

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. $V_{O(sat)} = 0.26\text{ V}$ typical at $I_O = 210\text{ mA}$ for saturation output mode
- Stand-by current: $<1\mu\text{A}$
- Independently controlled for CH1 and CH2
- TSSOP20 Package

Applications

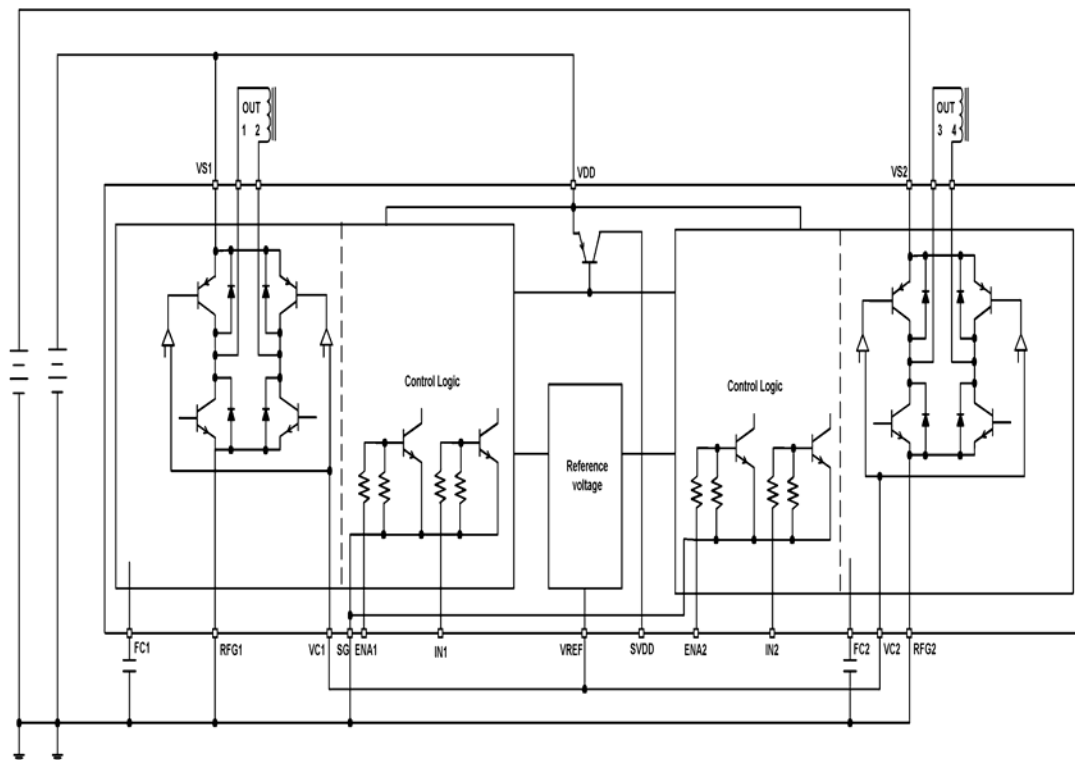
- Camera
- Printer
- Other portable equipment

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.

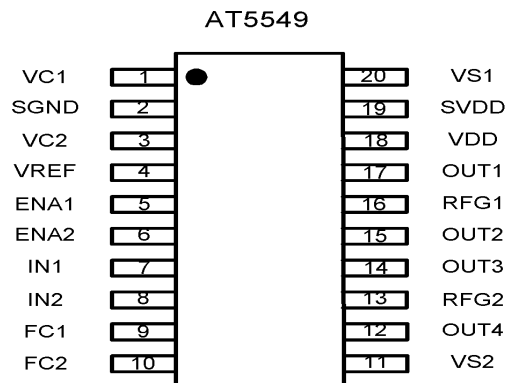
The AT5549 is optimal for 2-phase excitation drive for 2-phase stepping motors using 4-input logic (ENA1,ENA2, IN1,IN2).

