TS7800

3-Terminal Fixed 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 up to 1.5 ampere.

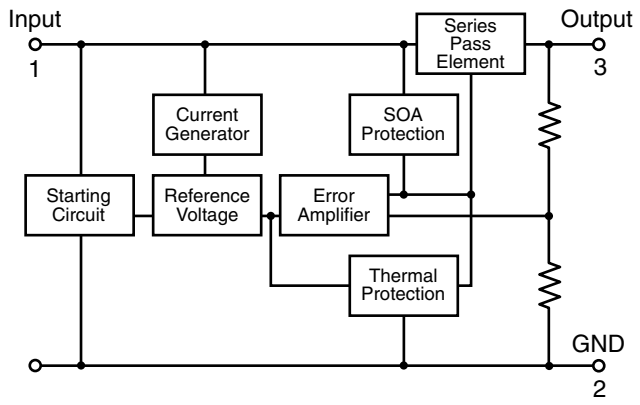
Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

FEATURES

- Output Current up to 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

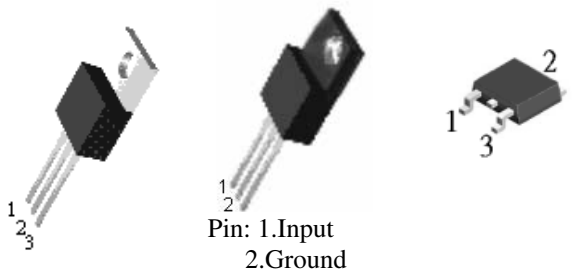
CIRCUIT SCHEMATIC

Representative Schematic Diagram



PIN ARRANGEMENT

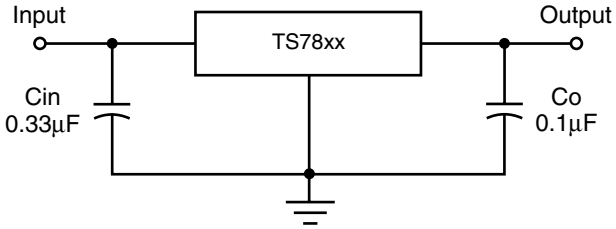
TO-220 TO-220F TO-252



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

TYPICAL CONNECTING CIRCUIT

Standard Application



Notes:

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 part number indicate output 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.

TS7800

3-Terminal Fixed Positive Voltage Regulators

• *ABSOLUTE MAXIMUM RATINGS* (Ta=25℃)

RATING		SYMBOL	TS7800 Series	UNIT
Input Voltage		Vin *	35	V
Input Voltage		Vin **	40	V
Power Dissipation	TO-220	Without heatsink	2	
	TO-220	Pt ***	15	℃/
	TO-220F	With	10	W
	TO-252	heatsink	10	
Operating Ambient Temperature		Topr	-20 to +85	℃
Operating Junction Temperature		Tj	0 to +125	℃
Storage Temperature		Tstg	-25 to +150	℃

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

• *ORDERING INFORMATION*

DEVICE	OPERATING TEMPERATURE (AMBIENT)	PACKAGE
TS78xxCZ	-20℃ to +85℃	TO-220
TS78xxCI		TO-220F
TS78xxCP		TO-252

• *TS7805 ELECTRICAL CHARACTERISTICS*

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		4.90	5	5.10	V
		7V≤Vin≤20V, 5mA≤Iout≤1.5A, PD≤15W		4.85	-	5.15	V
Line Regulation	REGline	Tj=25℃	7.5V≤Vin≤25V	--	3	100	mV
			8V≤Vin≤12V	--	1	50	mV
Load Regulation	REGload	Tj=25℃	5mA≤Iout≤1.5A	--	15	100	mV
			250mA≤Iout≤750mA	--	5	50	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.2	8	mA
Quiescent Current Change	ΔIq	7V≤Vin≤25V		--	--	1.3	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	40	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 8V≤Vin≤18V		62	78	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	17	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	750	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ΔTj	Iout=5mA, 0℃≤Tj≤125℃		--	-0.6	--	mV/℃

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.

