



## DESCRIPTION

The AA51882 is an integrated circuit to be applied on servo motor of radio controlled operation. It provides some flexible functions to tune the servo. External H-Bridge driver will be chosen for large servo motor application.

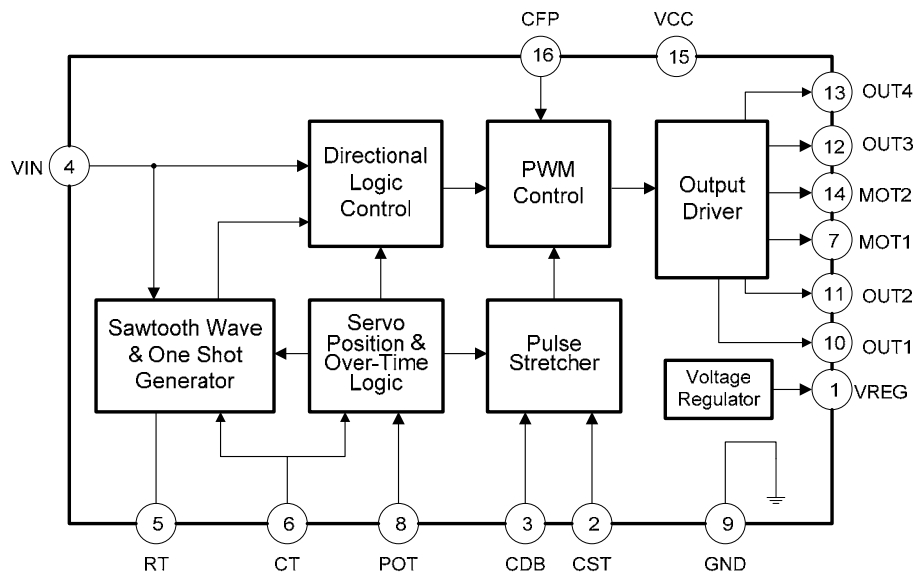
## FEATURES

- Built-in voltage regulator.
- Adjustable dead band range control by external capacitor.
- Fixed pulse width setting to provide start-up power and speed control. .
- Incorporates a protection circuit for "H-Bridge" driving configuration.
- Small outline package – TSSOP16L.

## APPLICATIONS

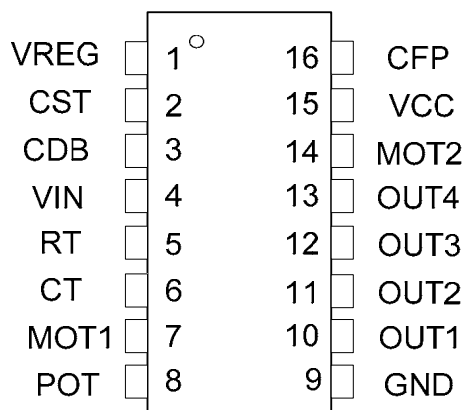
- Servo motor control.
- Radio controlled car, boat, and airplane.
- IA products (such as air-condition).
- Remote positioning.

## BLOCK DIAGRAM





## PIN DESCRIPTION



TOP VIEW

PIN NO.	PIN NAME	FUNCTION
1	VREG	Constant output voltage of 2.5V (typical). Make connections from this pin to a potentiometer or pulse stretcher resistor.
2	CST	Connect the capacitor and resistor of the pulse stretcher section.
3	CDB	Dead band setting by connecting a capacitor.
4	VIN	Input signal, an adjustable pulse of 20ms cycle and 1.0-2.0ms pulse-width, operate with a positive pulse of peak value 3V or greater.
5	RT	Timing Resistor, connect a resistor that will determine the value of the constant current of this pin. A resistor of 18k $\Omega$ will yield a current of 1.0mA.
6	CT	Local pulse setting, connect a capacitor that will generate a triangular wave by constant current charging.
7	MOT1	Output Driver 1 (connect to motor)



PIN NO.	PIN NAME	FUNCTION
8	POT	Servo position voltage from the potentiometer connected to the servo's drive shaft.
9	GND	Ground pin
10	OUT1	Connect to the (Q4) base of the external NPN transistor
11	OUT2	Connect to the (Q1) base of the external PNP transistor
12	OUT3	Connect to the (Q3) base of the external NPN transistor
13	OUT4	Connect to the (Q2) base of the external PNP transistor
14	MOT2	Output Driver 2 (connect to motor)
15	VCC	Power supply pin
16	CFP	Fixed driving pulse setting

