

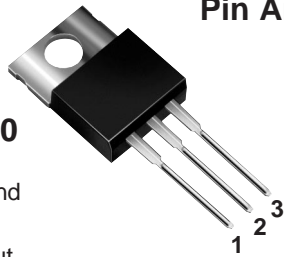
## 3-Terminal Fixed Negative Voltage Regulators

### Pin Arrangement

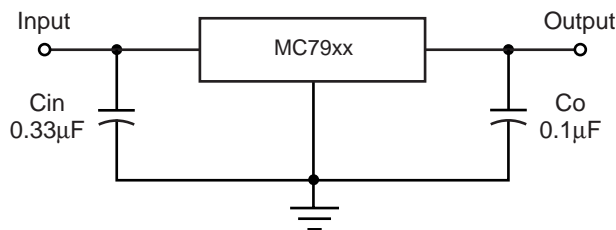
#### TO-220

1. Ground
2. Input
3. Output

(heatsink connected to pin 2)



### Standard Application



#### Notes:

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

### Description

These voltage regulators are intended as complements to the popular MC78xx Series devices. These negative regulators are available in the same seven-voltage options as the MC78xx devices. In addition, one extra voltage option commonly employed in MECL systems is also available in the negative MC79xx Series.

Available in fixed output voltage options from -5.0 to -24 volts, these regulators employ current limiting, thermal shut-down, and safe-area compensation – making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 1.5 ampere.

### 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

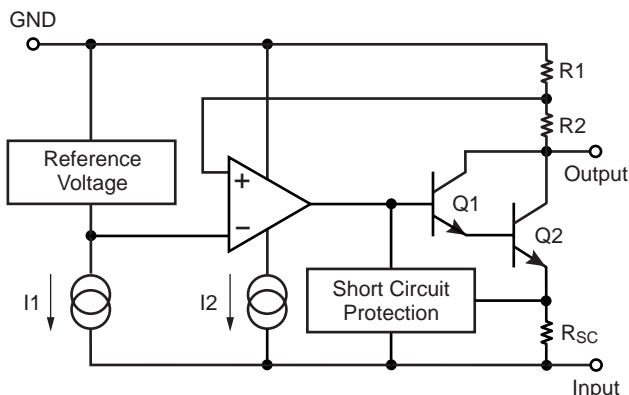
### Mechanical Data

**Case:** TO-220 Package

**Weight:** approx. 2.24g

Case outline is on the back page

### Internal Block Diagram



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## Maximum Ratings Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Input Voltage <sup>(1)</sup>	$V_{in}$	-30	V
Input Voltage <sup>(2)</sup>	$V_{in}$	-40	V
Power Dissipation <sup>(3)</sup>	$P_D$	15	W
Operating Junction Temperature Range	$T_J$	-20 to +150	°C
Storage Junction Temperature Range	$T_{stg}$	-65 to +150	°C

**Notes:** (1) MC7905 to MC7918  
(2) MC7924  
(3) Follow the derating curve. When  $T_J$  exceeds 150°C, the internal circuit cuts off the output

## Electrical Characteristics – MC7905

$V_{in} = -10V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^\circ C$  to  $125^\circ C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_o$	1	$T_J = 25^\circ C$	-4.90	-5.0	-5.10	V
			$V_{in} = -7$ to $-20V$ , $I_o = 5mA$ to $1A$	-4.85	—	-5.15	
Line Regulation ( $T_J = 25^\circ C$ )	$\Delta REG_{line}$	1	$V_{in} = -7$ to $-25V$	—	3	100	mV
			$V_{in} = -8$ to $-12V$	—	1	50	
Load Regulation ( $T_J = 25^\circ C$ )	$\Delta REG_{load}$	1	$I_o = 5mA$ to $1.5A$	—	10	100	mV
			$I_o = 250mA$ to $750mA$	—	3	50	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	2	4	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -7$ to $-25V$	—	—	1.3	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	40	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -8$ to $-18V$ $I_o = 100mA$ , $f = 120Hz$	62	74	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_o/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	-0.4	—	$mV/^\circ C$

**Note:** Where the condition  $T_J = 25^\circ C$  is specified, pulse testing (<10ms) with low duty cycle is required to maintain junction temperature stability.

