

### 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.

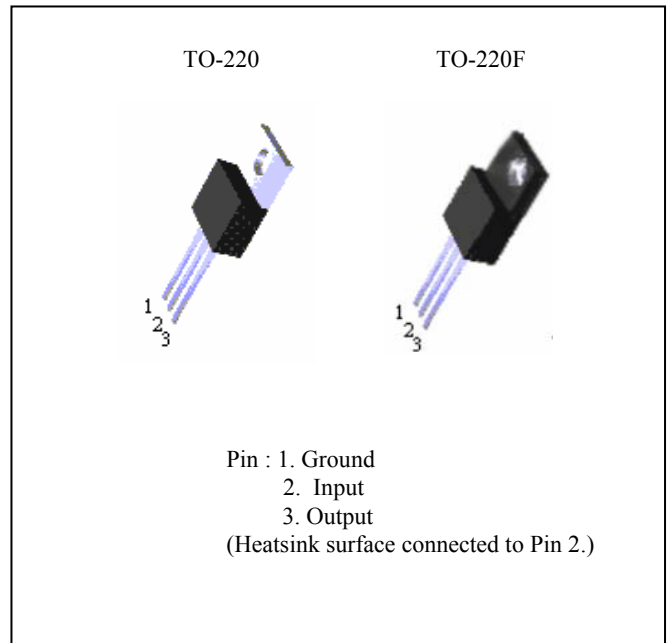
Available in fixed output voltage options from -5.0 to -24 volts, these regulators employ current limiting, thermal shutdown, and safe-area compensation--making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 1 ampere.

**FEATURES**

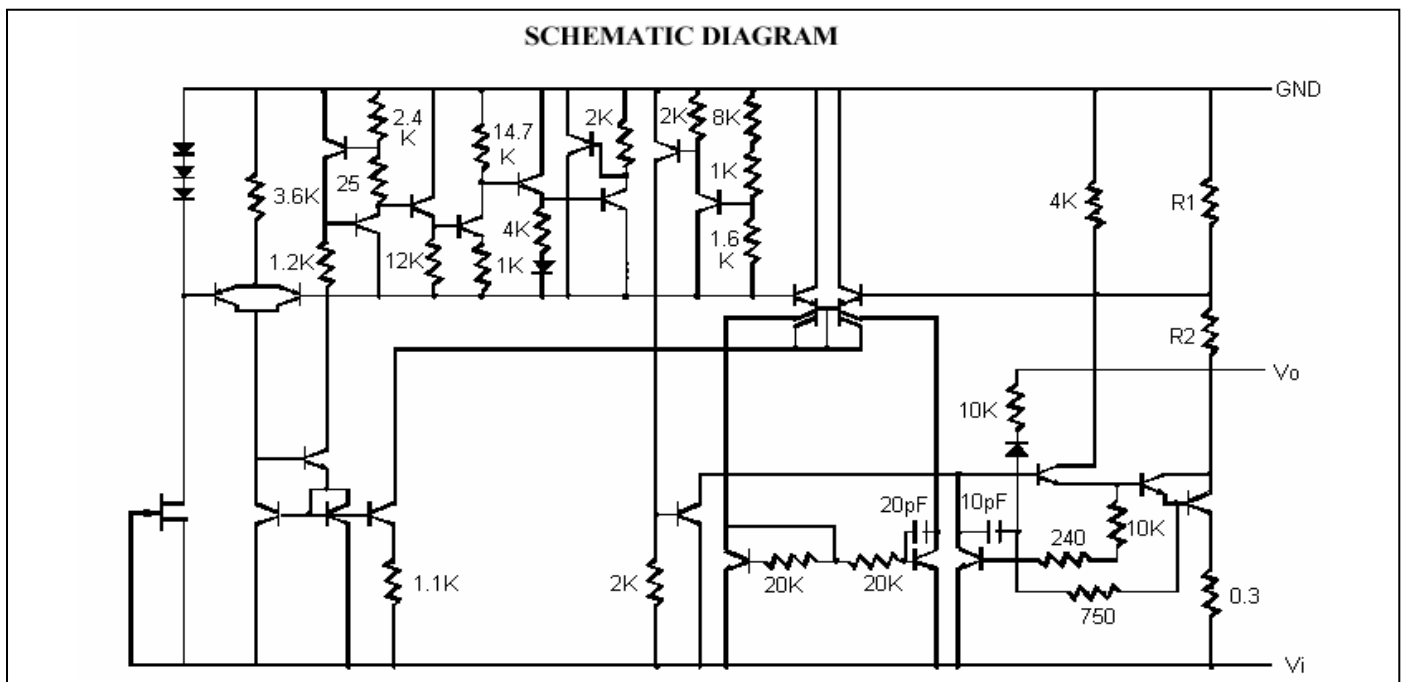
- Output Current up to 1 Ampere
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Available in 4% Voltage Tolerance