Block Diagram



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

Pin Configuration



Ordering Information

Part number	Package	Remarks
AT5549	TSSOP20	AT5549P

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

$T_a=+25^{\circ}\text{C}$

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

($T_a=+25^{\circ}\text{C}$)

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, I _{OL} =0	0.85	0.90	0.95	V
S _{VDD} output voltage	V _{SVDD}	V _{DD} =5V, I _{OL} =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 =5Ω (across OUTs) , R _{FB} =2Ω , 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 =5Ω (across OUTs) , R _{FB} =2Ω , Standard circuit 3	95	112	124	mA

Operating current consumption S1	I_{OPS1}	V_S system , $V_{DD}=5V$, $V_S=3V$, $V_C=SVDD$	-	20	30	mA
Operating current consumption S2	I_{OPS2}	V_S system , $V_{DD}=5V$, $V_S=3V$, $V_C=V_{ref}$	-	1	2	mA
Operating current consumption D1	I_{OPD1}	V_{DD} system , $V_{DD}=5V$, $V_S=3V$, $V_C=SVDD$	-	3.5	6	mA
Operating current consumption D2	I_{OPD2}	V_{DD} system , $V_{DD}=5V$, $V_S=3V$, $V_C=V_{ref}$	-	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		IN1		SVDD	OUT1	OUT2	OUT3	OUT4	Notes
1	2	1	2						
L	L	x	x	OFF	OFF	OFF	OFF	OFF	Standby mode
H	L	H	x	ON	L	H	OFF	OFF	CH1 reverse rotation
		L	x	ON	H	L	OFF	OFF	CH1 forward rotation
L	H	x	H	ON	OFF	OFF	L	H	CH2 reverse rotation
		x	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

x indicates “don’t care”

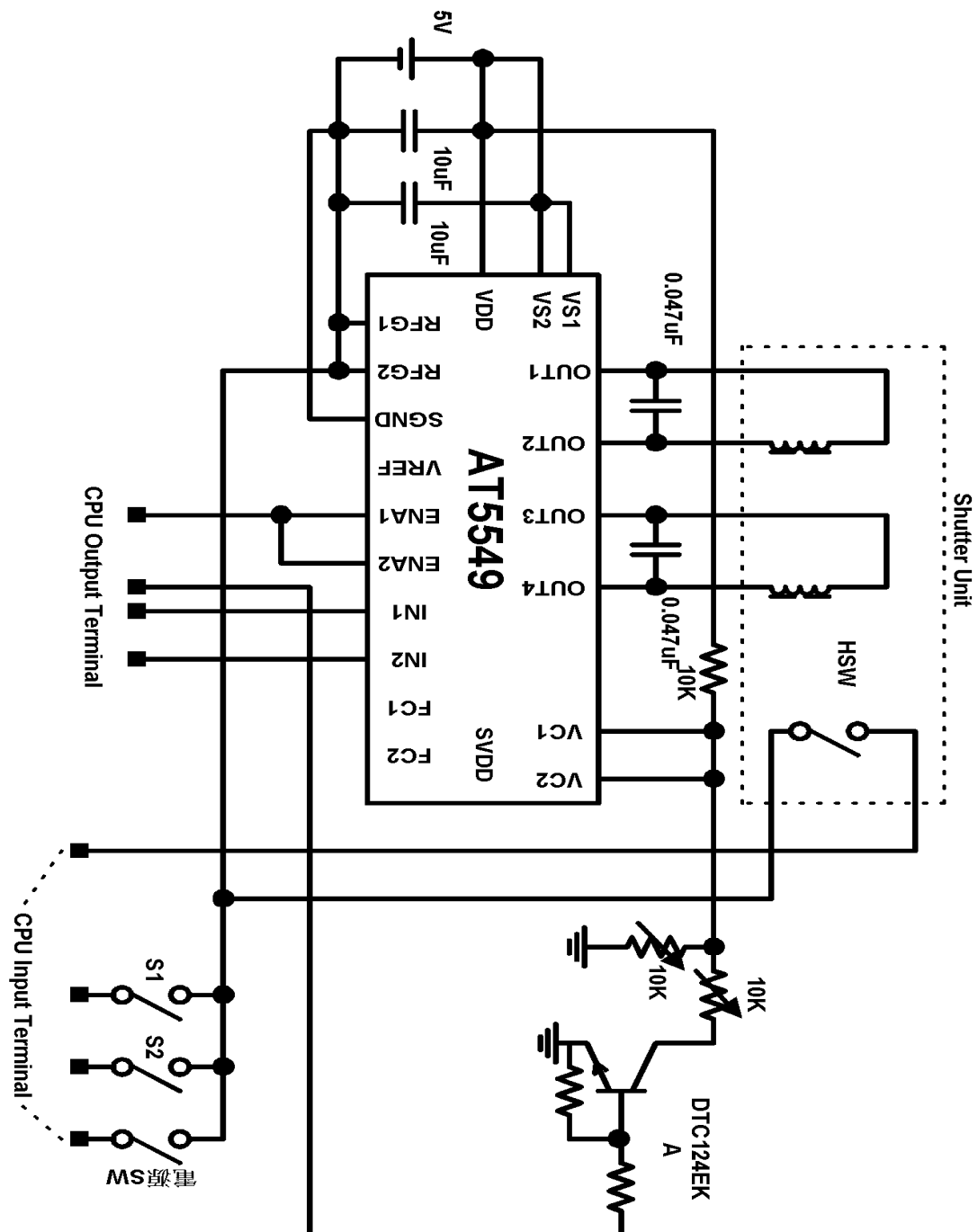
Constant voltage output VO is controlled as $VO=1.95*VC$.

