TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS7900 Series

3-Terminal Fixed Negative Voltage Regulator

TO-220

ITO-220

TO-263 (D^2PAK)

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

General Description

The TS7900 series of fixed output negative voltage regulators are intended as complements to the popular TS7800 series device. These negative regulators are available in the same seven-voltage options as the TS7900 devices. In addition, one extra voltage option commonly employed in MECL systems is also available in the negative TS7900A Series. Available in fixed output voltage options from -5.0 to -24 volts, these regulators employ current limiting, thermal shutdown, and safe-area compensation--making them remarkably rugged under most operating conditions. With adequate heat sinking they can deliver output currents in excess of 1 ampere.
This series is offered in 3-pin TO-220, ITO-220 & TO-263 package.

Features

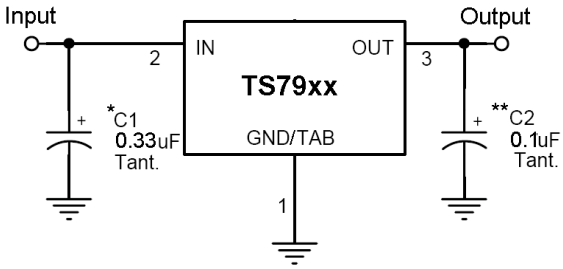
- Output Voltage Range -5 to -24V
- Output current up to 1A
- No external components required
- Internal thermal overload protection
- Internal short-circuit current limiting
- Output transistor safe-area compensation
- Output voltage offered in 4% tolerance

Ordering Information

Part No.	Package	Packing
TS79**xx**CZ C0	TO-220	50pcs / Tube
TS79**xx**CI C0	ITO-220	50pcs / Tube
TS79**xx**CM RN	TO-263	800pcs / 13” Reel

Note: Where **xx** denote voltage option

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

Note: * TS7905 to TS7918
** TS7924
*** Follow the derating curve

TS7900 Series

3-Terminal Fixed Negative Voltage Regulator

TS7905 Electrical Characteristics

(Vin= -10V, Iout=500mA, 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, 10mA≤Iout≤1A, PD≤15W		-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	10mA≤Iout≤1A	--	15	100	
			250mA≤Iout≤750mA	--	5	50	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4	8	mA
Quiescent Current Change	ΔIq	-7.5V≤Vin≤-25V		--	--	1.3	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	40	--	μV
Ripple Rejection Ratio	RR	f=120Hz, -8V≤Vin≤-18V		62	74	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	750	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-0.1	--	mV/ °C

TS7906 Electrical Characteristics

(Vin= -11V, Iout=500mA, 0oC≤Tj≤125oC, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C		-5.75	-6	-6.25	V
		-8.5V≤Vin≤-21V, 10mA≤Iout≤1A, PD≤15W		-5.7	-6	-6.3	
Line Regulation	REGline	Tj=25°C	-8.5V≤Vin≤-25V	--	5	120	mV
			-9V≤Vin≤-13V	--	1.5	60	
Load Regulation	REGload	Tj=25°C	10mA≤Iout≤1A	--	14	120	
			250mA≤Iout≤750mA	--	4	60	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4	8	mA
Quiescent Current Change	ΔIq	-8.5V≤Vin≤-25V		--	--	1.3	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	44	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -9V≤Vin≤-19V		60	73	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	550	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-0.1	--	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.

TS7908 Electrical Characteristics

Vin= -14V, Iout=500mA, 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, 10mA≤Iout≤1A, PD≤15W		-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	10mA≤Iout≤1A	--	12	160	
			250mA≤Iout≤750mA	--	4	80	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4.3	8	mA
Quiescent Current Change	ΔIq	10.5V≤Vin≤25V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	52	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 11V≤Vin≤21V		56	72	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	450	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	mV/ °C

TS7909 Electrical Characteristics

(Vin= -15V, Iout=500mA, 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, 10mA≤Iout≤1A, PD≤15W		-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	10mA≤Iout≤1A	--	12	180	
			250mA≤Iout≤750mA	--	4	90	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4.3	8	mA
Quiescent Current Change	ΔIq	-11.5V≤Vin≤-26V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	58	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -12V≤Vin≤-22V		56	71	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	450	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	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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TS7912 Electrical Characteristics

(Vin= -19V, Iout=500mA, 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, 10mA≤Iout≤1A, PD ≤15W		-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	10mA≤Iout≤1A	--	12	240	
			250mA≤Iout≤750mA	--	4	120	
Quiescent Current	Iq	Tj=25°C, Iout=0		--	4.3	8	mA
Quiescent Current Change	ΔIq	-14.5V≤Vin≤-30V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	75	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -15V≤Vin≤-25V		55	70	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	350	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	mV/ °C

