

THREE-TERMINAL POSITIVE VOLTAGE REGULATORS

These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area

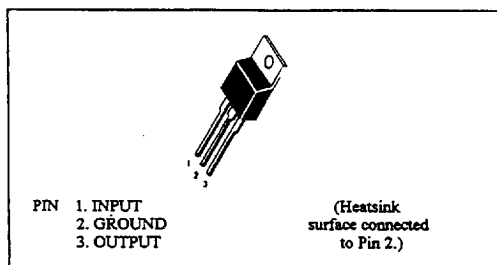
compensation. With adequate heatsinking they can deliver output currents in excess of 1.5 ampere.

Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

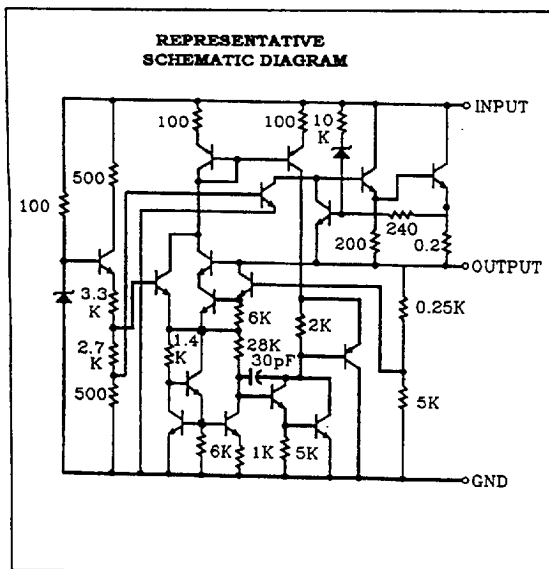
FEATURES

- Output Current in Excess of 1.5 Ampere
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered in 2% Tolerance

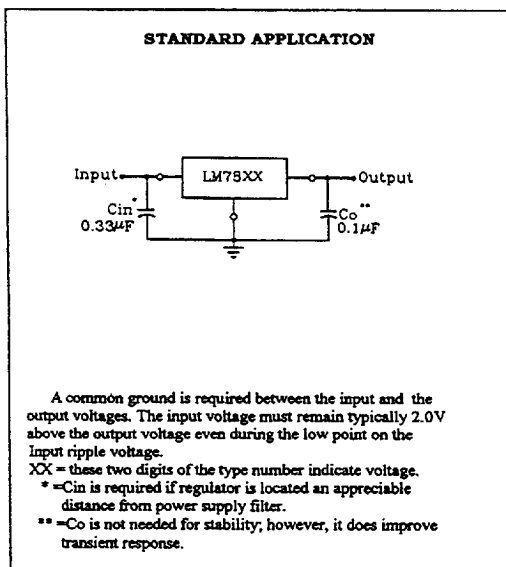
PIN ARRANGEMENT



CIRCUIT SCHEMATIC



TYPICAL CONNECTING CIRCUIT



• ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	LM7800 Series	Unit
Input Voltage	Vin *	30	V
Input Voltage	Vin **	40	V
Power Dissipation	P _D ***	15	W
Operating Ambient Temperature	Topr	-20 to +75	°C
Operating Junction Temperature	Tj	-20 to +125	°C
Storage Temperature	Tstg	-55 to +125	°C

Note: *LM7805 to LM7818

** LM7824

***Follow the derating curve

• LM7805 ELECTRICAL CHARACTERISTICS

(Vin=10V, Iout=500mA, 0°C ≤ Tj ≤ 125°C, Cin=0.33 μF, Cout=0.1 μF; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	Vout	Tj=25°C	4.90	5.0	5.10	V
		7V ≤ Vin ≤ 20V, 5mA ≤ Iout ≤ 1.0A, P _D ≤ 15W	4.85	--	5.15	V
Line Regulation	REG _{line}	Tj=25°C	--	3	100	mV
		7V ≤ Vin ≤ 25V	--	1	50	mV
Load Regulation	REG _{load}	Tj=25°C	--	15	100	mV
		5mA ≤ Iout ≤ 1.5A	--	5	50	mV
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.2	8.0	mA
Quiescent Current Change	Δ Iq	7V ≤ Vin ≤ 25V	--	--	1.3	mA
		5mA ≤ Iout ≤ 1.0A	--	--	0.5	mA
Output Noise Voltage	Vn	Ta=25°C, 10Hz ≤ f ≤ 100KHz	--	40	--	μV
Ripple Rejection Ratio	RR	f=120Hz	62	78	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2.0	--	V
Output Resistance	Rout	f=1KHz	--	17	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	750	--	mA
Peak Output Current	Io peak	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	Δ Vout / Δ Tj	Iout=5mA, 0°C ≤ Tj ≤ 125°C	--	-1.1	--	mV/°C

