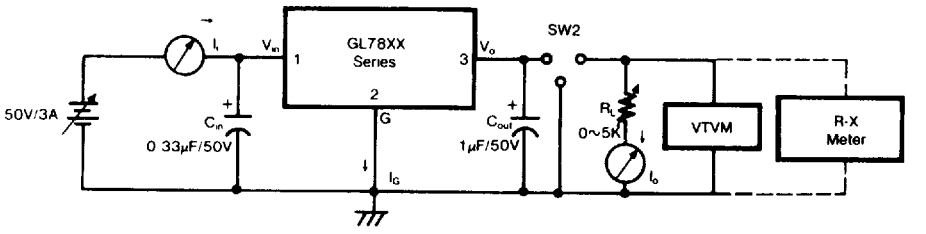
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN	VALUES MAX	UNIT
Output Voltage(1)	V_{01}	T_j=25℃, V_{in}=25V, I_o=500mA		17 3	18 7	V
Output Voltage(2)	V_{02}	20 5V≦V_{in}≦33V, 5 0mA≦I_o≦=1 0A		17.1	18.9	V
Line Regulation	$\triangle V_{01}$	T_j=25℃	20 5V≦V_{in}≦33V, I_o=500mA		180	mV
	$\triangle V_{02}$		24.0V≦V_{in}≦30V, I_o=500mA		90	mV
Load Regulation	$\triangle V_{03}$	T_j=25℃	5.0mA≦I_o≦1 5A, V_{in}=21V		180	mV
	$\triangle V_{04}$		250mA≦V_{10}≦750mA, V_{in}=25V		90	mV
Quiescent Current	I_Q	T_j=25℃, V_{in}=25V, I_o=50mA			8.0	mA
Quiescent Current Change	$\triangle I_{Q1}$	20 5V≦V_{in}≦33V, I_o=500mA			1.0	mA
	$\triangle I_{Q2}$	5 0mA≦I_o≦1 0A, V_{in}=25V			0 5	mA
Output Noise Voltage	N_0	V_{in}=25V, I_o=500mA, 10Hz≦f≦100KHz		110(TYP)		μV
Ripple Rejection	R_R	T_j=25℃, V_i=1$V_{(rms)}$, 120Hz, I_o=20mA 21V≦V_{in}≦33V		59		dB
Input-Output Voltage Differential	V_d	T_j=25℃, I_o=1.0A		2(TYP)		V
Short-Circuit Limit	I_{sc}	V_{in}=25V, Output-GND			1 0	A
Peak Output Current	I_{peak}	T_j=25℃, V_{in}=25V, V_o=17.1V		1 5	3 3	A

GL7824 Electrical Characteristics (T_A=25°C)

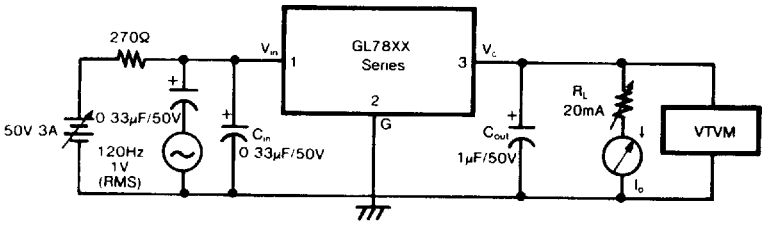
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN	VALUES MAX.	UNIT
Output Voltage (1)	V_{01}	T_j=25°C, V_{in}=33V, I_o=500mA		23	25	V
Output Voltage (2)	V_{02}	27V≤V_{in}≤38V, 5.0mA≤I_o≤1 0A		22 8	25 2	V
Line Regulation	ΔV_{01}	T_j=25°C	27V≤V_{in}≤38V, I_o=500mA		240	mV
	ΔV_{02}		30V≤V_{in}≤36V, I_o=500mA		120	mV
Load Regulation	ΔV_{03}	T_j=25°C	5mA≤I_o≤1 5A, V_{in}=33V		240	mV
	ΔV_{04}		250mA≤I_o≤750mA, V_{in}=33V		120	mV
Quiescent Current	I_Q	T_j=25°C, V_{in}=33V, I_o=500mA			8.0	mA
Quiescent Current Change	ΔI_{Q1}	27V≤V_{in}≤38V, I_o=500mA			1.0	mA
	ΔI_{Q2}	5 0mA≤I_o≤1 0A V_{in}=33V			0.5	mA
Output Noise Voltage	N_o	V_{in}=33V, I_o=500mA, 10Hz≤f≤100KHz		170(TYP)		μV
Ripple Rejection	R_R	T_j=25°C, V_i=1$V_{(rms)}$ 120Hz, I_o=20mA, 28V≤V_{in}≤38V		56		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}=31V, V_O=22 8V		1 5	3.3	A

