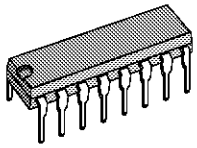
SGS-THOMSON MICROELECTRONICS

L9305A

DUAL HIGH CURRENT RELAY DRIVER

- HIGH OUTPUT CURRENT
- HYSTERESIS INPUT COMPARATOR WITH WIDE RANGE COMMON MODE OPERATION AND GROUND COMPATIBLE INPUTS
- INPUT COMPARATOR HYSTERESIS
- INTERNAL THERMAL PROTECTION WITH HYSTERESIS
- INTERNAL OUTPUT OVERVOLTAGE CLAMPING
- SINGLE SUPPLY VOLTAGE (3.5V up to 18V)



Powerdip (8 + 8)

ORDERING NUMBER : L9305A

DESCRIPTION

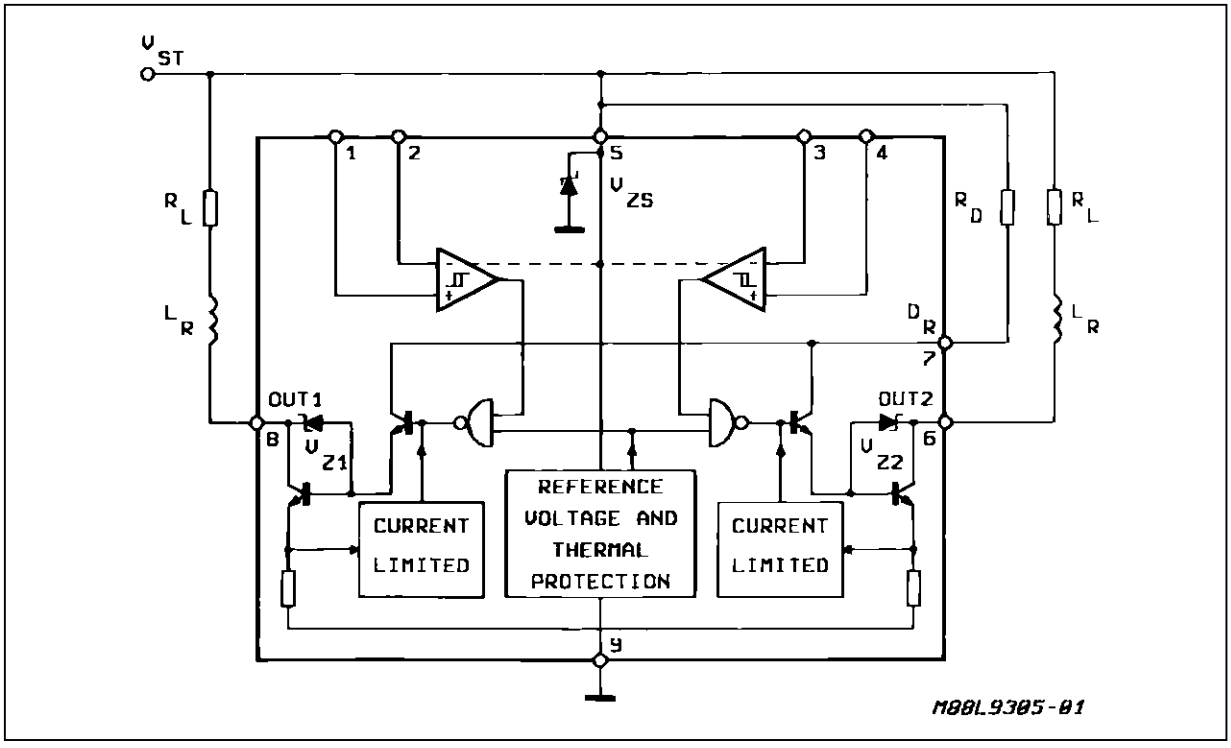
The L9305A is a monolithic interface circuit with differential input comparator and open collector output able to sink high current specifically to drive relays, lamps, d.c. motors.

Particular care has been taken to protect the device against destructive failures - short circuit of outputs to V_S, output overvoltages, supply overvoltage.

A built in thermal shut-down switches off the device when the IC's internal dissipation becomes too great and the chip temperature exceeds a set security threshold.

