

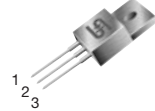


# TS7800

## 3-Terminal Fixed Positive Voltage Regulators

TO-220

ITO-220



Pin: 1. Input 2. Ground 3. Output  
(Heatsink surface connected to Pin 2.)

Voltage Range  
5 to 24 Volts  
Current  
1 Ampere

### Features

- ◇ Output Current up to 1 Ampere
- ◇ No External Components Required
- ◇ Internal Thermal Overload Protection
- ◇ Internal Short-Circuit Current Limiting
- ◇ Output Transistor Safe-Area Compensation
- ◇ Output Voltage Offered in 4% Tolerance

### Ordering Informations

Device	Operating Temperature (Ambient)	Package
TS78xxCZ	-20°C to +85°C	TO-220
TS78xxCI		TO-220F

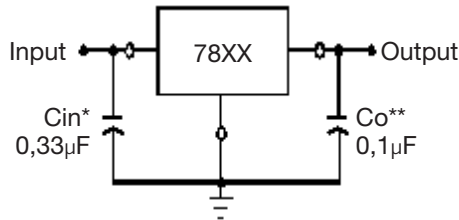
### Absolute Maximum Ratings (Ta=25°C)

Ratings	Symbol	TS7800 Series	Unit
Input Voltage	Vin *	35	V
Input Voltage	Vin **	40	V
Power Dissipation TO-220	Without heatsink	2	°C/W
TO-220	Pt ***	15	
TO-220F	With heatsink	10	
Operating Ambient Temperature	Topr	-20 to +85	°C
Operating Junction Temperature	Tj	0 to +125	°C
Storage Temperature	Tstg	-25 to +150	°C

Note: \* TS7805 to TS7818 \*\* TS7824 \*\*\* Follow the derating curve

### Standard Application

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.



XX = these two digits of the type number indicate voltage.

\* = Cin is required if regulator is located an appreciable distance from power supply filter.

\*\* = Co is not needed for stability; however, it does improve transient response.

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### TS7805 Electrical Characteristics

( $V_{in}=10V$ ,  $I_{out}=500mA$ ,  $0^{\circ}C \leq T_j \leq 125^{\circ}C$ ,  $C_{in}=0.33\mu F$ ,  $C_{out}=0.1\mu F$ ; unless otherwise specified.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	Vout	$T_j=25^{\circ}C$	4.80	5	5.20	V	
		7VAVinA20V, 5mAAloutA1.5A, PDA15W	4.75	5	5.25	V	
Line Regulation	REGline	$T_j=25^{\circ}C$	7.5VAVinA25V	--	3	100	mV
		8VAVinA12V	--	1	50	mV	
Load Regulation	REGload	$T_j=25^{\circ}C$	5mAAloutA1.5A	--	15	100	mV
		250mAAloutA750mA	--	5	50	mV	
Quiescent Current	Iq	$I_{out}=0$ , $T_j=25^{\circ}C$	--	4.2	8	mA	
Quiescent Current Change	OIq	7VAVinA25V	--	--	1.3	mA	
		5mAAloutA1.5A	--	--	0.5	mA	
Output Noise Voltage	Vn	10HzAfA100KHz, $T_j=25^{\circ}C$	--	40	--	$\mu V$	
Ripple Rejection Ratio	RR	$f=120Hz$ , 8VAVinA18V	62	78	--	dB	
Voltage Drop	Vdrop	$I_{out}=1.0A$ , $T_j=25^{\circ}C$	--	2	--	V	
Output Resistance	Rout	$f=1KHz$	--	17	--	mK	
Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	750	--	mA	
Peak Output Current	Io peak	$T_j=25^{\circ}C$	--	2.2	--	A	
Temperature Coefficient of Output Voltage	O <sub>Vout</sub> /OT <sub>j</sub>	$I_{out}=5mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-0.6	--	mV/ $^{\circ}C$	

