3-Terminal Negative Output Voltage Regulators

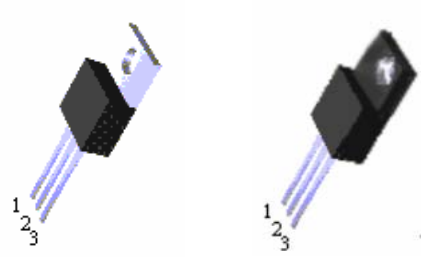
These voltage regulators are intended as complements to the popular PJ7900 Series devices. These negative regulators are available in the same seven-voltage options as the PJ7900 devices. In addition, one extra voltage option commonly employed in MECL systems is also available in the negative PJ7900 Series.

Available in fixed output voltage options from -5.0 to -24 volts, these regulators employ current limiting, thermal shutdown, and safe-area compensation--making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 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
- Available in 4% Voltage Tolerance

TO-220 TO-220F



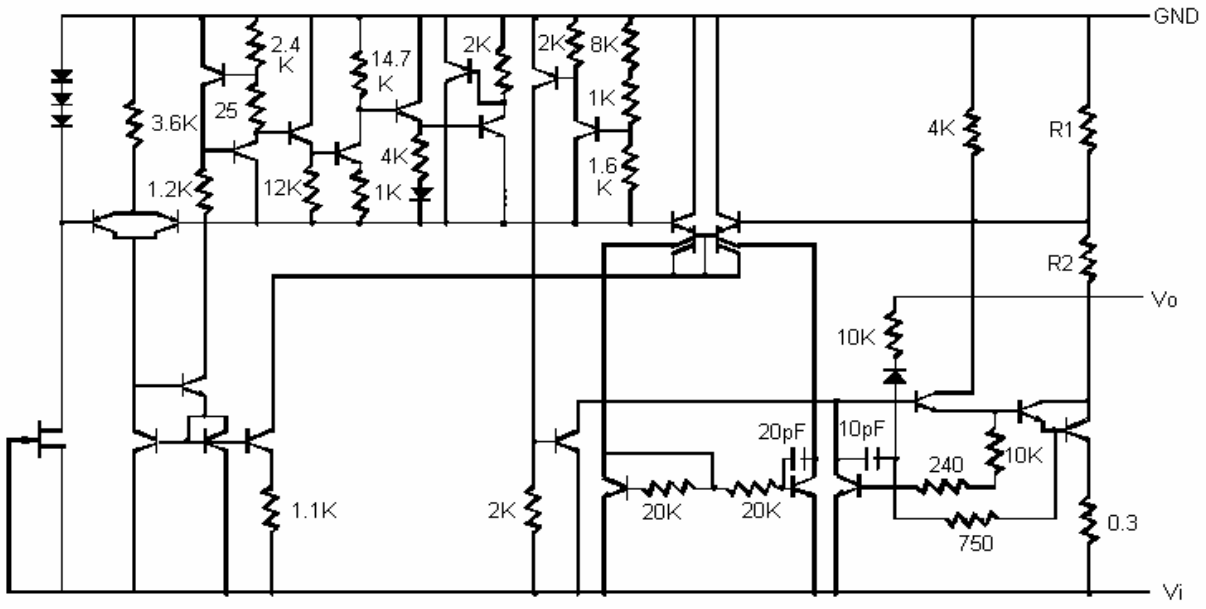
Pin : 1. Ground
2. Input
3. Output
(Heatsink surface connected to Pin 2.)

ORDERING INFORMATION

Device	Operating Temperature (Ambient)	Package
PJ79xxCZ	-20 ℃ to +85℃	TO-220
PJ79xxCI		TO-220F

CIRCUIT SCHEMATIC

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

RATING	SYMBOL	PJ7900 Series	UNIT
Input Voltage *(-5V≧Vo≧-18V) **(-24V)	Vin	-35 -40	V
Power Dissipation TO-220	Without heatsink	2	℃/W
TO-220 TO-220F	Pt ***	15	
	With heatsink	10	
Operating Ambient Temperature	Topr	-20 to +85	℃
Operating Junction Temperature	Tj	0 to +125	℃
Storage Temperature	Tstg	-25 to +150	℃

Note: *1: PJ7905 to PJ7918
**2: PJ7924
***3: Follow the derating curve. When Tj exceeds 150℃, the internal circuit cuts off the output.

