

**LOW CURRENT**  
**1.2V TO 37V ADJUSTABLE VOLTAGE REGULATOR**

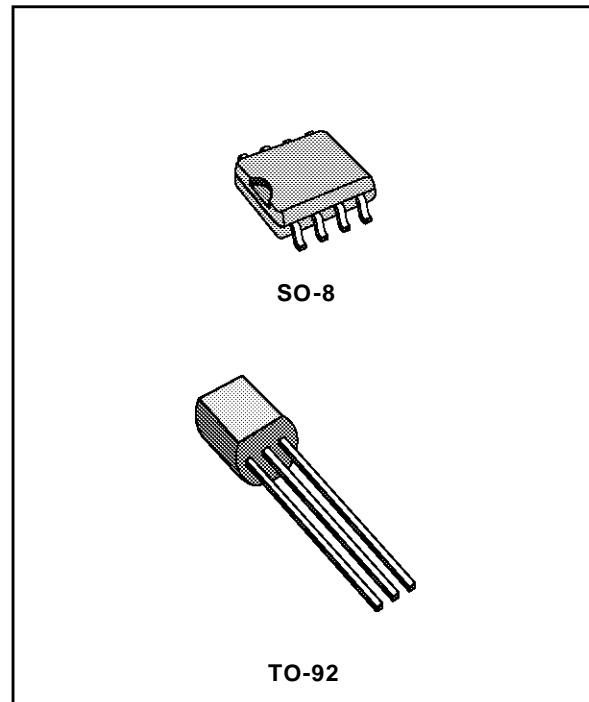
- OUTPUT VOLTAGE RANGE : 1.2 TO 37V
- OUTPUT CURRENT IN EXCESS OF 100 mA
- LINE REGULATION TYP. 0.01%
- LOAD REGULATION TYP. 0.1%
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SAFE AREA COMPENSATION
- FLOATING OPERATION FOR HIGH VOLTAGE APPLICATIONS

**DESCRIPTION**

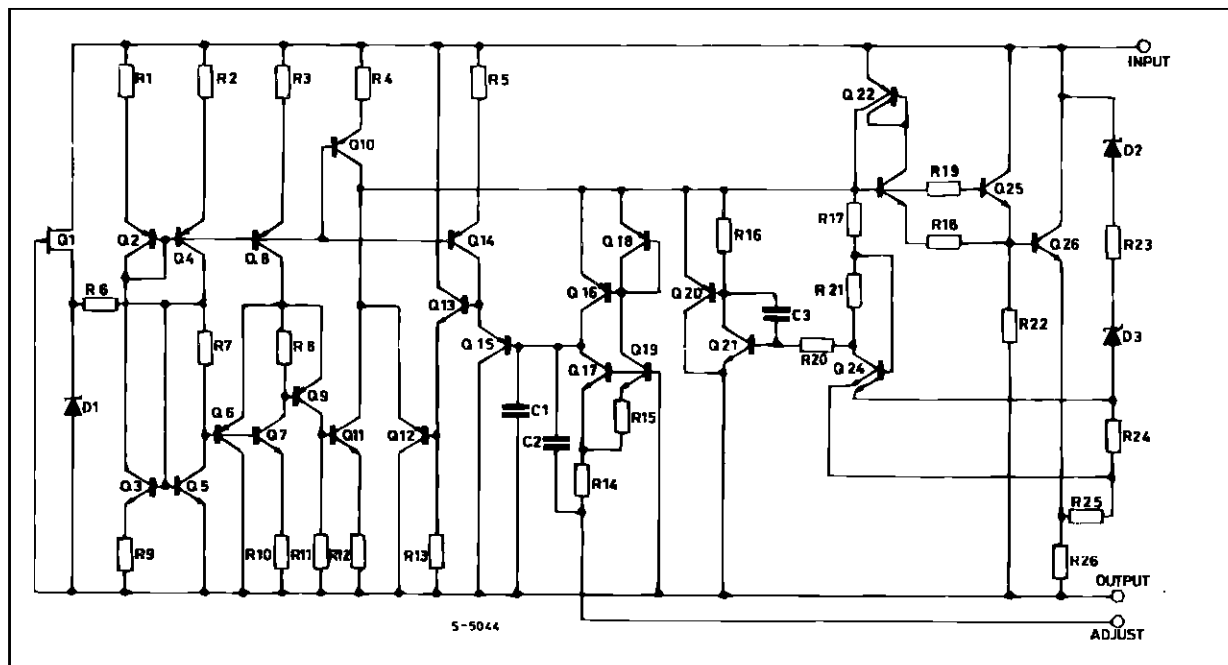
The LM217L/LM317L are monolithic integrated circuit in SO-8 and TO-92 packages intended for use as positive adjustable voltage regulators.

