L298

Dual Full-Bridge Driver

Product Specification

Specification Revision History:

Version	Date	Description
2025-02-A1	2025-02	New

Contents

1、General Description

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt package. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

Features:

- Operating supply voltage up to 46V
- Total DC current up to 4A
- Low saturation voltage
- Over-temperature protection
- Logical ”0” input voltage up to 1.5V (High noise immunity)

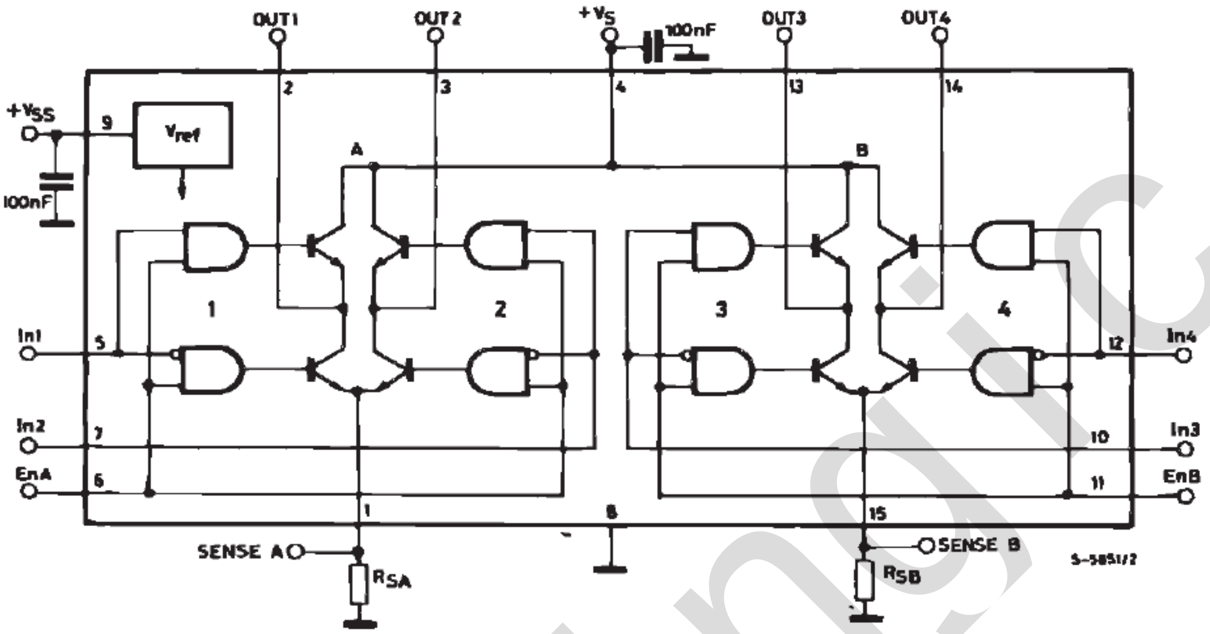
Ordering Information:

Tube packing specifications:

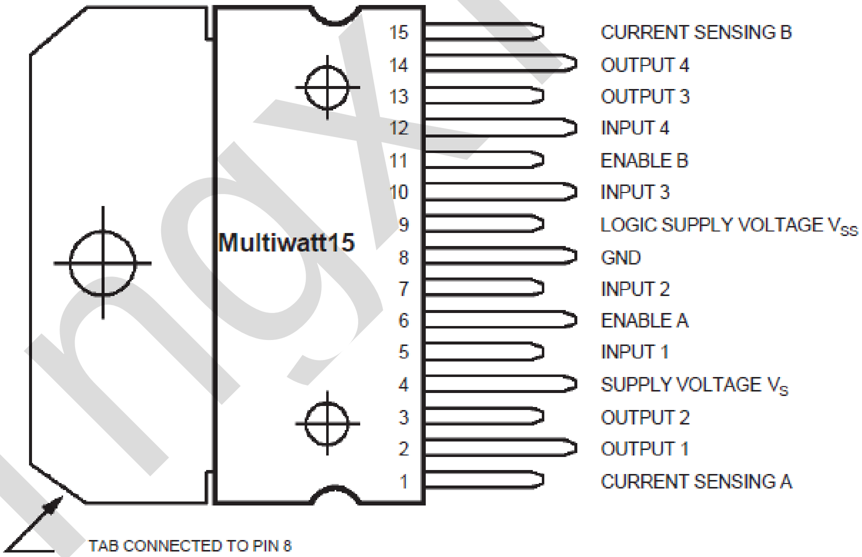
Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity
L298N(LX)	ZIP-15	L298N	25 PCS/tube	16 tube/box	400 PCS/box

