GL78XX Series

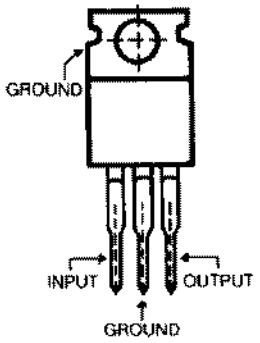
POSITIVE VOLTAGE REGULATOR

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)



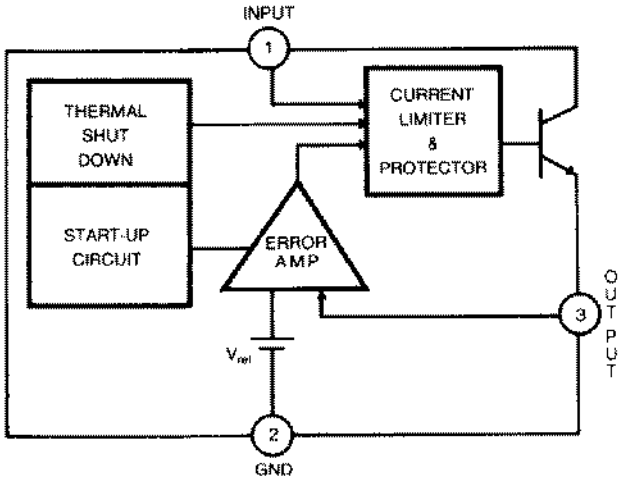
Features

- 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_{O1}	T_j=25°C, V_{in}=10V, I_o=500mA		4.8	5.2	V
Output Voltage (2)	V_{O2}	7V≤V_{in}≤20V, 5.0mA≤I_o≤1.0A		4.75	5.25	V
Line Regulation	ΔV_{O1}	T_j=25°C	7≤V_{in}≤25V, I_o=500mA		50	mV
	ΔV_{O2}		8V≤V_{in}≤12V, I_o=500mA		25	mV
Load Regulation	ΔV_{O3}	T_j=25°C	5.0mA≤I_o≤1.5A, V_{in}=10V		50	mV
	ΔV_{O4}		250mA≤I_o≤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≤V_{in}≤25V, I_o=500mA			1.3	mA
	ΔI_{Q2}	5.0mA≤I_o≤1.0A, V_{in}=10V			0.5	mA
Output Noise Voltage	No	V_{in}=10V, I_o=500mA, 10Hz≤f≤100KHz		40(TYP)		μV
Ripple Rejection	R_R	T_j=25°C, V_i=1$V_{(rms)}$ 120Hz, I_o=20mA, 8V≤V_{in}≤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_{O1}	T_j=25°C, V_{in}=11V, I_o=500mA		5.75	6.25	V
Output Voltage (2)	V_{O2}	8V≤V_{in}≤21V, 5.0mA≤I_o≤1.0A		5.7	6.3	V
Line Regulation	ΔV_{O1}	T_j=25°C	8≤V_{in}≤25V, I_o=500mA		60	mV
	ΔV_{O2}		9V≤V_{in}≤13V, I_o=500mA		30	mV
Load Regulation	ΔV_{O3}	T_j=25°C	5mA≤I_o≤1.5A, V_{in}=11V		60	mV
	ΔV_{O4}		250mA≤I_o≤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≤V_{in}≤25V, I_o=500mA			1.3	mA
	ΔI_{Q2}	V_{in}=11V, 5mA≤I_o≤1.0A			0.5	mA
Output Noise Voltage	N_o	V_{in}=11V, I_o=500mA, 10Hz≤f≤100KHz		45(TYP)		μV
Ripple Rejection	R_R	T_j=25°C, V_i=1$V_{(rms)}$ 120Hz, I_o=20mA, 9V≤V_{in}≤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≤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=1$V_{(rms)}$, 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 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≤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=1$V_{(rms)}$ 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=1$V_{(rms)}$, 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=1$V_{(rms)}$, 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

GL7818 Electrical Characteristics(T_A=25°C)