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**

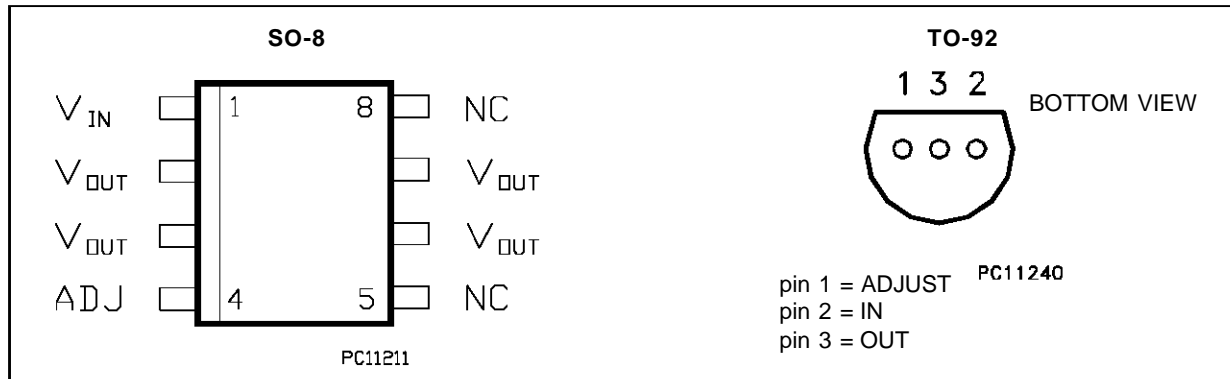


# LM217L/LM317L

## ABSOLUTE MAXIMUM RATING

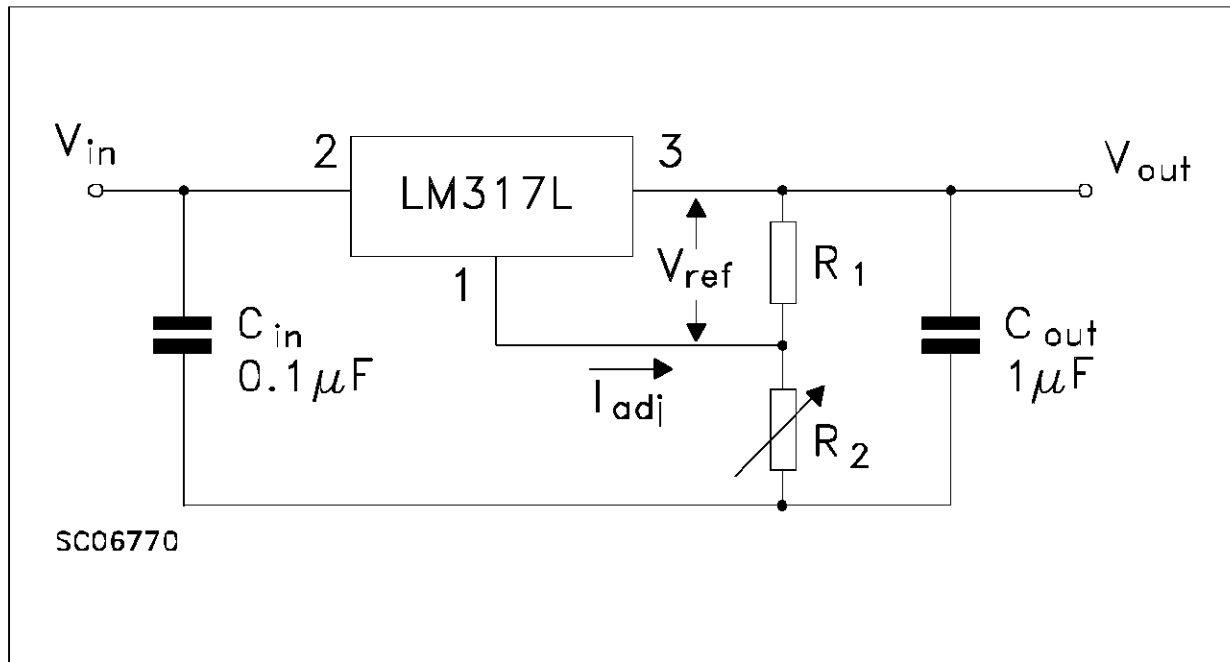
Symbol	Parameter	Value	Unit	
$V_i - V_o$	Input-Output Differential Voltage	40	V	
$P_d$	Power Dissipation	Internally Limited		
$T_{opr}$	Operating Junction Temperature Range	for LM217L for LM317L	-40 to 125 0 to 125	°C °C
$T_{stg}$	Storage Temperature Range	-55 to 150	°C	

