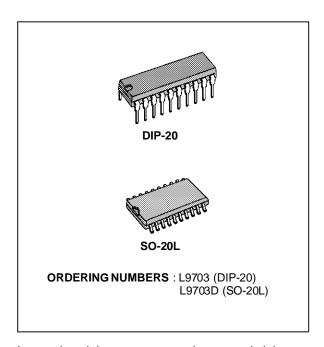


OCTAL GROUND CONTACT MONITORING CIRCUIT

- OPERATING DC SUPPLY VOLTAGE RANGE 5V TO 25V
- SUPPLY OVERVOLTAGE PULSE UP TO 40V
- VERY LOW STANDBY QUIESCENT CUR-RENT 0.2mA
- INTERNAL CLAMPING DIODES AT CONTACT INPUTS TO V_S AND GND
- INPUT PULSE CURRENT CAPABILITY UP TO + 50mA; 75mA
- NOMINAL CONTACT CURRENT OF 10mA DE-FINED BY EXTERNAL CONTACT SERIES RE-SISTORS R_{I N1-8}
- CONTACT STATUS MONITORING BY COM-PARING THE RESISTANCE AT CONTACT SENSE INPUTS WITH THE INTERNAL REFER-ENCE RESISTOR VALUE
- HIGH IMMUNITY DUE TO RESISTANCE COM-PARISON WITH HYSTERESIS

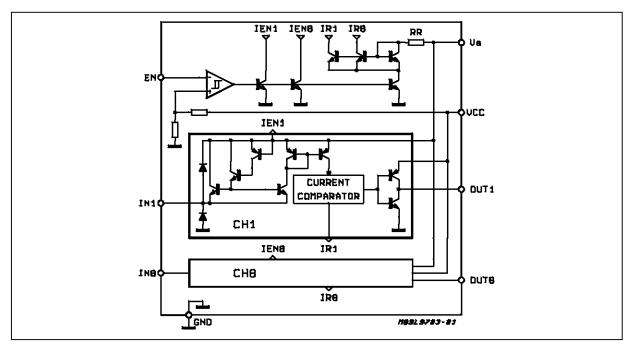
DESCRIPTION

The L9703 is a bipolar monolithic integrated circuit for monitoring the status of up to eight contacts connected to GND.



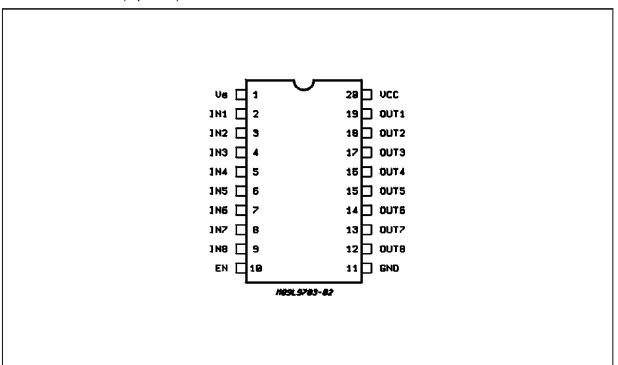
It contains eight contact sense inputs and eight microcomputer compatible three-state outputs.

BLOCK DIAGRAM



March 1992 1/9

PIN CONNECTION (top view)



ABSOLUTE MAXIMUM RATINGS

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

THERMAL DATA

Symbol	Parameter		DIP20	SO20	Unit
R _{th j-amb}	Thermal Resistance Junction to Ambient	MAX.	80	165	°C/W



