AT5549

Preliminary Product Information

BTL Motor Driver for Shutter/Stepping Motor

Features

- Optimal for 2 phase excitation drive for 2-phase stepping motors / shutter for DSC
- Built-in 3 operating mode:
  Saturation Output
  Constant Voltage Output
  Constant Current Output
- Low saturation voltage. V_O(sat) = 0.26 V typical at I_O = 210 mA for saturation output mode
- Stand-by current: <1μA
- Independently controlled for CH1 and CH2
- TSSOP20 Package

Applications

- Camera
- Printer
- Other portable equipment

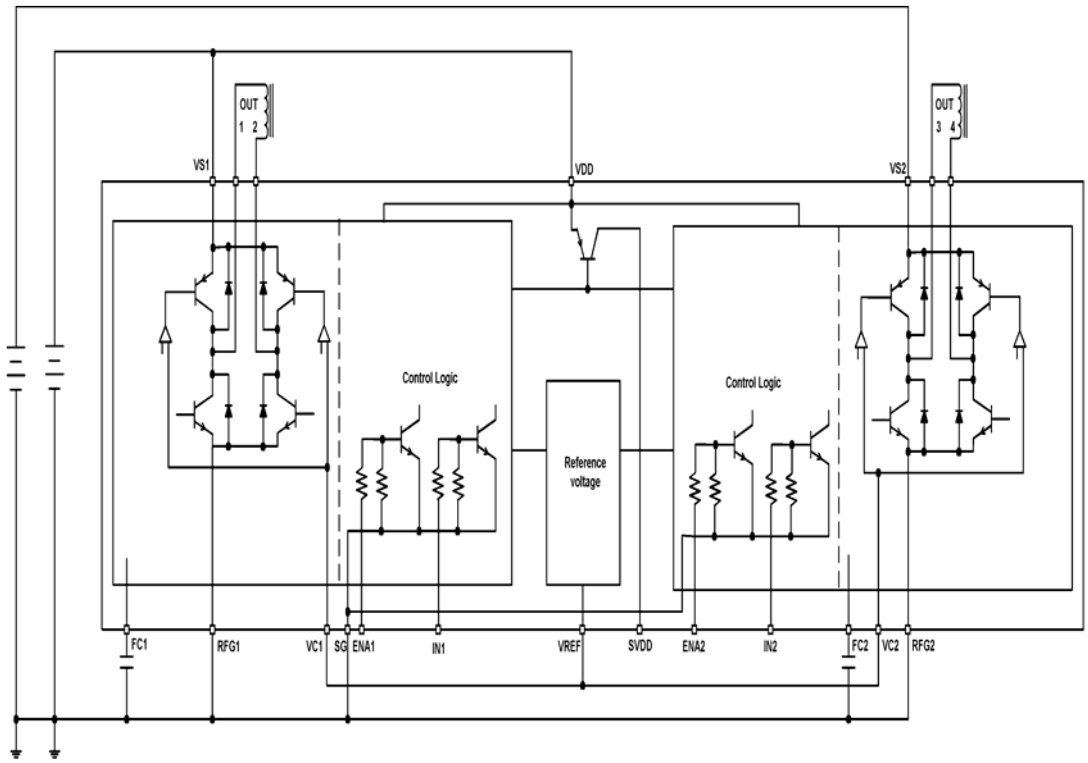
General Description

The AT5549 is 2-channel low-voltage/low saturation voltage type bidirectional motor driver IC that are optimal for use as 2-phase stepping motor drivers in cameras, printers, and other portable equipment. The output circuits are of the H-bridge bipolar type, and they achieve low saturation output and low power characteristics despite being provided in a miniature package. Operation for each independent CH1(OUT1,2) and CH2(OUT3,4) is selectable from saturation output drive, constant voltage drive and constant current drive according to the circuit conditions.

The AT5549 is optimal for 2-phase excitation drive for 2-phase stepping motors using 4-input logic (ENA1,ENA2, IN1,IN2).

.

