



Specifications* for EASY SOUND® - EM55200U Tiny Controller-Based Synthesizer

*Patents pending for EM 55200U & the
embedded Ultrasound Talking Toy feature*

1. General Description

EM55200U is a high quality voice synthesizer IC that contains one 4-bit Input port, two 4-bit I/O ports, and a tiny controller. Two of its I/O pins can generate IR or ultrasonic carrier for IR, or ultrasonic application, and 1 of these 2 pins can also act as receiver. By programming the tiny controller, user's application may include section combination, trigger mode, control outputs, keyboard matrix, and other logic functions, which can be implemented easily.

2. Features

- Direct Drive output
- Single power supply
- Crystal/Ring oscillator option
- Power down mode for energy saving
- Reset pin available
- Single ROM (32k x 10 bits) for program and voice data storage. 32 K maximum program address size available
- Readable ROM data
- One 6-bit timer overflow control is provided
- Two stacks for subroutine call
- 5 bits ASPCM synthesis
- 15 steps volume control
- Direct Drive/traditional DAC
- 8 bits resolution D/A.
- 38K Hz modulation carrier for IR or ultrasound transmission
- Built in signal detector for ultrasound receiver function



3. 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 | 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. |
| P2.3 | I/O | Bit 3 of Port 2. This pin also acts as signal output for amplified signal from P31. |
| P3.0 | I/O | Bit 0 of Port 3. |
| P3.1 | I/O | Bit 1 of Port 3. This pin can provide 38KHz carrier signal for IR or ultrasound or acts as signal input pin for ultrasonic or IR signal. |
| P3.2 | I/O | Bit 2 of Port 3. This pin can generate 38KHz square wave. |
| P3.3 | I/O | Bit 3 of Port 3. The pin can be treated as an LED output flashing with volume. |
| VDD | I | Positive digital power supply. |
| OSCI | I | Ring oscillator/crystal input pin. |
| RST | I | Reset Pin |
| OSCO | O | Crystal output pin. |
| TEST | I | For testing only. |
| VSSD | I | Negative digital power supply. |
| VCC | I | Positive analog power supply |
| VSSC | I | Negative analog power supply |
| VO | O | Constant current output/ Push Pull voice output |
| VO1 | O | Push Pull voice output |



4. Absolute Maximum Ratings

| Items | Symbol | Min | Max | Unit |
|-----------------------|-----------------|--------------|--------------|-------------|
| Supply Voltage | $V_{DD}-V_{SS}$ | -0.3 | 6.0 | V |
| Input Voltage | V_{IN} | $V_{SS}-0.3$ | $V_{DD}+0.3$ | V |
| Operating Temperature | T_{OP} | 0.0 | +70.0 | $^{\circ}C$ |
| Storage Temperature | T_{STG} | -55.0 | +125.0 | $^{\circ}C$ |

