TS78M00L 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.

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

- 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.

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

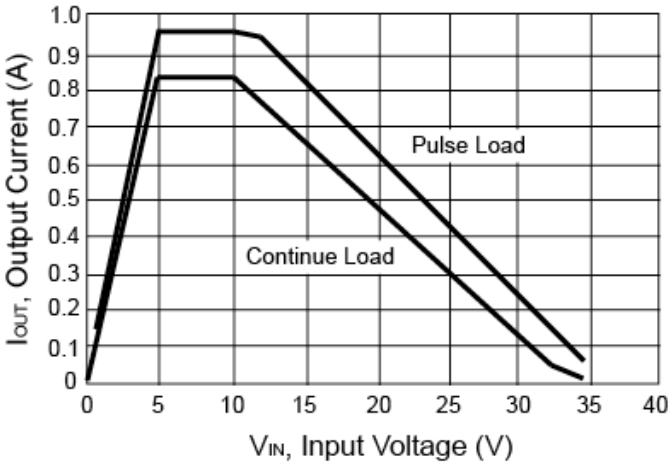


Figure 1. Input Voltage vs. Output Current (max.)

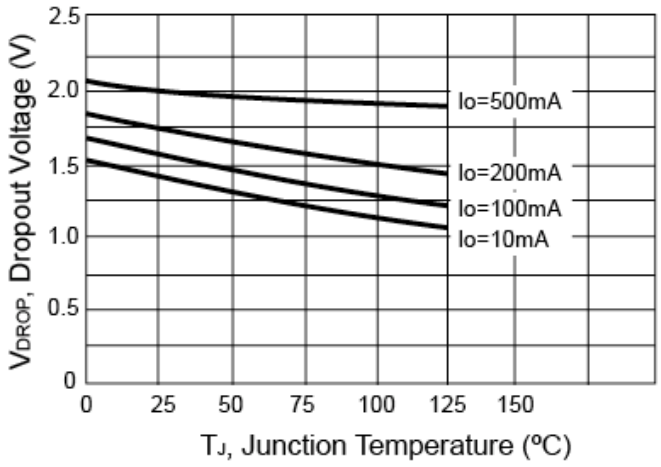


Figure 2. Vdrop vs. Junction Temperature

