

## LOW CURRENT 1.2 TO 37V ADJUSTABLE VOLTAGE REGULATOR

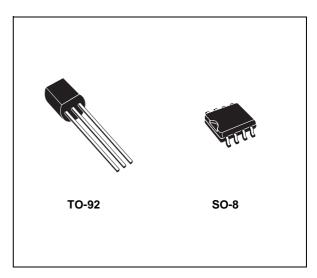
- OUTPUT VOLTAGE RANGE: 1.2 TO 37V
- OUTPUT CURRENT IN EXCESS OF 100 mA
- LINE REGULATION TYP. 0.01%
- LOAD REGULATION TYP. 0.1%
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SAFE AREA COMPENSATION
- FLOATING OPERATION FOR HIGH VOLTAGE APPLICATIONS

#### **DESCRIPTION**

The LM217L/LM317L are monolithic integrated circuit in SO-8 and TO-92 packages intended for use as positive adjustable voltage regulators.

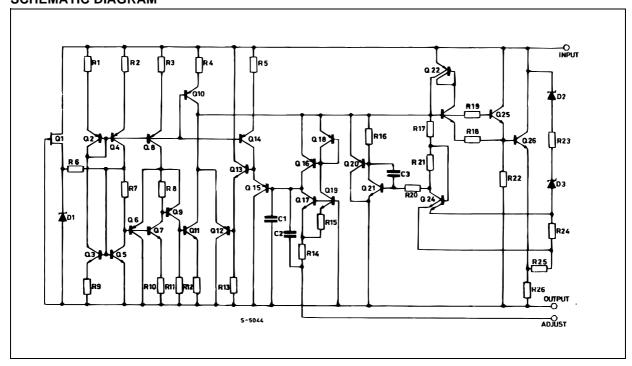
They are designed to supply until 100 mA of load current with an output voltage adjustable over a 1.2 to 37V range.

The nominal output voltage is selected by means of only a resistive divider, making the device



exceptionally easy to use and eliminating the stocking of many fixed regulators

### SCHEMATIC DIAGRAM

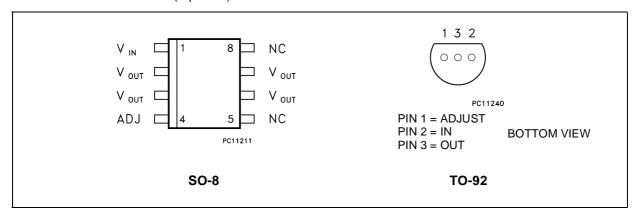


February 2003 1/10

### **ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter <sup>2</sup>		Value	Unit
V <sub>I -</sub> V <sub>O</sub>	Input-Output Differential Voltage		40	V
P <sub>d</sub>	Power Dissipation		Internally Limited	
т	Operating Junction Temperature	for LM217L	-40 to 125	°C
T <sub>opr</sub>	Range	for LM317L	0 to 125	C
T <sub>stg</sub>	Storage Temperature Range		-55 to 150	°C

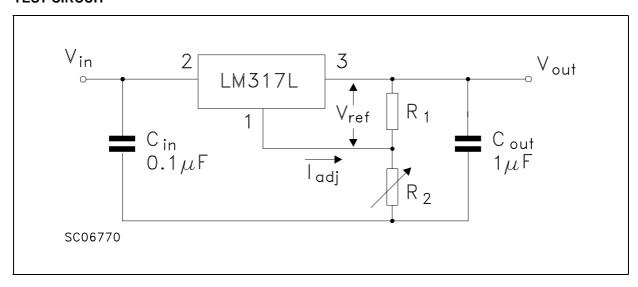
### **CONNECTION DIAGRAM** (top view)



### **ORDERING CODES**

TYPE	SO-8	TO-92
LM217L	LM217LD	LM217LZ
LM317L	LM317LD	LM317LZ

### **TEST CIRCUIT**



### **ELECTRICAL CHARACTERISTICS OF LM217L** (refer to the test circuits, $T_J$ = - 40 to 125°C, $V_I$ - $V_O$ = 5 V, $I_O$ = 40 mA, unless otherwise specified).