2、Block Diagram And Pin Description

2.1、Block Diagram



2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1, 15	Sense A, Sense B	Between this pin and ground is connected the sense resistor to control the current of the load.
2, 3	Out 1, Out 2	Outputs of the Bridge A; the current that flows through the load connected between these two pins is monitored at pin 1.
4	VS	Supply Voltage for the Power Output Stages. A non-inductive 100nF capacitor must be connected between this pin and ground.
5, 7	Input 1, Input 2	TTL Compatible Inputs of the Bridge A.
6, 11	Enable A, Enable B	TTL Compatible Enable Input: the L state disables the bridge A (enable A) and/or the bridge B (enable B).
8	GND	Ground.
9	VSS	Supply Voltage for the Logic Blocks. A100nF capacitor must be connected between this pin and ground.
10, 12	Input 3, Input 4	TTL Compatible Inputs of the Bridge B.
13, 14	Out 3, Out 4	Outputs of the Bridge B. The current that flows through the load connected between these two pins is monitored at pin 15.

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, All voltage referenced to Vss, unless otherwise specified)

Characteristic	Symbol	Conditions	Value	Unit
Power Supply	V_S	-	50	V
Logic Supply Voltage	VSS	-	7	V
Input and Enable Voltage	VI,Ven	-	-0.3 to 7	V
Peak Output Current (each Channel)	I_O	Non Repetitive (t=100us)	3	A
		Repetitive (80% on –20% off; ton=10ms)	2.5	A
		DC Operation	2	A
Sensing Voltage	Vsens	-	-1 to 2.3	mW
Total Power Dissipation (Tcase=75℃)	Ptot	-	25	℃
Junction Operating Temperature	Top	-	-25 to 130	℃
Storage and Junction Temperature	Tstg, Tj	-	-40 to 150	℃

3.2、Thermal Data

Parameter	Symbol	Conditions	Value	Unit
Thermal Resistance Junction-case (Max.)	$R_{th\ j\text{-}case}$	-	3	℃/W
Thermal Resistance Junction-ambient (Max.)	$R_{th\ j\text{-}amb}$	-	35	℃/W

(*) Mounted on aluminum substrate

3.3、Electrical Characteristics

(V_S=42V; V_{SS}=5V, Tj=25℃, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (pin 4)	V_S	Operative Condition	V_{IH}+2.5	-	46	V
Logic Supply Voltage (pin 9)	V_{SS}	-	4.5	5	7	V
Quiescent Supply Current (pin 4)	I_S	V_{en}=H; I_L=0; Vi=L	-	13	22	mA
		V_{en}=H; I_L=0; Vi=H	-	50	70	mA
		V_{en}=L; Vi=X	-	-	4	mA
Quiescent Current from V_{SS} (pin 9)	I_{SS}	V_{en}=H; I_L=0; Vi=L	-	24	36	mA
		V_{en}=H; I_L=0; Vi=H	-	7	12	mA
		V_{en}=L; Vi=X	-	-	6	mA
Input Low Voltage (pins 5, 7, 10, 12)	V_{iL}	-	-0.3	-	1.5	V
Input High Voltage (pins 5, 7, 10, 12)	V_{iH}	-	2.3	-	V_{SS}	V
Low Voltage Input Current (pins 5, 7, 10, 12)	I_{iL}	V_i=L	-	-	-10	uA
High Voltage Input Current (pins 5, 7, 10, 12)	I_{iH}	V_i=H≤V_{SS}-0.6V	-	30	100	uA
Enable Low Voltage (pins 6, 11)	V_{en}=L	-	–0.3	-	1.5	V
Enable High Voltage (pins 6, 11)	V_{en}=H	-	2.3	-	V_{SS}	V
Low Voltage Enable Current (pins 6, 11)	I_{en}=L	V_{en}=L	-	-	-10	uA
High Voltage Enable Current (pins 6, 11)	I_{en}=H	V_{en}=H≤V_{SS}-0.6V	-	30	100	uA
Source Saturation Voltage	$V_{CEsat(H)}$	I_L=1A	0.95	1.35	1.7	V
		I_L=2A	-	2	2.7	V
Sink Saturation Voltage	$V_{CEsat(L)}$	I_L=1A(5)	0.85	1.2	1.6	V
		I_L=2A(5)	-	1.7	2.3	V
Total Drop	V_{CEsat}	I_L=1A(5)	1.80	-	3.2	V
		I_L=2A(5)	-	-	4.9	V
Sensing Voltage (pins 1, 15)	Vsens	-	-1 (1)	-	2	V
Source Current Turn-off Delay	T1(V_i)	0.5V_i to 0.9I_L(2)(4)	-	1.5	-	us
Source Current Fall Time	T2(V_i)	0.9I_L to 0.1I_L(2)(4)	-	0.2	-	us
Source Current Turn-on Delay	T3(V_i)	0.5V_i to 0.1I_L(2)(4)	-	2	-	us
Source Current Rise Time	T4(V_i)	0.1I_L to 0.9I_L(2)(4)	-	0.7	-	us
Sink Current Turn-off Delay	T5(V_i)	0.5V_i to 0.9I_L(3)(4)	-	0.7	-	us

