Micro-porous Ultrasonic Humidifier Driver IC

Outline

TTP320-AO8 is a device dedicated for use in ultrasonic humidifier applications. The application principle for micro-porous ultrasonic atomization piece is to use electronic high-frequency oscillation resonance to atomize the liquid water molecules. The device built-in adjust output power controller, auto-scan to get the atomization piece optimal resonance frequency. The device also support communication interface for function registers (include overload protection, no water judgment, setting PWM duty, scanning frequency).

Characteristic

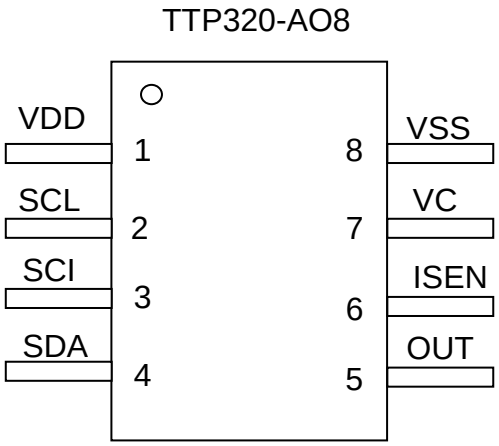
- Operating voltage : 2.4V ~ 5.5V.
- Standby current, no load < 2.0uA@VDD=5V.
- Be applicable Micro-porous ultrasonic atomizer. The center resonance frequency range is 90KHz ~180KHz (arrange in pairs R1), the center resonance frequency can be self automatic adjustable range in ±15%.
- Lower standby power saving function can be used for battery applications.
- Support communication interface setting functions for MCU.
- MCU can read ISEN pin voltages through ADC to achieve “Overload Protection” and “No water Judgment”
- MCU can set PWM “Duty” and “Resonance Frequency” through the internal registers.
- Built-in LVD 3.2V (accuracy ±5%) to protect battery.

Applications

- Wide consumer products for ultrasonic humidifier, nebulizer applications.

Pin assignment

SOP-8



Pin Description

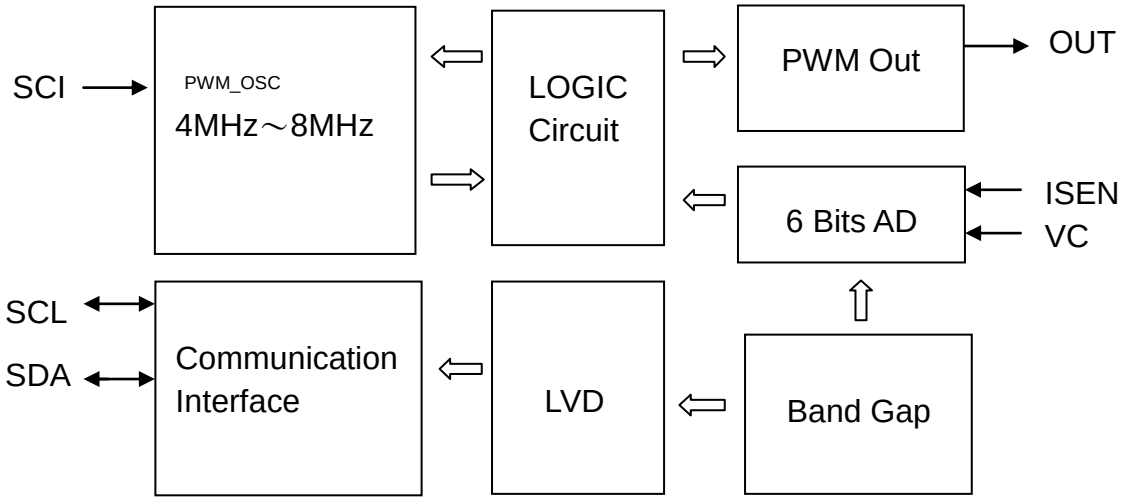
Pin no.	Pin name	I/O Type	Pin Description
1	VDD	P	Positive power supply
2	SCL	I/OD	Communication interface SCL I/O pin
3	SCI	I	Adjust PWM frequency oscillator input pin
4	SDA	I/OD	Communication interface SDA I/O pin
5	OUT	O	Resonance frequency output pin
6	ISEN	I	Current-detect input pin
7	VC	I	Voltage charge input pin
8	VSS	P	Negative power supply, ground

SDA /SCL pin have no Diode protective circuit

Pin Type

- I CMOS input pin
- O CMOS output pin
- I／O CMOS I／O
- P Power／Ground
- I-PH CMOS input and pull-high resister
- I-PL CMOS input and pull-low resister
- I/OD Open drain output, have no Diode Protective circuit

Block diagram



Electrical Characteristics

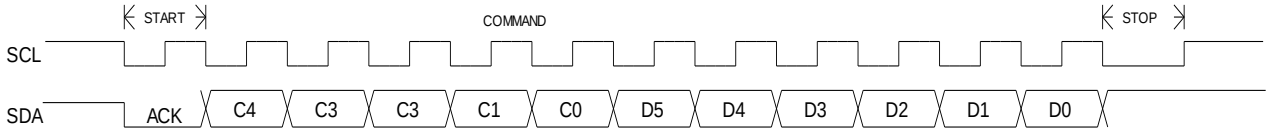
- **Absolute maximum ratings**

Parameter	Symbol	Conditions	Rating	Unit
Operating Temperature	T_{OP}	—	-20～+70	℃
Storage Temperature	T_{STG}	—	-50～+125	℃
Supply Voltage	VDD	Ta=25°C	VSS-0.3～VSS+5.5	V
Input Voltage	V_{IN}	Ta=25°C	VSS-0.3～VDD+0.3	V
Human Body Mode	ESD	—	5	KV
Note：VSS symbolizes for system ground				