Symbol	Parameter	Test Co	onditions	Min.	Тур.	Max.	Unit
ΔV <sub>O</sub>	Line Regulation	$V_{I} - V_{O} = 3 \text{ to } 40 \text{ V}$	T <sub>J</sub> = 25°C		0.01	0.02	%/V
		$I_L < 20 \text{ mA}$			0.02	0.05	
ΔV <sub>O</sub>	Load Regulation	$V_O \le 5 V$	T <sub>J</sub> = 25°C		5	15	mV
		$I_0 = 5 \text{ to } 100 \text{ mA}$			20	50	
		$V_O \ge 5 V$	$T_J = 25^{\circ}C$		0.1	0.3	%
I <sub>O</sub> = 5 to 1	$I_0 = 5 \text{ to } 100 \text{ mA}$			0.3	1		
I <sub>ADJ</sub>	Adjustment Pin Current				50	100	μA
$\Delta I_{ADJ}$	Adjustment Pin Current	$V_1 - V_0 = 3 \text{ to } 40 \text{ V}$ $P_d < 625 \text{ mW}$		0.2	5	μA	
V <sub>REF</sub>	Reference Voltage	$V_1 - V_O = 3 \text{ to } 40 \text{ V}$ $I_O = 10 \text{ to } 500 \text{ mA}$ $P_d < 625 \text{ mW}$		1.2	1.25	1.3	V
$\Delta V_{O}/V_{O}$	Output Voltage Temperature Stability				0.7		%
I <sub>O(min)</sub>	Minimum Load Current	$V_{I} - V_{O} = 40 \text{ V}$			3.5	5	mA
I <sub>O(max)</sub>	Maximum Output Current	$V_1 - V_0 = 3 \text{ to } 13 \text{ V}$ $V_1 - V_0 = 40 \text{ V}$		100	200		mA
					50		
eN	Output Noise Voltage	B = 10 Hz to 10 KHzT <sub>J</sub> = 25°C			0.003		%
SVR	Supply Voltage Rejection (*)	$T_J = 25^{\circ}C$	$C_{ADJ} = 0$		65		dB
	f = 120 Hz	$C_{ADJ} = 10 \mu F$	66	80			

<sup>(\*)</sup> CADJ is connected between Adjust pin and Ground.

# **ELECTRICAL CHARACTERISTICS OF LM317L** (refer to the test circuits, $T_J = 0$ to 125°C, $V_I - V_O = 5$ V, $I_O = 40$ mA, unless otherwise specified).

Symbol	Parameter	Test Conditions			Тур.	Max.	Unit
$\Delta V_{O}$	Line Regulation	$V_I - V_O = 3 \text{ to } 40 \text{ V}$	$T_J = 25$ °C		0.01	0.04	%/V
		I <sub>L</sub> < 20 mA			0.02	0.07	
$\Delta V_{O}$	Load Regulation	$V_O \le 5 V$	$T_J = 25^{\circ}C$		5	25	mV
		$I_{O} = 5 \text{ to } 100 \text{ mA}$			20	70	
		$V_O \ge 5 V$	$T_J = 25^{\circ}C$		0.1	0.5	%
$I_{O} = 5 \text{ to } 100 \text{ m}$	$I_O = 5 \text{ to } 100 \text{ mA}$			0.3 1.	1.5		
I <sub>ADJ</sub>	Adjustment Pin Current				50	100	μΑ
$\Delta I_{ADJ}$	Adjustment Pin Current	$V_1 - V_0 = 3 \text{ to } 40 \text{ V}$ $P_d < 625 \text{ mW}$		0.2	5	μA	
V <sub>REF</sub>	Reference Voltage	$V_1 - V_O = 3 \text{ to } 40 \text{ V}$ $I_O = 5 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$		1.2	1.25	1.3	V
$\Delta V_{O}/V_{O}$	Output Voltage Temperature Stability				0.7		%
I <sub>O(min)</sub>	Minimum Load Current	$V_{I} - V_{O} = 40 \text{ V}$			3.5	5	mA
I <sub>O(max)</sub>	Maximum Output Current	Current $V_1 - V_0 = 3 \text{ to } 13 \text{ V}$ $V_1 - V_0 = 40 \text{ V}$		100	200		mA
					50		
eN	Output Noise Voltage	B = 10 Hz to 10 KHzT <sub>J</sub> = 25°C			0.003		%
SVR	Supply Voltage Rejection (*)	$T_J = 25^{\circ}C$	$C_{ADJ} = 0$		65		dB
	f = 120 Hz		C <sub>ADJ</sub> = 10 μF	66	80		

<sup>(\*)</sup> CADJ is connected between Adjust pin and Ground.