### TS7806 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.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	Vout	$T_j=25^{\circ}C$	5.75	6	6.25	V	
		8VAVinA21V, 5mAAloutA1.5A, PDA15W	6.3	6	6.3	V	
Line Regulation	REGline	$T_j=25^{\circ}C$	8VAVinA25V	--	5	120	mV
		9VAVinA13V	--	1.5	60	mV	
Load Regulation	REGload	$T_j=25^{\circ}C$	5mAAloutA1.5A	--	14	120	mV
		250mAAloutA750mA	--	4	60	mV	
Quiescent Current	Iq	$I_{out}=0$ , $T_j=25^{\circ}C$	--	4.3	8	mA	
Quiescent Current Change	OIq	8VAVinA25V	--	--	1.3	mA	
		5mAAloutA1.5A	--	--	0.5	mA	
Output Noise Voltage	Vn	10HzAfA100KHz, $T_j=25^{\circ}C$	--	45	--	$\mu V$	
Ripple Rejection Ratio	RR	$f=120Hz$ , 9VAVinA19V	59	75	--	dB	
Voltage Drop	Vdrop	$I_{out}=1.0A$ , $T_j=25^{\circ}C$	--	2	--	V	
Output Resistance	Rout	$f=1KHz$	--	19	--	mK	
Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	550	--	mA	
Peak Output Current	Io peak	$T_j=25^{\circ}C$	--	2.2	--	A	
Temperature Coefficient of Output Voltage	O <sub>Vout</sub> /OT <sub>j</sub>	$I_{out}=5mA$ , $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-0.7	--	mV/ $^{\circ}C$	

Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

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### TS7808 Electrical Characteristics

(Vin=14V, Iout=500mA, 0°CATjA125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	Vout	Tj=25°C	7.69	8	8.32	V	
		10.5VAVinA23V, 5mAAloutA1.5A, PD A15W	7.61	8	8.40	V	
Line Regulation	REGline	Tj=25°C	10.5VAVinA25V	--	6	160	mV
		11VAVinA17V	--	2	80	mV	
Load Regulation	REGload	Tj=25°C	10mAAloutA1.5A	--	12	160	mV
		250mAAloutA750mA	--	4	80	mV	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA	
Quiescent Current Change	ΔIq	10.5VAVinA25V	--	--	1	mA	
		5mAAloutA1.5A	--	--	0.5	mA	
Output Noise Voltage	Vn	10HzAfA100KHz, Tj=25°C	--	52	--	μV	
Ripple Rejection Ratio	RR	f=120Hz, 11VAVinA21V	56	72	--	dB	
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V	
Output Resistance	Rout	f=1KHz	--	16	--	mK	
Output Short Circuit Current	Ios	Tj=25°C	--	450	--	mA	
Peak Output Current	I <sub>o peak</sub>	Tj=25°C	--	2.2	--	A	
Temperature Coefficient of Output Voltage	OVout/OTj	Iout=5mA, 0°CATjA125°C	--	-0.8	--	mV/°C	

### TS7809 Electrical Characteristics

(Vin=15V, Iout=500mA, 0°CATjA125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage	Vout	Tj=25°C	8.65	9	9.36	V	
		11.5VAVinA24V, 5mAAloutA1.5A, PD A15W	8.57	9	9.45	V	
Line Regulation	REGline	Tj=25°C	11.5VAVinA26V	--	6	180	mV
		11.5VAVinA17V	--	2	90	mV	
Load Regulation	REGload	Tj=25°C	5mAAloutA1.5A	--	12	180	mV
		250mAAloutA750mA	--	4	90	mV	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA	
Quiescent Current Change	ΔIq	11.5VAVinA26V	--	--	1	mA	
		5mAAloutA1.5A	--	--	0.5	mA	
Output Noise Voltage	Vn	10HzAfA100KHz, Tj=25°C	--	52	--	μV	
Ripple Rejection Ratio	RR	f=120Hz, 11.5VAVinA21.5V	55	72	--	dB	
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V	
Output Resistance	Rout	f=1KHz	--	16	--	mK	
Output Short Circuit Current	Ios	Tj=25°C	--	450	--	mA	
Peak Output Current	I <sub>o peak</sub>	Tj=25°C	--	2.2	--	A	
Temperature Coefficient of Output Voltage	OVout/OTj	Iout=5mA, 0°CATjA125°C	--	-1	--	mV/°C	

Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

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### TS7810 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.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vout	$T_j=25^{\circ}C$	9.6	10	10.4	V
		12.5VAVinA25V, 5mAAloutA1.5A, PD A15W	9.5	10	10.5	V
Line Regulation	REGline	$T_j=25^{\circ}C$				
		12.5VAVinA28V	--	7	200	mV
		13VAVinA17V	--	2	100	mV
Load Regulation	REGload	$T_j=25^{\circ}C$				
		10mAAloutA1.5A	--	12	200	mV
		250mAAloutA750mA	--	4	100	mV
Quiescent Current	Iq	$I_{out}=0$ , $T_j=25^{\circ}C$	--	4.3	8	mA
Quiescent Current Change	$\Delta Iq$	12.5VAVinA28V	--	--	1	mA
		5mAAloutA1.5A	--	--	0.5	mA
Output Noise Voltage	Vn	10HzAfA100KHz, $T_j=25^{\circ}C$	--	70	--	$\mu V$
Ripple Rejection Ratio	RR	$f=120Hz$ , 13VAVinA23V	55	71	--	dB
Voltage Drop	Vdrop	$I_{out}=1.0A$ , $T_j=25^{\circ}C$	--	2	--	V
Output Resistance	Rout	$f=1KHz$	--	18	--	mK
Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	400	--	mA
Peak Output Current	I <sub>o peak</sub>	$T_j=25^{\circ}C$	--	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	--	$mV/^{\circ}C$

### TS7812 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.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vout	$T_j=25^{\circ}C$	11.53	12	12.48	V
		14.5VAVinA27V, 5mAAloutA1.5A, PD A15W	11.42	12	12.60	V
Line Regulation	REGline	$T_j=25^{\circ}C$				
		14VAVinA30V	--	10	240	mV
		15VAVinA19V	--	3	120	mV
Load Regulation	REGload	$T_j=25^{\circ}C$				
		10mAAloutA1.5A	--	12	240	mV
		250mAAloutA750mA	--	4	120	mV
Quiescent Current	Iq	$T_j=25^{\circ}C$ , $I_{out}=0$	--	4.3	8	mA
Quiescent Current Change	$\Delta Iq$	14.5VAVinA30V	--	--	1	mA
		5mAAloutA1.5A	--	--	0.5	mA
Output Noise Voltage	Vn	10HzAfA100KHz, $T_j=25^{\circ}C$	--	75	--	$\mu V$
Ripple Rejection Ratio	RR	$f=120Hz$ , 15VAVinA25V	55	71	--	dB
Voltage Drop	Vdrop	$I_{out}=1.0A$ , $T_j=25^{\circ}C$	--	20	--	V
Output Resistance	Rout	$f=1KHz$	--	18	--	mK
Output Short Circuit Current	Ios	$T_j=25^{\circ}C$	--	350	--	mA
Peak Output Current	I <sub>o peak</sub>	$T_j=25^{\circ}C$	--	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	--	$mV/^{\circ}C$

Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

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### TS7815 Electrical Characteristics

(Vin=23V, Iout=500mA, 0°CATjA125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vout	Tj=25°C	14.42	15	15.60	V
		17.5VAVinA30V, 5mAAloutA1.5A, PD A15W	14.28	15	15.75	V
Line Regulation	REGline	Tj=25°C				
		17.5VAVinA30V	--	12	300	mV
		18VAVinA22V	--	3	150	mV
Load Regulation	REGload	Tj=25°C				
		10mAAloutA1.5A	--	12	300	mV
		250mAAloutA750mA	--	4	150	mV
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.3	8	mA
Quiescent Current Change	ΔIq	17.5VAVinA30V	--	--	1	mA
		5mAAloutA1.5A	--	--	0.5	mA
Output Noise Voltage	Vn	10HzAfA100KHz, Tj=25°C	--	90	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 18VAVinA28V	54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	19	--	mK
Output Short Circuit Current	Ios	Tj=25°C	--	230	--	mA
Peak Output Current	I <sub>o peak</sub>	Tj=25°C	--	2.1	--	A
Temperature Coefficient of Output Voltage	OVout/OTj	Iout=5mA, 0°CATjA125°C	--	-1	--	mV/°C

