TS7900 series

3-Terminal Fixed Negative Output Voltage Regulator

TO-220 ITO-220



Pin assignment:
1. Ground
2. Input
3. Output

(Heatsink surface connected to Pin 2)

Voltage Range - 5V to - 24V
Output Current up to 1A

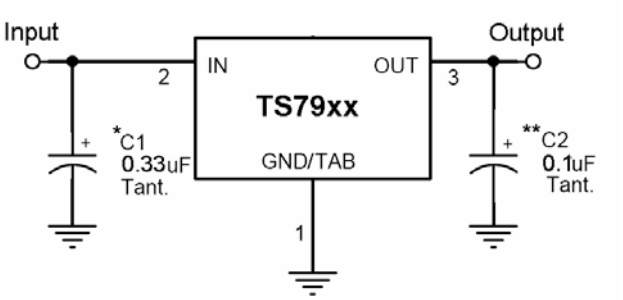
General Description

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 TS7800 devices. In addition, one extra voltage option commonly employed in MECL systems is also available in the negative TS7900 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 heatsinking they can deliver output currents in excess of 1 ampere.
This series is offered in 3-pin TO-220, ITO-220 package.

Features

- ✧ 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

Standard Application



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.

Ordering Information

Part No.	Operating Temp. (Ambient)	Package
TS79xxCZ	-20 ~ +85°C	TO-220
TS79xxCI		ITO-220

Note: Where xx denotes voltage option.

Absolute Maximum Rating

Input Voltage		Vin *	- 35	V
Input Voltage		Vin **	- 40	V
Power Dissipation	TO-220	Without heatsink	2	°C/W
	TO-220	Pt ***	15	
	ITO-220	Without heatsink	10	
Operating Junction Temperature Range		T_J	0 ~ +150	°C
Storage Temperature Range		T_{STG}	-65 ~ +150	°C

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

TS7905 Electrical Characteristics

(Vin= -10V, Iout=500mA, 0 °C ≤Tj≤125 °C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Conditions		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	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -8V≤Vin≤-18V		62	74	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25 °C		--	2	--	V
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

TS7906 Electrical Characteristics

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

Parameter	Symbol	Test Conditions		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		-6.3	-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=1.0A, Tj=25 °C		--	2	--	V
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.

TS7908 Electrical Characteristics

(Vin=-14V, Iout=500mA, 0 °C ≤Tj≤125 °C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Conditions		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	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	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -11V≤Vin≤-21V		56	72	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25 °C		--	2	--	V
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 Conditions		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	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=1.0A, Tj=25 °C		--	2	--	V
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.

TS7912 Electrical Characteristics

(Vin=-19V, Iout=500mA, 0 °C ≤Tj≤125 °C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Conditions		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	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=1.0A, Tj=25 °C		--	2	--	V
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 Conditions		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	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	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -18V≤Vin≤-28V		54	69	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25 °C		--	2	--	V
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.

TS79818 Electrical Characteristics

(Vin=-27V, Iout=500mA, 0 °C ≤Tj≤125 °C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Conditions		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	Tj=25 °C, Iout=0		--	4	8	mA
Quiescent Current Change	Δlq	-21V≤Vin≤-33V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25 °C		--	110	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -21V≤Vin≤-31V		53	68	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25 °C		--	2	--	V
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

TS7824 Electrical Characteristics

(Vin=-33V, Iout=500mA, 0 °C ≤Tj≤125 °C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Conditions		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	8	mA
Quiescent Current Change	Δlq	-27V≤Vin≤-38V		--	--	1	
		10mA≤Iout≤1A		--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25 °C		--	170	--	uV
Ripple Rejection Ratio	RR	f=120Hz, -27V≤Vin≤-37V		50	65	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25 °C		--	2	--	V
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 - Worst Case Power Dissipation v.s. Ambient Temperature

