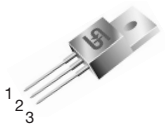
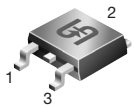
TS79M00

3-Terminal Medium Current Negative Voltage Regulators

TO-220 TO-252





Pin: 1. Ground 2. Input 3. Output
(Heatsink surface connected to Pin 2.)

Voltage Range
-5 to -24 Volts
Current
500 mA

Features

- ✧ 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 Informations

Device	Operating Temperature (Ambient)	Package
TS79MxxCZ	-20 °C ~ +85°C	TO-220
TS79MxxCP		TO-252

Absolute Maximum Ratings (Ta=25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (-5.0V~ -15V)	Vin	-35	Vdc
(-18V~ -24V)		-40	
Power Dissipation (Package Limitation)			
Plastic Package, TO-220			
TA=25°C	P_D	Internally Limited	
Thermal Resistance, Junction-to-Air	θ_{JA}	70	°C/W
Thermal Resistance, Junction-to-Case	θ_{JC}	5.0	°C/W
Plastic Package, DPAK (TO-252)			
TA=25°C	P_D	Internally Limited	
Thermal Resistance, Junction-to-Air	θ_{JA}	92	°C/W
Thermal Resistance, Junction-to-Case	θ_{JC}	5.0	°C/W
Operating Junction Temperature Range	Tj	+150	°C
Storage Temperature Range	Tstg	-65 to +150	°C

Rev. 1 02/2003

TS79M05 Electrical Characteristics

(Vin= -10V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-4.8	-5.0	-5.2	Vdc
Voltage	(-7.0Vdc≤Vin≤-20Vdc, 5.0mA≤Io≤350mA)		-4.75	-5.0	-5.25	
Line Regulation (Tj=25°C, -7.0Vdc≤Vin≤-25Vdc, Io=200mA)		REGline	-	3.0	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 20 10	 100 50	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-8.0Vdc≤Vin≤-25Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	40	-	μA
Ripple Rejection (Io=100mA, f=120Hz, -9.0V≤Vin≤-19V) (Io=300mA, f=120Hz, -9.0V≤Vin≤-19V, Tj=25°C)		RR	 62 62	 - 80	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

TS79M06 Electrical Characteristics

(Vin= -11V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-5.75	-6	-6.25	Vdc
Voltage	(-8.0Vdc≤Vin≤-21Vdc, 5.0mA≤Io≤350mA)		-5.70	-6	-6.30	
Line Regulation (Tj=25°C, -8.0Vdc≤Vin≤-25Vdc, Io=200mA)		REGline	-	3.0	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 20 10	 120 60	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-9.0Vdc≤Vin≤-25Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	45	-	μA
Ripple Rejection (Io=100mA, f=120Hz, -9.0V≤Vin≤-19V) (Io=300mA, f=120Hz, -9.0V≤Vin≤-19V, Tj=25°C)		RR	 59 59	 - 80	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

Rev. 1 02/2003

TS79M08 Electrical Characteristics

(Vin= -14V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-7.70	-8	-8.30	Vdc
Voltage	(-10.5Vdc≤Vin≤–23Vdc, 5mA≤Io≤350mA)		-7.84	-8	-8.16	
Line Regulation (Tj=25°C, -10.5Vdc≤Vin≤–25Vdc, Io=200mA)		REGline	-	60	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 25 10	 160 80	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-10.5Vdc≤Vin≤-25Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	52	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -11.5V≤Vin≤-21.5V) (Io=300mA, f=120Hz, -11.5V≤Vin≤-21.5V, Tj=25°C)		RR	 56 56	 - 80	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

TS79M09 Electrical Characteristics

(Vin= -15V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-8.64	-9	-9.36	Vdc
Voltage	(-11.5Vdc≤Vin≤–23Vdc, 5mA≤Io≤350mA)		-8.55	-9	-9.45	
Line Regulation (Tj=25°C, -11.5Vdc≤Vin≤–25Vdc, Io=200mA)		REGline	-	60	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 25 10	 180 90	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-11.5Vdc≤Vin≤-25Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	52	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -12.5V≤Vin≤-22.5V) (Io=300mA, f=120Hz, -12.5V≤Vin≤-22.5V, Tj=25°C)		RR	 56 56	 - 80	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

