

The **ML78L00-FBE\*** series of 3-Terminal Positive Voltage Regulators. These regulators employ internal current-limiting and thermal-shutdown, making them essentially indestructible. If adequate heat sinking is provided, they can deliver up to 100mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators. The **ML78L00-FBE** series used as a zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnitude, along with lower quiescent current and lower noise.

\* Parts of **FBE** are satisfied with requirements of directive 2002/95/EC on RoHS.

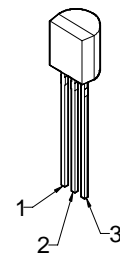
#### ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Input Voltage	V <sub>IN</sub>	(ML78L05A to ML78L10A)	30
		(ML78L12A to ML78L18A)	35
		(ML78L24A)	40
Output Current	I <sub>O</sub>	100	mA
Power Dissipation	P <sub>D</sub>	500	mW
Operating Temperature Range	T <sub>opr</sub>	-40 to +85	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to +150	°C

#### Package Outline

TO-92



1. OUT
2. GND
3. IN

#### ELECTRICAL CHARACTERISTICS

(T<sub>j</sub>=25°C, C<sub>IN</sub>=0.33μF, C<sub>O</sub>=0.1μF)

Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
<b>ML78L05A</b>								
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =10V	I <sub>O</sub> =40mA		4.75	5.0	5.25	V
Line Regulation 1	Δ V <sub>O</sub> V <sub>in</sub> 1	V <sub>IN</sub> =7V to 20V	I <sub>O</sub> =40mA		-	-	150	mV
Line Regulation 2	Δ V <sub>O</sub> V <sub>in</sub> 2	V <sub>IN</sub> =8V to 20V	I <sub>O</sub> =40mA		-	-	100	mV
Load Regulation 1	Δ V <sub>O</sub> I <sub>O</sub> 1	V <sub>IN</sub> =10V	I <sub>O</sub> =1 to 40mA		-	-	30	mV
Load Regulation 2	Δ V <sub>O</sub> I <sub>O</sub> 2	V <sub>IN</sub> =10V	I <sub>O</sub> =1 to 100mA		-	-	60	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =10V	I <sub>O</sub> =0mA		-	3.8	6	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>O</sub> / Δ T	V <sub>IN</sub> =10V	I <sub>O</sub> =1mA		-	0.4	-	mV/°C
Ripple Rejection	RR	8V<V <sub>IN</sub> <18V	I <sub>O</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	41	49	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =10V		BW=10Hz to 100KHz I <sub>O</sub> =40mA	-	42	-	μV
<b>ML78L06A</b>								
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =11V	I <sub>O</sub> =40mA		5.7	6.0	6.3	V
Line Regulation 1	Δ V <sub>O</sub> V <sub>in</sub> 1	V <sub>IN</sub> =8V to 20V	I <sub>O</sub> =40mA		-	-	175	mV
Line Regulation 2	Δ V <sub>O</sub> V <sub>in</sub> 2	V <sub>IN</sub> =9V to 20V	I <sub>O</sub> =40mA		-	-	125	mV
Load Regulation 1	Δ V <sub>O</sub> I <sub>O</sub> 1	V <sub>IN</sub> =11V	I <sub>O</sub> =1 to 40mA		-	-	40	mV
Load Regulation 2	Δ V <sub>O</sub> I <sub>O</sub> 2	V <sub>IN</sub> =11V	I <sub>O</sub> =1 to 100mA		-	-	80	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =11V	I <sub>O</sub> =0mA		-	3.9	6	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>O</sub> / Δ T	V <sub>IN</sub> =11V	I <sub>O</sub> =1mA		-	0.5	-	mV/°C
Ripple Rejection	RR	9V<V <sub>IN</sub> <19V	I <sub>O</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	40	48	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =11V		BW=10Hz to 100KHz I <sub>O</sub> =40mA	-	46	-	μV



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Sep-05

**ELECTRICAL CHARACTERISTICS**

(Tj=25°C, C<sub>IN</sub>=0.33μF, Co=0.1μF)

Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
<b>ML78L08A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =14V	I <sub>o</sub> =40mA		7.6	8.0	8.4	V
Line Regulation 1	Δ V <sub>o</sub> V <sub>in</sub> 1	V <sub>IN</sub> =10.5V to 23V	I <sub>o</sub> =40mA		-	-	175	mV
Line Regulation 2	Δ V <sub>o</sub> V <sub>in</sub> 2	V <sub>IN</sub> =11V to 23V	I <sub>o</sub> =40mA		-	-	125	mV
Load Regulation 1	Δ V <sub>o</sub> I <sub>o</sub> 1	V <sub>IN</sub> =14V	I <sub>o</sub> =1 to 40mA		-	-	40	mV
Load Regulation 2	Δ V <sub>o</sub> I <sub>o</sub> 2	V <sub>IN</sub> =14V	I <sub>o</sub> =1 to 100mA		-	-	80	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =14V	I <sub>o</sub> =0mA		-	4.0	6	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =14V	I <sub>o</sub> =1mA		-	0.6	-	mV/°C
Ripple Rejection	RR	13V<V <sub>IN</sub> <23V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	37	46	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =14V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	54	-	μV
<b>ML78L09A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =16V	I <sub>o</sub> =40mA		8.55	9.0	9.45	V
Line Regulation 1	Δ V <sub>o</sub> V <sub>in</sub> 1	V <sub>IN</sub> =12V to 24V	I <sub>o</sub> =40mA		-	-	175	mV
Line Regulation 2	Δ V <sub>o</sub> V <sub>in</sub> 2	V <sub>IN</sub> =13V to 24V	I <sub>o</sub> =40mA		-	-	125	mV
Load Regulation 1	Δ V <sub>o</sub> I <sub>o</sub> 1	V <sub>IN</sub> =16V	I <sub>o</sub> =1 to 40mA		-	-	40	mV
Load Regulation 2	Δ V <sub>o</sub> I <sub>o</sub> 2	V <sub>IN</sub> =16V	I <sub>o</sub> =1 to 100mA		-	-	90	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =16V	I <sub>o</sub> =0mA		-	4.1	6	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =16V	I <sub>o</sub> =1mA		-	0.65	-	mV/°C
Ripple Rejection	RR	15V<V <sub>IN</sub> <25V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	38	45	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =16V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	58	-	μV
<b>ML78L10A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =17V	I <sub>o</sub> =40mA		9.5	10.0	10.5	V
Line Regulation 1	Δ V <sub>o</sub> V <sub>in</sub> 1	V <sub>IN</sub> =13V to 25V	I <sub>o</sub> =40mA		-	-	175	mV
Line Regulation 2	Δ V <sub>o</sub> V <sub>in</sub> 2	V <sub>IN</sub> =14V to 25V	I <sub>o</sub> =40mA		-	-	125	mV
Load Regulation 1	Δ V <sub>o</sub> I <sub>o</sub> 1	V <sub>IN</sub> =17V	I <sub>o</sub> =1 to 40mA		-	-	40	mV
Load Regulation 2	Δ V <sub>o</sub> I <sub>o</sub> 2	V <sub>IN</sub> =17V	I <sub>o</sub> =1 to 100mA		-	-	90	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =17V	I <sub>o</sub> =0mA		-	4.2	6	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =17V	I <sub>o</sub> =1mA		-	0.7	-	mV/°C
Ripple Rejection	RR	15V<V <sub>IN</sub> <25V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	37	44	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =17V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	62	-	μV
<b>ML78L12A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =19V	I <sub>o</sub> =40mA		11.4	12.0	12.6	V
Line Regulation 1	Δ V <sub>o</sub> V <sub>in</sub> 1	V <sub>IN</sub> =14.5V to 27V	I <sub>o</sub> =40mA		-	-	250	mV
Line Regulation 2	Δ V <sub>o</sub> V <sub>in</sub> 2	V <sub>IN</sub> =16V to 27V	I <sub>o</sub> =40mA		-	-	200	mV
Load Regulation 1	Δ V <sub>o</sub> I <sub>o</sub> 1	V <sub>IN</sub> =19V	I <sub>o</sub> =1 to 40mA		-	-	50	mV
Load Regulation 2	Δ V <sub>o</sub> I <sub>o</sub> 2	V <sub>IN</sub> =19V	I <sub>o</sub> =1 to 100mA		-	-	100	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =19V	I <sub>o</sub> =0mA		-	4.3	6.5	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =19V	I <sub>o</sub> =1mA		-	0.9	-	mV/°C
Ripple Rejection	RR	15V<V <sub>IN</sub> <25V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	37	42	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =19V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	70	-	μV

**ELECTRICAL CHARACTERISTICS**

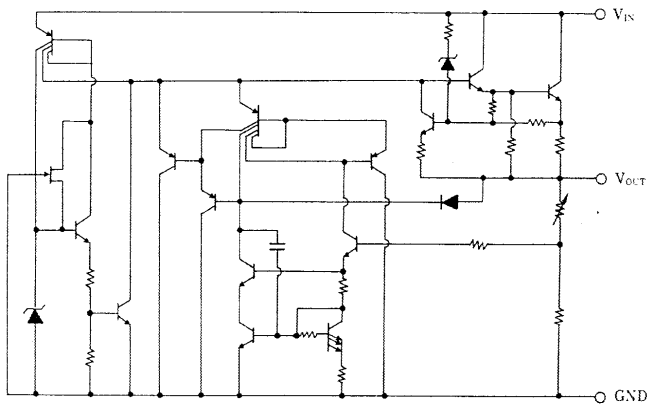
(Tj=25°C, C<sub>IN</sub>=0.33μF, Co=0.1μF)

Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
<b>ML78L15A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =23V	I <sub>o</sub> =40mA		14.25	15.0	15.75	V
Line Regulation 1	Δ V <sub>o</sub> / V <sub>in</sub> 1	V <sub>IN</sub> =17.5V to 30V	I <sub>o</sub> =40mA		-	-	300	mV
Line Regulation 2	Δ V <sub>o</sub> / V <sub>in</sub> 2	V <sub>IN</sub> =19V to 30V	I <sub>o</sub> =40mA		-	-	250	mV
Load Regulation 1	Δ V <sub>o</sub> / I <sub>o</sub> 1	V <sub>IN</sub> =23V	I <sub>o</sub> =1 to 40mA		-	-	75	mV
Load Regulation 2	Δ V <sub>o</sub> / I <sub>o</sub> 2	V <sub>IN</sub> =23V	I <sub>o</sub> =1 to 100mA		-	-	150	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =23V	I <sub>o</sub> =0mA		-	4.6	6.5	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =23V	I <sub>o</sub> =1mA		-	1	-	mV/°C
Ripple Rejection	RR	18.5V<V <sub>IN</sub> <28.5V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	34	39	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =23V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	82	-	μV
<b>ML78L18A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =26V	I <sub>o</sub> =40mA		17.1	18.0	18.9	V
Line Regulation 1	Δ V <sub>o</sub> / V <sub>in</sub> 1	V <sub>IN</sub> =20.5V to 33V	I <sub>o</sub> =40mA		-	-	360	mV
Line Regulation 2	Δ V <sub>o</sub> / V <sub>in</sub> 2	V <sub>IN</sub> =22V to 33V	I <sub>o</sub> =40mA		-	-	300	mV
Load Regulation 1	Δ V <sub>o</sub> / I <sub>o</sub> 1	V <sub>IN</sub> =26V	I <sub>o</sub> =1 to 40mA		-	-	90	mV
Load Regulation 2	Δ V <sub>o</sub> / I <sub>o</sub> 2	V <sub>IN</sub> =26V	I <sub>o</sub> =1 to 100mA		-	-	180	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =26V	I <sub>o</sub> =0mA		-	4.7	6.5	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =26V	I <sub>o</sub> =1mA		-	1.1	-	mV/°C
Ripple Rejection	RR	21.5V<V <sub>IN</sub> <31.5V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	32	36	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =26V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	89	-	μV
<b>ML78L24A</b>								
Output Voltage	V <sub>o</sub>	V <sub>IN</sub> =32V	I <sub>o</sub> =40mA		22.8	24.0	25.2	V
Line Regulation 1	Δ V <sub>o</sub> / V <sub>in</sub> 1	V <sub>IN</sub> =26.5V to 39V	I <sub>o</sub> =40mA		-	-	480	mV
Line Regulation 2	Δ V <sub>o</sub> / V <sub>in</sub> 2	V <sub>IN</sub> =29V to 39V	I <sub>o</sub> =40mA		-	-	400	mV
Load Regulation 1	Δ V <sub>o</sub> / I <sub>o</sub> 1	V <sub>IN</sub> =32V	I <sub>o</sub> =1 to 40mA		-	-	120	mV
Load Regulation 2	Δ V <sub>o</sub> / I <sub>o</sub> 2	V <sub>IN</sub> =32V	I <sub>o</sub> =1 to 100mA		-	-	240	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =32V	I <sub>o</sub> =0mA		-	4.8	6.5	mA
Average Temperature Coefficient of Output Voltage	Δ V <sub>o</sub> / Δ T	V <sub>IN</sub> =32V	I <sub>o</sub> =1mA		-	1.4	-	mV/°C
Ripple Rejection	RR	27.5V<V <sub>IN</sub> <37.5V	I <sub>o</sub> =40mA	e <sub>in</sub> =1Vp-p f=120Hz	30	33	-	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =32V	BW=10Hz to 100KHz	I <sub>o</sub> =40mA	-	97	-	μV

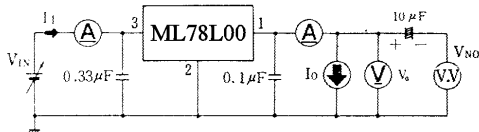
# ML78L00-FBE SERIES

## ■ Equivalent Circuit

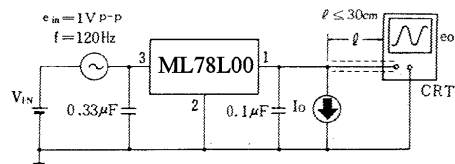


## ■ Test Circuit

1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage, Peak Output/Short-Circuit Current
2. Ripple Rejection

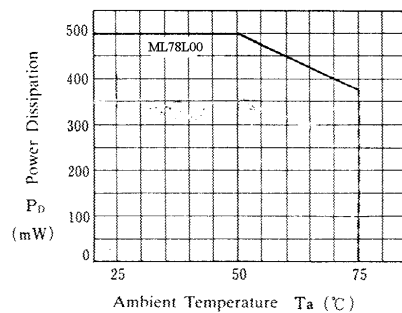


- Measurement is to be conducted in pulse testing.
- $I_Q = I_1 - I_o$



$$RR = 20 \log_{10} \left( \frac{e_{in}}{e_o} \right) \text{ (dB)}$$

## ■ Ambient Temperature vs. Power Dissipation



# ML78L00-FBE SERIES

## Typical Characteristics