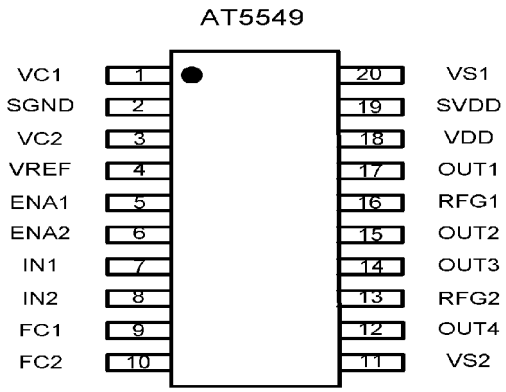
Block Diagram



Aimtron reserves the right without notice to change this circuitry and specifications.

2F, No.10, Prosperity RD. II, Science-Based Industrial Park, Hsinchu 300,Taiwan, R.O.C.
Tel: 886-3-563-0878
Fax: 886-3-563-0879
WWW: http://www.aimtron.com.tw
Email: service@aimtron.com.tw

Pin Configuration



Ordering Information

Part number	Package	Marking
AT5549P	TSSOP20	AT5549P
AT5549P GRE	TSSOP20,Green	AT5549P, date code with one bottom line

Pin Description

Symbol	Pin No.	Descript	Symbol	Pin No.	Descript
VC1	1	Reference voltage input terminals for CH1 output	**VS2**	11	Power supply input for CH2 output
SGND	2	- input for drive voltage	**OUT4**	12	Shutter coil drive terminal
VC2	3	Reference voltage input terminals for CH2 output	**RFG2**	13	Current Control pin for CH2
VREF	4	0.9V Reference voltage output	**OUT3**	14	Shutter coil drive terminal
ENA1	5	CH1 Enable input	**OUT2**	15	Shutter coil drive terminal
ENA2	6	CH2 Enable input	**RFG1**	16	Current Control pin for CH1
IN1	7	Control terminal for CH1	**OUT1**	17	Shutter coil drive terminal
IN2	8	Control terminal for CH2	**VDD**	18	+ input for drive voltage
FC1	9	Connect capacitor between FC1 and SGND to prevent oscillation at constant current mode	**SVDD**	19	VDD voltage output
FC2	10	Connect capacitor between FC1 and SGND to prevent oscillation at constant current mode	**VS1**	20	Power supply input for CH1 output

Absolute Maximum Rating

T_a=+25°C

Parameter	Symbol	Condition	Ratings	Units
Maximum Supply Voltage	V_{CC}		-0.3 to +8.0	V
OUT1,2,3,4 Voltage	V_{OUT}		-0.3 to +8.0	V
OUT1,2,3,4 output current	I_{OUT}		300	mA
Input Voltage	V_{IN}		-0.3 to V_{DD} +0.4	V
Power Dissipation	P_D	Mounted PCB*Note	850	mW
Operating Temperature	T_a		-20 to +75	°C
Storage Temperature	T_{stg}		-40 to +150	°C

Note: On the 114.3x76.1x1.6-mm glass-epoxy printed circuit board

Electrical Characteristics

(T_a=+25°C)

