



LM217L LM317L

LOW CURRENT 1.2 TO 37V ADJUSTABLE VOLTAGE REGULATOR

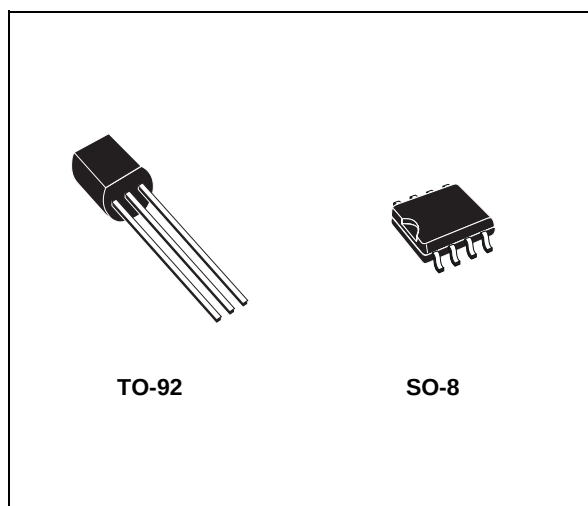
- OUTPUT VOLTAGE RANGE: 1.2 TO 37V
- OUTPUT CURRENT IN EXCESS OF 100 mA
- LINE REGULATION TYP. 0.01%
- LOAD REGULATION TYP. 0.1%
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SAFE AREA COMPENSATION
- FLOATING OPERATION FOR HIGH VOLTAGE APPLICATIONS

DESCRIPTION

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

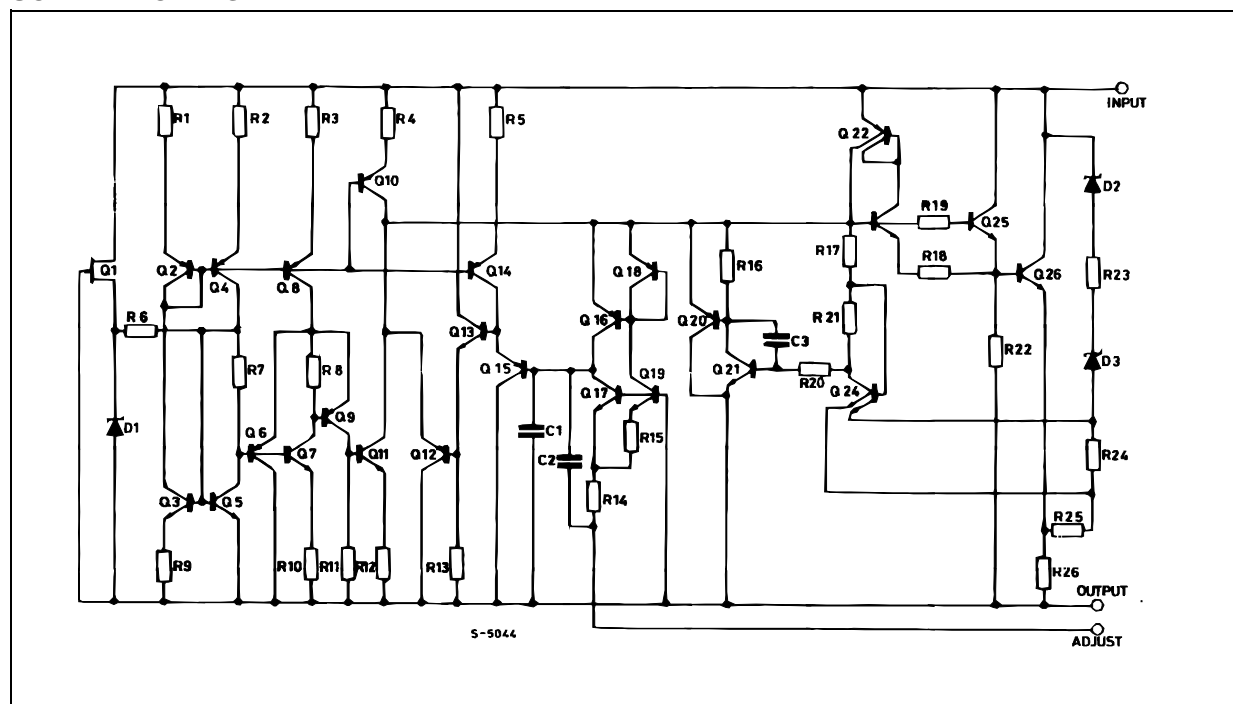
They are designed to supply until 100 mA of load current with an output voltage adjustable over a 1.2 to 37V range.

