

NSP2.0

Data Sheet

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Table of Contents

1.	GENERAL DESCRIPTION	3
2.	FEATURES	3
3.	PIN DESCRIPTION	4
4.	ELECTRICAL CHARACTERISTICS	5
4.1	Absolute Maximum Ratings	5
4.2	D.C. Characteristics	5
4.3	A.C. Characteristics	6
4.4	Output Power	6
5.	TYPICAL APPLICATION CIRCUIT	8
5.1	Connect to Host uC by I2C Interface	8
5.2	Connect to Host uC by UART Interface.....	10
5.3	Connect to HOST uC by Two-Wire Interface.....	11
5.4	Connect to HOST uC by One-Wire Interface	12
5.5	PCB Layout Notice.....	13
6.	PACKAGE INFORMATION	13
6.1	Pin Assignment	13
6.2	Package Dimension	14
7.	ORDERING INFORMATION	16
8.	REVISION HISTORY	16

1. General Description

NSP2.0 series are advanced Voice IC with embedded Flash to implement Voice Assistance applications. It provides hardware I2C, UART and firmware One-Wire, Two-Wire interface to communicate with host MCU, and support In-System-Program (ISP) to update content with high data transition rate; Besides, NSP2.01G series support up to 1.0 Watt (@ 5.5V) amplifier to drive speaker directly, which is suitable for all the voice assistance applications.

The NSP2.0 series include 6 part numbers with different durations, shown as below selection guide:

Part No.	Package	Duration (S)		V _{DD} (V)	LVR (V)	Voice CH	ISP	Audio Output (8Ω,THD+N < 1%)		MCU I/F	
		12KH z	16KHz					3.3V	5.5V	H/W	F/W
NSP2080A	SOP8	96	72	2.0~5.5	1.9	2	V	0.2W	0.5W	I2C UART	One-Wire Two-Wire
NSP2170A		177	133								
NSP2340A		420	315								
NSP2080A01G	SOP16	96	72					0.4W	1.0W		
NSP2170A01G		177	133								
NSP2340A01G		420	315								

2. Features

- Operating voltage : 2.0~5.5V
- Operating temperature : -40°C ~ 85°C
- Interface with MCU : UART 、 I2C (Slave) 、 Two-Wire 、 One-Wire
- Audio output :
 - NSP2080A ~ 2340A: PWM Output, 0.5 Watt @ 5.5V (THD + N < 1%, 8Ω)
 - NSP2080A01G ~ 2340A01G: Push-Pull Amplifier 1.0 Watt @ 5.5V (THD + N < 1%, 8Ω)
- Provide ISP (In System Program) to update content from Host MCU
- Voice channel : 2-ch Voice
- Low Voltage Reset (LVR)
- Low Standby current : <= 2uA
- Flash Data Retention : 10-Year
- Flash Program/Erase Cycling Endurance : 100K
- Package form : SOP8 、 SOP16

- Package is Halogen-free, RoHS-compliant and TSCA-compliant

3. PIN Description

NSP2080A / NSP2170A / NSP2340A

Pin Name	I/O	Function
BP00 BP01	I/O	● General input / output pins ● BP00, BP01 share with ICPCCLK and ICPDATA ● Each pin can be set as I2C 、UART 、Two-Wire 、One-Wire interface
VDD	Power	Positive power supply
REG	Power	Internal regulator, 0.1uF capacitor is needed
VSS	Power	Negative power supply
PWM+	O	PWM driver positive output to drive speaker directly
PWM-	O	PWM driver negative output to drive speaker directly
/RESET	I	IC reset input, low active

NSP2080A01G / NSP2170A01G / NSP2340A01G

Pin Name	I/O	Function
BP00 BP01	I/O	● General input / output pins ● BP00, BP01 share with ICPCCLK and ICPDATA ● Each pin can be set as I2C 、UART 、Two-Wire 、One-Wire interface
VDD	Power	Positive power supply
REG	Power	Internal regulator, 0.1uF capacitor is needed
VSS	Power	Negative power supply
SPKP	O	Positive speaker signal amplified output
SPKN	O	Negative speaker signal amplified output
/RESET	I	IC reset input, low active
VDDA	Power	Positive power supply for amplifier
VSSA	Power	Negative power supply for amplifier
SPKVDD	Power	Positive power supply for speaker driving
SPKVSS	Power	Negative power supply for speaker driving
RGAIN	I	Gain control pin

4. Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter	Symbol	Conditions	Rated Value	Unit
Input Voltage	V _{IN}	All Inputs	V _{SS} -0.3 to V _{DD} +0.3	V
Storage Temp.	T _{STG}	-	-55 to +150	°C
Operating Temp.	T _{OPR}	-	-40 to +85	°C

Noted: Exposure to conditions beyond those listed under the absolute Maximum ratings table may adversely affect the life and reliability of the device.

4.2 D.C. Characteristics

(V_{DD} – V_{SS} = 4.5V, T_A = 25° C, No Load unless otherwise specified)

NSP2080A / NSP2170A / NSP2340A

Parameter	Sym	Conditions	Min	Typ	Max	Unit
Operating Voltage	V _{DD}		2.0	-	5.5	V
Operating Current	I _{OP1}	No load	-	5	-	mA
Standby Current (STOP)	I _{DD1}	No load	-	-	1	μA
Input Low Voltage	V _{IL}	All input pins	V _{SS}	-	0.3 V _{DD}	V
Input High Voltage	V _{IH}	All input pins	0.7 V _{DD}	-	V _{DD}	V
Pull High resistor BP00, BP01	R _{PH}	V _{DD} = 4.5V	105K	150K	195K	Ω
Output Current BP00, BP01	I _{OL}	V _{DD} = 3V, V _{OUT} = 0.4V	8	-	-	mA
	I _{OH}	V _{DD} = 3V, V _{OUT} = 2.6V	-4	-	-	mA