Sink Current Fall Time	$T6(V_i)$	$0.9I_L$ to $0.1I_L$ (3)(4)	-	0.25	-	us
Sink Current Turn-on Delay	$T7(V_i)$	$0.5V_i$ to $0.9I_L$ (3)(4)	-	1.6	-	us
Sink Current Rise Time	$T8(V_i)$	$0.1I_L$ to $0.9I_L$ (3)(4)	-	0.2	-	us
Commutation Frequency	$fc(V_i)$	I_L=2A	-	25	40	KHz
Source Current Turn-off Delay	$T1(V_{en})$	$0.5V_{en}$ to $0.9I_L$ (2)(4)	-	3	-	us
Source Current Fall Time	$T2(V_{en})$	$0.9I_L$ to $0.1I_L$ (2)(4)	-	1	-	us
Source Current Turn-on Delay	$T3(V_{en})$	$0.5V_{en}$ to $0.1I_L$ (2)(4)	-	0.3	-	us
Source Current Rise Time	$T4(V_{en})$	$0.1I_L$ to $0.9I_L$ (2)(4)	-	0.4	-	us
Sink Current Turn-off Delay	$T5(V_{en})$	$0.5V_{en}$ to $0.9I_L$ (3)(4)	-	2.2	-	us
Sink Current Fall Time	$T6(V_{en})$	$0.9I_L$ to $0.1I_L$ (3)(4)	-	0.35	-	us
Sink Current Turn-on Delay	$T7(V_{en})$	$0.5V_{en}$ to $0.9I_L$ (3)(4)	-	0.25	-	us
Sink Current Rise Time	$T8(V_{en})$	$0.1I_L$ to $0.9I_L$ (3)(4)	-	0.1	-	us

Note:

(1) Sensing voltage can be -1V for t<50usec; in steady state V_{sens} min>-0.5V.

(2) See fig. 2.

(3) See fig. 4.

(4) The load must be a pure resistor.

Figure 1: Typical Saturation Voltage vs. Output Current.

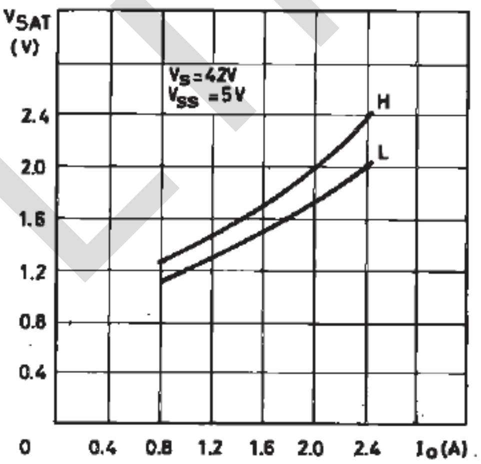
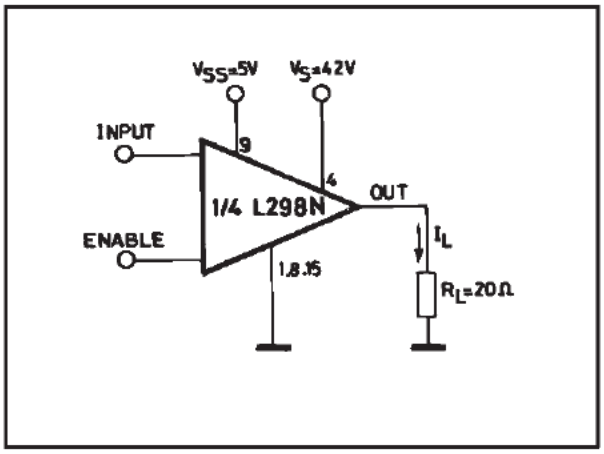


Figure 2: Switching Times Test Circuits.



Note : For INPUT Switching, set EN = H
For ENABLE Switching, set IN = H

Figure 3: Source Current Delay Times vs. Input or Enable Switching.