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

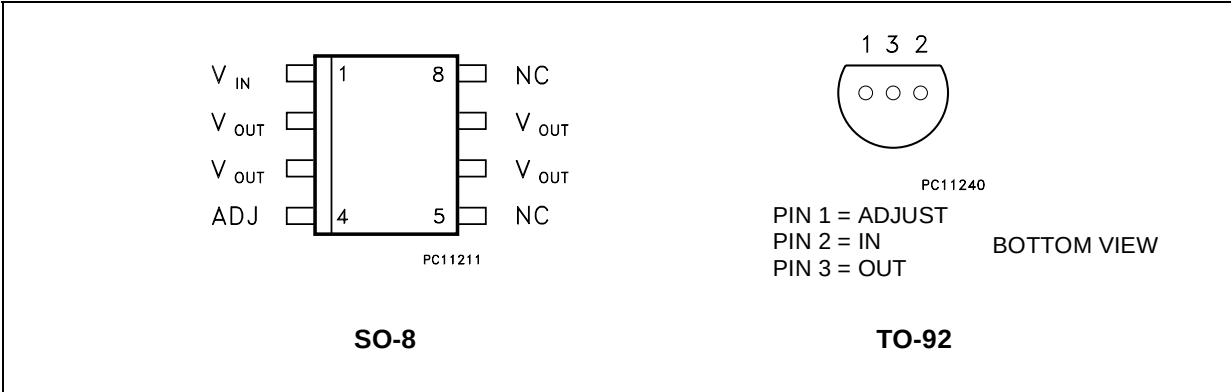


LM217L/LM317L

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter ²		Value	Unit
$V_I - V_O$	Input-Output Differential Voltage		40	V
P_d	Power Dissipation		Internally Limited	
T_{opr}	Operating Junction Temperature Range	for LM217L	-40 to 125	°C
		for LM317L	0 to 125	
T_{stg}	Storage Temperature Range		-55 to 150	°C

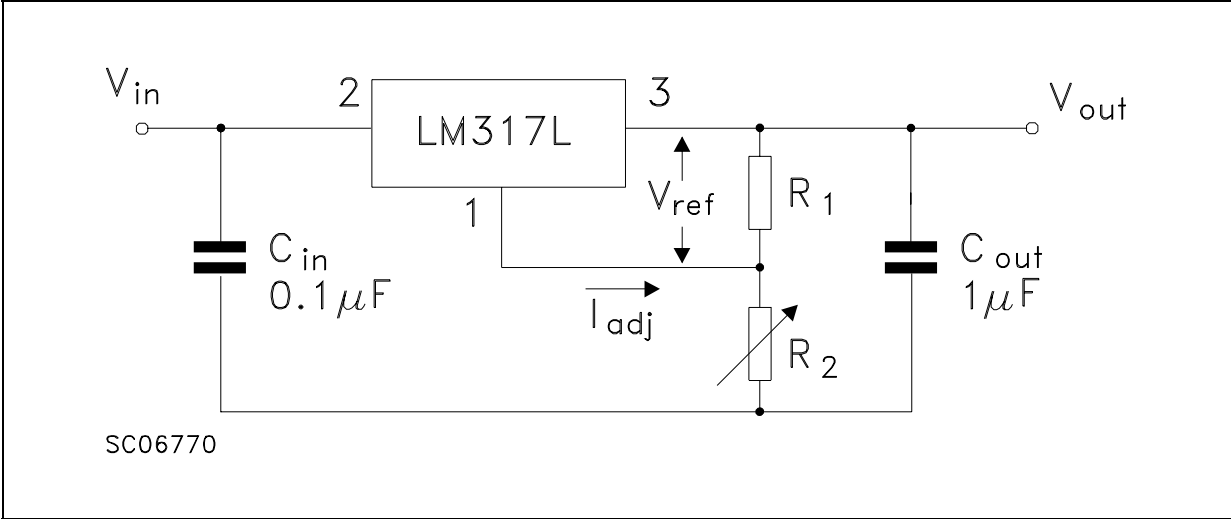
CONNECTION DIAGRAM (top view)



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 , $V_I - V_O = 5\text{ V}$, $I_O = 40\text{ mA}$, unless otherwise specified).