NSP2080A01G / NSP2170A01G / NSP2340A01G

Parameter	Sym	Conditions	Min	Typ	Max	Unit
Operating Voltage	V _{DD}		2.0	-	5.5	V
Operating Current	I _{OP1}	No load	-	6.5	-	mA
Standby Current (STOP)	I _{DD1}	No load	-	-	2	μA
Input Low Voltage	V _{IL}	All input pins	V _{SS}	-	0.3 V _{DD}	V
Input High Voltage	V _{IH}	All input pins	0.7 V _{DD}	-	V _{DD}	V
Pull High resistor BP00, BP01	R _{PH}	V _{DD} = 4.5V	105K	150K	195K	Ω
Output Current BP00, BP01	I _{OL}	V _{DD} = 3V, V _{OUT} = 0.4V	8	-	-	mA
	I _{OH}	V _{DD} = 3V, V _{OUT} = 2.6V	-4	-	-	mA

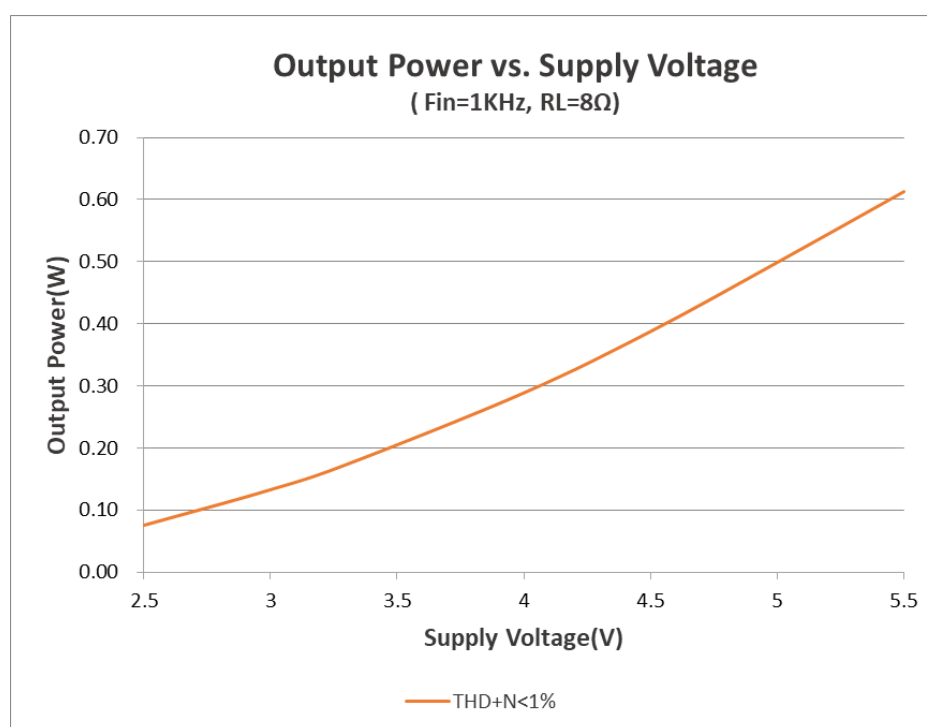
4.3 A.C. Characteristics

(VDD = 4.5V, TA = 25°C, No Load unless otherwise specified)

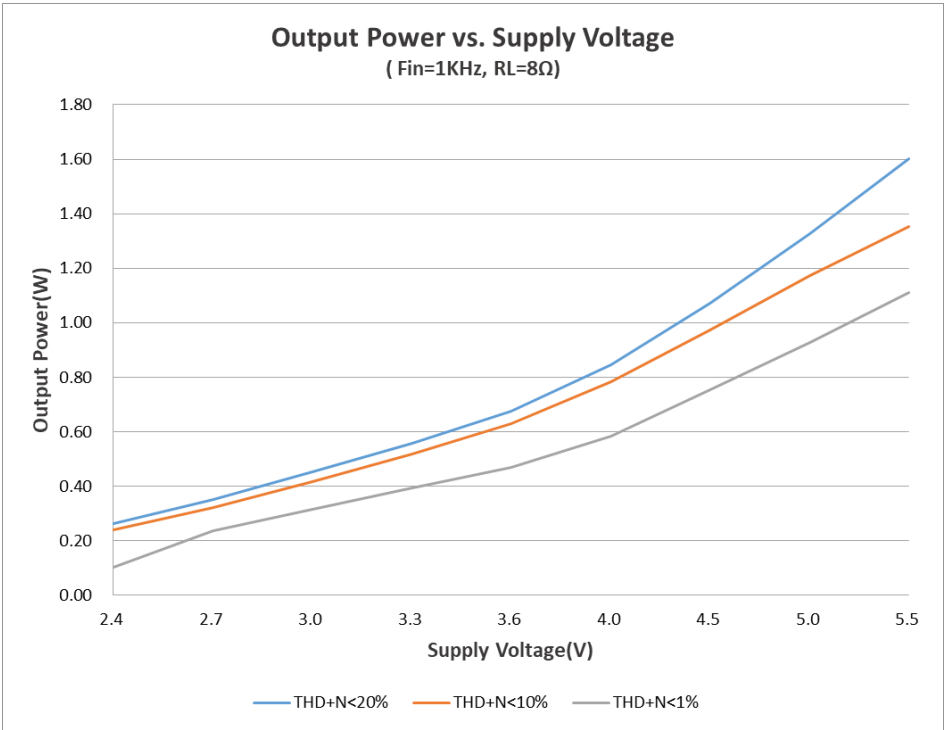
Parameter	Sym	Conditions	Min	Typ	Max	Unit
Frequency Deviation by Voltage Drop	$\Delta F/F$	(Fmax – Fmin)/Fmin @VDD: 2.0 ~ 5.5V	-	-	3	%

