GENERAL DESCRIPTION

EM55M450/EM55P450/EM55Q450 series is a tiny-controller-based voice synthesizer IC which contains all the function of EM55000 series and has an MTP/OTP/QTP ROM inside.

FEATURES

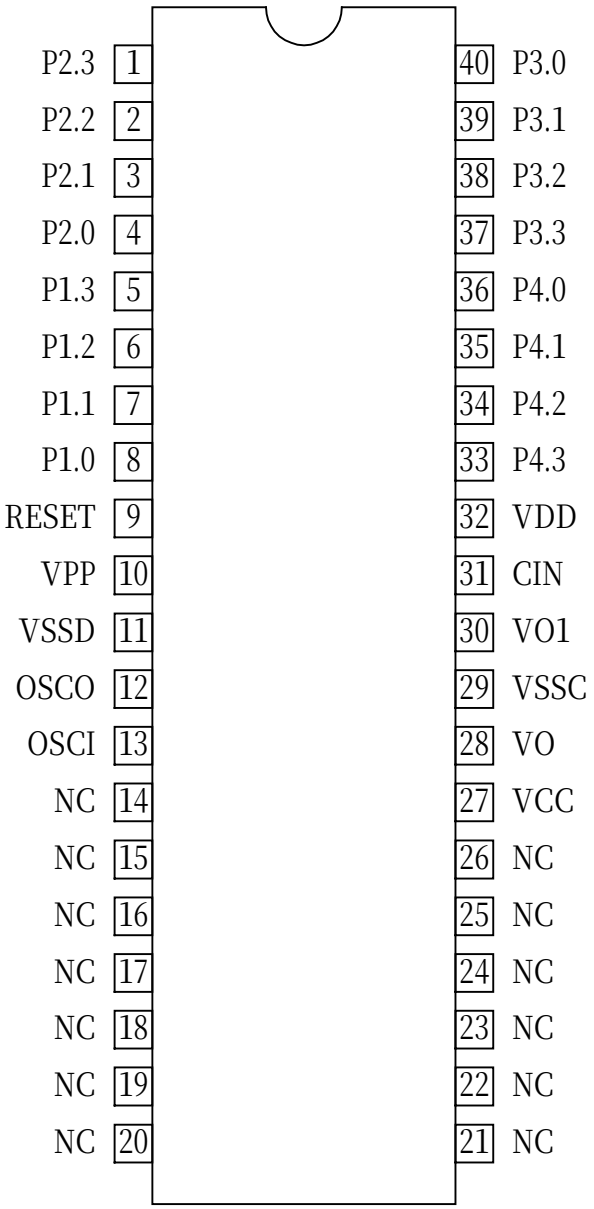
	EM55M450/EM55P450/EM55Q450
RAM (nibbles)	128
PROGRAM	32K*10
ROM(bits)	204Kx 10
I/O ports	4 I + 12 I/O
D/A	Green/Traditional DAC by option
OSC	Ring or Resonator type by option
Reset Pin	Yes

- Single power supply 2.4V~5.1V, suitable for 3 batteries application.
- Port1 and Port2 with wake-up function, Port3.2 with programmable IR(38KHz carry) communication function
- Power down mode for saving power consumption
- Single ROM for voice and program data
- Readable ROM code data
- One 6-bit timer overflow control
- Two stacks for subroutine calling
- 5-bit ASPCM /7-bit PCM voice synthesizer
- Multiple playing speeds in 1KHz ~22KHz for voice playback
- Multiple levels of volume control
- Traditional fixed current D/A output to drive external connected transistor for speaker or direct drive output to speaker.
- Write cycle times:

Name	EM55M450	EM55P450	EM55Q450
Cycle Times	Greater than 1 time	1	0
Package Type	DIP/COB board form	DIP/DIE form	DIE form