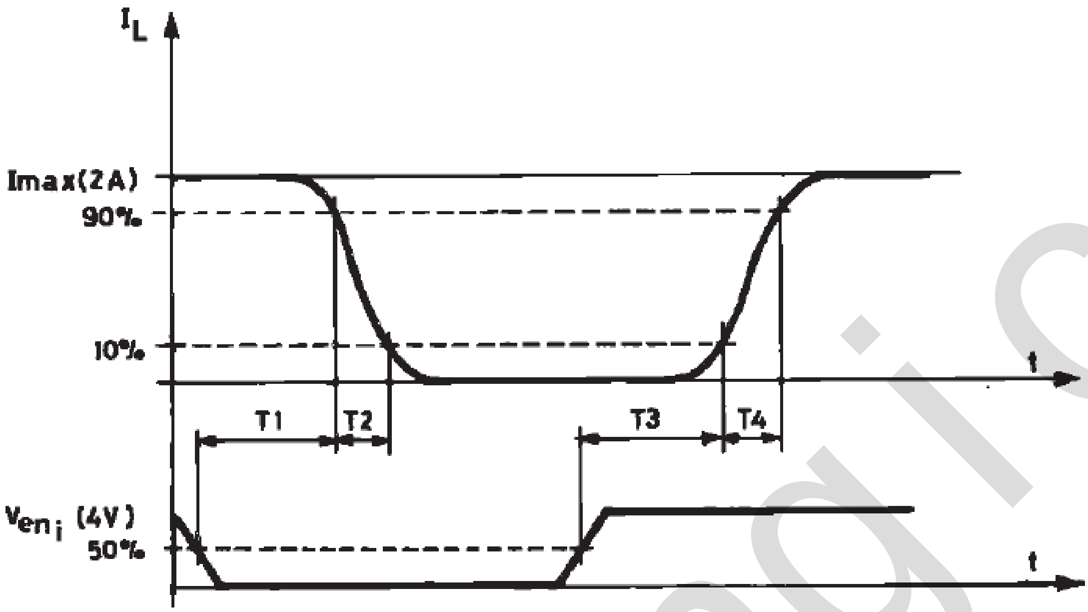
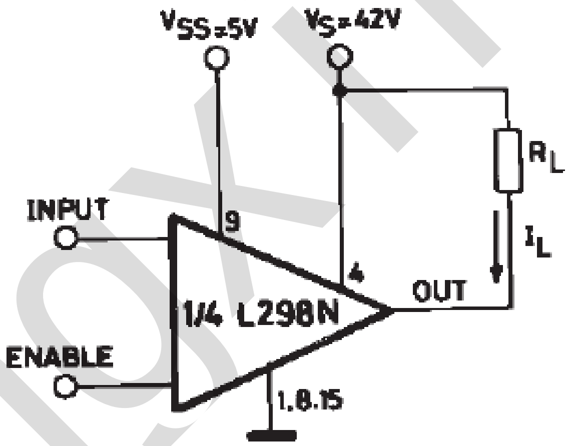


Figure 4: Switching Times Test Circuits.



Note: For INPUT Switching, set EN=H
For ENABLE Switching, set IN=L

Figure 5: Sink Current Delay Times vs. Input 0 V Enable Switching.

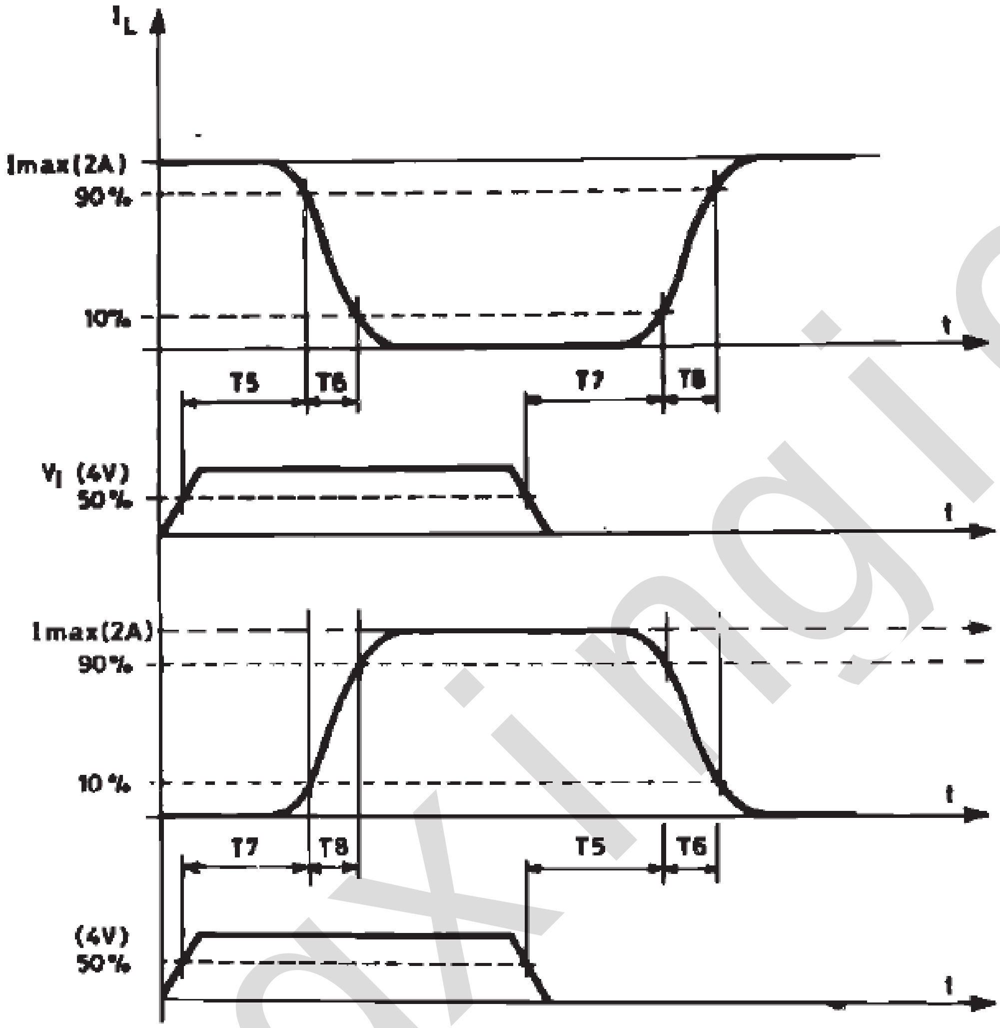
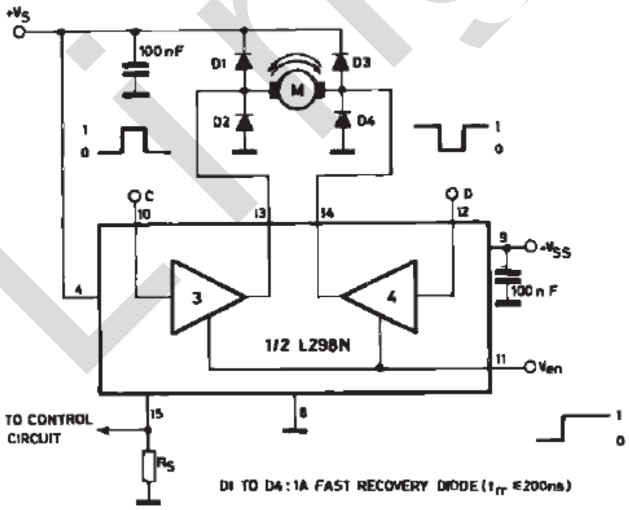


