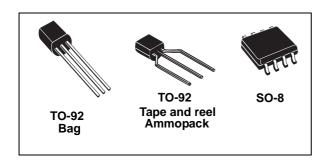
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LM217L, LM317L

Low current 1.2 to 37 V adjustable voltage regulators

Datasheet - production data



Features

Outuput voltage range: 1.2 to 37 V

• Output current up to 100 mA

Line regulation typ. 0.01%

Load regulation typ. 0.1%

Thermal overload protection

• Short-circuit protection

Output transition safe area compensation

Floating operation for high voltage applications

Description

The LM217L/LM317L are monolithic integrated circuits in SO-8 and TO-92 packages intended for use as positive adjustable voltage regulators. They are designed to supply up to 100 mA of load current with an output voltage adjustable over a 1.2 to 37 V 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.

Table 1. Device summary

Order codes				
SO-8 (tape and reel)	TO-92 (Bag)	TO-92 (Ammopack)	TO-92 (tape and reel)	
LM217LD13TR			LM217LZ-TR	
LM317LD13TR	LM317LZ	LM317LZ-AP	LM317LZ-TR	

Contents LM217L, LM317L

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LM217L, LM317L Diagram

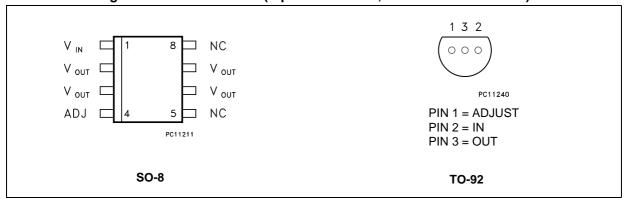
1 Diagram

Figure 1. Schematic diagram

Pin configuration LM217L, LM317L

2 Pin configuration

Figure 2. Pin connections (top view for SO-8, bottom view for TO-92)



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LM217L, LM317L Maximum ratings

3 Maximum ratings

Table 2. Absolute maximum ratings

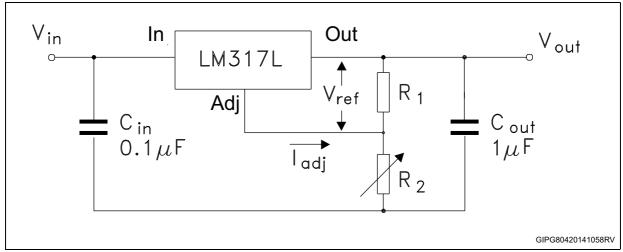
Symbol	Parameter		Value	Unit
V_I - V_O	Input-output differential voltage		40	V
P _D	Power dissipation		Internally limited	mW
_	Operating impation temporature range	for LM217L	-40 to 125	°C
T _{OP}	Operating junction temperature range	for LM317L	0 to 125	
T _{STG}	Storage temperature range		-55 to 150	°C

Table 3. Thermal data

Symbol	Parameter	SO-8	TO-92	Unit
R_{thJC}	Thermal resistance junction-case (max)			°C/W
R _{thJA}	Thermal resistance junction-ambient (max)		200	C/VV

^{1.} Considering 6 cm² of copper Board heat-sink.

Figure 3. Test circuit



Our SO-8 package used for voltage regulators is modified internally to have pins 2, 3, 6 and 7 electrically communed to the
die attach flag. This particular frame decreases the total thermal resistance of the package and increases its ability to
dissipate power when an appropriate area of copper on the printed circuit board is available for heat-sinking. The external
dimensions are the same as for the standard SO-8.