Parameter	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Stand-by current	I_{STB}	V_E=6.5V	-	-	1.0	μA
Vref output voltage	V_{refOL}	V_{DD}=5V, IOL=0	0.85	0.90	0.95	V
S_{VDD} output voltage	V_{SVDD}	V_{DD}=5V, IOL=10mA	4.7	4.8	4.9	V
H Bridge						
Function assurance voltage range 1	V_{OPR1}	V_{DD} system, $V_{S1,2}$=2.0V	1.9	-	6.5	V
Function assurance voltage range 2	V_{OPR2}	V_S system, V_D=5.0V	1.6	-	6.5	V
Output saturation voltage 1 (OUT) (Saturation control)	V_{OUT1}	V_{DD}=2.9 to 5V, V_C=SVDD, V_S=2V I_{OL}=210mA (PNP side) , Standard circuit 1	0.07	0.2	0.3	V
Output saturation voltage 2 (OUT) (Saturation control)	V_{OUT2}	V_{DD}=2.9 to 5V, V_C=SVDD, V_S=2V I_{OL}=210mA (NPN side) , Standard circuit 1	0.09	0.13	0.16	V
Output voltage 1 (OUT) (CV control)	V_{OUT3}	V_{DD}=2.9 to 6V, V_C=1.54V, V_S=3.5V I_{OL}=210mA (PNP side) , Standard circuit 2	2.8	3.0	3.2	V
Output voltage 2 (OUT) (CV control)	V_{OUT4}	V_{DD}=2.9 to 5V, V_C=Vref, V_S=2V I_{OL}=210mA (PNP side) , Standard circuit 2	1.66	1.76	1.86	V
Output voltage 1 (OUT) (CC control)	V_{OUT5}	V_{DD}=2.9 to 5V, V_C=1.8V, V_S=3.5V, R_L=5 Ω (across OUTs) , R_{FB}=2 Ω , Standard circuit 3	190	212	234	mA
Output voltage 2 (OUT) (CC control)	V_{OUT6}	V_{DD}=2.9 to 5V, V_C= Vref, V_S=1.95V, R_L=5 Ω (across OUTs) , R_{FB}=2 Ω , Standard circuit 3	95	112	124	mA

Operating current consumption S1	$I_{OPS}1$	V_S system , V_{DD}=5V , V_S=3V , V_C=SVDD	-	20	30	mA
Operating current consumption S2	$I_{OPS}2$	V_S system , V_{DD}= 5V , V_S=3V , V_C= Vref	-	1	2	mA
Operating current consumption D1	$I_{OPD}1$	V_{DD} system , V_{DD}=5V , V_S=3V , V_C=SVDD	-	3.5	6	mA
Operating current consumption D2	$I_{OPD}2$	V_{DD} system , V_{DD}= 5V , V_S=3V , V_C= Vref	-	3.5	6	mA
Pass through current	I_{TC}	V_{DD}= 5V , V_S=3.5V	-	10	20	mA
Pass through current generating time	T_{TC}	V_{DD}= 5V , V_S=3.5V	-	-	2	μS
Switching delay time	T_{TSW1}		-	-	0.1	μS
VC input current	I_{IN}	V_{DD}=2.9 to 6V , V_S=2.0V , V_{C1}=V_{C2}=5.5V , V_{IN}=5.0V	0	120	150	μA
Control input						
Maximum input current of control terminals	I_{IH}	V_{DD}= 5V , V_S=3.5V , V_{IH}=5.5V	-	-	100	μA
	I_{IL}	V_{IL}=GND	-1	-	0	μA
Input “L” level	V_{IL}	ENA , IN	-0.3	-	1.0	V
Input “H” level	V_{IH}	ENA , IN	2.0	-	6.0	V

Truth Tables

ENA		IN		SVDD	OUT1	OUT2	OUT3	OUT4	Notes
1	2	1	2						
L	L	×	×	OFF	OFF	OFF	OFF	OFF	Standby mode
H	L	H	×	ON	L	H	OFF	OFF	CH1 reverse rotation
		L	×	ON	H	L	OFF	OFF	CH1 forward rotation
L	H	×	H	ON	OFF	OFF	L	H	CH2 reverse rotation
		×	L	ON	OFF	OFF	H	L	CH2 forward rotation
H	H	H	H	ON	L	H	L	H	CH1,2 reverse rotation
		L	L	ON	H	L	H	L	CH1,2 forward rotation
H	H	H	L	ON	L	H	H	L	CH1 reverse & CH2 forward rotation
		L	H	ON	H	L	L	H	CH1 forward & CH2 reverse rotation

× indicates “don’t care”