LM7806 ELECTRICAL CHARACTERISTICS

($V_{in}=11V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	5.88	6.0	6.12	V
		$8V \leq V_{in} \leq 21V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	5.83	--	6.17	V
Line Regulation	Δ REGline	$T_j=25^{\circ}C$	$8V \leq V_{in} \leq 25V$		120	mV
			$9V \leq V_{in} \leq 13V$		60	mV
Load Regulation	Δ REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$		120	mV
			$250mA \leq I_{out} \leq 750mA$		60	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.3	8.0	mA
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$	$8V \leq V_{in} \leq 25V$		1.3	mA
			$5mA \leq I_{out} \leq 1.0A$		0.5	mA
Output Noise Voltage	V_n	$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	--	45	--	μV
Ripple Rejection Ratio	RR	$f=120Hz$	59	75	--	dB
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	2.0	--	V
Output Resistance	R_{out}	$f=1KHz$	--	19	--	m Ω
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	550	--	mA
Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	2.2	--	A
Temperature Coefficient of Output Voltage	$\Delta V_{out}/\Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-0.8	--	mV/ $^{\circ}C$

LM7808 ELECTRICAL CHARACTERISTICS

($V_{in}=14V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	7.84	8.0	8.16	V
		$10.5V \leq V_{in} \leq 23V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	7.74	--	8.26	V
Line Regulation	Δ REGline	$T_j=25^{\circ}C$	$10.5V \leq V_{in} \leq 25V$		160	mV
			$11V \leq V_{in} \leq 17V$		80	mV
Load Regulation	Δ REGload	$T_j=25^{\circ}C$	$5mA \leq I_{out} \leq 1.5A$		160	mV
			$250mA \leq I_{out} \leq 750mA$		80	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.3	8.0	mA
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$	$10.5V \leq V_{in} \leq 25V$		1.0	mA
			$5mA \leq I_{out} \leq 1.0A$		0.5	mA
Output Noise Voltage	V_n	$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	--	52	--	μV
Ripple Rejection Ratio	RR	$f=120Hz$	56	72	--	dB
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	2.0	--	V
Output Resistance	R_{out}	$f=1KHz$	--	16	--	m Ω
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	450	--	mA
Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	2.2	--	A
Temperature Coefficient of Output Voltage	$\Delta V_{out}/\Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-1.8	--	mV/ $^{\circ}C$

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LM7809 ELECTRICAL CHARACTERISTICS

($V_{in}=15V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	8.82	9	9.18	V
		$10.5V \leq V_{in} \leq 27V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	8.77	--	9.23	V
Line Regulation	ΔREG_{line}	$T_j=25^{\circ}C$				
		$11.5V \leq V_{in} \leq 30V$	--	6	160	mV
Load Regulation	ΔREG_{load}	$T_j=25^{\circ}C$				
		$12V \leq V_{in} \leq 18V$	--	2.0	80	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$				
		$5mA \leq I_{out} \leq 1.5A$	--	12	160	mV
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$				
		$250mA \leq I_{out} \leq 750mA$	--	4	80	mV
Output Noise Voltage	V_n	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.3	1.0	mA
		$14.5V \leq V_{in} \leq 30V$	--	--	0.5	mA
Ripple Rejection Ratio	RR	$5mA \leq I_{out} \leq 1.0A$	--	--	--	mA
		$f=120Hz$	--	52	--	μV
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	72	--	dB
Output Resistance	R_{out}	$f=1KHz$	--	2.0	--	V
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	16	--	$m\Omega$
Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	450	--	mA
Temperature Coefficient of Output Voltage	$\Delta V_{out}/\Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	2.2	--	A
			--	-1.8	--	mV/ $^{\circ}C$