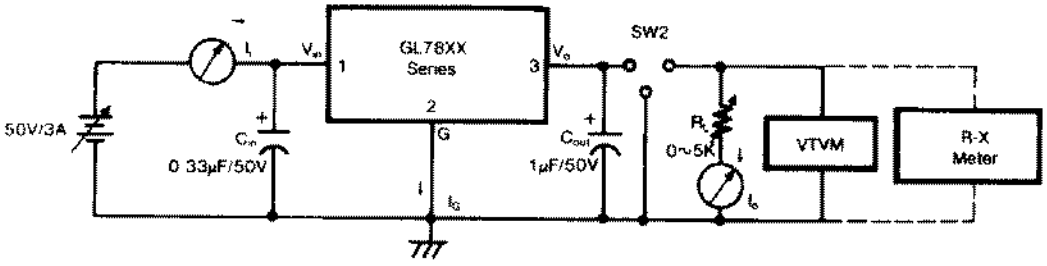
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN	VALUES MAX	UNIT
Output Voltage(1)	V_{01}	T_j=25℃, V_{in}=25V, I_o=500mA		17.3	18.7	V
Output Voltage(2)	V_{02}	20.5V≦V_{in}≦33V, 5.0mA≦I_o≦=1.0A		17.1	18.9	V
Line Regulation	ΔV_{01}	T_j=25℃	20.5V≦V_{in}≦33V, I_o=500mA		180	mV
	ΔV_{02}		24.0V≦V_{in}≦30V, I_o=500mA		90	mV
Load Regulation	ΔV_{03}	T_j=25℃	5.0mA≦I_o≦1.5A, V_{in}=21V		180	mV
	ΔV_{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	ΔI_{Q1}	20.5V≦V_{in}≦33V, I_o=500mA			1.0	mA
	ΔI_{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_r=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)

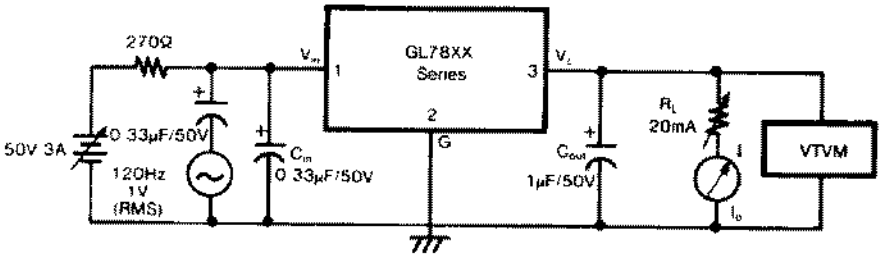
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES MIN	VALUES MAX.	UNIT
Output Voltage (1)	V_{01}	T_j=25°C, V_{in}=33V, I_o=500mA		23	25	V
Output Voltage (2)	V_{02}	27V≤V_{in}≤38V, 5.0mA≤I_o≤1.0A		22.8	25.2	V
Line Regulation	ΔV_{01}	T_j=25°C	27V≤V_{in}≤38V, I_o=500mA		240	mV
	ΔV_{02}		30V≤V_{in}≤36V, I_o=500mA		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_r=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)

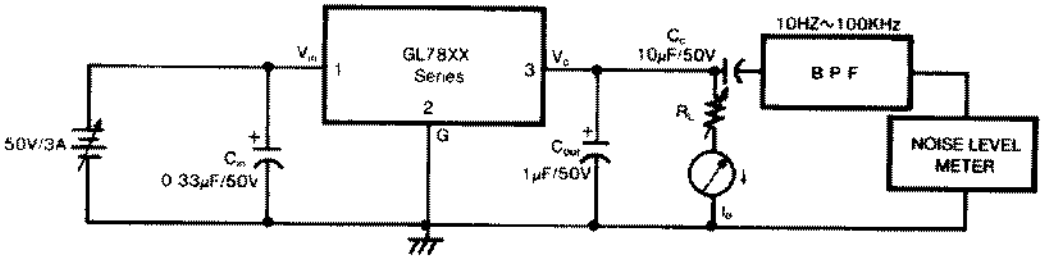
1 V_{O1}, V_{O2}, ΔV_O, I_Q, ΔI_Q, V_d, I_{SC}, I_{pk}