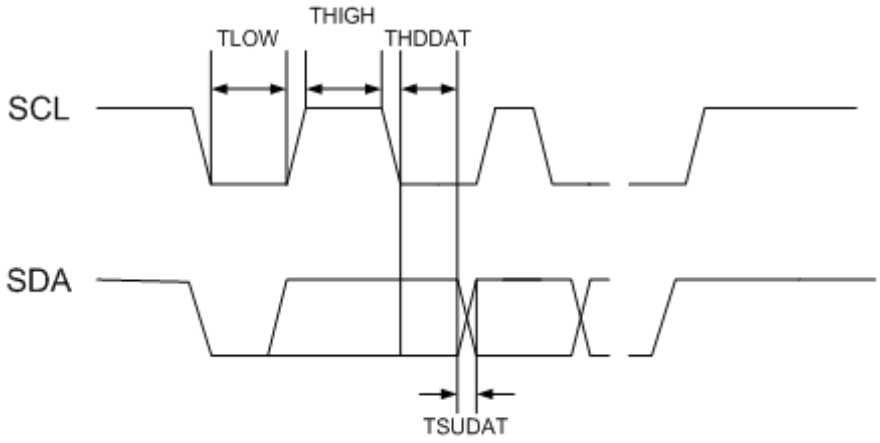
- **DC / AC characteristics：（Test condition at room temperature = 25 ℃）**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	VDD		2.4	5.0	5.5	V
Low voltage detect	LVD		3.04	3.2V	3.16	V
Standby current	I_{OFF}	VDD=5.0V System Off(standby)	-	-	2.0	uA
Input Ports	V_{IL}	Input Low Voltage	0	-	0.2	VDD
Input Ports	V_{IH}	Input High Voltage	0.8	-	1.0	VDD
Output Port Sink Current	I_{OL}	VDD=5V, V_{OL}=1.0V	-	16	-	mA
Output Port Source Current	I_{OH}	VDD=5V, V_{OH}=4.0V	-	14	-	mA

Serial communication waveform



SCL: Data is sent out at the falling edge.
SDA: Start transfer by the MSB.
START: Serial communication start, TTP320-AO8 responds to the master low level, confirms that the connection is work.
STOP: Serial communication end, ensure that the data of TTP320-AO8 is released and return to the high level.
COMMAND : COM 5bit (C4～C0) ; DATA 6 bit (D5～D0).



Switching Characteristics

Symbol	Description	Min	Max	Units
FCLK	CLK clock frequency	0	25	KHz
TLOW	Low period of the SCL clock.	20	2000	us
THIGH	High period of the SCL clock.	20	2000	us
THDDAT	Data hold time.	0	-	us
TSUDAT	Data set-up time.	250	-	ns

SCL over 10ms (Min) signal no variable, the system return to standby mode by itself (TIME OUT time mechanism)

Command function table:

MSB LSB

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	R/W	Description
0	0	0	0	1	-	FDUTY(4:0)					W01	OUT small cycle
					-	1	0	0	0	0		FDUTY define
0	0	1	0	0	SCAN_SD_ST(5:0)						W04	Scan frequency start value
					0	0	0	0	0	0		
0	0	1	0	1	SCAN_SD_END(5:0)						W05	Scan frequency end value
					1	1	1	1	1	1		
0	0	1	1	0	SCAN_ON(2:0)			BCY(2:0)			W06	OUT big cycle
					0	0	0	0	0	0		Read AD period
0	0	1	1	1	RADC_TP(1:0)		VC_DIS(1:0)		RADF(1:0)		W07	Scan frequency mechanism flag
					0	1	0	0	0	1		
0	1	0	0	0	-	-	-	-	SD_CHG	RE_SCAN	W08	RE_SCAN
					-	-	-	-	1	**0**		
0	1	0	0	1	-	-	-	-	-	LVDEN	W09	LVD control
					-	-	-	-	-	0		
0	1	1	0	0	-	-	MCU_ON(3:0)				W0C	OUT output define
					-	-	0	0	0	0		Power off
1	0	0	0	1	SCAN_T		N_NOWV	N_NOWS			R11	SCAN busy
1	0	0	1	0						LVDF	R12	LVD flag
1	0	0	1	1	MAX_VC(5:0)=N ; VC(max)=N*30mV						R13	Read VC the highest voltage
					n	n	n	N	n	n		
1	0	1	0	0	MAX_SD(5:0)=N ;						R14	Read the best scan frequency point
					n	n	n	N	n	n		
1	0	1	1	0	NOW_VC(5:0)=N ; VC(now)=N*30mV						R16	Read VC the now voltage
					n	n	n	N	n	n		
1	0	1	1	1	NOW_SD(5:0)=N ;						R17	Read the now scan frequency point
					n	n	n	n	n	n		

F(ato) =F(osc)/44.

F(osc)=8M～4MHz.

F(ato): Atomization piece resonance frequency : 180K～90KHz.

Note: SCAN_T =1: SCAN Busy.

SCAN_T =0: SCAN non Busy.

