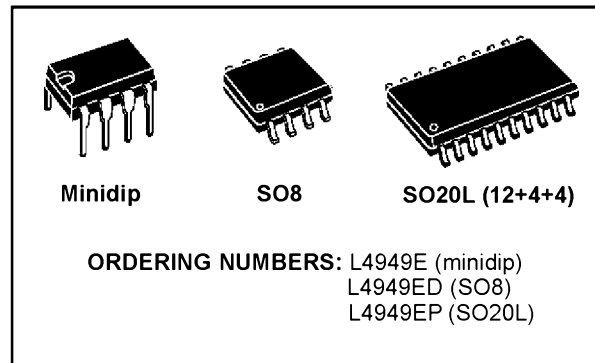


## MULTIFUNCTION VERY LOW DROP VOLTAGE REGULATOR

PRODUCT PREVIEW

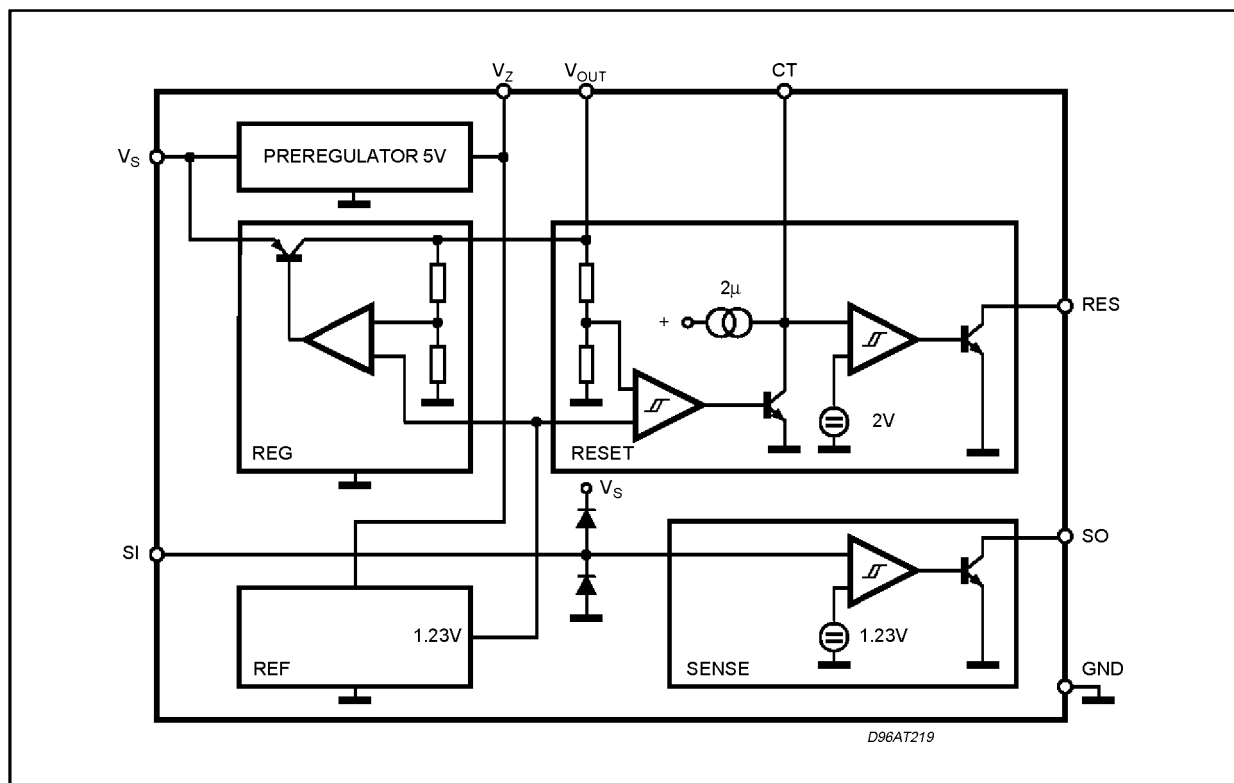
- OPERATING DC SUPPLY VOLTAGE RANGE 5V - 28V
- TRANSIENT SUPPLY VOLTAGE UP TO 40V
- EXTREMELY LOW QUIESCENT CURRENT IN STANDBY MODE
- HIGH PRECISION STANDBY OUTPUT VOLTAGE  $5V \pm 1\%$
- OUTPUT CURRENT CAPABILITY UP TO 100mA
- VERY LOW DROPOUT VOLTAGE LESS THAN 0.5V
- RESET CIRCUIT SENSING THE OUTPUT VOLTAGE
- PROGRAMMABLE RESET PULSE DELAY WITH EXTERNAL CAPACITOR
- VOLTAGE SENSE COMPARATOR
- THERMAL SHUTDOWN AND SHORT CIRCUIT PROTECTIONS