4.4 Output Power

NSP2080A / NSP2170A / NSP2340A (Frequency Input = 1KHz Sine Wave, RL=8Ω)

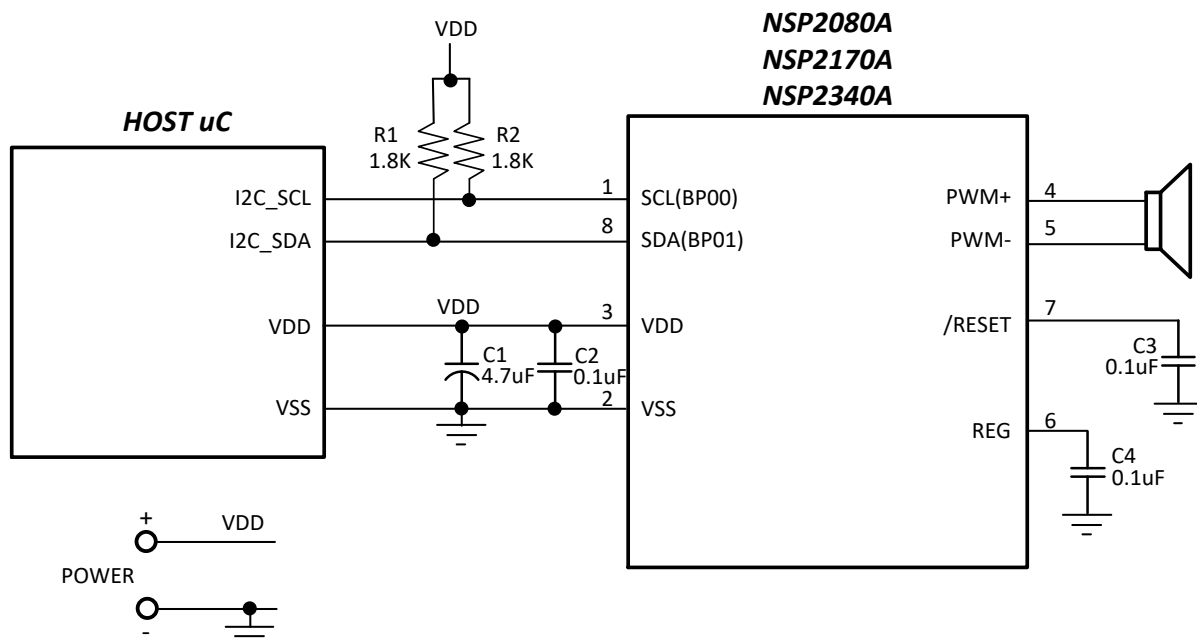


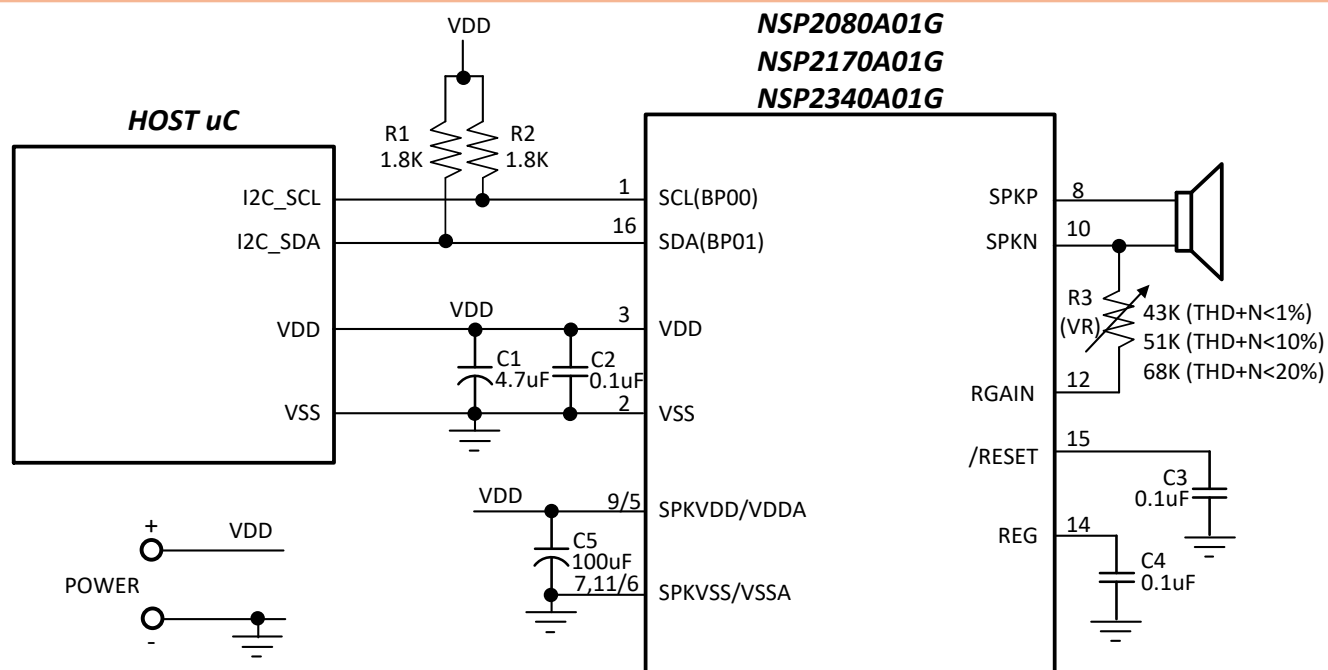
NSP2080A01G / NSP2170A01G / NSP2340A01G (Frequency Input = 1KHz, RL=8Ω)



