

# N584HP300

## Data Sheet

The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.

Nuvoton is providing this document only for reference purposes of *PowerSpeech*<sup>®</sup> based system design. Nuvoton assumes no responsibility for errors or omissions.

All data and specifications are subject to change without notice.

For additional information or questions, please contact: Nuvoton Technology Corporation.

[www.nuvoton.com](http://www.nuvoton.com)

**Table of Contents**

|                                     |    |
|-------------------------------------|----|
| 1. General Description.....         | 3  |
| 2. Features .....                   | 3  |
| 3. PAD Description .....            | 5  |
| 4. Block Diagram.....               | 6  |
| 5. Electrical Characteristics ..... | 7  |
| 5.1 Absolute Maximum Ratings.....   | 7  |
| 5.2 DC Parameters .....             | 7  |
| 5.3 AC Parameters .....             | 8  |
| 6. Typical Application Circuit..... | 9  |
| 7. Revision History.....            | 11 |

## 1. General Description

N584HP300 (OTP) is a 4-bit microcontroller-based speech synthesizer with PWM mode output to drive the speaker directly. The synthesizer contains one voice-channel and/or dual tone melody. It has *Ultra I/O™* to simplify the procedure of defining the output pattern, besides, it also includes 4-level Low Voltage Detection function. The N584HP300 built-in OTP to cover following ROM version bodies:

| N584H      | H009 | H010 | H019 | H020 | H029 | H030 | H039 | H040 |
|------------|------|------|------|------|------|------|------|------|
| ROM (Kbit) | 300  | 300  | 620  | 620  | 940  | 940  | 1260 | 1260 |
| *Duration  | 12'' | 12'' | 24'' | 24'' | 37'' | 37'' | 49'' | 49'' |
| I/O pins   | 4    | 8    | 4    | 8    | 4    | 8    | 4    | 8    |

| N584H      | H060 | H070 | H120  | H170  | H210  | H260  | H300 |
|------------|------|------|-------|-------|-------|-------|------|
| ROM (Kbit) | 1740 | 1900 | 3340  | 4460  | 5740  | 7020  | 7980 |
| *Duration  | 68'' | 73'' | 131'' | 175'' | 225'' | 275'' | 312  |
| I/O pins   | 8    | 8    | 16    | 16    | 16    | 16    | 16   |

Note1: The duration time is based on 4-bit NM4 at 6 KHz sampling rate

## 2. Features

- Operating Voltage and CPU Frequency:
  - 1.8 ~ 5.5V (Fcpu = 4 MHz)
  - 2.0 ~ 5.5V (Fcpu = 8 MHz)
- Speech synthesis
  - 1-channel voice
  - Dual Tone Melody w/ 8 octaves
  - 4-bit NM4
- Build in internal oscillator (TRIM)
- Build in PWM Direct Drive circuit
- Programmable sample rate
- Provides power management to save current consumption
  - 4 / 8 MHz system clock, with Ring type oscillator
  - STOP mode for stopping entire device's operation
- Provides 16 I/O
- High sink current capability