**ORDERING INFORMATION**

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



**CIRCUIT SCHEMATIC**



3-Terminal Negative Output Voltage Regulators

**ABSOLUTE MAXIMUM RATINGS** (Ta=25°C)

RATING	SYMBOL	PJ7900 Series	UNIT
Input Voltage *(-5V ≥ Vo ≥ -18V) **(-24V)	Vin	-35 -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: \*1: PJ7905 to PJ7918  
 \*\*2: PJ7924  
 \*\*\*3: Follow the derating curve. When Tj exceeds 150°C, the internal circuit cuts off the output.

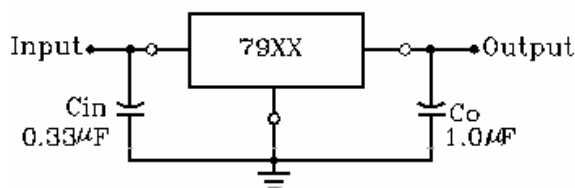
**• PJ7905 ELECTRICAL CHARACTERISTICS**

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

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX	UNIT	
Output Voltage	Vo	1	Tj=25°C	-4.80	-5.0	-5.20	V	
			Vi=-7 to -20V, Io=5mA to 1A, Pd<15W	-4.75	-5.0	-5.25	V	
Line Regulation	REGline	1	Tj=25°C	Vi=-7 to -25V	--	3	100	mV
				Vi=-8 to -12V	--	1	50	mV
Load Regulation	REGload	1	Tj=25°C	Io=5mA to 1.5A	--	10	100	mV
				Io=250mA to 750mA	--	3	50	mV
Quiescent Current	Iq	2	Tj=25°C	--	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°C	--	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°C	--	1.1	--	V	
Peak Output Current	Io-peak	1	Tj=25°C	--	2.1	--	A	
Output Voltage Temperature Coefficient	Δ Vo/Ta	1	Io=5mA, Tj=0 to 125°C	--	-0.4	--	mV/°C	

Note: The specified condition Tj=25°C 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.

3-Terminal Negative Output Voltage Regulators

• **PJ7906 ELECTRICAL CHARACTERISTICS**

( $V_{in}=-11V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25°C	-5.75	-6.0	-6.25	V
			Vi=-8 to -21V, Io=5mA to 1A, Pd<15W	-5.70	-6.0	-6.30	V
Line Regulation	REGline	1	Tj=25°C	--	4	120	mV
			Vi=-9 to -13V	--	1.5	60	mV
Load Regulation	REGload	1	Tj=25°C	--	10	120	mV
			Io=250mA to 750mA	--	3	60	mV
Quiescent Current	Iq	2	Tj=25°C	--	2	4	mA
Quiescent Current Change	Δ Iq	2	Vi=-8 to -25V, Tj=25°C	--	--	1.3	mA
			Io=5mA to 1A, Tj=25°C	--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25°C	--	44	--	μV
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°C	--	1.1	--	V
Peak Output Current	Io-peak	1	Tj=25°C	--	2.1	--	A
Output Voltage Temperature Coefficient	Δ Vo/Ta	1	Io=5mA, Tj=0 to 125°C	--	-0.5	--	mV/°C

Note: The specified condition Tj=25°C 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**

