

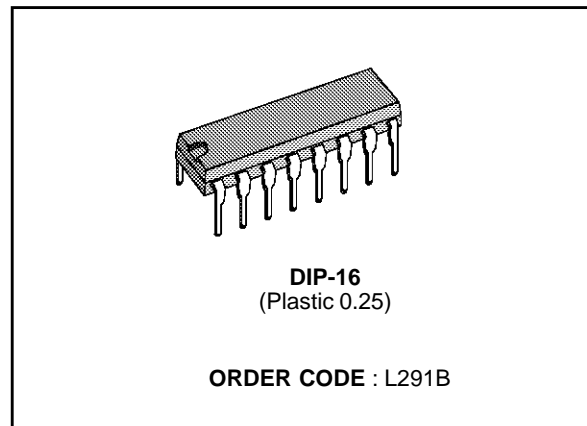
**5 BIT - D/A CONVERTER AND POSITION AMPLIFIER**

- 5 BIT D/A CONVERTER (1/2 LSB MAX LINEARITY ERROR);
- ERROR AMPLIFIER;
- POSITION AMPLIFIER.

**DESCRIPTION**

The L291, a monolithic LSI circuit in a 16-lead dual in-line plastic package, is intended for use with the L290 and L292 to form a complete 3 chip DC motor positioning system for applications such as carriage/daisy-wheel position control in typewriters.

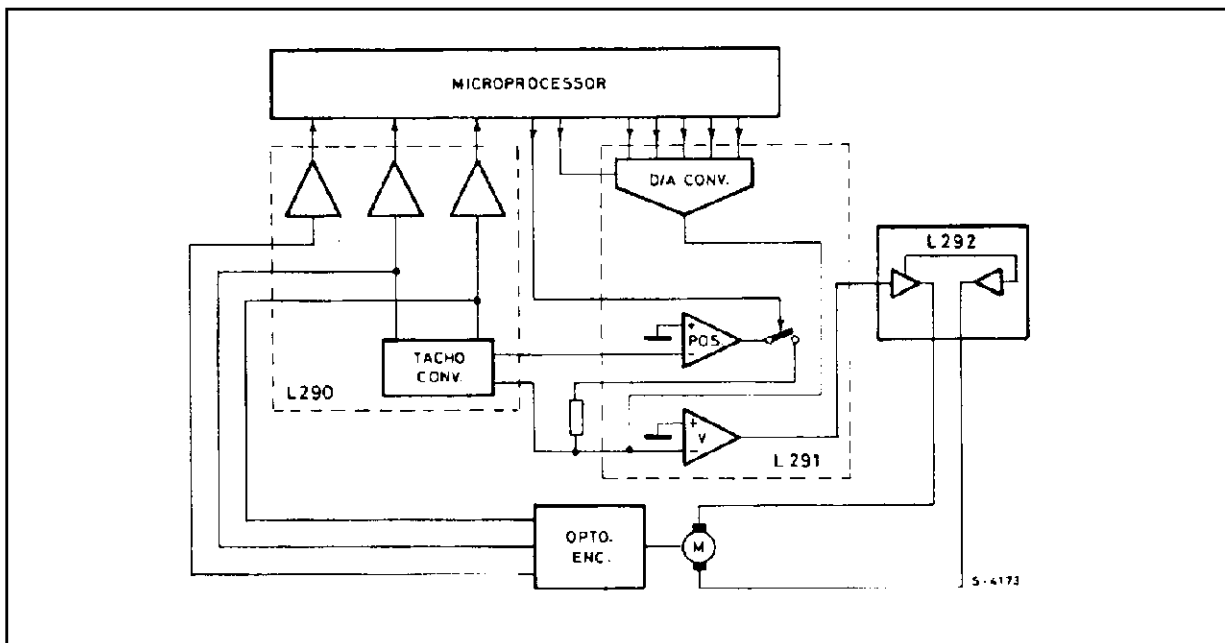
The L290/291/292 system can be directly controlled by a microprocessor.