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
ΔV_O	Line Regulation	$V_I - V_O = 3$ to 40 V $I_L < 20\text{ mA}$	$T_J = 25^\circ\text{C}$		0.01	0.02	%V
					0.02	0.05	
ΔV_O	Load Regulation	$V_O \leq 5\text{ V}$ $I_O = 5$ to 100 mA	$T_J = 25^\circ\text{C}$		5	15	mV
					20	50	
		$V_O \geq 5\text{ V}$ $I_O = 5$ to 100 mA	$T_J = 25^\circ\text{C}$		0.1	0.3	%
					0.3	1	
I_{ADJ}	Adjustment Pin Current				50	100	μA
ΔI_{ADJ}	Adjustment Pin Current	$V_I - V_O = 3$ to 40 V $I_O = 5$ to 100 mA $P_d < 625\text{ mW}$			0.2	5	μA
V_{REF}	Reference Voltage	$V_I - V_O = 3$ to 40 V $I_O = 10$ to 500 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	$V_I - V_O = 40\text{ V}$			3.5	5	mA
$I_{O(\max)}$	Maximum Output Current	$V_I - V_O = 3$ to 13 V		100	200		mA
		$V_I - V_O = 40\text{ V}$			50		
eN	Output Noise Voltage	$B = 10\text{ Hz}$ to 10 KHz $T_J = 25^\circ\text{C}$			0.003		%
SVR	Supply Voltage Rejection (*)	$T_J = 25^\circ\text{C}$ $f = 120\text{ Hz}$	$C_{ADJ} = 0$		65		dB
			$C_{ADJ} = 10\text{ }\mu\text{F}$	66	80		

(*) C_{ADJ} is connected between Adjust pin and Ground.

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

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
ΔV_O	Line Regulation	$V_I - V_O = 3$ to 40 V $I_L < 20\text{ mA}$	$T_J = 25^\circ\text{C}$		0.01	0.04	%V
					0.02	0.07	
ΔV_O	Load Regulation	$V_O \leq 5\text{ V}$ $I_O = 5$ to 100 mA	$T_J = 25^\circ\text{C}$		5	25	mV
					20	70	
		$V_O \geq 5\text{ V}$ $I_O = 5$ to 100 mA	$T_J = 25^\circ\text{C}$		0.1	0.5	%
					0.3	1.5	
I_{ADJ}	Adjustment Pin Current				50	100	μA
ΔI_{ADJ}	Adjustment Pin Current	$V_I - V_O = 3$ to 40 V $I_O = 5$ to 100 mA $P_d < 625\text{ mW}$			0.2	5	μA
V_{REF}	Reference Voltage	$V_I - V_O = 3$ to 40 V $I_O = 5$ to 100 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	$V_I - V_O = 40\text{ V}$			3.5	5	mA
$I_{O(\max)}$	Maximum Output Current	$V_I - V_O = 3$ to 13 V		100	200		mA
		$V_I - V_O = 40\text{ V}$			50		
eN	Output Noise Voltage	$B = 10\text{ Hz}$ to 10 KHz $T_J = 25^\circ\text{C}$			0.003		%
SVR	Supply Voltage Rejection (*)	$T_J = 25^\circ\text{C}$ $f = 120\text{ Hz}$	$C_{ADJ} = 0$		65		dB
			$C_{ADJ} = 10\text{ }\mu\text{F}$	66	80		

(*) C_{ADJ} is connected between Adjust pin and Ground.