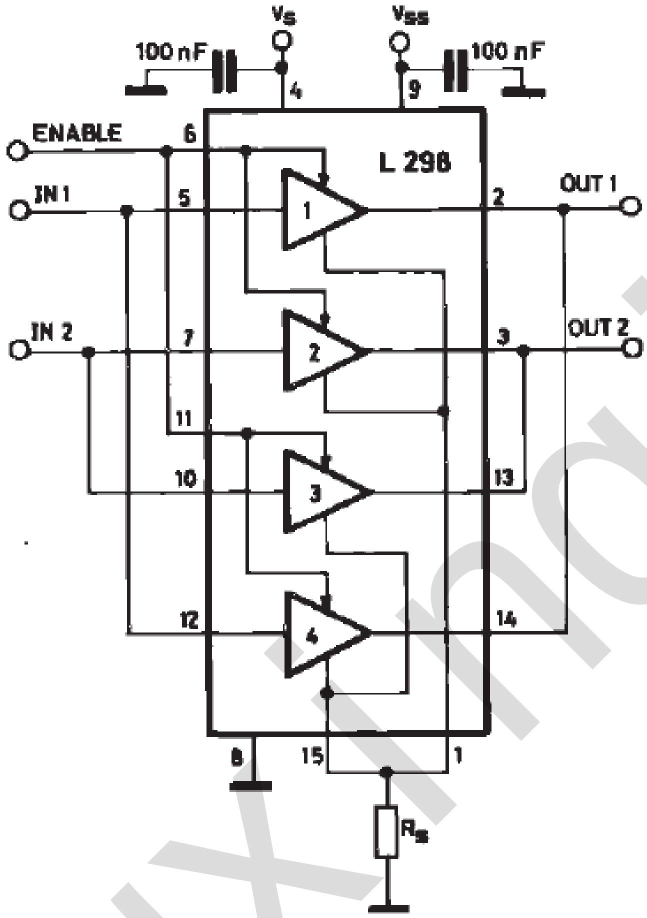
Figure 6: Bidirectional DC Motor Control.



Inputs		Function
V_{en} = H	C = H ; D = L	Forward
	C = L ; D = H	Reverse
	C = D	Fast Motor Stop
V_{en} = L	C = X ; D = X	Free Running Motor Stop

L = Low H = High X = Don't care

Figure 7: For higher currents, outputs can be paralleled. Take care to parallel channel 1 with channel4 and channel2 with channel3.



4、Application Information

4.1、Power Output Stage

The L298 integrates two power output stages (A; B). The power output stage is a bridge configuration and its outputs can drive an inductive load in common or differenzial mode, depending on the state of the inputs. The current that flows through the load comes out from the bridge at the sense output: an external resistor (R_{SA} ; R_{SB}.) allows to detect the in-tensity of this current.