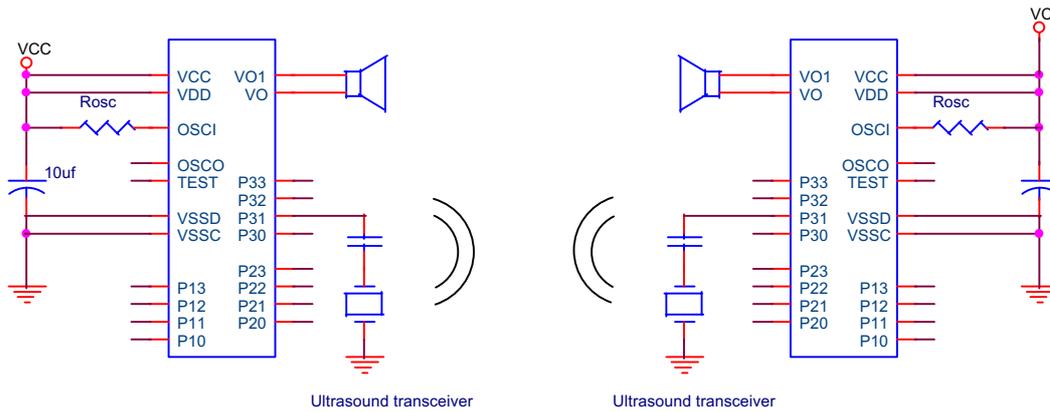
5. Electrical Characteristics

| Items | Sym | Min | Typ. | Max. | Unit | Condition |
|---|-----------|------|------|------|------------|--|
| Operating Voltage | V_{DD} | 2.2 | 3.0 | 5.5 | V | - |
| Standby Current | I_{DDS} | - | - | 2.0 | μA | $V_{DD}=3V$ |
| Operating Current | I_{DDO} | - | 350 | 500 | μA | $V_{DD}=3V$, no load, constant current D/A Operate, receiver circuit enable |
| | | | 250 | 350 | μA | $V_{DD}=3V$, no load, constant current D/A Operate, receiver circuit disable |
| | | | 2 | 4 | mA | $V_{DD}=3V$, no load, push/pull current D/A Operate |
| P2,P3,P4 Drive Current | I_{OD} | 2.0 | 3.0 | - | mA | $V_{DD}=3V, V_O=2.4V$ |
| P2 Sink Current (before KEYB) | I_{OS} | | 3.0 | 10.0 | μA | $V_{DD}=3V, V_O=3V$ |
| P2 Sink Current (after KEYB) | I_{OS} | 2.3 | 3.5 | - | mA | $V_{DD}=3V, V_O=0.4V$ |
| P3,P4 Sink Current | I_{OS} | 2.3 | 3.5 | - | mA | $V_{DD}=3V, V_O=0.4V$ |
| P1 Input Current | I_{IH} | - | 3.0 | 10.0 | μA | $V_{DD}=3V$ |
| VO Output Current | I_{VO} | 4.0 | 5.0 | 6.0 | mA | $V_{DD}=3V, V_O=0.7V$ |
| | | | 5.1 | 6.3 | mA | $V_{DD}=4.5V, V_O=0.7V$ |
| VO1, VO Output Current | I_{VO} | 120 | 150 | 180 | mA | $V_{DD}=3V$ |
| Oscillation Resistor | R | - | 100 | - | K Ω | $V_{DD}=3V$ |
| Oscillation Freq. | F_{OSC} | 1.08 | 1.2 | 1.32 | MHz | $V_{DD}=2.2\sim 5.2V$ |
| Min. Detected Voltage when P31 functions as Receiver. | V_{ac} | 5 | - | - | mV | $V_{DD}=2.2\sim 5.2V$ V_{ac} is defined as V_{p-p} and AC voltage at 40 KHz frequency |

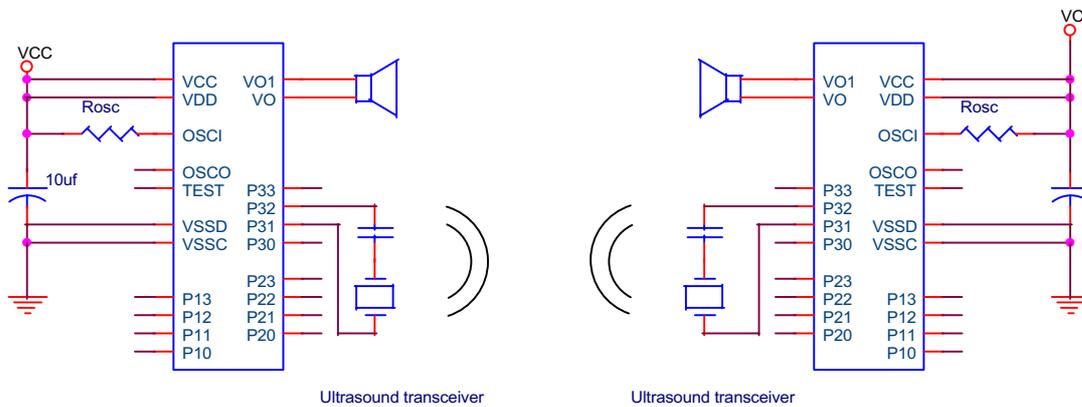


6. Application Circuit

Single End Application Circuit for Ultrasound:



Dual Port Application Circuit for Ultrasound:



7. Ultrasound Application For Talking Toy