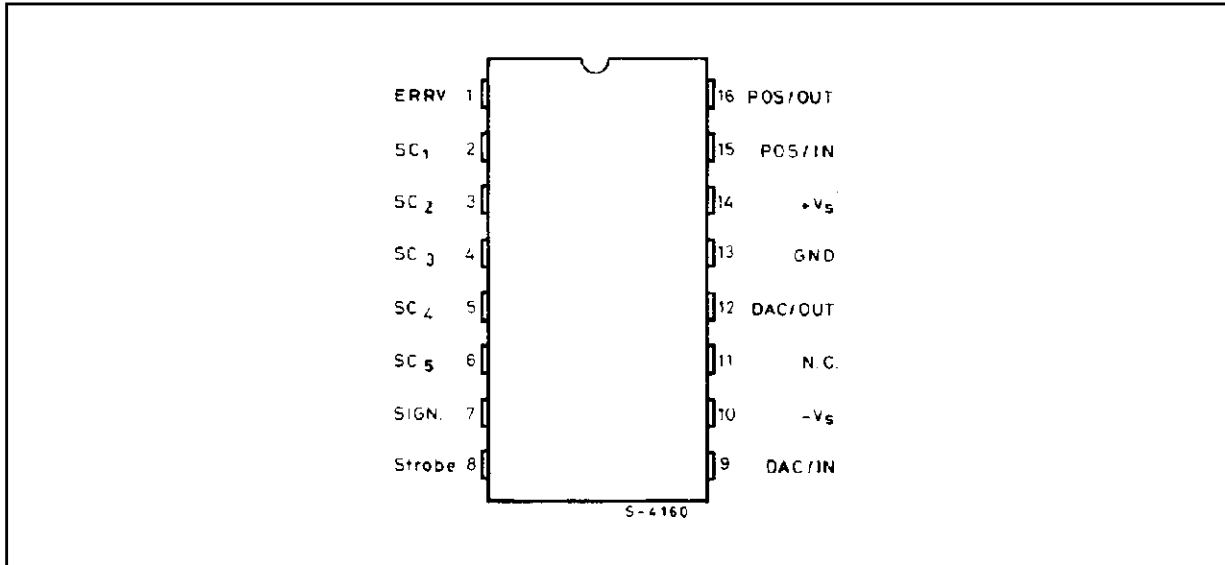
**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_s$	Supply Voltage	$\pm 15$	V
$P_{tot}$	Total Power Dissipation $T_{amb} = 70^\circ\text{C}$	1	W
$T_{stg}, T_j$	Storage and Junction Temperature	- 40 to 150	$^\circ\text{C}$