Input range of VC is 0.2 to 6V and the output is saturation when $VC \geq VO$

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

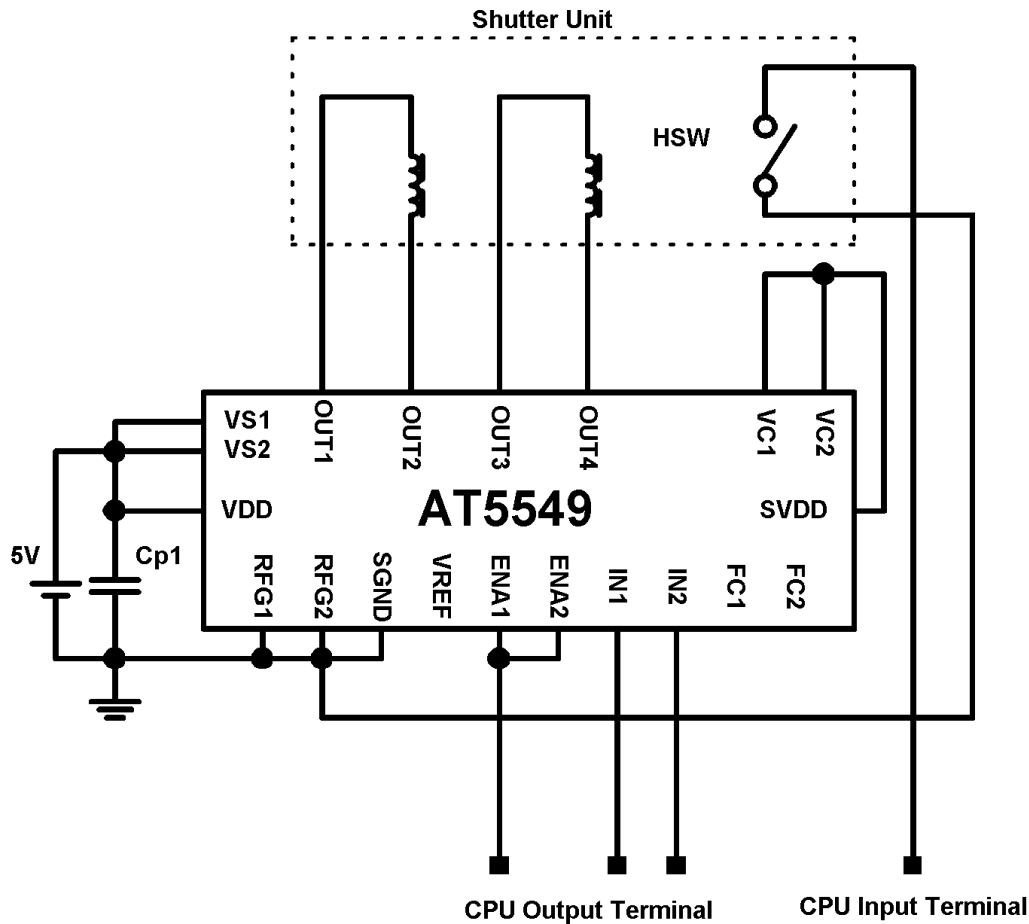
CH1 (between OUT1 and OUT2* and CH2 (between OUT3 and OUT4) are controlled independently