### DESCRIPTION

The L4949E is a monolithic integrated 5V voltage regulator with a very low dropout output and additional functions as power-on reset and input voltage sense. It is designed for supplying the microcomputer controlled systems especially in automotive applications.

### BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

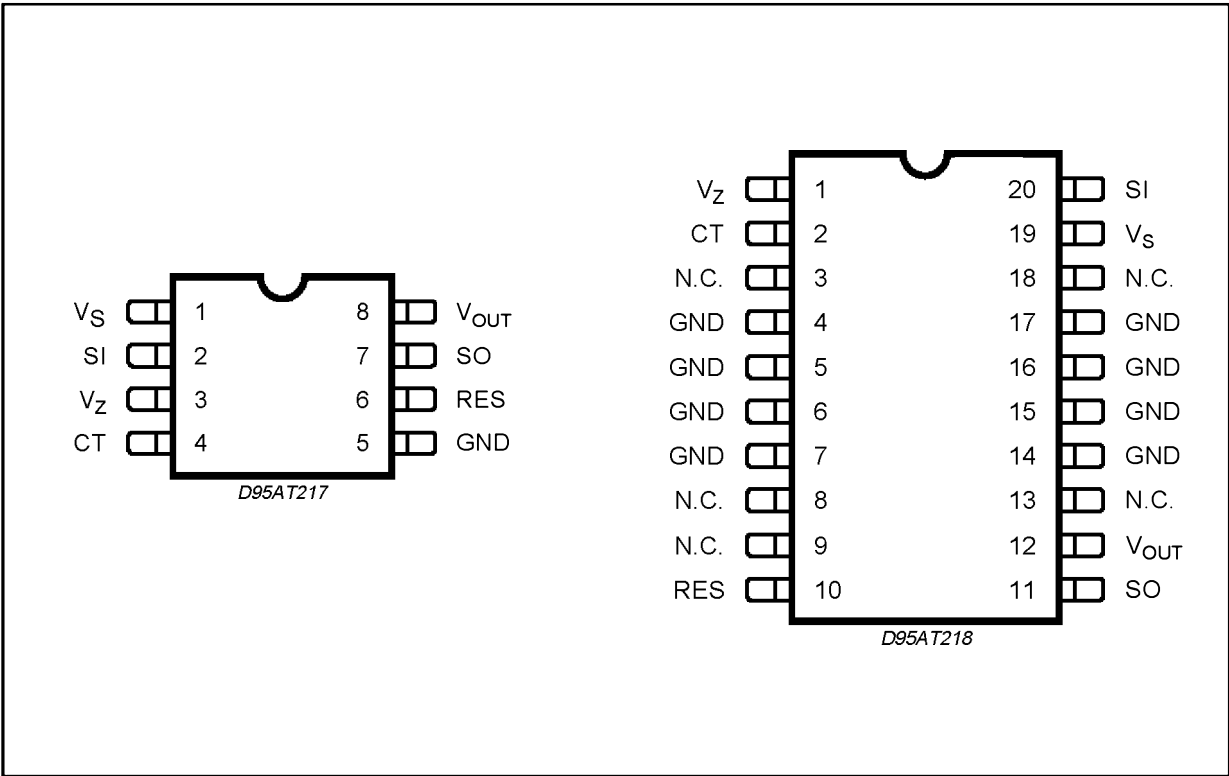
Symbol	Parameter	Value	Unit
V <sub>SDC</sub>	DC Operating Supply Voltage	28	V
V <sub>STR</sub>	Transient Supply Voltage (T < 1s)	40	V
I <sub>O</sub>	Output Current	Internally Limited	
V <sub>O</sub>	Output Voltage	20	V
I <sub>SI</sub>	Sense Input Current	±1	mA
I <sub>EN</sub>	Enable Input Current	-1	mA
V <sub>EN</sub>	Enable Input Voltage	V <sub>s</sub>	
V <sub>RES</sub> , V <sub>SO</sub>	Output Voltages	20	V
I <sub>RES</sub> , I <sub>SO</sub>	Output Currents	5	mA
V <sub>Z</sub>	Preregulator Output Voltage	7	V
I <sub>Z</sub>	Preregulator Output Current	5	mA
T <sub>J</sub>	Junction Temperature	-40 to +150	°C
T <sub>stg</sub>	Storage Temperature Range	-55 to +150	°C