Command function description：

1. OUT Pin : output duty setting of resonance frequency of the atomization piece

W01/FDUTY(4:0) : OUT small cycle DUTY H/L ratio define

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	0	0	0	1	-	FDUTY(4:0)					W01
					-	1	0	0	0	0	

FDUTY(4:0)					DUTY H/L ratio		
(4)	(3)	(2)	(1)	(0)	DUTY_H	DUTY_L	Ratio
0	0	0	0	0	6	38	13.6%
0	0	0	0	1	7	37	15.9%
0	0	0	1	0	8	36	18.2%
0	0	0	1	1	9	35	20.5%
0	0	1	0	0	10	34	22.7%
0	0	1	0	1	11	33	25.0%
0	0	1	1	0	12	32	27.3%
0	0	1	1	1	13	31	29.5%
0	1	0	0	0	14	30	31.8%
0	1	0	0	1	15	29	34.1%
0	1	0	1	0	16	28	36.4%
0	1	0	1	1	17	27	38.6%
0	1	1	0	0	18	26	40.9%
0	1	1	0	1	19	25	43.2%
0	1	1	1	0	20	24	45.5%
0	1	1	1	1	21	23	47.7%
1	0	0	0	0	22	22	50.0%
1	0	0	0	1	23	21	52.3%
1	0	0	1	0	24	20	54.5%
1	0	0	1	1	25	19	56.8%
1	0	1	0	0	26	18	59.1%
1	0	1	0	1	27	17	61.4%
1	0	1	1	0	28	16	63.6%
1	0	1	1	1	29	15	65.9%
1	1	0	0	0	30	14	68.2%
1	1	0	0	1	31	13	70.5%
1	1	0	1	0	32	12	72.7%
1	1	0	1	1	33	11	75.0%
1	1	1	0	0	34	10	77.3%
1	1	1	0	1	35	9	79.5%
1	1	1	1	0	36	8	81.8%
1	1	1	1	1	37	7	84.1%

2. Set F(osc) scan frequency start point : W04/SCAN_SD_ST(5:0)

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	0	1	0	0	VCE_ST(5:0)						W04
					0	0	0	0	0	0	

3. Set F(osc) scan frequency end point: W05/SCAN_SD_ST(5:0)

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	0	1	0	1	VCE_END(5:0)						W05
					1	1	1	1	1	1	

If SCAN_SD_ST(5:0) = SCAN_SD_END(5:0), then fix SCAN_SD(5:0)

4. W06/BCY(2:0) : Define OUT big cycle VC charge time
W06/SCAN_ON(2:0) : define SCAN time OUT power (power scan frequency)

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	0	1	1	0	SCAN_ON(2:0)			BCY(2:0)			W06
					0	0	0	0	0	0	

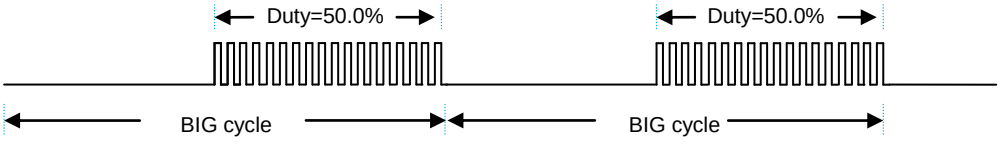
5. Define OUT BIG cycle VC charge time : BCY(2:0)

BCY(2)	BCY(1)	BCY(0)	VC charge time
0	0	0	100.0%
0	0	1	87.5%
0	1	0	75.0%
0	1	1	62.5%
1	0	0	50.0%
1	0	1	37.5%
1	1	0	25.0%
1	1	1	12.5%

6. OUT power(water output) : SCAN_ON(2:0) : define SCAN time

SACN_ON(2)	SACN_ON(1)	SACN_ON(0)	OUT power (water output)
0	0	0	100.0%
0	0	1	87.5%
0	1	0	75.0%
0	1	1	62.5%
1	0	0	50.0%
1	0	1	37.5%
1	1	0	25.0%
1	1	1	12.5%

Note: OUT power(water output) description : Example: 50.0% (Duty)



7. Set scan frequency mechanism flag: W07

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	0	1	1	1	RADC_TP(1:0)		VC_DIS(1:0)		RADF(1:0)		W07
					0	1	0	0	0	1	

8. Define read VC AD value period (BIG cycle) : RADC_TP(1:0)

RADC_TP(1)	RADC_TP(0)	Period
0	0	1024 OUT clock
0	1	2048 OUT clock
1	0	4096 OUT clock
1	1	8192 OUT clock

9. Before VC voltage charge, Discharge voltage control : VC_DIS(1:0)

VC_DIS(1)	VC_DIS(0)	Discharge time
0	0	Disable discharge(0ms)
0	1	1ms
1	0	2ms
1	1	4ms

10. Define read AD value time , OUT and VC charge function : RADF(1:0)

RADF(1)	RADF(0)	OUT	VC
1	1	PWM	Charge voltage
1	0	PWM	No charge voltage
0	X	No PWM	No charge voltage

Note: X=> don't care

11. RE_SCAN : W08(0)

Set scan frequency mode: W08(1)

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	1	0	0	0	-	-	-	-	SD_CHG	RE_SCAN	W08
					-	-	-	-	1	**0**	

RE_SCAN : Re-scan frequency

F(osc): Before scan frequency is completed => RE_SCAN reset is 0(cannot be set)

Set RE_SCAN=1 => start re-scan frequency

SD_CHG : Set scan frequency method

- SD_CHG=1 : method 1 => high and low frequency interleaved scan.
- SD_CHG=0 : method 2 => scan from low to high frequency.

12. LVDEN: W09(0):

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	
0	1	0	0	1	-	-	-	-	-	LVDEN	W09
					-	-	-	-	-	0	

LVDEN=0: LVD Disable (Default)

LVDEN=1: LVD Enable

13. Scan Frequency Method Description

13-1 : Scan frequency method 1 (SD_CHG=1) => high and low frequency interleaved scan.