Rev. 1 02/2003

TS79M12 Electrical Characteristics

(Vin= -19V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-11.52	-12	-12.48	Vdc
Voltage	(-14.5Vdc≤Vin≤–27Vdc, 5mA≤Io≤350mA)		-11.40	-12	-12.60	
Line Regulation (Tj=25°C, -14.5Vdc≤Vin≤–30Vdc, Io=200mA)		REGline	-	80	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 25 10	 240 120	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-14.5Vdc≤Vin≤-30Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	75	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -15V≤Vin≤-25V) (Io=300mA, f=120Hz, -15V≤Vin≤-25V, Tj=25°C)		RR	 55 55	 - 80	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

TS79M15 Electrical Characteristics

(Vin= -19V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted) (Note 5)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-14.40	-15	-15.60	Vdc
Voltage	(-17.5Vdc≤Vin≤–30Vdc, 5mA≤Io≤350mA)		-14.25	-15	-15.75	
Line Regulation (Tj=25°C, -17.5Vdc≤Vin≤–30Vdc, Io=200mA)		REGline	-	10	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 25 10	 300 150	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	8.0	mA
Quiescent Current Change (-17.5Vdc≤Vin≤-30Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	90	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -18.5V≤Vin≤-28.5V) (Io=300mA, f=120Hz, -18.5V≤Vin≤-28.5V, Tj=25°C)		RR	 54 54	 - 70	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

Rev. 1 02/2003

TS79M18 Electrical Characteristics

(Vin= -23V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-17.28	-18	-18.72	Vdc
Voltage	(-21Vdc≤Vin≤–33Vdc, 5mA≤Io≤350mA)		-17.10	-18	-18.90	
Line Regulation (Tj=25°C, -21Vdc≤Vin≤–33Vdc, Io=200mA)		REGline	-	10	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 30 10	 360 180	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	9	mA
Quiescent Current Change (-21Vdc≤Vin≤-33Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	100	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -22V≤Vin≤-32V) (Io=300mA, f=120Hz, -22V≤Vin≤-32V, Tj=25°C)		RR	 53 53	 - 70	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

TS79M24 Electrical Characteristics

(Vin= -27V, Io=350mA, 0°C≤Tj≤125°C, PD≤5.0W, unless otherwise noted)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output	(Tj=25°C)	Vo	-23.0	-24	-25.0	Vdc
Voltage	(-27Vdc≤Vin≤–38Vdc, 5.0mA≤Io≤350mA)		-22.8	-24	-25.2	
Line Regulation (Tj=25°C, -27Vdc≤Vin≤–38Vdc, Io=200mA)		REGline	-	10	50	mV
Load Regulation (Tj=25°C, 5.0mA≤Io≤500mA) (Tj=25°C, 5.0mA≤Io≤200mA)		REGload	 - -	 30 10	 480 240	mV
Input Bias Current (Tj=25°C)		I_{IB}	-	3.2	9	mA
Quiescent Current Change (-27Vdc≤Vin≤-38Vdc,Io=200mA) (5.0mA≤Io≤350mA)		ΔI_{IB}	 - -	 - -	 0.8 0.5	mA
Output Noise Voltage (Ta=25°C, 10Hz≤f≤100kHz)		Vn	-	170	-	μV
Ripple Rejection (Io=100mA, f=120Hz, -28V≤Vin≤-38V) (Io=300mA, f=120Hz, -28V≤Vin≤-38V, Tj=25°C)		RR	 50 50	 - 70	 - -	dB
Dropout Voltage (Tj=25°C)		Vin-Vo	-	2.0	-	Vdc
Short Circuit Current Limit (Tj=25°C, Vin=-35V)		Ios	-	50	-	mA
Average Temperature Coefficient of Output Voltage (Io=5.0mA)		ΔVo/ΔT	-	0.4	-	mV/°C
Peak Output Current (Tj=25°C)		Io	-	700	-	mA

Rev. 1 02/2003

Definitions

Line-Regulation: The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature in not significantly affected.
Load-Regulation: The change in output voltage for a change in load current at constant chip temperature.
Maximum Power dissipation: The maximum total device dissipation for which the regulator will operate within specifications.
Input Bias Current: That part of the input current that is not delivered to the load.
Output Noise Voltage: The rms AC voltage at the output, with constant load and no input ripple, measured over a specified frequency range.
Long Term Stability: Output voltage stability under accelerated life test conditions with the maximum rated voltage listed in the devices'electrical characteristics and maximum power dissipation.