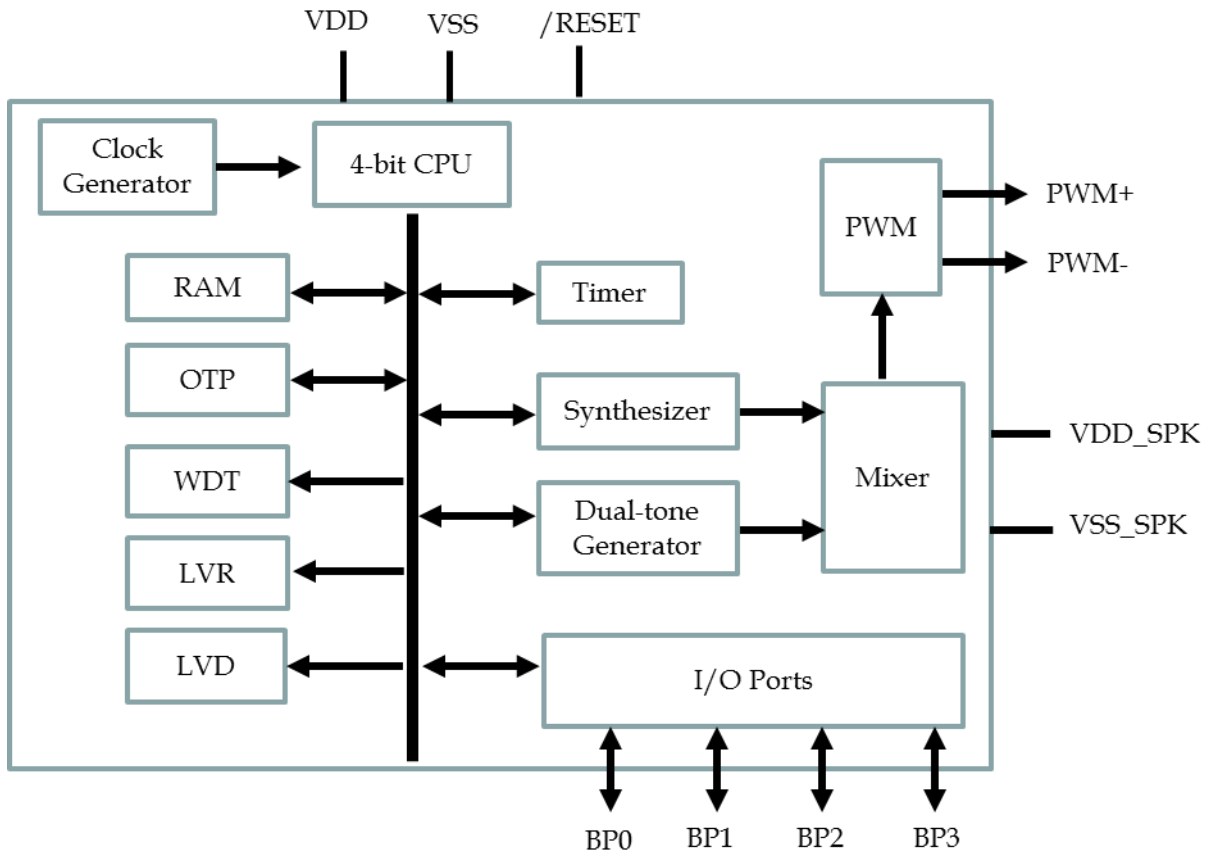
- Support capture timer to implement up to 8 capture sensor key
- Provides 224\*4 bits RAM
- Provides 64K\*10 of program data
- Provides IR carrier generator (38 KHz or 56 KHz)
- Provides Watch Dog Timer (WDT)
- Provides Low Voltage Reset (LVR: 1.7V, 1.9V)
- Provides Low Voltage Detection (LVD: 2.2V, 2.4V, 3.0V, 3.3V)
- Shared ROM for voice and program storage
- Supports *PowerScript™* for developing codes easily
- Full-fledged development system
  - Source-level ICE debugger (*PowerScript™* format)
  - Event synchronization mechanism
  - User-friendly GUI environment
  - It has *Ultra I/O™* to simplify the defined output pattern

### 3. Pad Description

| Pad Name    | I/O | Function   |
|-------------|-----|--|
| BP00 ~ BP03 | I/O | Bi-directional I/O port0, defined as input or output. As input, it can be set as pull-high, pull-low or floating. As output, it is defined as CMOS. BP03 can also be defined as IR carrier output. |
| BP10 ~ BP13 | I/O | Bi-directional I/O port1, defined as input or output. As input, it can be set as pull-high, pull-low or floating. As output, it is defined as CMOS.  |
| BP20 ~ BP23 | I/O | Bi-directional I/O port2, defined as input or output. As input, it can be set as pull-high, pull-low or floating. As output, it is defined as CMOS.  |
| BP30 ~ BP33 | I/O | Bi-directional I/O port3, defined as input or output. As input, it can be set as pull-high, pull-low or floating. As output, it is defined as CMOS.  |
| VDD, VDD_IO | -   | Power supply   |
| VSS, VSS_IO | -   | Ground   |
| V33O        | -   | 3.3V regulator output  |
| VPP         | -   | Positive high voltage 7.5V input during OTP memory writer mode. NC for normal operation mode   |
| PWM+        | O   | PWM drive positive output  |
| PWM-        | O   | PWM drive negative output  |
| VDD_SPK     | -   | Power supply for PWM drive   |
| VSS_SPK     | -   | Ground for PWM drive   |
| TEST        | -   | Test pin   |
| /RESET      | I   | Chip reset input with Schmitt trigger, internal pull-high  |

Note: As program OTP, the BP01 ~ BP03, VDD, VSS, V33O, /RESET and VPP pin will be used.

### 4. Block Diagram



## 5. Electrical Characteristics

### 5.1 Absolute Maximum Ratings

| Item            | Symbol    | Conditions | Rated Value       | Unit |
|-----------------|-----------|------------|-------------------|------|
| Power Supply    | VDD – VSS | -          | -0.3 ~ +7.0       | V    |
| Input Voltage   | VIN       | All Inputs | VSS-0.3 ~ VDD+0.3 | V    |
| Storage Temp.   | TSTG      | -          | -55 ~ +150        | °C   |
| Operating Temp. | TOPR      | -          | 0 ~ +70           | °C   |

NOTE:

Operating the device under conditions beyond those indicated above may cause permanent damage or affect device reliability.

