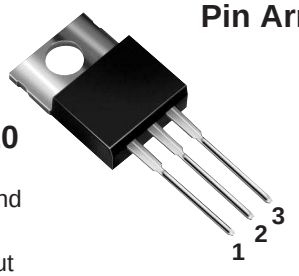
New Product

3-Terminal Fixed Negative Voltage Regulators

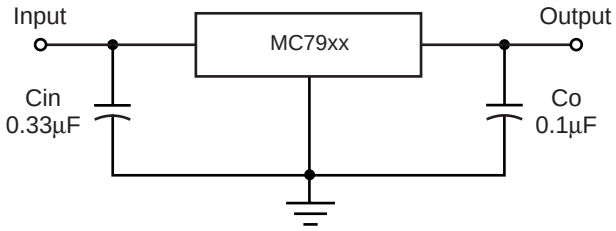
Pin Arrangement



TO-220

1. Ground
2. Input
3. Output
(heatsink connected to pin 2)

Standard Application



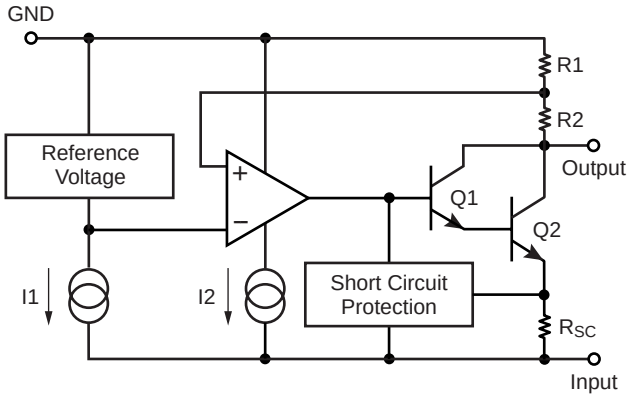
Notes:
A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V more negative even during the high point on the input ripple voltage.

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.

Internal Block Diagram



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 shutdown, and safe-area compensation – making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 1.5 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

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

Parameter	Symbol	Value	Unit
Input Voltage(1)	V_{in}	–30	V
Input Voltage(2)	V_{in}	–40	V
Power Dissipation(3)	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} = 2μF, C_{out} = 1μF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	Vo	1	T_J = 25°C	–4.90	–5.0	–5.10	V
			V_{in} = –7 to –20V, Io = 5mA to 1A	–4.85	—	–5.15	
Line Regulation (T_J = 25°C)	ΔREG_{line}	1	V_{in} = –7 to –25V	—	3	100	mV
			V_{in} = –8 to –12V	—	1	50	
Load Regulation (T_J = 25°C)	ΔREG_{load}	1	Io = 5mA to 1.5A	—	10	100	mV
			Io = 250mA to 750mA	—	3	50	
Quiescent Current	I_q	2	T_J = 25°C	—	2	4	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –7 to –25V	—	—	1.3	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	40	—	μV
Ripple Rejection Ratio	RR	3	V_{in} = –8 to –18V Io = 100mA, f = 120Hz	62	74	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{o\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta Vo/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–0.4	—	mV/°C

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

Electrical Characteristics – MC7906

V_{in} = –11V, I_{out} = 500mA, C_{in} = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–5.88	–6.0	–6.12	V
			V_{in} = –8 to –21V, Io = 5mA to 1A	–5.82	—	–6.18	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –8 to –25V	—	4	120	mV
			V_{in} = –9 to –13V	—	1.5	60	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	10	120	mV
			Io = 250mA to 750mA	—	3	60	
Quiescent Current	I_q	2	T_J = 25°C	—	2	4	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –8 to –25V	—	—	1.3	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	44	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –9 to –19V Io = 100mA, f = 120Hz	60	73	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{O\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–0.5	—	mV/°C

Electrical Characteristics – MC7908

Vin = –14V, I_{out} = 500mA, Cin = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–7.84	–8.0	–8.16	V
			V_{in} = –10.5 to –23V, Io = 5mA to 1A	–7.76	—	–8.24	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –10.5 to –25V	—	6	160	mV
			V_{in} = –11 to –15V	—	2	80	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	160	mV
			Io = 250mA to 750mA	—	4	80	
Quiescent Current	I_q	2	T_J = 25°C	—	2.2	4.5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –10.5 to –25V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	52	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –11 to –21V Io = 100mA, f = 120Hz	56	71	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{O\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–0.6	—	mV/°C