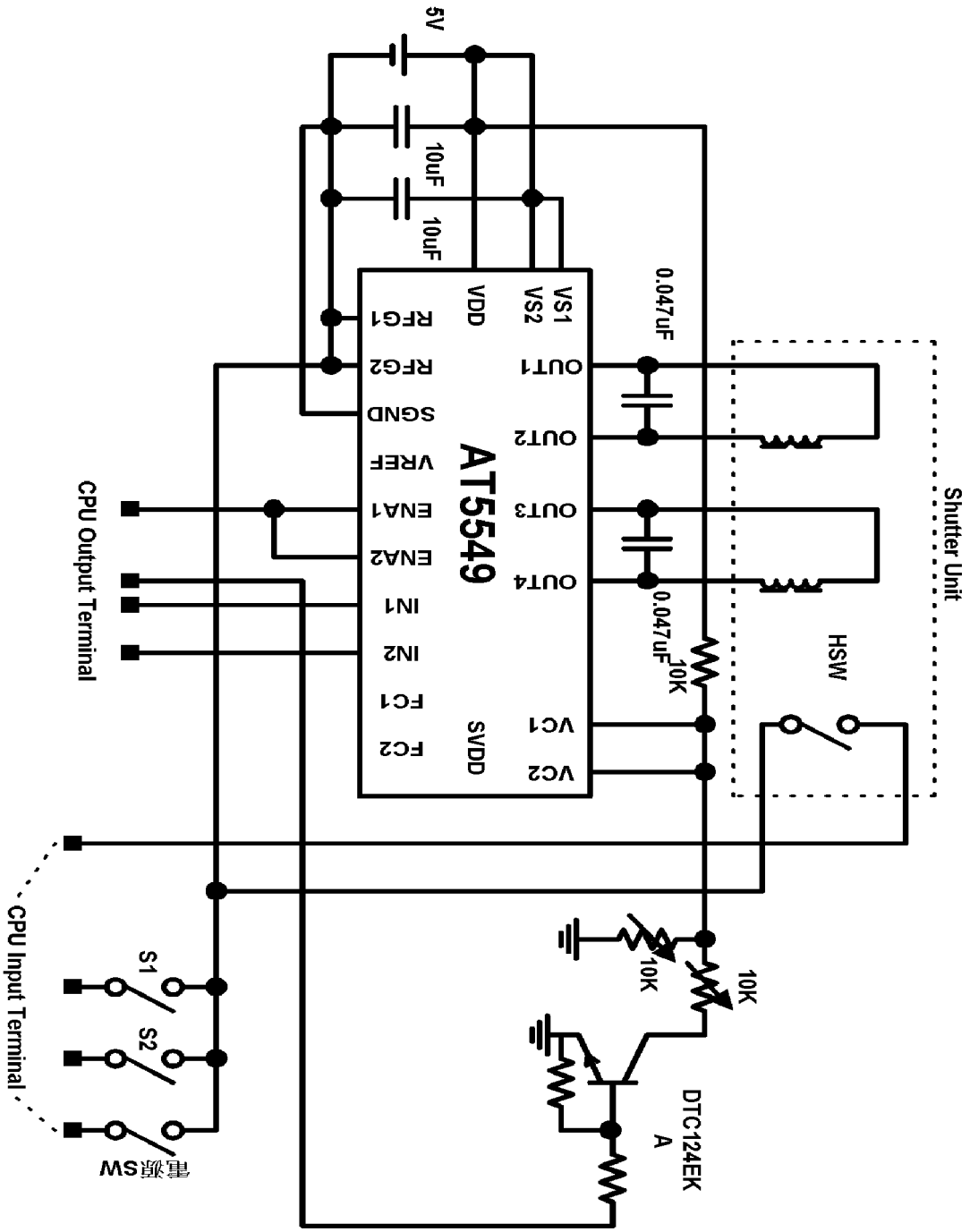
Constant voltage output VO is controlled as VO=1.95*VC.