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

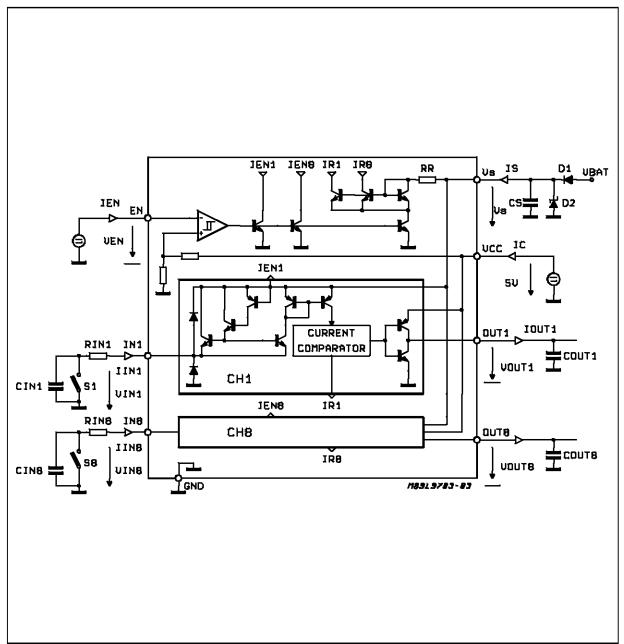
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V_{ENL}	Enable Input Voltage LOW (device activated)				0.8	V
V_{ENH}	Enable Input Voltage HIGH		2.4			V
V _{EN hyst}	Enable Input Hysteresis		200	420	800	mV
I _{EN}	Enable Input Current	2.4V < V _{EN} < V _{CC}			5	μΑ
		$0V < V_{EN} < 0.8V$	-5	-1		μΑ
Vouth	Output Voltage HIGH	0 < I _{OUT} < 100μA	4.0	V _{CC} -0.1	Vcc	V
Voutl	Output Voltage LOW	I _{OUT} = -1mA	0.05	0.2	0.4	V
lout ts	Output TRISTATE Current	0 < V _{OUT} < V _{CC}			0.5	μΑ
V _{IN}	Input Voltage (device active)	EN = LOW $R_{IN} = 1k\Omega$	V _S - 2	V _S - 1.5	V _S - 0.4	V
V_{IN}	Input Clamped Voltage (device disabled)	EN = HIGH I _{IN} = 30mA I _{IN} = -30mA	V _S + 0.3	V _S + 1 -1	V _S + 2 -0.3	V V
Іоит	Output Current	OUT = HIGH V _{OUT} = 0			2	mA
lout	Output Current	OUT = LOW VOUT = 5.5V			-20	mA
R_{IL}	Input Resistor (note 1) LOW Threshold	$ \begin{vmatrix} 5V < V_S < 16V \\ \Delta V_{GND} \le 0.1V_S \end{vmatrix} $	1.8	4		ΚΩ
R _{IH}	Input Resistor (note 1) HIGH Threshold			5.3	20	ΚΩ
R _{IL} R _{IH}	Input Resistor Threshold Ratio (note1)		0.65	0.75	0.85	
Iqc	Quiescent Current	EN = HIGH (t_{ENH} ≥ 80 μ s) 5V < V _S < 16V -40°C ≤ T_i ≤ 100°C		0.12	0.16	mA
IQS	Quiescent Current	All Inputs Open			0.04	mA
		All Inputs Closed			0.24	mA
I _{QC}	Quiescent Current	EN = LOW			6 6	mA mA
t _{do}	Delay Time/Output (EN LOW to output data ready)	C _{OUT} ≤ 50pF			15 +3R _{IN} C _{IN}	μs
t _{dTS}	Delay Time/Tristate (EN HIGH to output TRISTATE)	C _{OUT} ≤ 50pF			10	μs

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



APPLICATION CIRCUIT

Figure 1 : Typical Application Diagram for the L9703 Circuit. The current flowing in the arrow direction is assumed positive. The external capacitors C_{IN} and C_{OUT} represent the total wiring capacitance at the corresponding pins.



FUNCTIONAL DESCRIPTION

The L9703 circuit monitors the status of the contacts connected to ground and through this series external resistors R_{IN} to the contact sense input pins. The contacts equivalent circuit is supposed to be as shown in fig. 2.

The L9703 circuit compares the input current with the current through the internal reference resistor. The device is designed to work with an external input series resistor of $R_{\text{IN}1-8} = 1 \text{k}\Omega$. With this input resistor the contact current, when the contact is closed and the device activated (EN = LOW) is

$$I_{IN} = \frac{V_S - 2V}{1k\Omega}$$
 (1)

For this calculation the limit value of the V_S to IN saturation voltage of 2V was considered so that the lowest limit value of I_{IN} is calculated in (1).

The function of the circuit can be demonstrated with the transfer characteristics, showing the output status as a function of the input resistor $R_{\rm I}$, shown in figure 3. The input resistor is a sum of the $R_{\rm IN}$ and the contact resistance $R_{\rm CON}$ or $R_{\rm COFF}$, for the closed contact:

$$R_{I} = R_{IN} + R_{CON}, \qquad (2)$$

and for the open contact:

$$R_{I} = R_{IN} + R_{COFF}. (3)$$

The output goes HIGH when the input resistance increases above 5.3k Ω (typical value) and goes LOW, when the input resistance decreases below $4k\Omega$ (typical value). The limit values of $R_I=1.8K\Omega$ for LOW and $R_I=20k\Omega$ for HIGH implies that a contact with $R_{CON}=100\Omega$ (at $I_{IN}=10$ mA) will be recognized as ON = LOW and a contact with $R_{COFF}=19k\Omega$ will be recognized as OFF = HIGH. These limits are valid within the supply voltage range $6V \le VS \le 16V$ and the ground potential difference of $\Delta VGND = 0.1V$.