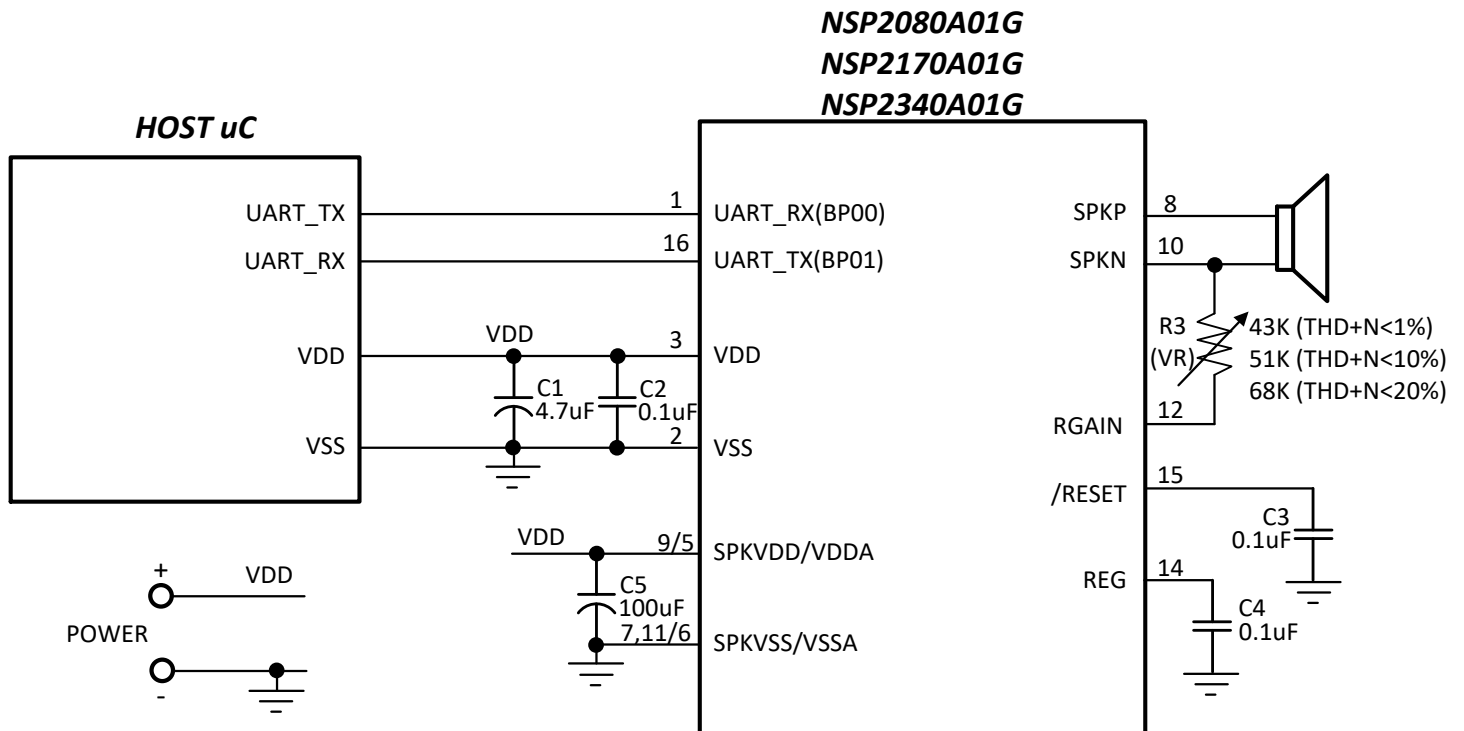
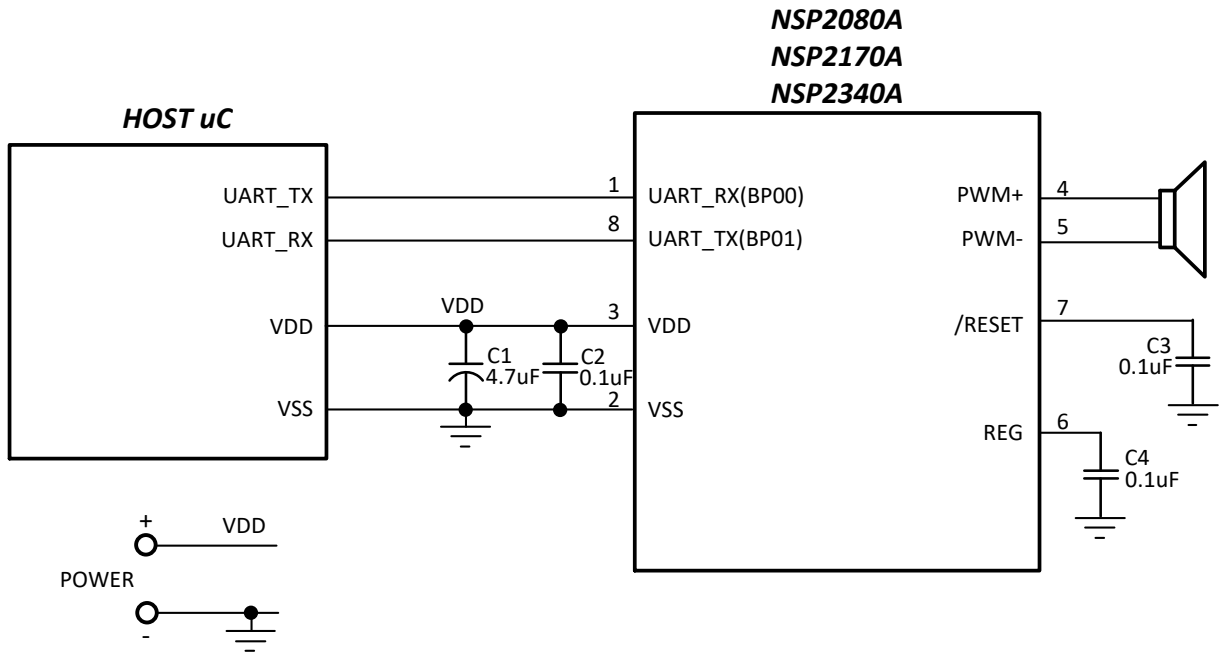
5. Typical Application Circuit