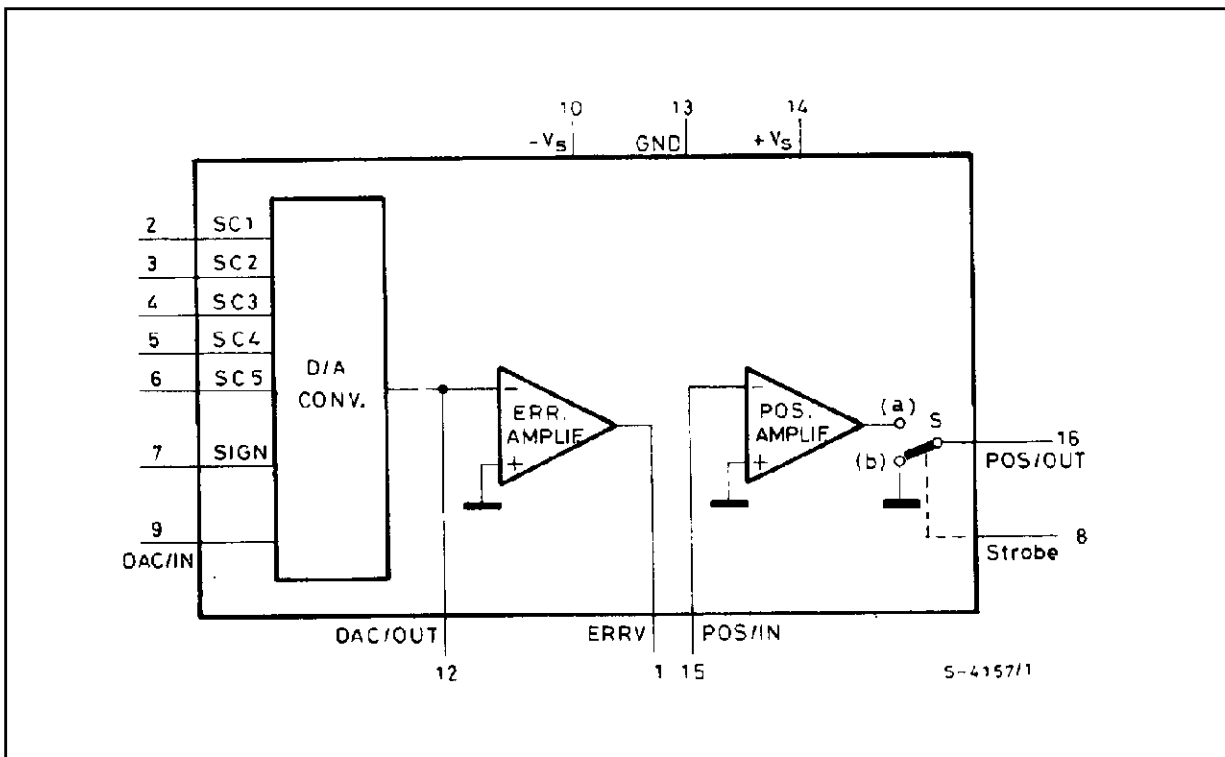
**SYSTEM BLOCK DIAGRAM**



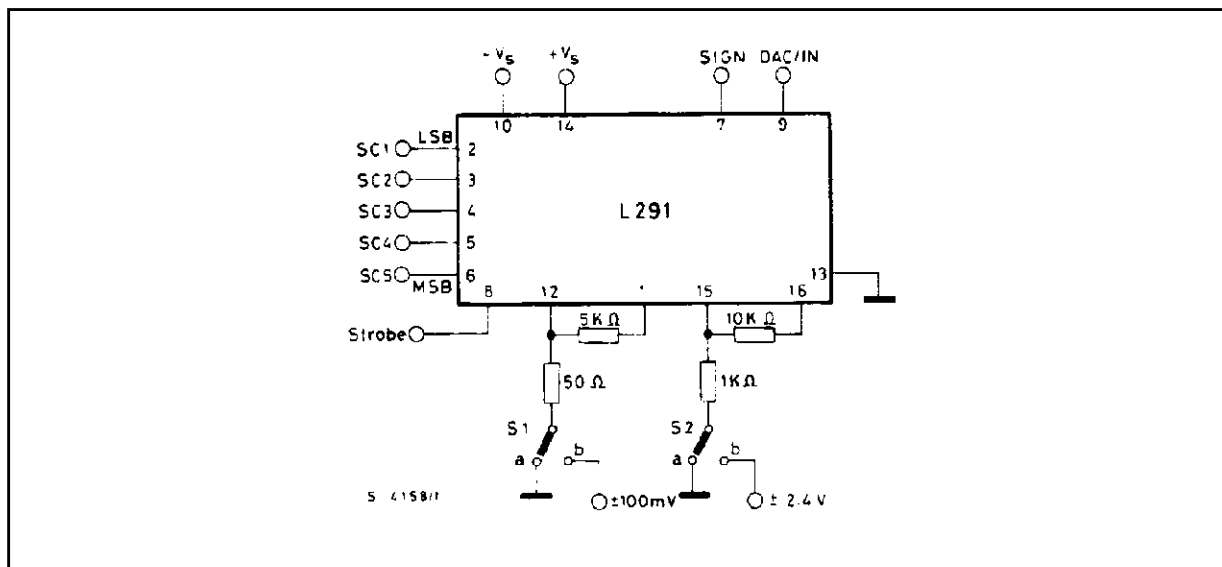
CONNECTION DIAGRAM (top view)