Note: The circuit is ESD protected according to MIL-STD-883C

THERMAL DATA

Symbol	Description		Minidip	SO-8	SO20L	Unit
R <sub>th j-amb</sub>	Thermal Resistance Junction-ambient	Max	100	200	50	°C/W
R <sub>th j-pins</sub>	Thermal Resistance Junction-ambient	Max			15	°C/W
T <sub>JSD</sub>	Thermal Shutdown Junction temperature		165			°C

PIN CONNECTIONS



**ELECTRICAL CHARACTERISTICS** ( $V_S = 14V$ ;  $-40^{\circ}C < T_J < 125^{\circ}C$  unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_O$	Output Voltage	$T_J = 25^{\circ}C$ ; $I_O = 1mA$	4.95	5	5.05	V
$V_O$	Output Voltage	$6V < V_{IN} < 28V$ , $1mA < I_O < 50mA$	4.90	5	5.10	V
$V_O$	Output Voltage	$V_{IN} = 40V$ ; $T < 1s$ $1mA < I_O < 50mA$	4.85		5.20	V
$V_{DP}$	Dropout Voltage	$I_O = 10mA$		0.1	0.25	V
		$I_O = 50mA$		0.2	0.4	V
		$I_O = 100mA$		0.3	0.5	V
$V_{IO}$	Input to Output Voltage Difference in Undervoltage Condition	$V_{IN} = 4V$ , $I_O = 35mA$			0.4	V
$I_{Outh}^{**}$	Max Output Leakage	$V_{IN} = 25V$ , $V_O = 5.5V$	20	50	80	$\mu A$
$V_{OL}$	Line Regulation	$6V < V_{IN} < 28V$ ; $I_O = 1mA$			20	mV
$V_{OLO}$	Load Regulation	$1mA < I_O < 100mA$			30	mV
$I_{LIM}$	Current Limit	$V_O = 4.5V$	105	200	400	mA
		$V_O = 0V$ (note 1)		100		mA
$I_{QSE}$	Quiescent Current	$I_O = 0.3mA$ ; $T_J < 100^{\circ}C$		200	300	$\mu A$
$I_Q$	Quiescent Current	$I_O = 100mA$			5	mA

\*\* With this test we guarantee that with no output current the output voltage will not exceed 5.5V

**RESET**

$V_{RT}$	Reset Threshold Voltage			$V_O - 0.5V$		V
$V_{RTH}$	Reset Threshold Hysteresis		50	100	200	mV
$t_{RD}$	Reset Pulse Delay	$C_T = 100nF$ ; $T_R \geq 100\mu s$	55	100	180	ms
$t_{RR}$	Reset Reaction Time	$C_T = 100nF$		5	30	$\mu s$
$V_{RL}$	Reset Output Low Voltage	$R_{RES} = 10K\Omega$ to $V_O$ $V_S \geq 1.5V$			0.4	V
$I_{RH}$	Reset Output High Leakage Current	$V_{RES} = 5V$			1	$\mu A$
$V_{CTth}$	Delay Comparator Threshold			2		V
$V_{CTth, hy}$	Delay Comparator Threshold Hysteresis			100		mV

**SENSE**

$V_{st}$	Sense Low Threshold		1.16	1.23	1.35	V
$V_{sth}$	Sense Threshold Hysteresis		20	100	200	mV
$V_{SL}$	Sense Output Low Voltage	$V_{SI} \leq 1.16V$ ; $V_S \geq 3V$ $R_{SO} = 10K\Omega$ to $V_O$			0.4	V
$I_{SH}$	Sense Output Leakage	$V_{SO} = 5V$ ; $V_{SI} \geq 1.5V$			1	$\mu A$
$I_{SI}$	Sense Input Current	$V_{SI} = 0$	-20	-8	-3	$\mu A$