A hysteresis input comparator increases the interface's noise immunity, allowing the correct use also in critical environments as automotive or industrial applications.

BLOCK DIAGRAM

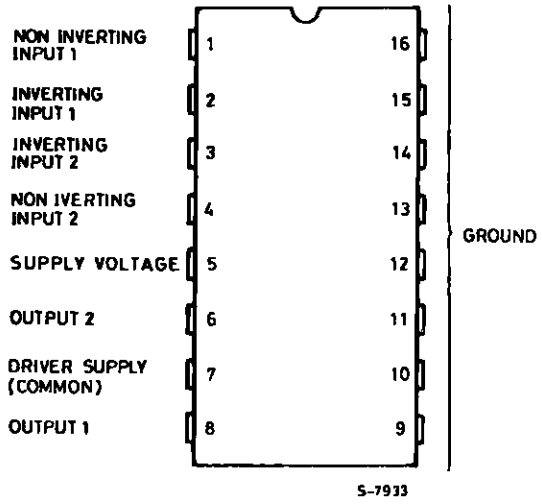


ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_5	Supply Voltage	(*) 20	V
V_7	Driver Supply Voltage	26	V
I_{ZS}	Supply Zener Clamp Current (DC) (PULSED) (**)	30 80	mA mA
V_I	Comparator Input Voltage Range	– 0.2 to 24	V
V_I	Differential Input Voltage	24	V
T_j, T_{stg}	Junction and Storage Temperature	– 55 to 150	°C
P_{tot}	Power Dissipation at T_{amb} = 85°C	928	mW
I_o	Output Current	Int. limited	

(*) The maximum allowed supply voltage without series resistors is limited by the built-in zener protection diodes
(**) $T_{on} \leq 2.5$ ms ; repetition time ≥ 30 ms.

PIN CONNECTION (top view)



THERMAL DATA

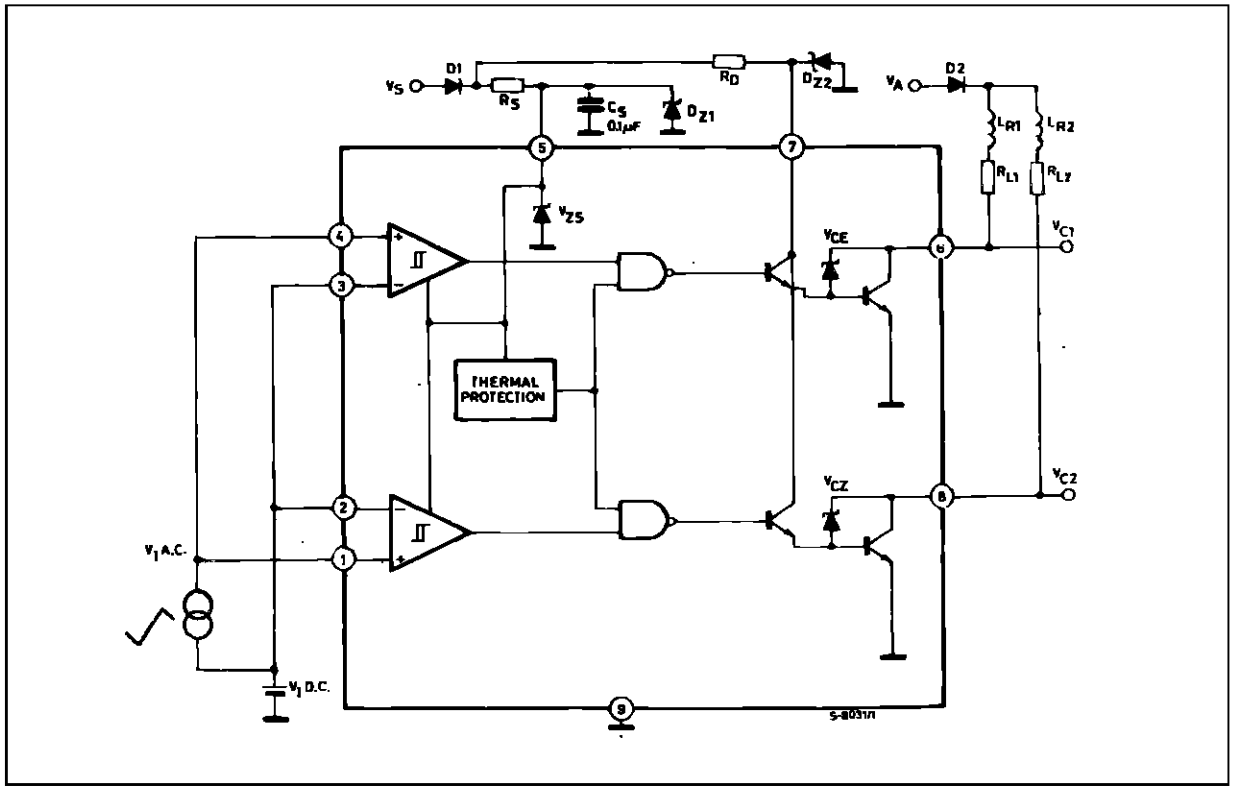
Symbol	Parameter		Value	Unit
$R_{th\ j\text{-}pins}$	Thermal Resistance Junction to pins	Max.	15	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction to Ambient	Max.	70	°C/W