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**Electrical Characteristics – MC7906**
 $V_{in} = -11V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^{\circ}C$  to  $125^{\circ}C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^{\circ}C$	-5.88	-6.0	-6.12	V
			$V_{in} = -8$ to $-21V$ , $I_o = 5mA$ to $1A$	-5.82	—	-6.18	
Line Regulation ( $T_J = 25^{\circ}C$ )	REG <sub>line</sub>	1	$V_{in} = -8$ to $-25V$	—	4	120	mV
			$V_{in} = -9$ to $-13V$	—	1.5	60	
Load Regulation ( $T_J = 25^{\circ}C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	10	120	mV
			$I_o = 250mA$ to $750mA$	—	3	60	
Quiescent Current	$I_q$	2	$T_J = 25^{\circ}C$	—	2	4	mA
Quiescent Current Change ( $T_J = 25^{\circ}C$ )	$\Delta I_q$	2	$V_{in} = -8$ to $-25V$	—	—	1.3	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^{\circ}C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	44	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -9$ to $-19V$ $I_o = 100mA$ , $f = 120Hz$	60	73	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^{\circ}C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^{\circ}C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^{\circ}C$	—	-0.5	—	mV/ $^{\circ}C$

**Electrical Characteristics – MC7908**
 $V_{in} = -14V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^{\circ}C$  to  $125^{\circ}C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^{\circ}C$	-7.84	-8.0	-8.16	V
			$V_{in} = -10.5$ to $-23V$ , $I_o = 5mA$ to $1A$	-7.76	—	-8.24	
Line Regulation ( $T_J = 25^{\circ}C$ )	REG <sub>line</sub>	1	$V_{in} = -10.5$ to $-25V$	—	6	160	mV
			$V_{in} = -11$ to $-15V$	—	2	80	
Load Regulation ( $T_J = 25^{\circ}C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	160	mV
			$I_o = 250mA$ to $750mA$	—	4	80	
Quiescent Current	$I_q$	2	$T_J = 25^{\circ}C$	—	2.2	4.5	mA
Quiescent Current Change ( $T_J = 25^{\circ}C$ )	$\Delta I_q$	2	$V_{in} = -10.5$ to $-25V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^{\circ}C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	52	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -11$ to $-21V$ $I_o = 100mA$ , $f = 120Hz$	56	71	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^{\circ}C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^{\circ}C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^{\circ}C$	—	-0.6	—	mV/ $^{\circ}C$

## Electrical Characteristics – MC7909

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

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^\circ C$	-8.82	-9.0	-9.18	V
			$V_{in} = -11.5$ to $-24V$ , $I_o = 5mA$ to $1A$	-8.73	—	-9.27	
Line Regulation ( $T_J = 25^\circ C$ )	REG <sub>line</sub>	1	$V_{in} = -11.5$ to $-27V$	—	7	180	mV
			$V_{in} = -12$ to $-16V$	—	2	90	
Load Regulation ( $T_J = 25^\circ C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	180	mV
			$I_o = 250mA$ to $750mA$	—	4	90	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	2.2	4.5	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -11.5$ to $-27V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	58	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -12$ to $-22V$ $I_o = 100mA$ , $f = 120Hz$	56	71	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	0.6	—	$mV/^\circ C$

## Electrical Characteristics – MC7912

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

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^\circ C$	-11.76	-12.0	-12.24	V
			$V_{in} = -14.5$ to $-27V$ , $I_o = 5mA$ to $1A$	-11.64	—	-12.36	
Line Regulation ( $T_J = 25^\circ C$ )	REG <sub>line</sub>	1	$V_{in} = -14.5$ to $-30V$	—	10	240	mV
			$V_{in} = -15$ to $-19V$	—	3	120	
Load Regulation ( $T_J = 25^\circ C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	240	mV
			$I_o = 250mA$ to $750mA$	—	4	120	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	2.5	5	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -14.5$ to $-30V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	75	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -15$ to $-25V$ $I_o = 100mA$ , $f = 120Hz$	55	70	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	-0.8	—	$mV/^\circ C$