Figure 1: Current Limit

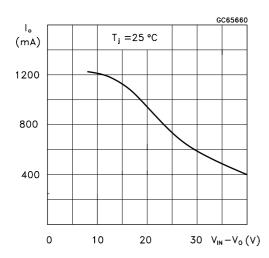
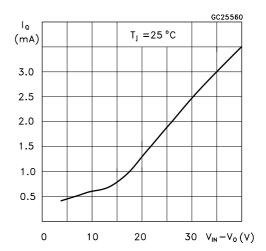


Figure 2: Minimum Operating Current



#### **APPLICATION INFORMATION**

The LM317L provides an internal reference voltage of 1.25V between the output and adjustments terminals. This is used to set a constant current flow across an external resistor divider (see fig. 4), giving an output voltage  $V_{\Omega}$  of:

$$V_O = V_{REF} (1 + R_2/R_1) + I_{ADJ} R_2$$

The device was designed to minimize the term  $I_{ADJ}$  (100µA max) and to maintain it very constant with line and load changes. Usually, the error term  $I_{ADJ} \times R_2$  can be neglected. To obtain the previous requirement, all the regulator quiescent current is returned to the output terminal, imposing a minimum load current condition. If the load is insufficient, the output voltage will rise.

Since the LM317L is a floating regulator and "sees" only the input-to-output differential voltage, supplies of very high voltage with respect to ground can be regulated as long as the maximum input-to-output differential is not exceeded. Furthermore, programmable regulator are easily obtainable and, by connecting a fixed resistor between the adjustment and output, the device can be used as a precision current regulator. In order to optimize the load regulation, the current set resistor  $R_1$  (see fig. 4) should be tied as close as possible to the regulator, while the ground terminal of  $R_2$  should be near the ground of the load to provide remote ground sensing.

