Dual full bridge driver

Overview

L298N is a special driver chip for double full-bridge stepper motor, which contains 4 channel logic drive circuit. It is a special driver for two-phase and four-phase stepper motors, which can drive two two-phase or one four-phase stepper motors at the same time, and contains two high-voltage and high-current double full-bridge drivers with two H-bridges. Receiving standard TTL logic level signal, it can drive the stepper motor below 36V and 2A, and the output voltage can be adjusted directly through the power supply; The chip can provide the analog timing signal directly from the I/O port of the microcontroller. There are two enable inputs to control the operation and cut-off of the two H-bridges respectively, and the emitter of the lower transistor of each bridge is connected, and a detection resistor is connected to the outside. Another logic power input allows the logic circuit to operate at a lower voltage.

The L298N is packaged in Multiwatt15.

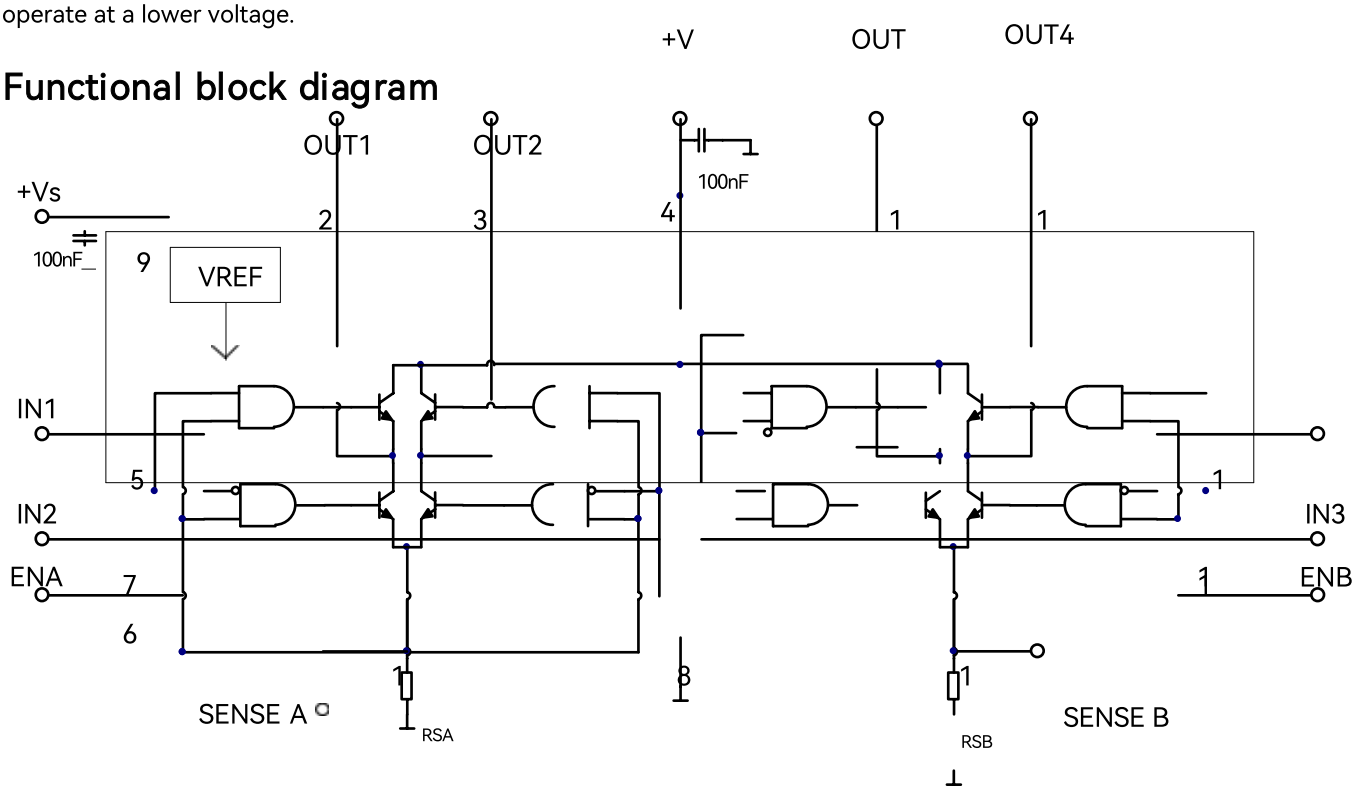
Main characters

- Operating voltage up to 36V.
- Total DC current up to 4A.
- Saturation pressure decreases.
- Built-in high temperature protection.
- Logic "0" potential input voltage up to 1.5V

Main application field

- Electronic toys
- Coin counting machine

Functional block diagram



Pin specification

