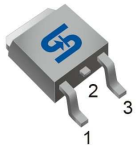
TS78M00 Series

3-Terminal 500mA Positive Voltage Regulator

TO-252 (DPAK)



Pin Definition:
1. Input
2. Ground (tab)
3. Output

General Description

The TS78M00 Series positive voltage regulators are identical to the popular TS7800 Series devices, except that they are specified for only half the output current. Like the TS7800 devices, the TS78M00 Series 3-Terminal regulators are intended for local, on-card voltage regulation.

Internal current limiting, thermal shutdown circuitry and safe-area compensation for the internal pass transistor combine to make these devices remarkably rugged under most operating conditions. Maximum output current with adequate heatsink is 500mA

Features

- Output Voltage Range 5 to 24V
- Output current up to 500mA
- No external components required
- Internal thermal overload protection
- Internal short-circuit current limiting
- Output transistor safe-area compensation
- Output voltage offered in 4% tolerance

Ordering Information

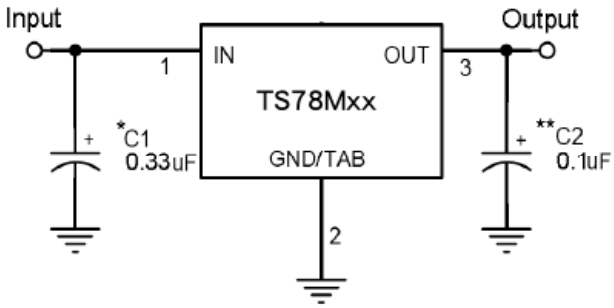
Part No.	Package	Packing
TS78M**xx**CP ROG	TO-252	2.5Kpcs / 13” Reel

Note: “G” denotes for Halogen Free

Note: Where **xx** denote voltage option, available are:

05=5V, **08**=9V, **09**=9V, **12**=12V, **15**=15V, **18**=18V, **24**=24V

Standard Application Circuit



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 type number indicate 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.

Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Input Voltage	V_{IN}*	35	V
Input Voltage	V_{IN}**	40	V
Power Dissipation	P_D	Internal Limited	W
Operating Junction Temperature	T_J	0~+125	°C
Storage Temperature Range	T_{STG}	-65~+150	°C
Thermal Resistance - Junction to Case	$R\Theta_{JC}$	10	°C/W
Thermal Resistance - Junction to Ambient	$R\Theta_{JA}$	100	°C/W

Note: * TS78M05 to TS78M18

** TS78M24

*** Follow the derating curve

TS78M00 Series

3-Terminal 500mA Positive Voltage Regulator

TS78M05 Electrical Characteristics

(Vin=10V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C		4.80	5	5.20	V
		7.5V≤Vin≤20V, 5mA≤Iout≤350mA		4.75	5	5.25	
Line Regulation	REGline	Tj=25°C	7.5V≤Vin≤25V	--	3	100	mV
			8V≤Vin≤12V	--	1	50	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	15	100	
			5mA≤Iout≤200mA	--	5	50	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	3	6	mA
Quiescent Current Change	ΔIq	7.5V≤Vin≤25V		--	--	0.8	
		5mA≤Iout≤350mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	40	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 8V≤Vin≤18V		62	78	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	17	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout= 5mA, 0°C≤Tj≤125°C		--	-0.2	--	mV/°C

TS78M08 Electrical Characteristics

Vin=14V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C		7.69	8	8.32	V
		10.5V≤Vin≤23V, 5mA≤Iout≤350mA		7.61	8	8.40	
Line Regulation	REGline	Tj=25°C	10.5V≤Vin≤25V	--	6	160	mV
			11V≤Vin≤17V	--	2	80	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	160	
			5mA≤Iout≤200mA	--	4	80	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	3	6	mA
Quiescent Current Change	ΔIq	10.5V≤Vin≤25V		--	--	0.8	
		5mA≤Iout≤350mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	52	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 11V≤Vin≤21V		56	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout= 5mA, 0°C≤Tj≤125°C		--	-0.2	--	mV/°C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TS78M00 Series