## PIN CONNECTION AND ORDERING NUMBER



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

## TEST CIRCUIT



**ELECTRICAL CHARACTERISTICS FOR LM217L** (Refer to the test circuits,  $-40 \leq T_j \leq 125 \text{ }^\circ\text{C}$   
 $V_i - V_o = 5 \text{ V}$ ,  $I_o = 40 \text{ mA}$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$\Delta V_o$	Line Regulation	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_L < 20 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		0.01	0.02	%/V
					0.02	0.05	%/V
$\Delta V_o$	Load Regulation	$V_o \leq 5 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		5	15	mV
					20	50	mV
		$V_o \geq 5 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		0.1	0.3	%
					0.3	1	%
$I_{ADJ}$	Adjustment Pin Current			50	100	$\mu\text{A}$	
$\Delta I_{ADJ}$	Adjustment Pin Current	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$		0.2	5	$\mu\text{A}$	
$V_{REF}$	Reference Voltage	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$	1.2	1.25	1.3	V	
$\frac{\Delta V_o}{V_o}$	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	$V_i - V_o = 3 \text{ to } 13 \text{ V}$ $V_i - V_o = 40 \text{ V}$	100	200 50		mA	
$e_N$	Output Noise Voltage (percentance of $V_o$ )	$B = 10\text{Hz to } 10\text{KHz}$ $T_j = 25 \text{ }^\circ\text{C}$		0.003		%	
SVR	Supply Voltage Rejection (*)	$T_j = 25 \text{ }^\circ\text{C}$ $f = 120 \text{ Hz}$	$C_{ADJ}=0$		65		dB
			$C_{ADJ}=10\mu\text{F}$	66	80		dB

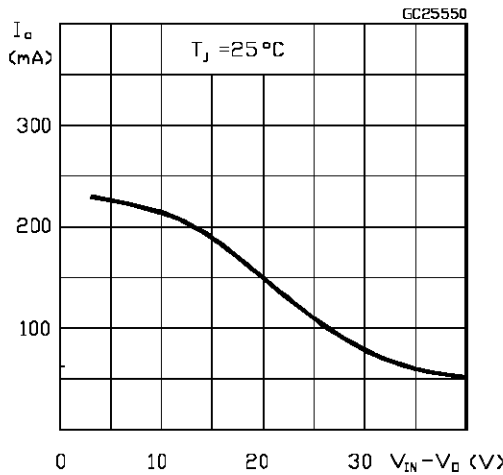
(\*)  $C_{ADJ}$  is connected between Adjust pin and Ground.

**ELECTRICAL CHARACTERISTICS FOR LM317L** (Refer to the test circuits,  $0 \leq T_j \leq 125 \text{ }^\circ\text{C}$   
 $V_i - V_o = 5 \text{ V}$ ,  $I_o = 40 \text{ mA}$ , unless otherwise specified)