( $V_{in}=-14V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	1	Tj=25°C	-7.69	-8.0	-8.32	V
			Vi=-10.5 to -23V, Io=5mA to 1A, Pd<15W	-7.61	-8.0	-8.40	V
Line Regulation	REGline	1	Tj=25°C	--	6	160	mV
			Vi=-11 to -17V	--	2	80	mV
Load Regulation	REGload	1	Tj=25°C	--	12	160	mV
			Io=250mA to 750mA	--	4	80	mV
Quiescent Current	Iq	2	Tj=25°C	--	2	4	mA
Quiescent Current Change	Δ Iq	2	Vi=-10.5 to -25V, Tj=25°C	--	--	1	mA
			Io=5mA to 1A	--	--	0.5	mA
Output Noise Voltage	Vn	1	f=10Hz to 100KHz, Ta=25°C	--	52	--	μV
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°C	--	2	--	V
Peak Output Current	Io-peak	1	Tj=25°C	--	2.1	--	A
Output Voltage Temperature Coefficient	Δ Vo/Ta	1	Io=5mA, Tj=0 to 125°C	--	-0.6	--	mV/°C

Note: The specified condition Tj=25°C 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.

3-Terminal Negative Output Voltage Regulators

**PJ7909 ELECTRICAL CHARACTERISTICS**

( $V_{in}=-15V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_o$	1	$T_j=25^\circ C$	-8.65	-9.0	-9.36	V	
			$V_i=-11.5$ to $-24V$ , $I_o=5mA$ to $1A$ , $P_p<15W$	-8.57	-9.0	-9.45	V	
Line Regulation	REGline	1	$T_j=25^\circ C$	$V_i=-11.5$ to $-26V$	--	7	180	mV
				$V_i=-12$ to $-18V$	--	2	90	mV
Load Regulation	REGload	1	$T_j=25^\circ C$	$I_o=5mA$ to $1.5A$	--	12	180	mV
				$I_o=250mA$ to $750mA$	--	4	90	mV
Quiescent Current	$I_q$	2	$T_j=25^\circ C$	--	2.2	4.5	mA	
Quiescent Current Change	$\Delta I_q$	2	$V_i=-11.5$ to $-26V$ , $T_j=25^\circ C$	--	--	1	mA	
			$I_o=5mA$ to $1.5A$	--	--	0.5	mA	
Bias Current	$I_{IB}$	2	$T_j=25^\circ C$	--	2.2	4.5	mA	
Output Noise Voltage	$V_n$	1	$f=10Hz$ to $100KHz$ , $T_a=25^\circ C$	--	58	--	$\mu V$	
Ripple Rejection Ratio	RR	3	$V_i=-12$ to $-22V$ , $I_o=100mA$ , $f=120Hz$	56	71	--	dB	
Min. I/O Voltage Difference	$V_{dif}$		$I_o=1A$ , $T_j=25^\circ C$	--	1.1	--	V	
Peak Output Current	$I_o\text{-peak}$	1	$T_j=25^\circ C$	--	2.1	--	A	
Output Voltage Temperature Coefficient	$\Delta V_o/T_a$	1	$I_o=5mA$ , $T_j=0$ to $125^\circ C$	--	-0.6	--	mV/ $^\circ C$	

Note: The specified condition  $T_j=25^\circ C$  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**

( $V_{in}=-19V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_o$	1	$T_j=25^\circ C$	-11.53	-12	-12.48	V	
			$V_i=-14.5$ to $-27V$ , $I_o=5mA$ to $1A$ , $P_p<15W$	-11.42	-12	-12.60	V	
Line Regulation	REGline	1	$T_j=25^\circ C$	$V_i=-14.5$ to $-30V$	--	10	240	mV
				$V_i=-16$ to $-22V$	--	3	120	mV
Load Regulation	REGload	1	$T_j=25^\circ C$	$I_o=5mA$ to $1.5A$	--	12	240	mV
				$I_o=250mA$ to $750mA$	--	4	120	mV
Quiescent Current	$I_q$	2	$T_j=25^\circ C$	--	2.5	5	mA	
Quiescent Current Change	$\Delta I_q$	2	$V_i=-14.5$ to $-30V$ , $T_j=25^\circ C$	--	--	1	mA	
			$I_o=5mA$ to $1.5A$	--	--	0.5	mA	
Output Noise Voltage	$V_n$	1	$f=10Hz$ to $100KHz$ , $T_a=25^\circ C$	--	75	--	$\mu V$	
Ripple Rejection Ratio	RR	3	$V_i=-15$ to $-25V$ , $I_o=100mA$ , $f=120Hz$	55	70	--	dB	
Min. I/O Voltage Difference	$V_{dif}$		$I_o=1A$ , $T_j=25^\circ C$	--	1.1	--	V	
Peak Output Current	$I_o\text{-peak}$	1	$T_j=25^\circ C$	--	2.1	--	A	
Output Voltage Temperature Coefficient	$\Delta V_o/T_a$	1	$I_o=5mA$ , $T_j=0$ to $125^\circ C$	--	-0.8	--	mV/ $^\circ C$	

Note: The specified condition  $T_j=25^\circ C$  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.

