MICRO

ML78L00-FBL1* SERIES

3-TERMINAL POSITIVE VOLTAGE REGULATOR

The **ML78L00-FBL1* 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-FBL1 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.
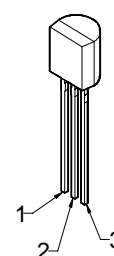
* FBL1 menas lead free compoent.

ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

PARAMETER	SYMBOL	MAXIMUM RATINGS		UNIT
Input Voltage	V_{IN}	(ML78L05A to ML78L10A)	30	V
		(ML78L12A to ML78L18A)	35	
		(ML78L24A)	40	
Output Current	Io	100		mA
Power Dissipation	P_D	500		mW
Operating Temperature Range	Topr	-40 to +85		℃
Storage Temperature Range	Tstg	-40 to +150		℃

■ Package Outline
TO-92

1. OUT
2. GND
3. IN

ELECTRICAL CHARACTERISTICS

$(Tj=25℃, C_{IN}=0.33μF, Co=0.1μF)$

Measurement is to be conducted is pulse testing.

PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
ML78L05A								
Output Voltage	Vo	V_{IN}=10V	Io=40mA		4.75	5.0	5.25	V
Line Regulation 1	△Vo Vin 1	V_{IN}=7V to 20V	Io=40mA		-	-	150	mV
Line Regulation 2	△Vo Vin 2	V_{IN}=8V to 20V	Io=40mA		-	-	100	mV
Load Regulation 1	△Vo Io 1	V_{IN}=10V	Io=1 to 40mA		-	-	30	mV
Load Regulation 2	△Vo Io 2	V_{IN}=10V	Io=1 to 100mA		-	-	60	mV
Quiescent Current	IQ	V_{IN}=10V	Io=0mA		-	3.8	6	mA
Average Temperature Cofficient of Output Voltage	△Vo / △T	V_{IN}=10V	Io=1mA		-	0.4	-	mV/℃
Ripple Rejection	RR	8V<V_{IN}<18V	Io=40mA ein=1Vp-p	f=120Hz	41	49	-	dB
Output Noise Voltage	V_{NO}	V_{IN}=10V	BW=10Hz to 100KHz	Io=40mA	-	42	-	$μ$V
ML78L06A								
Output Voltage	Vo	V_{IN}=11V	Io=40mA		5.7	6.0	6.3	V
Line Regulation 1	△Vo Vin 1	V_{IN}=8V to 20V	Io=40mA		-	-	175	mV
Line Regulation 2	△Vo Vin 2	V_{IN}=9V to 20V	Io=40mA		-	-	125	mV
Load Regulation 1	△Vo Io 1	V_{IN}=11V	Io=1 to 40mA		-	-	40	mV
Load Regulation 2	△Vo Io 2	V_{IN}=11V	Io=1 to 100mA		-	-	80	mV
Quiescent Current	IQ	V_{IN}=11V	Io=0mA		-	3.9	6	mA
Average Temperature Cofficient of Output Voltage	△Vo / △T	V_{IN}=11V	Io=1mA		-	0.5	-	mV/℃
Ripple Rejection	RR	9V<V_{IN}<19V	Io=40mA ein=1Vp-p	f=120Hz	40	48	-	dB
Output Noise Voltage	V_{NO}	V_{IN}=11V	BW=10Hz to 100KHz	Io=40mA	-	46	-	$μ$V

ELECTRICAL CHARACTERISTICS   (Tj=25℃,C_IN=0.33μF,Co=0.1μF)

Measurement is to be conducted is pulse testing.