TS7800

3-Terminal Fixed Positive Voltage Regulators

• *TS7806 ELECTRICAL CHARACTERISTICS*

(Vin=11V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		5.88	6	6.12	V
		8V≤Vin≤21V, 5mA≤Iout≤1.5A, PD≤15W		5.82	--	6.18	V
Line Regulation	REGline	Tj=25℃	8V≤Vin≤25V	--	5	120	mV
			9V≤Vin≤13V	--	1.5	60	mV
Load Regulation	REGload	Tj=25℃	5mA≤Iout≤1.5A	--	14	120	mV
			250mA≤Iout≤750mA	--	4	60	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.3	8	mA
Quiescent Current Change	△Iq	8V≤Vin≤25V		--	--	1.3	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	45	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 9V≤Vin≤19V		59	75	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	19	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	550	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-0.7	--	mV/℃

• *TS7808 ELECTRICAL CHARACTERISTICS*

(Vin=14V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		7.84	8	8.16	V
		10.5V≤Vin≤23V, 5mA≤Iout≤1.5A, PD ≤15W		7.76	--	8.24	V
Line Regulation	REGline	Tj=25℃	10.5V≤Vin≤25V	--	6	160	mV
			11V≤Vin≤17V	--	2	80	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	160	mV
			250mA≤Iout≤750mA	--	4	80	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.3	8	mA
Quiescent Current Change	△Iq	10.5V≤Vin≤25V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	52	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 11V≤Vin≤21V		56	72	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	450	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-0.8	--	mV/℃

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.

TS7800

3-Terminal Fixed Positive Voltage Regulators

• *TS7809 ELECTRICAL CHARACTERISTICS*

(Vin=15V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		8.82	9	9.18	V
		11.5V≤Vin≤24V, 5mA≤Iout≤1.5A, PD ≤15W		8.73	--	9.27	V
Line Regulation	REGline	Tj=25℃	11.5V≤Vin≤26V	--	6	180	mV
			11.5V≤Vin≤17V	--	2	90	mV
Load Regulation	REGload	Tj=25℃	5mA≤Iout≤1.5A	--	12	180	mV
			250mA≤Iout≤750mA	--	4	90	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.3	8	mA
Quiescent Current Change	△Iq	11.5V≤Vin≤26V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	52	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 11.5V≤Vin≤21.5V		55	72	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	450	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-1	--	mV/℃

• *TS7810 ELECTRICAL CHARACTERISTICS*

(Vin=16V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		9.8	10	10.2	V
		12.5V≤Vin≤25V, 5mA≤Iout≤1.5A, PD ≤15W		9.7	-	10.3	V
Line Regulation	REGline	Tj=25℃	12.5V≤Vin≤28V	--	7	200	mV
			13V≤Vin≤17V	--	2	100	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	200	mV
			250mA≤Iout≤750mA	--	4	100	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.3	8	mA
Quiescent Current Change	△Iq	12.5V≤Vin≤28V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	70	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 13V≤Vin≤23V		55	71	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	18	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	400	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-1	--	mV/℃

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.

TS7800

3-Terminal Fixed Positive Voltage Regulators

• *TS7812 ELECTRICAL CHARACTERISTICS*

Vin=19V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		11.76	12.0	12.24	V
		14.5V≤Vin≤27V, 5mA≤Iout≤1.5A, PD ≤15W		11.64	--	12.36	V
Line Regulation	REGline	Tj=25℃	14V≤Vin≤30V	--	10	240	mV
			15V≤Vin≤19V	--	3	120	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	240	mV
			250mA≤Iout≤750mA	--	4	120	mV
Quiescent Current	Iq	Tj=25℃, Iout=0		--	4.3	8	mA
Quiescent Current Change	△Iq	14.5V≤Vin≤30V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	75	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 15V≤Vin≤25V		55	71	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	20	--	V
Output Resistance	Rout	f=1KHz		--	18	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	350	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.2	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-1	--	mV/℃