PIN ASSIGNMENT

EM55M450/EM55P450



PDIP 40 PIN

PIN DESCRIPTIONS

Symbol	I/O	Function
P1.0	I	Bit 0 of Port 1
P1.1	I	Bit 1 of Port 1
P1.2	I	Bit 2 of Port 1
P1.3	I	Bit 3 of Port 1
P2.0/ PD0	I/O	Bit 0 of Port 2 / Program data pin for parallel data bit 0,4
P2.1/ PD1	I/O	Bit 1 of Port 2 / Program data pin for parallel data bit 1,5
P2.2/ PD2	I/O	Bit 2 of Port 2 / Program data pin for parallel data bit 2,6
P2.3/ PD3	I/O	Bit 3 of Port 2 / Program data pin for parallel data bit 3,7
P3.0/ RDYB	I/O	Bit 0 of Port 3 / Program Ready signal
P3.1 / WEB	I/O	Bit 1 of Port 3 / programming write enable
P3.2 / OEB	I/O	Bit 2 of Port 3 / programming output enable
P3.3/ ACLK	I/O	Bit 3 of Port 3 / programming address increase
P4.0	I/O	Bit 0 of Port 4
P4.1	I/O	Bit 1 of Port 4
P4.2	I/O	Bit 2 of Port 4
P4.3	I/O	Bit 3 of Port 4
TEST / VPP(MTP power)	I	Test / Programming power source
VDD	I	Positive power supply
VSSD	I	Power ground
VCC	I	Analog positive power supply
VSSC	I	Analog power ground
Cin	I	Regulator capacitor
OSCI / CLK	I	Oscillation component pin / Program clock
OSCO	I	Oscillation component pin
RESET	I	RESET pin (active high)
VO1	O	Push Pull voice output
VO	O	Constant current output / Push Pull voice output

ABSOLUTE MAXIMUM RATING

Items	Symbol	Min	Max	Unit
Supply Voltage	V_{DD}-V_{SS}	-0.3	6.0	V
Input Voltage	V_{IN}	V_{GND}-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	0.0	+70.0	^{0}C
Storage Temperature	T_{STG}	-25.0	+125.0	^{0}C

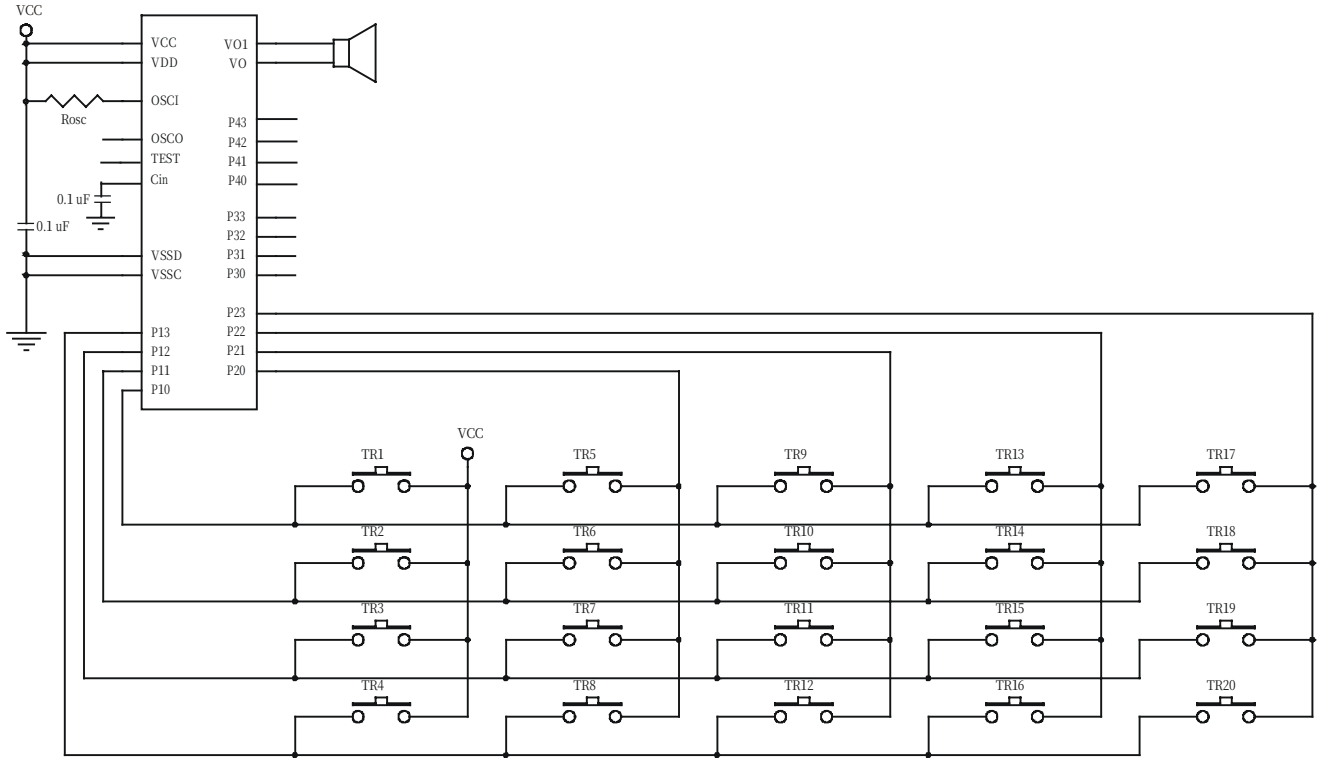
ELECTRICAL CHARACTERISTICS (V_{DD}=3V, 25°C unless otherwise specified)