### 5.2 DC Parameters

(VDD–VSS = 4.5V, VDD\_SPK–VSS\_SPK=4.5V, TA = 25°C; no load, unless otherwise specified)

| Parameter                                   | Sym              | Conditions                                   | Min        | Typ        | Max        | Unit |
|---|------------------|--|------------|------------|------------|------|
| Operating voltage                           | VDD              | Fcpu = 4 MHz<br>Fcpu = 8 MHz                 | 1.8<br>2.0 |            | 5.5<br>5.5 | V    |
| Operating current                           | I <sub>OP</sub>  | Fcpu=8 MHz, VDD=4.5V<br>Fcpu=8 MHz, VDD=3.0V |            | 5.0<br>3.0 |            | mA   |
| Standby current                             | I <sub>SB</sub>  | VDD=4.5V<br>VDD=3.0V                         |            | 3<br>3     | 10<br>10   | μA   |
| Output high current<br>(BP0, BP1, BP2, BP3) | I <sub>OH</sub>  | VDD=3.0V, Vout=2.6V<br>VDD=4.5V, Vout=2.6V   | -5         | -6<br>-30  |            | mA   |
| Output low current<br>(BP0, BP1, BP2, BP3)  | I <sub>OL</sub>  | VDD=3.0V, Vout=0.4V<br>VDD=4.5V, Vout=1.0V   | 8          | 12<br>34   |            | mA   |
| PWM driver current                          | I <sub>pw</sub>  | RI=8Ω, connect to PWM+ and<br>PWM-           | 200        |            |            | mA   |
| Pull-high resistor<br>(BP0, BP1, BP2, BP3)  | R <sub>PL</sub>  | VDD=4.5V                                     |            | 150K<br>1M |            | Ω    |
| LVD Voltage                                 | V <sub>LVD</sub> | LVD_SEL[1:0] = 11                            | 3.14       | 3.3        | 3.47       | V    |
|   |                  | LVD_SEL[1:0] = 10                            | 2.85       | 3.0        | 3.15       | V    |
|   |                  | LVD_SEL[1:0] = 01                            | 2.28       | 2.4        | 2.52       | V    |
|   |                  | LVD_SEL[1:0] = 00                            | 2.09       | 2.2        | 2.31       | V    |

### 5.3 AC Parameters

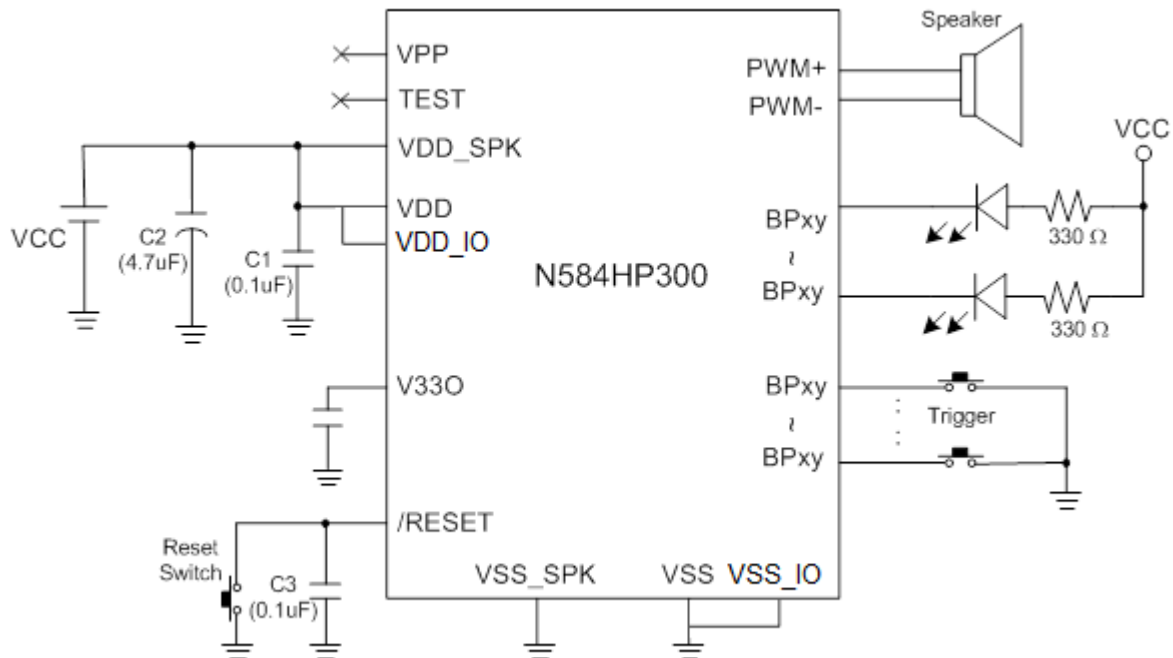
(VDD–VSS = 4.5V, TA = 25° C; unless otherwise specified)

| Parameter            | Sym                  | Conditions  | Min  | Typ  | Max  | Unit |
|----------------------|----------------------|---|------|------|------|------|
| Main-clock Frequency | Fosc                 | 8 MHz   | 7.95 | 8.19 | 8.44 | MHz  |
| Frequency Deviation  | $\frac{\Delta F}{F}$ | Fosc=8MHz,<br>VDD=2.2 ~ 5.5V<br>$\frac{Fosc(max) - Fosc(min)}{Fosc(min)}$ |      | 3    | 5    | %    |