**PREREGULATOR**

$V_Z$	Preregulator Output Voltage	$I_Z = 10\mu A$	4.5	5	6	V
$I_Z$	Preregulator Output Current				10	$\mu A$

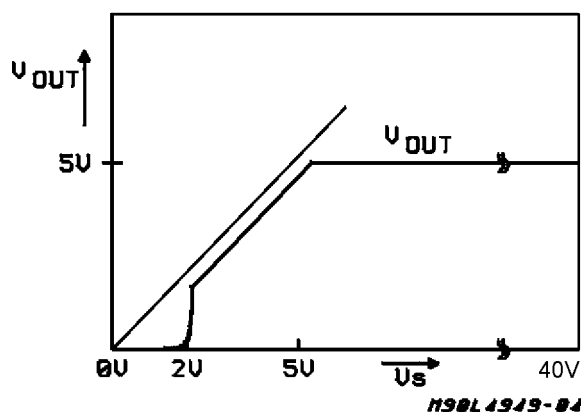
Note 1: Foldback characteristic



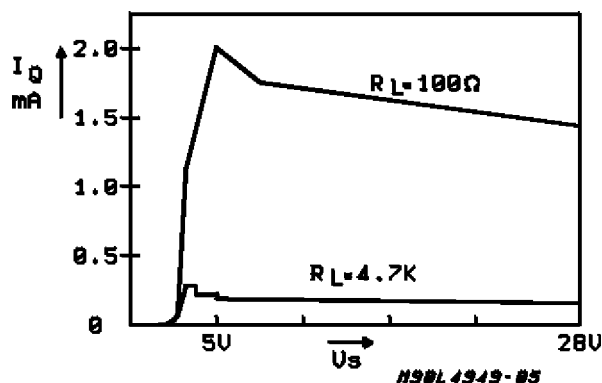
With this structure very low dropout voltage at currents up to 100mA is obtained. The dropout operation of the standby regulator is maintained down to 3V input supply voltage. The output voltage is regulated up to the transient input supply voltage of 40V. With this feature no functional interruption due to overvoltage pulses is generated. The typical curve showing the standby output voltage as a function of the input supply voltage is shown in Fig. 2. The current consumption of the device (quiescent current) is less than 300µA.

To reduce the quiescent current peak in the undervoltage region and to improve the transient response in this region, the dropout voltage is controlled, the quiescent current as a function of the supply input voltage is shown in Fig. 3.

**Figure 2:** Output Voltage vs. Input Voltage



**Figure 3:** Quiescent Current vs. Supply Voltage



### Preregulator

To improve the transient immunity a preregulator stabilized the internal supply voltage to 5V. This internal voltage is present at Pin 3 (V<sub>Z</sub>). This voltage should not be used as an output because the output capability is very small ( $\leq 10\mu\text{A}$ ).

This output may be used as an option when a better transient behaviour for supply voltages less than 8V is required (see also application note).

In this case a capacitor (100nF - 1µF) must be connected between Pin 3 and GND. If this feature is not used Pin 3 must be left open.

### Reset Circuit

The block circuit diagram of the reset circuit is shown in Fig. 4. The reset circuit supervises the output voltage.

The reset threshold of 4.5V is defined with the internal reference voltage and standby output divider.

The reset pulse delay time  $t_{RD}$ , is defined with the charge time of an external capacitor  $C_T$ :

$$t_{RD} = \frac{C_T \cdot 2V}{2\mu\text{A}}$$

The reaction time of the reset circuit originates from the discharge time limitation of the reset capacitor  $C_T$  and is proportional to the value of  $C_T$ .

The reaction time of the reset circuit increases the noise immunity. Standby output voltage drops below the reset threshold only a bit longer than the reaction time results in a shorter reset delay time.

The nominal reset delay time will be generated for standby output voltage drops longer than approximately 50µs.

The typical reset output waveforms are shown in Fig. 5.

