eSHP170

Tiny OTP Controller with Single Speech Channel

Product Specification

DOC. VERSION 1.1

ELAN MICROELECTRONICS CORP.

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Contents

Specification Revision History

Doc. Version	Revision Description	Date
1.0	Initial Release	2008/7/03
1.1	Add the frequency deviation and update the standby current	2009/10/21

1 General Description

The eSHP170 is a 4-bit microcontroller based sound processors embedded with an 512k word OTP (One Time Programmable) ROM. It is equipped with a synthesized speech feature to obtain good quality voice. It also offers one 4-bit input port, three 4-bit I/O ports and one 4-bit output port. By programming through the microcontroller, applications, such as section combination, trigger mode, output control, keyboard matrix, and other logic functions are easily put into effect.

2 Features

- System clock**:** 2 MHz @2.4V ~ 5.5V
- 170 seconds voice capacity are provided (@6kHz sample rate)
- Sleep mode to conserve power, less than 3μA@3V standby current
- Crystal or internal RC oscillator (IRC). (Does not support oscillator auto option)
- Built in 4-bit tiny controller
- Input/Output ports**:**
  - One Input port (P1) with software controlled pull low resistor
  - Three input/output ports (P2 ~ P4)

    P2 is software controlled with pull-low resistor

    P2/P3 has software controlled wake-up function
  - One output port (P5)
  - I/O Pin P3.2 can be modulated with 38.5kHz carry signal to implement IR function
  - I/O Pin P3.3 can be configured as flash with volume application
- Flash equipped with 4 volume level options**:** 1/2, 1/4,1/8, & 1/16
- Single ROM for voice program with a maximum of 32K program addressing size
- Reset pin is available
- Readable ROM data via offset address
- 4-level stack for subroutine nesting
- Built-in traditional DAC and PWM Direct Drive. DAC/PWM can be automatically selected.
- Small variation traditional DAC current

- eSHP170 is compatible with eSH005, eSH010, eSH015, eSH020, eSH030, eSH040, eSH060, eSH085, eSH120, eSH170, & eSH007. It is also compatible with eSHS007, eSHS015, eSHS030, eSHS040, & eSHS060
- Sample rate range**:** 4k~24kHz
- PCM/5-bit eDPCM/6-bit eDPCM algorithm for speech synthesis (to provide silence compression), which is transparent to user
- Supports self-test function for checking IC status
- Provides 4-step drive and 1-step sink current control for output pin (Vo1A / Vo1B functions as general output pin) which can directly drive/sink special motor or large loading component
- Waveform Mark function and Waveform Control Port (WCP) are provided to control operation that synchronizes with voice
- Support EASY/Assembly language for developing codes
- Full-fledged development systems**:**
  - User-friendly GUI environment
  - Visual EZ tool for graph windows
  - Writer system with USB port

3 Parts List

IC Type	Time (Sec)	Stack	Program Size (Bits)	ROM (Bits)	RAM (Bits)	I/O	OSC	IR	Reset	PWM/ DAC
eSHP170	170	4	32K × 10	512K × 10	128 x 4	20 I/O	IRC/ CRYSTAL	Yes	Yes	DAC/ PWM

4 Applications

- Voice playback devices
- Educational learning equipments

5 Pin Description

Symbol	I/O	Function Description
OSCI	I	Crystal oscillator in
OSCO	I	Crystal oscillator out
P1.0~P1.3	I	Bits 0 ~ 3 of Port 1 [1, 5]
P2.0~P2.3	I/O	Bits 0 ~ 3 of Port 2 [1, 5]
P3.0~P3.3	I/O	Bits 0 ~ 3 of Port 3 [5]
P4.0~P4.3 [2]	I/O	Bits 0 ~ 3 of Port 4 [5]
P5.0~P5.3 [3]	O	Bits 0 ~ 3 of Port 5
VO1A	O	PWM voice output / DAC voice output
VO1B	O	PWM voice output
VDD/VDD1	I	Digital Power [5]
VSSD/VSSD1	I	Digital Ground [5]
VCC1	I	Analog Power
VSSC1	I	Analog Ground
TEST	I	Test pin
RESET	I	Reset pin (internal pull-low, active high)
VPP1 [4]	I	Programming power source 1 [5]
VPP2 [4]	I	Programming power source 2 [5]

[1] *When IC enters standby mode, if the pins have pull-low resistors, suggest not to connect Pins P2.0 ~ P2.3 to pull-high level to minimize power consumption.*

[2] *To use Port 4 with eSHP170, select eSH120/170/007 as target IC setting.*

[3] *To use Port 5 with eSHP170, select eSH120/170/007 target IC setting. If Crystal oscillator is selected, the function of P5.3 will be disabled.*