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

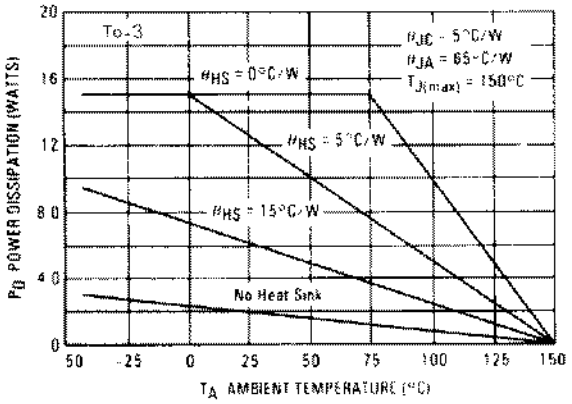


FIGURE 2 INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

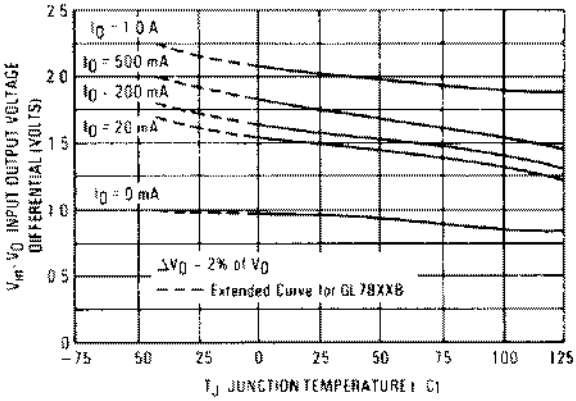


FIGURE 3 – INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

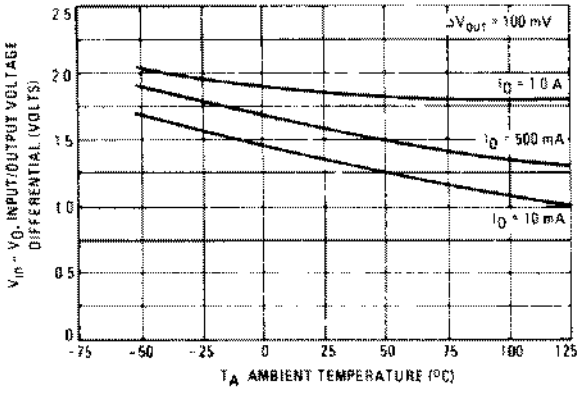


FIGURE 4 – PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

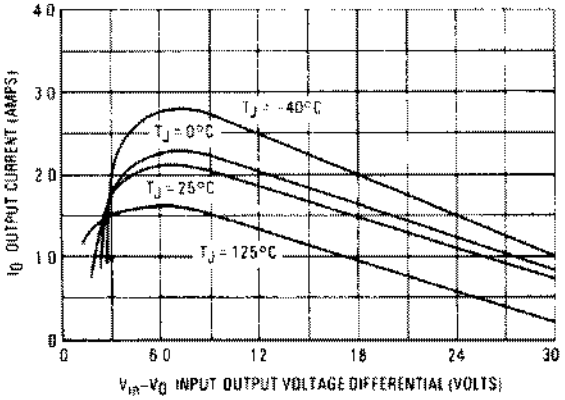


FIGURE 5 – PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

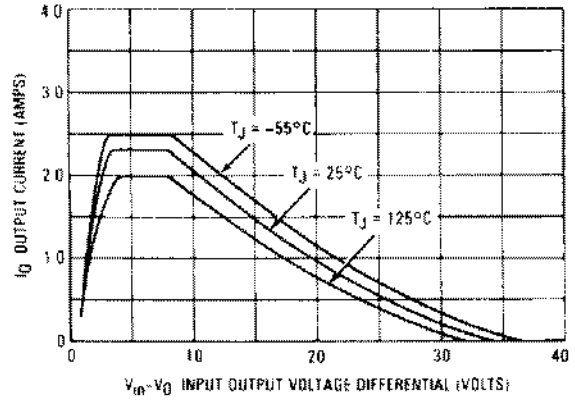
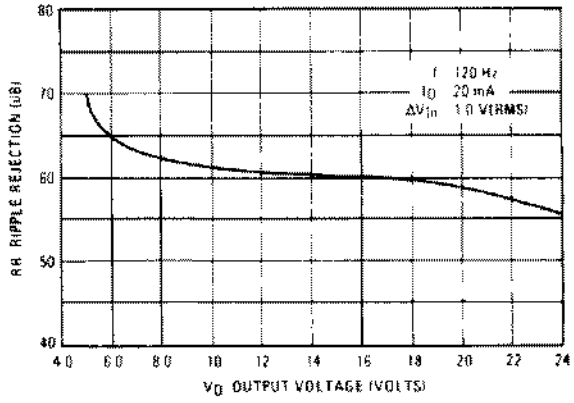