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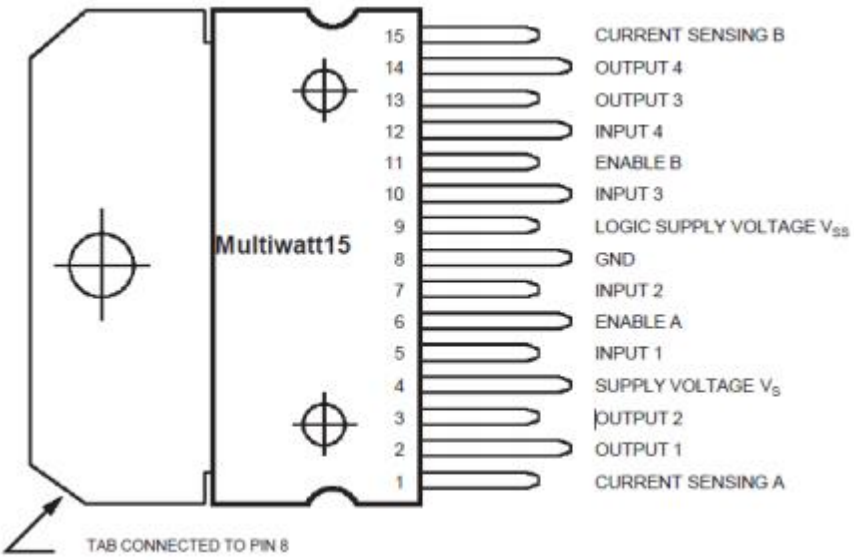


Pin No.	Pin name	I/O	Description
1	SENSING A	I	An indirect detection resistor in the foot and ground controls the looad current
2	OUTPUT 1	Oo	A bridge output, output current is monitored by pin 1
3	OUTPUT 2	O	
4	VS	P	To power the output, ground through a non-inductive capacitor
5	INPUT 1	I	TTL compatible input for bridge A
6	ENABLE A	I	TTL compatible enable input, input low level to bridge cutoff
7	INPUT 2	I	Same 5
8	GND	P	Load
9	VSS	P	The logical unit supplies power and is grounded through a 100nF capacitor
10	INPUT 3	I	B-bridge TTL compatible input
11	ENABLE B	I	TTL compatible enable input, input low level to bridge cutoff
12	INPUT 4	I	B-bridge TTL compatible input
13	OUTPUT 3	O	B bridge output, the output current is monitored by pin 15
14	OUTPUT 4	O	
15	SENSING B	I	Same 1

Limited Parameter

Parameter	Identification	Value
Power supply Voltage(*Note1)	Vs	38V
Logic supply voltage	Vss	7V
Input and enable terminal voltages	Vi，en	-3 to 7 V
Package output current (per channel) Non-repetitive (t=100us)	Io	3A

Repeated (80%on-20%Off, ton=10ms) DC operation		2.5A 2A
Power supply Voltage	Vsens	-1 to 2.3 V
Logic supply voltage	Ptot	25W

*Note1: The maximum supply voltage must be established in the range where both the supply and output peak voltage are less than this value.