[4] *Do not attach VPP1 / VPP2 when QTP die form is chosen.*

[5] *There are 16 pins for OTP programming control. They are P1.0~P1.3, P2.0~P2.3, P3.0, P4.0 , VDD, VSSD, VDD1, VSSD2 VPP! And VPP2.*

6 Specifications

6.1 Absolute Maximum Ratings

Parameter	Specification
Supply voltage (VDDx – Vssx)	-0.3V to +6.0V
Input voltage	Vssx – 0.3V to VDDx + 0.3V
Operating Temperature	0°C to 70°C
Storage Temperature	-55°C to 125°C

6.2 Electrical Characteristics

V_{DD}=3V, Vssx=0V, Ta= 25°C unless otherwise specified

Items	Sym.	Condition	Min	Typ.	Max.	Unit
Operating Voltage	V_{DDx}	–	2.4	3.0	5.5	V
Standby current	I_{DDS}	V_{DD}=3V , no load	–	2	3	μA
Operating mode current	I_{op}	V_{DD}=3V, no load, D/A stop	–	700	–	μA
Drive current of P2, P4, P5	I_{OD}	V_{DD}=3V, V_{OD}=2.4V	–	5.5	–	mA
Sink current of P2, P4, P5	I_{OS}	V_{DD}=3V, V_{OS}=0.4V	–	6.5	–	mA
Drive current of P3	I_{OD}	V_{DD}=3V, V_{OD}=2.4V	–	8	–	mA
Sink current of P3	I_{OS}	V_{DD}=3V, V_{OS}=0.4V	–	10	–	mA
Input current of P1, P2	I_{IH}	V_{DD}=3V,	–	3.0	–	μA
Output current of VO1A	I_{VO1A}	V_{DD}=3V, V_{VO1A}=0.7V (traditional current DA)	–	3	–	mA
Drive current of VO1A, VO1B	I_{VOD}	V_{DD}=3V,V_{OD}=2.4V, Step=Z	–	X*	–	mA
Sink current of VO1A, VO1B	I_{VOS}	V_{DD}=3V, V_{OD}=0.4V	–	85	–	mA
Oscillation freq.	F_{High}	V_{DD}=3V	1.9	2	2.1	MHz

*

mA \ Step	Z=3	Z=2	Z=1	Z=0
X	85mA	60mA	45mA	27mA

7 Internal RC Oscillator Frequency Deviation

7.1 Oscillator Frequency vs. VDD

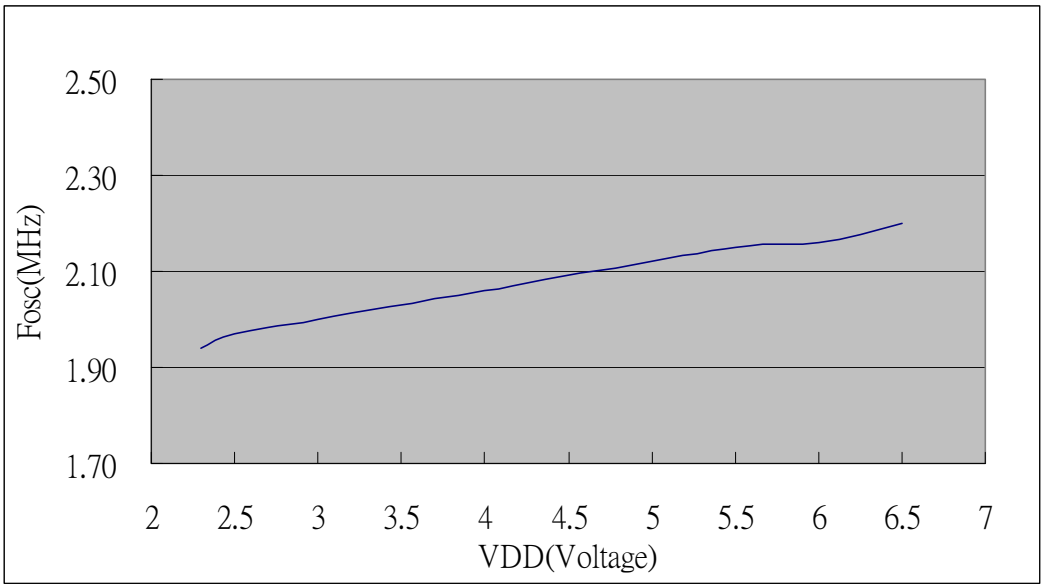

Figure 7-1 Oscillator Frequency vs. VDD Deviation

8 Application Circuits

The following notes apply to all conditions illustrated in the application diagrams below**:**

1. For noisy power supply application, adding a ceramic capacitor between VCC and ground near the IC's VDD/VDD1 pad is recommended. The recommend capacitor value is 0.1µF.
2. For heavy loading application, adding an electrolytic capacitor between VCC and ground is recommended. The recommended capacitor value for button cell application is 10µF.