**Electrical Characteristics – MC7915**
 $V_{in} = -23V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^\circ C$  to  $125^\circ C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^\circ C$	-14.7	-15	-15.3	V
			$V_{in} = -17.5$ to $-30V$ , $I_o = 5mA$ to $1A$	-14.55	—	-15.45	
Line Regulation ( $T_J = 25^\circ C$ )	REG <sub>line</sub>	1	$V_{in} = -17.5$ to $-30V$	—	11	300	mV
			$V_{in} = -18$ to $-22V$	—	3	150	
Load Regulation ( $T_J = 25^\circ C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	300	mV
			$I_o = 250mA$ to $750mA$	—	4	150	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	2.5	5	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -17.5$ to $-30V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	90	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -18$ to $-28V$ $I_o = 100mA$ , $f = 120Hz$	54	69	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{O-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	0.9	—	mV/ $^\circ C$

**Electrical Characteristics – MC7918**
 $V_{in} = -27V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^\circ C$  to  $125^\circ C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_O$	1	$T_J = 25^\circ C$	-17.64	-18.0	-18.36	V
			$V_{in} = -21$ to $-33V$ , $I_o = 5mA$ to $1A$	-17.46	—	-18.54	
Line Regulation ( $T_J = 25^\circ C$ )	REG <sub>line</sub>	1	$V_{in} = -21$ to $-33V$	—	15	360	mV
			$V_{in} = -22$ to $-26V$	—	5	180	
Load Regulation ( $T_J = 25^\circ C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	360	mV
			$I_o = 250mA$ to $750mA$	—	4	180	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	2.5	5	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -21$ to $-33V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	110	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -21$ to $-31V$ $I_o = 100mA$ , $f = 120Hz$	53	68	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{O-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	-1	—	mV/ $^\circ C$

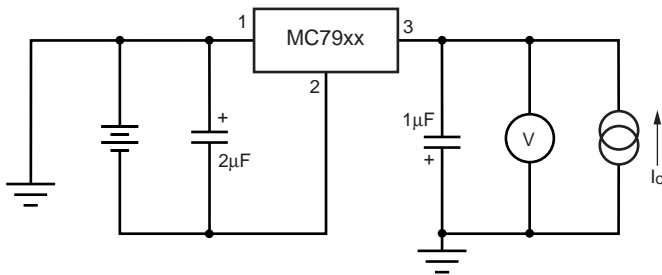
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## Electrical Characteristics – MC7924

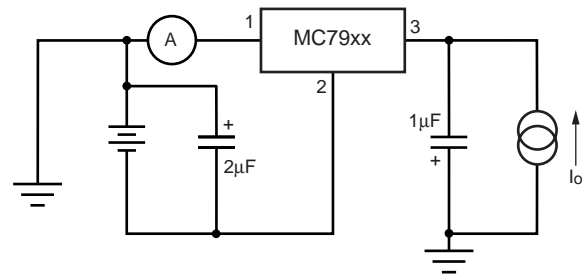
$V_{in} = -33V$ ,  $I_{out} = 500mA$ ,  $C_{in} = 2\mu F$ ,  $C_{out} = 1\mu F$ ;  $T_J = 0^\circ C$  to  $125^\circ C$ , unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	$V_o$	1	$T_J = 25^\circ C$	-23.52	-24	-24.48	V
			$V_{in} = -26$ to $-38V$ , $I_o = 5mA$ to $1A$	-23.28	—	-24.72	
Line Regulation ( $T_J = 25^\circ C$ )	REG <sub>line</sub>	1	$V_{in} = -26$ to $-38V$	—	18	480	mV
			$V_{in} = -27$ to $-32V$	—	6	240	
Load Regulation ( $T_J = 25^\circ C$ )	REG <sub>load</sub>	1	$I_o = 5mA$ to $1.5A$	—	12	480	mV
			$I_o = 250mA$ to $750mA$	—	4	240	
Quiescent Current	$I_q$	2	$T_J = 25^\circ C$	—	3	5	mA
Quiescent Current Change ( $T_J = 25^\circ C$ )	$\Delta I_q$	2	$V_{in} = -26$ to $-38V$	—	—	1	mA
			$I_o = 5mA$ to $1A$	—	—	0.5	
Output Noise Voltage ( $T_J = 25^\circ C$ )	$V_n$	1	$f = 10Hz$ to $100KHz$	—	170	—	$\mu V$
Ripple Rejection Ratio	RR	3	$V_{in} = -26$ to $-36V$ $I_o = 100mA$ , $f = 120Hz$	50	65	—	dB
Dropout Voltage	$V_{drop}$		$I_o = 1.0A$ , $T_J = 25^\circ C$	—	1.1	—	V
Peak Output Current	$I_{o-peak}$	1	$T_J = 25^\circ C$	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_o / \Delta T_A$	1	$I_o = 5mA$ , $T_J = 0$ to $125^\circ C$	—	-1	—	mV/ $^\circ C$