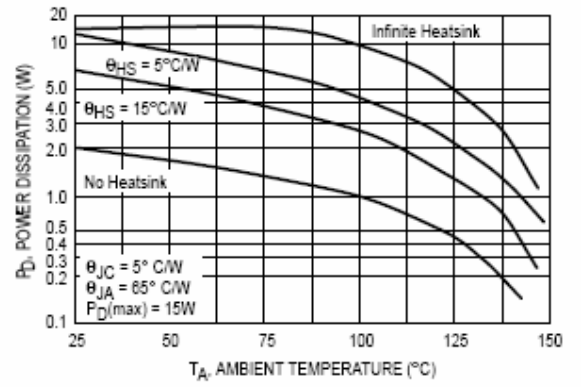


FIGURE 2 - Peak Output Current v.s. Input-Output Differential Voltage

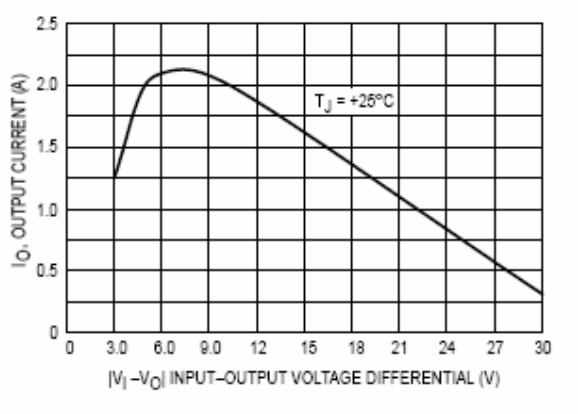


FIGURE 3 –Ripple Rejection v.s. Frequency

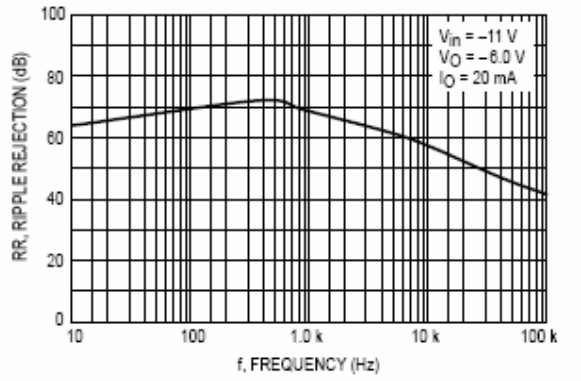


FIGURE 4 –Ripple Rejection v.s. Output Voltage

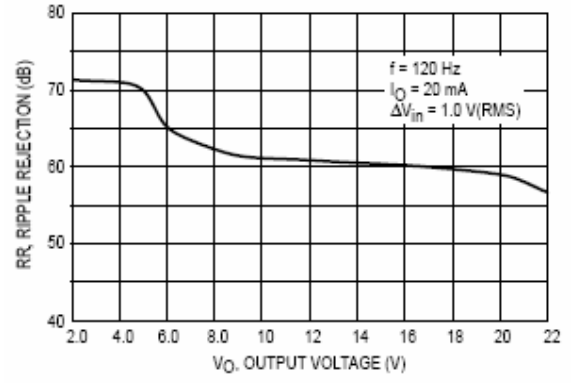


FIGURE 5 –Output Voltage v.s. Junction Temperature

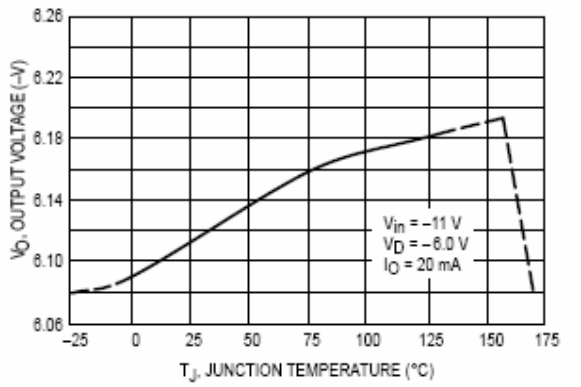
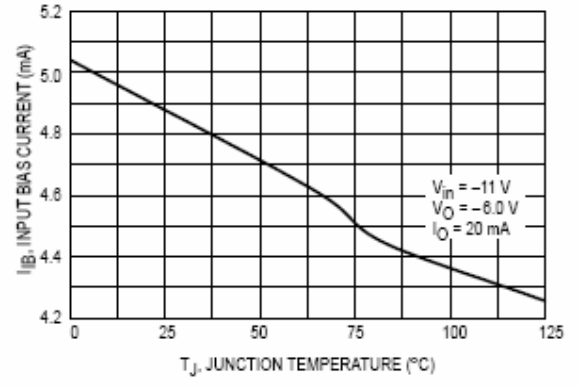
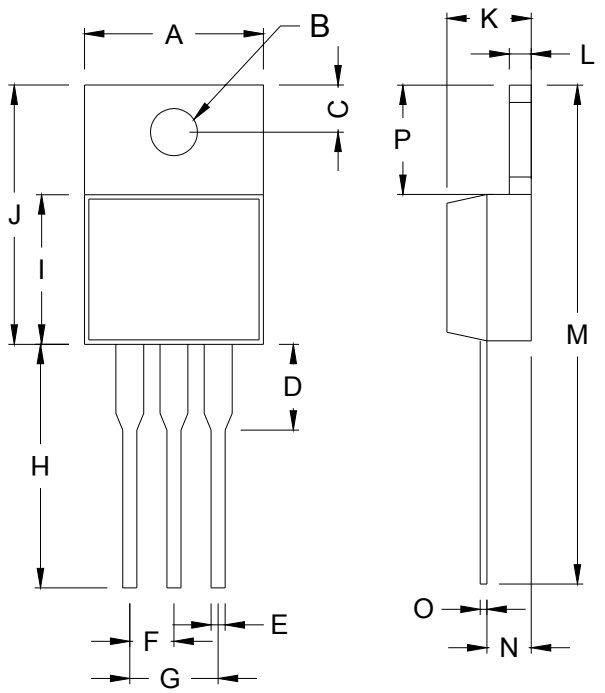


FIGURE 6 –Quiescent Current v.s. Temperature