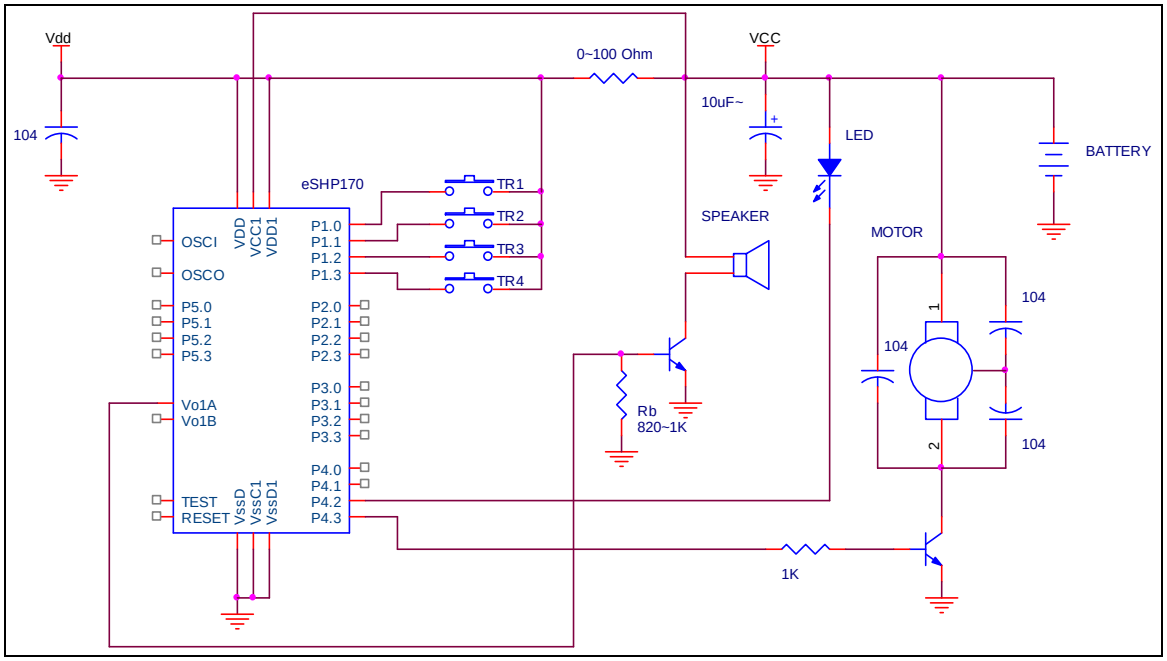

Figure 8-1 eSHP170 Application Circuit for Large Loading

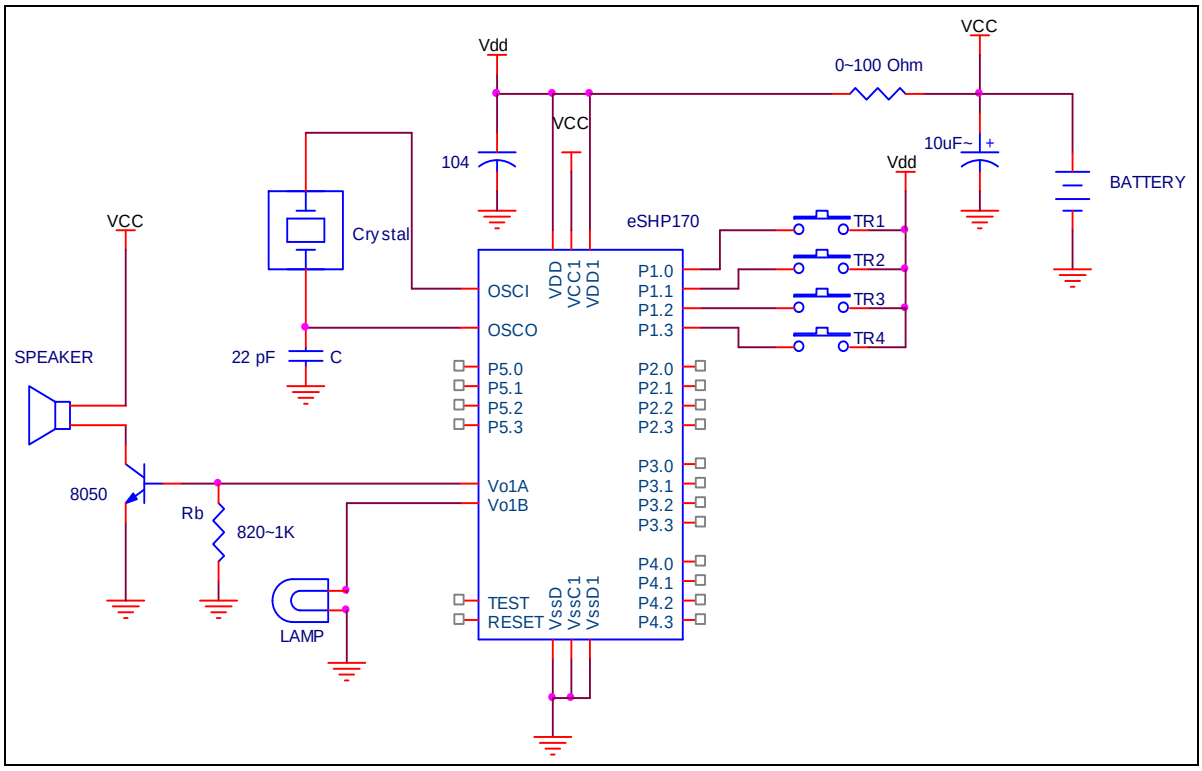

Figure 8-2 eSHP170 Application