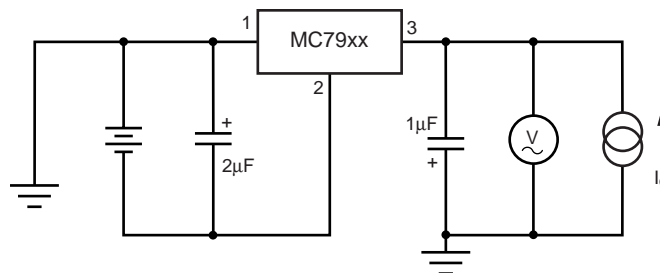
Test Circuit 1



Test Circuit 2

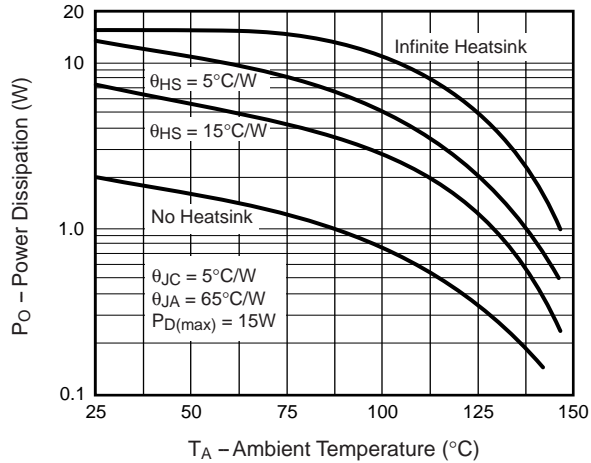


Test Circuit 3

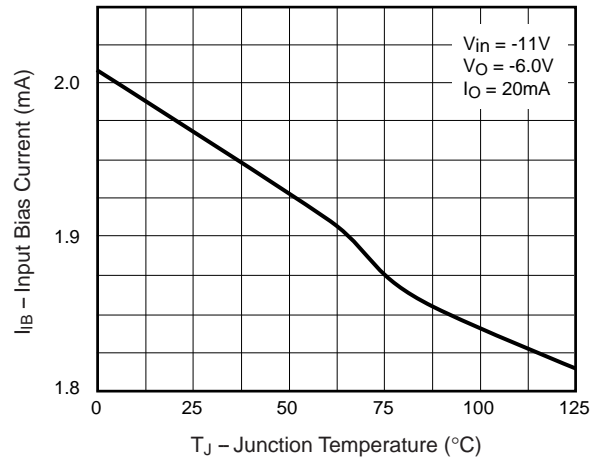


## Ratings and Characteristic Curves ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

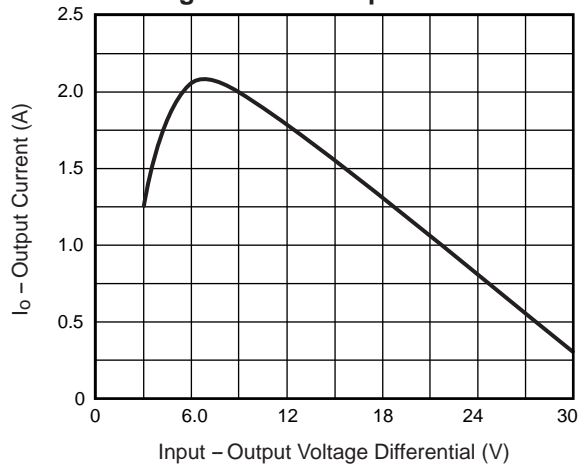
**Fig. 1 – Power Dissipation vs. Ambient Temperature**



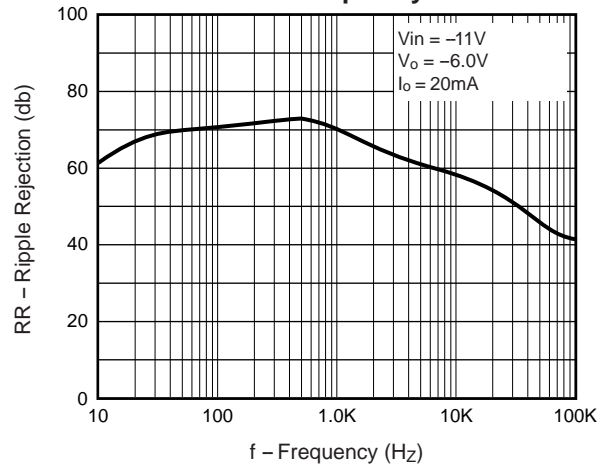