Input range of VC is 0.2 to 6V and the output is saturation when VC≥VO

Constant current output IO is controlled as IO=(VC/4.5) /RFG

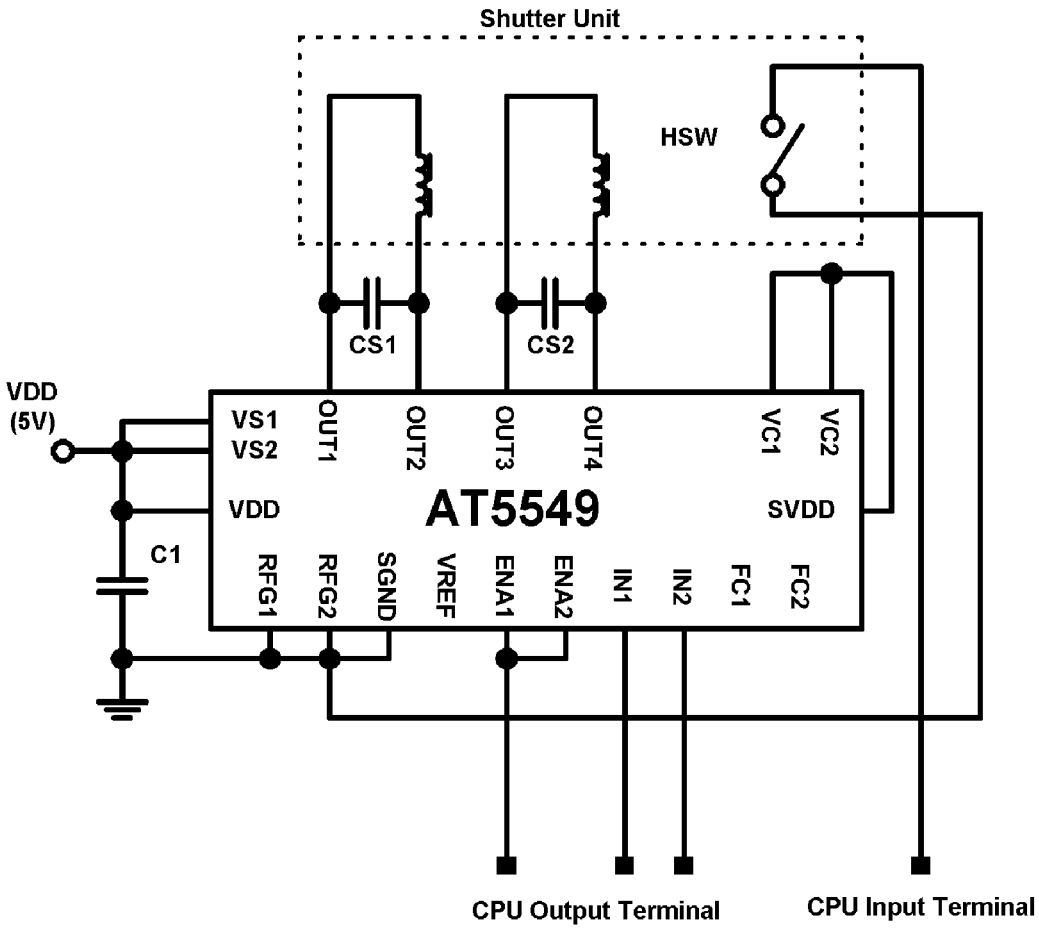
CH1 (between OUT1 and OUT2* and CH2 (between OUT3 and OUT4) are controlled independently