### Sense Comparator

The sense comparator compares an input signal with an internal voltage reference of typical 1.23V. The use of an external voltage divider makes this comparator very flexible in the application.

It can be used to supervise the input voltage either before or after the protection diode and to give additional informations to the microprocessor like low voltage warnings.

Figure 4

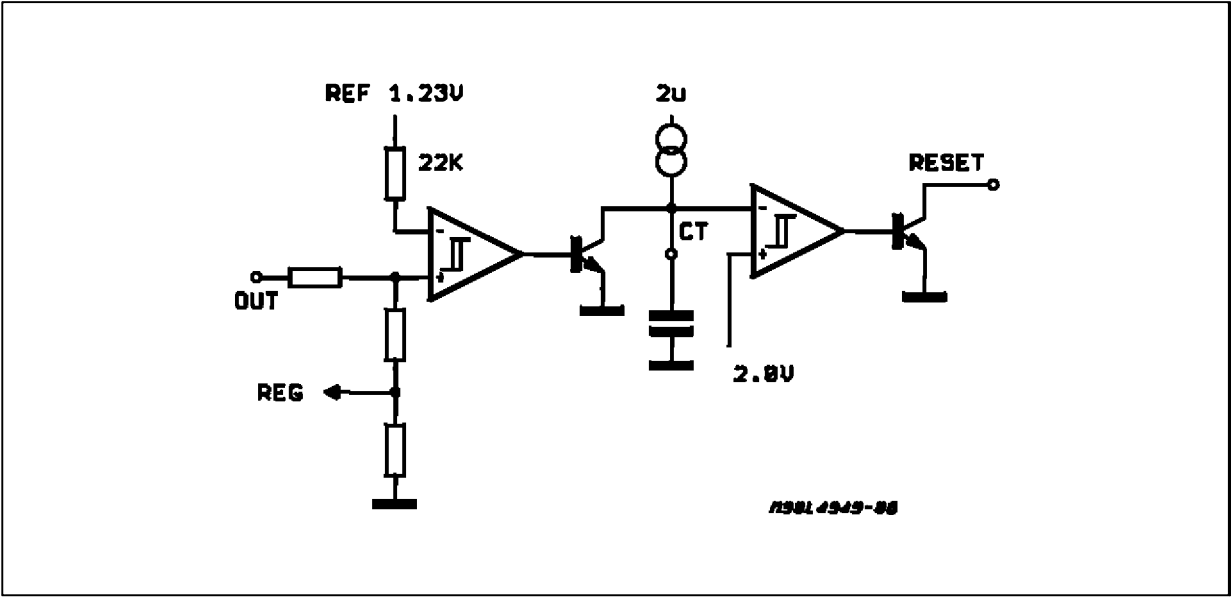
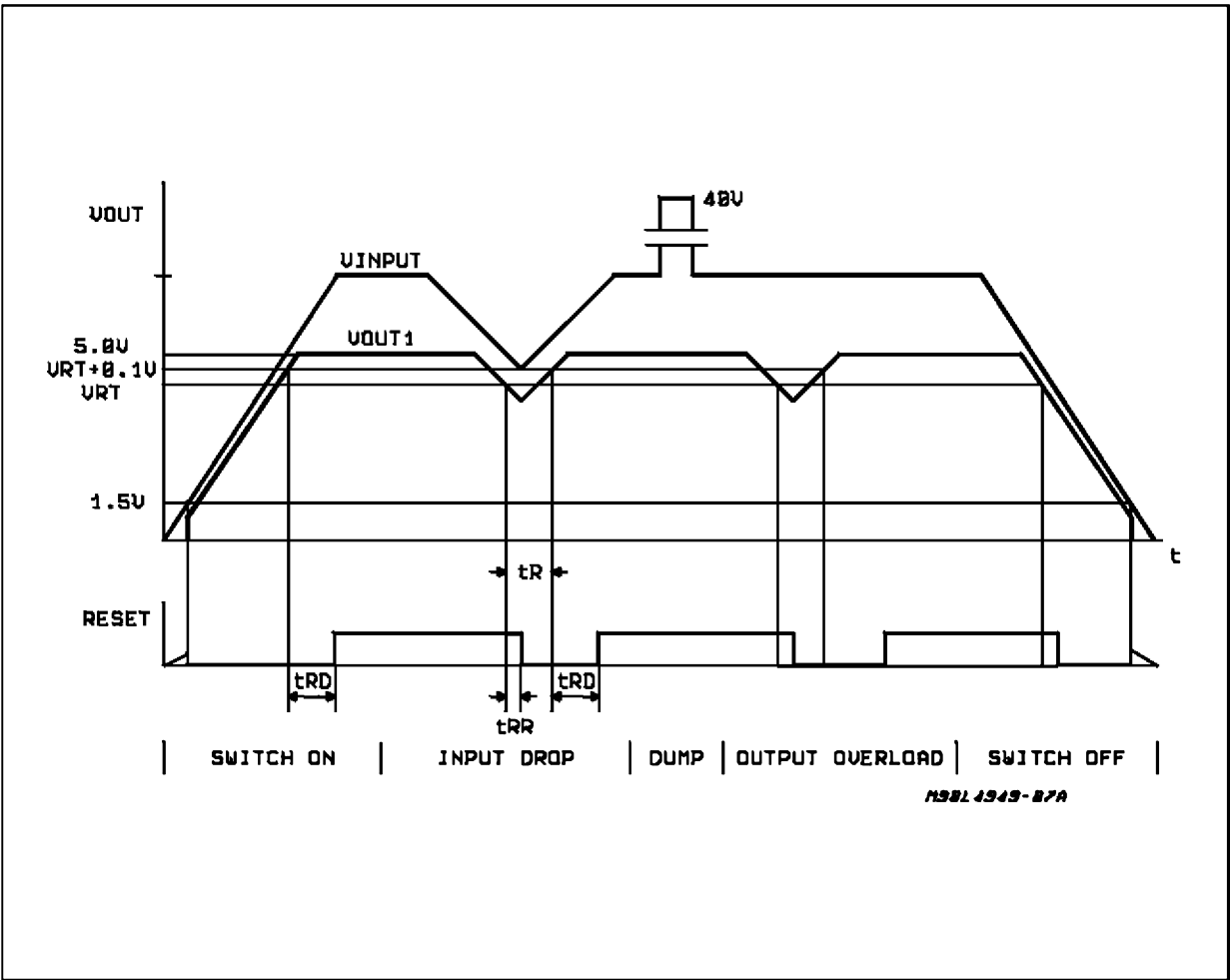
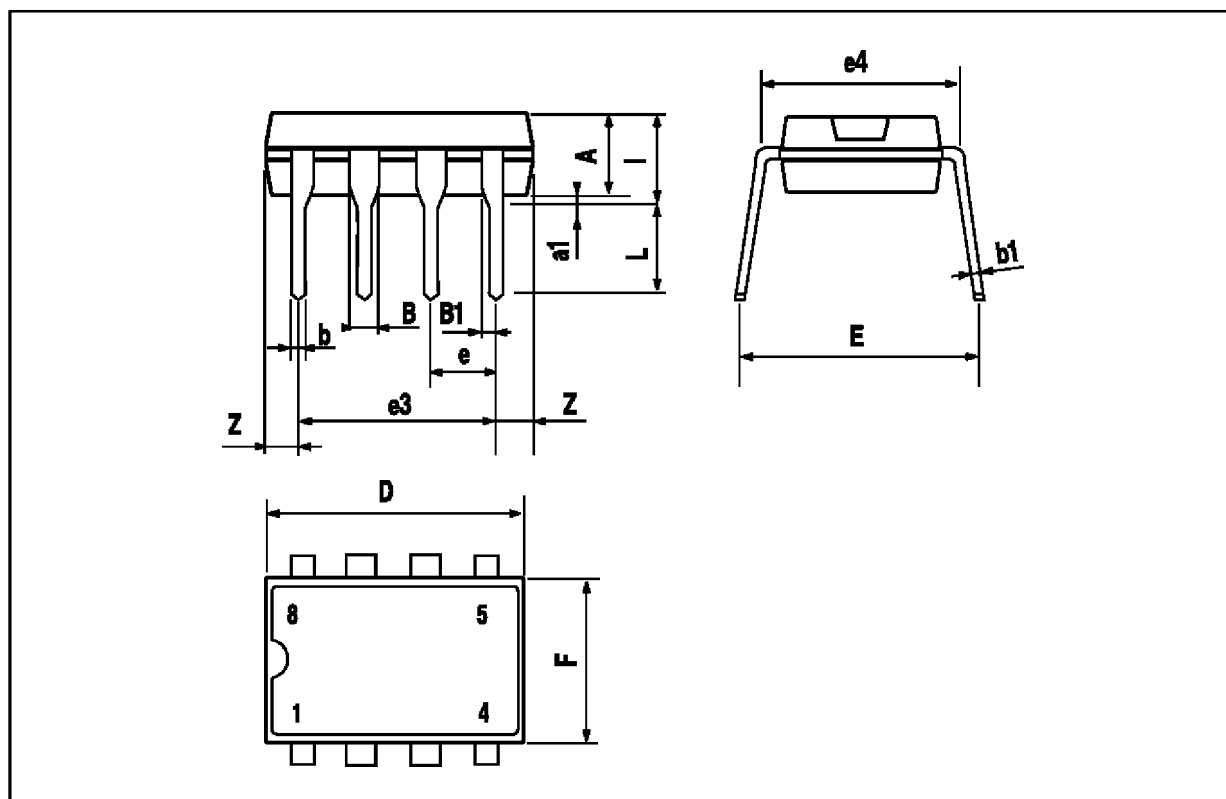