SCAN_SD(5:0)						F(osc)
5	4	3	2	1	0	Offset Rate
0	0	0	0	0	0	-16.0%
0	0	0	0	0	1	15.5%
0	0	0	0	1	0	-15.5%
0	0	0	0	1	1	15.0%
0	0	0	1	0	0	-15.0%
0	0	0	1	0	1	14.5%
0	0	0	1	1	0	-14.5%
0	0	0	1	1	1	14.0%
0	0	1	0	0	0	-14.0%
0	0	1	0	0	1	13.5%
0	0	1	0	1	0	-13.5%
0	0	1	0	1	1	13.0%
0	0	1	1	0	0	-13.0%
0	0	1	1	0	1	12.5%
0	0	1	1	1	0	-12.5%
0	0	1	1	1	1	12.0%
0	1	0	0	0	0	-12.0%
0	1	0	0	0	1	11.5%
0	1	0	0	1	0	-11.5%
0	1	0	0	1	1	11.0%
0	1	0	1	0	0	-11.0%
0	1	0	1	0	1	10.5%
0	1	0	1	1	0	-10.5%
0	1	0	1	1	1	10.0%
0	1	1	0	0	0	-10.0%
0	1	1	0	0	1	9.5%
0	1	1	0	1	0	-9.5%
0	1	1	0	1	1	9.0%
0	1	1	1	0	0	-9.0%
0	1	1	1	0	1	8.5%
0	1	1	1	1	0	-8.5%
0	1	1	1	1	1	8.0%

SCAN_SD(5:0)						F(osc)
5	4	3	2	1	0	Offset Rate
1	0	0	0	0	0	-8.0%
1	0	0	0	0	1	7.5%
1	0	0	0	1	0	-7.5%
1	0	0	0	1	1	7.0%
1	0	0	1	0	0	-7.0%
1	0	0	1	0	1	6.5%
1	0	0	1	1	0	-6.5%
1	0	0	1	1	1	6.0%
1	0	1	0	0	0	-6.0%
1	0	1	0	0	1	5.5%
1	0	1	0	1	0	-5.5%
1	0	1	0	1	1	5.0%
1	0	1	1	0	0	-5.0%
1	0	1	1	0	1	4.5%
1	0	1	1	1	0	-4.5%
1	0	1	1	1	1	4.0%
1	1	0	0	0	0	-4.0%
1	1	0	0	0	1	3.5%
1	1	0	0	1	0	-3.5%
1	1	0	0	1	1	3.0%
1	1	0	1	0	0	-3.0%
1	1	0	1	0	1	2.5%
1	1	0	1	1	0	-2.5%
1	1	0	1	1	1	2.0%
1	1	1	0	0	0	-2.0%
1	1	1	0	0	1	1.5%
1	1	1	0	1	0	-1.5%
1	1	1	0	1	1	1.0%
1	1	1	1	0	0	-1.0%
1	1	1	1	0	1	0.5%
1	1	1	1	1	0	-0.5%
1	1	1	1	1	1	0.0%

13-2 : Scan frequency method 2 (SD_CHG=0) => scan from low to high frequency.

SCAN_SD(5:0)						F(osc)
5	4	3	2	1	0	Offset Rate
0	0	0	0	0	0	-16.0%
0	0	0	0	0	1	-15.5%
0	0	0	0	1	0	-15.0%
0	0	0	0	1	1	-14.5%
0	0	0	1	0	0	-14.0%
0	0	0	1	0	1	-13.5%
0	0	0	1	1	0	-13.0%
0	0	0	1	1	1	-12.5%
0	0	1	0	0	0	-12.0%
0	0	1	0	0	1	-11.5%
0	0	1	0	1	0	-11.0%
0	0	1	0	1	1	-10.5%
0	0	1	1	0	0	-10.0%
0	0	1	1	0	1	-9.5%
0	0	1	1	1	0	-9.0%
0	0	1	1	1	1	-8.5%
0	1	0	0	0	0	-8.0%
0	1	0	0	0	1	-7.5%
0	1	0	0	1	0	-7.0%
0	1	0	0	1	1	-6.5%
0	1	0	1	0	0	-6.0%
0	1	0	1	0	1	-5.5%
0	1	0	1	1	0	-5.0%
0	1	0	1	1	1	-4.5%
0	1	1	0	0	0	-4.0%
0	1	1	0	0	1	-3.5%
0	1	1	0	1	0	-3.0%
0	1	1	0	1	1	-2.5%
0	1	1	1	0	0	-2.0%
0	1	1	1	0	1	-1.5%
0	1	1	1	1	0	-1.0%
0	1	1	1	1	1	-0.5%

SCAN_SD(5:0)						F(osc)
5	4	3	2	1	0	Offset Rate
1	0	0	0	0	0	0.0%
1	0	0	0	0	1	0.5%
1	0	0	0	1	0	1.0%
1	0	0	0	1	1	1.5%
1	0	0	1	0	0	2.0%
1	0	0	1	0	1	2.5%
1	0	0	1	1	0	3.0%
1	0	0	1	1	1	3.5%
1	0	1	0	0	0	4.0%
1	0	1	0	0	1	4.5%
1	0	1	0	1	0	5.0%
1	0	1	0	1	1	5.5%
1	0	1	1	0	0	6.0%
1	0	1	1	0	1	6.5%
1	0	1	1	1	0	7.0%
1	0	1	1	1	1	7.5%
1	1	0	0	0	0	8.0%
1	1	0	0	0	1	8.5%
1	1	0	0	1	0	9.0%
1	1	0	0	1	1	9.5%
1	1	0	1	0	0	10.0%
1	1	0	1	0	1	10.5%
1	1	0	1	1	0	11.0%
1	1	0	1	1	1	11.5%
1	1	1	0	0	0	12.0%
1	1	1	0	0	1	12.5%
1	1	1	0	1	0	13.0%
1	1	1	0	1	1	13.5%
1	1	1	1	0	0	14.0%
1	1	1	1	0	1	14.5%
1	1	1	1	1	0	15.0%
1	1	1	1	1	1	15.5%