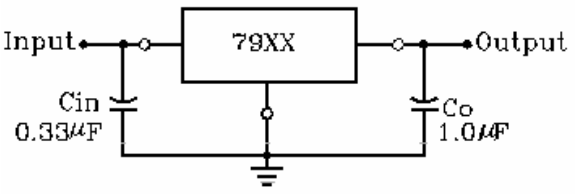
• *PJ7905 ELECTRICAL CHARACTERISTICS*

(Vin=-10V, Iout=500mA, Cin=2 μF, Cout=1 μF; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX	UNIT
Output Voltage	Vo	1	Tj=25℃		-4.80	-5.0	-5.20	V
			Vi=-7 to -20V, Io=5mA to 1A, P_D<15W		-4.75	-5.0	-5.25	V
Line Regulation	REGline	1	Tj=25℃	Vi=-7 to -25V	--	3	100	mV
				Vi=-8 to -12V	--	1	50	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	10	100	mV
				Io=250mA to 750mA	--	3	50	mV
Quiescent Current	Iq	2	Tj=25℃		--	2	4	mA
Quiescent current Change	Δ Iq	2	VIN=-7 to -25V		--	--	1.3	mA
			Io=5mA to 1.5A				0.5	
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	40	--	μV
Ripple Rejection Ratio	RR	3	Vi=-8 to -18V, Io=100mA, f=120Hz		62	74	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.4	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V more negative even during the high 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 improves stability and transient response.

• *PJ7906 ELECTRICAL CHARACTERISTICS*

(Vin=-11V, Iout=500mA, Cin=2 μ F, Cout=1 μ F; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-5.75	-6.0	-6.25	V
			Vi=-8 to -21V, Io=5mA to 1A, P_D<15W		-5.70	-6.0	-6.30	V
Line Regulation	REGline	1	Tj=25℃	Vi=-8 to -25V	--	4	120	mV
				Vi=-9 to -13V	--	1.5	60	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	10	120	mV
				Io=250mA to 750mA	--	3	60	mV
Quiescent Current	Iq	2	Tj=25℃		--	2	4	mA
Quiescent Current Change	ΔIq	2	Vi=-8 to -25V, Tj=25℃		--	--	1.3	mA
			Io=5mA to 1A, Tj=25℃		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	44	--	μ V
Ripple Rejection Ratio	RR	3	Vi=-9 to -19V, Io=100mA, f=120Hz		60	73	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.5	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

• *PJ7908 ELECTRICAL CHARACTERISTICS*

(Vin=-14V, Iout=500mA, Cin=2 μ F, Cout=1 μ F; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-7.69	-8.0	-8.32	V
			Vi=-10.5 to -23V, Io=5mA to 1A, P_D<15W		-7.61	-8.0	-8.40	V
Line Regulation	REGline	1	Tj=25℃	Vi=-10.5 to -25V	--	6	160	mV
				Vi=-11 to -17V	--	2	80	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	160	mV
				Io=250mA to 750mA	--	4	80	mV
Quiescent Current	Iq	2	Tj=25℃		--	2	4	mA
Quiescent Current Change	ΔIq	2	Vi=-10.5 to -25V, Tj=25℃		--	--	1	mA
			Io=5mA to 1A		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	52	--	μ V
Ripple Rejection Ratio	RR	3	Vi=-11 to -21V, Io=100mA, f=120Hz		56	71	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	2	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.6	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

• PJ7909 ELECTRICAL CHARACTERISTICS

(Vin=-15V , Iout=500mA, Cin=2uF, Cout=1uF; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-8.65	-9.0	-9.36	V
			Vi=-11.5 to -24V, Io=5mA to 1A, P_D<15W		-8.57	-9.0	-9.45	V
Line Regulation	REGline	1	Tj=25℃	Vi=-11.5 to -26V	--	7	180	mV
				Vi=-12 to -18V	--	2	90	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	180	mV
				Io=250mA to 750mA	--	4	90	mV
Quiescent Current	Iq	2	Tj=25℃		--	2.2	4.5	mA
Quiescent Current Change	ΔIq	2	Vi=-11.5 to -26V, Tj=25℃		--	--	1	mA
			Io=5mA to 1.5A		--	--	0.5	mA
Bias Current	I_{IB}	2	Tj=25℃		--	2.2	4.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	58	--	μV
Ripple Rejection Ratio	RR	3	Vi=-12 to -22V,Io=100mA, f=120Hz		56	71	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.6	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