3-Terminal 500mA Positive Voltage Regulator

TS78M09 Electrical Characteristics

(Vin=15V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C		8.65	9	9.36	V
		11.5V≤Vin≤23V, 5mA≤Iout≤350mA		8.57	9	9.45	
Line Regulation	REGline	Tj=25°C	11.5V≤Vin≤26V	--	6	180	mV
			12V≤Vin≤17V	--	2	90	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	180	
			5mA≤Iout≤200mA	--	4	90	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	3	6	mA
Quiescent Current Change	ΔIq	11.5V≤Vin≤26V		--	--	0.8	
		5mA≤Iout≤350mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	52	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 12V≤Vin≤22V		55	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout= 5mA, 0°C≤Tj≤125°C		--	-0.2	--	mV/°C

TS78M12 Electrical Characteristics

(Vin=19V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C		11.53	12	12.48	V
		14.5V≤Vin≤27V, 5mA≤Iout≤350mA		11.42	12	12.60	
Line Regulation	REGline	Tj=25°C	14.5V≤Vin≤30V	--	10	240	mV
			15V≤Vin≤19V	--	3	120	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	240	
			5mA≤Iout≤200mA	--	4	120	
Quiescent Current	Iq	Tj=25°C, Iout=0		--	3	6	mA
Quiescent Current Change	ΔIq	14.5V≤Vin≤30V		--	--	0.8	
		5mA≤Iout≤500mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	75	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 15V≤Vin≤25V		55	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	18	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=5mA, 0°C≤Tj≤125°C		--	-0.3	--	mV/°C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
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TS78M15 Electrical Characteristics

(Vin=23V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C		14.42	15	15.60	V
		17.5V≤Vin≤30V, 5mA≤Iout≤350mA		14.28	15	15.75	
Line Regulation	REGline	Tj=25°C	17.5V≤Vin≤30V	--	12	300	mV
			18V≤Vin≤22V	--	3	150	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	300	
			5mA≤Iout≤200mA	--	4	150	
Quiescent Current	Iq	Tj=25°C, Iout=0		--	3	6	mA
Quiescent Current Change	ΔIq	17.5V≤Vin≤30V		--	--	0.8	
		5mA≤Iout≤500mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	90	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 18V≤Vin≤28V		54	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	19	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-0.3	--	mV/°C

TS78M18 Electrical Characteristics

(Vin=24V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C		17.30	18	18.72	V
		21V≤Vin≤33V, 5mA≤Iout≤350mA		17.14	18	18.90	
Line Regulation	REGline	Tj=25°C	21V≤Vin≤33V	--	15	360	mV
			22V≤Vin≤26V	--	5	180	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	360	
			5mA≤Iout≤200mA	--	4	180	
Quiescent Current	Iq	Tj=25°C, Iout=0		--	3	6	mA
Quiescent Current Change	ΔIq	21V≤Vin≤33V		--	--	0.8	
		5mA≤Iout≤500mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	110	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 21V≤Vin≤31V		54	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	22	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout= 5mA, 0°C≤Tj≤125°C		--	-0.5	--	mV/°C

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- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TS78M24 Electrical Characteristics

Vin=33V, Iout=350mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C		23.07	24	24.96	V
		27V≤Vin≤38V, 5mA≤Iout≤350mA		22.85	24	25.20	
Line Regulation	REGline	Tj=25°C	27V≤Vin≤38V	--	18	480	mV
			28V≤Vin≤32V	--	6	240	
Load Regulation	REGload	Tj=25°C	5mA≤Iout≤500mA	--	12	480	
			5mA≤Iout≤200mA	--	4	240	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	3	6	mA
Quiescent Current Change	ΔIq	27V≤Vin≤38V		--	--	0.8	
		5mA≤Iout≤500mA		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	170	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 27V≤Vin≤37V		54	80	--	dB
Voltage Drop	Vdrop	Iout=500mA, Tj=25°C		--	2	--	V
Output Resistance	Rout	f=1KHz		--	28	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C		--	50	--	mA
Peak Output Current	Io peak	Tj=25°C		--	0.7	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout= 5mA, 0°C≤Tj≤125°C		--	-0.5	--	mV/°C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