14. Start ON mode: W0C/MCU_ON(3:0)

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	Description	
0	1	1	0	0	-	-	0	0	0	0	System off	
					-	-	0	0	0	1		
					-	-	0	0	1	0		
					-	-	0	0	1	1		
					-	-	0	1	0	0		
					-	-	0	1	0	1		
					-	-	0	1	1	0		
					-	-	0	1	1	1	0	ON_L0
					-	-	1	0	0	0	100.0%	ON_L8
					-	-	1	0	0	1	87.5%	ON_L7
					-	-	1	0	1	0	75.0%	ON_L6
					-	-	1	0	1	1	62.5%	ON_L5
					-	-	1	1	0	0	50.0%	ON_L4
					-	-	1	1	0	1	37.5%	ON_L3
					-	-	1	1	1	0	25.0%	ON_L2
					-	-	1	1	1	1	12.5%	ON_L1

Note: Power (water yield) is divided to 9 percentage points: ON_L0 ~ON_L8

15. Read return value :

C4	C3	C2	C1	C0	D5	D4	D3	D2	D1	D0	R/W	Description
1	0	0	0	1	SCAN_T		N_NOWV	N_NOWS			R11	SCAN busy
1	0	0	1	0						LVDF	R12	LVD flag
1	0	0	1	1	MAX_VC(5:0)=N ; VC(max)=N*30mV						R13	Read VC the highest voltage
					n	n		n	n	n		
1	0	1	0	0	MAX_SD(5:0)=N ;						R14	Read the best scan frequency point
					n	n		n	n	n		
1	0	1	1	0	NOW_VC(5:0)=N ; VC(now)=N*30mV						R16	Read VC the now voltage
					n	n		n	n	n		
1	0	1	1	1	NOW_SD(5:0)=N ;						R17	Read the now scan frequency point
					n	n	n	n	n	n		

R11_D5: SCAN_T=1 busy(scan frequency busy); SCAN_T=0(scan frequency is completed)
R11_D3: N_NOWV : NOW_VC(5:0) index
N_NOWV =0 (new value); N_NOWV ==1 (old value)
R11_D2: N_NOWS : NOW_SD(5:0) index
N_NOWS =0 (new value); N_NOWS ==1 (old value)
R13_D(5:0): MAX_VC(5:0) : Maximum voltage value VC(max) after scan frequency complete.
R14_D(5:0): MAX_SD(5:0) : VC(max) relative operating frequency value SD(max).
R16_D(5:0): NOW_VC(5:0) : The recent voltage value VC(now).
R17_D(5:0): NOW_SD(5:0) : VC(now) relative operating frequency value SD(now).
R12_D0: LVDF is cleared “0” is after reading LVDF, when VDD is less than detect voltage 3.2V then LVDF will be set “1”. It will not be cleared “0” if voltage high than 3.2V. It will be cleared “0” after reading LVDF status (R12) setting.

TTP320-AO8 Serial communication：

Set： OUT frequency DUTY H/L ratio, OUT scan frequency start value and end value, set scan frequency mechanism, OUT output setting (ON/OFF, power adjustment).

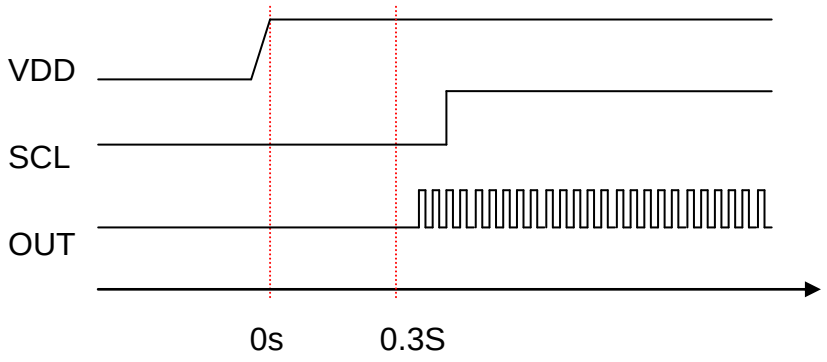
Read： SCAN busy flag, Maximum voltage value and optimal frequency value after scan frequency completed, the most recent voltage value and relative operating frequency value.

Resonance frequency match:

IC and atomization piece's center resonance frequency match through adjust SCI pin resister (R1), there are two ways:

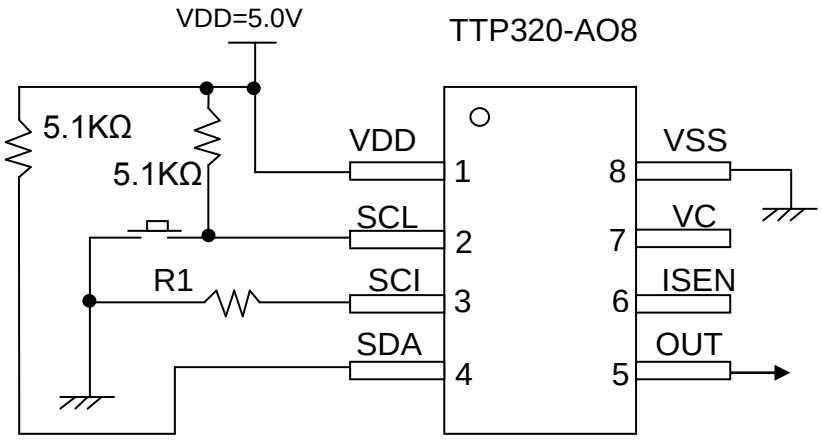
1. When adjust atomization piece's PWM frequency, the first SCAN_SD_ST and SCAN_SD_END set to 20H. The center frequency 0% position then adjust the SCI external resistor to get the best resonance frequency, and the resonance frequency can be self adjusted range +15%/-15% during mass production. It can self adjust the optimal frequency every time it is turned on. Reducing the atomization piece's influence of aging and error.