TS7915 Electrical Characteristics

Vin= -23V, Iout=500mA, 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, 10mA≤Iout≤1A, PD ≤15W		-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	10mA≤Iout≤1A	--	12	300	
			250mA≤Iout≤750mA	--	4	150	
Quiescent Current	Iq	Tj=25°C, Iout=0		--	4.3	8	mA
Quiescent Current Change	ΔIq	-17.5V≤Vin≤-30V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	90	--	μV
Ripple Rejection Ratio	RR	f=120Hz, -18V≤Vin≤-28V		54	69	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	230	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	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.

TS7918 Electrical Characteristics

Vin= -24V, Iout=500mA, 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, 10mA≤Iout≤1A, PD ≤15W		-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	10mA≤Iout≤1A	--	12	360	
			250mA≤Iout≤750mA	--	4	180	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4.5	8	mA
Quiescent Current Change	ΔIq	-21V≤Vin≤-33V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	110	--	μV
Ripple Rejection Ratio	RR	f=120Hz, -21V≤Vin≤-31V		53	68	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	200	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	mV/ °C

TS7924 Electrical Characteristics

Vin= -33V, Iout=500mA, 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, 10mA≤Iout≤1A, PD ≤15W		-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	10mA≤Iout≤1A	--	12	480	
			250mA≤Iout≤750mA	--	4	240	
Quiescent Current	Iq	Iout=0, Tj=25°C		--	4.6	8	mA
Quiescent Current Change	ΔIq	-27V≤Vin≤-38V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C		--	170	--	μV
Ripple Rejection Ratio	RR	f=120Hz, -27V≤Vin≤-37V		50	65	--	dB
Voltage Drop	Vdrop	Iout=1A, Tj=25°C		--	2	--	V
Output Short Circuit Current	Ios	Tj=25°C		--	150	--	mA
Peak Output Current	Io peak	Tj=25°C		--	2.1	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C		--	-1	--	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