Electrical Characteristics Curve

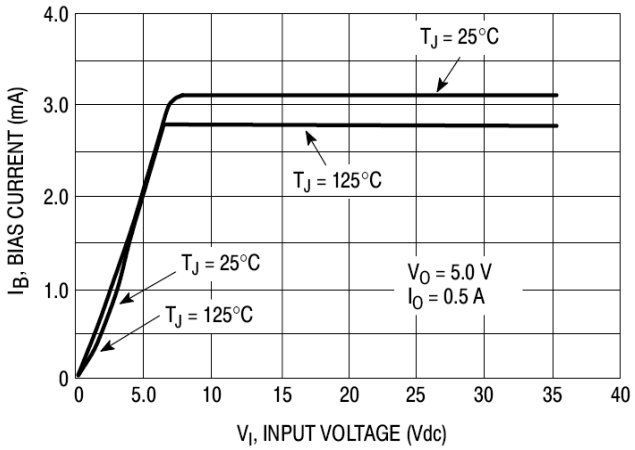


Figure 1. Bias Current vs. Input Voltage

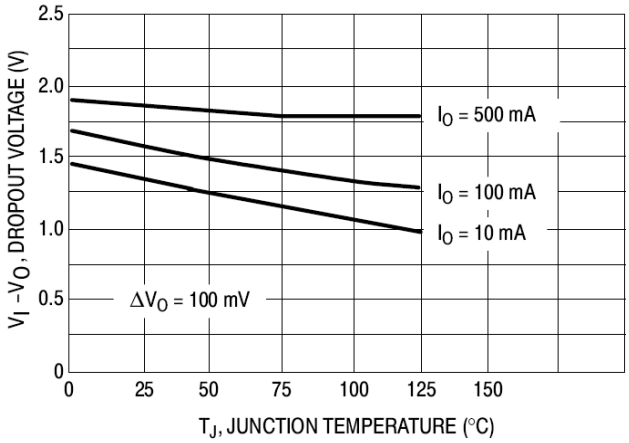


Figure 2. Dropout Voltage vs. Junction Temperature

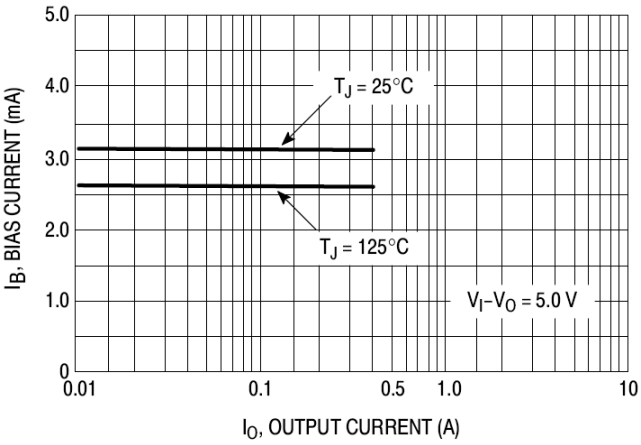


Figure 3. Bias Current vs. Output Current

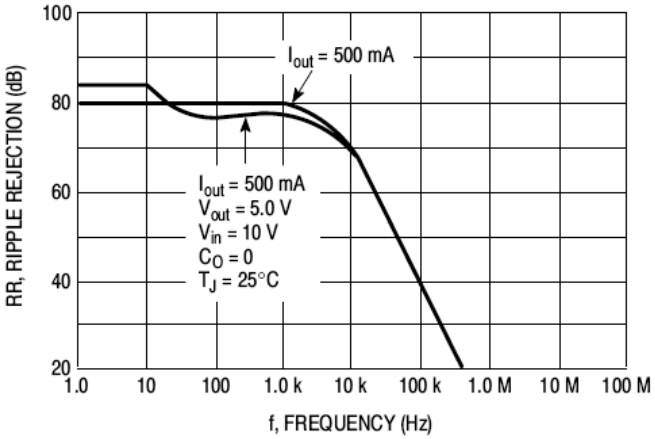


Figure 4. Ripple Rejection vs. Frequency

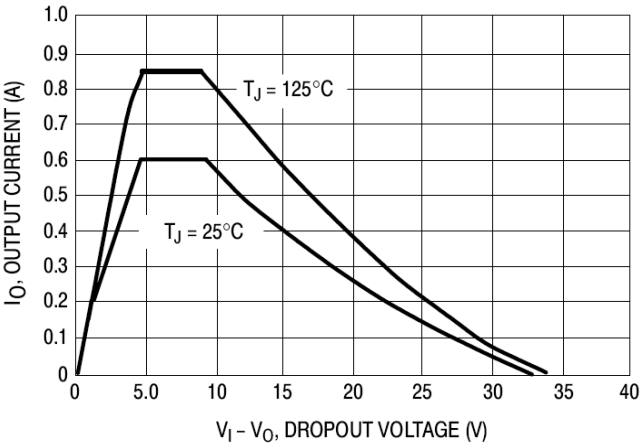
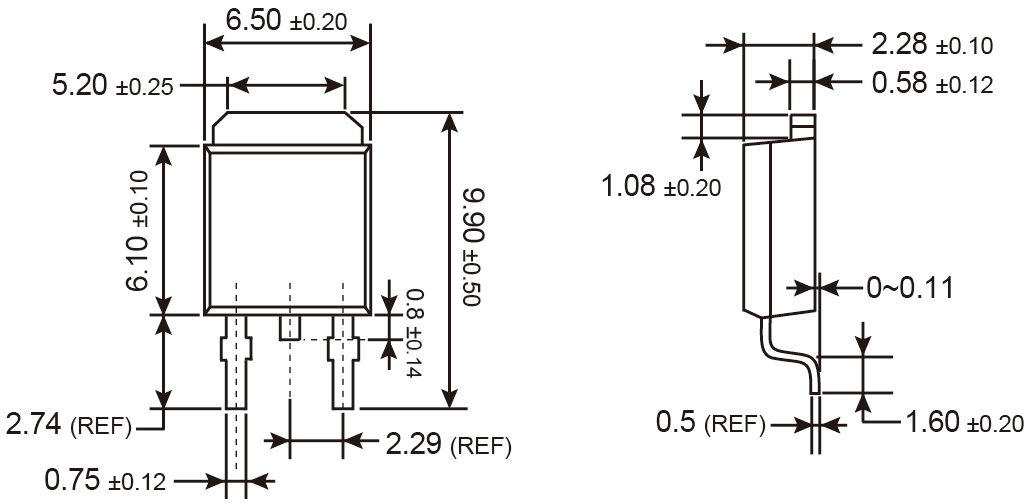


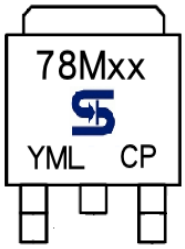
Figure 6. Peak Output Current vs. Dropout Voltage

TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



XX = Output Voltage
(**05**=5V, **08**=8V, **09**=9V, **12**=12V, **15**=15V, **18**=18V, **24**=24V)
Y = Year Code
M = Month Code for Halogen Free Product

O	=Jan	**P**	=Feb	**Q**	=Mar	**R**	=Apr
S	=May	**T**	=Jun	**U**	=Jul	**V**	=Aug
W	=Sep	**X**	=Oct	**Y**	=Nov	**Z**	=Dec

L = Lot Code
CP = Package Code for TO-252

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