Electrical characteristics LM217L, LM317L

4 Electrical characteristics

(Refer to the test circuits, T_J = - 40 to 125°C, V_I - V_O = 5 V, I_O = 40 mA, unless otherwise specified)

Table 4. Electrical characteristics of LM217L

Symbol	Parameter	Test conditions	3	Min.	Тур.	Max.	Unit
$\Delta v_{ m o}$	Line regulation	$V_1 - V_0 = 3 \text{ to } 40 \text{ V}, I_0 = 20 \text{ mA}$	$T_J = 25^{\circ}C$		0.01	0.02	%/V
Δν ₀	Line regulation	V - V = 3 to 40 V, 10 = 20 111A			0.02	0.05	/0/ V
		$V_{O} \le 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$	$T_J = 25^{\circ}C$		5	15	mV
$\Delta V_{ m O}$	Load regulation	V ₀ ≤ 5 V, I ₀ = 5 to 100 IIIA			20	50	1117
Δν ₀	Load regulation	$V_{O} \ge 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$	$T_J = 25^{\circ}C$		0.1	0.3	%
		V ₀ ≥ 3 V, I ₀ = 3 to 100 IIIA			0.3	1	/0
I _{ADJ}	Adjustment pin current				50	100	μΑ
Δ I _{ADJ}	Adjustment pin current	$V_1 - V_O = 3 \text{ to } 40 \text{ V}, I_O = 5 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$			0.2	5	μA
V _{REF}	Reference voltage	$V_1 - V_O = 3 \text{ to } 40 \text{ V}, I_O = 10 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$		1.2	1.25	1.3	٧
$\Delta V_{O}/V_{O}$	Output voltage temperature stability				0.7		%
I _{O(min)}	Minimum load current	V _I - V _O = 40 V			3.5	5	mA
1	Maximum output current	$V_1 - V_0 = 3 \text{ to } 13 \text{ V}$		100	200		mA
I _{O(max)}	iwaximum output current	V _I - V _O = 40 V			50		ША
eN	Output noise voltage	B = 10 Hz to 10 KHz, T _J = 25°C			0.003		%
SVR	Supply voltage rejection ⁽¹⁾	T _J = 25°C	$C_{ADJ} = 0$		65		dB
SVIX	Oupply voltage rejection V	f = 120 Hz	$C_{ADJ} = 10 \mu F$	66	80		ub

^{1.} $C_{\mbox{\scriptsize ADJ}}$ is connected between adjust pin and ground.



(Refer to the test circuits, T_J = 0 to 125°C, V_I - V_O = 5 V, I_O = 40 mA, unless otherwise specified)

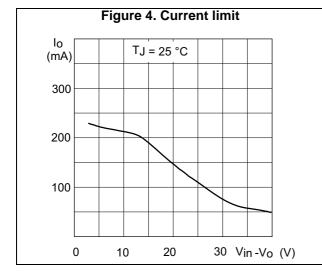
Table 5. Electrical characteristics of LM317L

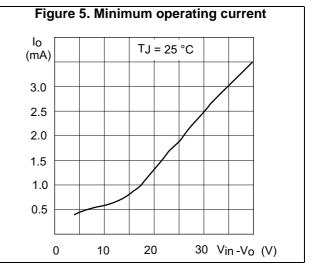
Symbol	Parameter	Test conditions	3	Min.	Тур.	Max.	Unit
$\Delta v_{ m O}$	Line regulation	$V_1 - V_0 = 3 \text{ to } 40 \text{ V}, I_0 = 20 \text{ mA}$	$T_J = 25$ °C		0.01	0.04	%/V
Δν ₀	Line regulation	V - V = 3 to 40 V, 10 = 20 IIIA			0.02	0.07	/0/ V
		$V_{O} \le 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$	$T_J = 25^{\circ}C$		5	25	mV
Av	Load regulation	$V_0 \le 5 \text{ V}, I_0 = 5 \text{ to 100 IIIA}$			20	70	IIIV
Δv_{o}	Load regulation	V > 5 V I = 5 to 100 mA	$T_J = 25^{\circ}C$		0.1	0.5	%
		$V_{O} \ge 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$			0.3	1.5	%
I _{ADJ}	Adjustment pin current	,			50	100	μΑ
Δ I _{ADJ}	Adjustment pin current	$V_1 - V_O = 3 \text{ to } 40 \text{ V}, I_O = 5 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$			0.2	5	μΑ
V _{REF}	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 _{O(min)}	Minimum load current	V _I - V _O = 40 V			3.5	5	mΑ
	Maximum autout aurrant	$V_1 - V_0 = 3 \text{ to } 13 \text{ V}$		100	200		A
I _{O(max)} Maximum output current		V _I - V _O = 40 V			50		mA
eN	Output noise voltage	B = 10 Hz to 10 KHz, T _J = 25°C			0.003		%
SVR	Supply voltage rejection (1)	T _J = 25°C	$C_{ADJ} = 0$		65		dB
SVK	Supply voltage rejection (1) 1 2 2 5 6 f = 120 Hz		C _{ADJ} = 10 μF	66	80		uБ

C_{ADJ} is connected between adjust pin and ground.