Figure 5



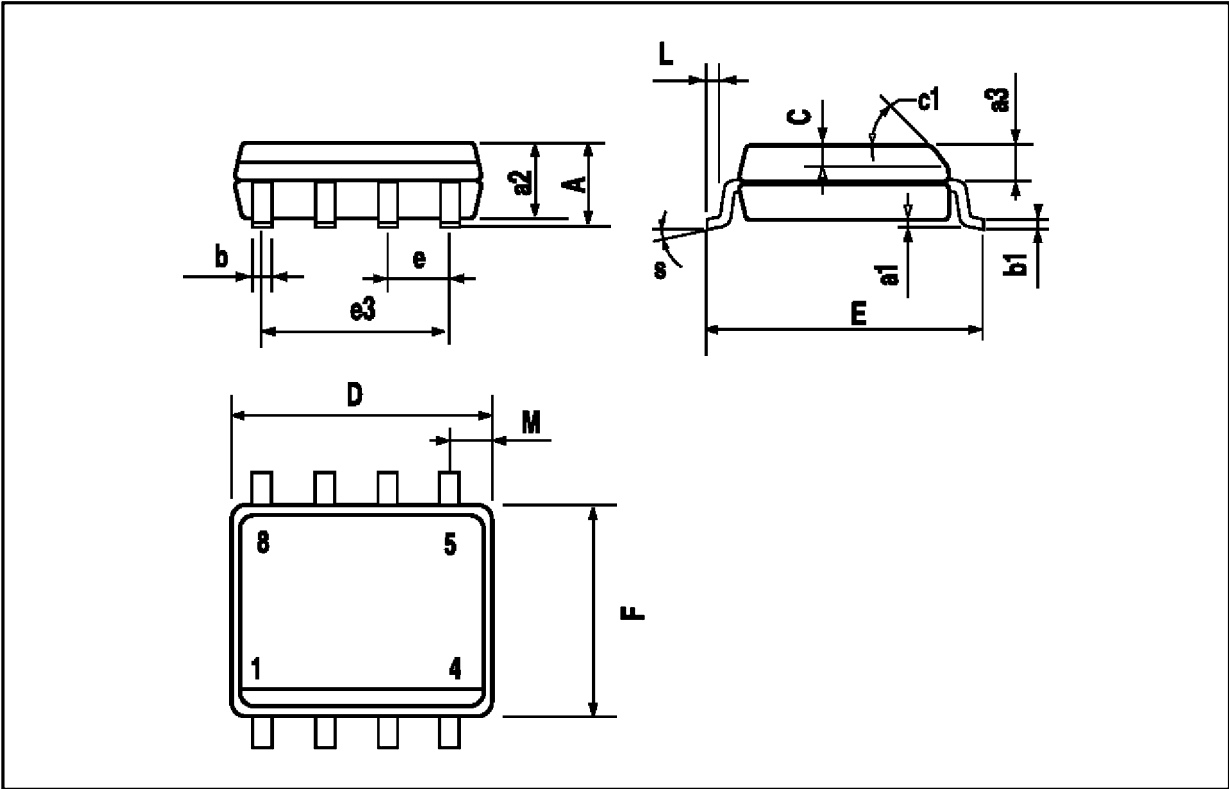
## MINIDIP PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063



