Contents LM217L, LM317L

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LM217L, LM317L Diagram

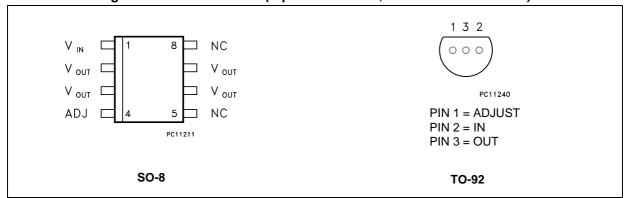
# 1 Diagram

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)



LM217L, LM317L Maximum ratings

### 3 Maximum ratings

Table 2. Absolute maximum ratings

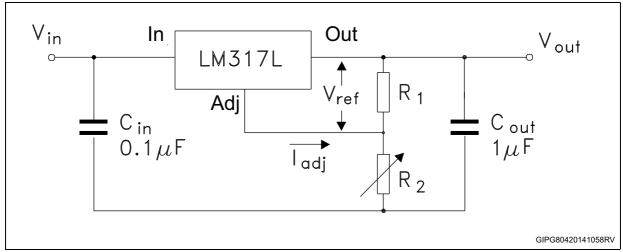
Symbol	Parameter	Value	Unit	
$V_I$ - $V_O$	Input-output differential voltage	40	V	
P <sub>D</sub>	Power dissipation		Internally limited	mW
_	Operating impation temporature range	for LM217L	-40 to 125	°C
T <sub>OP</sub>	Operating junction temperature range for LM317L		0 to 125	
T <sub>STG</sub>	Storage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

Table 3. Thermal data

Symbol	Parameter	SO-8	TO-92	Unit
$R_{thJC}$	Thermal resistance junction-case (max)	20		°C/W
R <sub>thJA</sub>	Thermal resistance junction-ambient (max)	55 <sup>(1)(2)</sup>	200	C/VV

<sup>1.</sup> Considering 6 cm<sup>2</sup> 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		Min.	Тур.	Max.	Unit
$\Delta V_{\rm O}$	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 <sub>0</sub>		$V_1 - V_0 = 3 10 40 V, I_0 = 20 111A$			0.02	0.05	70/ 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 <sub>0</sub> ≤ 5 V, I <sub>0</sub> = 5 to 100 IIIA			20	50	1110
Δν <sub>0</sub>	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	%
		$v_0 \ge 3 \text{ v}, v_0 = 3 \text{ to 100 IIIA}$			0.3	1	7%
I <sub>ADJ</sub>	Adjustment pin current				50	100	μA
$\Delta$ I <sub>ADJ</sub>	Adjustment pin current	$V_I - V_O = 3 \text{ to } 40 \text{ V}, I_O = 5 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$			0.2	5	μΑ
V <sub>REF</sub>	Reference voltage	$V_I - V_O = 3 \text{ to } 40 \text{ V}, I_O = 10 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$		1.2	1.25	1.3	V
$\Delta V_{O}/V_{O}$	Output voltage temperature stability				0.7		%
I <sub>O(min)</sub>	Minimum load current	V <sub>I</sub> - V <sub>O</sub> = 40 V			3.5	5	mA
	Maximum autaut aurrant	$V_{I} - V_{O} = 3 \text{ to } 13 \text{ V}$		100	200		mΛ
I <sub>O(max)</sub>	Maximum output current	V <sub>I</sub> - V <sub>O</sub> = 40 V			50		mA
eN	Output noise voltage	B = 10 Hz to 10 KHz, T <sub>J</sub> = 25°C			0.003		%
S//D	Supply voltage rejection (1)	T <sub>J</sub> = 25°C	$C_{ADJ} = 0$		65		dB
SVR	Supply voltage rejection (1)	f = 120 Hz	$C_{ADJ} = 10 \mu F$	66	80		ub

C<sub>ADJ</sub> 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)