Typical Application



Application Information

(1) Saturation drive control

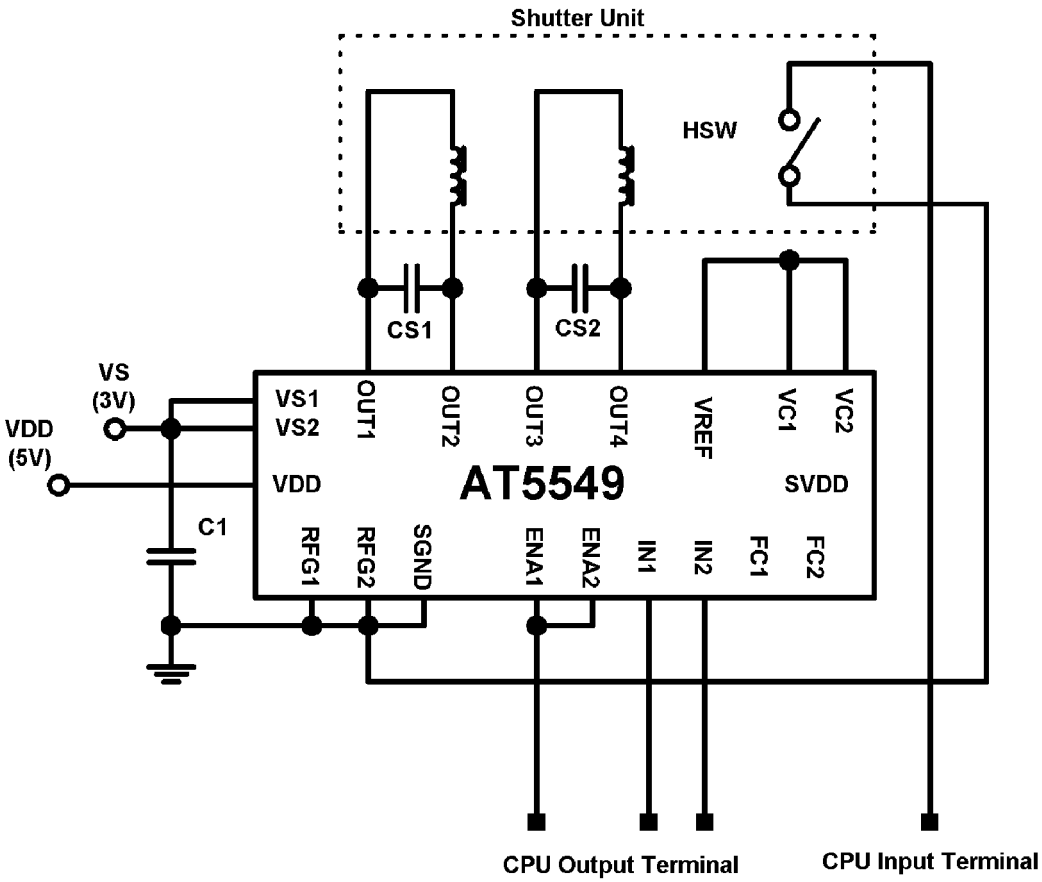


Operational conditions for saturation drive control

- Shorting RFG with SGND
- Connecting a capacitor of 4700pF~0.22uF between OUTs
- Inputting the voltage that is VC > VS/1.95V (VS≥1.6V)
- Output voltage VOUT

