



TS78L00

3-Terminal Low Current Positive Voltage Regulators

The TS78L00 Series of positive voltage Regulators are inexpensive, easy-to-use devices suitable for a multitude of applications that require a regulated supply of up to 100 mA. Like their higher power TS7800 Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the TS78L00 devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode-resistor combination, as output impedance and quiescent current are substantially reduced.

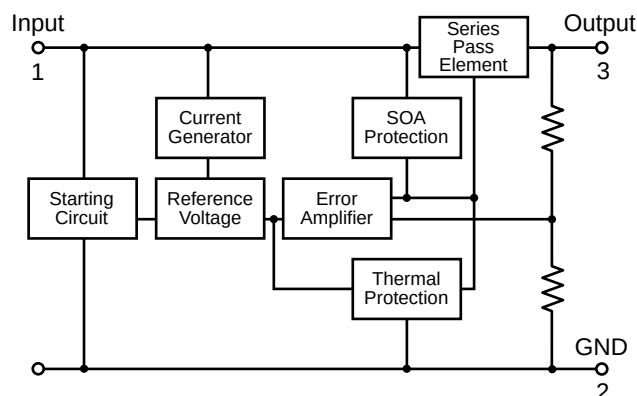
FEATURES

- Wide Range of Available, Fixed Output Voltages
- Low Cost
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (TS79L00 Series)

Available in $\pm 2\%$ Voltage Tolerance.

CIRCUIT SCHEMATIC

REPRESENTATIVE CIRCUIT SCHEMATIC



TO-92



Pin 1. Output
2. Ground
3. Input

SOT-89



TS78L00

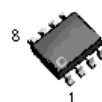
Pin 1. Input
2. Ground
3. Output

TS78L00A

1. Output
2. Ground
3. Input

(Heatsink surface connected to Pin 2)

SOP-8



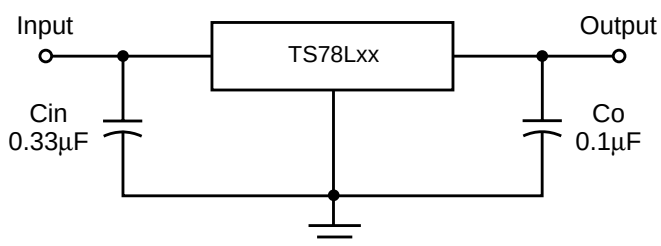
Pin: 1.Vout 5.Nc
2.Gnd 6.Gnd
3.Gnd 7.Gnd
4.Nc 8.Vin

ORDERING INFORMATION

Device	Operating Temperature (Ambient)	Package
TS78LxxCT	-20 to +85	TO-92
TS78LxxCS		SOP-8
TS78LxxCY		SOT-89
TS78LxxACY		

TYPICAL CONNECTING CIRCUIT

STANDARD APPLICATION



Notes:

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low 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 is not needed for stability, however, it does improve transient response.



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MAXIMUM RATINGS (Ta=+25°C unless otherwise noted.)

RATING	SYMBOL	TS78L00 SERIES	UNIT
Input Voltage	Vi *1	35	V
Input Voltage	Vi *2	40	V
Storage Temperature Range	Tstg	-25 to +150	°C
Operating Ambient Temperature	Topr	-20 to +85	°C
Operating Junction Temperature	Tj	0 to +125	°C

Note : *1. TS78L05 to TS78L18

*2. TS78L24

- This specification applies only for DC power dissipation permitted by absolute maximum ratings.
- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33uF capacitor across the input and a 0.1uF capacitor across the output.

• TS78L05 ELECTRICAL CHARACTERISTICS :

(Vi=10V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	4.9	5.0	5.1	Vdc
Line Regulation (Tj=+25°C, Io=40mA) 7.0V≤Vi≤20V 8.0V≤Vi≤20V	REGline		32 26	150 100	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		15 8	60 30	mV
Output Voltage 7.0V≤Vi≤20V, 1.0mA≤Io≤40mA Vi = 10V, 1.0mA≤Io≤70mA	Vo	4.8 4.8		5.2 5.2	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		3.8	6.0 5.5	mA
Input Bias Current Change 8.0V≤Vi≤20V 1.0mA≤Io≤40mA	Δ I _{IB}			1.5 0.1	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		40		μV
Ripple Rejection (Io=40mA, f=120Hz, 8.0V≤Vi≤18V, Tj=+25°C)	RR	40	49		dB
Dropout Voltage	Vi-Vo		1.7		Vdc



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• TS78L08 ELECTRICAL CHARACTERISTICS :