Typical performance LM217L, LM317L

5 Typical performance





6 Application information

The LM317L provides an internal reference voltage of 1.25 V between the output and adjustments terminals. This is used to set a constant current flow across an external resistor divider (see *Figure 6.*), giving an output voltage V_O of:

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

The device was designed to minimize the term I_{ADJ} (100 μA 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 regulator as the maximum input-to-output differential is not exceeded. Furthermore, programmable regulators 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 *Figure 6.*) 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.



Application circuits LM217L, LM317L

7 Application circuits

Figure 6. Basic adjustable regulator

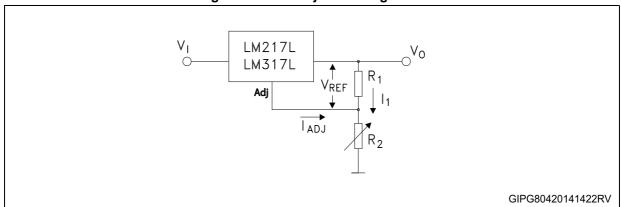


Figure 7. Voltage regulator with protection diodes

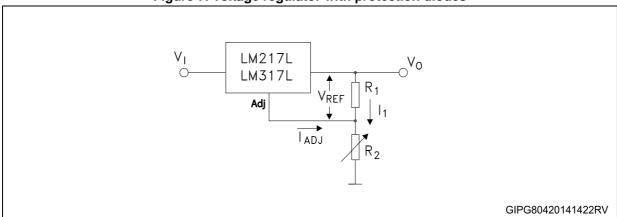
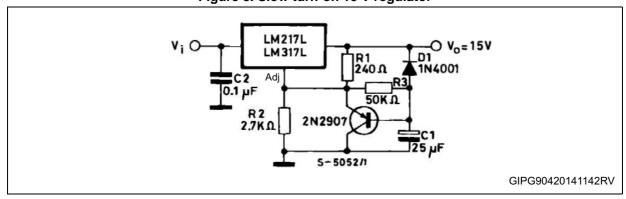


Figure 8. Slow turn-on 15 V regulator



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LM217L, LM317L Application circuits

Figure 9. Current regulator

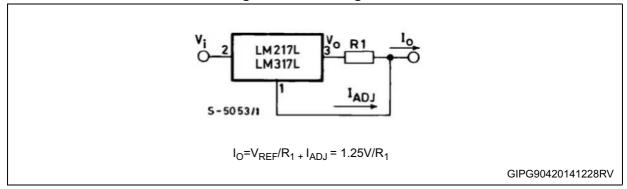


Figure 10. 5 V Electronic shut-down regulator

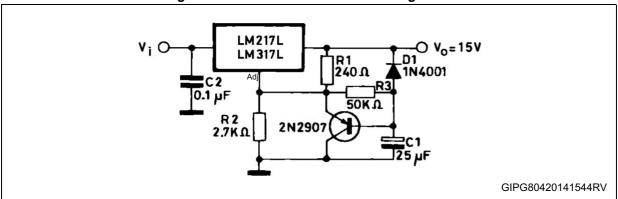
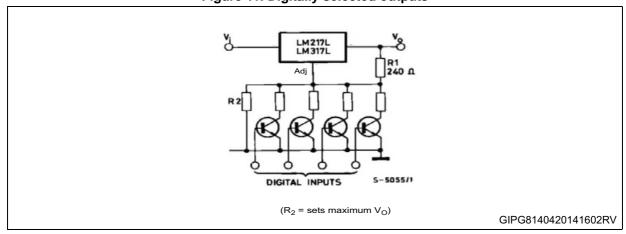


