nuvoTon

N5132

Data Sheet

4-bit uC base Voice Synthesizer (OTP)

Content

1. INTRODUCTION

N5132 builds in 4-bit uC. Its 2Mbit OTP memory size covers up to 60 seconds voice duration scope. In the system frequency, 8MHz, N5132 can operate at 2.2~5.5V that is suitable for 2 or 3 batteries. In addition, N5132 provides H/W voice synthesizer for 1-ch voice playback. Meantime, N5132 has PWM output to drive speaker, WDT and LVR.

N5132 not just provides blank chip but also support on line program model to save customer's program schedule. Meanwhile, N5132 provides bare die and SOP20 package form for various applications.

2. FEATURE

- VDD: 2.2 ~ 5.5V (for 2 or 3 batteries application)

- Build in 2Mbit OTP

- System frequency (Ring Type oscillator):

  - 8MHz at 2.2~5.5V (Rosc = 150K ohm)

- H/W Voice Synthesizer

  - 1-ch voice

  - Algorithm: 5-bit MDM

- Build in PWM to drive speaker directly. It has 4-level volume control

- Provides STOP mode to stop entire IC operation

- Provides CPU mode interface to communicate with external MCU

- Watch Dog Timer (WDT)

- Low Voltage Reset (LVR)

- Offer easy use development tools

  - Voice combination and playback

  - NV-513X voice module

  - USB writer

- Package type: Die form or SOP20

3. PIN DESCRIPTION

PIN Name	IO	Function Description
BP10~BP13	I/O	Port 1 is a bi-directional I/O port as interface of program; or CPU mode interface (SPI). BP10: SSB, BP11: SCLK, BP12: MISO, BP13: MOSI
BP32, BP33	I/O	250Hz frequency output control port to measure the deviation of system frequency.
VDD, VDD1	-	Power
VSS, VSS1	-	Ground
V33O	-	3.3V output, only for internal usage
PWM+	O	PWM driver positive output
PWM-	O	PWM driver negative output
VDD_SPK	-	Power for PWM driver
VSS_SPK	-	Ground for PWM driver
OSC	I	Ring type oscillator. This port connects to Ring then ground.
/RESET	I	Chip reset
TEST	I	Test port with internal pull high. It shares with program interface.
VPP	-	Only use in OTP program mode

Note: As program OTP, BP10 ~ BP13, VDD, VSS, /RESET, TEST and VPP will be used.

4. DC/AC CHARACTERISTICS

4.1 Absolute maximum ratings

PARAMETER	SYMBOL	CONDITIONS	RATED VALUE	UNIT
Power Supply	V_{DD} – V_{SS}	-	-0.3 ~ +7.0	V
Input Voltage	V_{IN}	All Inputs	V_{SS}-0.3 ~ V_{DD}+0.3	V
Storage Temperature	T_{STG}	-	-55 ~ +150	°C
Operating Temperature	T_{OPR}	-	0 ~ +70	°C

Note: Exposure to conditions beyond those listed under the Absolute Maximum Ratings table may adversely affect the life and reliability of the device.

4.2 DC Characteristics

(VDD−VSS = 4.5V, VDD_SPK-VSS_SPK=4.5V, TA = 25° C; No Load unless otherwise specified)

Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Operating Voltage	V_{DD}	Fosc=8MHz (Rosc=150K ohm)	2.2	-	5.5	V
Operating Current	I_{OP}	Fosc=8MHz, VDD=3.0V		3.0		mA
		Fosc=8MHz, VDD=4.5V		5.0		mA
Standby Current	I_{SB}	VDD=4.5V			10	µA
PWM output current	Ipw	Rl=8Ω, connects PWM+ and PWM-	200			mA

4.3 AC Characteristics

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

| Parameter	Symbol	Condition	MIN	TYP	MAX	UNIT
Main Clock	Fosc	*Rosc=150KΩ	7.2	8	8.8	MHz
Frequency Deviation	$\frac{\Delta F}{F}$	Fosc = 8MHz, 2.2~3.6V			5	%
Frequency deviation	$\frac{\Delta F}{F}$	Fosc = 8MHz, 3.0~5.5V			5	%

Note*: System frequency will have deviation due to process' lot-to-lot discrepancy. The Rosc value must be adjusted according to actual system frequency.