Typical Application



Application Information

(1) Saturation drive control

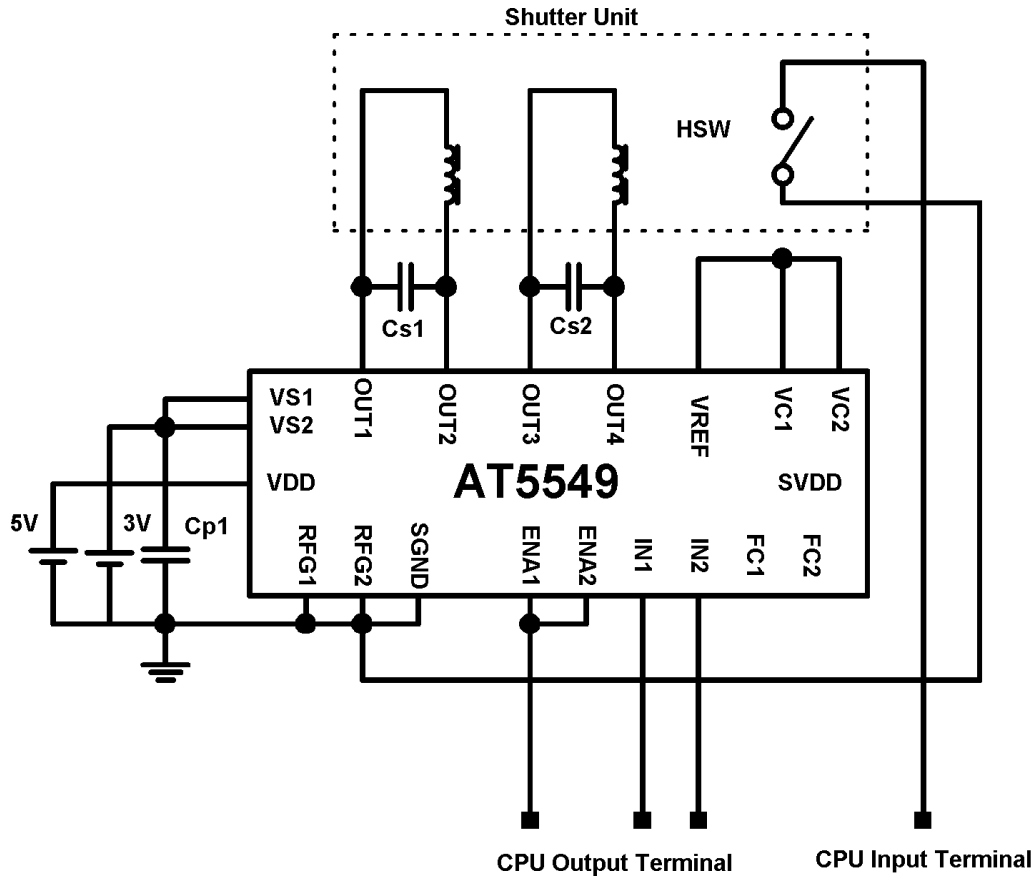


Operational conditions for saturation drive control

- Shorting RFG with SGND
- Inputting the voltage that is $VC > VS/1.95V$ ($VS \geq 1.6V$)
- Output voltage VOUT

