EASY SOUND®
EM55000S Series

Tiny Controller-Based Speech Synthesizer with PWM Output

Product Specification

DOC. VERSION 1.2

ELAN MICROELECTRONICS CORP.

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Contents

Specification Revision History

Doc. Version	Revision Description	Date
1.0	Initial version	2002/03/27
1.1	Added Application Circuits	2003/01/28
1.2	Revised RAM size from 32 nibbles to 48 nibbles for EM55007S & EM55009S; and 64 nibbles for EM55012S & EM550015S	2005/01/11

1 General Description

EM55000S series is a series of 3 to 15 seconds single chip high quality voice synthesizer IC. It is based on a tiny controller and is very suitable for low cost high quality toy market application.

2 Features

- 3 to 15 seconds voice capacity
- 5-bit ASPCM speech synthesis
- Port 2 provides wake-up function
- Power down mode for energy saving
- One 6 bit timer overflow control is provided
- 38KHz modulation for IR transmission
- Two stacks for subroutine call
- Direct Drive PWM output for voice
- Sample rate (KHz) : 4.3 / 5 / 6 / 7.5 / 10 / 15

Product	EM55003S	EM55005S	EM55007S	EM55009S	EM55012S	EM55015S
Duration (@ 6k sample rate)	3 sec	5 sec	7 sec	9 sec	12 sec	15 sec
ROM (bits)	10Kx10	16Kx10	28Kx10	32Kx10	44Kx10	48Kx10
PROG. ROM (bits)	8Kx10	16Kx10				
RAM (nibbles)	32		48		64	
I/O pins	2 I/O	4 I/O			6 I/O	
	P2.0, P2.1	P2.0, P2.1, P3.2, P3.3			P2.0, P2.1, P2.2, P3.1, P3.2, P3.3	
IR	No	Yes				
Voice silence compression	No	Yes				
Flash with Volume (pin)	Yes (P2.1)	Yes (P3.3)				

3 Pin Descriptions

Symbol	I/O	Function
P2.0	I/O	Bit 0 of Port 2
P2.1	I/O	Bit 1 of Port 2
P2.2	I/O	Bit 2 of Port 2 (excluding EM55003S ~ EM55009S)
P3.1	I/O	Bit 2 of Port 3 (excluding EM55003S ~ EM55015S)
P3.2	I/O	Bit 2 of Port 3 (exluding EM55003S)
P3.3	I/O	Bit 3 of Port 3 (exluding EM55003S)
VDD	I	Positive digital power supply.
OSCI	I	Ring oscillator input pin.
VSSD	I	Negative digital power supply.
VCC	I	Positive analog power supply
VSSC	I	Negative analog power supply
VO1	O	PWM output 1
VO2	O	PWM output 2

4 Absolute Maximum Ratings

Items	Symbol	Min	Max	Unit
Supply Voltage	VDD-VSS	-0.3	+6.0	V
Input Voltage	VIN	VSS-0.3	VDD+0.3	V
Operating Temperature	TOP	-20.0	+70.0	0C
Storage Temperature	TSTG	-55.0	+125.0	0C

5 Electrical Characteristics

(25°C, Vdd=3.0 Volts unless otherwise specified)

Items	Sym	Min.	Typ.	Max.	Unit	Condition
Operating Voltage	VDD	2.2	3.0	5.5	V	-
Standby Current	IDDS	-	-	2.0	uA	VDD=3V
Operating Current	IDDO	-	250	350	uA	VDD=3V, no load, PWM D/A stop
P2, P3 Drive Current	IOD	2.0	3.0	4.5	mA	VDD=3V, VO=2.4V
P2 Sink Current	IOS	-	3.0	10.0	uA	VDD=3V
P3 Sink Current	IOS	2.3	3.5	4.5	mA	VDD=3V, VO=0.4V
VO1, VO Output Current	IVO	150	180	-	mA	VDD=3V, Vo1=Vo2=1.5 V
Oscillation Resistor	R	-	220	-	KΩ	VDD=3V
Oscillation Freq.	FOSC	1.75	1.92	2.1	MHz	VDD=3V

6 Application Circuit

Applicable notes to the following application circuits:

1. For noisy power supply application, suppress noise by adding ceramic capacitor between VCC and ground near the IC's VDD pad. The recommended capacitor value is 0.1µF.
2. For heavy loading application, it is recommended that an electrolytic capacitor is added between VCC and ground. The recommended capacitor value for button cell applications is 10µF.
3. The recommended value for button cell internal impedance is 750Ω or less.
4. The use of spring direct trigger is not recommended. If you must use such trigger, you need to add a ceramic capacitor between trigger pin and ground to debounce the spring noise. The recommend capacitor value is 0.001 ~ 0.01 µF.

6.1 Heavy Noise for Motor Application Circuit