**Fig. 2 – Quiescent Current**



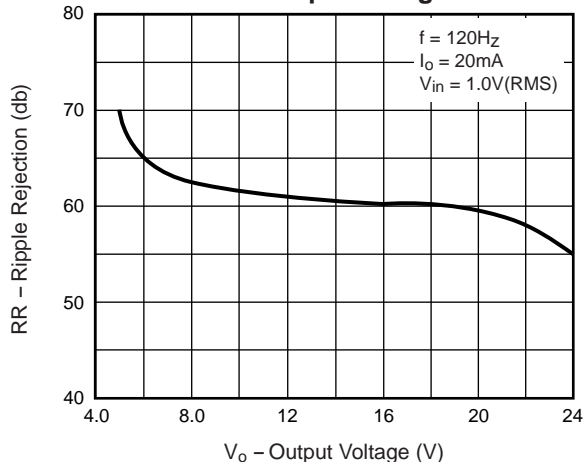
**Fig. 3 – Peak Output Current**



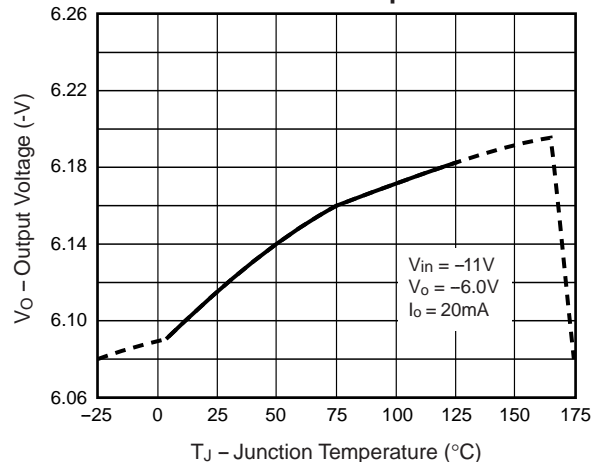
**Fig. 4 – Ripple Rejection Ratio vs. Frequency**



**Fig. 5 – Ripple Rejection vs. Output Voltage**



**Fig. 6 – Output Voltage vs. Junction Temperature**



## TO-220 Case Outline

