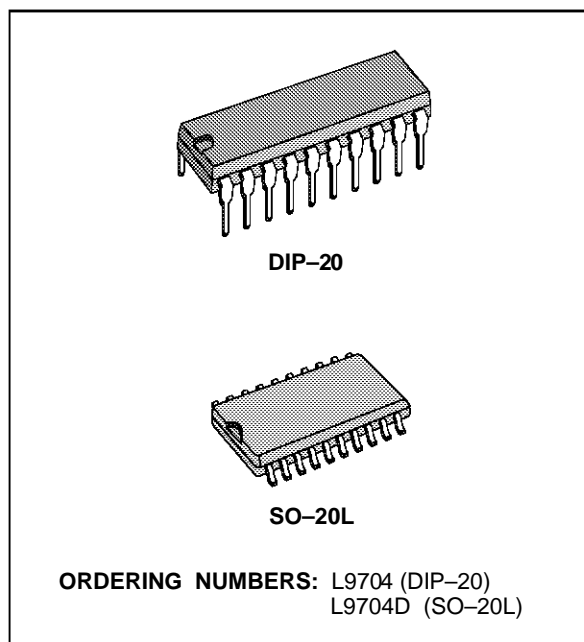


**OCTAL SUPPLY CONTACT MONITORING CIRCUIT**

- OPERATING DC SUPPLY VOLTAGE RANGE 5V TO 25V
- SUPPLY OVERVOLTAGE PULSE UP TO 40V
- VERY LOW STANDBY QUIESCENT CURRENT 0.2mA
- INTERNAL CLAMPING DIODES AT CONTACT INPUTS TO  $V_S$  AND GND
- INPUT PULSE CURRENT CAPABILITY UP TO + 50mA, - 75mA
- NOMINAL CONTACT CURRENTS OF 10mA DEFINED BY EXTERNAL CONTACT SERIES RESISTORS  $R_{IN1-8}$
- CONTACT STATUS MONITORING BY COMPARING THE RESISTANCE AT CONTACT SENSE INPUTS WITH THE INTERNAL REFERENCE RESISTOR VALUE
- HIGH IMMUNITY DUE TO RESISTANCE COMPARISON WITH HYSTERESIS