Figure 1 : Current Limit

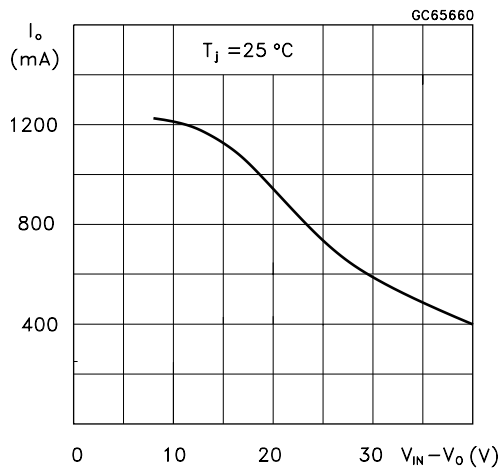
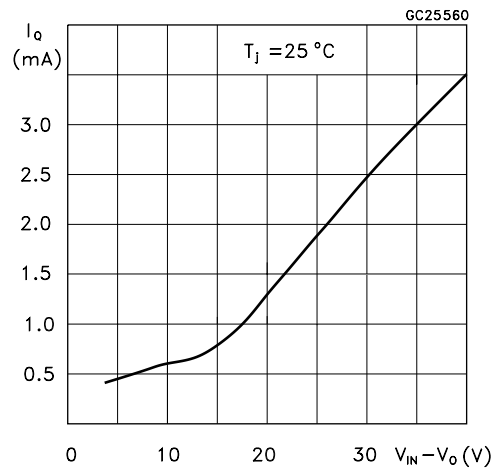


Figure 2 : Minimum Operating Current



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_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 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