**■ ABSOLUTE MAXIMUM RATINGS**

Ta=25℃

SYMBOL	PARAMETER	RATINGS	UNIT
VCC	Supply voltage	3~9	V
IO	Output current	70	mA
PD	Power dissipation	500	mW
TSTG	Storage temperature range	-40~+125	℃

**ELECTRICAL CHARACTERISTICS**

Ta=25°C, Vcc=5V

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN	TYP	MAX	
VCC	Supply voltage		3.0	5	7.5	V
ICC	Operating current	When output is OFF	---	5	8	mA
		When output is ON	---	6	11	mA
VREG	Regulator output voltage	Load capacitor 0.1uF	2.35	2.5	2.65	V
IREF	Reference current	RT = 18 kΩ, Pin 5 current value	80	100	120	uA
VINH	High input voltage	Pin4	3.0	---	Vcc	V
WSL	Standard local pulse width	RT = 18 kΩ, CT = 0.1 uF	1.4	1.5	1.6	ms
WDB1	Minimum dead bandwidth	CFP = 0.01uF, Not connect CDB	---	---	1.0	us
WDB2	Standard driving band width	Not connect CFP and CDB	---	2.5	6.0	us
ASTR	Pulse Stretcher gain	RT=18 kΩ, RST=120 kΩ, CST=0.1 uF	---	100	---	times
WFP	Fixed driving pulse width	CFP = 0.01uF, Not connect CDB	0.7	1.0	1.3	ms
WSDP	Standard driving pulse width	Not connect CFP and CDB	0.3	0.5	0.8	ms
WOP	Output pulse width	CST = 0.1 uF, RST = 120 kΩ, Pulse width 100uS (3pin)	8.0	10.0	12.0	ms
VSAT	Output pin saturation voltage	ISINK = 20 mA	---	0.2	0.4	V

**■ FUNCTIONAL DESCRIPTION****(1) Voltage Regulator**

This circuit is composed of a band gap circuit, and outputs a 2.5-volt temperature compensated reference voltage. This reference voltage is stabilized when the supply voltage is variable.

**(2) Sawtooth wave & One-Shot Generator**

Connect a capacitor to CT pin will generate a triangular wave by constant current charging. A typical value is 0.1uF. The constant current is determined by a resistor connected to RT pin. A typical capacitor of approximately 0.1uF should be connected in parallel with the resistor to increase stability.

**(3) Servo Position & Over-Time logic**

This circuitry consists of a pulse width comparator, which compares the servo position detection signal (POT pin) from the one-shot timer (CT pin) whose period depends on the resistance of a potentiometer connected to the servo's drive shaft. This feedback provides the stability for the control circuitry.

**(4) Pulse Stretcher**

The difference between the servo control signal and the feedback signal is the error signal. This error signal is used to toggle the direction of the current flows through the servo. The function of this pulse stretcher is to “stretch” the small error signal long enough and increases the duty cycle to the motor for it can maintain sufficient holding force. The circuit also implements a “dead band” function that prevents servo jitter and hunting. This is a range over which differences between the input and reference signals will not cause servo operation. When the signal differences exceed this “dead band” range, the servo will start to shift. The dead band will change according to the value of capacitor connected to the CDB pin.

**(5) Directional Logic Control**

The comparator circuit compares pulses from the servo control input (VIN pin) and the voltage controlled pulse generator. It provides either a positive or a negative output depending on whether the signal pulse width is larger or smaller than the position generator's output pulse (POT pin). Application of this error voltage to the motor driver circuit causes the motor to turn in a direction that will minimize the error until both pulse widths are the same.