• PJ7912 ELECTRICAL CHARACTERISTICS

(Vin=-19V, Iout=500mA, Cin=2 μF, Cout=1 μF; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-11.53	-12	-12.48	V
			Vi=-14.5 to -27V, Io=5mA to 1A, P_D<15W		-11.42	-12	-12.60	V
Line Regulation	REGline	1	Tj=25℃	Vi=-14.5 to -30V	--	10	240	mV
				Vi=-16 to -22V	--	3	120	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	240	mV
				Io=250mA to 750mA	--	4	120	mV
Quiescent Current	Iq	2	Tj=25℃		--	2.5	5	mA
Quiescent Current Change	ΔIq	2	Vi=-14.5 to -30V, Tj=25℃		--	--	1	mA
			Io=5mA to 1.5A		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	75	--	μV
Ripple Rejection Ratio	RR	3	Vi=-15 to -25V, Io=100mA, f=120Hz		55	70	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.8	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

• PJ7915 ELECTRICAL CHARACTERISTICS

(Vin=-23V, Iout=500mA, Cin=2 μF, Cout=1 μF; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-14.42	-15	-15.60	V
			Vi=-17.5 to -30V, Io=5mA to 1A, P_D<15W		-14.28	-15	-15.75	V
Line Regulation	REGline	1	Tj=25℃	Vi=-17.5 to -30V	--	11	300	mV
				Vi=-20 to -26V	--	3	150	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	300	mV
				Io=250mA to 750mA	--	4	150	mV
Quiescent Current	Iq	2	Tj=25℃		--	2.5	5	mA
Quiescent Current Change	ΔIq	2	Vi=-17.5 to -30V		--	--	1	mA
			lo=5mA to 1A		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	90	--	μV
Ripple Rejection Ratio	RR	3	Vi=-18.5 to -28.5V, Io=100mA, f=120Hz		54	69	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-0.9	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

• PJ7918 ELECTRICAL CHARACTERISTICS

(Vin=-27V, Iout=500mA, Cin=2 μF, Cout=1 μF; Tj=0℃ to 125℃, unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-17.30	-18	-18.72	V
			Vi=-21 to -33V, Io=5mA to 1A, P_D<15W		-17.14	-18	-18.90	V
Line Regulation	REGline	1	Tj=25℃	Vi=-21 to -33V	--	15	360	mV
				Vi=-24 to -30V	--	5	180	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	360	mV
				Io=250mA to 750mA	--	4	180	mV
Quiescent Current	Iq	2	Tj=25℃		--	2.5	5	mA
Quiescent Current Change	ΔIq	2	Vi=-21 to -33V, Tj=25℃		--	--	1	mA
			lo=5mA to 1.5A, Tj=25℃		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	110	--	μV
Ripple Rejection Ratio	RR	3	Vi=-22 to -32V, Io=100mA, f=120Hz		53	68	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-1	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

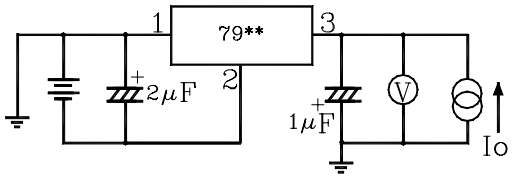
• *PJ7924 ELECTRICAL CHARACTERISTICS*

(Vin=-33V, Iout=500mA, Cin=2uF, Cout=1uF; Tj=0℃ to 125℃, unless otherwise specified.)

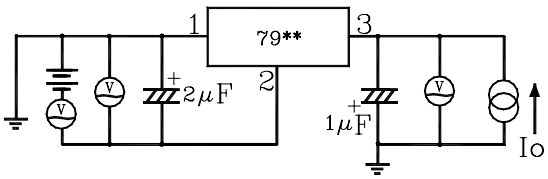
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25℃		-23.07	-24	-24.96	V
			Vi=-27 to -38V, Io=5mA to 1A, P_D<15W		-22.85	-24	-25.20	V
Line Regulation	REGline	1	Tj=25℃	Vi=-27 to -38V	--	18	480	mV
				Vi=-30 to -36V	--	6	240	mV
Load Regulation	REGload	1	Tj=25℃	Io=5mA to 1.5A	--	12	480	mV
				Io=250mA to 750mA	--	4	240	mV
Quiescent Current	Iq	2	Tj=25℃		--	3	5	mA
Quiescent Current Change	ΔIq	2	Vi=-27 to -38V, Tj=25℃		--	--	1	mA
			Io=5mA to 1.5A, Tj=25℃		--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25℃		--	170	--	μV
Ripple Rejection Ratio	RR	3	Vi=-28 to -38V, Io=100mA, f=120Hz		50	65	--	dB
Min. I/O Voltage Difference	Vdif		Io=1A, Tj=25℃		--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25℃		--	2.1	--	A
Output Voltage Tempoerature Coefficient	ΔVo/Ta	1	Io=5mA, Tj=0 to 125℃		--	-1	--	mV/℃

Note: The specified condition Tj=25℃ means that the test should be carried out with the test time so short (within 10mS), that the drift in characteristic value due to the rise in chip junction temperature can be ignored.