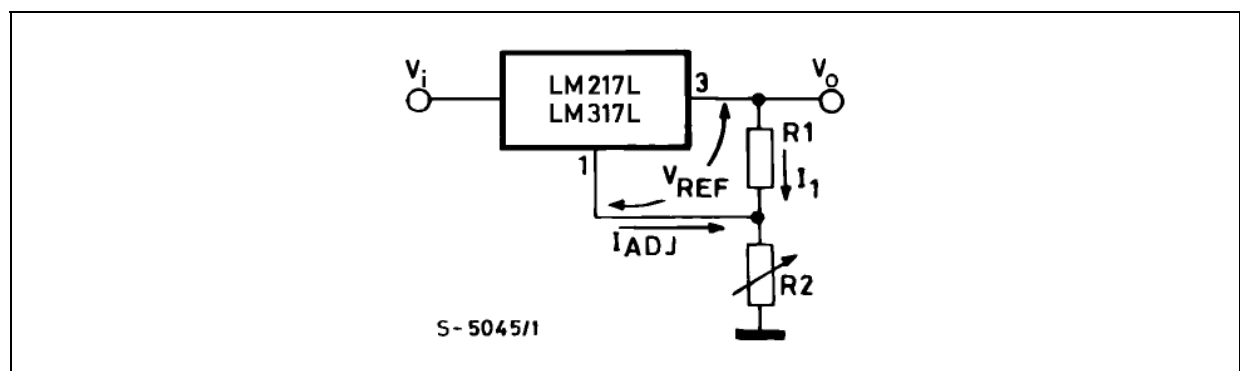


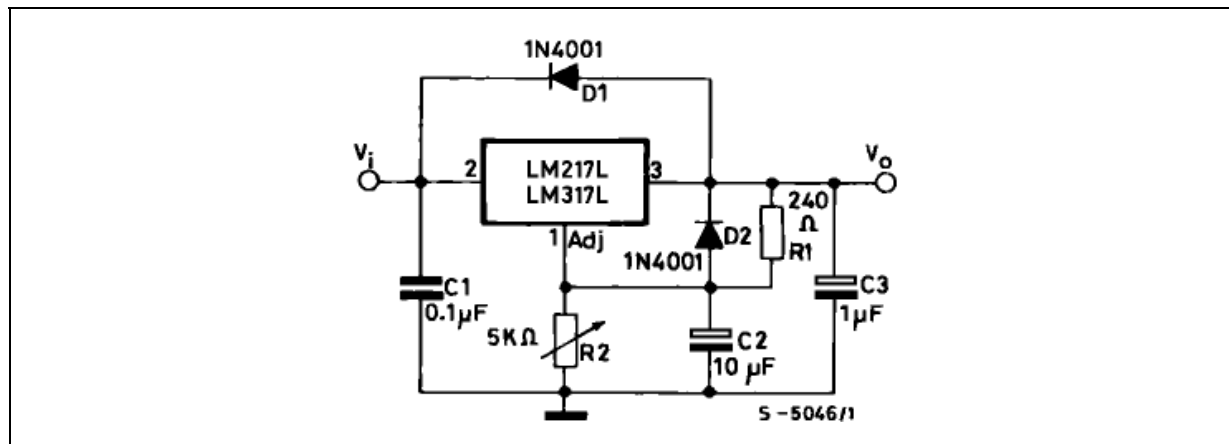
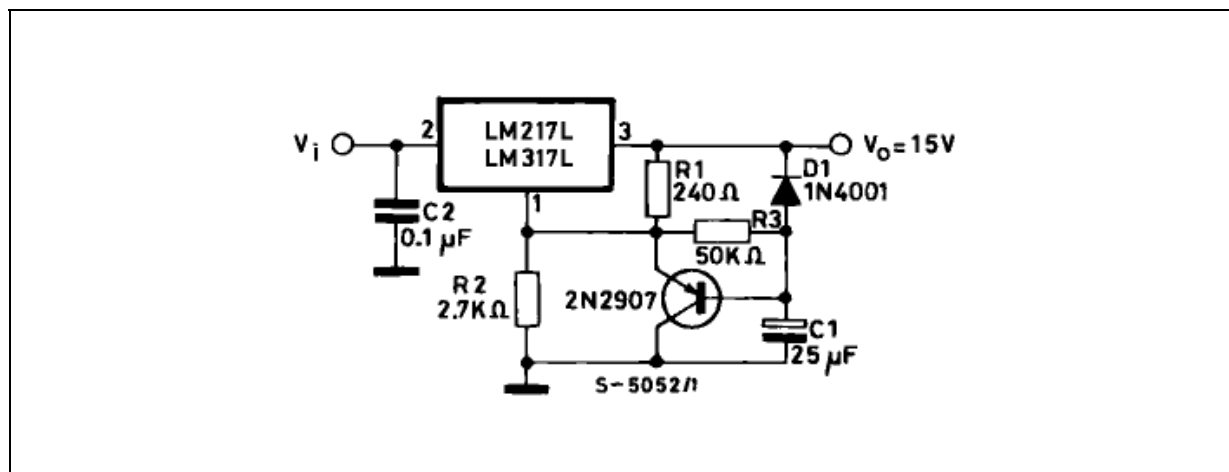
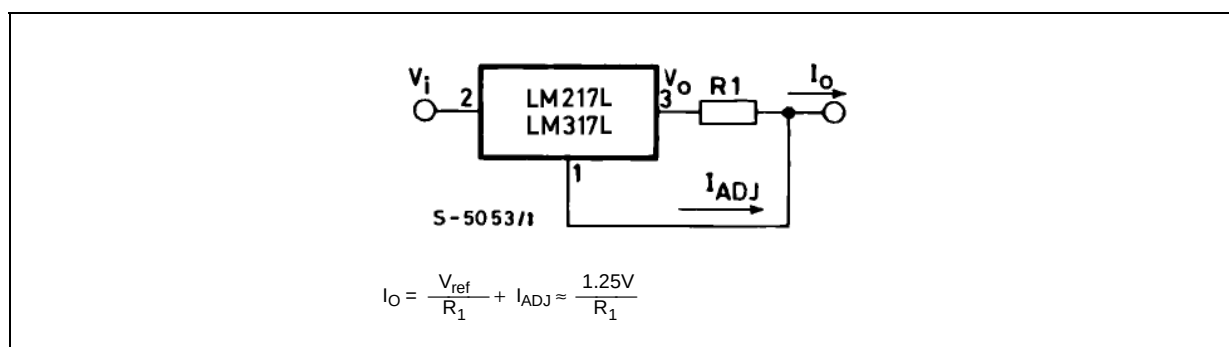
Figure 4 : Voltage Regulator with Protection Diodes**Figure 5 :** Slow Turn-on 15V Regulator**Figure 6 :** Current Regulator