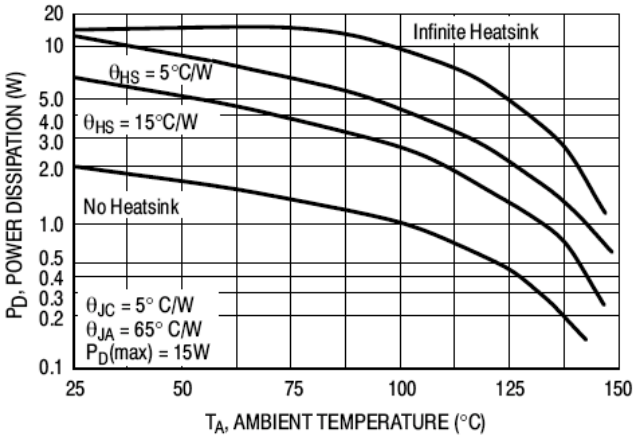


Figure 1. Worse Case Power Dissipation as a Function of Ambient Temperature

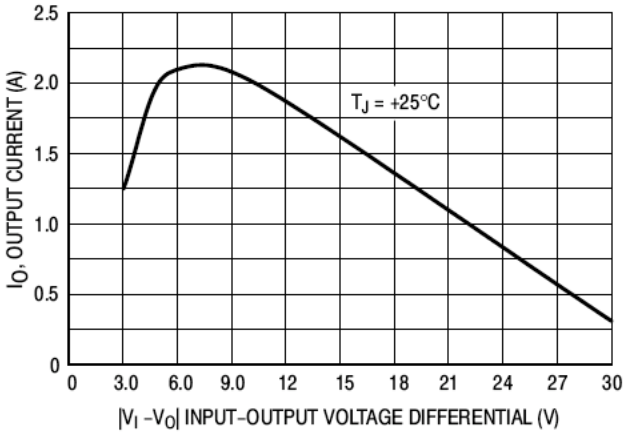


Figure 2. Peak Output Current as a Function of Input-Output Differential Voltage

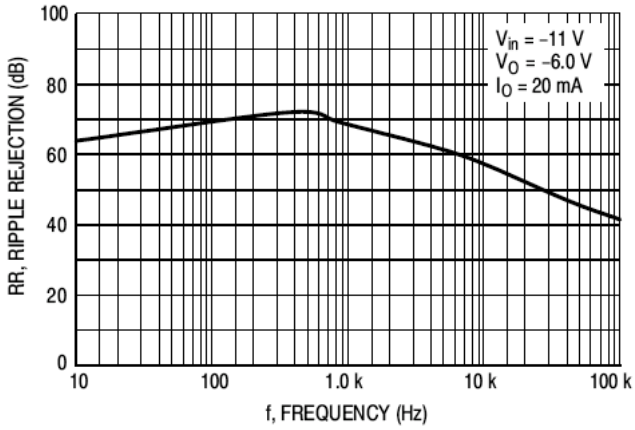


Figure 3. Ripple Rejection as a Function of Frequency

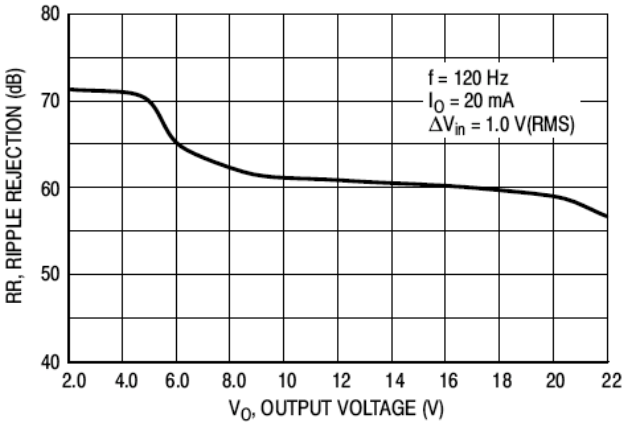


Figure 4. Ripple Rejection as a Function of Output Voltage

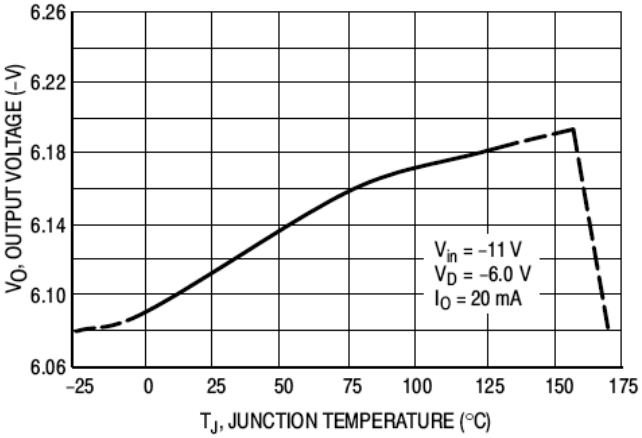


Figure 5. Output Voltage as a Function of Junction Temperature

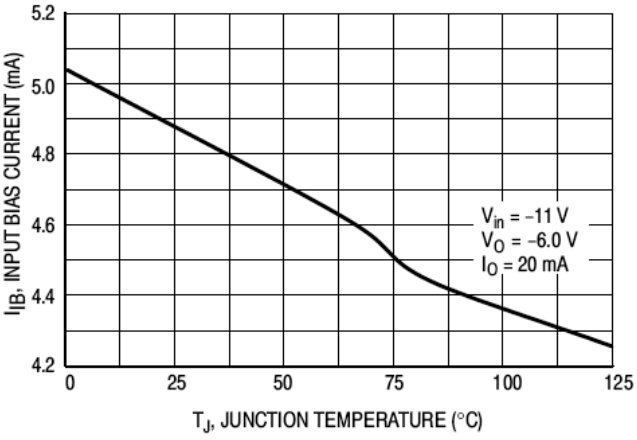


Figure 5. Output Voltage as a Function of Junction Temperature

Application Information