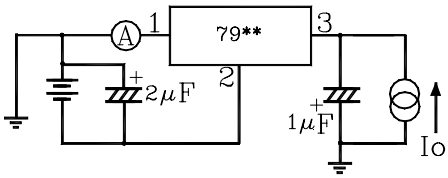
TEST CIRCUIT 1



TEST CIRCUIT 2



TEST CIRCUIT 3



$$RR=20LOG\left(\frac{|Vi|}{|Vo|}\right)$$

FIGURE 1 -WORST CASE POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE

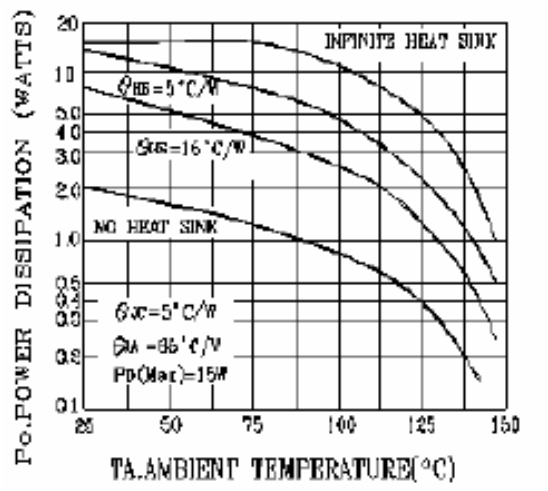


FIGURE 2 - WORST CASE POWER DISSIPATION AS FUNCTION OF AMBIENT TEMPERATURE

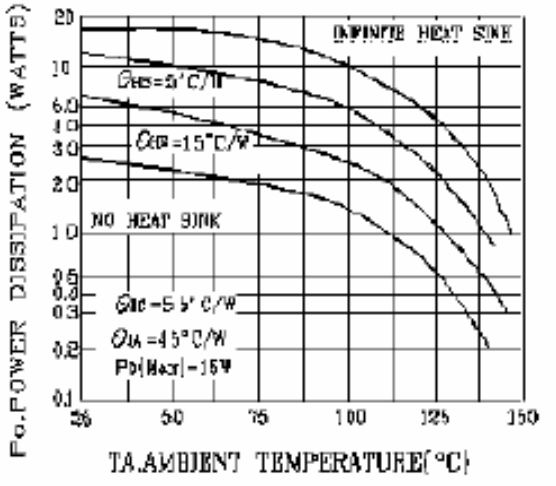


FIGURE 3 - PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAG

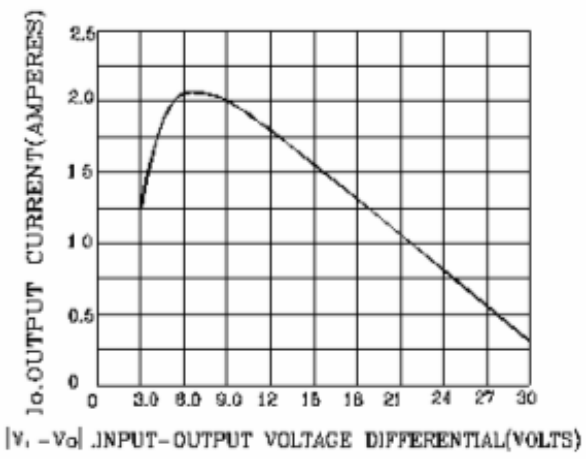


FIGURE 4 - RIPPLE REJECTION AS A FUNCTION OF FREQUENCY

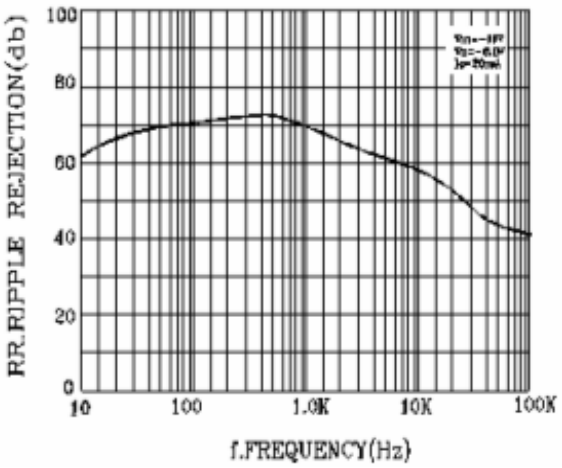


FIGURE 5 - RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES

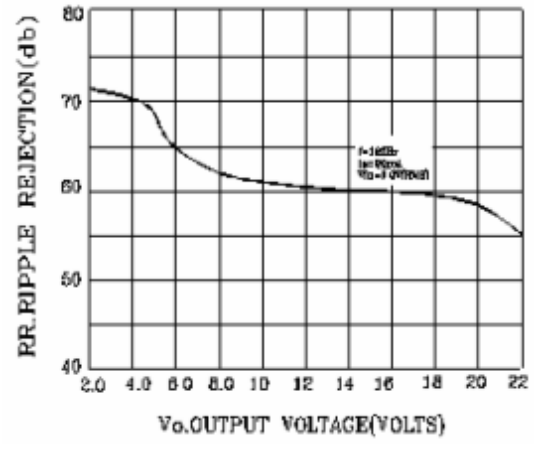
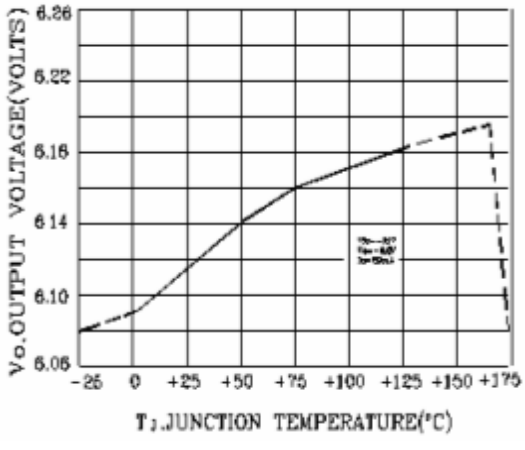
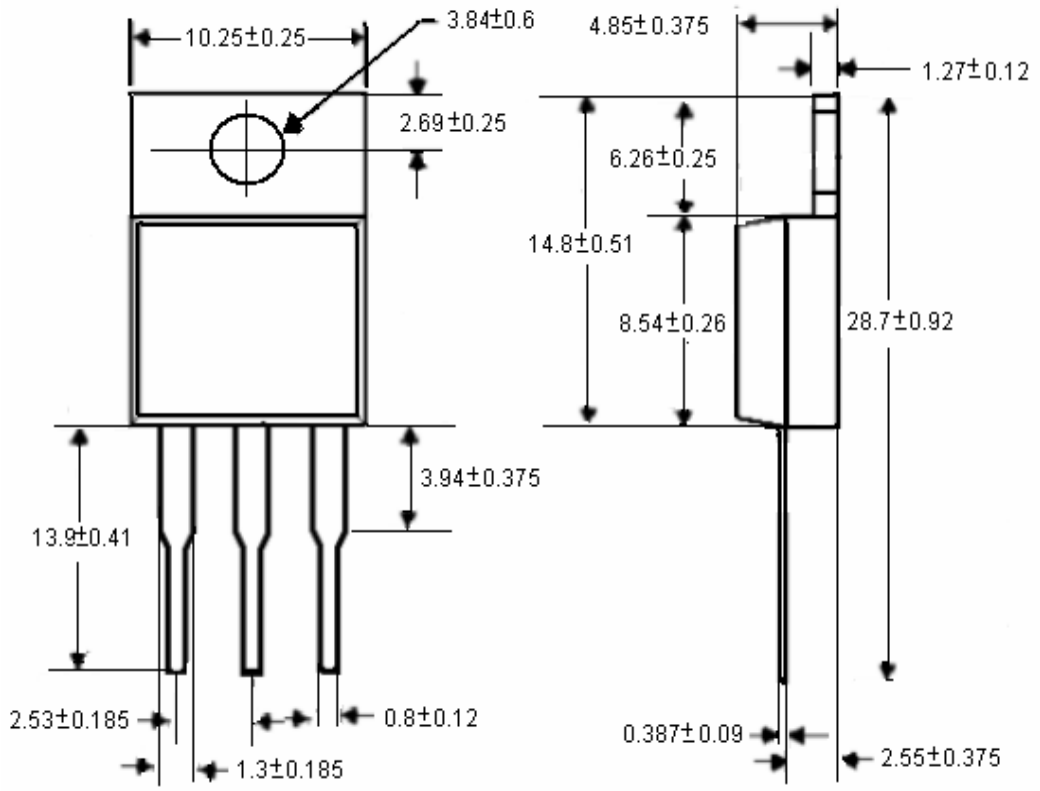


FIGURE 6 - OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATUR



TO-220 Unit:mm



TO-220F Unit:mm