$$VOUT = VS - VSAT(PNP) - VSAT(NPN) \quad *VSAT = \text{saturation voltage}$$

(2) Constant voltage drive control

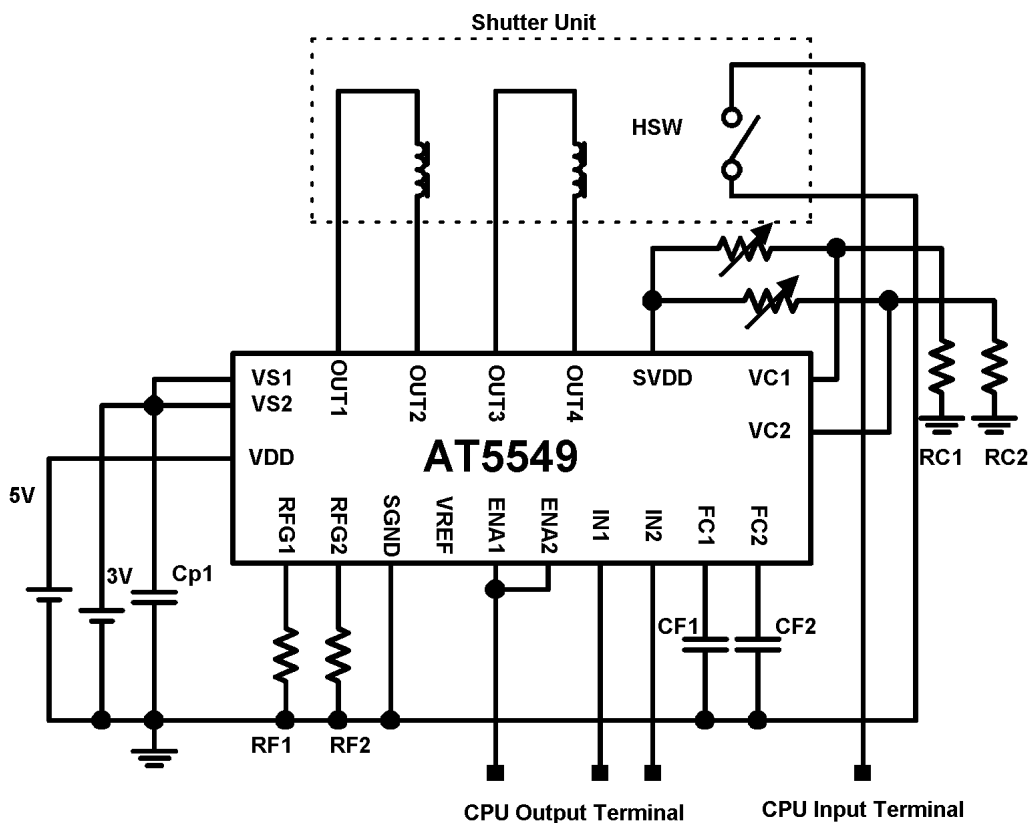


Operational conditions for constant voltage drive control

- Shorting RFG with SGND
- Connecting a capacitor of 4700pF between OUTs
- Inputting the voltage that is $VS \geq VS \times 1.95V$ ($VS \geq 1.6V$)
- Output voltage VOUT