Electrical Characteristics – MC7909

Vin = –15V, I_{out} = 500mA, Cin = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–8.82	–9.0	–9.18	V
			V_{in} = –11.5 to –24V, Io = 5mA to 1A	–8.73	—	–9.27	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –11.5 to –27V	—	7	180	mV
			V_{in} = –12 to –16V	—	2	90	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	180	mV
			Io = 250mA to 750mA	—	4	90	
Quiescent Current	I_q	2	T_J = 25°C	—	2.2	4.5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –11.5 to –27V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	58	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –12 to –22V Io = 100mA, f = 120Hz	56	71	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	Io_{-peak}	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	0.6	—	mV/°C

Electrical Characteristics – MC7912

Vin = –19V, I_{out} = 500mA, Cin = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–11.76	–12.0	–12.24	V
			V_{in} = –14.5 to –27V, Io = 5mA to 1A	–11.64	—	–12.36	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –14.5 to –30V	—	10	240	mV
			V_{in} = –15 to –19V	—	3	120	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	240	mV
			Io = 250mA to 750mA	—	4	120	
Quiescent Current	I_q	2	T_J = 25°C	—	2.5	5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –14.5 to –30V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	75	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –15 to –25V Io = 100mA, f = 120Hz	55	70	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	Io_{-peak}	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–0.8	—	mV/°C

Electrical Characteristics – MC7915

V_{in} = –23V, I_{out} = 500mA, C_{in} = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–14.7	–15	–15.3	V
			V_{in} = –17.5 to –30V, Io = 5mA to 1A	–14.55	—	–15.45	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –17.5 to –30V	—	11	300	mV
			V_{in} = –18 to –22V	—	3	150	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	300	mV
			Io = 250mA to 750mA	—	4	150	
Quiescent Current	I_q	2	T_J = 25°C	—	2.5	5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –17.5 to –30V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	90	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –18 to –28V Io = 100mA, f = 120Hz	54	69	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{O\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	0.9	—	mV/°C

Electrical Characteristics – MC7918

V_{in} = –27V, I_{out} = 500mA, C_{in} = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

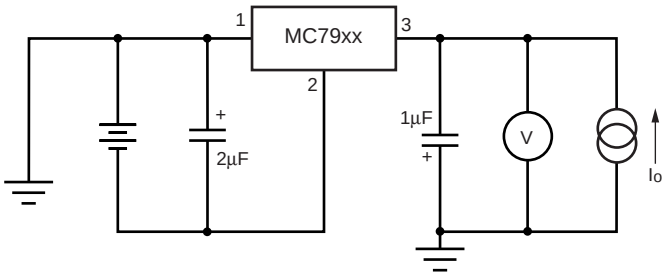
Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–17.64	–18.0	–18.36	V
			V_{in} = –21 to –33V, Io = 5mA to 1A	–17.46	—	–18.54	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –21 to –33V	—	15	360	mV
			V_{in} = –22 to –26V	—	5	180	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	360	mV
			Io = 250mA to 750mA	—	4	180	
Quiescent Current	I_q	2	T_J = 25°C	—	2.5	5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –21 to –33V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	110	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –21 to –31V Io = 100mA, f = 120Hz	53	68	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{O\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–1	—	mV/°C

Electrical Characteristics – MC7924

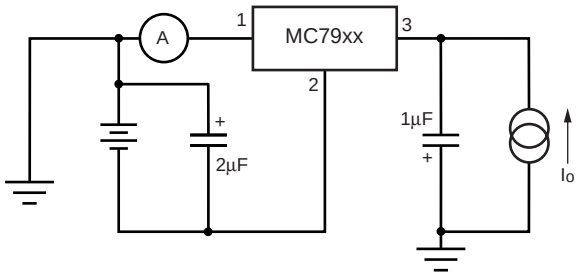
V_{in} = –33V, I_{out} = 500mA, C_{in} = 2µF, C_{out} = 1µF; T_J = 0°C to 125°C, unless otherwise noted.