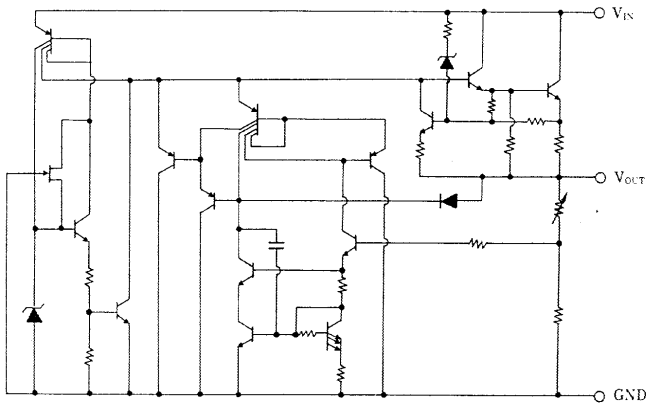| PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
ML78L08A								
Output Voltage	Vo	V$_{IN}$=14V	Io=40mA		7.6	8.0	8.4	V
Line Regulation 1	△ Vo Vin 1	V$_{IN}$=10.5V to 23V	Io=40mA		-	-	175	mV
Line Regulation 2	△ Vo Vin 2	V$_{IN}$=11V to 23V	Io=40mA		-	-	125	mV
Load Regulation 1	△ Vo Io 1	V$_{IN}$=14V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

ELECTRICAL CHARACTERISTICS (Tj=25℃,C_{IN}=0.33μF,Co=0.1μF)

Measurement is to be conducted is pulse testing.

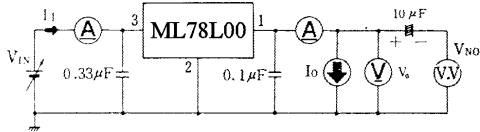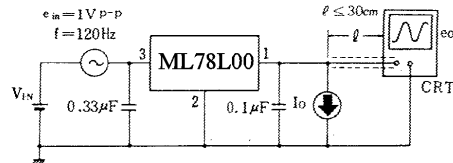| PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT
ML78L15A								
Output Voltage	Vo	V_{IN}=23V	Io=40mA		14.25	15.0	15.75	V
Line Regulation 1	△Vo Vin 1	V_{IN}=17.5V to 30V	Io=40mA		-	-	300	mV
Line Regulation 2	△Vo Vin 2	V_{IN}=19V to 30V	Io=40mA		-	-	250	mV
Load Regulation 1	△Vo Io 1	V_{IN}=23V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

■ **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
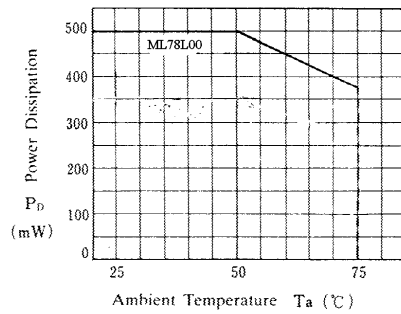
2. Ripple Rejection

○ Measurement is to be conducted in pulse testing.
○ $I_Q = I_1 - I_0$

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

■ **Ambient Temperature**
   vs.
   Power Dissipation

■ Typical Characteristics

78L05 Dropout Characteristics
(Tj = 25°C)

Output Voltage V_O (V)

- $I_O = 0\ mA$
- $I_O = 40\ mA$
- $I_O = 100\ mA$

Input Voltage V_{IN} (V)

78L05/L12/L24 Load Characteristics
(Tj = 25°C)

Output Voltage V_O (V)

- 78L24 $V_{IN} = 32V$
- 78L12 $V_{IN} = 19V$
- 78L05 $V_{IN} = 10V$

Output Current I_O (mA)

78L05 / L24 Quiescent Current vs. Output Current
(Tj = 25°C)

Quiescent Current I_O (mA)

- 78L24 $V_{IN} = 32V$
- 78L05 $V_{IN} = 10V$

Output Current Io(mA)

78L05 Output Voltage vs. Temperature

Output Voltage V_O (V)

Ambient Temperature Ta (°C)

78L05 Quiescent Current vs. Input Voltage
(Io = 0mA, Tj = 25°C)

Quiescent Current Io(mA)

Input Voltage V_{IN} (V)

78L12 Output Voltage vs. Temperature

Output Voltage V_O (V)

Ambient Temperature Ta (°C)

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