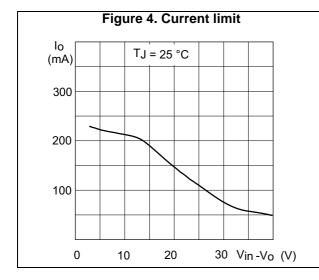
Table 5. Electrical characteristics of LM317L

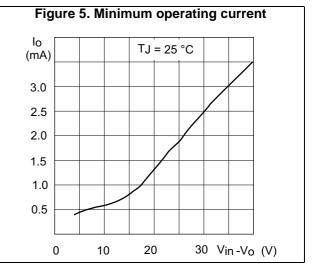
Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
Av	Line regulation	$V_1 - V_0 = 3 \text{ to } 40 \text{ V}, I_0 = 20 \text{ mA}$	$T_J = 25^{\circ}C$		0.01	0.04	%/V
$\Delta v_{O}$	Line regulation	$ V  - V_0 = 31040 \text{ V},  V  = 20111\text{A}$			0.02	0.07	
		$V_{O} \le 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$	$T_J = 25^{\circ}C$		5	25	mV
Av	Load regulation	$V_0 \le 5 \text{ V}, I_0 = 5 \text{ to 100 IIIA}$			20	70	IIIV
$\Delta V_{O}$	Load regulation	V > 5 V   5 to 100 mA	$T_J = 25^{\circ}C$		0.1	0.5	0/
		$V_{O} \ge 5 \text{ V}, I_{O} = 5 \text{ to } 100 \text{ mA}$			0.3	1.5	%
I <sub>ADJ</sub>	Adjustment pin current	•			50	100	μΑ
$\Delta$ I <sub>ADJ</sub>	Adjustment pin current	$V_I - V_O = 3 \text{ to } 40 \text{ V}, I_O = 5 \text{ to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$			0.2	5	μΑ
V <sub>REF</sub>	Reference voltage	$V_1$ - $V_O$ = 3 to 40 V, $I_O$ = 5 to 100 mA $P_d$ < 625 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 <sub>I</sub> - V <sub>O</sub> = 40 V			3.5	5	mΑ
	Maximum autaut aurrant	$V_1 - V_0 = 3 \text{ to } 13 \text{ V}$		100	200		A
I <sub>O(max)</sub>	Maximum output current	V <sub>I</sub> - V <sub>O</sub> = 40 V			50		mA
eN	Output noise voltage	B = 10 Hz to 10 KHz, T <sub>J</sub> = 25°C			0.003		%
SV/D	Supply voltage rejection (1)	T <sub>J</sub> = 25°C	$C_{ADJ} = 0$		65		٩D
SVR	Supply voltage rejection (1)	$f = 120 \text{ Hz}$ $C_{ADJ} = 10 \mu\text{F}$		66	80		dB

C<sub>ADJ</sub> 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<sub>O</sub> 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  $\mu A$  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.



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Application circuits LM217L, LM317L

# 7 Application circuits

Figure 6. Basic adjustable regulator

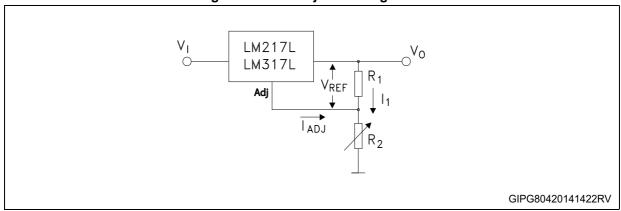


Figure 7. Voltage regulator with protection diodes

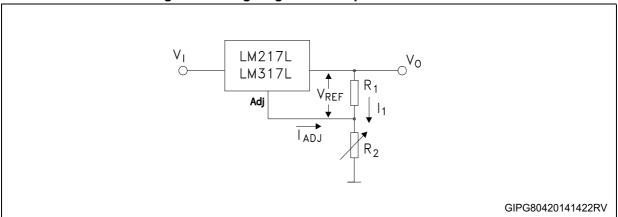
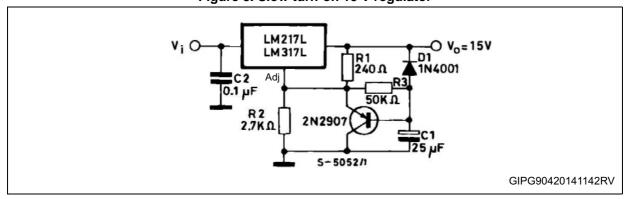