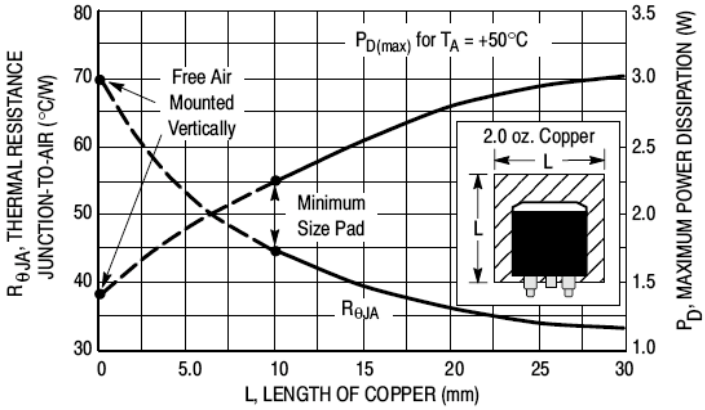
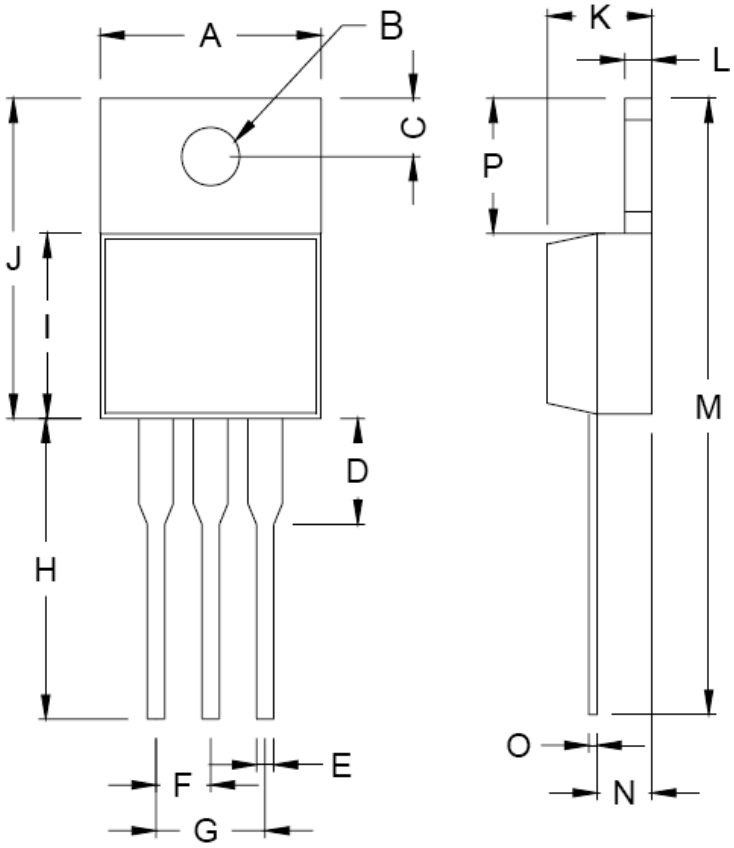


Figure 7. D^2PAK Thermal Resistance and Maximum Power Dissipation vs. P.C.B Copper Length

TS7900 Series

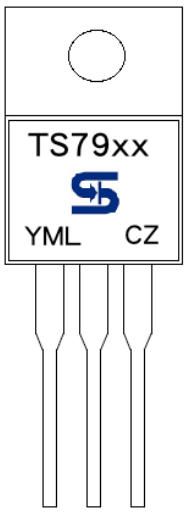
3-Terminal Fixed Negative Voltage Regulator

TO-220 Mechanical Drawing



TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	-	6.350	-	0.250
E	0.381	1.106	0.015	0.040
F	2.345	2.715	0.092	0.058
G	4.690	5.430	0.092	0.107
H	12.700	14.732	0.500	0.581
I	8.382	9.017	0.330	0.355
J	14.224	16.510	0.560	0.650
K	3.556	4.826	0.140	0.190
L	0.508	1.397	0.020	0.055
M	27.700	29.620	1.060	1.230
N	2.032	2.921	0.080	0.115
O	0.255	0.610	0.010	0.024
P	5.842	6.858	0.230	0.270