$$VOUT = 1.95 \times VC - VSAT(NPN) \quad *VSAT = \text{saturation voltage}$$

(3) Constant current drive control

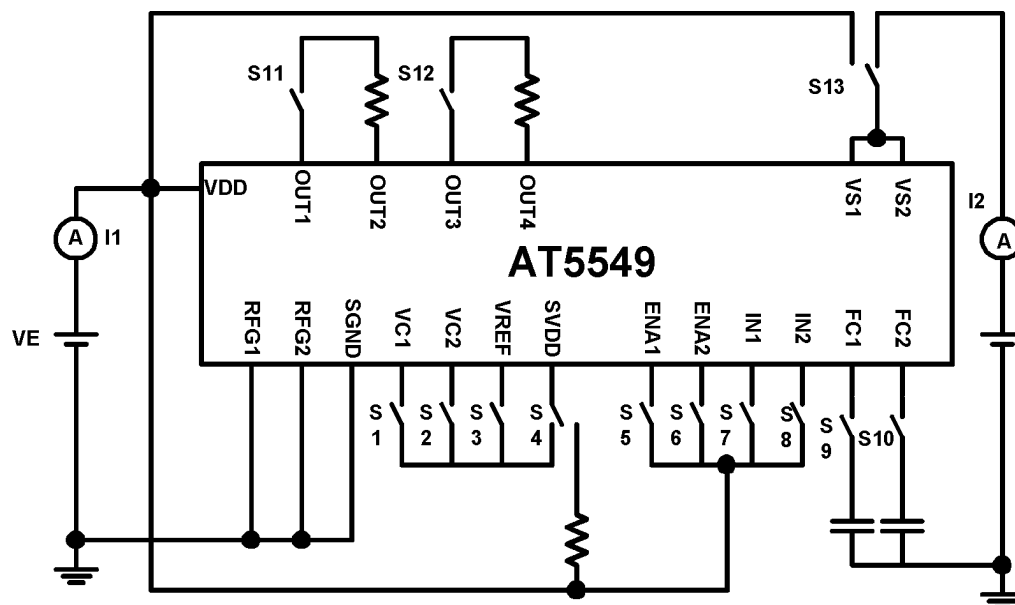


Operational conditions for constant current drive control

- Connecting RF between RFG and SGND
- Connecting a capacitor of 680pF between FC and SGND to prevent oscillation
- Shorting VS with SVDD
- Output current IOUT