LM7810 ELECTRICAL CHARACTERISTICS

($V_{in}=16V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	9.8	10	10.2	V
		$17.5V \leq V_{in} \leq 30V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	9.75	-	12.25	V
Line Regulation	ΔREG_{line}	$T_j=25^{\circ}C$				
		$10.5V \leq V_{in} \leq 30V$	--	10	240	mV
Load Regulation	ΔREG_{load}	$T_j=25^{\circ}C$				
		$13V \leq V_{in} \leq 9V$	--	3.0	120	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$				
		$5mA \leq I_{out} \leq 1.5A$	--	12	240	mV
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$				
		$250mA \leq I_{out} \leq 750mA$	--	4.0	120	mV
Output Noise Voltage	V_n	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.3	8.0	mA
		$14.5V \leq V_{in} \leq 30V$	--	--	1.0	mA
Ripple Rejection Ratio	RR	$5mA \leq I_{out} \leq 1.0A$	--	--	0.5	mA
		$f=120Hz$	--	52	--	μV
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	72	--	dB
Output Resistance	R_{out}	$f=1KHz$	--	2.0	--	V
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	16	--	$m\Omega$
Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	450	--	mA
Temperature Coefficient of Output Voltage	$\Delta V_{out}/\Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	2.2	--	A
			--	-1.8	--	mV/ $^{\circ}C$

LM7812 ELECTRICAL CHARACTERISTICS

($V_{in}=19V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	11.76	12.0	12.24	V
		$14.5V \leq V_{in} \leq 27V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	11.66	--	12.34	V
Line Regulation	ΔREG_{line}	$T_j=25^{\circ}C$	--	10	240	mV
		$14.5V \leq V_{in} \leq 30V$	--	3.0	120	mV
Load Regulation	ΔREG_{load}	$T_j=25^{\circ}C$	--	12	240	mV
		$5mA \leq I_{out} \leq 1.5A$	--	4.0	120	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.3	8.0	mA
		$14.5V \leq V_{in} \leq 30V$	--	--	1.0	mA
Quiescent Current Change	ΔI_q	$5mA \leq I_{out} \leq 1.0A$	--	--	0.5	mA
		$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	--	75	--	μV
Output Noise Voltage	V_n	$f=120Hz$	55	71	--	dB
Ripple Rejection Ratio	RR	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	2.0	--	V
Voltage Drop	V_{drop}	$f=1KHz$	--	18	--	m Ω
Output Resistance	R_{out}	$T_j=25^{\circ}C$	--	350	--	mA
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	2.2	--	A
Peak Output Current	$I_{o peak}$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-1.0	--	mV/ $^{\circ}C$
Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$					

LM7815 ELECTRICAL CHARACTERISTICS

($V_{in}=23V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	14.7	15.0	15.3	V
		$17.5V \leq V_{in} \leq 30V$, $5mA \leq I_{out} \leq 1.0A$, $P_D \leq 15W$	14.55	--	15.45	V
Line Regulation	ΔREG_{line}	$T_j=25^{\circ}C$	--	11	300	mV
		$17.5V \leq V_{in} \leq 30V$	--	3.0	150	mV
Load Regulation	ΔREG_{load}	$T_j=25^{\circ}C$	--	12	300	mV
		$5mA \leq I_{out} \leq 1.5A$	--	4	150	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	--	4.4	8.0	mA
		$17.5V \leq V_{in} \leq 30V$	--	--	1.0	mA
Quiescent Current Change	ΔI_q	$5mA \leq I_{out} \leq 1.0A$	--	--	0.5	mA
		$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	--	90	--	μV
Output Noise Voltage	V_n	$f=120Hz$	54	70	--	dB
Ripple Rejection Ratio	RR	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	2.0	--	V
Voltage Drop	V_{drop}	$f=1KHz$	--	19	--	m Ω
Output Resistance	R_{out}	$T_j=25^{\circ}C$	--	230	--	mA
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	2.1	--	A
Peak Output Current	$I_{o peak}$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-1.0	--	mV/ $^{\circ}C$
Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$					

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LM7818 ELECTRICAL CHARACTERISTICS