2. SCL pin connect to ground before power on initial, about 0.3 seconds after power on initial, then OUT pin is the output of the PWM center frequency.

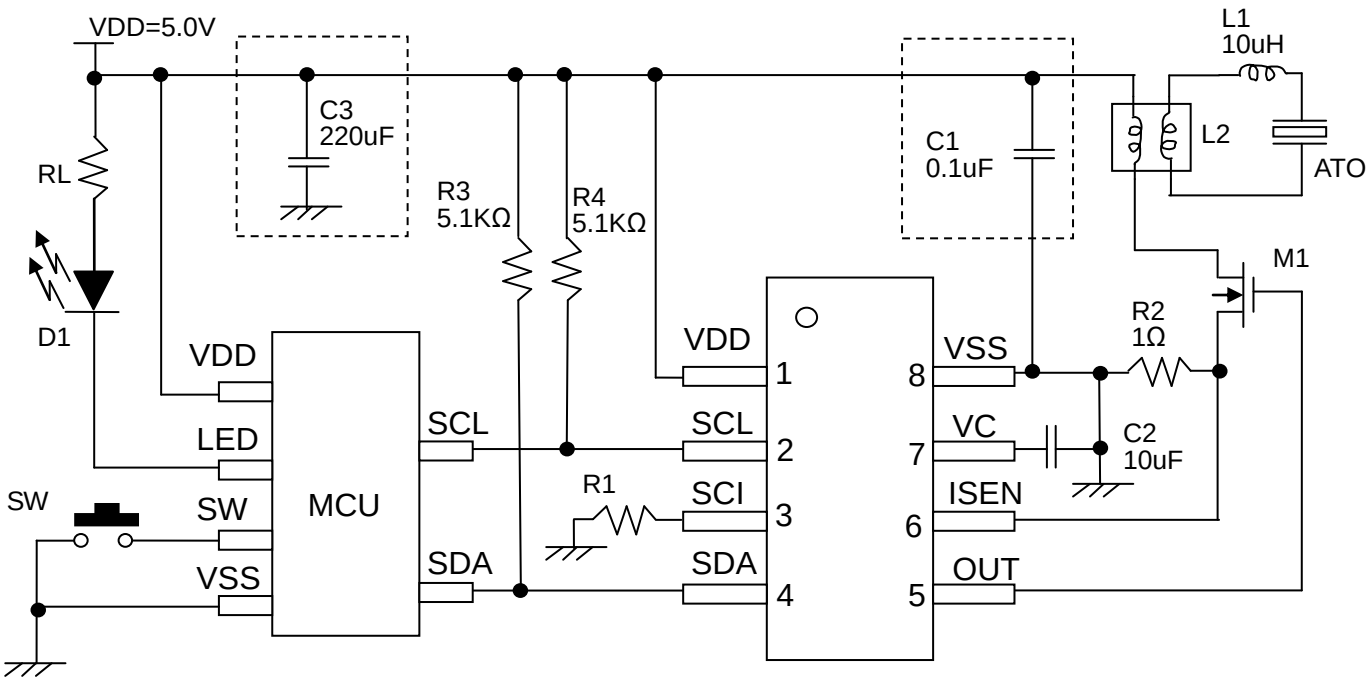


3. VDD=5V, SCI resister(R1) and OUT pin output PWM center frequency as follow table:

SCI resister (R1)	OUT PWM center frequency
30KΩ	179 KHz
33KΩ	163 KHz
36KΩ	151 KHz
39KΩ	140 KHz
43KΩ	125 KHz
47KΩ	118 KHz
51KΩ	109 KHz
56KΩ	101 KHz
62KΩ	92 KHz



Application circuit TTP320-AO8 Reference only



Note: 1. On PCB must notice M1 heat dissipation.
2. C2 should be as close as possible to the IC.
3. L2 Wire winding ratio depends on the atomization piece drive's voltage.
4. M1 NMOS transistor drive capability depends on the atomization piece power.