(Vi=14V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C, unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	7.84	8.0	8.16	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 10.5V≤Vi≤23V, 11V≤Vi≤23V,	REGline		42 36	175 125	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		18 10	80 40	mV
Output Voltage 10.5V≤Vi≤23V, 1.0mA≤Io≤40mA Vi=14V, 1.0mA≤Io≤70mA	Vo	7.68 7.68		8.32 8.32	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		3.0	6.0 5.5	mA
Input Bias Current Change 11V≤Vi≤23V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.2	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		54		μV
Ripple Rejection (Io=40mA, f=120Hz, 12V≤Vi≤23V, Tj=+25°C)	RR	36	45		dB
Dropout Voltage (Tj=+25°C)	Vi-Vo		1.7		Vdc

• TS78L09 ELECTRICAL CHARACTERISTICS :

(Vi=16V, Io=40mA, Ci=0.33 μF, Co=0.1μF, -40°C <Tj<+125°C (for TS78Lxx), 0°C <Tj<125°C (TS78Lxx)), unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	8.82	9.0	9.18	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 11.5V≤Vi≤24V, 12V≤Vi≤24V,	REGline		45 40	175 125	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		19 11	90 40	mV
Output Voltage 11.5V≤Vi≤24V, 1.0mA≤Io≤40mA Vi=16V, 1.0mA≤Io≤70mA	Vo	8.64 8.64		9.36 9.36	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		3.0	6.0 5.5	mA
Input Bias Current Change 11V≤Vi≤23V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.1	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		58		μV
Ripple Rejection (Io=40mA, f=120Hz, 12V≤Vi≤23V, Tj=+25°C)	RR	37	45		dB
Dropout Voltage (Tj=+25°C)	Vi-Vo		1.7		Vdc



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• TS78L12 ELECTRICAL CHARACTERISTICS :

(Vi=19V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	11.76	12	12.24	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 14.5V≤Vi≤27V 16V≤Vj≤27V	REGline		55 49	250 200	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		22 13	100 50	mV
Output Voltage 14.5V≤Vi≤27V, 1.0mA≤Io≤40mA Vi=19V, 1.0mA≤Io≤70mA	Vo	11.52 11.52		12.48 12.48	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		42	6.5 6.0	mA
Input Bias Current Change 16V≤Vi≤27V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.2	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		70		μV
Ripple Rejection (Io=40mA, f=120Hz, 15V≤Vi≤25V, Tj=+25°C)	RR	36	42		dB
Dropout Voltage(Tj=+25°C)	Vi-Vo		1.7		Vdc

• TS78L15 ELECTRICAL CHARACTERISTICS :

(Vi=23V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	14.7	15	15.3	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 17.5V≤Vi≤30V 20V≤Vi≤30V	REGline		65 58	300 250	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		25 12	150 75	mV
Output Voltage 17.5V≤Vi≤30V, 1.0mA≤Io≤40mA Vi=23V, 1.0mA≤Io≤70mA	Vo	14.40 14.40		15.60 15.60	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		4.4	6.5 6.0	mA
Input Bias Current Change 20V≤Vi≤30V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.2	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		82		μV
Ripple Rejection (Io=40mA, f=120Hz, 18.5V≤Vi≤28.5V, Tj=+25°C)	RR	33	39		dB
Dropout Voltage (Tj=+25°C)	Vi-Vo		1.7		Vdc



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• TS78L18 ELECTRICAL CHARACTERISTICS :

(Vi=27V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	17.64	18	18.36	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 2154V≤Vi≤33V 22V≤Vj≤33V	REGline		70 64	325 275	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		30 15	170 85	mV
Output Voltage 21.5V≤Vi≤33V, 1.0mA≤Io≤40mA Vi=27V, 1.0mA≤Io≤70mA	Vo	17.44 17.44		18.56 18.56	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		3.1	6.5 6.0	mA
Input Bias Current Change 22V≤Vi≤33V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.2	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		150		μV
Ripple Rejection (Io=40mA, f=120Hz, 23V≤Vi≤33V, Tj=+25°C)	RR	32	46		dB
Dropout Voltage (Tj=+25°C)	Vi-Vo		1.7		Vdc

• TS78L24 ELECTRICAL CHARACTERISTICS :