BLOCK DIAGRAM



## TEST CIRCUIT



## THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th-j-amb}$	Thermal resistance junction-ambient	Max	80 °C/W

**ELECTRICAL CHARACTERISTICS** (refer to the circuit, S1 and S2 in (a),  $V_s = \pm 12$  V,  $T_{amb} = 25$  °C, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_s$	Supply Voltage		$\pm 10$		$\pm 15$	V
$I_d$	Quiescent Drain Current			6.5	10	mA

## POSITION AMPLIFIER

$V_{strobe}$	Enable Voltage Level	$V_L$ (S in (a)) *	0		0.8	V
		$V_H$ (S in (b)) *	2.4		$+V_s$	V
$V_{os}$	Output Offset Voltage (pin 16)	$V_{strobe} = V_L$ ; $G_V = 20$ dB			$\pm 50$	mV
$I_b$	Input Bias Current (pin 15)	$V_{strobe} = V_L$			0.3	$\mu$ A
$V_o$	Output Voltage Swing (pin 16)	$V_{strobe} = V_L$ ; S2 in (b); $V_s = \pm 10.8$ V	$\pm 9$			V
$V_R$	Residual Output Voltage (pin 16)	$V_{strobe} = V_H$			$\pm 20$	mV

\* See block diagram and the note for Position Amplifier.

**ELECTRICAL CHARACTERISTICS** (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
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**D/A CONVERTER**

$I_{ref}$	Current Reference Input Range (pin 9)		0.3		1.2	mA	
$V_{os}$	Current Reference Offset Voltage (pin 9)	$I_{ref} = 0.3$ to $1.2$ mA All Inputs High			$\pm 20$	mV	
$I_o$	Output Current Range (pin 12)				1.4	mA	
$I_o$	Output Current (pin 12)	$I_{ref} = 0.722$ mA SC1 to SC5 = L	SIGN = L( $I_{o1}$ )	-1.358	-1.4	-1.442	mA
			SIGN = H( $I_{o2}$ )	+1.358	+1.4	+1.442	
$\Delta I_o$	Linearity Error	$I_{o1} + I_{o2}$	-21		+21	$\mu$ A	
		$I_{ref} = 0.722$ mA			1.61	%FS	
$I_{os}$	Pin 12 Output Offset Current (including Error Amplifier bias current)	All Inputs High			$\pm 0.4$	$\mu$ A	
$V_L$	Low Voltage Level (digital inputs)	SC1 = LSB	0		0.8	V	
$V_H$	High Voltage Level (digital inputs)	SC5 = MSB	2.4		$+V_S$	V	
$I_L$	Digital Input Current (low state)	$V_L = 0.4$ V			-50	$\mu$ A	
$I_H$	Digital Inputs Current (high state)	$V_H = +V_S$			1	$\mu$ A	

**ERROR AMPLIFIER**

$V_{os}$	Output Offset Voltage (pin 1)	$I_{ref} = 0.5$ mA; All Inputs High $G_v = 40$ dB			$\pm 200$	mV
$I_o$	Output Current (pin 1)				$\pm 5$	mA
$V_o$	Output Voltage Swing (pin 1)	All Inputs High S1 in (b); $R_L = 10$ K $\Omega$	$\pm 7.4$		$\pm 8.4$	Vp

**D/A CONVERTER**

The L291 contains a 5-bit D/A converter accepting a binary code and generating a bipolar output current, the polarity of which depends on the SIGN input. The amplitude of the output current is a multiple of a reference current  $I_{ref}$ .

The maximum output current is

$$I_{FS} = \pm \frac{31}{16} I_{ref}$$

The following table shows the value of  $I_o$  for different input codes. Note that the input bits are active low.