Figure 11. Digitally selected outputs



8 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

8.1 TO-92 Bag package information

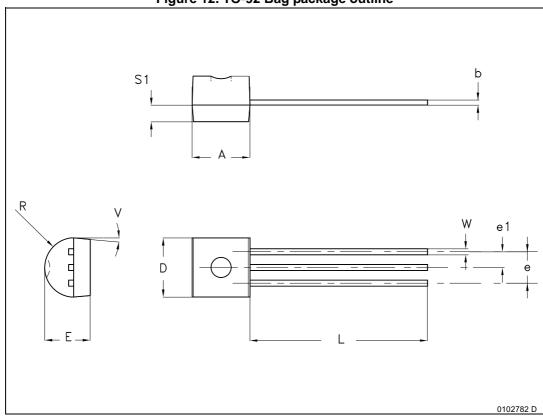


Figure 12. TO-92 Bag package outline

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Table 6. TO-92 Bag mechanical data

Dim.		mm				
Dilli.	Min.	Тур.	Max.			
А	4.32		4.95			
b	0.36		0.51			
D	4.45		4.95			
E	3.30		3.94			
е	2.41		2.67			
e1	1.14		1.40			
L	12.70		15.49			
R	2.16		2.41			
S1	0.92		1.52			
W	0.41		0.56			
V		5°				

8.2 TO-92 Ammopack package information

Table 7. TO-92 Ammopack mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
A1			4.80
Т			3.80
T1			1.60
T2			2.30
d	0.45	0.47	0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1, F2	2.40	2.50	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.5	6.00	6.5
W1	8.50	9.00	9.25
W2			0.50
Н		18.50	21
H3	0.5	1	2
H0	15.50	16.00	18.8
H1		25.0	27.0
D0	3.80	4.00	4.20
t			0.90
L			11.00
I1	3.00		
delta P	-1.00		1.00

8.3 TO-92 packing information

Φ1

Pull-out direction

Figure 14. TO-92 tape and reel outline

Table 8. TO-92 tape and reel mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
A1			4.80
Т			3.80
T1			1.60
T2			2.30
d	0.45	0.47	0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1, F2	2.40	2.50	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.5	6.00	6.5
W1	8.50	9.00	9.25
W2			0.50
Н		18.50	21
H3	0.5	1	2
H0	15.50	16.00	18.8
H1		25.0	27.0
D0	3.80	4.00	4.20
t			0.90
L			11.00
I1	3.00		
delta P	-1.00		1.00
Ø1	352	355	358
Ø2	28	30	32
u	44	47	50

8.4 SO-8 package information

SEATING PLANE

OU16023_G_FU

Figure 15. SO-8 package outline

Table 9. SO-8 mechanical data

Dim.		mm	
Diiii.	Min.	Тур.	Max.
А			1.75
A1	0.10		0.25
A2	1.25		
b	0.31		0.51
b1	0.28		0.48
С	0.10		0.25
c1	0.10		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
е		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
L2		0.25	
k	0°		8°
ccc			0.10

Figure 16. SO-8 recommended footprint

8.5 SO-8 packing information

A Po Note: Drawing not in scale

Figure 17. SO-8 tape and reel outline

Table 10. SO-8 tape and reel mechanical data

Dim.		mm	
Dilli.	Min.	Тур.	Max.
Α			330
С	12.8		13.2
D	20.2		
N	60		
Т			22.4
Ao	8.1		8.5
Во	5.5		5.9
Ko	2.1		2.3
Po	3.9		4.1
Р	7.9		8.1

Revision history LM217L, LM317L

9 Revision history

Table 11. Revision history

Date	Revision	Changes
16-Mar-2005	2	Add Tape & reel for TO-92.
23-Dec-2005	3	Mistake on ordering table in header.
18-May-2007	4	Order codes has been updated and the document has been reformatted.
20-May-2014	5	Added TO-92 Ammopack package. Updated Section 6: Application information and Section 8: Package information. Added Section 8.5: SO-8 packing information. Minor text changes.
		Added Table 3: Thermal data.
17-Sep-2015 7 Updated <i>Table 1: Device summary</i> . Minor text changes.		

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