3-Terminal Negative Output Voltage Regulators

**PJ7915 ELECTRICAL CHARACTERISTICS**

( $V_{in}=-23V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$	1	$T_j=25^\circ C$	-14.42	-15	-15.60	V
			$V_i=-17.5$ to $-30V$ , $I_o=5mA$ to $1A$ , $P_D<15W$	-14.28	-15	-15.75	V
Line Regulation	REGline	1	$T_j=25^\circ C$	--	11	300	mV
			$V_i=-20$ to $-26V$	--	3	150	mV
Load Regulation	REGload	1	$T_j=25^\circ C$	--	12	300	mV
			$I_o=250mA$ to $750mA$	--	4	150	mV
Quiescent Current	$I_q$	2	$T_j=25^\circ C$	--	2.5	5	mA
Quiescent Current Change	$\Delta I_q$	2	$V_i=-17.5$ to $-30V$	--	--	1	mA
			$I_o=5mA$ to $1A$	--	--	0.5	mA
Output Noise Voltage	$V_n$	1	$f=10Hz$ to $100KHz$ , $T_a=25^\circ C$	--	90	--	$\mu V$
Ripple Rejection Ratio	RR	3	$V_i=-18.5$ to $-28.5V$ , $I_o=100mA$ , $f=120Hz$	54	69	--	dB
Min. I/O Voltage Difference	$V_{dif}$		$I_o=1A$ , $T_j=25^\circ C$	--	1.1	--	V
Peak Output Current	$I_{o-peak}$	1	$T_j=25^\circ C$	--	2.1	--	A
Output Voltage Temperature Coefficient	$\Delta V_o/T_a$	1	$I_o=5mA$ , $T_j=0$ to $125^\circ C$	--	-0.9	--	$mV/^\circ C$

Note: The specified condition  $T_j=25^\circ C$  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**

( $V_{in}=-27V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$	1	$T_j=25^\circ C$	-17.30	-18	-18.72	V
			$V_i=-21$ to $-33V$ , $I_o=5mA$ to $1A$ , $P_D<15W$	-17.14	-18	-18.90	V
Line Regulation	REGline	1	$T_j=25^\circ C$	--	15	360	mV
			$V_i=-24$ to $-30V$	--	5	180	mV
Load Regulation	REGload	1	$T_j=25^\circ C$	--	12	360	mV
			$I_o=250mA$ to $750mA$	--	4	180	mV
Quiescent Current	$I_q$	2	$T_j=25^\circ C$	--	2.5	5	mA
Quiescent Current Change	$\Delta I_q$	2	$V_i=-21$ to $-33V$ , $T_j=25^\circ C$	--	--	1	mA
			$I_o=5mA$ to $1.5A$ , $T_j=25^\circ C$	--	--	0.5	mA
Output Noise Voltage	$V_n$	1	$f=10Hz$ to $100KHz$ , $T_a=25^\circ C$	--	110	--	$\mu V$
Ripple Rejection Ratio	RR	3	$V_i=-22$ to $-32V$ , $I_o=100mA$ , $f=120Hz$	53	68	--	dB
Min. I/O Voltage Difference	$V_{dif}$		$I_o=1A$ , $T_j=25^\circ C$	--	1.1	--	V
Peak Output Current	$I_{o-peak}$	1	$T_j=25^\circ C$	--	2.1	--	A
Output Voltage Temperature Coefficient	$\Delta V_o/T_a$	1	$I_o=5mA$ , $T_j=0$ to $125^\circ C$	--	-1	--	$mV/^\circ C$

Note: The specified condition  $T_j=25^\circ C$  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.