$$\mathbf{IOUT=VC/(RF\times4.5)(A)}$$

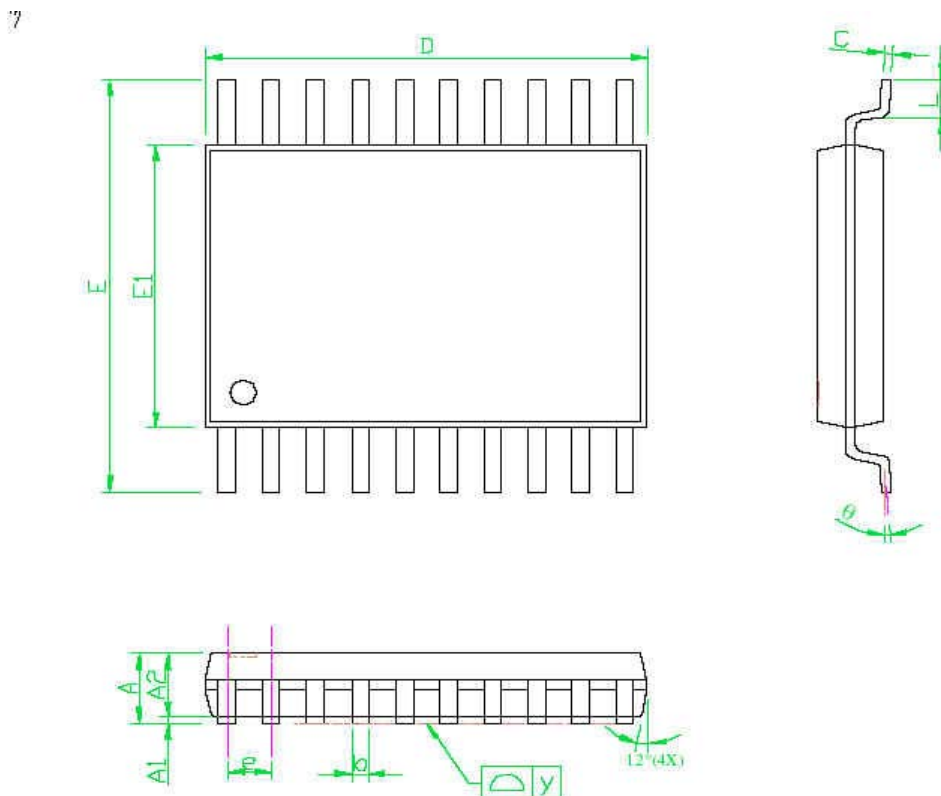
Test Circuit



Switch conditions table

Circuit Part	VC2	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	ON	GND	OFF	OFF	OFF	OFF	ON	VDD	I1
Stepping motor	ON	ON	ON	VC	ON	ON	x	x	OFF	VS	I1
	ON	ON	ON	OFF	ON	ON	x	x	OFF	VS	I1
	ON	ON	ON	VC	ON	ON	x	x	OFF	VS	I2
	ON	ON	ON	OFF	ON	ON	x	x	OFF	VS	I2

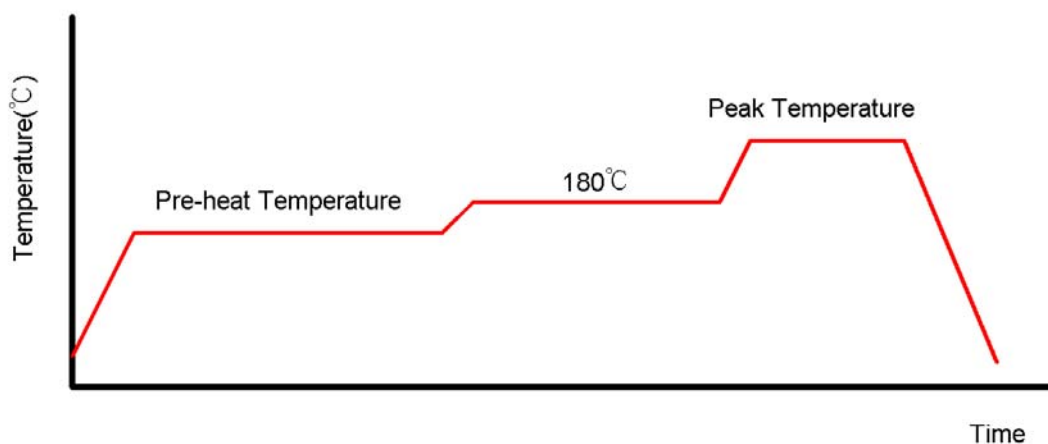
Package Outline: TSSOP20



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°

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A



Classification Reflow Profiles

	Convection or IR/Convection	VPR
Average Heating Rate(180°C to peak)	5°C/second max.	10°C/second max.
Preheat Temperature(125±20°C)	120 seconds max.	
Temperature maintained above 180°C	10~150 seconds	
Time within 5°C of actual Peak Temperature	10~20 seconds	60 seconds
Peak Temperature Range(Note 1)	219~225°C or 235~240°C	219~225°C or 235~240°C
Cooling Rate	6°C /second max.	10°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	

*1 The maximum peak temperatures for IR and VP reflow are depending on package dimensions.

Package Reflow Conditions

Pkg. Thickness ≥2.5mm and all bags	Pkg. Thickness <2.5mm and Pkg. Volume ≥350 mm ³	Pkg. Thickness <2.5mm and Pkg. Volume <350 mm ³
Convection 219~225°C		Convection 235~240°C
VPR 219~225°C		VPR 235~240°C
IR/Convection 219~225°C		IR/Convection 235~240°C