FIG.1- WORST CASE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE (TO-220)

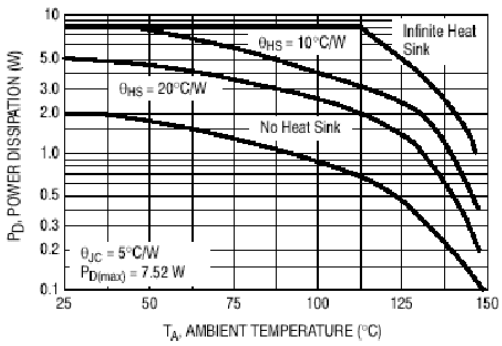
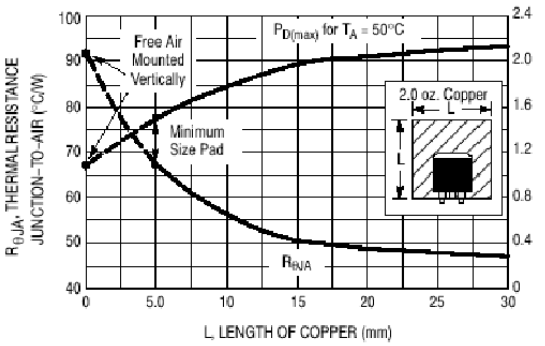
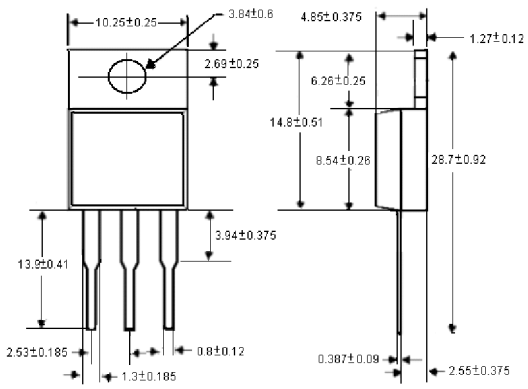


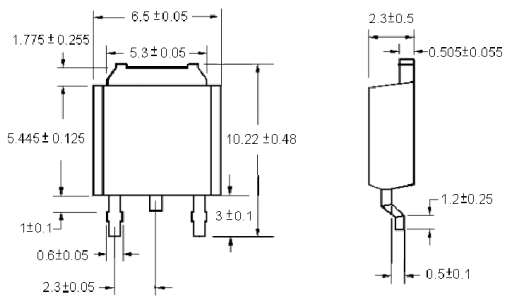
FIG.2- DPAK THERMAL RESISTANCE AND MAXIMUM POWER DISSIPATION VERSUS P.C.B. COPPER LENGTH



TO-220 Unit: mm



TO-252 Unit: mm



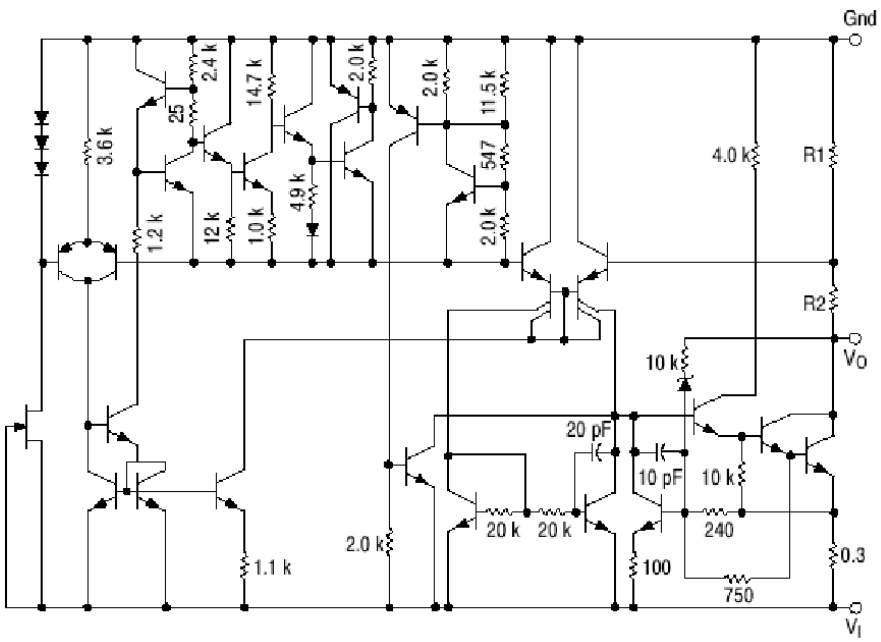
Applications Information

Design Considerations

The TS79Mxx Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 mF or larger tantalum, Mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulator's input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

FIG.3- REPRESENTATIVE SCHEMATIC DIAGRAM



Rev. 1 02/2003