**(6) PWM Control**

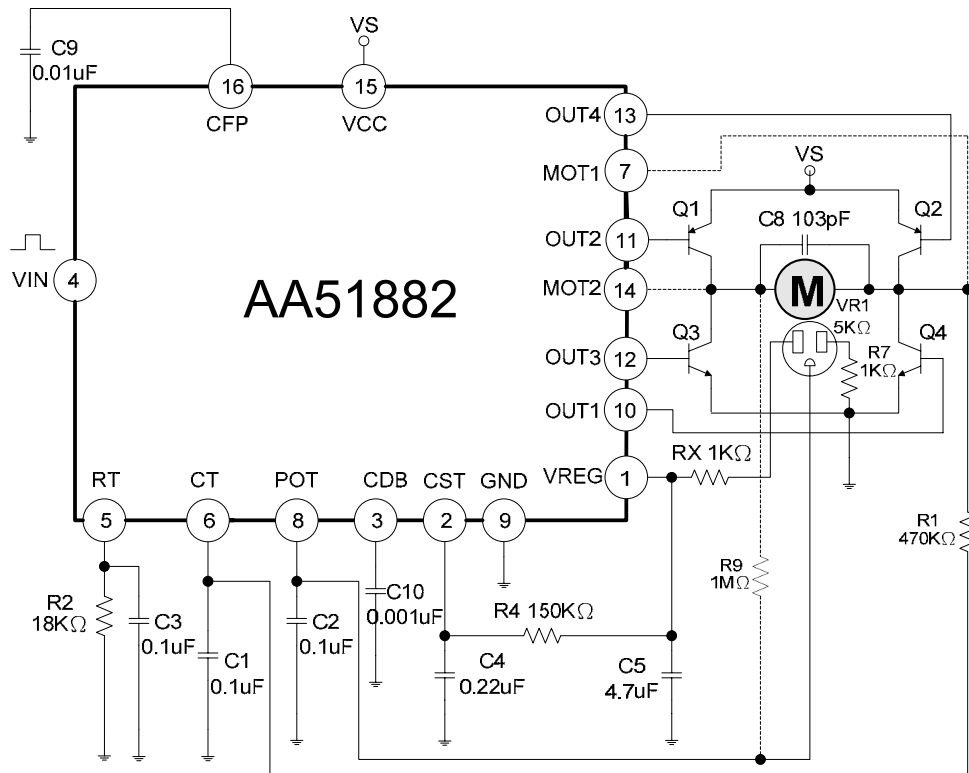
This signal generated by directional logic control block is used to control a flip-flop that toggles the direction the current flows through the motor. The outputs of the flip-flop drive an external H-Bridge output driver that handles the high current going through the motor. This output of this block will be turned on or off with each input pulse based on the status of the directional logic. The PWM drive techniques provide the benefits of reduced power dissipation, improved servo motor performance and positively affect system efficiency.

## (7) Output driver

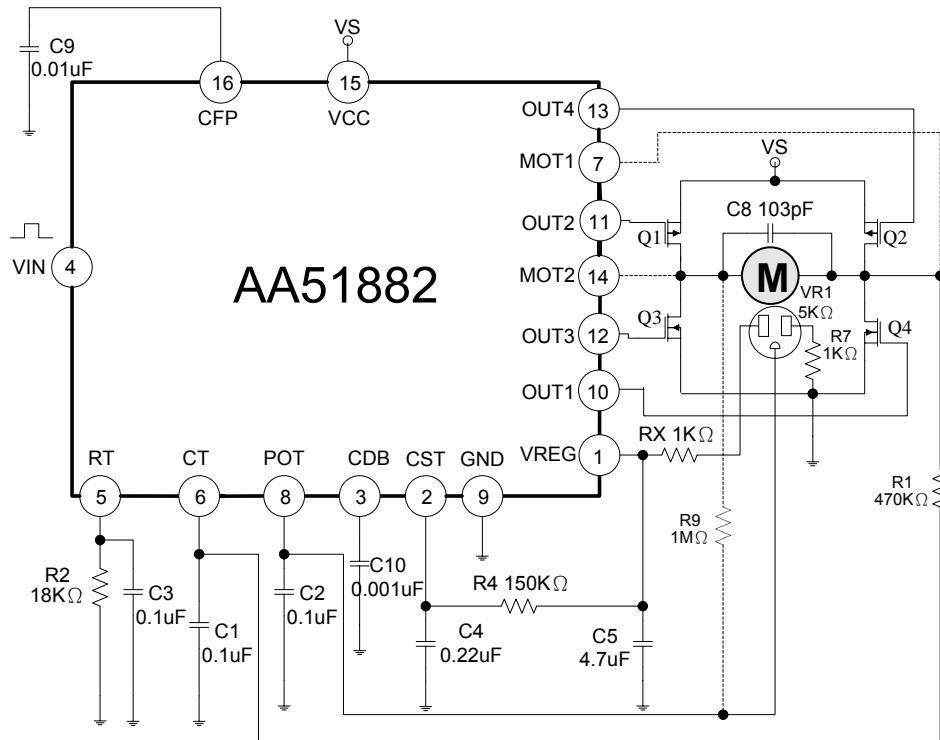
The output driver controls the servo current direction. For heavy load application, the OUT2 and OUT4 pin will be connected to the base of the external PNP transistors and the OUT1 and OUT3 pin will be connected to the base of the external NPN transistors. MOT1 and MOT2 pins are connected to PIN1 by 18kΩ resistor internally. They can be connected to both side of servo to get the better performance when servo is to be stopped.