5.1 Connect to Host uC by I2C Interface

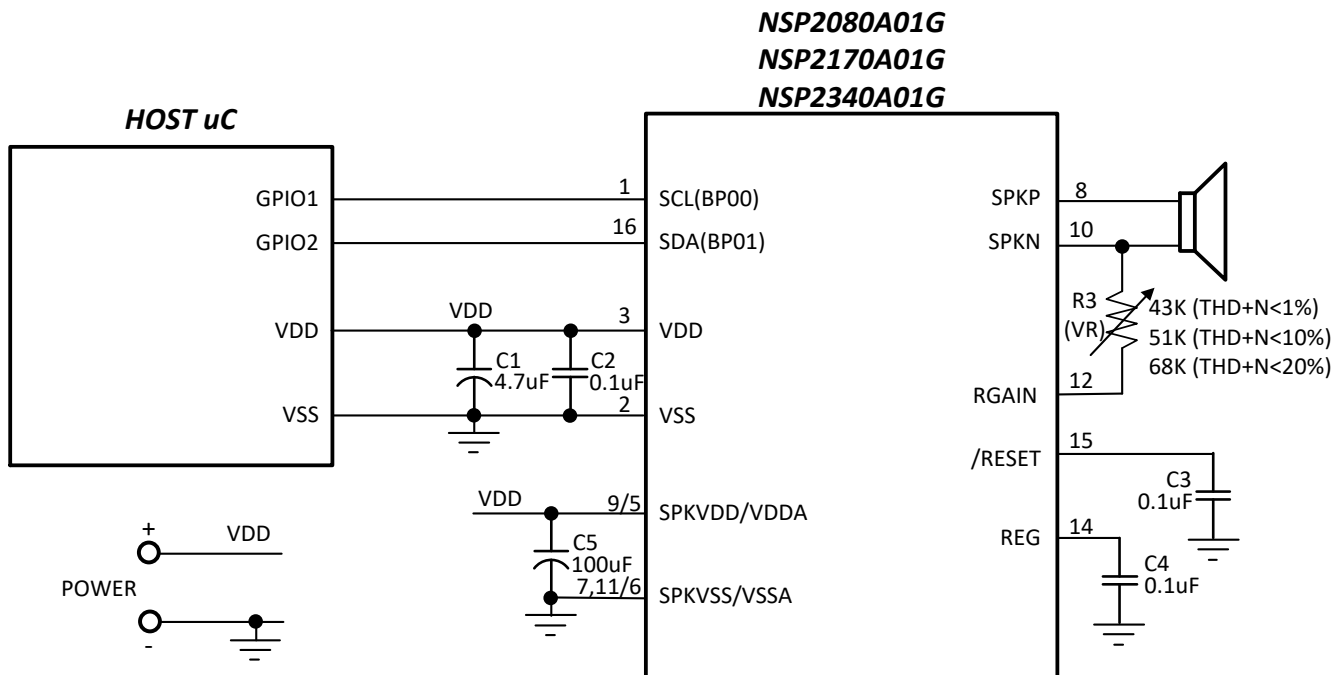
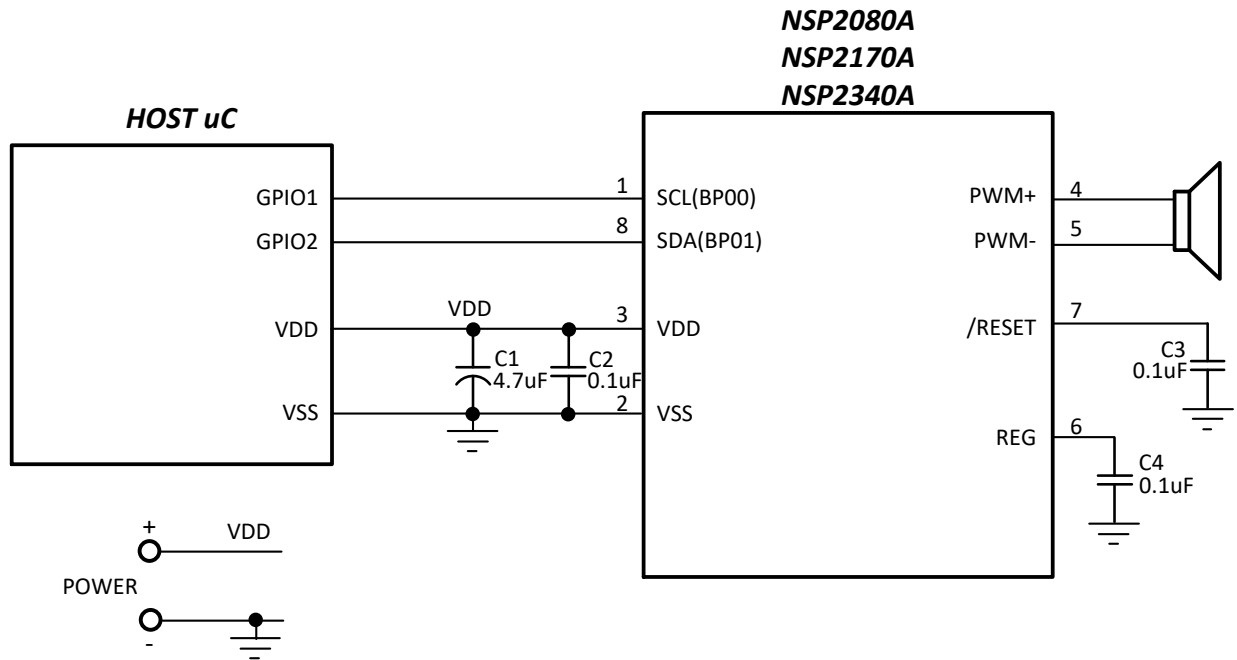