5. TYPICAL APPLICATION CIRCUIT

5.1 3-battery Application Circuit
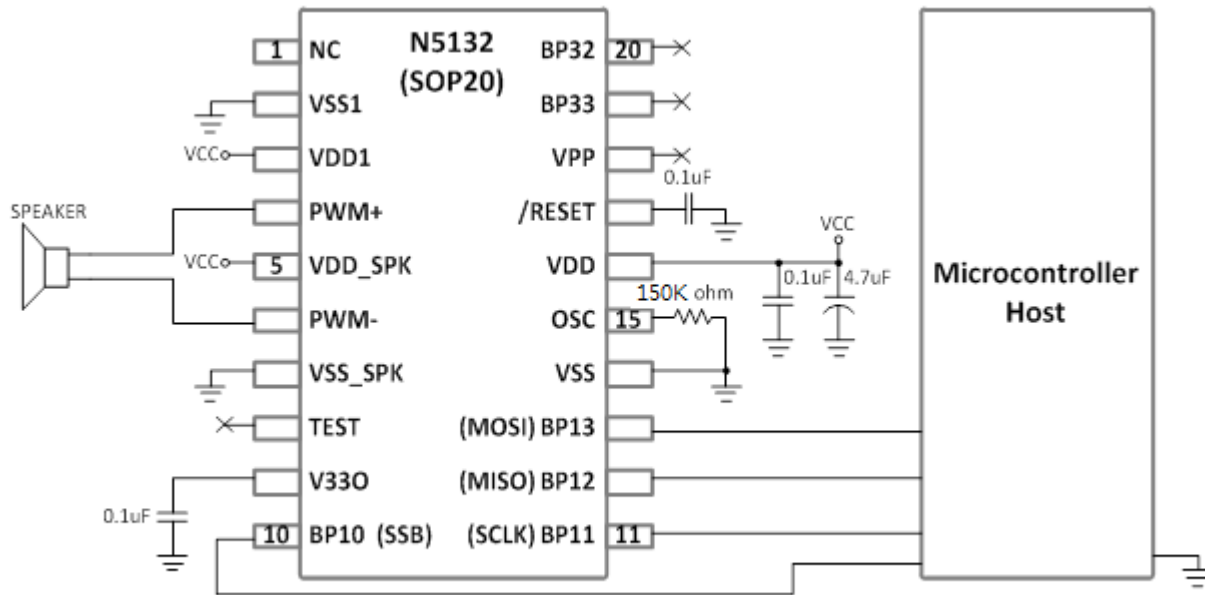
## 5.2 2-battery Application Circuit
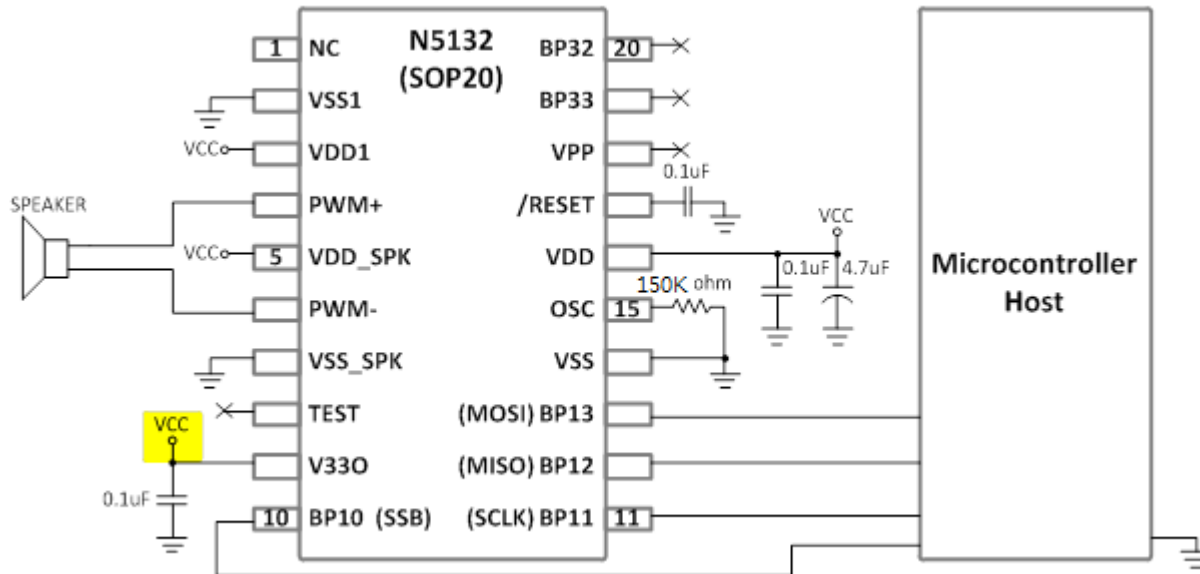
Note:

1. The Rosc typical value is 150K ohm at 8MHz. It should be connected to GND (VSS)

2. In PCB layout, VSS_SPK and VSS should be connected; VDD_SPK and VDD should be connected.

3. 4.7uF is optional for power stability. Its value is depends on application.

4. At 3-battery application, V33O 0.1uF is must for power stable. In 2-battery application, the V33O 0.1uF is optional. V33O must connect with VDD

5. In light loading application, the 0.1uF in VDD and GND is must to filter power noise

6. The 0.1uF in /RESET and GND is optional for power reset stability

7. CPU interface (SPI) defines as: BP10: SSB, BP11: SCLK, BP12: MISO, BP13: MOSI

8. As BP32 be grounding, it can control BP33 output a 250Hz standard frequency for the purpose of system frequency deviation measurement. As the value higher than 250Hz, means system frequency too fast, then adjust Rosc value be higher to slow down; vise verse, as it lower than 250Hz, means system frequency too slow, then adjust Rosc value be lower to speed up it.

9. The above application circuits are for reference only. No warranty for mass production.

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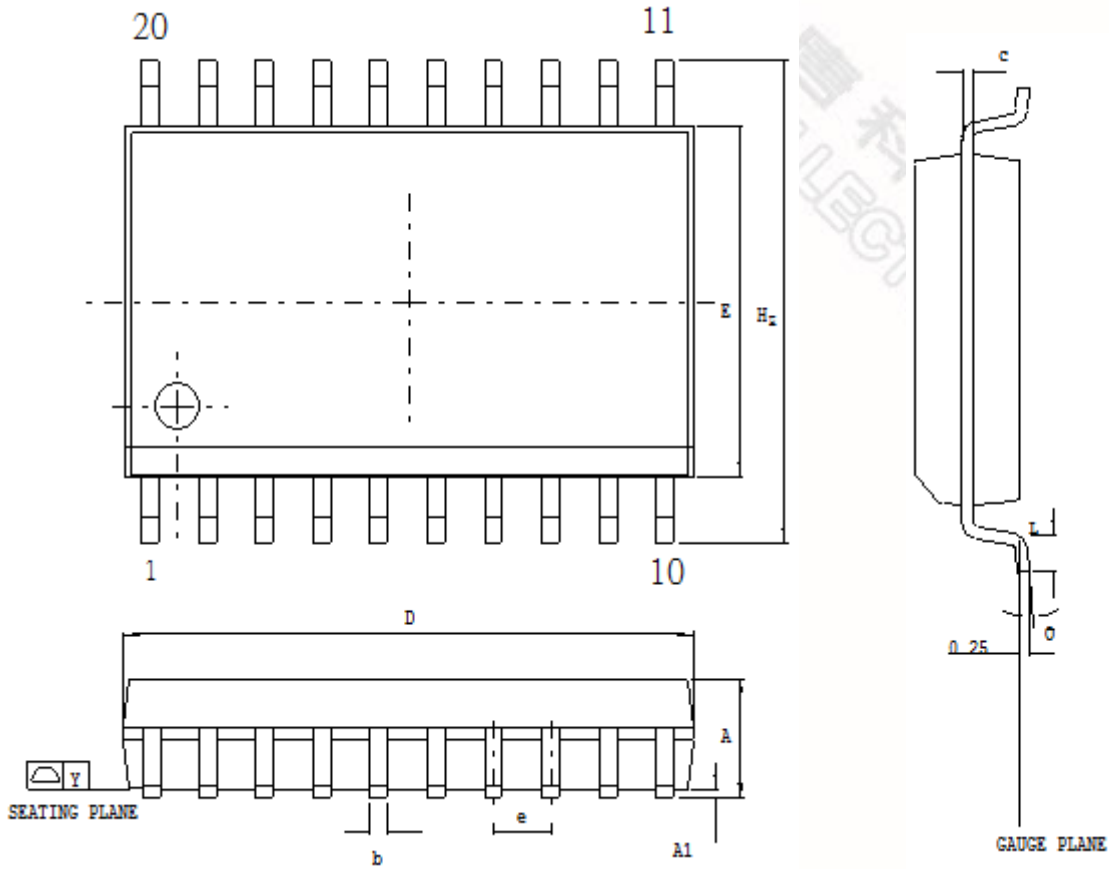# 6. PACKAGE INFORMATION