Figure 7 : 5V Electronic Shut-down Regulator

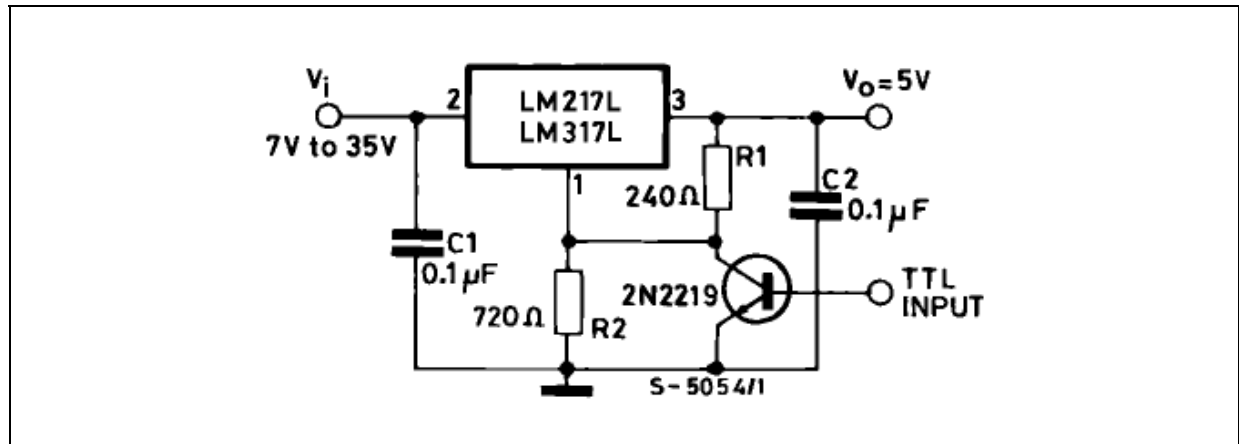
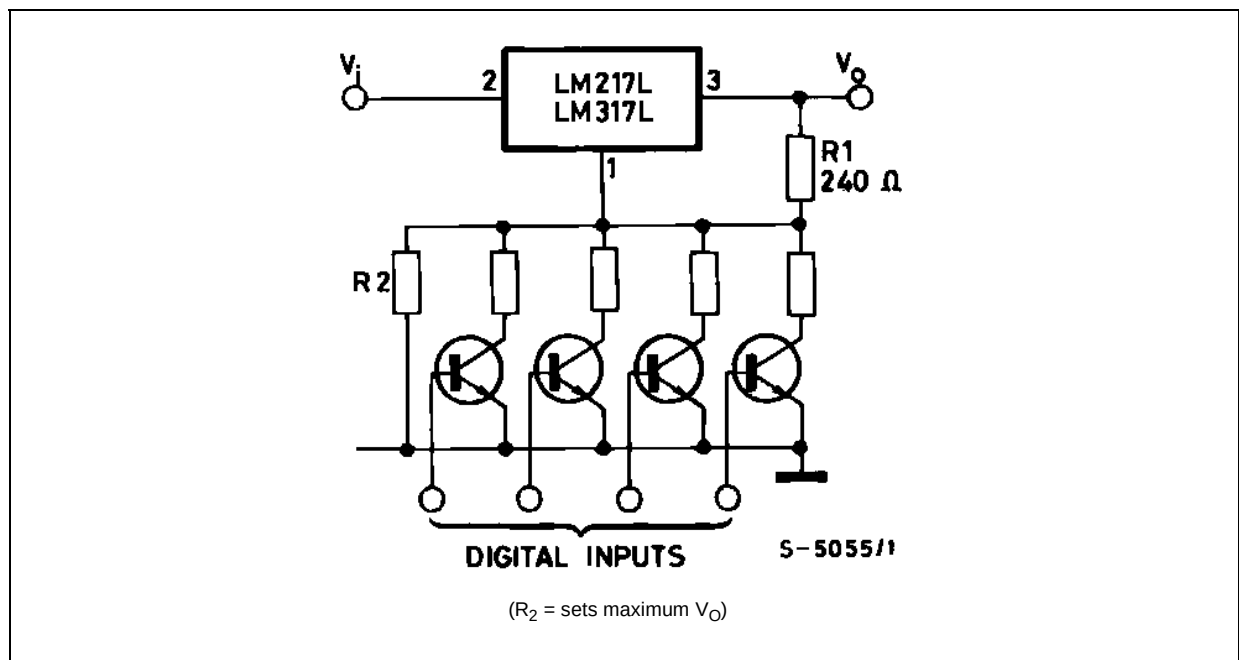
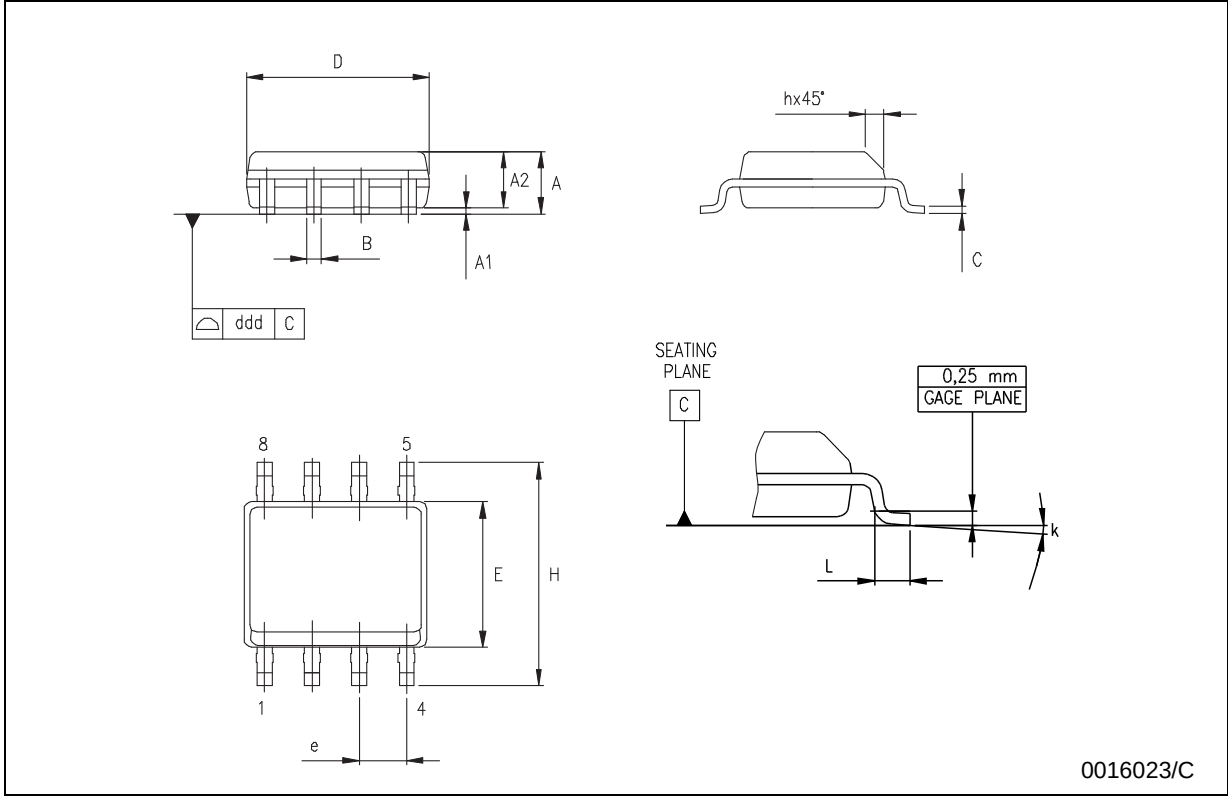