($V_{in}=27V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

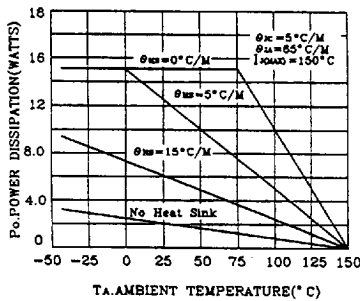
Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	17.64	18.0	18.36	V
		$21.0V \leq V_{in} \leq 33V$, $5mA \leq I_{out} \leq 1.0A$, $P_{\leq 15W}$	17.44	—	18.56	V
Line Regulation	$\Delta V_o \text{ line}$	$T_j=25^{\circ}C$	—	15	360	mV
		$21.0V \leq V_{in} \leq 33V$	—	5.0	180	mV
Load Regulation	$\Delta \text{REGload}$	$T_j=25^{\circ}C$	—	12	360	mV
		$5mA \leq I_{out} \leq 1.5A$	—	4.0	180	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	—	4.5	8.0	mA
		$21.0V \leq V_{in} \leq 33V$	—	—	1.0	mA
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$	—	—	0.5	mA
		$5mA \leq I_{out} \leq 1.0A$	—	—	—	—
Output Noise Voltage	V_n	$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	—	110	—	μV
Ripple Rejection Ratio	RR	$f=120Hz$	53	69	—	dB
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	—	2.0	—	V
Output Resistance	R_{out}	$f=1KHz$	—	22	—	$m\Omega$
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	—	200	—	mA
Peak Output Current	$I_o \text{ peak}$	$T_j=25^{\circ}C$	—	2.1	—	A
Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	—	-1.0	—	mV/ $^{\circ}C$

LM7824 ELECTRICAL CHARACTERISTICS

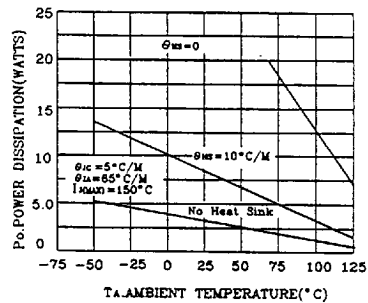
($V_{in}=33V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Item	Symbol	Test Conditions	min.	typ.	max.	unit
Output Voltage	V_{out}	$T_j=25^{\circ}C$	23.52	24.0	24.48	V
		$27.0V \leq V_{in} \leq 38V$, $5mA \leq I_{out} \leq 1.0A$, $P_{\leq 15W}$	23.32	—	24.68	V
Line Regulation	$\Delta V_o \text{ line}$	$T_j=25^{\circ}C$	—	18	480	mV
		$27.0V \leq V_{in} \leq 38V$	—	6.0	240	mV
Load Regulation	$\Delta V_o \text{ load}$	$T_j=25^{\circ}C$	—	12	480	mV
		$5mA \leq I_{out} \leq 1.5A$	—	4.0	240	mV
Quiescent Current	I_q	$T_j=25^{\circ}C$, $I_{out}=0$	—	4.6	8.0	mA
		$27.0V \leq V_{in} \leq 38V$	—	—	1.0	mA
Quiescent Current Change	ΔI_q	$T_j=25^{\circ}C$	—	—	0.5	mA
		$5mA \leq I_{out} \leq 1.0A$	—	—	—	—
Output Noise Voltage	V_n	$T_a=25^{\circ}C$, $10Hz \leq f \leq 100KHz$	—	170	—	μV
Ripple Rejection Ratio	RR	$f=120Hz$	50	66	—	dB
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	—	2.0	—	V
Output Resistance	R_{out}	$f=1KHz$	—	28	—	$m\Omega$
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	—	150	—	mA
Peak Output Current	$I_o \text{ peak}$	$T_j=25^{\circ}C$	—	2.1	—	A
Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=5mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	—	-1.5	—	mV/ $^{\circ}C$

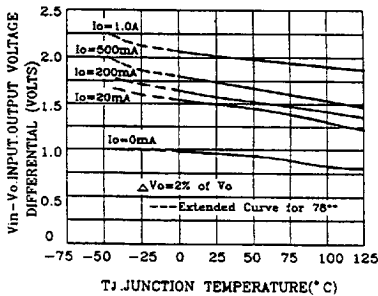
**FIGURE 1 - WORST CASE POWER DISSIPATION
versus AMBIENT TEMPERATURE (Case 221A)**