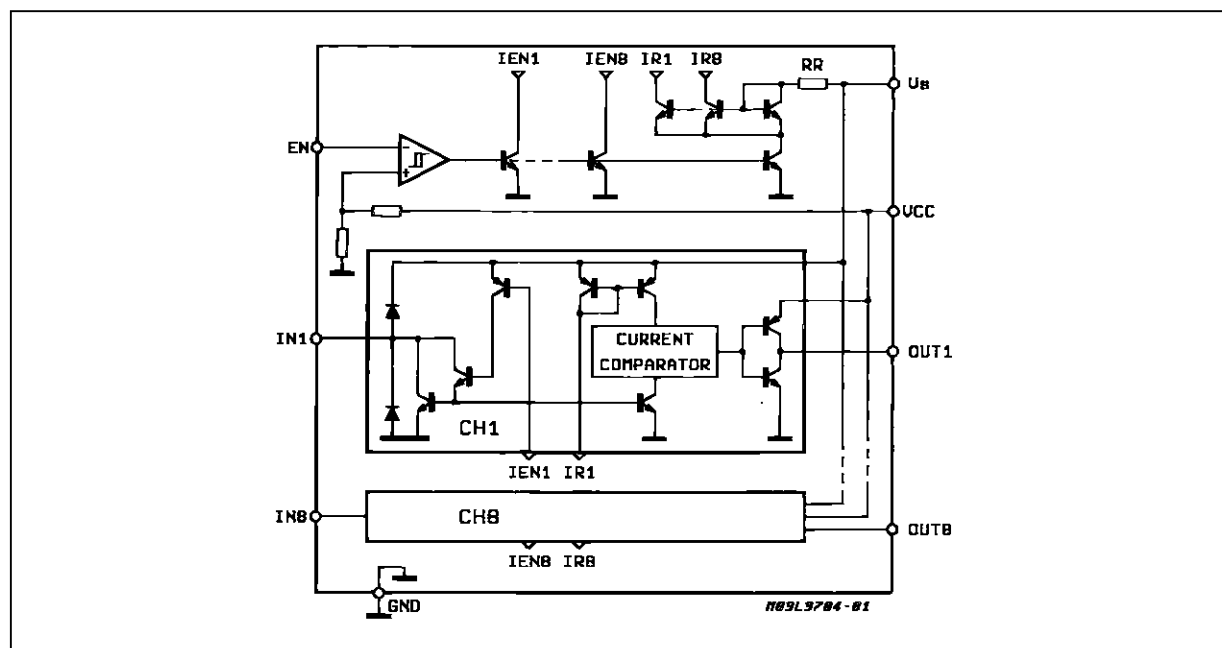


**DESCRIPTION**

The L9704 is a bipolar monolithic integrated circuit for monitoring the status of up to eight contacts connected to the power supply (battery).

It contains eight contact sense inputs and eight microcomputer compatible three-state outputs.

**BLOCK DIAGRAM**



# L9704

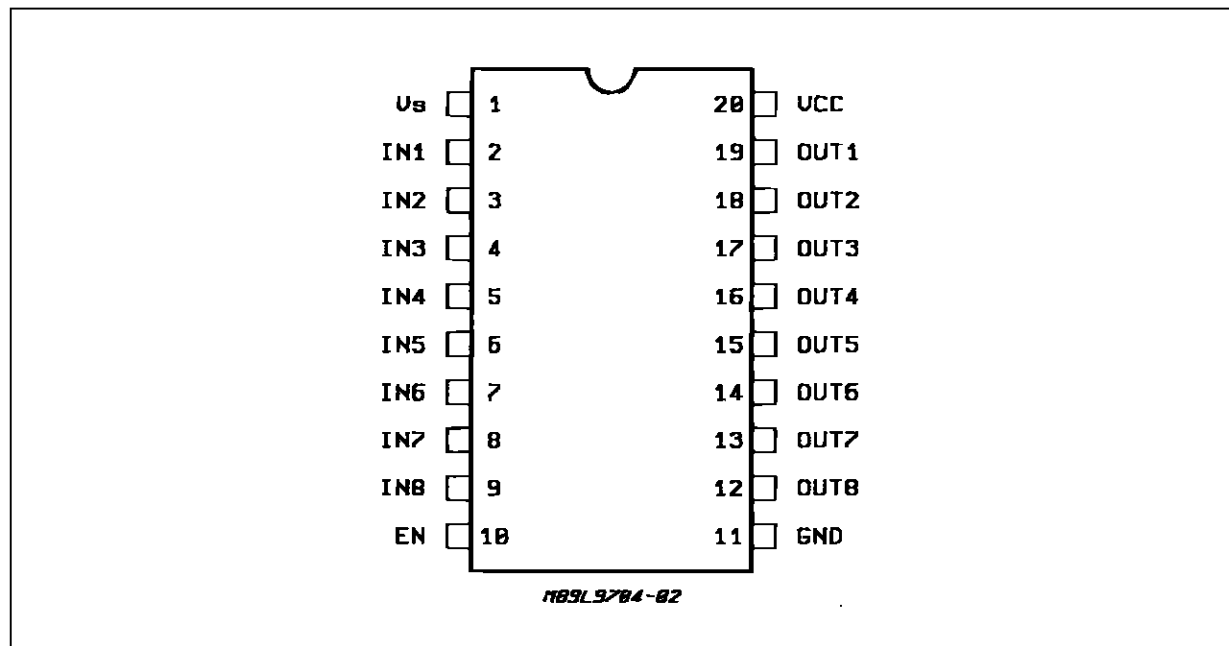
## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Test Conditions	Unit
V <sub>S</sub>	Transient Supply Voltage (t ≤ 1s)	+40	V
V <sub>CC</sub>	Logic Supply Voltage	7	V
I <sub>IN DC</sub>	Input DC Current	±40	mA
I <sub>INP</sub>	Input DC Pulse (test pulse specification: 0 < t <sub>P</sub> < 2ms, f ≤ 0.2Hz, n = 25000)	50 -75	mA mA
I <sub>O</sub>	Output Current	Internally Limited	
V <sub>EN</sub>	Enable Input Voltage	V <sub>CC</sub> +0.3 -0.3	V V
P <sub>O</sub>	Power Dissipation at T <sub>amb</sub> = 80°C DIP20 SO20	875 420	mW mW
T <sub>stg</sub> , T <sub>J</sub>	Storage and Junction Temperature Range	-55 to 150	°C