Electrical specification

Conditions: (Vs=42V,Vss=5V,Tj=25℃)

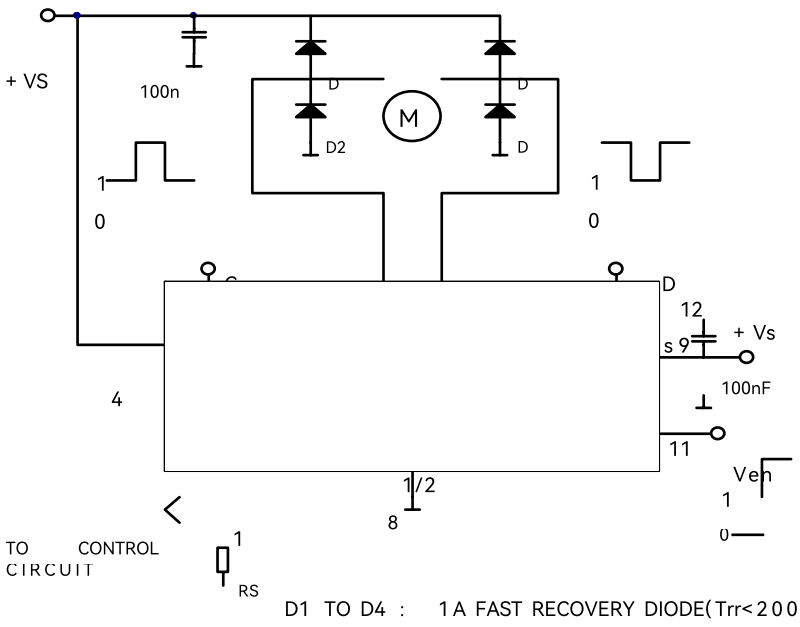
Parameter	Identify	Test conditions	Min	Typical	Max	Unit
Pover supply voltage(Pin 4)	Vs	Working conditions(*note2)	VIH+2.5	-	36	V
Logic supply voltage(Pin9)	Vss		4.5	5	7	V
Static working current(Pin4)	Is	Ven=H; IL=0 Vi=L	- -	13	22	mA
		Vi=H	- -	50	70	
		Ven=L Vi=X	- -	- -	4	mA
VSS end static working electricity(Pin9)	Iss	Ven=H; IL=0 Vi=L	- -	27	36	mA
		Vi=H	- -	7	12	
		Ven=L Vi=X	- -	- -	6	mA
Input low voltage (pin5,7,10,12)	ViL		-0.3	- -	1.5	V
Input high voltage (pin5,7,10,12)	ViH		2.3	- -	Vss	V
Low voltage input current(pin5,7,10,12)	IiL	Vi=L	- -	- -	-10	uA
High voltage input current(pin5,7,10,12)	IiH	Vi=H ≤ Vss-0.6V	- -	30	100	uA
Enable low voltage at the terminal(pins 6,10)	Ven=L		-0.3	- -	1.5	V
Enable high voltage at the terminal(pins 6,10)	Ven=H		2.3	- -	Vss	V
Low voltage enable current(pins 6,10)	Ien=L	Ven=L	- -	- -	-10	uA
High voltage enable current(pins 6,10)	Ien=H	Vi=H ≤ Vss-0.6V	- -	30	100	uA
Saturation voltage drop when pulling current	VCEsat(H)	IL=1A	0.95	1.35	1.7	V
		IL=2A		2	2.7	V
Saturation voltage drop during current injection	VCEsat(L)	IL=1A	0.85	1.2	1.6	V
		IL=2A		1.7	2.3	V

Total saturation pressure drop	VCEsat	IL=1A IL=2A	1.8	- - - -	3.2 4.9	V V
Detecting voltage(pins 1,15)	Vsense		-1	- -	2	V

*Note 2: The maximum power supply voltage should be established within the range where both the power supply and output peak voltage are less than this value.