Figure 3: Basic Adjustable Regulator

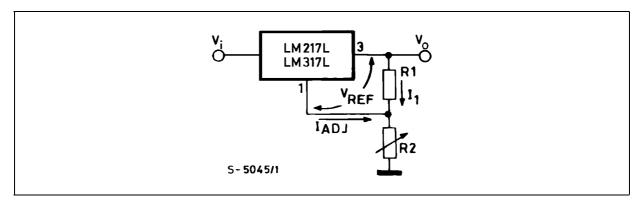


Figure 4: Voltage Regulator with Protection Diodes

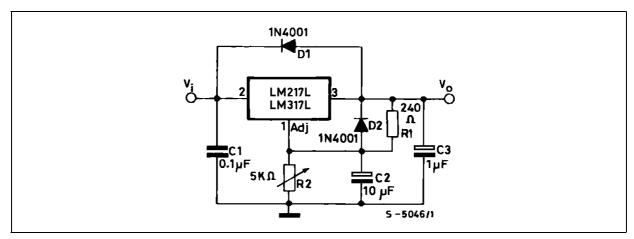


Figure 5 : Slow Turn-on 15V Regulator

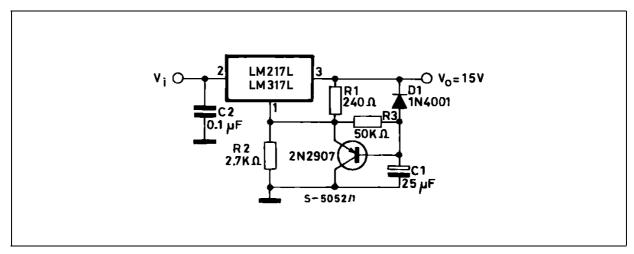


Figure 6 : Current Regulator

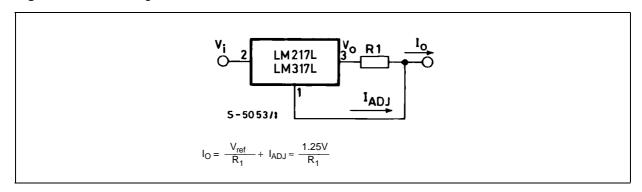


Figure 7:5V Electronic Shut-down Regulator

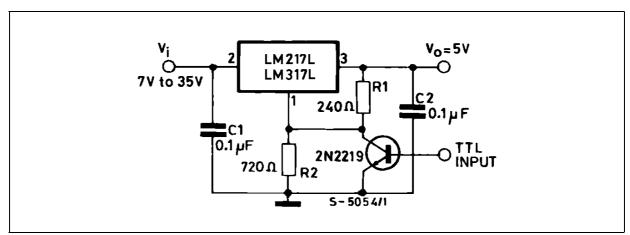
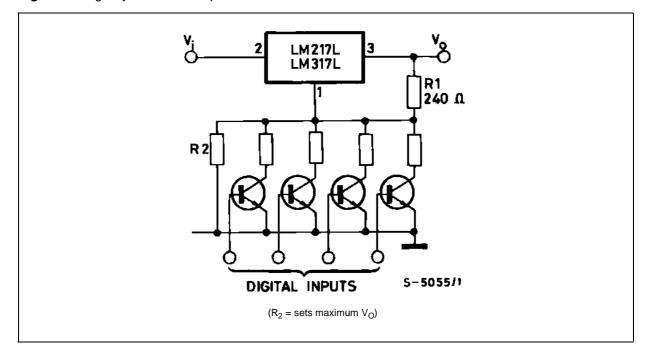
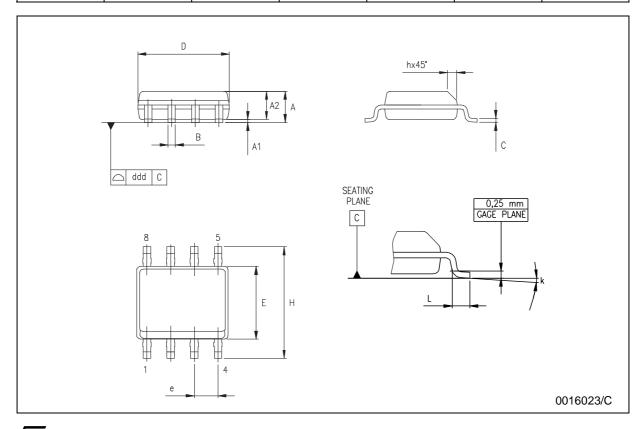


Figure 8 : Digitally Selected Outputs



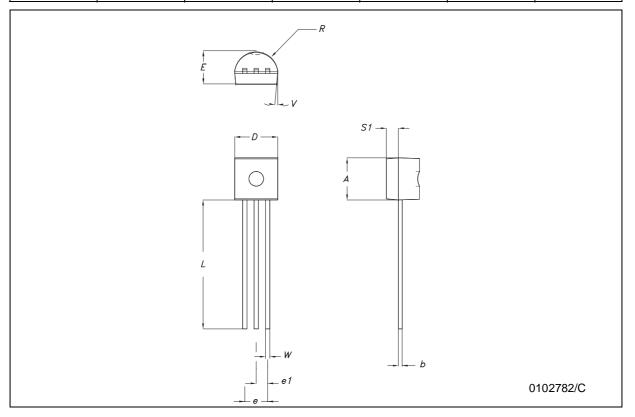
### **SO-8 MECHANICAL DATA**

DIM.		mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
А	1.35		1.75	0.053		0.069	
A1	0.10		0.25	0.04		0.010	
A2	1.10		1.65	0.043		0.065	
В	0.33		0.51	0.013		0.020	
С	0.19		0.25	0.007		0.010	
D	4.80		5.00	0.189		0.197	
Е	3.80		4.00	0.150		0.157	
е		1.27			0.050		
Н	5.80		6.20	0.228		0.244	
h	0.25		0.50	0.010		0.020	
L	0.40		1.27	0.016		0.050	
k	8° (max.)						
ddd			0.1			0.04	



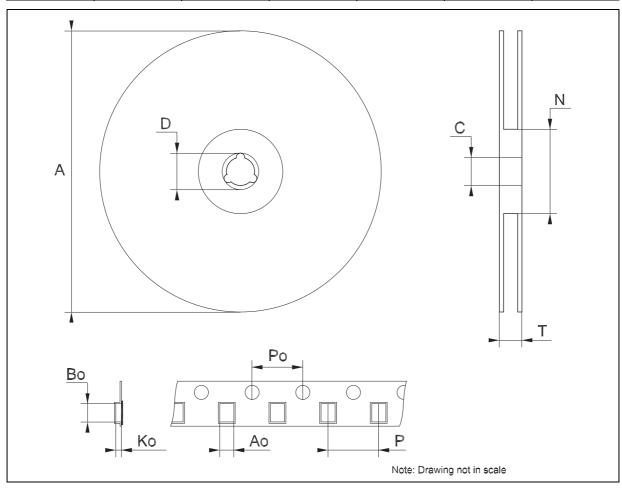
### **TO-92 MECHANICA DATA**

DIM.		mm.				
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
А	4.32		4.95	170.1		194.9
b	0.36		0.51	14.2		20.1
D	4.45		4.95	175.2		194.9
E	3.30		3.94	129.9		155.1
е	2.41		2.67	94.9		105.1
e1	1.14		1.40	44.9		55.1
L	12.7		15.49	500.0		609.8
R	2.16		2.41	85.0		94.9
S1	0.92		1.52	36.2		59.8
W	0.41		0.56	16.1		22.0



### Tape & Reel SO-8 MECHANICAL DATA

DIM		mm.			inch	
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α			330			12.992
С	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
Т			22.4			0.882
Ao	8.1		8.5	0.319		0.335
Во	5.5		5.9	0.216		0.232
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
Р	7.9		8.1	0.311		0.319



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4