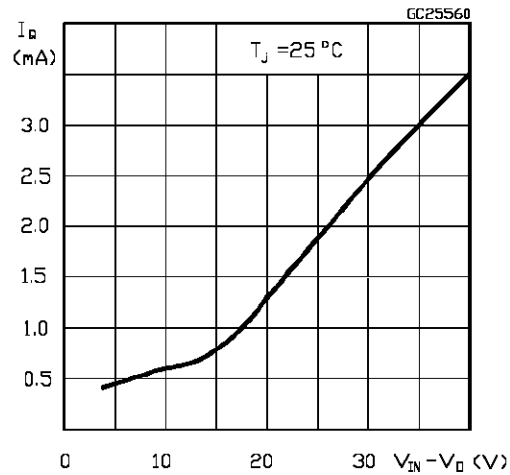
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$\Delta V_o$	Line Regulation	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_L < 20 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		0.01	0.04	%/V
					0.02	0.07	%/V
$\Delta V_o$	Load Regulation	$V_o \leq 5 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		5	25	mV
					20	70	mV
		$V_o \geq 5 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$	$T_j = 25 \text{ }^\circ\text{C}$		0.1	0.5	%
					0.3	1.5	%
$I_{ADJ}$	Adjustment Pin Current			50	100	$\mu\text{A}$	
$\Delta I_{ADJ}$	Adjustment Pin Current	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$		0.2	5	$\mu\text{A}$	
$V_{REF}$	Reference Voltage	$V_i - V_o = 3 \text{ to } 40 \text{ V}$ $I_o = 5 \text{ mA to } 100 \text{ mA}$ $P_d < 625 \text{ mW}$	1.2	1.25	1.3	V	
$\frac{\Delta V_o}{V_o}$	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	$V_i - V_o = 3 \text{ to } 13 \text{ V}$ $V_i - V_o = 40 \text{ V}$	100	200 50		mA	
$e_N$	Output Noise Voltage (percentance of $V_o$ )	$B = 10\text{Hz to } 10\text{KHz}$ $T_j = 25 \text{ }^\circ\text{C}$		0.003		%	
SVR	Supply Voltage Rejection (*)	$T_j = 25 \text{ }^\circ\text{C}$ $f = 120 \text{ Hz}$	$C_{ADJ}=0$		65		dB
			$C_{ADJ}=10\mu\text{F}$	66	80		dB

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

Current Limit



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:

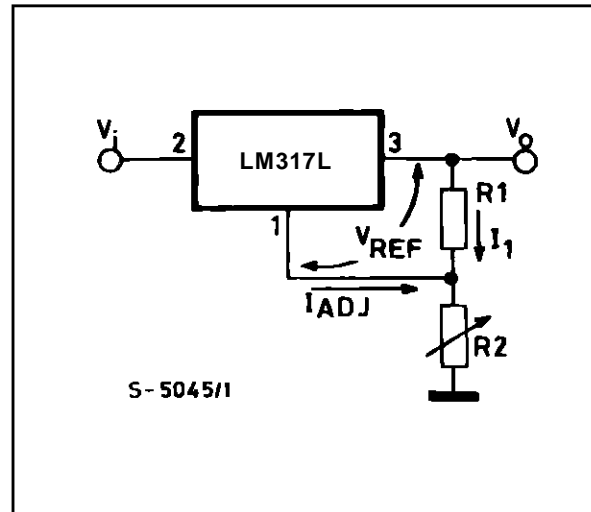
$$V_O = V_{REF} \left( 1 + \frac{R_2}{R_1} \right) + I_{ADJ} R_2$$

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  $I_{ADJ} R_2$  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.

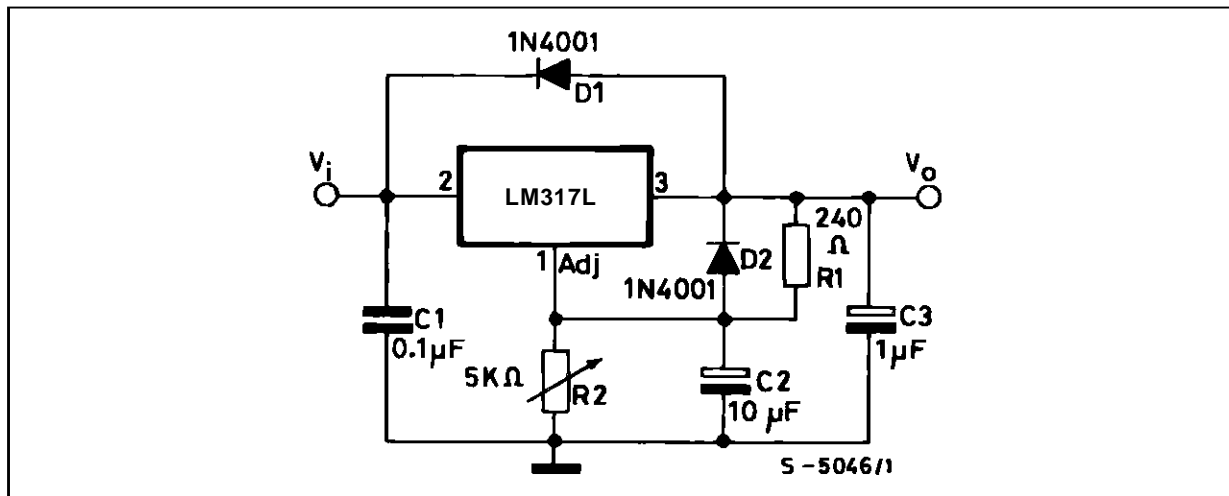
Since the LM317L is a floating regulator and "sees" only the input-to-output differential voltage, supplies of very high voltage with respect to ground can be regulated as long as the maximum input-to-output differential is not exceeded. Furthermore, programmable regulator are easily obtainable and, by connecting a fixed resistor between the adjustment and output, the device can be used as a precision current regulator.