ELECTRICAL CHARACTERISTICS (V_5 = 14.4V, T_{amb} = 25°C ; refer to block diagram unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_5	Supply Voltage		3.5		18*	V
I_S "st.by"	Supply Current	$V_I^+ - V_I^- \geq 70mV$		5	8	mA
I_{SON}	Supply Current	$V_I^- - V_I^+ > 70mV$		18	30	mA
V_{CZ}	Output Clamping Voltage (for each channel)	I_{OUT} = 1A	20		27	V
V_{ZS}	Supply Voltage Clamp	I_{ZS} = 10mA	20		27	V
V_{IH}	Comparator Hysteresis	$V_I^+ - V_I^-$ = 200mVpp f = 1kHz	20		70	mV
I_B	Input Bias Current	$V^+ = V^-$ = 0V		0.2	1	µA
I_{OS}	Input Offset Current	$V^+ = V^-$ = 0V		± 20	± 200	nA
CMR	Input Common Mode Range	V_5 = 3.5V to 18V	0		V_5 – 1.6	V
I_{SC}	Output Short Circuit Current for Each Channel	$V_I^- - V_I^+ \geq 70mV$ V_{out} = 16.5V			0.85	A
		V_{out} = 6V			2.5	A
I_{CD}	Driver Transistor Current Capability	$V_I^- - V_I^+ \geq 70mV$ DC			300	mA
		Pulsed (**)			600	mA
V_{CSAT}	On Status Saturation Voltage	$V_I^- - V_I^+ \geq 70mV$ I_{CD} = 100mA I_{COUT} = 1.2A			1	V
I_{OL}	Output Leakage Current	$V_I^+ - V_I^- \geq 70mV$			250	µA

* $T_{ON} \leq$ 2.5 ms ; repetition time ≥ 30 ms.
** The maximum allowed supply voltage without limiting resistors is limited by the built-in protection zener diodes see V_{CZ}, V_{ZS} Spec. velues.

TEST AND APPLICATION CIRCUIT



APPLICATION INFORMATIONS (refer to application circuit)

D1 and D2 diodes are required only for reverse polarity protection.

If V_S may be higher than V_{ZS} a resistor R_S is necessary to limit the zener current I_{ZS}. In order to determine R_S value the following equations can be used :

1) $$\frac{V_{S\,MAX} - V_{D1} - V_{ZS\,min}}{R_S} < I_{ZS\,MAX}$$

2) $V_{S\,min} - V_{D1} - R_S - I_{SON\,MAX} > V_{ST\,min}$

where from T_{amb} = 25 °C :

- $V_{S\,MAX}$ and $V_{S\,min}$ are the maximum and minimum values of power supply voltage
- V_{D1} is the forward diode D1 voltage drop
- $V_{ZS\,min}$ = 20 V
- $I_{ZS\,MAX}$ = 30 mA for d.c. mode and $I_{ZS\,MAX}$ = 80 mA for pulsed mode (see Absolute maximum ratings)
- $I_{SOM\,MAX}$ = 30 mA
- $V_{ST\,min}$ = 3.5 V

If no R_S value can satisfy the system 1), 2) a more powerfull external zener D_Z = 18 V is required.