Circuit Showing the Vo1B Driving Lamp and Crystal Oscillator

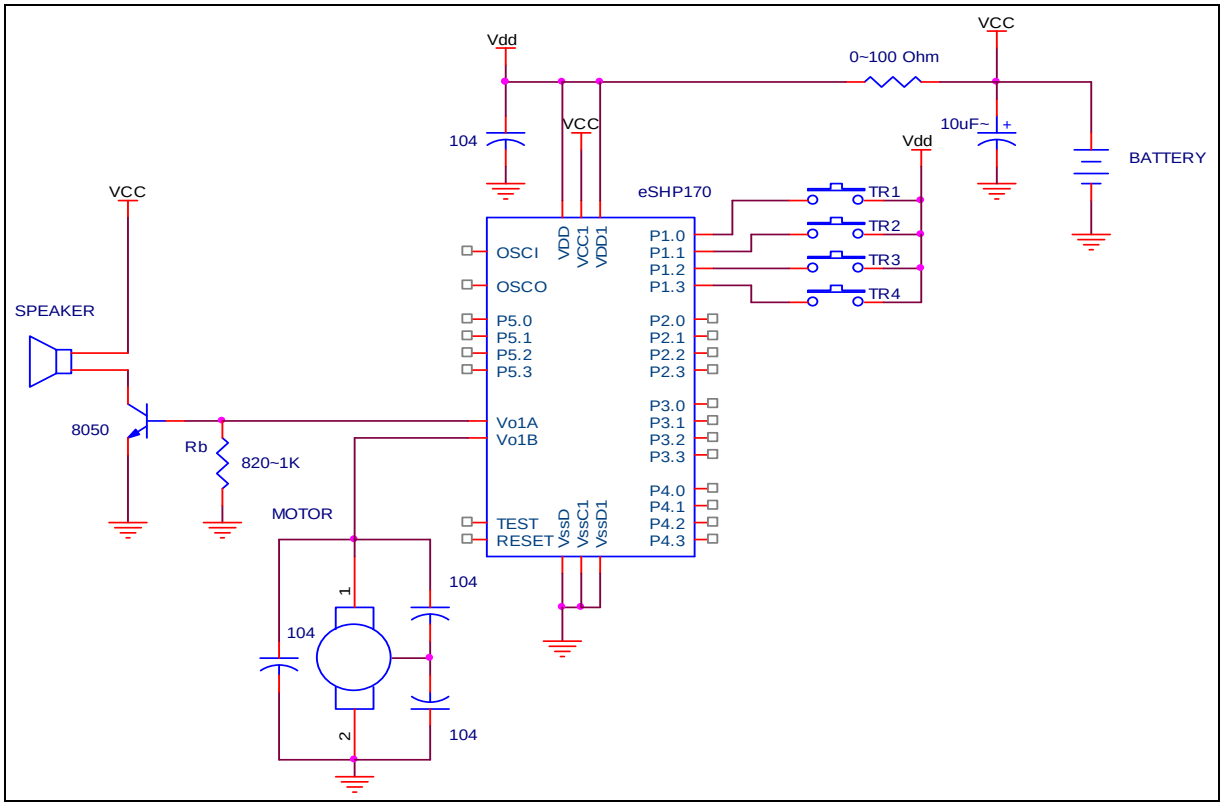

Figure 8-3 eSHP170 Application Circuit the Showing Vo1B Driving Motor