Parameter	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	1	T_J = 25°C	–23.52	–24	–24.48	V
			V_{in} = –26 to –38V, Io = 5mA to 1A	–23.28	—	–24.72	
Line Regulation (T_J = 25°C)	REG_{line}	1	V_{in} = –26 to –38V	—	18	480	mV
			V_{in} = –27 to –32V	—	6	240	
Load Regulation (T_J = 25°C)	REG_{load}	1	Io = 5mA to 1.5A	—	12	480	mV
			Io = 250mA to 750mA	—	4	240	
Quiescent Current	I_q	2	T_J = 25°C	—	3	5	mA
Quiescent Current Change (T_J = 25°C)	ΔI_q	2	V_{in} = –26 to –38V	—	—	1	mA
			Io = 5mA to 1A	—	—	0.5	
Output Noise Voltage (T_J = 25°C)	V_n	1	f = 10Hz to 100KHz	—	170	—	µV
Ripple Rejection Ratio	RR	3	V_{in} = –26 to –36V Io = 100mA, f = 120Hz	50	65	—	dB
Dropout Voltage	V_{drop}		Io = 1.0A, T_J = 25°C	—	1.1	—	V
Peak Output Current	$I_{O\text{-}peak}$	1	T_J = 25°C	—	2.1	—	A
Temp. Coefficient of Output Voltage	$\Delta V_O/\Delta T_A$	1	Io = 5mA, T_J = 0 to125°C	—	–1	—	mV/°C

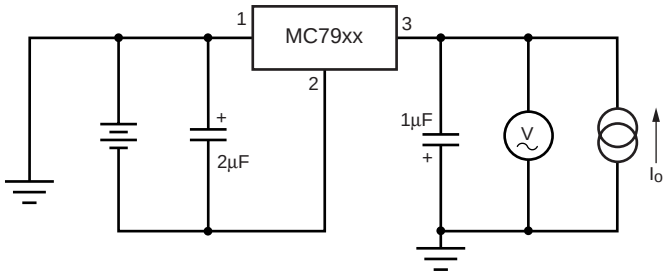
Test Circuit 1



Test Circuit 2



Test Circuit 3



Ratings and Characteristic Curves (TA = 25°C unless otherwise noted)