## THERMAL DATA

Symbol	Parameter	DIP20	SO20	Unit
R <sub>th j-amb</sub>	Thermal Resistance Junction to Ambient MAX.	80	165	°C/W

## PIN CONNECTION (top view)



**ELECTRICAL CHARACTERISTICS** ( $5V \leq V_S \leq 25V$ ;  $-40^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ ;  $4.75V \leq V_{CC} \leq 5.25V$  unless otherwise specified; the currents flowing in the arrow direction are assumed positive as marked in the application circuit diagram, fig. 1).

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit			
V <sub>ENL</sub>	Enable Input Voltage LOW (device activated)				0.8	V			
V <sub>ENH</sub>	Enable Input Voltage HIGH		2.4			V			
V <sub>ENhyst</sub>	Enable Input Hysteresis		200	300	800	mV			
I <sub>EN</sub>	Enable Input Current	$2.4V < V_{EN} < V_{CC}$			5	$\mu\text{A}$			
		$0V < V_{EN} < 0.8V$	-5	-1		$\mu\text{A}$			
V <sub>OUTH</sub>	Output Voltage HIGH	$0 < I_{OUT} < 100\mu\text{A}$	4.0	V <sub>CC</sub> - 0.1	V <sub>CC</sub>	V			
V <sub>OUTL</sub>	Output Voltage LOW	I <sub>OUT</sub> = -1mA	0.05	0.2	0.4	V			
I <sub>OUT TS</sub>	Output TRISTATE Current	$0 < V_{OUT} < V_{CC}$			0.5	$\mu\text{A}$			
V <sub>IN</sub>	Input Voltage (device active)	EN = LOW R <sub>IN</sub> = 1k $\Omega$	0.4	1.5	2	V			
V <sub>IN</sub>	Input Voltage During Clamping (device disabled)	EN = HIGH I <sub>IN</sub> = 30mA I <sub>IN</sub> = -30mA	V <sub>S</sub> + 0.3 -2	V <sub>S</sub> + 1 -1	V <sub>S</sub> + 2 -0.3	V V			
I <sub>OUT</sub>	Output Current	OUT = HIGH V <sub>OUT</sub> = 0			2	mA			
I <sub>OUT</sub>	Output Current	OUT = LOW V <sub>OUT</sub> = 5.5V			-20	mA			
R <sub>IL</sub>	Input Resistor (note 1) LOW Threshold	$5V < V_S < 16V$ $ \Delta V_{GND}  \leq 0.1V_S$	1.1	4.8		K $\Omega$			
R <sub>IH</sub>	Input Resistor (note 1) HIGH Threshold						6.5	29	K $\Omega$
$\frac{R_{IL}}{R_{IH}}$	Input Resistor Threshold Ratio (note1)						0.65	0.75	0.85
I <sub>QC</sub>	Quiescent Current	EN = HIGH (t <sub>ENH</sub> $\geq$ 80 $\mu\text{s}$ ) $5V < V_S < 16V$ $-40^\circ\text{C} \leq T_j \leq 100^\circ\text{C}$ All Inputs Open		0.12	0.16	mA			
I <sub>QS</sub>							0.04	mA	
S <sub>IIN 2)</sub>	Input Leakage Current	All Inputs Closed V <sub>BAT</sub> $\leq$ V <sub>D1</sub>			0.24	mA			
I <sub>QC</sub> I <sub>QS</sub>	Quiescent Current	EN = LOW			13	mA			
					2	mA			
t <sub>do</sub>	Delay Time/Output (EN LOW to output data ready)	C <sub>OUT</sub> $\leq$ 50pF			15 +3R <sub>IN</sub> C <sub>IN</sub>	$\mu\text{s}$			
t <sub>dTS</sub>	Delay Time/Tristate (EN HIGH to output TRISTATE)	C <sub>OUT</sub> $\leq$ 50pF			10	$\mu\text{s}$			

**Notes :**

1. The input resistor threshold value is a resistor value from the IN-pin to battery at which the corresponding output changes its status (see fig. 3)

2: S<sub>IIN</sub> is the sum of the input currents  $S_{IIN} = \sum_{i=1}^8 I_{INi}$ .

