**SP0-512 Text to Speech IC**

[www.speechchips.com](www.speechchips.com)

**Summary:**

The **SP0-512 RoboVoice Text to Speech IC** is a pre-programmed microcontroller that accepts English text from a serial connection, converts that text to phoneme codes then generates audio.  It is ideal for adding a robot voice to your embedded designs.

**Features:**
- Single chip text to speech IC
- Low power
- Communicates using a simple serial port. (9600 N81)
- 800 Rules that convert English text into phoneme codes
- Built in 16-Bit  @ 16KHz DAC. No external filter required.

**Pins:**

| #  | Name         | Notes                                                        |
|----|--------------|-------------------------------------------------------------|
| 1  | **!MCLR**    | See dsPic33 datasheet for reset circuit                     |
| 4  | **TX**       | Transmit to host                                            |
| 6  | **RX**       | Recieve from host                                           |
| 8  | **Vss (GND)**|                                                             |
| 13 | **3.3v (VDD)**|                                                            |
| 17 | **Speaking** | High when device is speaking                                |
| 19 | **Vss (GND)**|                                                             |
| 20 | **VCap**     | CPU logic filter capacitor connection. (10 µF Tantalum to ground) |
| 25 | **DAC+**     | Postive DAC signal                                          |
| 25 | **DAC-**     | Negative DAC signal                                         |
| 27 | **AVSS (GND)**| Analog GND                                                 |
| 28 | **AVDD - 3.3V**| Analog reference                                          |

**Sample Circuit:**
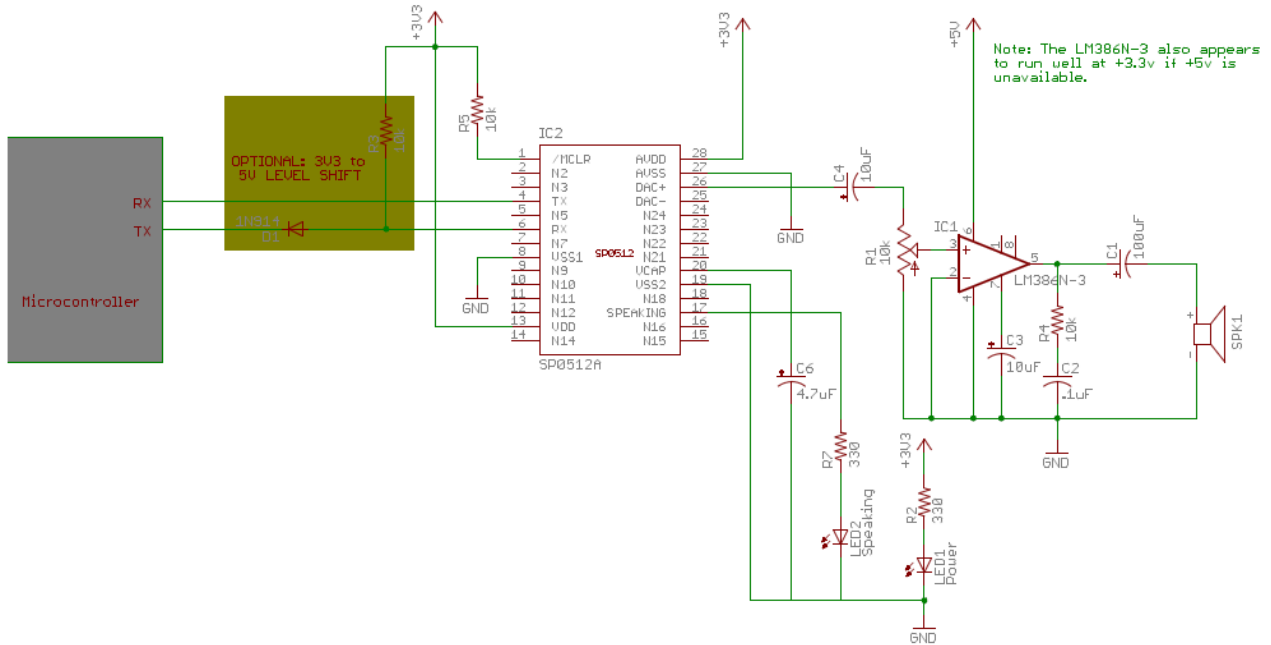


**References:**

The SP0-512 RoboVoice is based on the Microhip dsPIC33FJ64GP802 microcontroller.  The datasheet is available at http://ww1.microchip.com/downloads/en/DeviceDoc/70292F.pdf. User's should refer to this document for greater detail about the chip itself.

**General Control Codes:**

Control codes can be embedded in text strings to alter the parameters of speech.  Codes are enclosed in square brackets to indicate that they should be executed and not spoken.  Brackets may contain one code or serveral codes seperated by commas ().