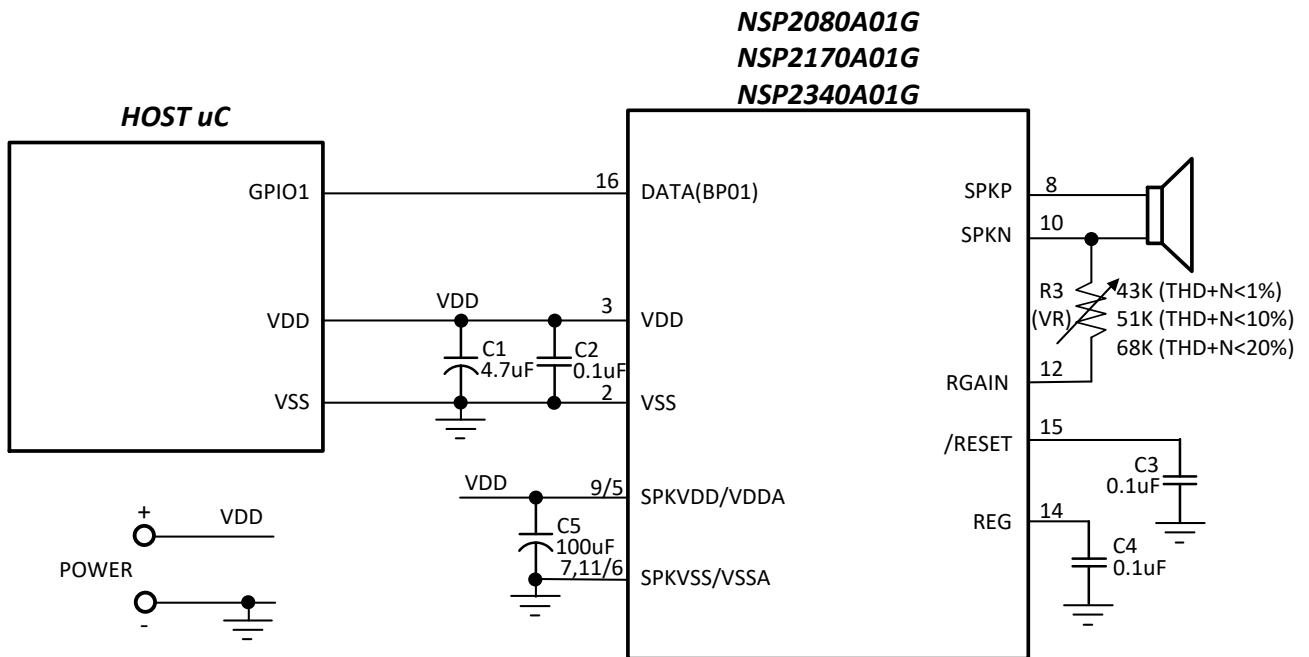
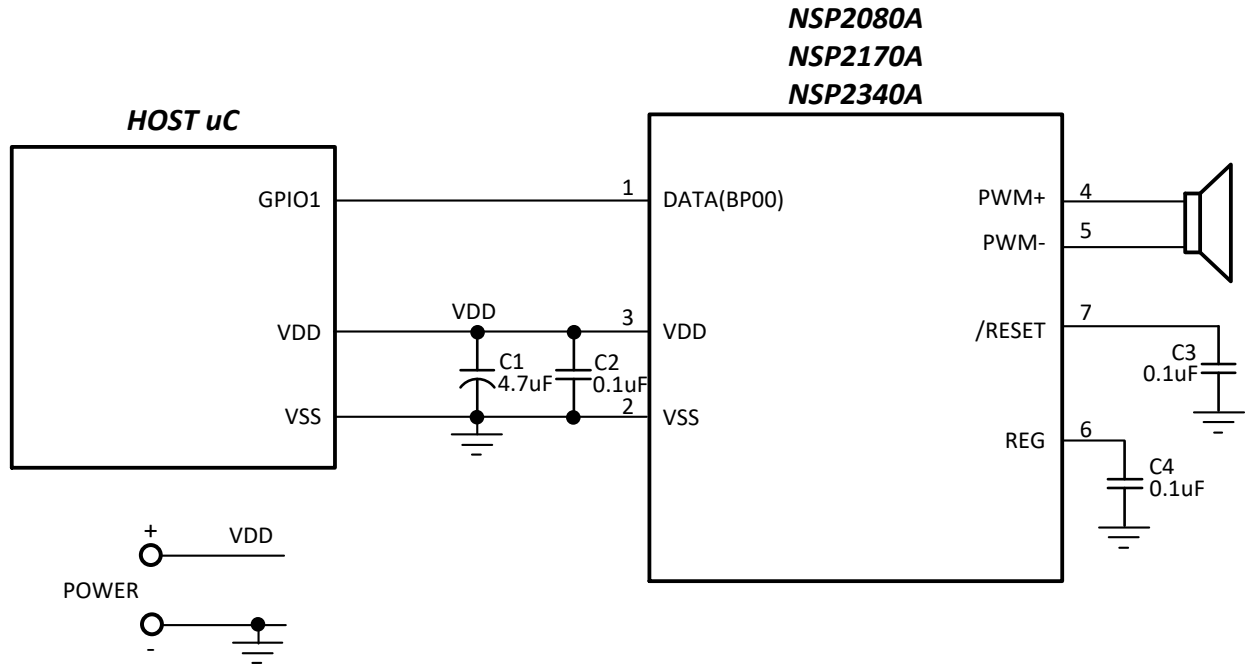
5.2 Connect to Host uC by UART Interface