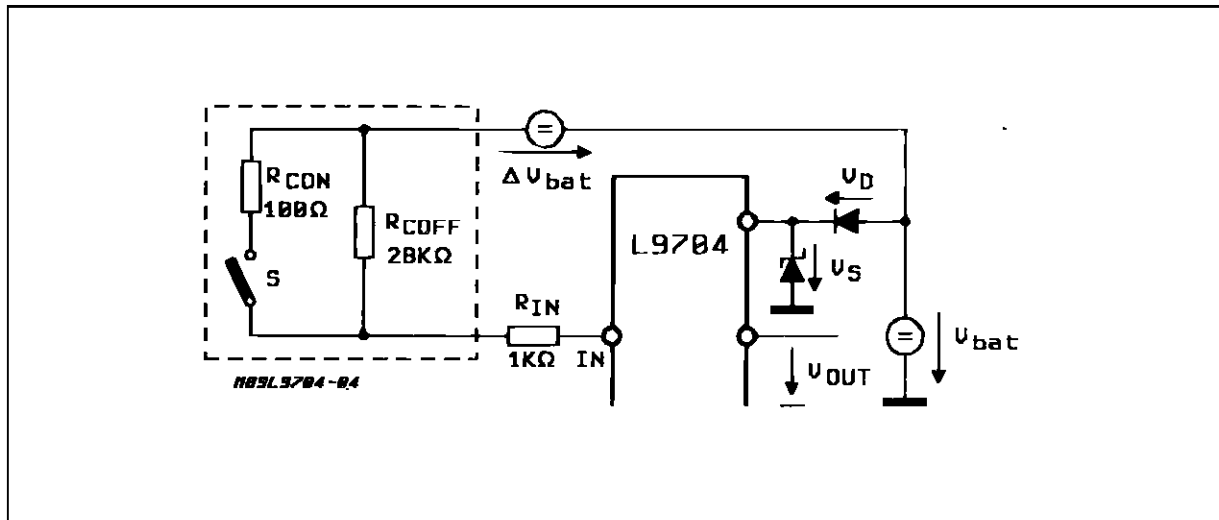


The internal clamping diodes at the contact monitoring inputs, together with the external contact series resistors  $R_{IN}$ , allows the device to withstand transients at the contact connection. The contact series resistor  $R_{IN}$  limits the input current at the transient.

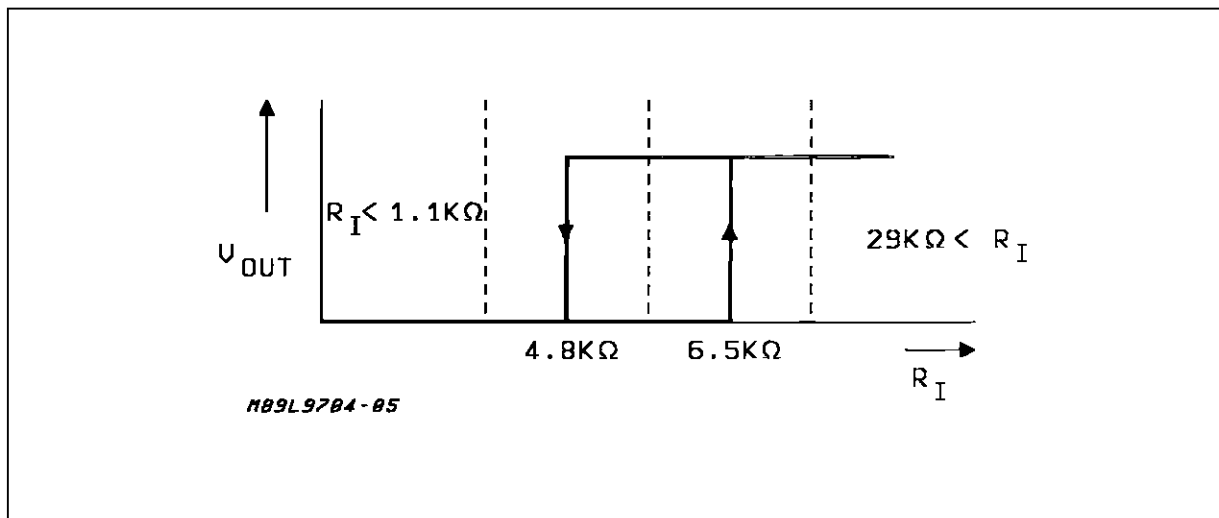
The dynamic behaviour of the circuit is defined by the times  $t_{do}$  and  $t_{dTS}$ . When the contact becomes open, the input capacitor  $C_{IN}$  must be charged