## 6. Typical Application Circuit

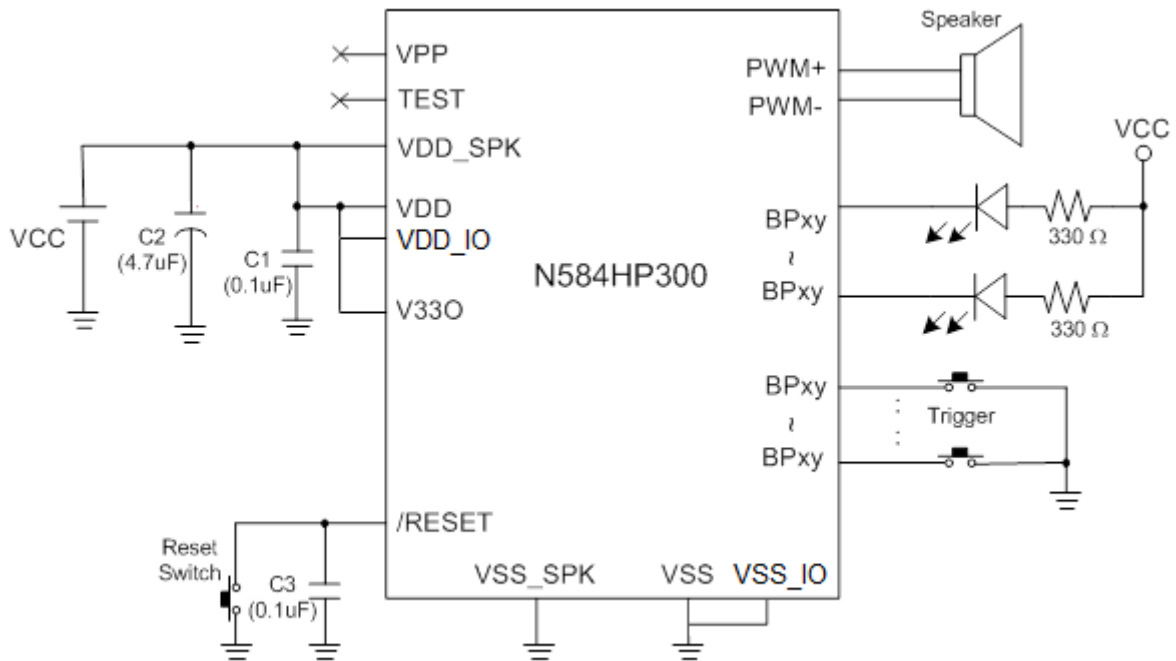
### 3-battery Application



#### Notes:

1. In PCB layout, VSS\_SPK should be connected to VSS; and VDD\_SPK should be connected to VDD
2. The C1 capacitor 0.1uF is recommended to prevent the IC from hang-up as battery power bouncing. For power line layout in extended length, suggest C1 to be 1uF
3. The C2 capacitor 4.7uF shunts between VDD and GND is to stabilize power noise
4. The C3 capacitor 0.1uF shunts between /Reset and GND is for power reset stability
5. The V330 capacitor value is 0.1uF. It is for regulator power stability on 3-battery applications
6. BPxy means I/O pins. X: 0 ~ 3; Y: 0 ~ 3

2-battery Application



Notes:

1. In PCB layout, VSS\_SPK should be connected to VSS; and VDD\_SPK should be connected to VDD
2. The C1 capacitor 0.1uF is recommended to prevent the IC from hang-up as battery power bouncing. As power line is long, suggest C1 to be 1uF
3. The C2 capacitor 4.7uF shunts between VDD and GND is to stabilize power noise
4. The C3 capacitor 0.1uF shunts between /Reset and GND is for power reset stability
5. BPxy means I/O pins. X: 0 ~ 3; Y: 0 ~ 3

## 7. Revision History

| Version | Date      | Substantial Changes         | Page |
|---------|-----------|-----------------------------|------|
| A1.0    | Sep. 2015 | Initial Release             |      |
| A2.0    | Jul. 2016 | Revise application circuits | 8, 9 |

### Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

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.

---

*Please note that all data and specifications are subject to change without notice.  
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*

*Release Date: Jul. 2016  
Version A2.0*