5.3 Connect to HOST uC by Two-Wire Interface



5.4 Connect to HOST uC by One-Wire Interface

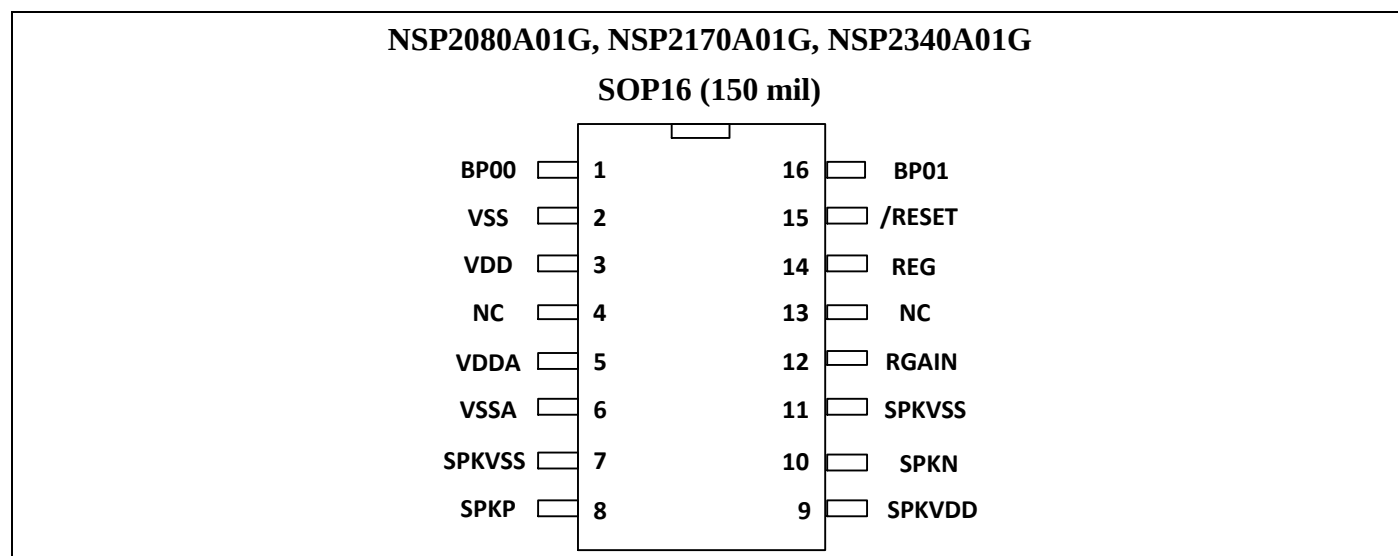
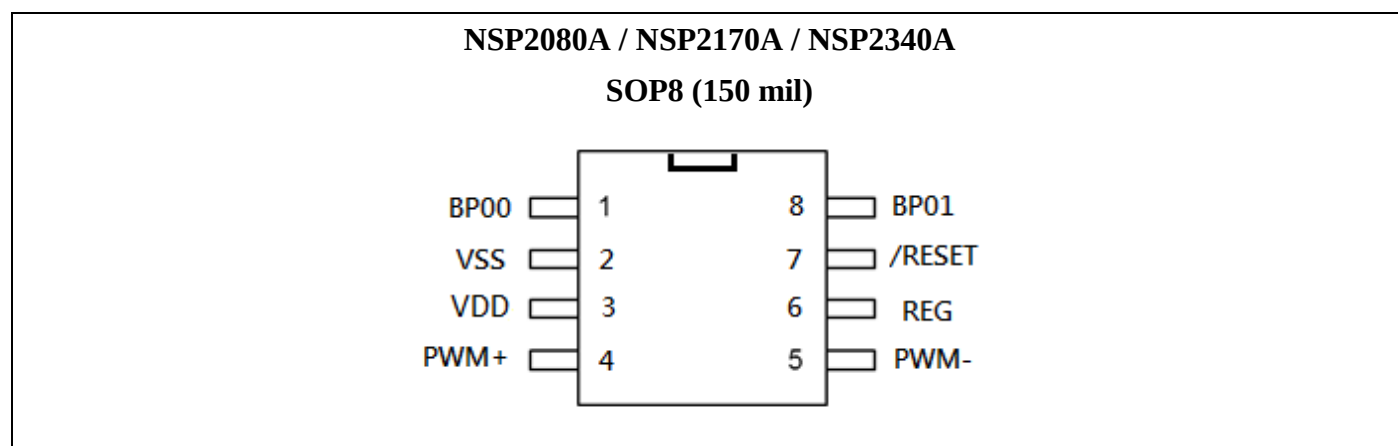


5.5 PCB Layout Notice

- The C1 、 C2 、 C4 and C5 connected to NSP2.0 chip as near as possible.