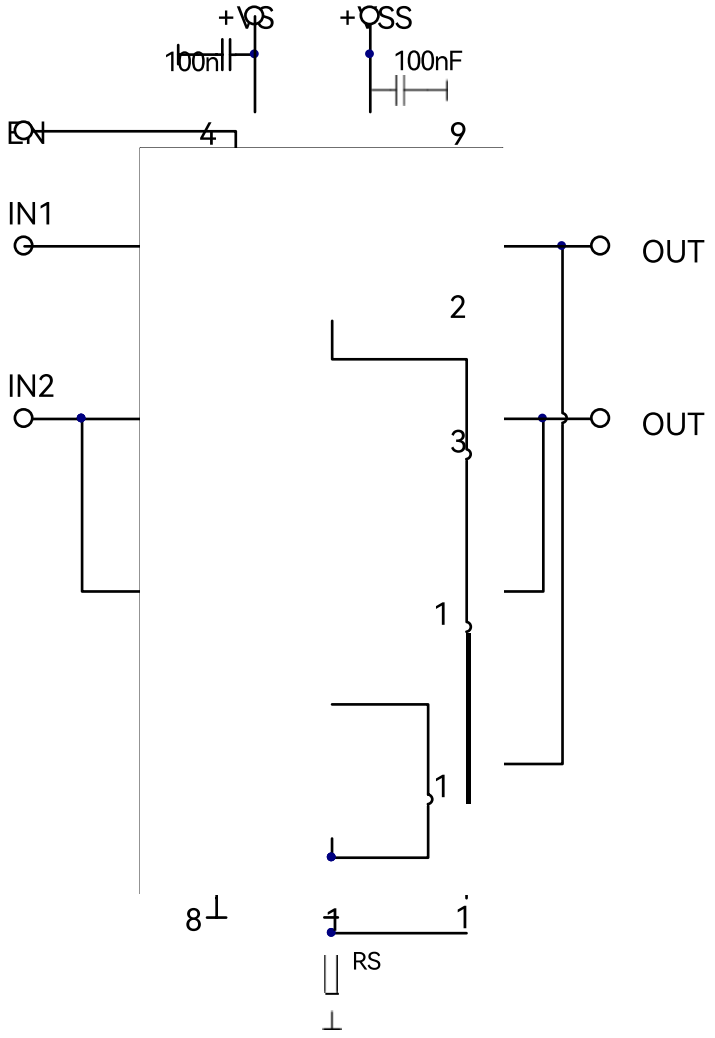
Parameter	Identity	Test Conditions	Min	Typical	Max	Unit
Pull current shutdown delay time	T1 (Vi)	0.5Vi to 0.9 IL		1.5		us
Pull current drop time	T2 (Vi)	0.9 IL to 0.1 IL		0.2		us
Delay time for starting up by pulling current	T3 (Vi)	0.5Vi to 0.1 IL		2		us
Pull current rise time	T4 (Vi)	0.1 IL to 0.9 IL		0.7		us
Filling current turn-off delay time	T5 (Vi)	0.5Vi to 0.9 IL		0.7		us
Filling current drop time	T6 (Vi)	0.9 IL to 0.1 IL		0.25		us
Filling current startup delay time	T7 (Vi)	0.5Vi to 0.1 IL		1.6		us
Irrigation current rise time	T8 (Vi)	0.1 IL to 0.9 IL		0.2		us
Conversion frequency	fc(Vi)	IL=2A		25	40	KHz
Pull current off delay time	T1 (Ven)	0.5Vi to 0.9 IL		3		us
Pull current drop time	T2 (Ven)	0.9 IL to 0.1 IL		1		us
Pull current startup delay time	T3 (Ven)	0.5Vi to 0.1 IL		0.3		us
Pull current rise time	T4 (Ven)	0.1 IL to 0.9 IL		0.4		us
Filling current turn-off delay time	T5 (Ven)	0.5Vi to 0.9 IL		2.2		us
Filling current drop time	T6 (Ven)	0.9 IL to 0.1 IL		0.35		us
Filling current startup delay time	T7 (Ven)	0.5Vi to 0.1 IL		0.25		us
Irrigation current rise time	T8 (Ven)	0.1 IL to 0.9 IL		0.1		us

Typical application 1: Bridge DC motor control



Input		Function
Ven=H	C=H;D=L	Towards the right
	C=L;D=H	Towards the left
	C=D	Emergency stop
Ven=L	C=X; D=C	Freedom
L is low level, H is high level, X is arbitrary		

Typical application 2: Parallel connection can increase the driving current. Note that 1 channel and 4 channels are connected in parallel, and 2 channels and 3 channels are connected in parallel.