## ■ TYPICAL APPLICATION EXAMPLE

### A. H-Bridge TRANSISTOR Driver



## B. H-Bridge MOSFET Driver



\* When the servo is about to reach the target position, the servo maybe overshoot for speed issue. There are two ways to suppress such dispensable action.

If MOT1 and MOT2 pins are connected to both side of servo (R9 is no need), you can try to reduce the value of R1 to let servo make an instant stop on the target position. If MOT1 and MOT2 are floating for PCB layout issue, R9 can be plugged and tuned to get the same efforts described before.

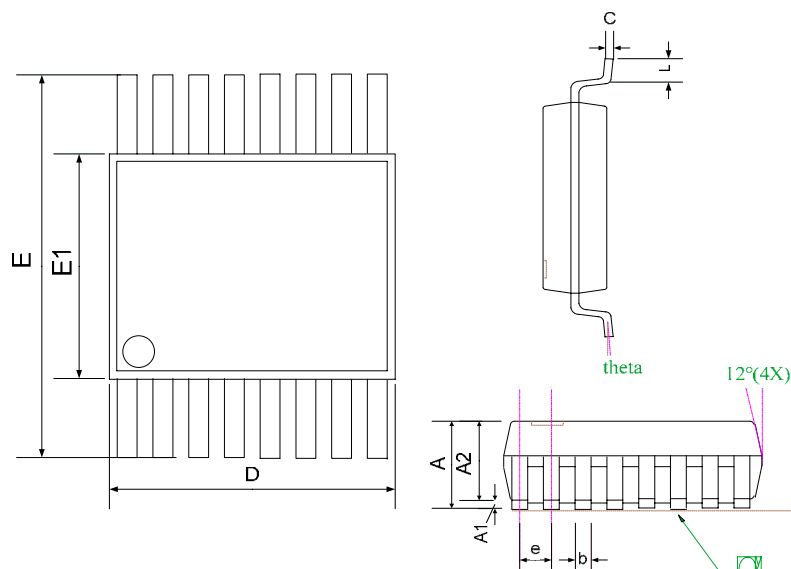
The application circuit is for reference only. The value of resistor and capacitor needs to be changed and gets the best performance in various servos.

Please select low threshold voltage (Vt) MOSFET driver for the maximum driving capacity. If Vt is higher, you should provide higher power supply voltage in order to turn on the MOSFET fully.

## ORDERING INFORMATION

ORDER NO.	PACKAGE	PACKING	Q'TY	MARK CHART
AA51882A	TSSOP 16L	TAPE & REEL	2,500ea	<div> AA51882   XXXX  A </div>

## PACKAGE DIMENSIONS



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.20	---	---	0.048
A1	0.05	---	0.15	0.002	---	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19	---	0.30	0.007	---	0.012
C	0.09	---	0.20	0.004	---	0.008
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
e	---	0.65	---	---	0.026	---
L	0.45	0.60	0.75	0.018	0.024	0.030
y	---	---	0.10	---	---	0.004
theta	0°	---	8°	0°	---	8°

### NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE  $\pm 0.1$  mm UNLESS OTHERWISE SPECIFIED
3. COPLANARITY : 0.1 mm
4. CONTROLLING DIMENSION IS MILLIMETER. CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MO-153

## NOTES ON USE

- The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.