Items	Sym.	Min	Typ.	Max.	Unit	Condition
Operating Voltage	V_{DD}	2.4	3.0	5.1	V	
Standby current	I_{DDS}	-	-	2	uA	no load
operating current	I_{DDO}	-	1.8	3.5	mA	no load, traditional D/A operate
operating current	I_{DDO}	-	3	6	mA	no load, Green voice D/A operate
Drive current of P2,P3, P4	I_{OD}	2.0	3.0	-	mA	V_O=2.4V
Sink current of P2 (before KEYB)	I_{OS}	-	3.0	10.0	uA	V_O=3V
Sink current of P2 (after KEYB)	I_{OS}	2.3	3.5	-	mA	V_O=0.4V
Sink current of P3,P4	I_{OS}	2.3	3.5	-	mA	V_O=0.4V
Input current of P1	I_{IH}	-	3.0	10.0	uA	V_O=3V
Output current of VO	I_{VO}	4.0	5.0	6	mA	V_O=0.7V, traditional D/A operate
Output sink current of VO1, VO	I_{VO}	120	150.		mA	Vo=Vo1=1.5 V, Green voice D/A operate
Oscillation resistor	R	-	100	-	KΩ	
Oscillation freq.	F_{OSC}	1.08	1.20	1.32	MHz	osc=100 KΩ

DC PROGRAMMING CHARACTERISTICS:

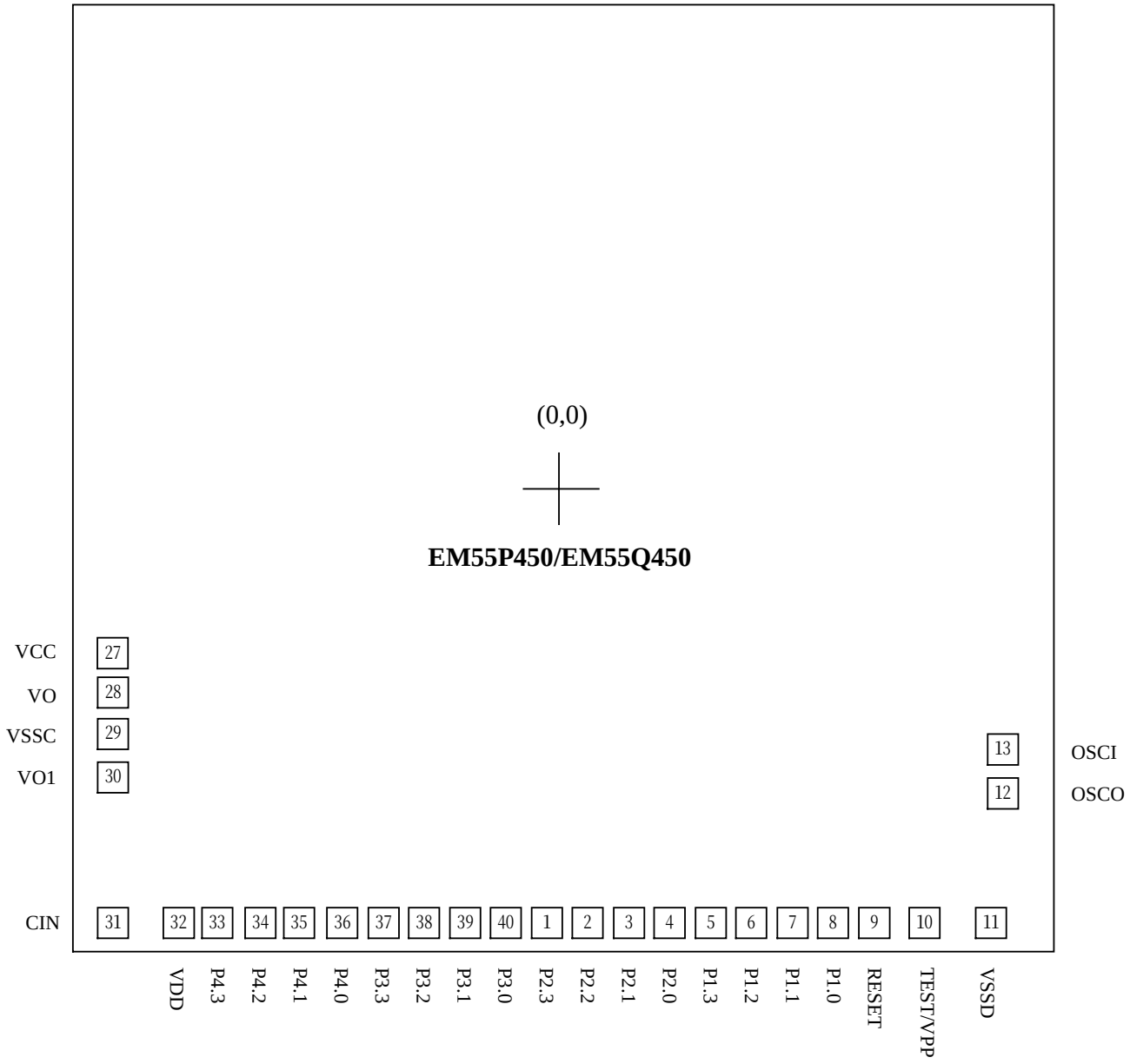
Items	Sym.	Min.	Typ.	Max.	Unit	Test Conditions
VDD programming voltage	VDD	4.7	5.0	5.3	V	
VDD erase voltage	VDD	4.7	5.0	5.3	V	
VPP voltage(programming process)	VPP	11.3	12	12.7	V	
Input current	I_{IN}	-	-	7	uA	VDD = 5V, V_{IN} = 0~VDD
Output high voltage	V_{OH}	2.4	2.4	-	V	I_{OH} = 400uA
Output low voltage	V_{OL}	-	-	0.4	V	I_{OL} = 2.1mA
VDD supply current	I_{DD}	-	-	100	mA	VDD=5V
VPP supply current	I_{PP}	-	-	50	mA	VPP=12V