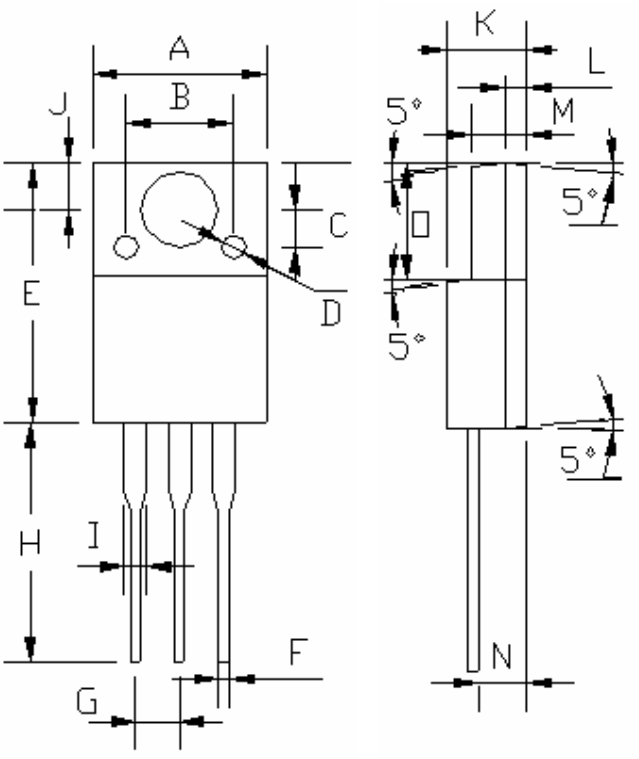
TSC

TO-220 Mechanical Drawing



TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.240	4.440	0.128	0.175
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

ITO-220 Mechanical Drawing



ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	□1.40 (typ.)		□0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
J	2.60	2.80	0.102	0.110
K	4.49	4.50	0.176	0.177
L	1.15 (typ.)		0.045 (typ.)	
M	3.03	3.05	0.119	0.120
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262