*GL78XX Series Test Circuit (AC & DC)

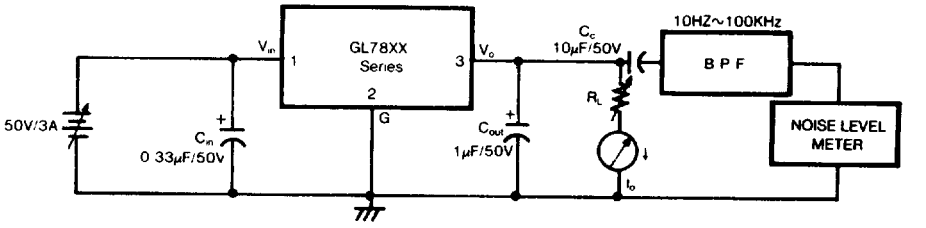
1 V_{O1}, V_{O2}, ΔV_O, I_Q, ΔI_Q, V_d, I_{SC}, I_{peak}



2 Ripple Rejection



3 Output Noise Voltage



* C_{in}, C_{out}, C_C is Tantalium Capacitor

TYPICAL CHARACTERISTICS
(T_A = +25°C unless otherwise noted)

FIGURE 1 – AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE

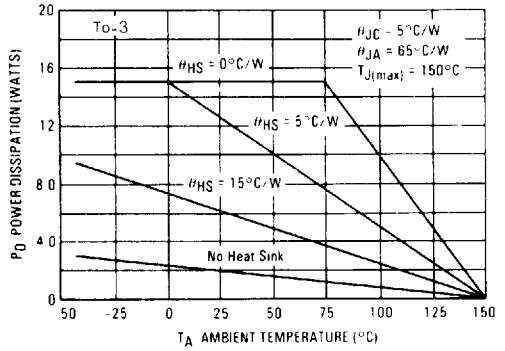


FIGURE 2 INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

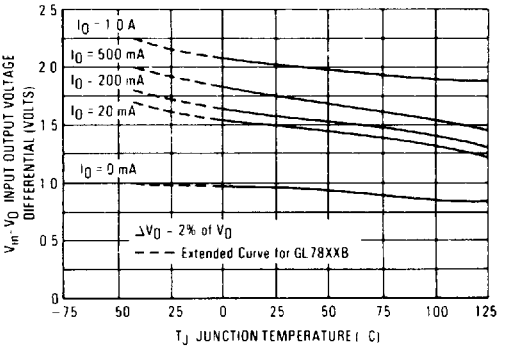


FIGURE 3 – INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

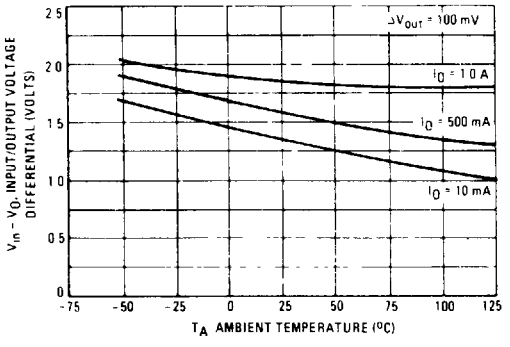


FIGURE 4 – PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

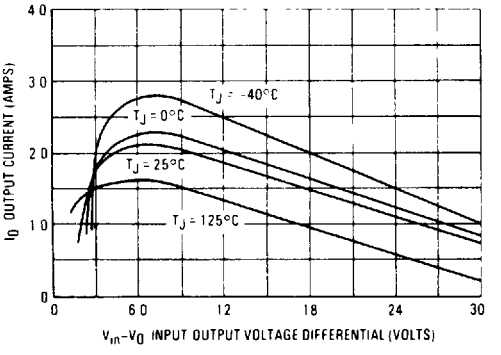