In order to optimise 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.

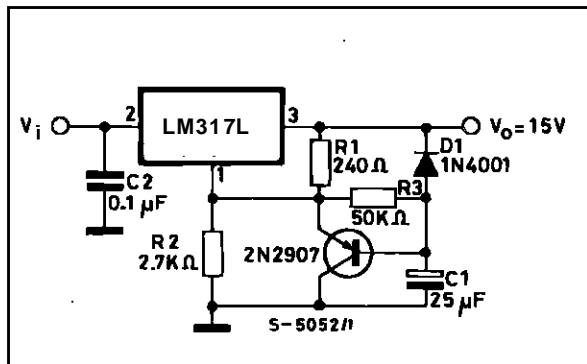
Figure 4 : Basic Adjustable Regulator.



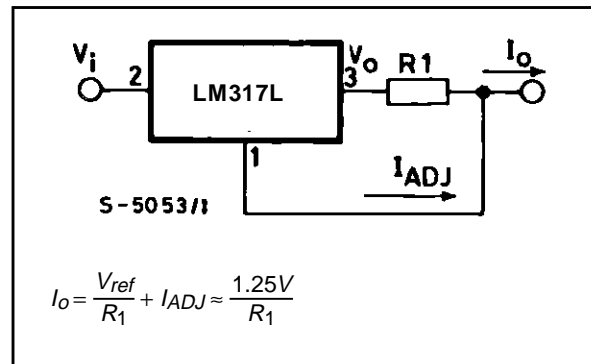
Voltage Regulator with Protection Diodes.



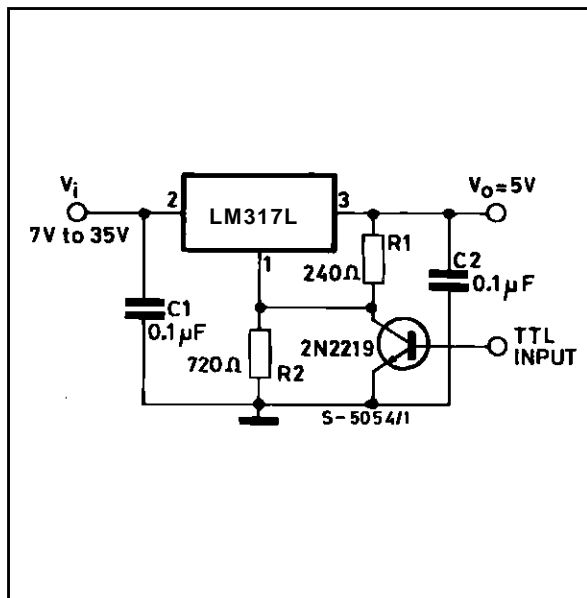
Slow Turn-on 15V Regulator.



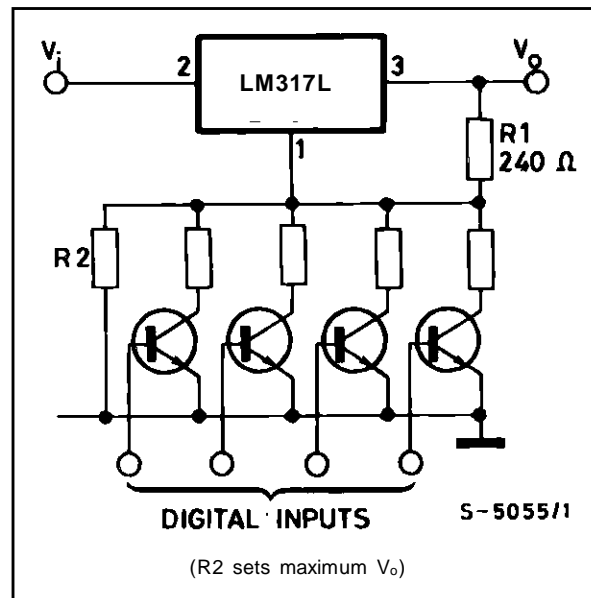
Current Regulator.



5V Electronic Shut-down Regulator.