SO8 PACKAGE MECHANICAL DATA

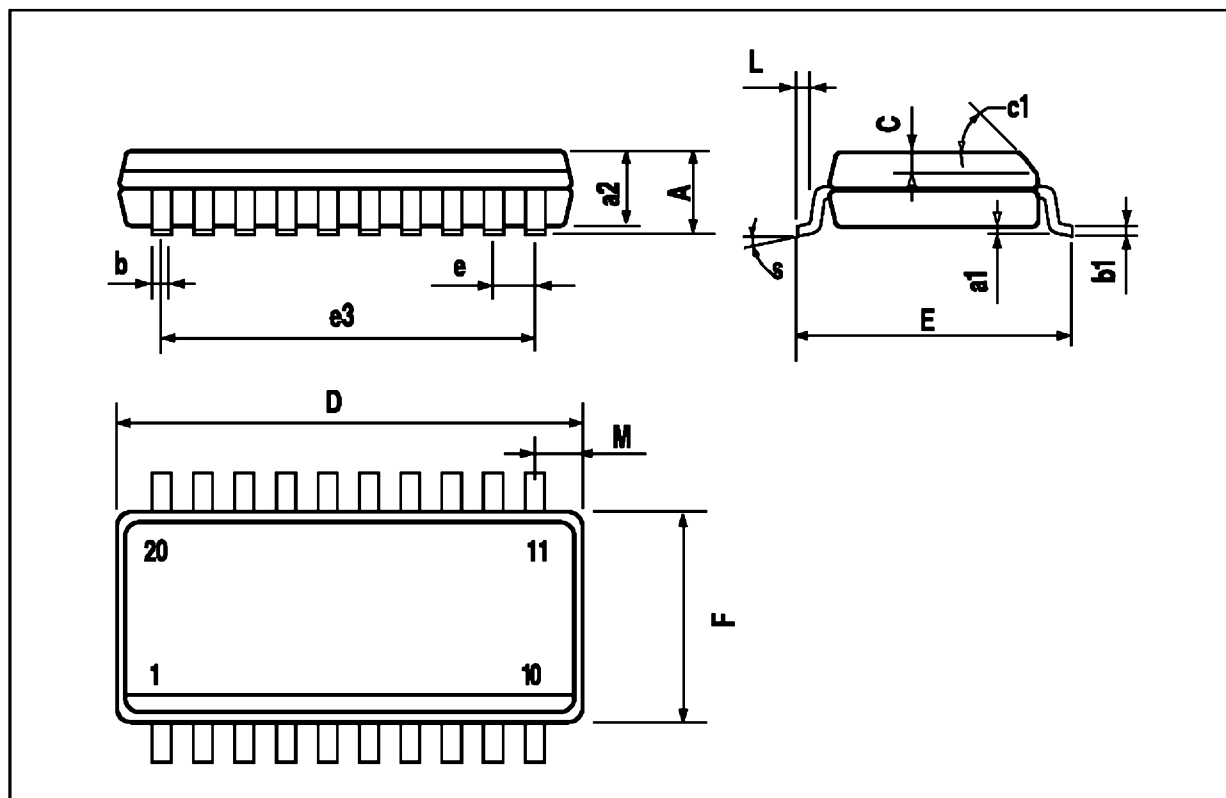
DIM.	mm			inch		
	MIN	TYP	MAX	MIN	TYP	MAX
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1		45			1.772	
D		1	4.8		0.039	0.189
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F		1	3.8		0.039	0.150
G						
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S			8			0.315





## SO20L PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN	TYP	MAX	MIN	TYP	MAX
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1		45			1.772	
D		1	12.6		0.039	0.496
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F		1	7.4		0.039	0.291
G	8.8		9.15	0.346		0.360
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S			8			0.315



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.

© 1995 SGS-THOMSON Microelectronics - Printed in Italy - 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 - United Kingdom - U.S.A.