through the resistor  $R_{IN}$ . In this case the total delay time may also be influenced by the time constant  $R_{IN} C_{IN}$ . The delay time  $t_{dTS}$ , when disabling the device is defined only by the internal circuitry. In both cases, an external output capacitance less than 50pF is assumed, the internal output capacitances of the three-state buffers are less than 5pF.

**Figure 2 :** The Contact Sense Input Connection with the Contact Equivalent Circuit.

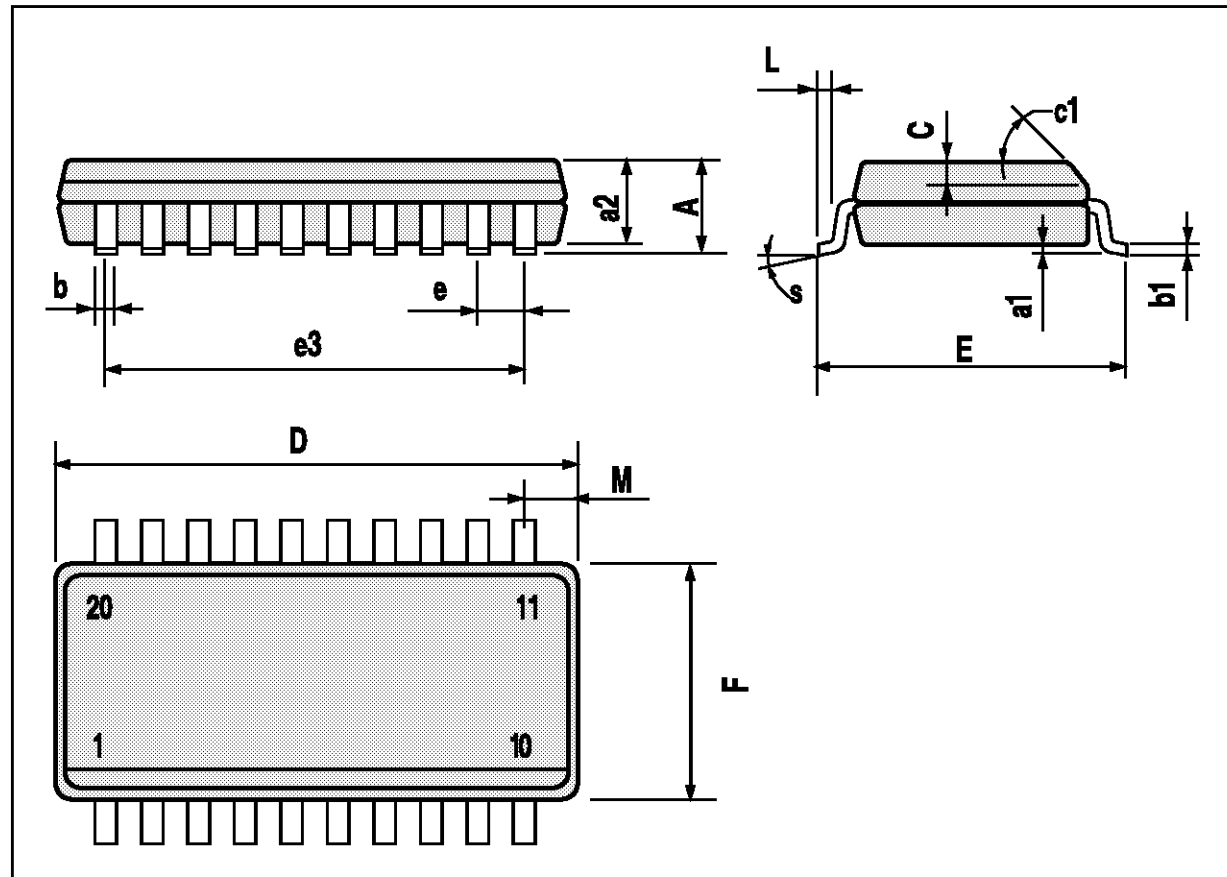