### TS7818 Electrical Characteristics

(Vin=27V, Iout=500mA, 0°CATjA125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vout	Tj=25°C	17.30	18	18.72	V
		21VAVinA33V, 5mAAloutA1.5A, PD A15W	17.14	18	18.90	V
Line Regulation	REGline	Tj=25°C				
		21VAVinA33V	--	15	360	mV
		22VAVinA26V	--	5	180	mV
Load Regulation	REGload	Tj=25°C				
		10mAAloutA1.5A	--	12	360	mV
		250mAAloutA750mA	--	4	180	mV
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.5	8	mA
Quiescent Current Change	ΔIq	21VAVinA33V	--	--	1	mA
		5mAAloutA1.5A	--	--	0.5	mA
Output Noise Voltage	Vn	10HzAfA100KHz, Tj=25°C	--	110	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 21VAVinA31V	54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	22	--	mK
Output Short Circuit Current	Ios	Tj=25°C	--	200	--	mA
Peak Output Current	I <sub>o peak</sub>	Tj=25°C	--	2.1	--	A
Temperature Coefficient of Output Voltage	OVout/OTj	Iout=5mA, 0°CATjA125°C	--	-1	--	mV/°C

Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

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### TS7824 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.)

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_{out}$	$T_j=25^{\circ}C$	23.07	24	24.96	V
		26V $V_{in}$ A38V, 5mA $I_{out}$ A1.5A, PD A15W	22.85	24	25.20	V
Line Regulation	REGline	26V $V_{in}$ A38V	--	18	480	mV
		$T_j=25^{\circ}C$ 27V $V_{in}$ A32V	--	6	240	mV
Load Regulation	REGload	10mA $I_{out}$ A1.5A	--	12	480	mV
		$T_j=25^{\circ}C$ 250mA $I_{out}$ A750mA	--	4	240	mV
Quiescent Current	$I_q$	$I_{out}=0$ , $T_j=25^{\circ}C$	--	4.6	8	mA
Quiescent Current Change	$\Delta I_q$	26V $V_{in}$ A38V	--	--	1	mA
		5mA $I_{out}$ A1.5A	--	--	0.5	mA
Output Noise Voltage	$V_n$	10Hz $\Delta$ f A100KHz, $T_j=25^{\circ}C$	--	170	--	$\mu V$
Ripple Rejection Ratio	RR	f=120Hz, 26V $V_{in}$ A36V	54	70	--	dB
Voltage Drop	$V_{drop}$	$I_{out}=1.0A$ , $T_j=25^{\circ}C$	--	2	--	V
Output Resistance	$R_{out}$	f=1KHz	--	28	--	mK
Output Short Circuit Current	$I_{os}$	$T_j=25^{\circ}C$	--	150	--	mA
Peak Output Current	$I_{o\ peak}$	$T_j=25^{\circ}C$	--	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/ $^{\circ}C$

Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

FIG. 1 - WORST CASE POWER DISSIPATION versus AMBIENT TEMPERATURE

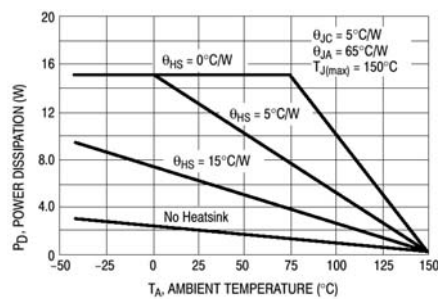
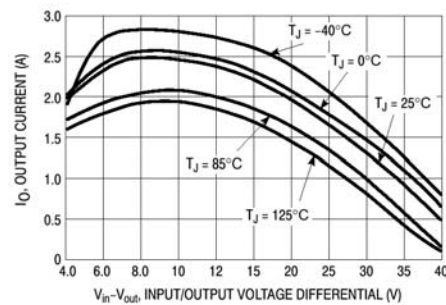


FIG. 2 - PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE



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FIG. 3 - QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