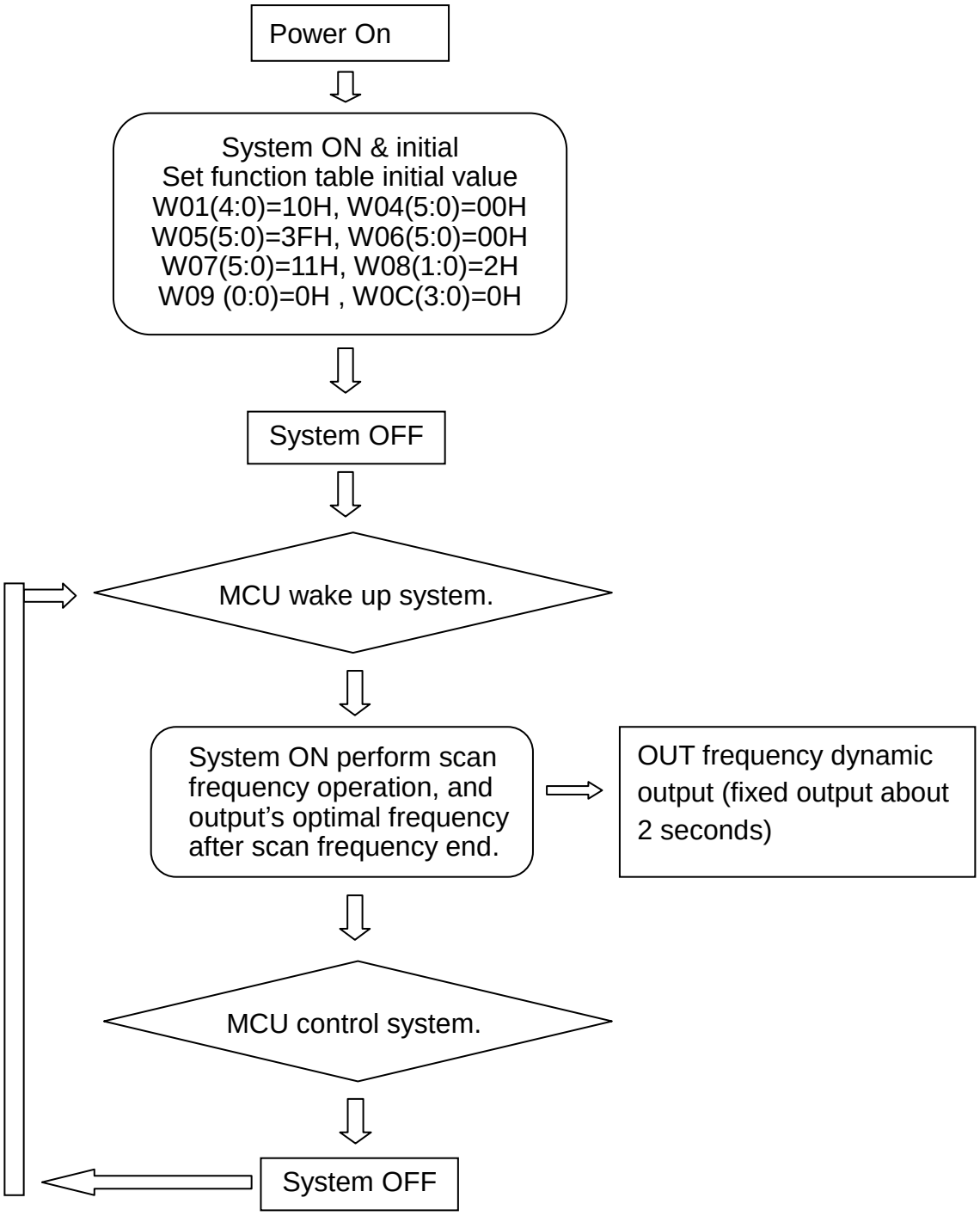
BOM table

Symbol	Type	Element parameter
C1	Terylene capacitor	0.1uF(*1)
C2	Electrolytic capacitor	10uF/16V
C3	Electrolytic capacitor	220uF/16V(*1)
R1	Carbon film resister	Reference R1 Page 12
R2	Carbon film resister	1Ω
R3	Carbon film resister	5.1KΩ
R4	Carbon film resister	5.1KΩ
RL	Carbon film resister	Depend on D1 specification
D1	LED	Light-emitting diode
L1	Color ring inductance	10uH
L2	High frequency transformer	Wire winding ratio (depend on atomization piece specification)
M1	NMOS transistor	Depend on atomization piece specification
SW	switch	Push button
ATO	ultrasonic atomization piece	Resonance frequency 90KHz~180KHz (*2)