Figure 8 : Digitally Selected Outputs



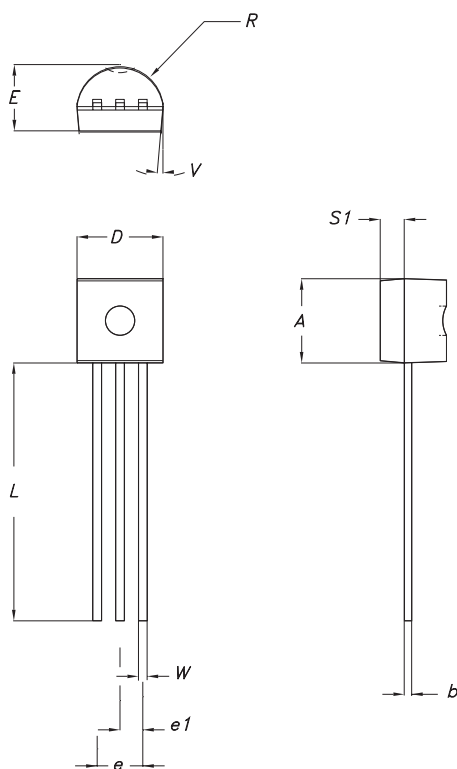
SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	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
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	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	g° (max.)					
ddd			0.1			0.04



TO-92 MECHANICA DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	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
e	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



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Tape & Reel SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.1		8.5	0.319		0.335
Bo	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
P	7.9		8.1	0.311		0.319