FIGURE 6 – RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES



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

FIGURE 7 – RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

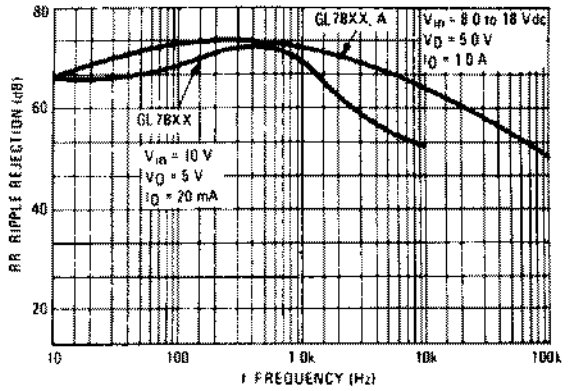


FIGURE 8 – OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

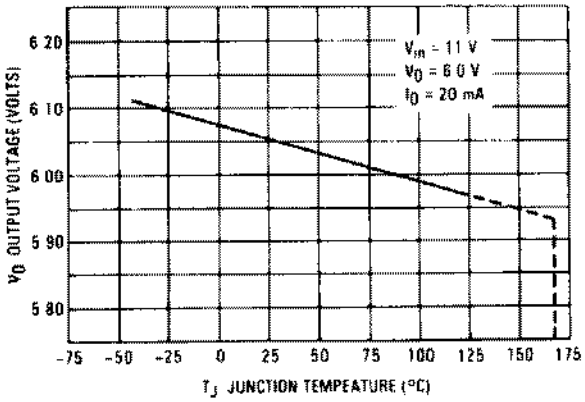


FIGURE 9 – OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

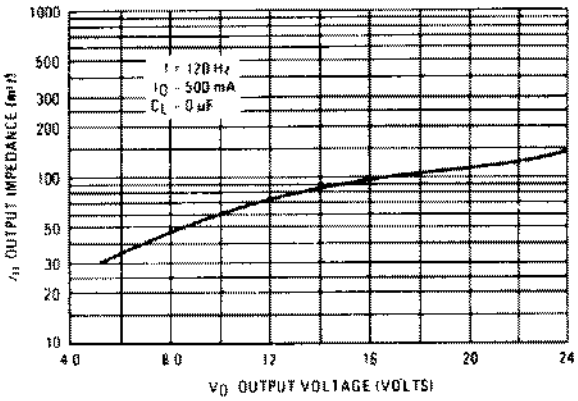


FIGURE 10 – QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

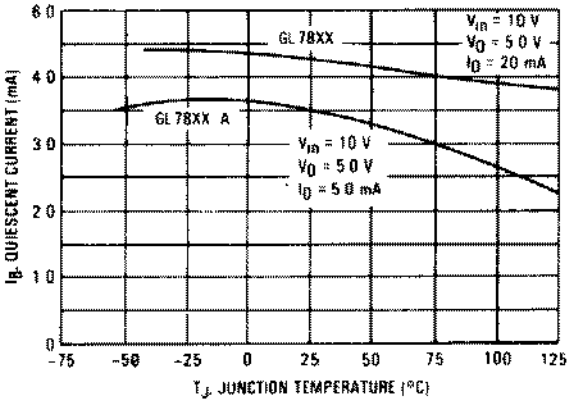


FIGURE 11 – DROPOUT CHARACTERISTICS