Figure 8. Slow turn-on 15 V regulator



LM217L, LM317L Application circuits

Figure 9. Current regulator

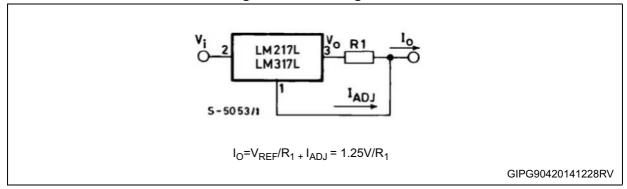


Figure 10. 5 V Electronic shut-down regulator

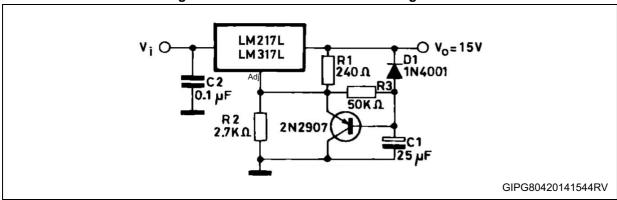
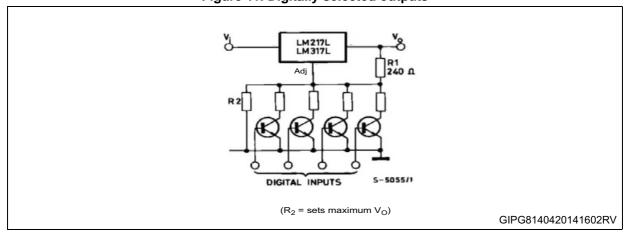


Figure 11. Digitally selected outputs



### 8 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

#### 8.1 TO-92 Bag package information

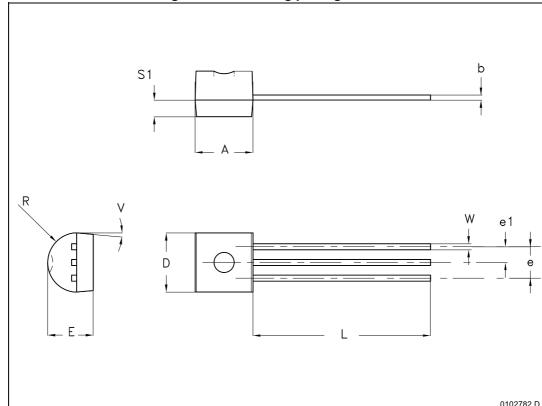


Figure 12. TO-92 Bag package outline

LM217L, LM317L **Package information** 

Table 6. TO-92 Bag mechanical data

Dim.		mm				
Dim.	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°				

#### **TO-92 Ammopack package information** 8.2

Figure 13. TO-92 Ammopack package outline delta H 0050910S\_Rev\_U

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

LM217L, LM317L Package information

## 8.3 TO-92 packing information

Φ1

Pull-out direction

Figure 14. TO-92 tape and reel outline

15/23

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

LM217L, LM317L Package information

### 8.4 SO-8 package information

SEATING PLANE

C COGGE PLANE

BASE METAL

0016023\_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

LM217L, LM317L Package information

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



LM217L, LM317L Package information

Table 10. SO-8 tape and reel mechanical data

Dim		mm	
Dim.	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.
19-May-2015	6	Updated the features in cover page, Table 4: Electrical characteristics of LM217L, Table 5: Electrical characteristics of LM317L and Figure 4: Current limit.  Added Table 3: Thermal data.  Minor text changes.
17-Sep-2015	7	Updated <i>Table 1: Device summary</i> . Minor text changes.



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