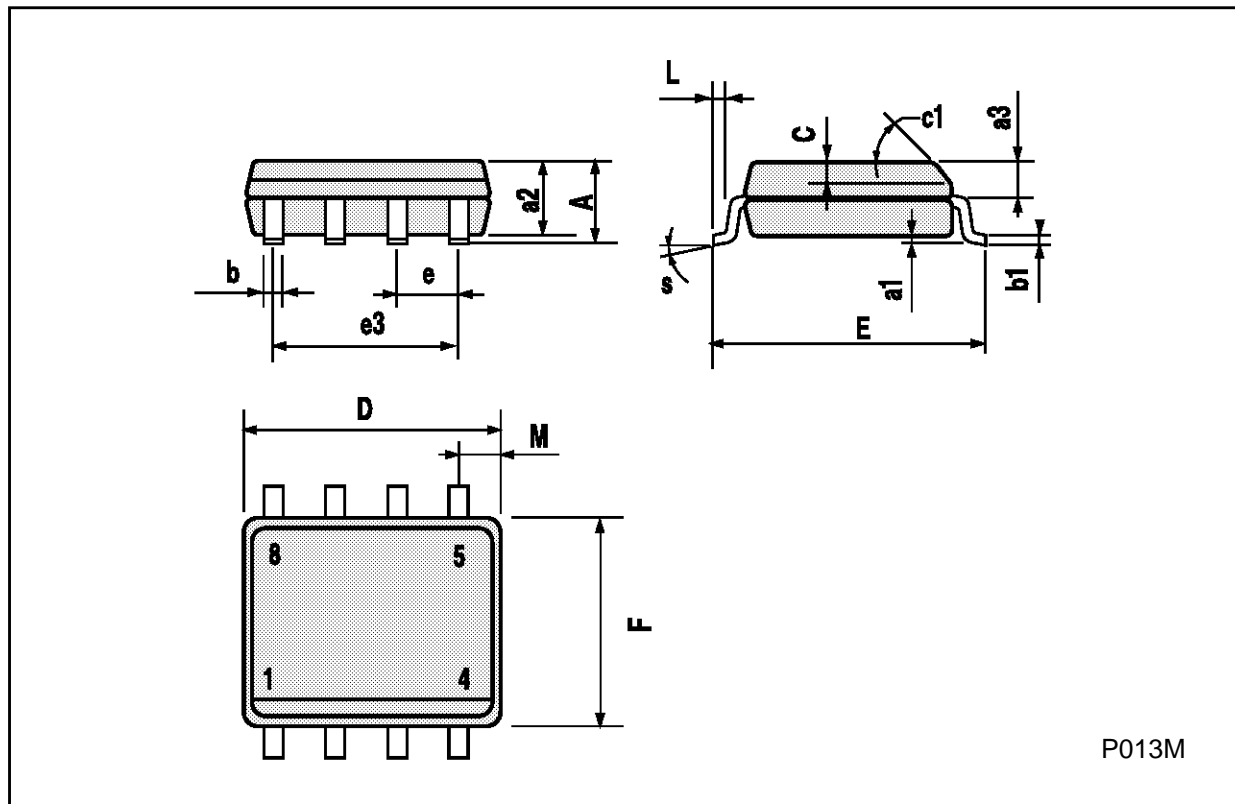


Digitally Selected Outputs.



**SO8 MECHANICAL DATA**

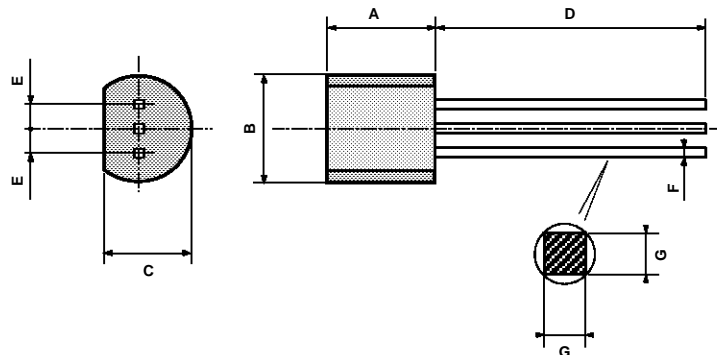
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



P013M

## TO-92 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.58		5.33	0.180		0.210
B	4.45		5.2	0.175		0.204
C	3.2		4.2	0.126		0.165
D	12.7			0.500		
E		1.27			0.050	
F	0.4		0.51	0.016		0.020
G	0.35			0.14		



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -  
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A