DIGITAL INPUT WORD						Output Current $I_o$
SIGN	SC5 MSB	SC4	SC3	SC2	SC1 LSB	
L	L	L	L	L	L	$-\frac{31}{16} I_{ref}$
L	H	H	H	H	L	$-\frac{1}{16} I_{ref}$
X	H	H	H	H	H	0
H	H	H	H	H	L	$+\frac{1}{16} I_{ref}$
H	L	L	L	L	L	$+\frac{31}{16} I_{ref}$

X = indifferent

L = low

H = High

This D/A converter has a maximum linearity error or equal to  $\pm 1/2$  LSB (or  $\pm 1.61\%$  Full Scale); that guarantees its monotonicity.

**ERROR AMPLIFIER**

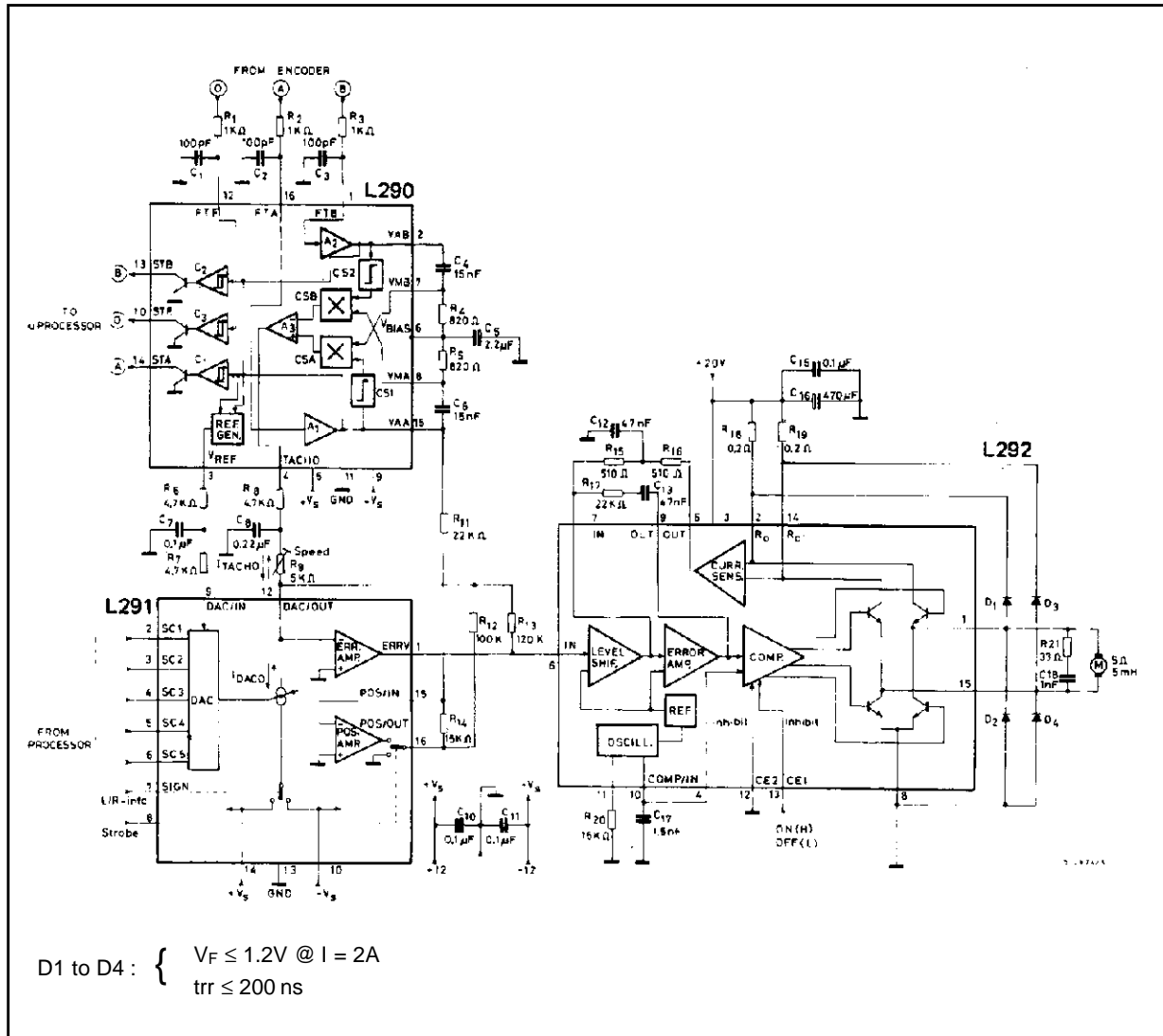
In order to have a good stability, the Error Amplifier must work with a closed loop gain greater or equal than 20 dB.