APPLICATION CIRCUIT



Note : It should add a 0.1 uF ceramic capacitor between Cin and ground.
It is suggested to add a 0.1 uF ceramic capacitor between VDD and VSS.

PAD DIAGRAM


(0,0)
EM55P450/EM55Q450
VCC 27
VO 28
VSSC 29
VO1 30
13 OSCI
12 OSCO
CIN 31
32 VDD
33 P4.3
34 P4.2
35 P4.1
36 P4.0
37 P3.3
38 P3.2
39 P3.1
40 P3.0
1 P2.3
2 P2.2
3 P2.1
4 P2.0
5 P1.3
6 P1.2
7 P1.1
8 P1.0
9 RESET
10 TEST/VPP
11 VSSD

Pin NO.	Symbol	X	Y	Pin NO.	Symbol	X	Y
1	P2.3	-2.0	-1356.0	21	NC		
2	P2.2	118.1	-1356.0	22	NC		
3	P2.1	238.1	-1356.0	23	NC		
4	P2.0	358.0	-1356.0	24	NC		
5	P1.3	478.1	-1356.0	25	NC		
6	P1.2	598.0	-1356.0	26	NC		
7	P1.1	718.1	-1356.0	27	VCC	-1311.0	-616.0
8	P1.0	838.0	-1356.0	28	VO	-1311.0	-736.0
9	RESET	958.0	-1356.0	29	VSSC	-1311.0	-856.0
10	TEST/VPP	1101.5	-1356.0	30	VO1	-1311.0	-976.0
11	VSSD	1276.0	-1356.0	31	CIN	-1282.7	-1356.0
12	OSCO	1304.0	-1013.4	32	VDD	-1082.0	-1356.0
13	OSCI	1304.0	-893.4	33	P4.3	-962.0	-1356.0
14	NC			34	P4.2	-842.0	-1356.0
15	NC			35	P4.1	-722.0	-1356.0
16	NC			36	P4.0	-602.0	-1356.0
17	NC			37	P3.3	-481.9	-1356.0
18	NC			38	P3.2	-362.0	-1356.0
19	NC			39	P3.1	-242.0	-1356.0
20	NC			40	P3.0	-122.0	-1356.0

Chip size : 2920*3020 um

For PCB layout, IC substrate must be connected to VSSD.