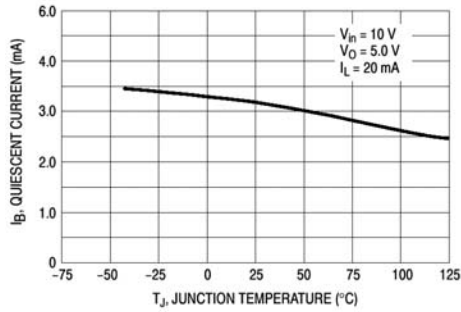


FIG. 4 - INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

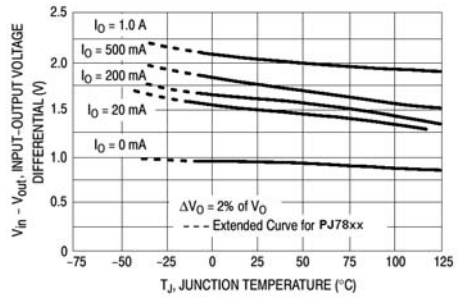


FIG. 5 - OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

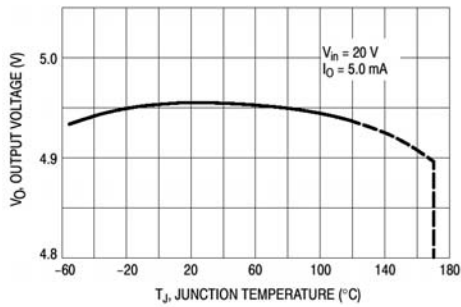


FIG. 6 - OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

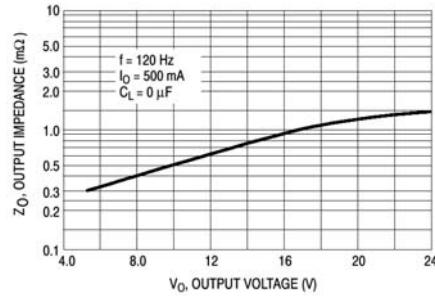


FIG. 7 - RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGE

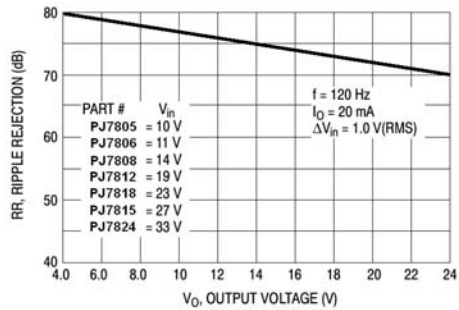
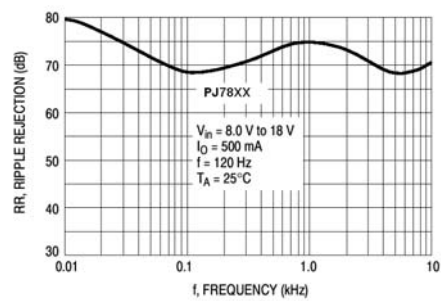


FIG. 8 - RIPPLE REJECTION AS A FUNCTION OF FREQUENCY





TO-220 Mechanical drawing		TO-220 DIMENSION				
1. Top View	2. Side View	DIM	MILLIMETERS		INCHES	
			MIN	MAX	MIN	MAX
		A	10.00	10.50	0.394	0.413
		B	3.24	4.44	0.128	0.175
		C	2.44	2.94	0.096	0.116
		D	3.565	4.315	0.140	0.170
		E	0.68	0.92	0.027	0.036
		F	1.115	1.485	0.044	0.058
		G	2.345	2.715	0.092	0.107
		H	13.49	14.31	0.531	0.563
		I	4.475	5.225	0.176	0.206
		J	1.15	1.39	0.045	0.055
		K	27.78	29.62	1.094	1.166
		L	2.175	2.925	0.086	0.115
		M	0.297	0.477	0.012	0.019
		N	8.28	8.80	0.326	0.346
		O	14.29	15.31	0.563	0.603
		P	6.01	6.51	0.237	0.256
TO-220F Mechanical drawing		TO-220F DIMENSION				
1. Top View	2. Side View	DIM	MILLIMETERS		INCHES	
			MIN	MAX	MIN	MAX
		A	9.9	10.1	0.390	0.398
		B	6.2	6.2	0.244	0.244
		C	2.2	2.2	0.087	0.087
		D	...1.4	...1.4	...0.055	...0.055
		E	15.0	15.2	0.591	0.598
		F	0.48	0.72	0.019	0.028
		G	2.355	2.725	0.093	0.107
		H	13.49	14.31	0.531	0.563
		I	1.115	1.485	0.044	0.058
		J	2.6	2.8	0.102	0.110
		K	4.4	4.6	0.173	0.181
		L	1.115	1.15	0.045	0.045
		M	2.95	3.15	0.116	0.124
		N	2.6	2.8	0.102	0.110
		O	6.55	6.65	0.258	0.262

Rev. 1 03/2003