(Vi=33V, Io=40mA, Ci=0.33μF, Co=0.1μF, 0°C <Tj<+125°C unless otherwise noted.)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
Output Voltage (Tj=+25°C)	Vo	23.52	24	24.48	Vdc
Line Regulation(Tj=+25°C, Io=40mA) 27.5V≤Vi≤38V 28V≤Vi≤38V	REGline		35 30	350 300	mV
Load Regulation Tj=+25°C, 1.0mA≤Io≤100mA Tj=+25°C, 1.0mA≤Io≤40mA	REGload		40 20	200 100	mV
Output Voltage 28V≤Vi≤38V, 1.0mA≤Io≤40mA 28V≤Vi≤33V, 1.0mA≤Io≤70mA	Vo	23.32 23.32		24.68 24.68	Vdc
Input Bias Current (Tj=+25°C) (Tj=+125°C)	I _{IB}		3.1	6.5 6.0	mA
Input Bias Current Change 28V≤Vi≤38V 1.0mA≤Io≤40mA	ΔI _{IB}			1.5 0.2	mA
Output Noise Voltage (Ta=+25°C, 10Hz≤f≤100KHz)	Vn		200		μV
Ripple Rejection (Io=40mA, f=120Hz, 29V≤Vi≤35V, Tj=+25°C)	RR	30	43		dB
Dropout Voltage (Tj=+25°C)	Vi-Vo		1.7		Vdc