3-Terminal Negative Output Voltage Regulators

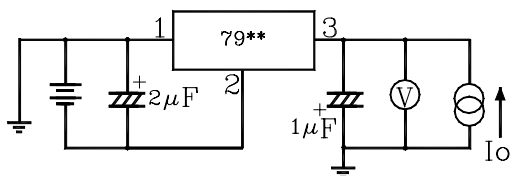
**PJ7924 ELECTRICAL CHARACTERISTICS**

( $V_{in}=-33V$ ,  $I_{out}=500mA$ ,  $C_{in}=2\mu F$ ,  $C_{out}=1\mu F$ ;  $T_j=0^\circ C$  to  $125^\circ C$ , unless otherwise specified.)

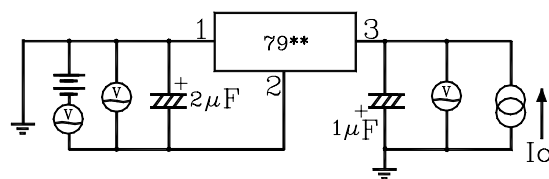
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_o$	1	$T_j=25^\circ C$	-23.07	-24	-24.96	V	
			$V_i=-27$ to $-38V$ , $I_o=5mA$ to $1A$ , $P_D<15W$	-22.85	-24	-25.20	V	
Line Regulation	REGline	1	$T_j=25^\circ C$	$V_i=-27$ to $-38V$	--	18	480	mV
				$V_i=-30$ to $-36V$	--	6	240	mV
Load Regulation	REGload	1	$T_j=25^\circ C$	$I_o=5mA$ to $1.5A$	--	12	480	mV
				$I_o=250mA$ to $750mA$	--	4	240	mV
Quiescent Current	$I_q$	2	$T_j=25^\circ C$	--	3	5	mA	
Quiescent Current Change	$\Delta I_q$	2	$V_i=-27$ to $-38V$ , $T_j=25^\circ C$	--	--	1	mA	
			$I_o=5mA$ to $1.5A$ , $T_j=25^\circ C$	--	--	0.5	mA	
Output Noise Voltage	$V_n$	1	$f=10Hz$ to $100KHz$ , $T_a=25^\circ C$	--	170	--	$\mu V$	
Ripple Rejection Ratio	RR	3	$V_i=-28$ to $-38V$ , $I_o=100mA$ , $f=120Hz$	50	65	--	dB	
Min. I/O Voltage Difference	$V_{dif}$		$I_o=1A$ , $T_j=25^\circ C$	--	1.1	--	V	
Peak Output Current	$I_o\text{-peak}$	1	$T_j=25^\circ C$	--	2.1	--	A	
Output Voltage Temperature Coefficient	$\Delta V_o/T_a$	1	$I_o=5mA$ , $T_j=0$ to $125^\circ C$	--	-1	--	$mV/^\circ C$	

Note: The specified condition  $T_j=25^\circ C$  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.