Then 1) becomes :

$$\frac{V_{S\,MAX} - V_{D1} - 18}{R_S} < I_{DZ\,MAX}$$

where $I_{DZ\,MAX}$ is the maximum allowed D_Z current.

V_A voltage cannot be higher than 20 V otherwise output overvoltage protection may be activated. Morever V_A must be less than 16 V if short circuit protection is required.

D_{Z2} = 22 to 24 V is a mandatory for output 7 protection if V_S may be higher than 26 V.

MOUNTING INSTRUCTION

The L9305A is assembled in a new plastic package, the Powerdip, in which 8 pins (from 9 to 16) are attached to the frame and remover the heat produced by the chip.

Figure 2 and 3 show two ways of heatsinking. In the first case, a PC board copper area is used as a heatsink l = 65 mm. While in the second case, the device is soldered to an external heatsink. In both examples, the thermal resistance junction-ambient is 35 °C/W.

Figure 2 : Example of Heatsink Using PC Board Copper (l = 65 mm).

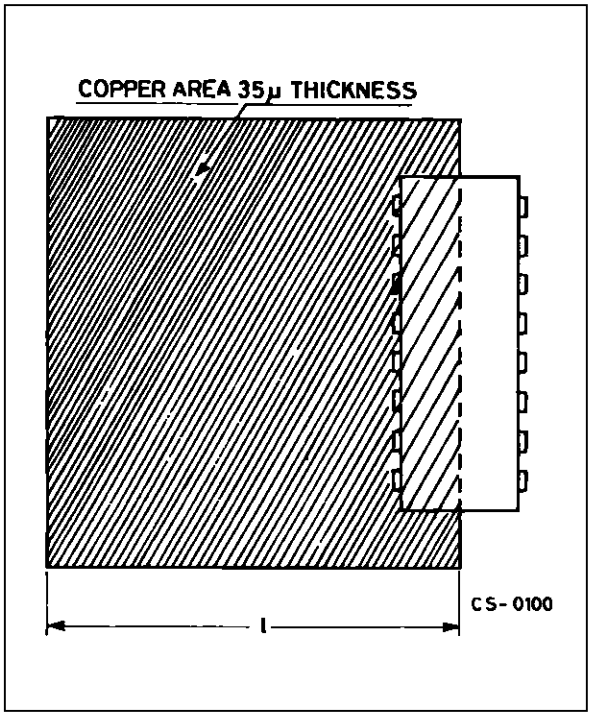
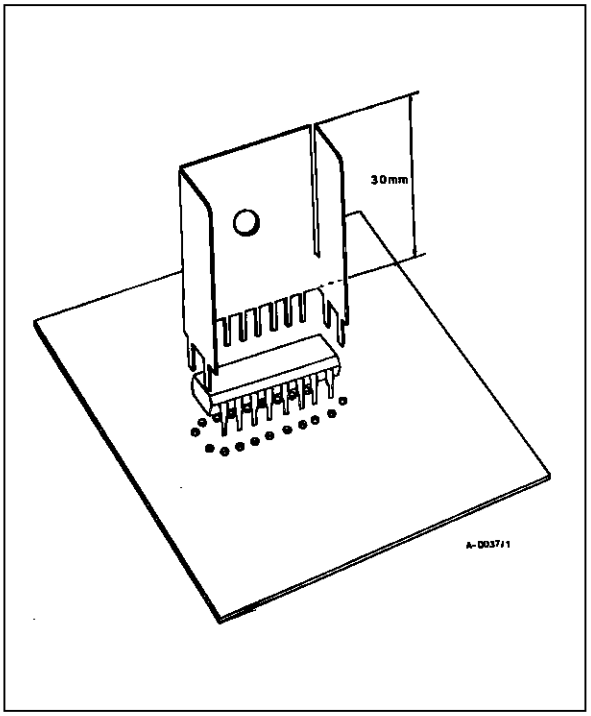


Figure 3 : Example of an External Heatsink.



POWERDIP16 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.85		1.40	0.033		0.055
b		0.50			0.020	
b1	0.38		0.50	0.015		0.020
D			20.0			0.787
E		8.80			0.346	
e		2.54			0.100	
e3		17.78			0.700	
F			7.10			0.280
I			5.10			0.201
L		3.30			0.130	
Z			1.27			0.050