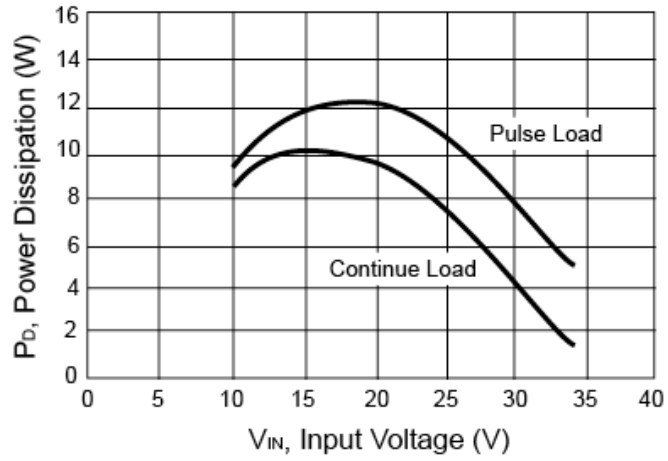


Figure 3. Input Voltage vs. Power Dissipation

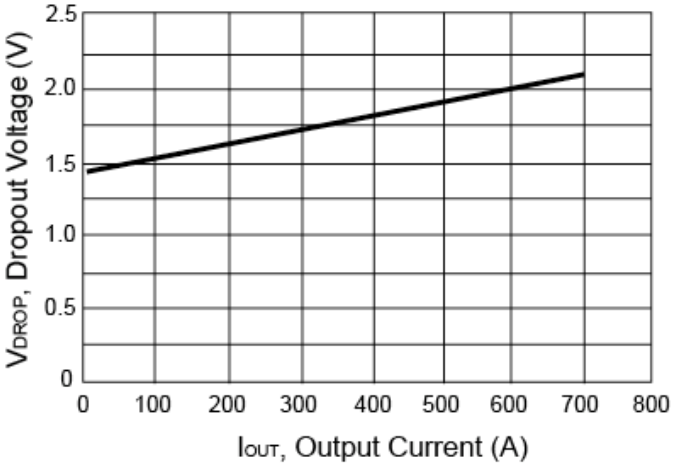


Figure 4. Vdrop vs. Output Current

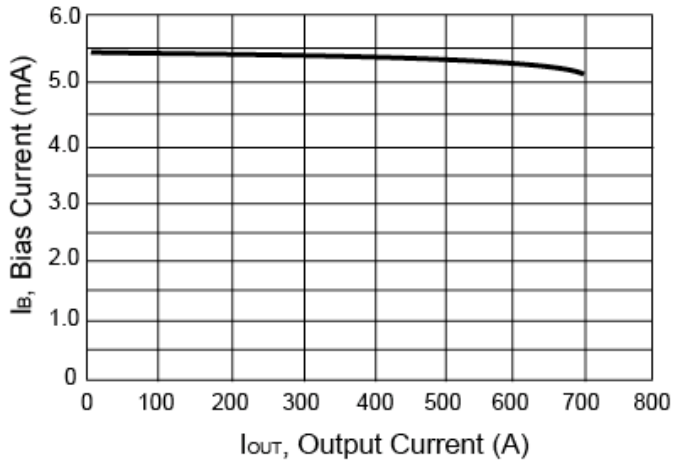


Figure 5. Bias Current vs. Output Current

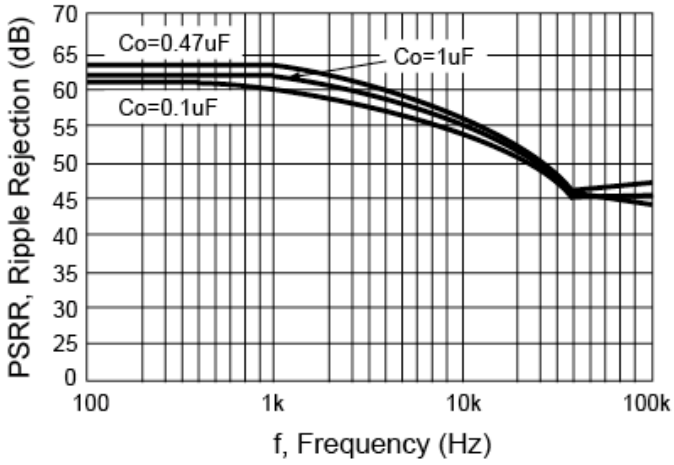


Figure 6. Ripple Rejection vs. Frequency

Application information

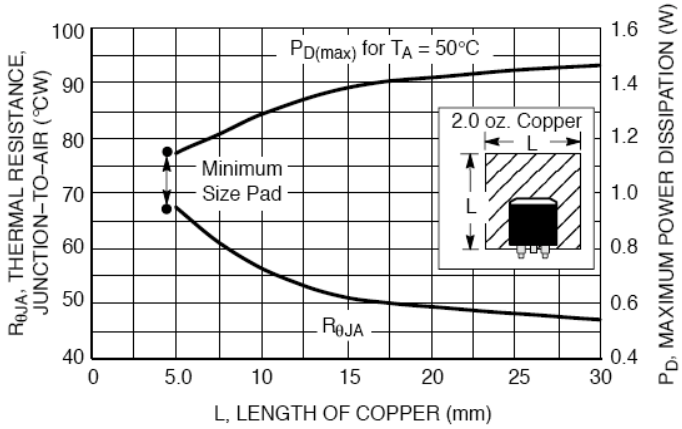
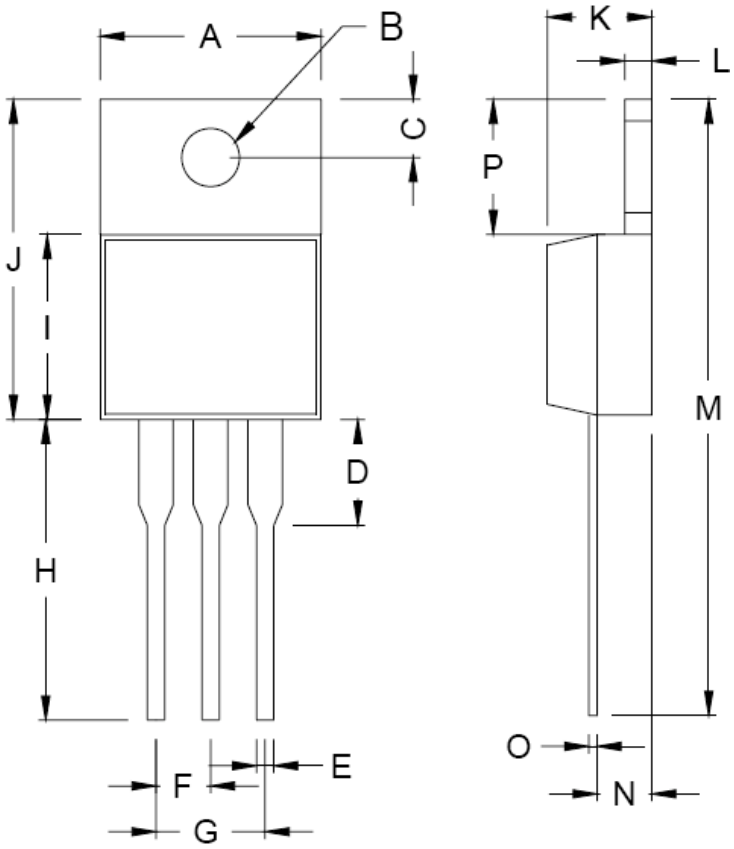