FIGURE 1- DROPOUT VOLTAGE versus JUNCTION TEMPERATURE

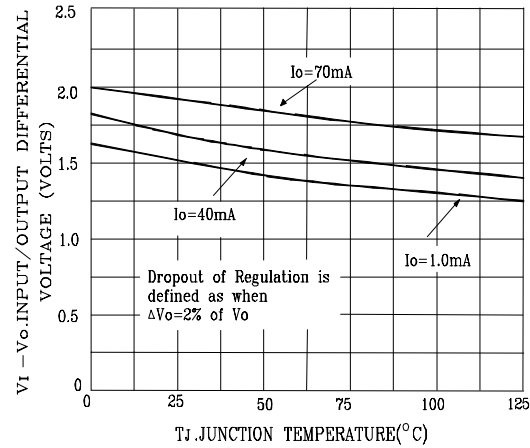


FIGURE 3 - INPUT BIAS CURRENT versus AMBIENT TEMPERATURE

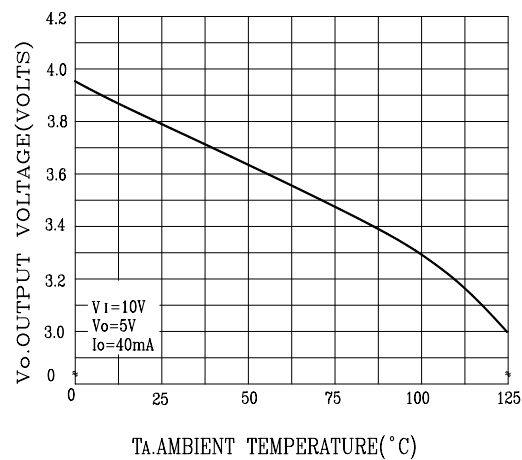


FIGURE 5 - MAXIMUM AVERAGE POWER DISSIPATION versus AMBIENT TEMPERATURE

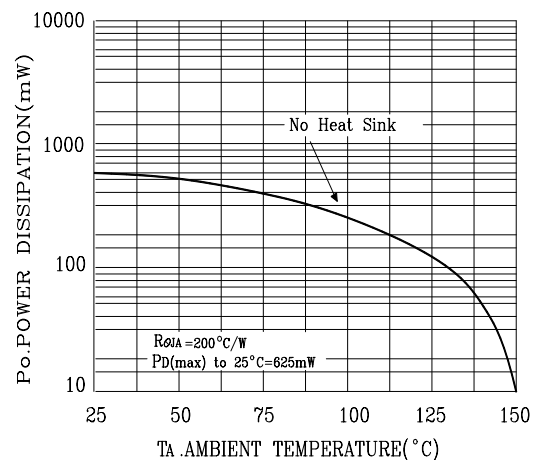


FIGURE 2 – DROPOUT CHARACTERISTICS

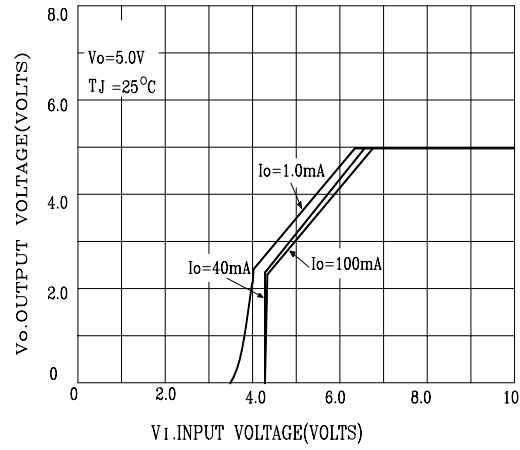
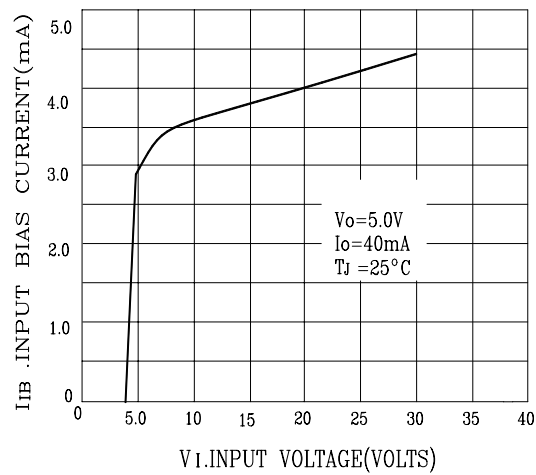
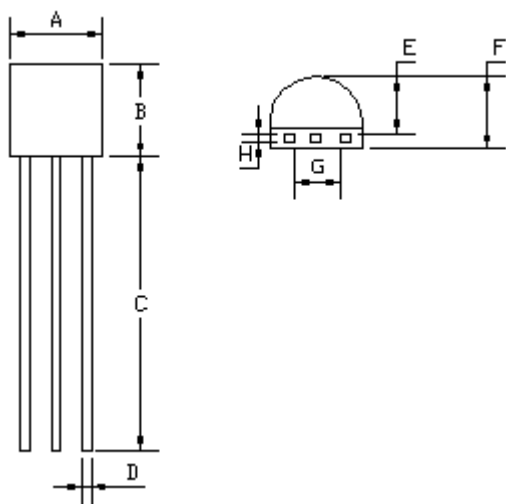


FIGURE 4 - INPUT BIAS CURRENT versus INPUT VOLTAGE



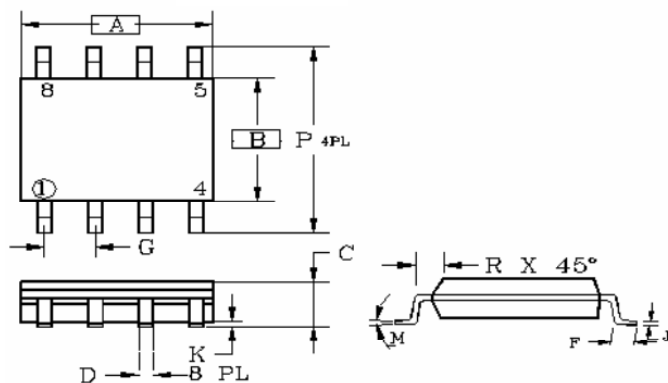
TO-92 Mechanical drawing



TO-92 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.3	4.7	0.169	0.185
B	4.3	4.7	0.169	0.185
C	14.3	14.3	0.563	0.563
D	0.435	0.485	0.017	0.019
E	2.19	2.81	0.086	0.111
F	3.3	3.7	0.130	0.146
G	2.42	2.66	0.095	0.105
H	0.375	0.425	0.015	0.107

SOP-8 Mechanical drawing

SOP-8



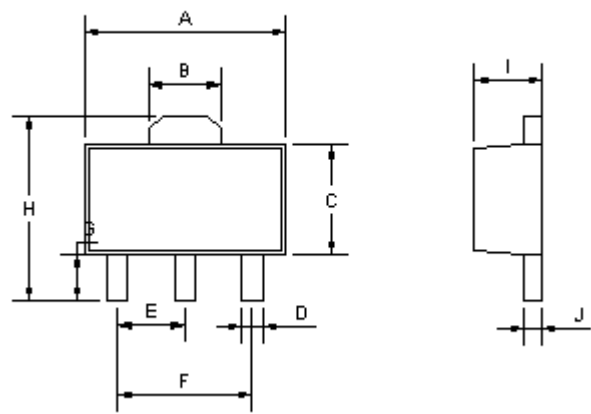
SOP-8 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019



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SOT-89 Mechanical drawing



SOT-89 Dimension				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.4	4.6	0.173	0.181
B	1.5	1.7	0.059	0.070
C	2.30	2.60	0.090	0.102
D	0.40	0.52	0.016	0.020
E	1.50	1.50	0.059	0.059
F	3.00	3.00	0.118	0.118
G	0.89	1.20	0.035	0.047
H	4.05	4.25	0.159	0.167
I	1.4	1.6	0.055	0.063
J	0.35	0.44	0.014	0.017