Fig. 1 – Power Dissipation vs. Ambient Temperature

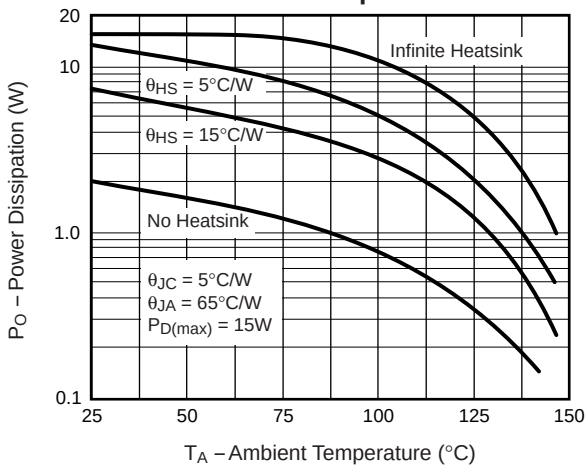


Fig. 2 – Quiescent Current

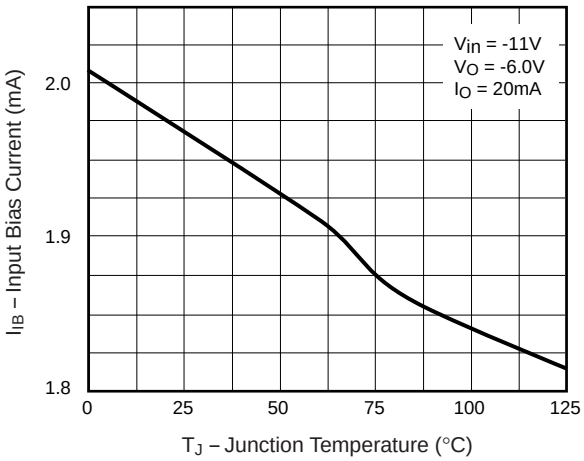


Fig. 3 – Peak Output Current

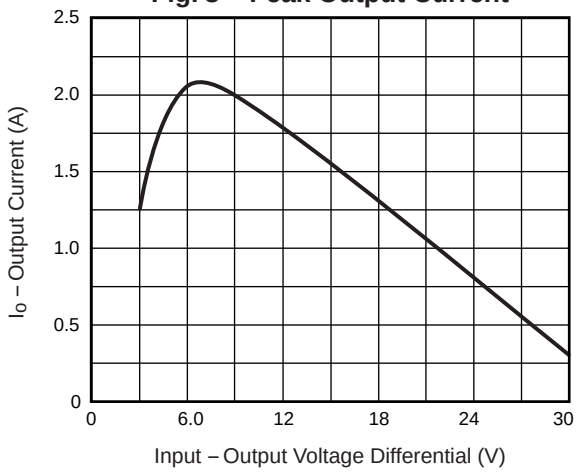


Fig. 4 –Ripple Rejection Ratio vs. Frequency

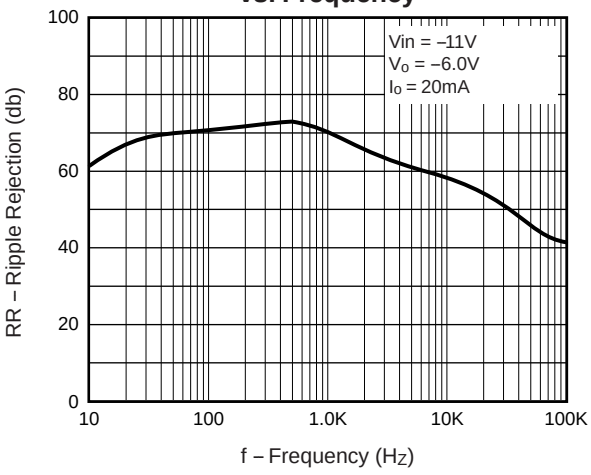


Fig. 5 – Ripple Rejection vs. Output Voltage

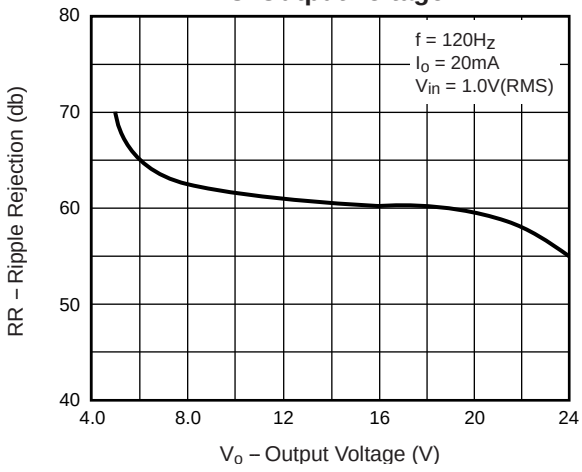
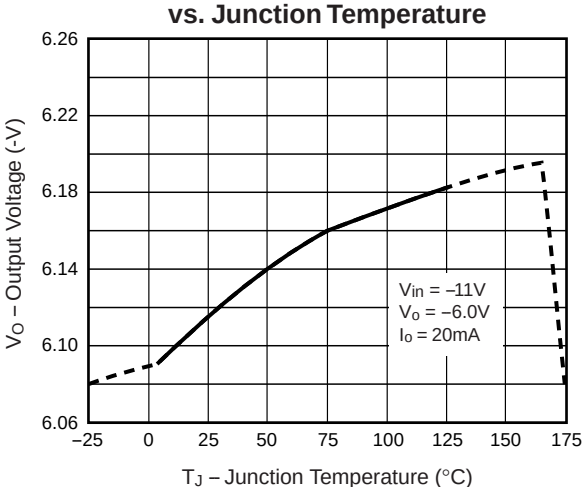


Fig. 6 – Output Voltage vs. Junction Temperature



TO-220 Case Outline