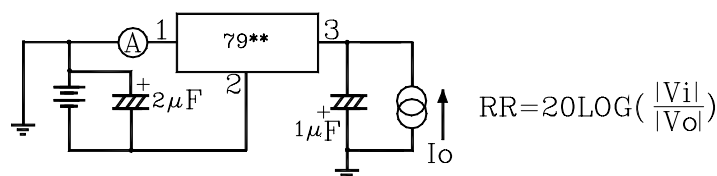
TEST CIRCUIT 1



TEST CIRCUIT 2



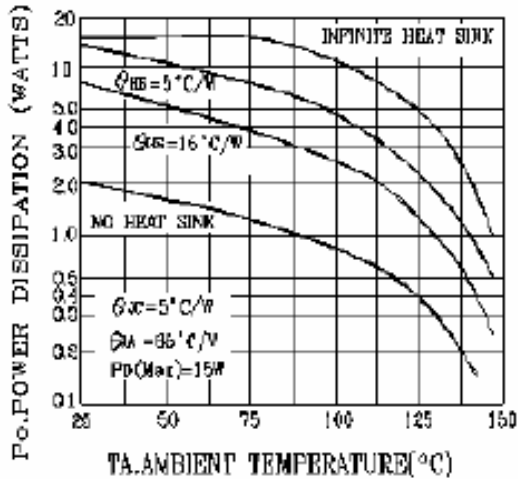
TEST CIRCUIT 3



3-Terminal Negative Output Voltage Regulators

FIGURE 1 - WORST CASE POWER DISSIPATION FIGURE  
DISSIPATION

AS A FUNCTION OF AMBIENT  
TEMPERATURE



2 - WORST CASE POWER

AS FUNCTION OF AMBIENT  
TEMPERATURE

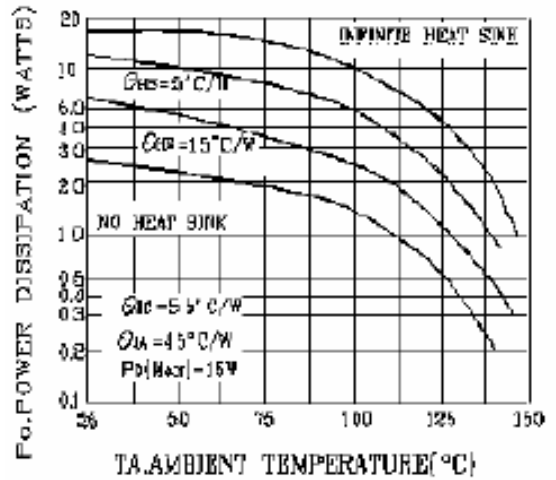
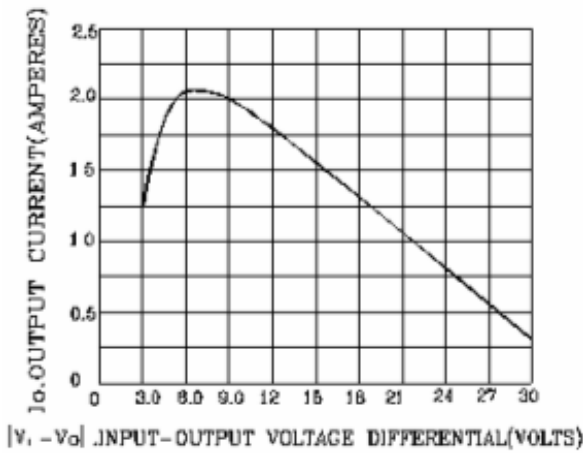


FIGURE 3 - PEAK OUTPUT CURRENT AS A FIGURE  
FUNCTION OF INPUT-OUTPUT  
DIFFERENTIAL VOLTAG



4 - RIPPLE REJECTION AS A  
FUNCTION OF FREQUENCY

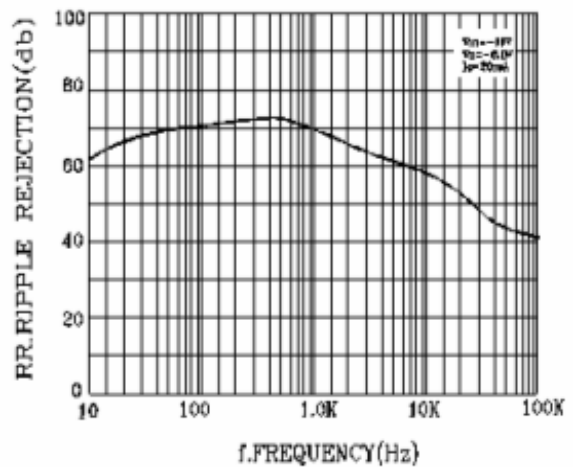
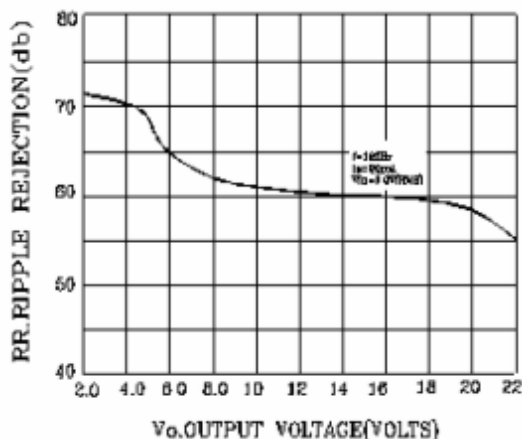


FIGURE 5 - RIPPLE REJECTION AS A FUNCTION FIGURE  
FUNCTION  
OF OUTPUT VOLTAGES



6 - OUTPUT VOLTAGE AS A  
OF JUNCTION TEMPERATUR