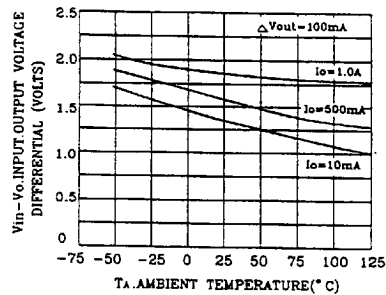
**FIGURE 2 - WORST CASE POWER DISSIPATION
versus AMBIENT TEMPERATURE (Case 1)**



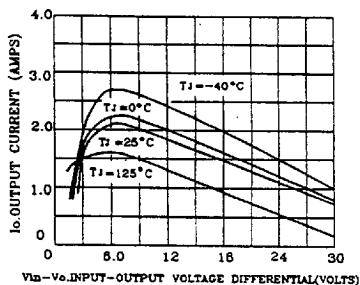
**FIGURE 3 - INPUT OUTPUT DIFFERENTIAL AS A
FUNCTION OF JUNCTION TEMPERATURE**



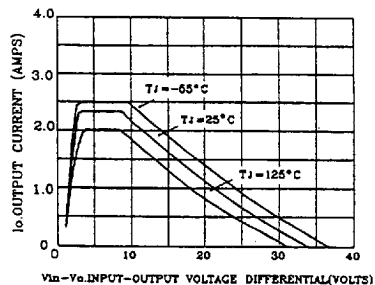
**FIGURE 4 - INPUT OUTPUT DIFFERENTIAL AS A
FUNCTION OF JUNCTION TEMPERATURE**



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



**FIGURE 6 - PEAK OUTPUT CURRENT AS A
FUNCTION OF INPUT-OUTPUT DIFFERENTIAL
VOLTAGE**



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FIGURE 7 - RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGE

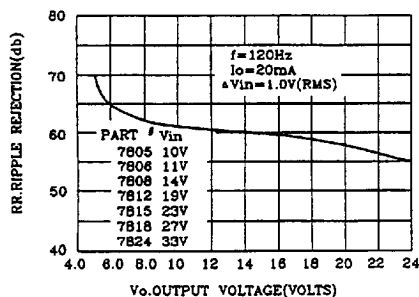


FIGURE 8 - RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

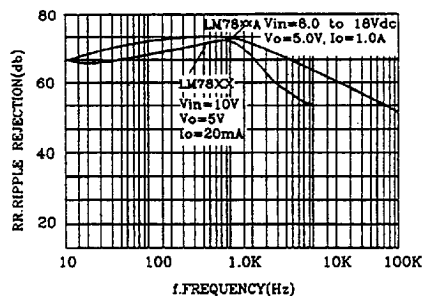


FIGURE 9 - OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

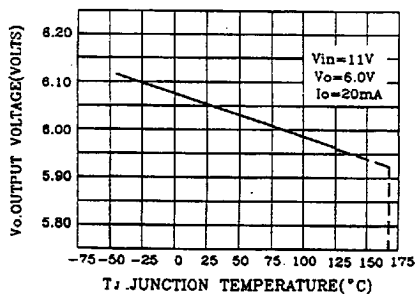


FIGURE 10 - OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

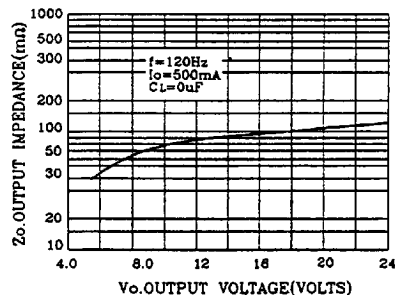


FIGURE 11 - QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

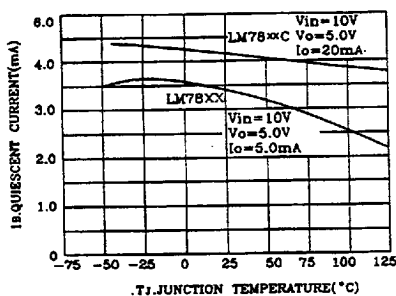


FIGURE 12 - DROPOUT CHARACTERISTICS