For example,  the string "[BD]This [BD]is [BD]a [BD]test" with say the words "this is a test" while lowering the pitch as each word is spoken.

| Code | Description |
|---|---|
| **BU** | Ramp Pitch Up |
| **BD** | Ramp Pitch Down |
| **RESET** | Reset pitch, speed, volume, glottal pulse, formant offsets and selected oscillator. |
| **PRESET** | Reset pitch to default frequency of 100Hz. |
| **PUP** | Increase pitch frequency by 4Hz. |
| **PDN** | Decrease pitch frequency by 4Hz. |
| **PLUP** | Increase pitch frequency by 20Hz. |
| **PLDN** | Decrease pitch frequency by 20Hz. |
| **GLOT1** | Use reverse ramp glottal pulse. |
| **GLOT2** | Use polynomial glottal pulse. (Default) |
| **SRESET** | Reset speed to default (100). |
| **S1-S15** | Set speaking speed from 1 to 15 with 1 being the fastest speed and 15 being the slowest. Default speaking speed is V?. |
| **VRESET** | Reset volume to default (V15) full volume. |
| **V1-V15** | Set volume from 1 to 15 where 15 is full volume. |
| **F1** | Select formant oscillator 1 |
| **F2** | Select formant oscillator 2 |
| **F3** | Select formant oscillator 3 |
| **FU100** | Add 100Hz to selected formant oscillator frequency. |
| **FD100** | Subtract 100Hz from selected formant oscillator frequency. |

| FU500 | Add 500Hz to selected formant oscillator frequency. |
|---|---|
| FD500 | Subtract 500Hz from selected formant oscillator frequency. |
| FU1000 | Add 1000Hz to selected formant oscillator frequency. |
| FD1000 | Subtract 1000Hz from selected formant oscillator frequency. |

**Musical Note Control Codes:**

The following control codes set the frequency of Formant 0 and can be used make the RoboVoice sing.

For example, the string "[G2]This [A2]is [B2]a [D3]test" will sing the words "This is a test".

| Note | Frequency (Hz) |
|---|---|
| C0 | 16.35 |
| C#0/Db0 | 17.32 |
| D0 | 18.35 |
| D#0/Eb0 | 19.45 |
| E0 | 20.60 |
| F0 | 21.83 |
| F#0/Gb0 | 23.12 |
| G0 | 24.50 |
| G#0/Ab0 | 25.96 |

| | |
|---|---|
| A0 | 27.50 |
| A#0/Bb0 | 29.14 |
| B0 | 30.87 |
| C1 | 32.70 |
| C#1/Db1 | 34.65 |
| D1 | 36.71 |
| D#1/Eb1 | 38.89 |
| E1 | 41.20 |
| F1 | 43.65 |
| F#1/Gb1 | 46.25 |
| G1 | 49.00 |
| G#1/Ab1 | 51.91 |
| A1 | 55.00 |
| A#1/Bb1 | 58.27 |
| B1 | 61.74 |
| C2 | 65.41 |
| C#2/Db2 | 69.30 |
| D2 | 73.42 |
| D#2/Eb2 | 77.78 |

| | |
|---|---|
| E2 | 82.41 |
| F2 | 87.31 |
| F#2/Gb2 | 92.50 |
| G2 | 98.00 |
| G#2/Ab2 | 103.83 |
| A2 | 110.00 |
| A#2/Bb2 | 116.54 |
| B2 | 123.47 |
| C3 | 130.81 |
| C#3/Db3 | 138.59 |
| D3 | 146.83 |
| D#3/Eb3 | 155.56 |
| E3 | 164.81 |
| F3 | 174.61 |
| F#3/Gb3 | 185.00 |
| G3 | 196.00 |
| G#3/Ab3 | 207.65 |
| A3 | 220.00 |
| A#3/Bb3 | 233.08 |

| | |
|---|---|
| B3 | 246.94 |
| C4 | 261.63 |
| C#4/Db4 | 277.18 |
| D4 | 293.66 |
| D#4/Eb4 | 311.13 |
| E4 | 329.63 |
| F4 | 349.23 |
| F#4/Gb4 | 369.99 |
| G4 | 392.00 |
| G#4/Ab4 | 415.30 |
| A4 | 440.00 |
| A#4/Bb4 | 466.16 |
| B4 | 493.88 |

Phoneme Control Codes

Phoneme control codes can be used to create words with a desired pronunciation.  For example, sending the following string with control codes "[F, AH, M, L, Y]" would cause the SP0-512 to speak the word "family".

| PA2 | Pause 2 - 40 MS at default speed |
|-----|----------------------------------|
| PA3 | Pause 3 - 60 MS at default speed |
| PA4 | Pause 4 - 80 MS at default speed |
| PA5 | Pause 5 - 100 MS at default speed |
| IY | |
| IH | |
| EH | |
| AY | |
| UH | |
| AX | |
| OW | |
| UX | |
| ER | |
| L | |
| R | |
| Y | |

| | |
|---|---|
| B | |
| D | |
| G | |
| M | |
| N | |
| NG | |
| P | |
| T | |
| K | |
| F | |
| TH | |
| S | |
| SH | |
| V | |
| THE | |
| Z | |
| ZH | |
| W | |
| IYRR | |

| | |
|---|---|
| EYRR | |
| EYIY | |
| AH | fAmily |
| AWRR | |
| OURR | |
| OH | |
| UH1 | |
| UW1 | |
| ER1 | |
| OHIH | |
| OU | |
| OWIY | |
| H | |
| J | |
| CH | |
| G1 | Ending G |
| D1 | Ending D |
| B1 | Ending B |
| J1 | Ending J |

| P1 | Ending P |
|---|---|
| BEEP | Generates a tone. |