• *TS7815 ELECTRICAL CHARACTERISTICS*

(Vin=23V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		14.7	15	15.3	V
		17.5V≤Vin≤30V, 5mA≤Iout≤1.5A, PD ≤15W		14.55	--	15.45	V
Line Regulation	REGline	Tj=25℃	17.5V≤Vin≤30V	--	12	300	mV
			18V≤Vin≤22V	--	3	150	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	300	mV
			250mA≤Iout≤750mA	--	4	150	mV
Quiescent Current	Iq	Tj=25℃, Iout=0		--	4.3	8	mA
Quiescent Current Change	△Iq	17.5V≤Vin≤30V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	90	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 18V≤Vin≤28V		54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	19	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	230	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.1	--	A
Temperature Coefficient of Output Voltage	△Vout/△Tj	Iout=5mA, 0℃≤Tj≤125℃		--	-1	--	mV/℃

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.

• *TS7818 ELECTRICAL CHARACTERISTICS*

(Vin=27V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		17.64	18	18.36	V
		21V≤Vin≤33V, 5mA≤Iout≤1.5A, PD ≤15W		17.46	--	18.54	V
Line Regulation	REGline	Tj=25℃	21V≤Vin≤33V	--	15	360	mV
			22V≤Vin≤26V	--	5	180	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	360	mV
			250mA≤Iout≤750mA	--	4	180	mV
Quiescent Current	Iq	Tj=25℃, Iout=0		--	4.5	8	mA
Quiescent Current Change	ΔIq	21V≤Vin≤33V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	110	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 21V≤Vin≤31V		54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	22	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	200	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ΔTj	Iout=5mA, 0℃≤Tj≤125℃		--	-1	--	mV/℃

• *TS7824 ELECTRICAL CHARACTERISTICS*

(Vin=33V, Iout=500mA, 0℃≤Tj≤125℃, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vout	Tj=25℃		23.52	24	24.48	V
		26V≤Vin≤38V, 5mA≤Iout≤1.5A, PD ≤15W		23.28	--	24.72	V
Line Regulation	REGline	Tj=25℃	26V≤Vin≤38V	--	18	480	mV
			27V≤Vin≤32V	--	6	240	mV
Load Regulation	REGload	Tj=25℃	10mA≤Iout≤1.5A	--	12	480	mV
			250mA≤Iout≤750mA	--	4	240	mV
Quiescent Current	Iq	Iout=0, Tj=25℃		--	4.6	8	mA
Quiescent Current Change	ΔIq	26V≤Vin≤38V		--	--	1	mA
		5mA≤Iout≤1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25℃		--	170	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 26V≤Vin≤36V		54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25℃		--	2	--	V
Output Resistance	Rout	f=1KHz		--	28	--	mΩ
Output Short Circuit Current	Ios	Tj=25℃		--	150	--	mA
Peak Output Current	Io peak	Tj=25℃		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ΔTj	Iout=5mA, 0℃≤Tj≤125℃		--	-1.5	--	mV/℃

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.

FIGURE 1 - WORST CASE POWER DISSIPATION versus AMBIENT TEMPERATURE

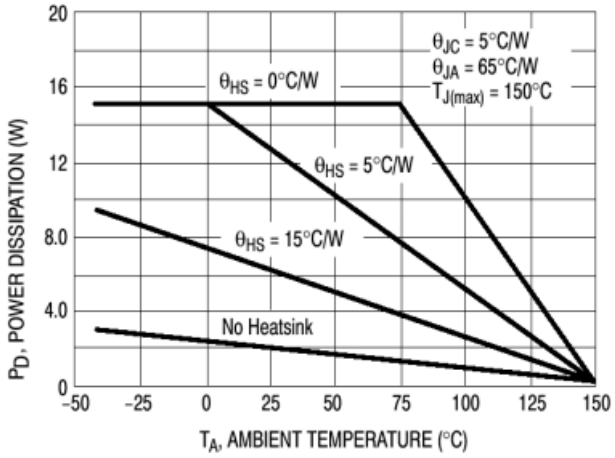


FIGURE 2 - PEAK OUTPUT CURRENT AS A UNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE

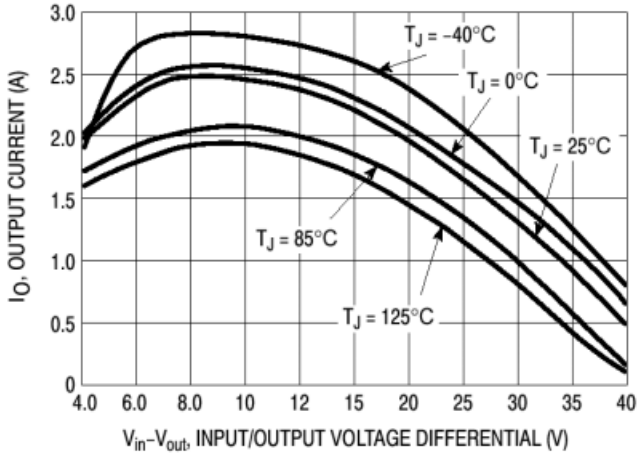


FIGURE 3 - QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

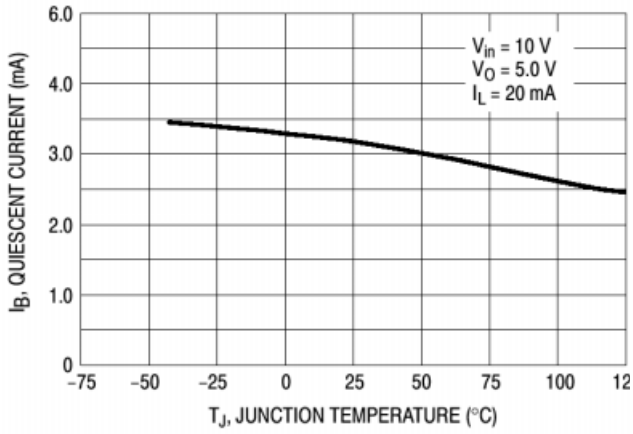


FIGURE 4 - INPUT OUTPUT DIFFERENTIAL AS A FUNCTION OF JUNCTION TEMPERATURE

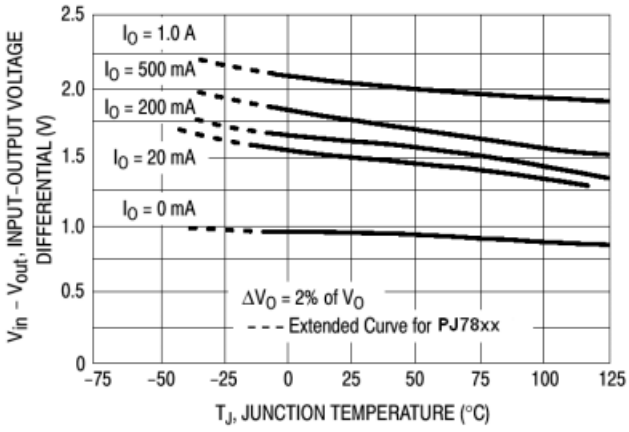


FIGURE 5 - OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE

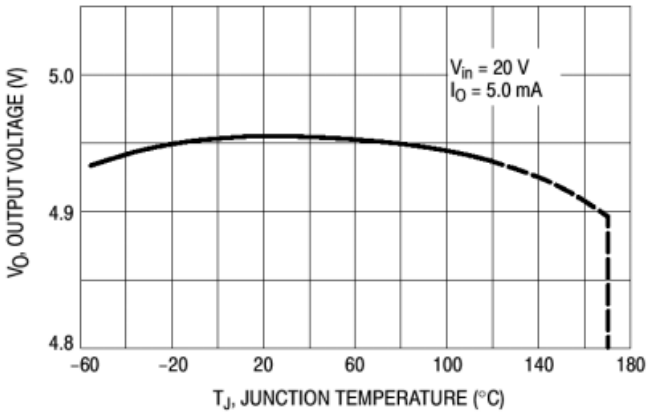


FIGURE 6 - OUTPUT IMPEDANCE AS A FUNCTION OF OUTPUT VOLTAGE

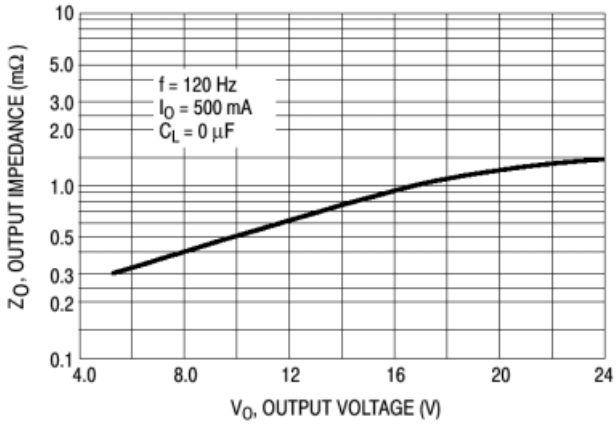


FIGURE 7 - RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGE

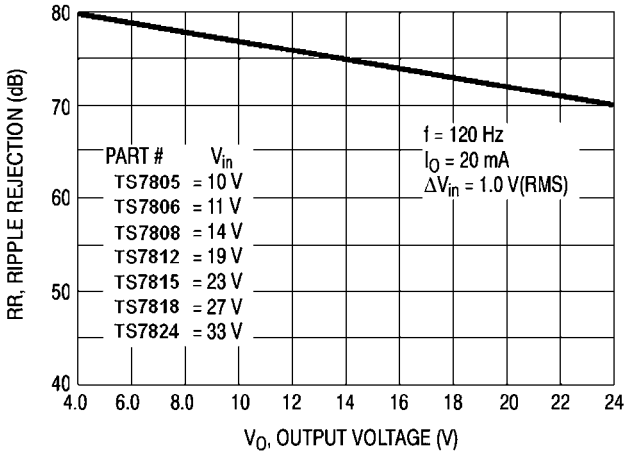
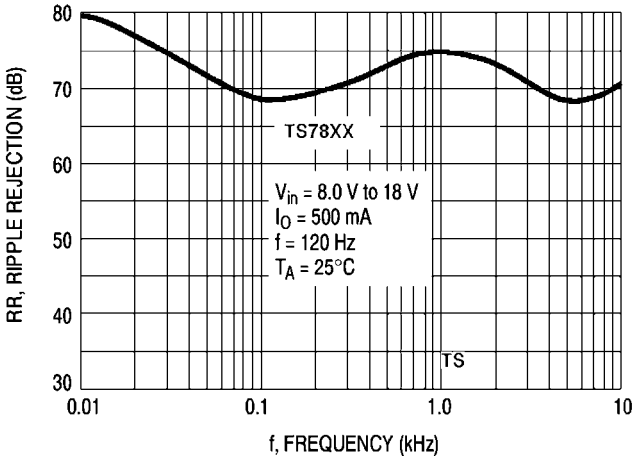