Application Description:

1.1 Power output stage

L298N integrates 2 power outputs (outA, B), each configured as an H-bridge driver, which can drive inductive loads according to different input states. The detection terminals senseA and B can be connected to a detection resistor to ground to detect the passing current.

1.2 Input level

There are four gate inputs IN1, IN2, IN3, IN4 and two enable inputs ENA, ENB. All inputs are compatible with TTL levels. When the enable terminal EN is high, the input can determine the working state of the H-bridge. When EN is low, the H-bridge is prohibited from working.
2. Recommendation

Connect a non polarized 100nf capacitor to the Vs and VSS terminals, and keep the capacitor as close to ground as possible. When a large capacitor is far away from the power supply end, a smaller capacitor needs to be connected closer to the chip power supply end.

The detection resistor is non wound, and the grounding terminal of the resistor must be close to the ground of the chip.

Each input signal line should be as short as possible.

Before turning on and off the power, the EN terminal must be ensured to be at a low level.

3. Bridge drive application drives DC motors

As shown in the figure, 4 fast recovery diodes need to be connected to the motor for protection, and the selection of VF should consider the worst-case scenario. The output voltage of the detection terminal can be controlled by interrupting the input voltage to control the current, or it can be used for overcurrent protection to make the EN terminal low.

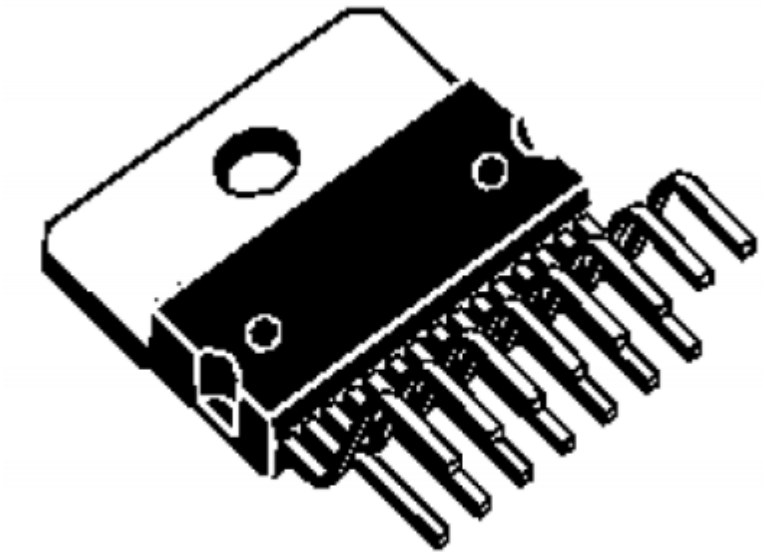
Rapid braking (stopping) of a 2A drive current motor may not be overcome.

4.When the peak current is higher than 2A, parallel connection can be selected.

5.When driving inductive loads, Schottky diodes are the preferred choice.

6. When driving a bidirectional stepper motor, the protective diode should also be a 2A fast recovery type when the driving current reaches 2A.

Encapsulation of mechanical data:



Multiwatt15

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	1.14	1.27	1.4	0.045	0.050	0.055
G1	17.57	17.78	17.91	0.692	0.700	0.705
H1	19.6			0.772		
H2			20.2			0.795
L	22.1		22.6	0.870		0.890
L1	22		22.5	0.866		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	4.2	4.3	4.6	0.165	0.169	0.181
M1	4.5	5.08	5.3	0.177	0.200	0.209
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