**POSITION AMPLIFIER**

It is inserted by means of the strobe signal, TTI and microprocessor compatible. Its output is connected to pin 16 when  $V_{strobe} = \text{Low}$  ; pin 16 grounded for  $V_{strobe} = \text{High}$ .

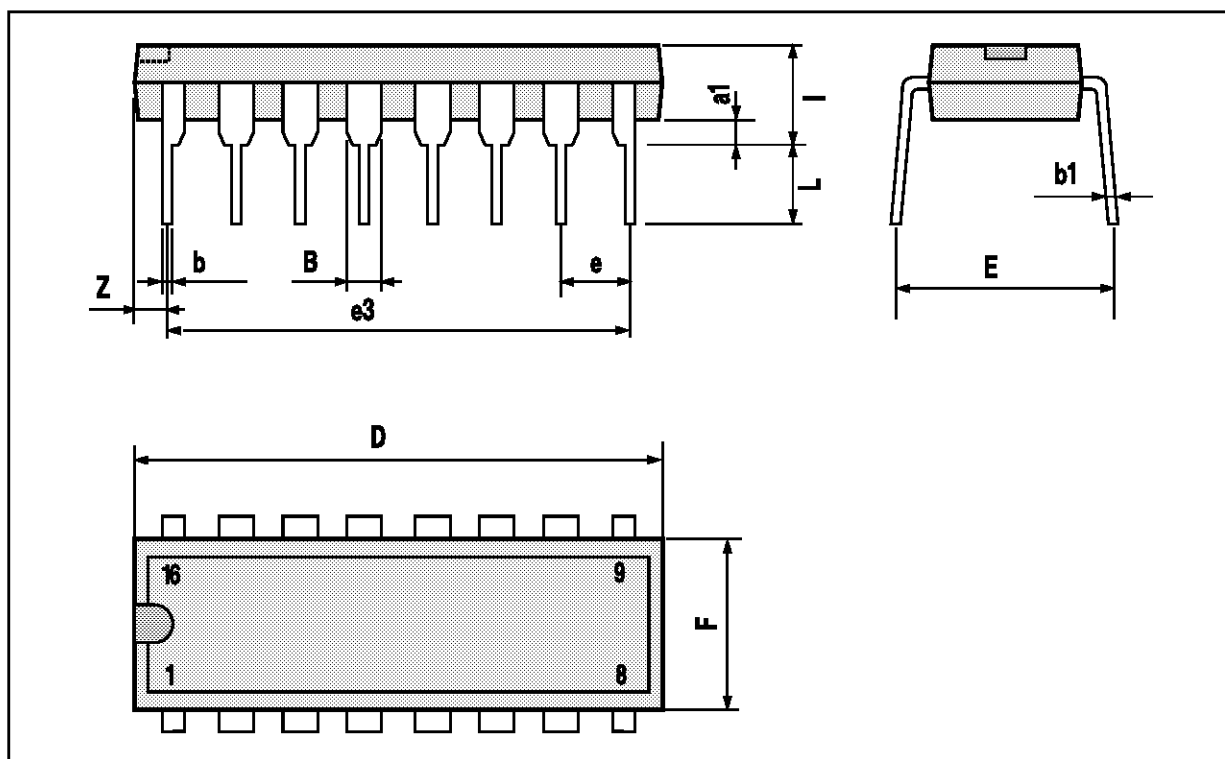
**SYSTEM DESCRIPTION** : refer to the L292 data sheet.

Figure 1. Complete Application Circuit.



## DIP-16 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



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