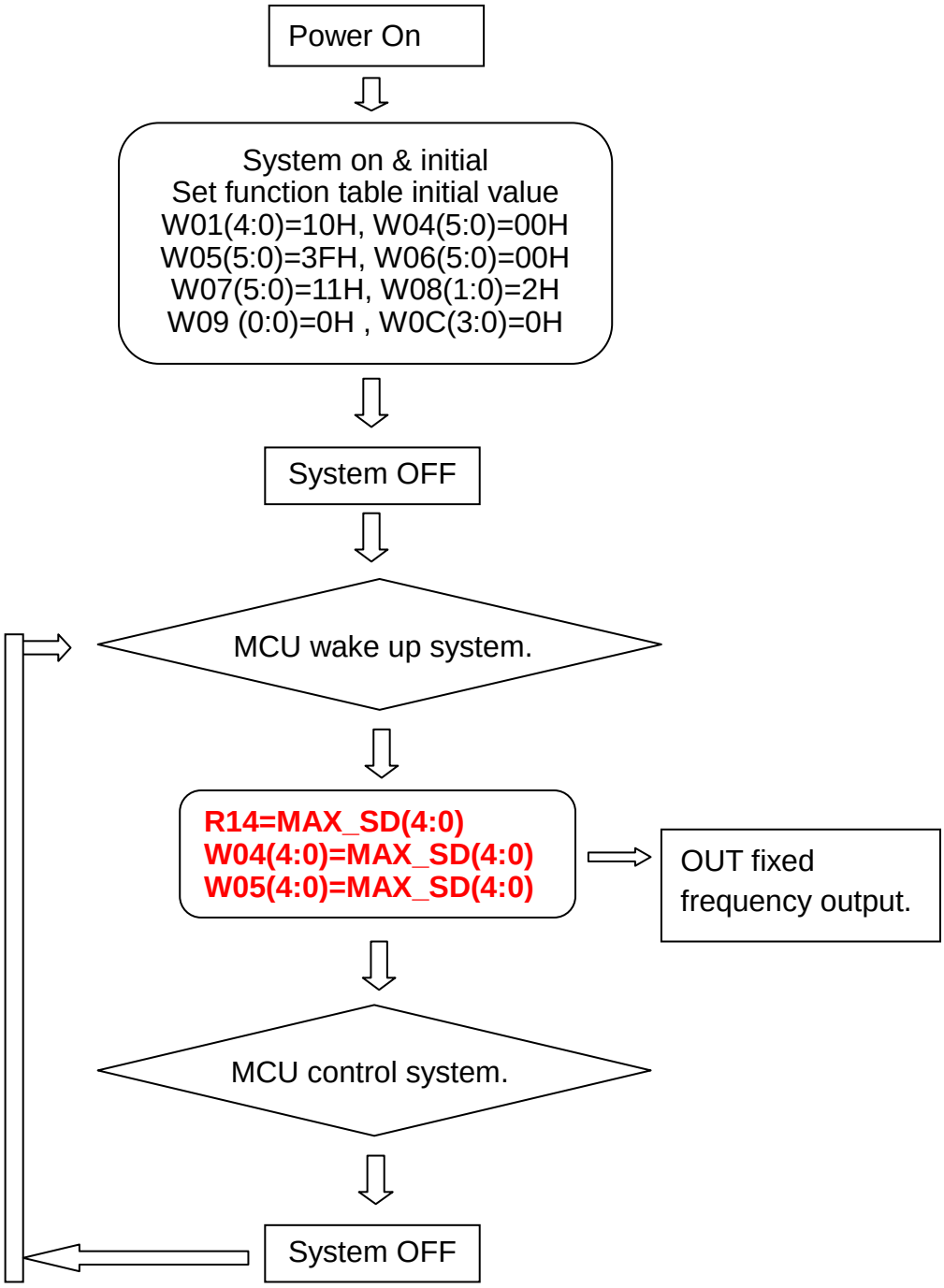
Note: (*1) Power filter component are installer as appropriate.
(*2) Please select a center frequency atomization piece in the circuit.

TTP320-AO8 System ON / OFF software program description

Examp 1: All frequency band(center frequency±15%) scanning time required is about 2.0 seconds

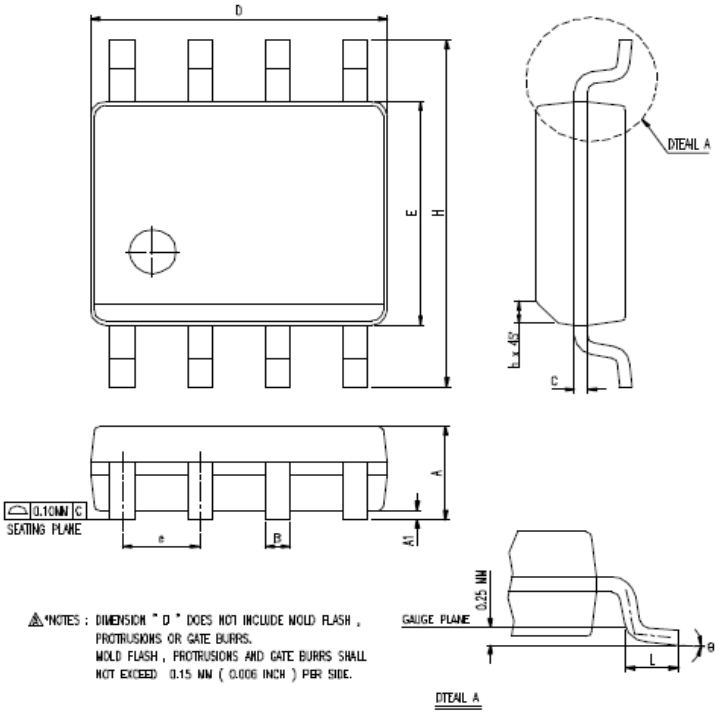


Examp 2: Single frequency scanning time required is about 50 milliseconds.



Package outline

Package Type: SOP 8

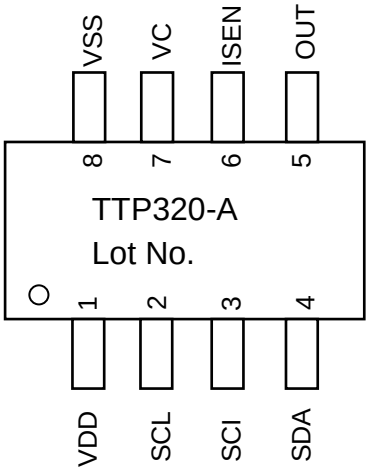


SYMBOL	DIMENSION IN MM		DIMENSION IN INCH	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.0532	0.0688
A1	0.10	0.25	0.0040	0.0098
B	0.33	0.51	0.013	0.020
C	0.19	0.25	0.0075	0.0098
e	1.27 BSC		0.050 BSC	
D	4.80	5.00	0.1890	0.1968
H	5.80	6.20	0.2284	0.2440
E	3.80	4.00	0.1497	0.1574
L	0.40	1.27	0.016	0.050
h	0.25	0.50	0.0099	0.0196
θ	0°	8°	0°	8°

Package configuration

TTP320-AO8

Package Type SOP-8



Ordering Information

TTP320		
Package Type	**Chip Type**	**Wafer Type**
TTP320-AO8	No support	No support

REVISION HISTORY：

2019/04/16: Initial version V1.2

2020/04/30: Revise incorrect format version V1.3