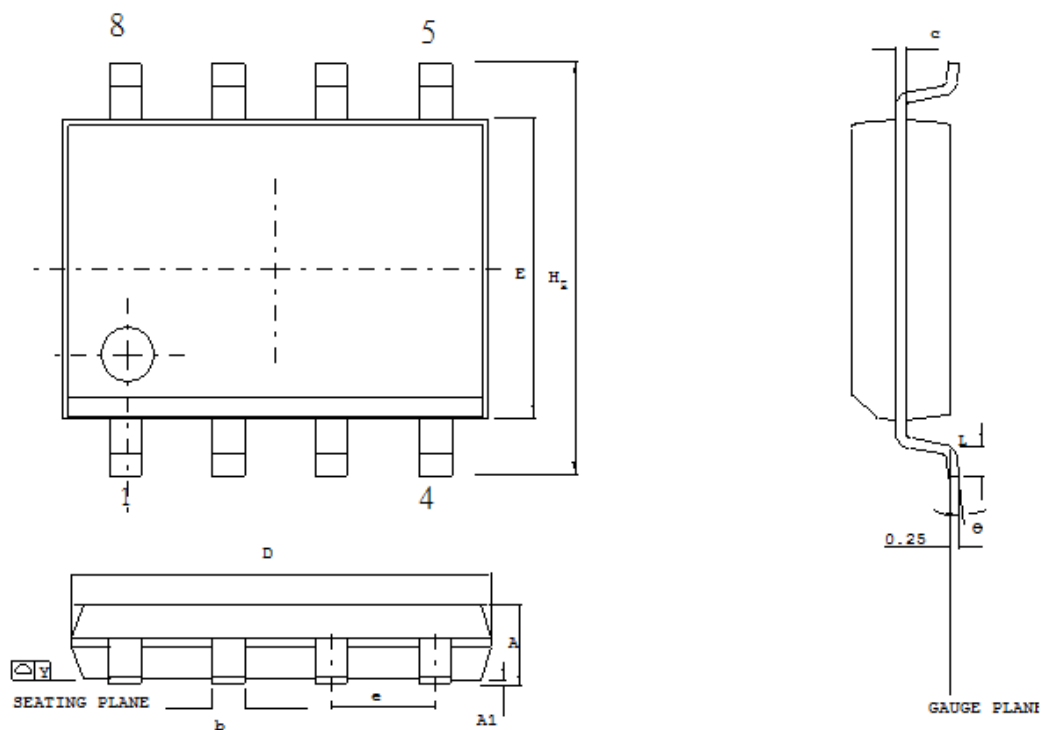
6. Package Information

6.1 Pin Assignment



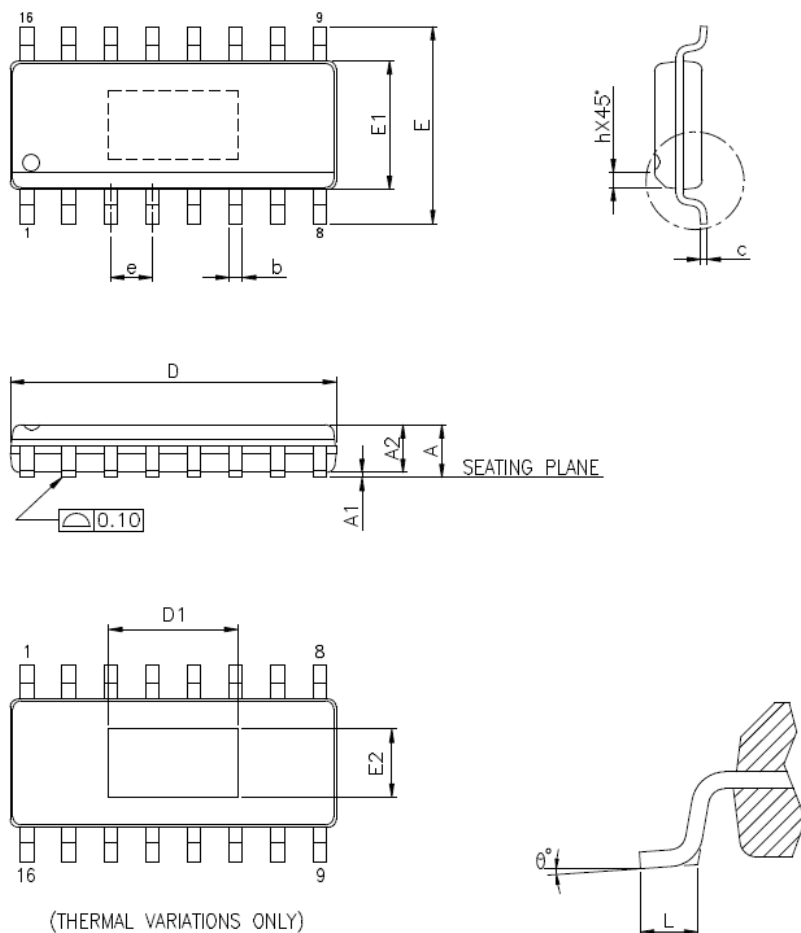
6.2 Package Dimension

SOP8, 150 mil (NSP2080A / NSP2170A / NSP2340A)



Control dimensions are in millimeters

Symbol	Dimension (mm)		Dimension (inch)	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
B	0.33	0.51	0.013	0.020
C	0.19	0.25	0.008	0.010
E	3.80	4.00	0.150	0.157
D	4.80	5.00	0.188	0.196
e	1.27 BSC		0.050 BSC	
H_E	5.80	6.20	0.228	0.244
Y	-	0.10	-	0.004
L	0.40	1.27	0.016	0.050
θ	0	10	0	10

SOP16, 150 mil (NSP2080A01G / NSP2170A01G / NSP2340A01G)

Control dimensions are in millimeters

Symbol	Dimension (mm)		Dimension (inch)	
	Min.	Max.	Min.	Max.
A	—	1.75	—	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	—	0.049	—
b	0.31	0.51	0.012	0.020
c	0.10	0.25	0.004	0.010
D	9.90 BSC		0.390 BSC	
E	6.00 BSC		0.236 BSC	
E1	3.90 BSC		0.154 BSC	
e	1.27 BSC		0.050 BSC	
L	0.40	1.27	0.016	0.050

h	0.25	0.50	0.010	0.020
E2	1.68	2.56	0.066	0.101
D1	3.86	4.72	0.152	0.186
θ°	0	8	0	8

7. Ordering Information

Part No.	Shape	Type	Remark
NSP2080A NSP2170A NSP2340A	E: Tube T: Tape & Reel	Package: SOP8 (150mil)	Blank
NSP2080A01G NSP2170A01G NSP2340A01G		Package: SOP16 (150mil)	

8. Revision History

Version	Date	Substantial Changes	Page
A1.0	May.25.2022	Initial Release	All
A1.1	Dec.6.2022	Modify PCB Layout Notice	8
A2.0	Mar.27.2023	Add NSP2080A01G, NSP2170A01G, NSP2340A01G	All
A2.1	April.11.2023	Modify Application Circuit, PCB layout notice,	8,9,10,11,12

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All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

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