The internal clamping diodes at the contact monitoring inputs, together with the external contacts 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 is 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.

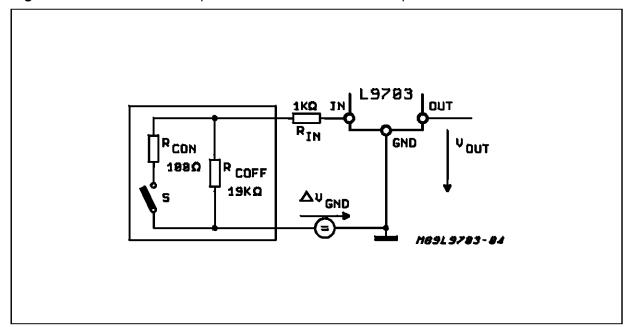
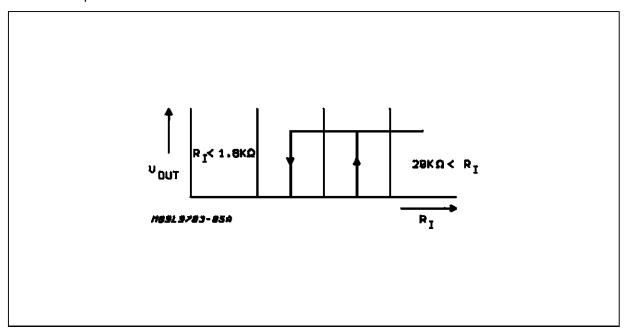
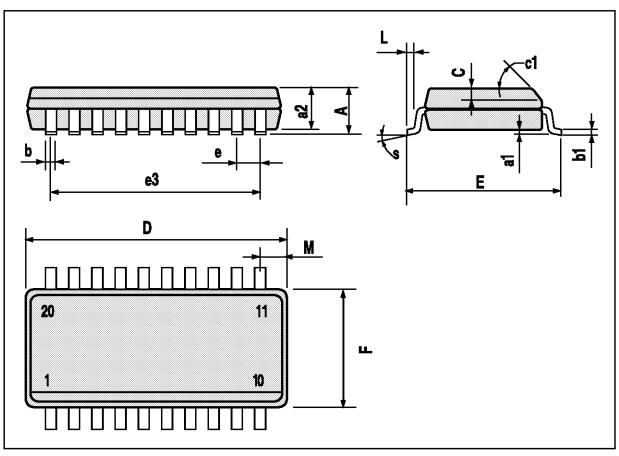


Figure 3 : The Output Voltage as a Function of the Input Resistance at the Corresponding Contact Sense Input.



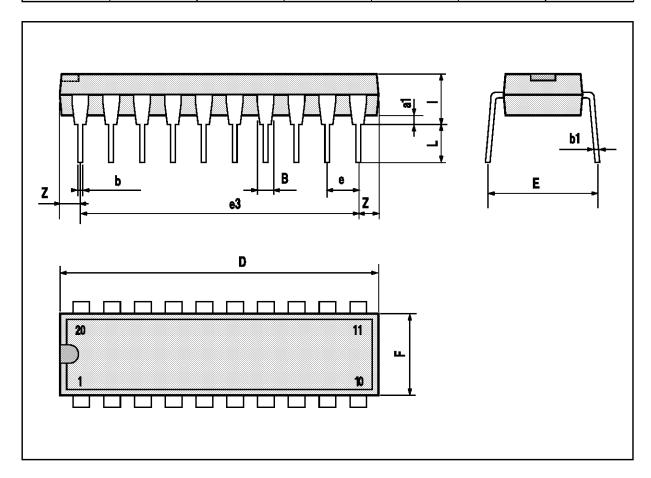
SO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch			
DIM.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Α			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	
С		0.5			0.020		
c1			45 ((typ.)			
D	12.6		13.0	0.496		0.512	
E	10		10.65	0.394		0.419	
е		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	
М			0.75			0.030	
S	8 (max.)						



DIP20 PACKAGE MECHANICAL DATA

DIM.	mm			inch			
Dim.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
a1	0.254			0.010			
В	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		
е		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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