4.2、Input Stage

Each bridge is driven by means of four gates the input of which are In1; In2 ; EnA and In3 ; In4 ; EnB. The In inputs set the bridge state when The En input is high; a low state of the En input inhibits the bridge. All the inputs are TTL compatible.

4.3、Suggestions

A non inductive capacitor, usually of 100nF, must be foreseen between both V_S and V_{SS}, to ground, as near as possible to GND pin. When the large capacitor of the power supply is too far from the IC, a second smaller one must be foreseen near the L298.

The sense resistor, not of a wire wound type, must be grounded near the negative pole of V_S that must be near the GND pin of the I.C.

Each input must be connected to the source of the driving signals by means of a very short path. Turn-On and Turn-Off: Before to Turn-ON the Supply Voltage and before to Turn it OFF, the Enable input must be driven to the Low state.

4.4、Applications

Fig 6 shows a bidirectional DC motor control Schematic Diagram for which only one bridge is needed. The external bridge of diodesD1 to D4 is made by four fast recovery elements (trr≤200nsec) that must be chosen of a VF as low as possible at the worst case of the load current.

The sense output voltage can be used to control the current amplitude by chopping the inputs, or to provide overcurrent protection by switching low the enable input.

The brake function (Fast motor stop) requires that the Absolute Maximum Rating of 2 Amps must never be overcome.

When the repetitive peak current needed from the load is higher than 2 Amps, a paralleled configuration can be chosen (See Fig.7).

An external bridge of diodes are required when inductive loads are driven and when the inputs of the IC are chopped; Shottky diodes would be preferred.

This solution can drive until3 Amps In DC operation and until 3.5 Amps of a repetitive peak current.

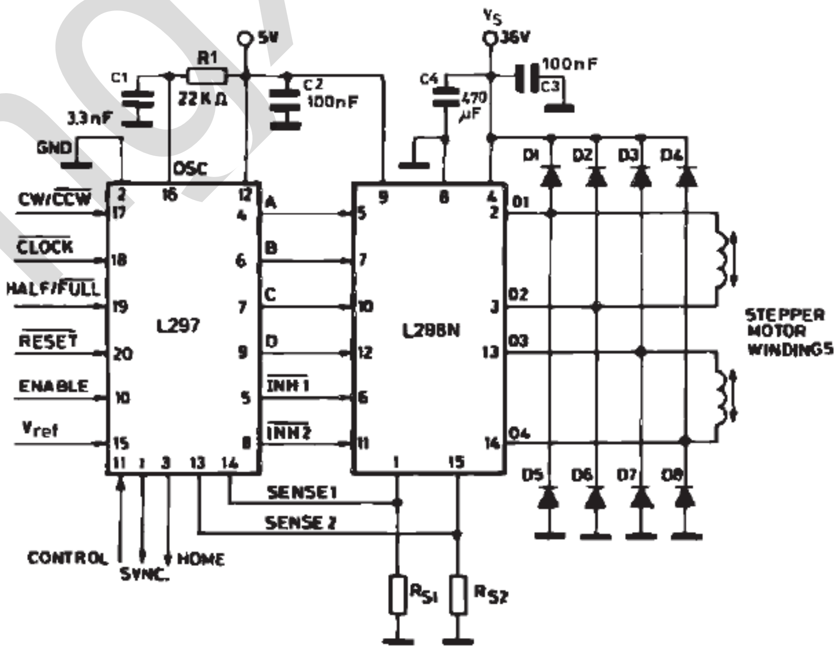
On Fig 8it is shown the driving of a two phase bipolar stepper motor; the needed signals to drive the inputs of the L298 are generated, in this example, from the IC L297.

Fig 9 shows an example of P.C.B. designed for the application of Fig 8.

Fig 10 shows a second two phase bipolar stepper motor control circuit where the current is controlled by the I.C. L6506.

Figure 8: Two Phase Bipolar Stepper Motor Circuit.

This circuit drives bipolar stepper motors with winding currents up to 2 A. The diodes are fast 2 A types.



$R_{S1} = R_{S2} = 0.5\,\Omega$

D1 to D8 = 2 A Fast diodes { $V_F \leq 1.2$ V @ I = 2 A; trr ≤ 200 ns }

Figure 9: Suggested Printed Circuit Board Layout for the Circuit of fig. 8 (1:1 scale).