Figure 7. DPAK Thermal Resistance and Maximum Power Dissipation vs. P.C.B Copper Length

TS78M00L Series

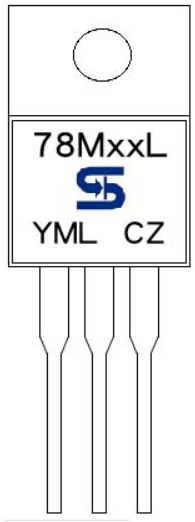
3-Terminal 500mA Positive Voltage Regulator

TO-220 Mechanical Drawing



TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.31	10.550	0.366	0.415
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	2.22	3.22	0.087	0.127
E	0.78	0.98	0.030	0.038
F	2.34	2.65	0.092	0.104
G	4.69	5.31	0.184	0.209
H	12.32	13.88	0.485	0.546
I	8.74	9.26	0.344	0.364
J	15.07	16.07	0.593	0.632
K	4.35	4.65	0.171	0.183
L	1.16	1.40	0.045	0.055
M	27.39	30.35	1.078	1.194
N	1.785	2.675	0.070	0.105
O	1.50	1.75	0.059	0.068
P	5.75	7.65	0.226	0.301

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
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

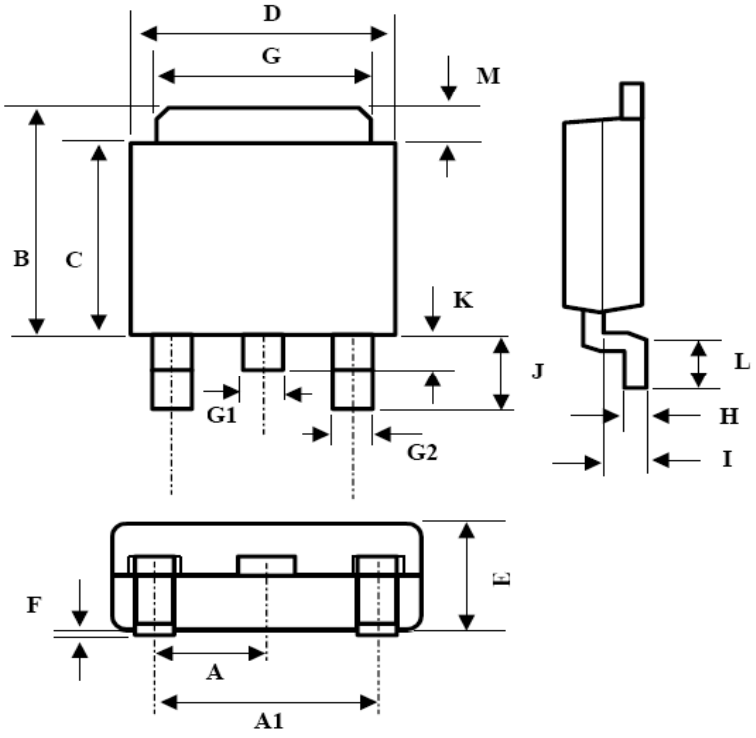
L = Lot Code

CZ = Package Code for TO-220

TS78M00L Series

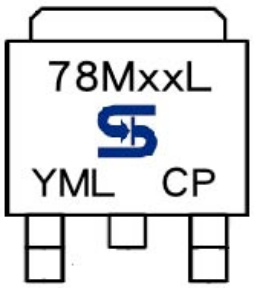
3-Terminal 500mA Positive Voltage Regulator

TO-252 Mechanical Drawing



TO-252 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.3BSC		0.09BSC	
A1	4.6BSC		0.18BSC	
B	6.80	7.20	0.268	0.283
C	5.40	5.60	0.213	0.220
D	6.40	6.65	0.252	0.262
E	2.20	2.40	0.087	0.094
F	0.00	0.20	0.000	0.008
G	5.20	5.40	0.205	0.213
G1	0.75	0.85	0.030	0.033
G2	0.55	0.65	0.022	0.026
H	0.35	0.65	0.014	0.026
I	0.90	1.50	0.035	0.059
J	2.20	2.80	0.087	0.110
K	0.50	1.10	0.020	0.043
L	0.90	1.50	0.035	0.059
M	1.30	1.70	0.051	0.67

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
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
L = Lot Code
CP = Package Code for TO-252

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