**Figure 3 :** The Output Voltage as a Function of the Input Resistance at the Corresponding Contact Sense Input.



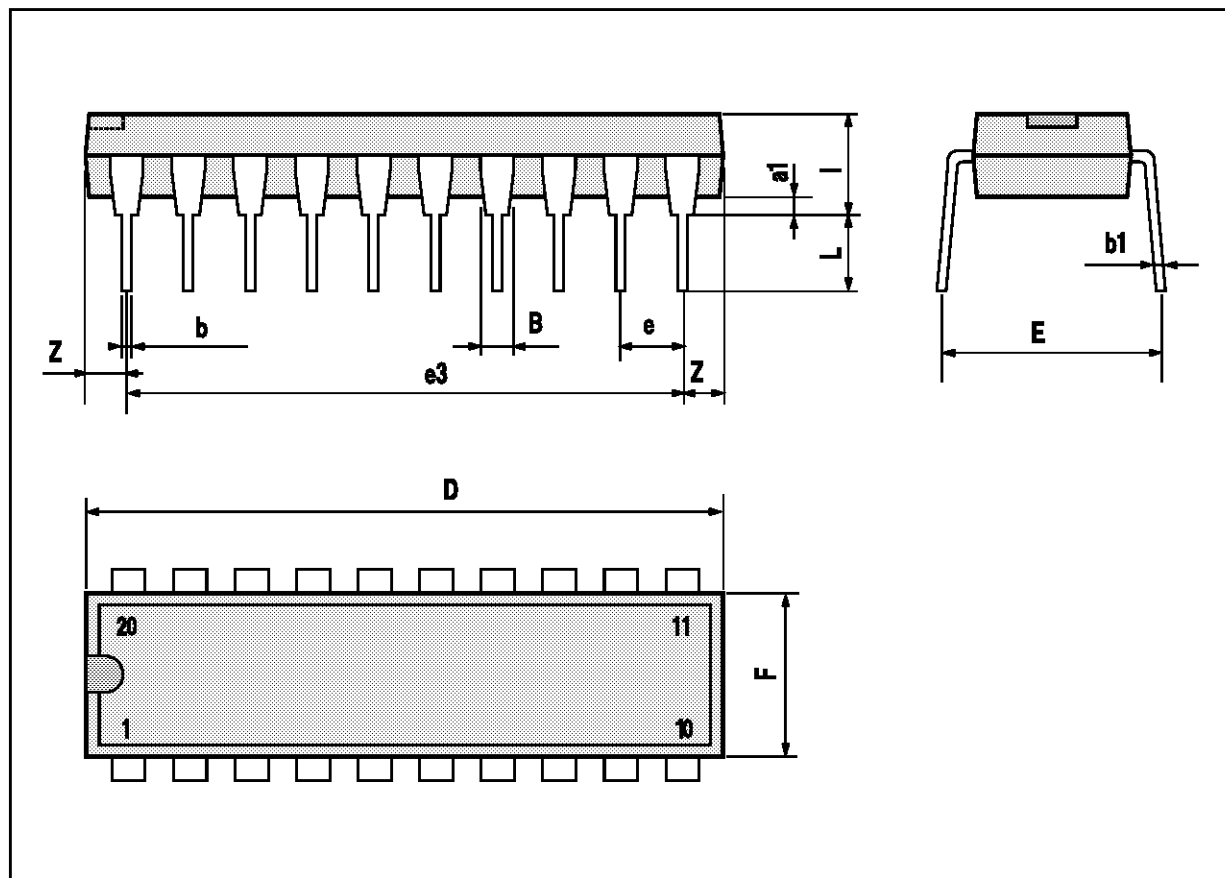
SO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
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 (typ.)					
D	12.6		13.0	0.496		0.512
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.4		7.6	0.291		0.299
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S	8 (max.)					



## DIP20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



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