  VOUT=VS-VSAT(PNP)-VSAT(NPN) *VSAT=saturation voltage

(2) Constant voltage drive control

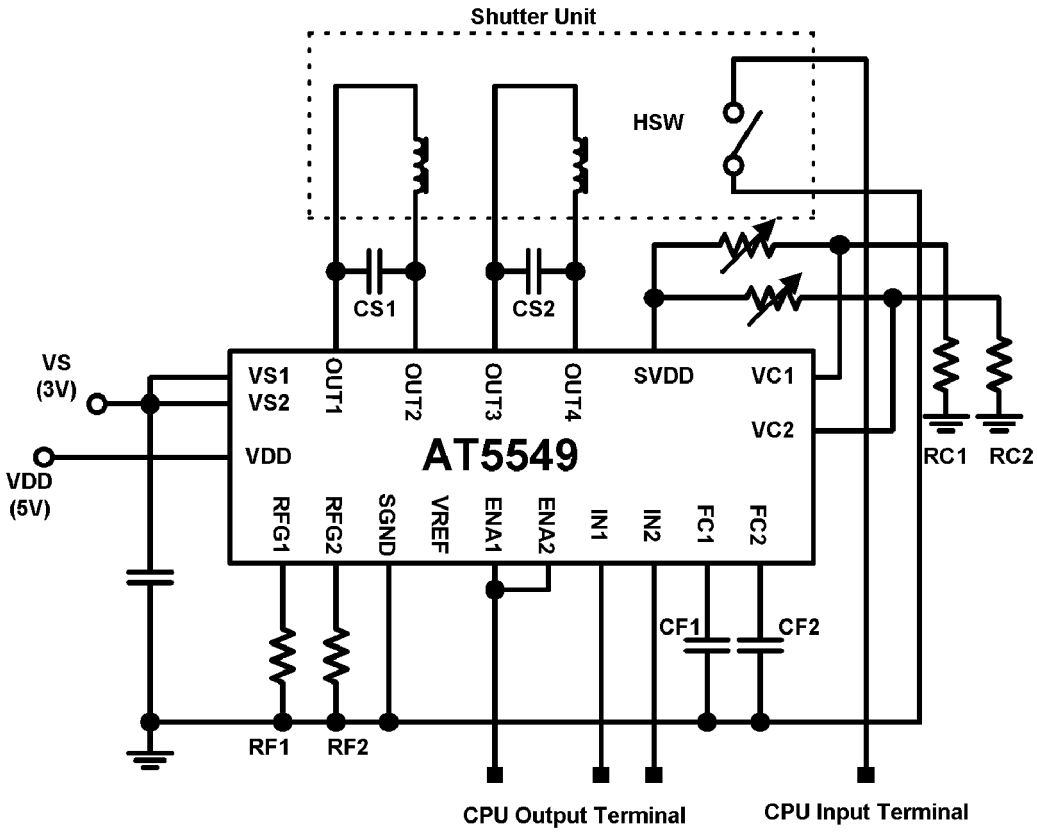


Operational conditions for constant voltage drive control

- Shorting RFG with SGND
- Connecting a capacitor of 4700pF~0.22uF between OUTs
- Inputting the voltage that is VS ≥ VC×1.95V (VS≥1.6V)
- Output voltage VOUT

  VOUT=1.95×VC-VSAT(NPN) *VSAT=saturation voltage

(3) Constant current drive control

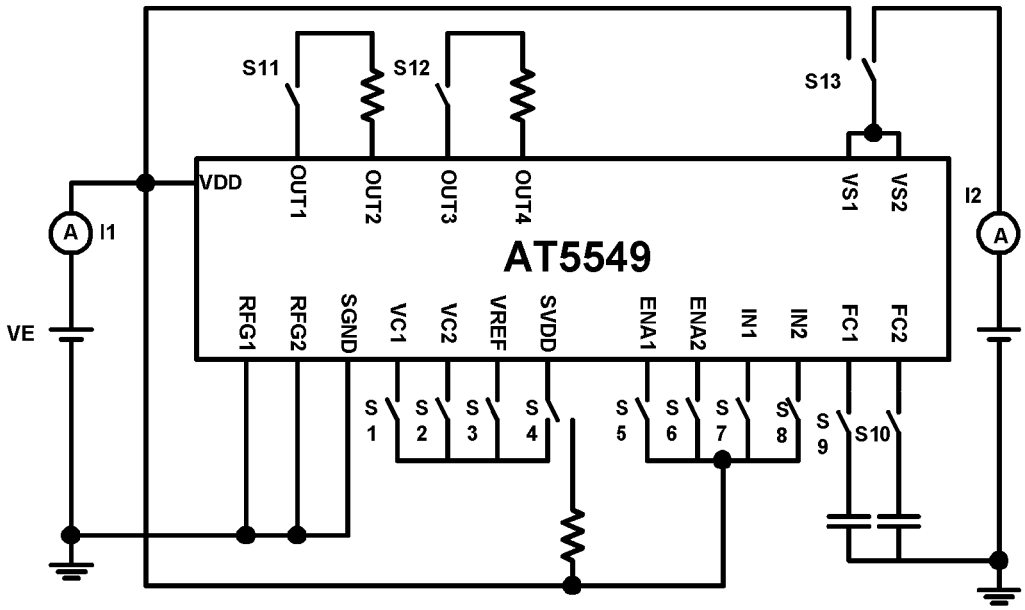


Operational conditions for constant current drive control

- Connecting RF between RFG and SGND
- Connecting a capacitor of 680pF between FC and SGND to prevent oscillation
- Connecting a capacitor of 4700pF~0.22uF between OUTs
- Can be shorting VS with VDD(Single power)
- Output current I_{OUT}