<u>**SOP20 Pin Assignment**</u>
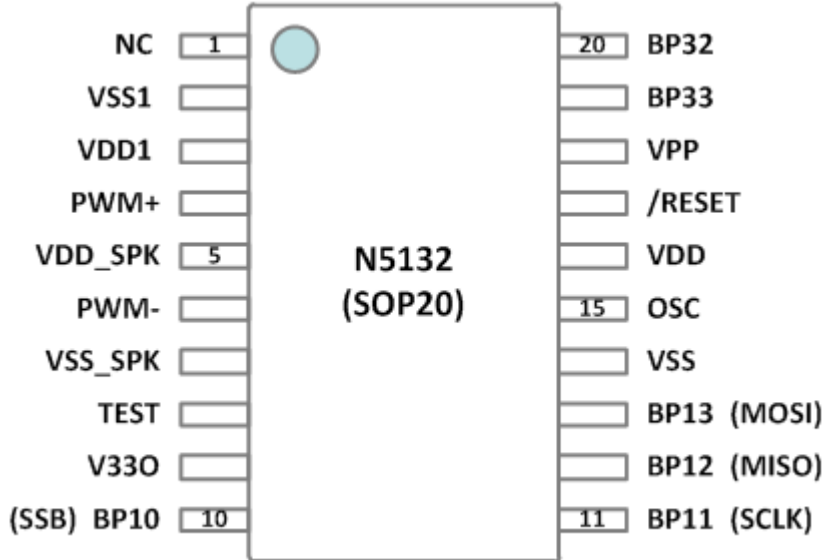
Note: as program OTP, it will use BP10 ~ BP13, VDD, VSS, /RESET, TEST and VPP

SOP20 Outlook Dimension

Control demensions are in milmeters .

SYMBOL	DIMENSION IN MM		DIMENSION IN INCH	
	MIN.	MAX.	MIN.	MAX.
A	2.35	2.65	0.093	0.104
A1	0.10	0.30	0.004	0.012
b	0.33	0.51	0.013	0.020
c	0.23	0.32	0.009	0.013
E	7.40	7.60	0.291	0.299
D	12.60	13.00	0.496	0.512
e	1.27 BSC		0.050 BSC	
Hz	10.00	10.65	0.394	0.419
Y	———	0.10	———	0.004
L	0.40	1.27	0.016	0.050
θ	0	8	0	8

7. ORDERING INFORMATION

(1). Blank die form Part Number: N5132

(2). Die form including pre-code: N5132XXXX

(3). Package Part Number:

    - SOP20 (300mil): N5132S20 (Blank);

    - SOP20 (300mil): N5132XXXXS20 (Including pre-code)

8. VERSION

Version	Date	Description
A1	Nov. 10, 2014	● First establishment

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