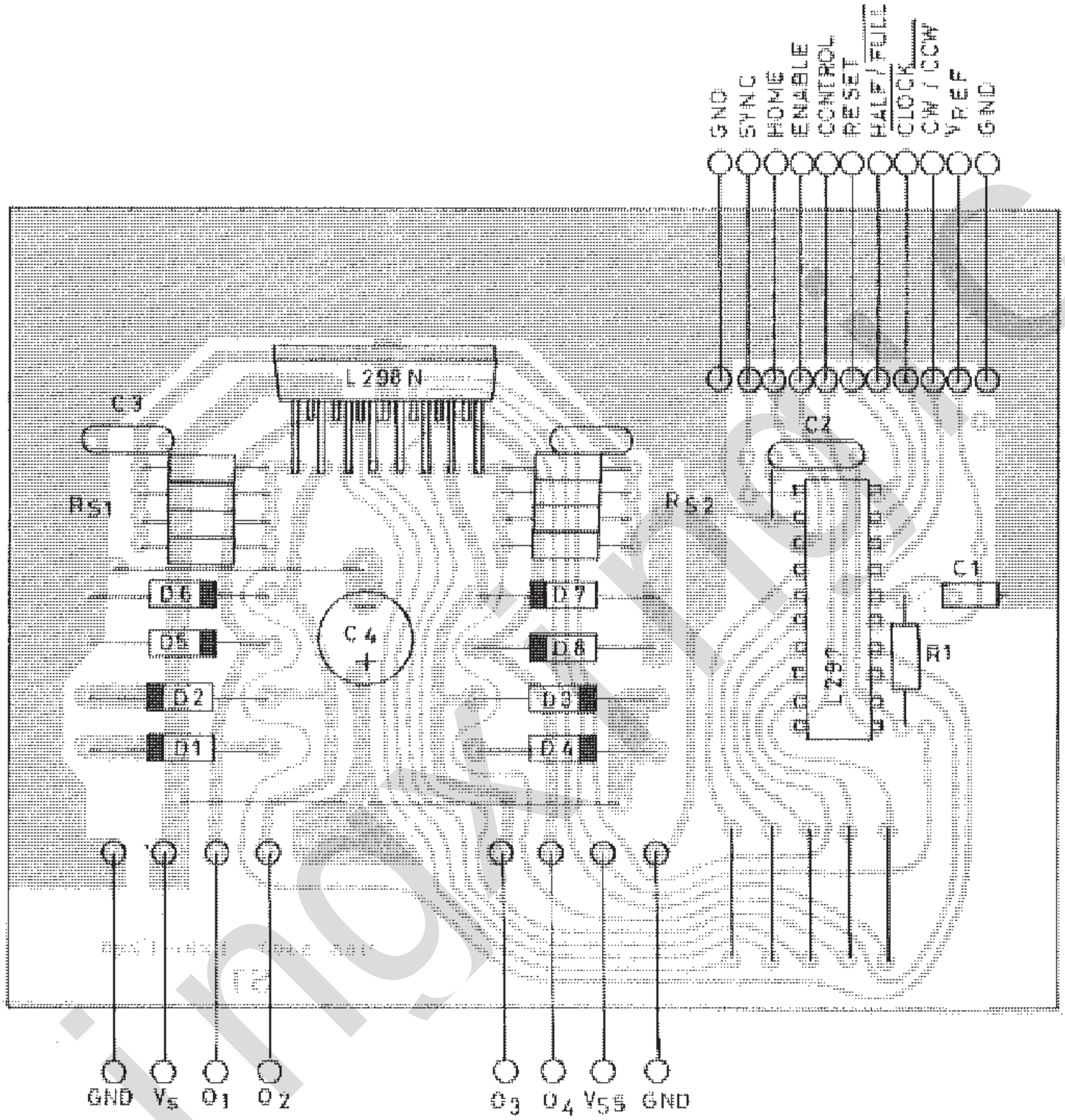
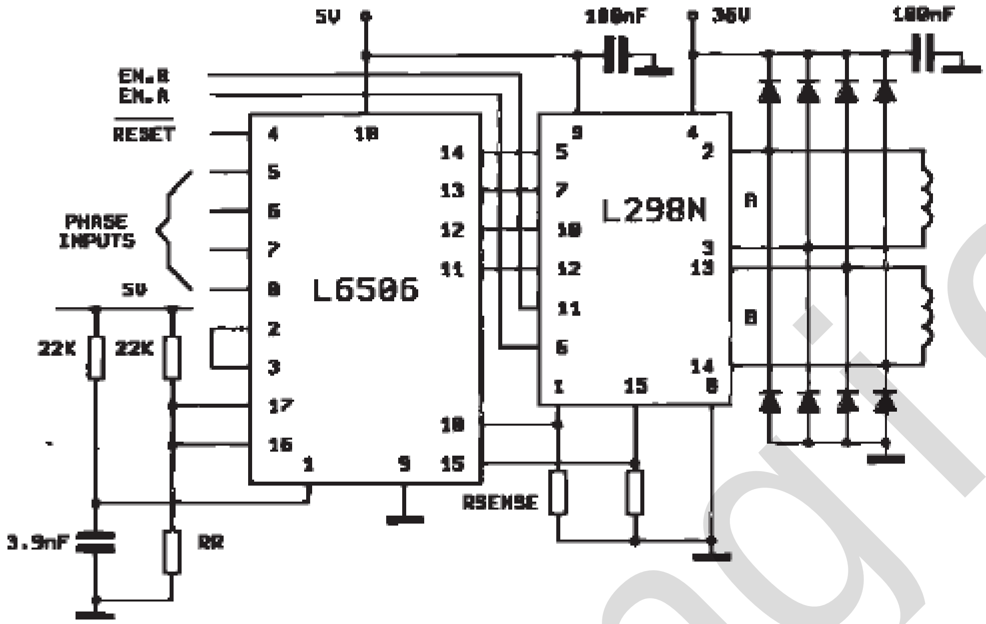