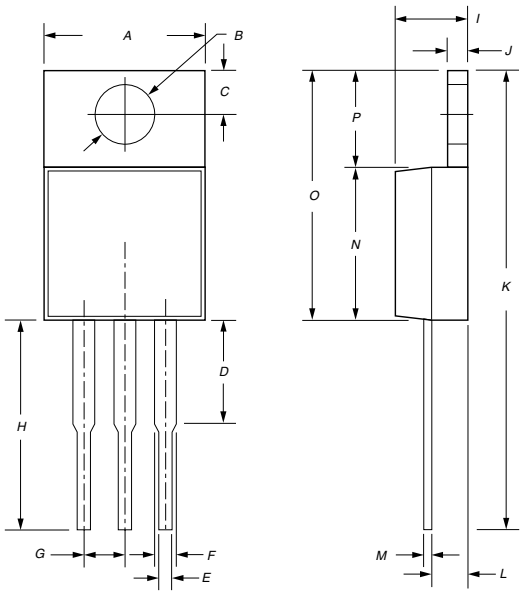
FIGURE 8 - RIPPLE REJECTION AS A FUNCTION OF FREQUENCY



TS7800

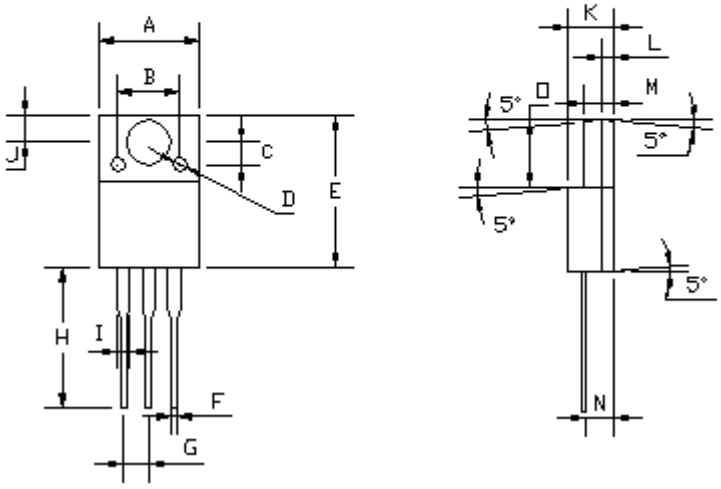
3-Terminal Fixed Positive Voltage Regulators

TO-220 Mechanical drawing



TO-220 DIMENSION				
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

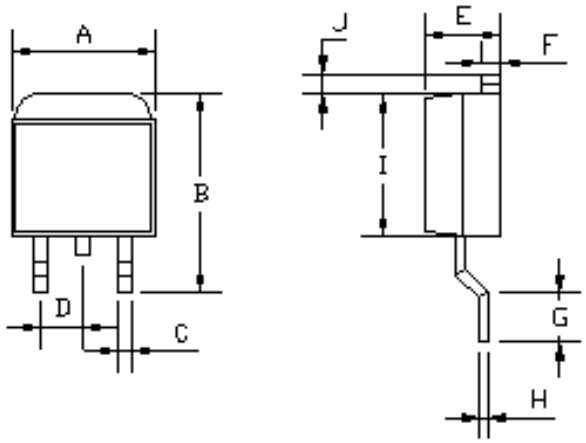


TO-220F DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.9	10.1	0.390	0.398
B	6.2	6.2	0.244	0.244
C	2.2	2.2	0.087	0.087
D	1.4	1.4	0.055	0.055
E	15.0	15.2	0.591	0.598
F	0.48	0.72	0.019	0.028
G	2.355	2.725	0.093	0.107
H	13.49	14.31	0.531	0.563
I	1.115	1.485	0.044	0.058
J	2.6	2.8	0.102	0.110
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

TS7800

3-Terminal Fixed Positive Voltage Regulators

TO-252 Mechanical drawing



TO-252 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.45	6.55	0.254	0.258
B	9.74	10.7	0.383	0.421
C	0.55	0.65	0.022	0.026
D	2.25	2.35	0.089	0.093
E	1.80	2.80	0.071	0.110
F	0.45	0.56	0.018	0.022
G	0.95	1.45	0.037	0.057
H	0.40	0.60	0.016	0.024
I	5.32	5.57	0.209	0.219
J	1.52	2.03	0.06	0.080