Marking Diagram

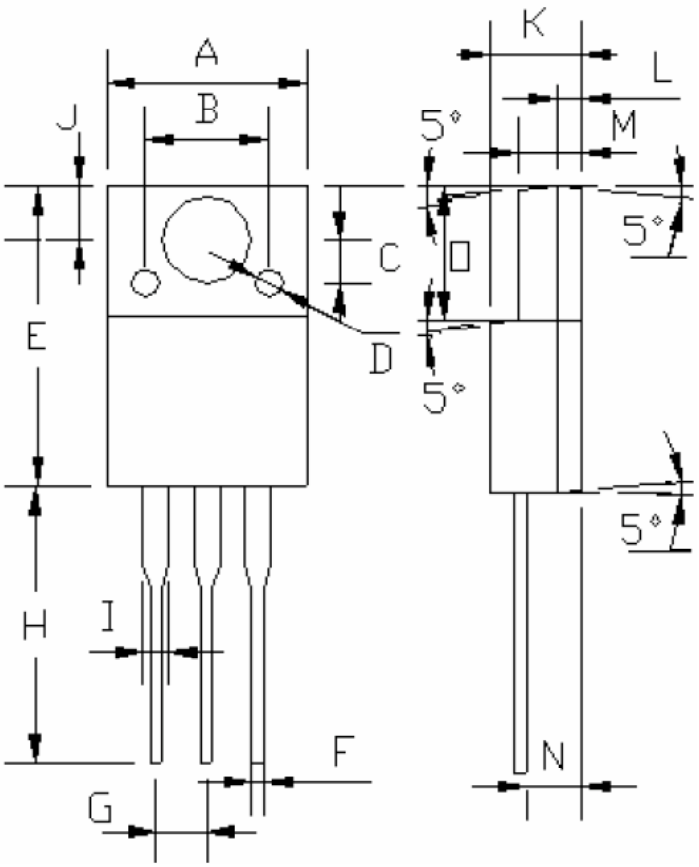


XX = Output Voltage
(05=-5V, 06=-6V, 08=-8V, 09=-9V, 12=-12V, 15=-15V, 18=-18V, 24=-24V)
Y = Year Code
M = Month Code
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
L = Lot Code
CZ = Package Code for TO-220

TS7900 Series

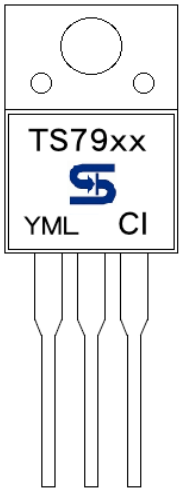
3-Terminal Fixed Negative Voltage Regulator

ITO-220 Mechanical Drawing



ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.96	10.36	0.392	0.407
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	∮ 1.40 (typ.)		∮ 0.055 (typ.)	
E	15.07	16.07	0.593	0.632
F	0.80 (typ.)		0.031 (typ.)	
G	2.44	2.64	0.096	0.104
H	13.08	13.48	0.514	0.530
I	1.47 (max.)		0.057 (max.)	
J	3.20	3.40	0.125	0.133
K	4.60	4.80	0.181	0.188
L	1.15 (typ.)		0.045 (typ.)	
M	2.44	2.64	0.096	0.104
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262

Marking Diagram



XX = Output Voltage
(05=-5V, 06=-6V, 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)

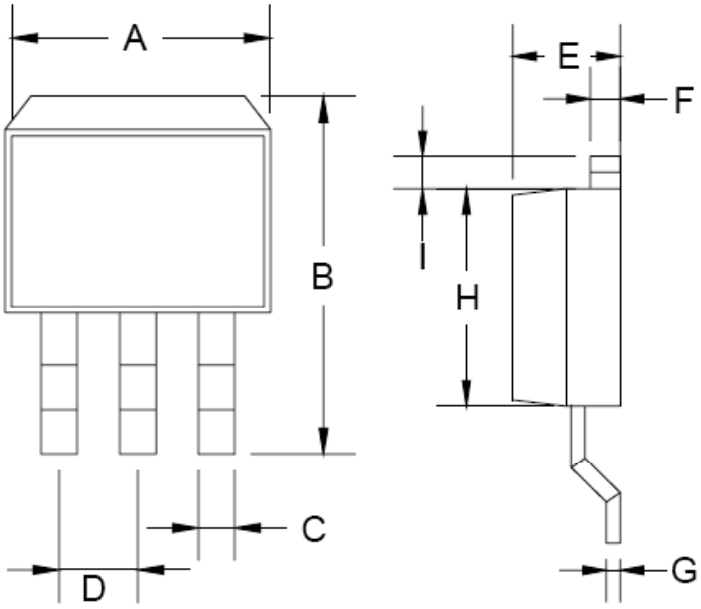
L = Lot Code

CI = Package Code for ITO-220

TS7900 Series

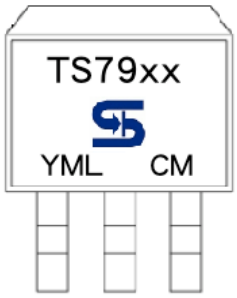
3-Terminal Fixed Negative Voltage Regulator

TO-263 Mechanical Drawing



TO-263 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	14.605	15.875	0.575	0.625
C	0.508	0.991	0.020	0.039
D	2.420	2.660	0.095	0.105
E	4.064	4.830	0.160	0.190
F	1.118	1.400	0.045	0.055
G	0.450	0.730	0.018	0.029
H	8.280	8.800	0.325	0.346
I	1.140	1.400	0.044	0.055
J	1.480	1.520	0.058	0.060

Marking Diagram



XX = Output Voltage
(05=-5V, 06=-6V, 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

CM = Package Code for TO-263

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