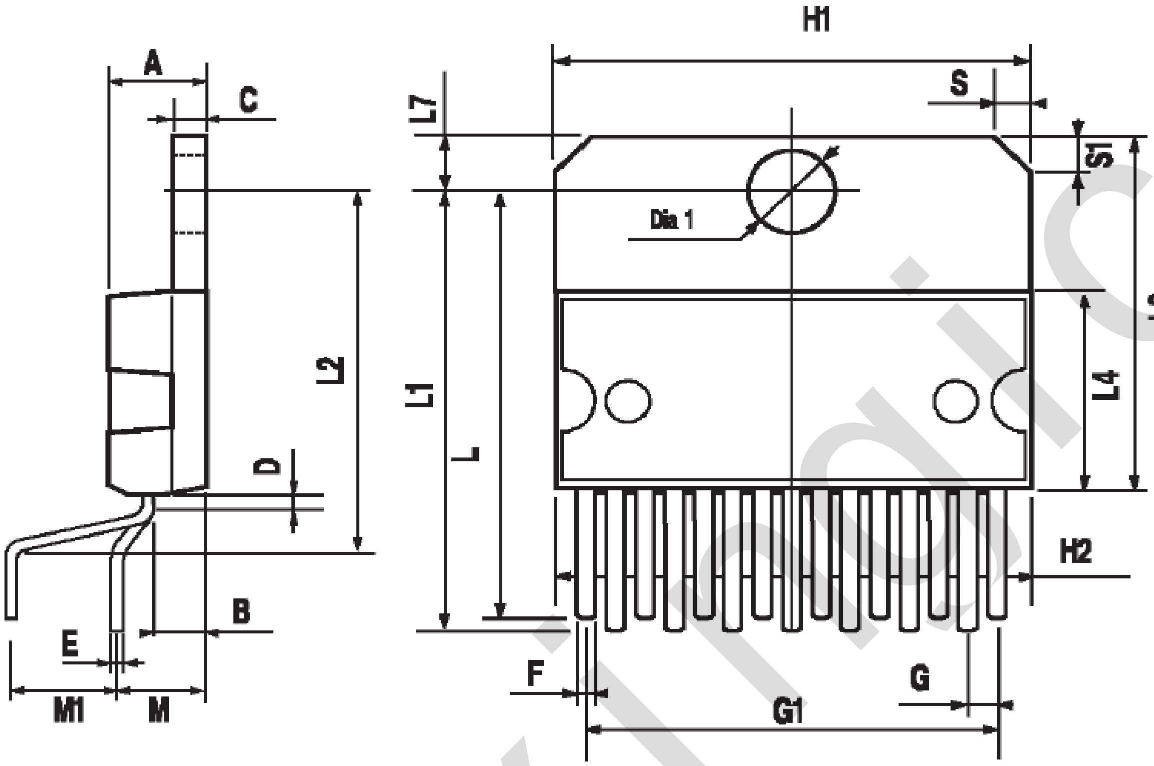
Figure 10: Two Phase Bipolar Stepper Motor Control Circuit by Using the Current Controller L6506.



R_R and R_{sense} depend from the load current

5、Package Information

5.1、Multiwatt15 V(ZIP-15)



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			5			0.197
B			2.65			0.104
C			1.6			0.063
D		1			0.039	
E	0.49		0.55	0.019		0.022
F	0.66		0.75	0.026		0.030
G	1.02	1.27	1.52	0.040	0.050	0.060
G1	17.53	17.78	18.03	0.690	0.700	0.710
H1	19.6			0.772		
H2			20.2			0.795
L	21.9	22.2	22.5	0.862	0.874	0.886
L1	21.7	22.1	22.5	0.854	0.870	0.886
L2	17.65		18.1	0.695		0.713
L3	17.25	17.5	17.75	0.679	0.689	0.699
L4	10.3	10.7	10.9	0.406	0.421	0.429
L7	2.65		2.9	0.104		0.114
M	4.25	4.55	4.85	0.167	0.179	0.191
M1	4.63	5.08	5.53	0.182	0.200	0.218
S	1.9		2.6	0.075		0.102
S1	1.9		2.6	0.075		0.102
Dia1	3.65		3.85	0.144		0.152

6、Statements And Notes

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