$$I_{OUT} = \frac{V_C}{R_F \times 4.5}(A)$$

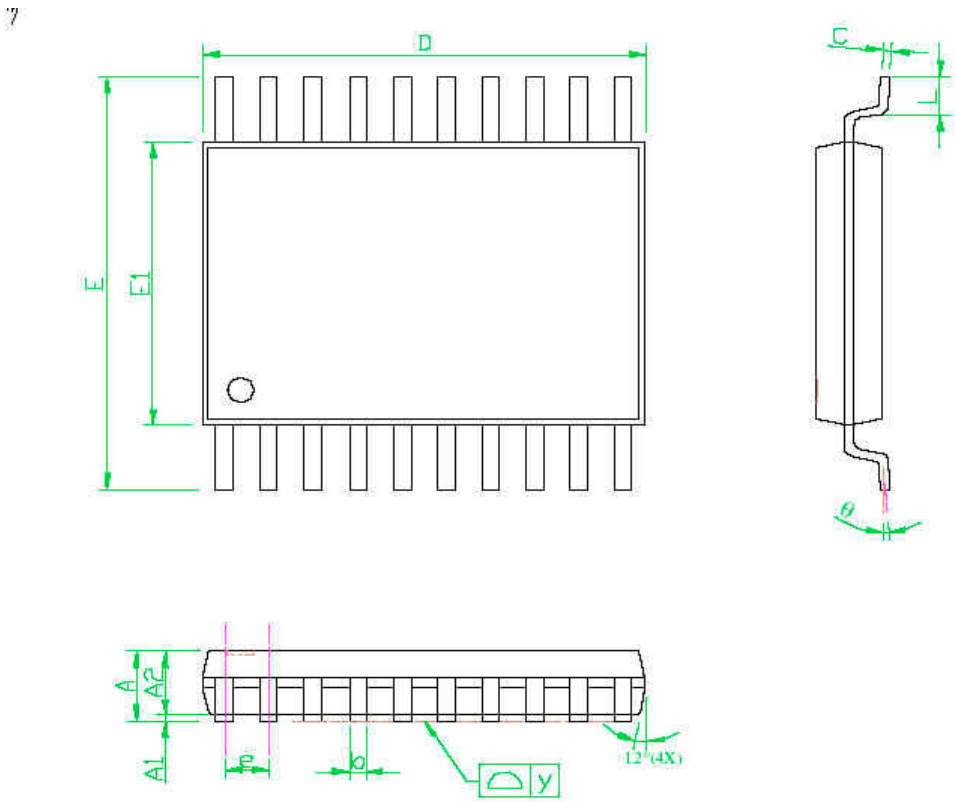
Test Circuit



Switch conditions table

Circuit Part	VC1	VC2	VREF	SVDD	ENA1	ENA2	IN1	IN2	OUT	VS	Current to be measure
SW	1	2	3	4	5	6	7	8	11~12	13	
Standby	ON		ON	GND	OFF		OFF		ON	VDD	I1
Stepping motor	ON		ON	VC	ON		×		OFF	VS	I1
	ON		ON	OFF	ON		×		OFF	VS	I1
	ON		ON	VC	ON		×		OFF	VS	I2
	ON		ON	OFF	ON		×		OFF	VS	I2

Package Outline: TSSOP20



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	6.40	6.50	6.60	0.252	0.256	0.260
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
θ	0°	—	8°	0°	—	8°