FIGURE 5 – PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

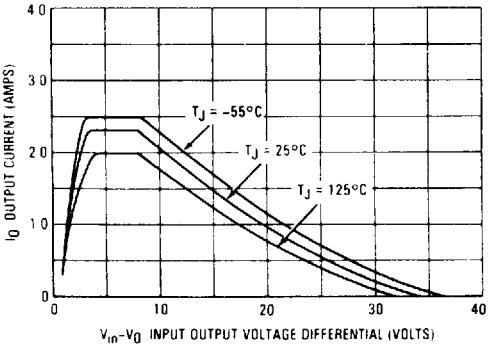
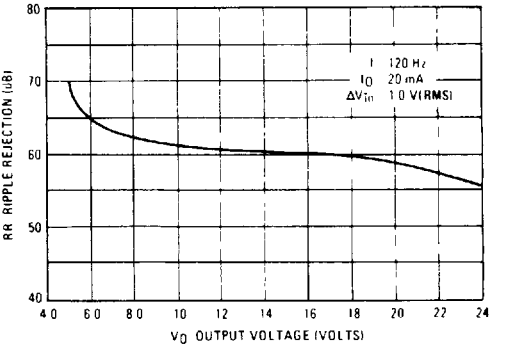


FIGURE 6 – RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES



TYPICAL CHARACTERISTICS (continued)
(T_A = 25°C unless otherwise noted.)

FIGURE 7 – RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

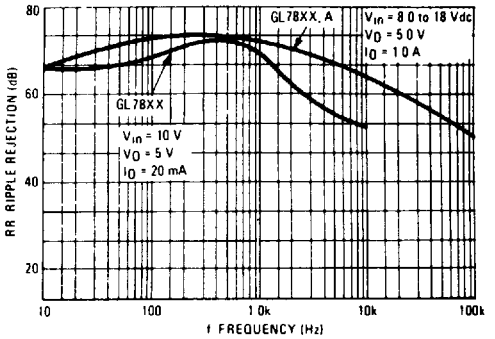


FIGURE 8 – OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

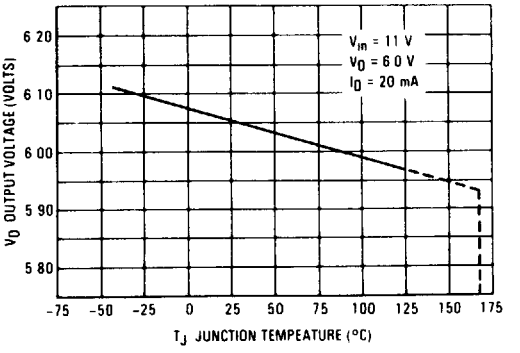


FIGURE 9 – OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

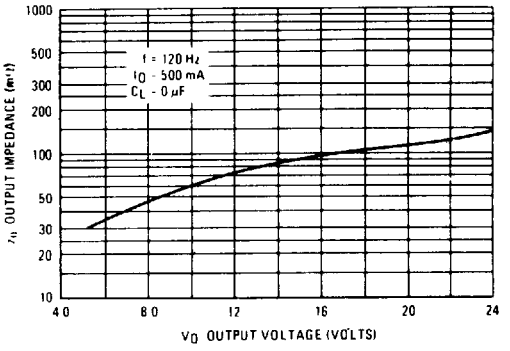


FIGURE 10 – QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

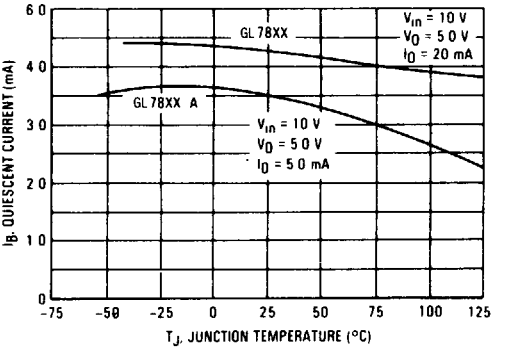


FIGURE 11 – DROPOUT CHARACTERISTICS