



HT8656 Talking Back

Features

- Operating voltage: 4.5V~5.5V
- ADM algorithm
- DRAM selection:
 - 64K
 - 256K
- Sampling rate selection:
 - 32Kb
 - 16Kb
- Auto stop recording
 - 0.5 seconds silence is detected
 - Recording capacity is full

- Built-in 2-stage microphone amplifier
- Built-in DRAM refresh circuit
- Voltage type D/A output
- Current type D/A output
- Auto record and playback
- Auto power-off
- Low power consumption

Applications

- Toys
- Education

- Games

General Description

The HT8656 is a single chip CMOS LSI for talking back applications using an ADM algorithm. Functions of the IC consist of recording/playing as well as auto power off. It starts recording when a sound input is detected, and stops to play back when silence lasts 0.5 seconds during recording. The auto power off function is activated once a REC/PLAY cycle has been implemented 64 times or an interval of silence exceeds 2 minutes.

The HT8656 provides a recording capacity of 2 seconds for DRAM of 64K and 8 seconds for DRAM of 256K at a 32Kb sampling rate and double recording capacity at a 16Kb sampling rate. A higher sampling rate will result in sounds of better quality but sacrifice the recording time, and vice versa.



Pin Assignment

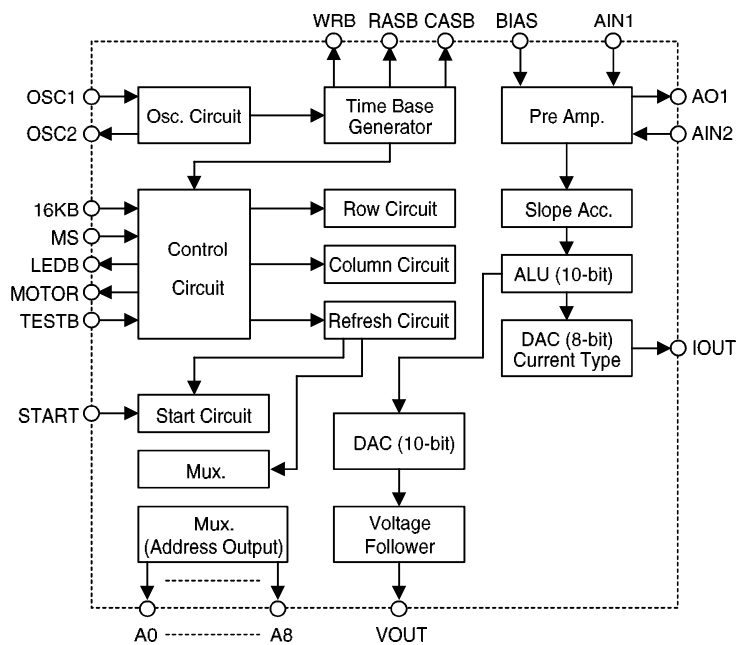
| | | | |
|------|----|----|-------|
| A6 | 1 | 28 | MS |
| A7 | 2 | 27 | 16KB |
| A5 | 3 | 26 | TESTB |
| A4 | 4 | 25 | VDD |
| A3 | 5 | 24 | VOUT |
| A2 | 6 | 23 | AIN2 |
| A1 | 7 | 22 | AO1 |
| A0 | 8 | 21 | AIN1 |
| RASB | 9 | 20 | BIAS |
| WRB | 10 | 19 | VSS |
| DATA | 11 | 18 | MOTOR |
| A8 | 12 | 17 | START |
| CASB | 13 | 16 | LEDB |
| OSC2 | 14 | 15 | OSC1 |

HT8656A
– 28 DIP

| | | | |
|------|----|----|-------|
| A6 | 1 | 28 | MS |
| A7 | 2 | 27 | 16KB |
| A5 | 3 | 26 | TESTB |
| A4 | 4 | 25 | VDD |
| A3 | 5 | 24 | IOU |
| A2 | 6 | 23 | AIN2 |
| A1 | 7 | 22 | AO1 |
| A0 | 8 | 21 | AIN2 |
| RASB | 9 | 20 | BIAS |
| WRB | 10 | 19 | VSS |
| DATA | 11 | 18 | MOTOR |
| A8 | 12 | 17 | START |
| CASB | 13 | 16 | LEDB |
| OSC2 | 14 | 15 | OSC1 |

HT8656B
– 28 DIP

Block Diagram



Pin diagram of the AT89C51 microcontroller. The chip is shown in a square package with pins numbered 1 to 16. The pins are arranged in a 4x4 grid. The top row (pins 1-4) are DATA, A8, CASB, and OSC2. The second row (pins 5-8) are OSC1, LEDB, START, and MOTOR. The third row (pins 9-12) are VSS, BIAS, AIN1, and AOT. The fourth row (pins 13-16) are AIN2, AOB, VOUT, and VDD. The right side of the chip has pins 17-24 labeled A4, A5, A7, A6, MS, 16KB, and TESTB. The top of the chip has pins 25-28 labeled A3, A2, A1, A0, RASB, and RASB. The bottom of the chip has pins 29-32 labeled WFB, AIN1, AOT, and AIN2.

Chip size: $3276.6 \times 3530.6 \text{ } (\mu\text{m})^2$

* The IC substrate should be connected to VDD in the PCB layout artwork.

Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---------|----------|----------|---------|----------|----------|
| 1 | -1488.19 | 1613.92 | 16 | 1488.19 | -1615.19 |
| 2 | -1488.19 | 1277.87 | 17 | 1488.19 | -377.19 |
| 3 | -1488.19 | 906.53 | 18 | 1488.19 | -124.71 |
| 4 | -1488.19 | 653.80 | 10 | 1488.19 | 130.30 |
| 5 | -1488.19 | -355.60 | 20 | 1488.19 | 384.05 |
| 6 | -1488.19 | -635.51 | 21 | 1488.19 | 651.51 |
| 7 | -1488.19 | -937.26 | 22 | 1488.19 | 1089.41 |
| 8 | -1488.19 | -1378.46 | 23 | 1488.19 | 1363.73 |
| 9 | -1396.75 | -1615.19 | 24 | 1436.88 | 1615.19 |
| 10 | -1170.43 | -1615.19 | 25 | 1226.57 | 1615.19 |
| 11 | -964.69 | -1615.19 | 26 | 973.84 | 1615.19 |
| 12 | -399.03 | -1615.19 | 27 | 723.65 | 1615.19 |
| 13 | -145.29 | -1615.19 | 28 | 473.20 | 1615.19 |
| 14 | 1033.27 | -1615.19 | 29 | -1052.83 | 1615.19 |
| 15 | 1239.01 | -1615.19 | | | |

Pin Description

| Pin No. | Pin Name | I/O | Internal Connection | Description |
|---------|-----------------|-----|---------------------|--|
| 1, 2 | A6, A7 | O | CMOS | DRAM address output |
| 3~8 | A5~A0 | O | CMOS | DRAM address output |
| 9 | RASB | O | CMOS | DRAM row address strobe |
| 10 | WRB | O | CMOS | DRAM write enable |
| 11 | DATA | I/O | CMOS | DRAM data input/output |
| 12 | A8 | O | CMOS | DRAM address output |
| 13 | CASB | O | CMOS | DRAM column address strobe |
| 14 | OSC2 | O | — | Oscillator output |
| 15 | OSC1 | I | — | Oscillator input |
| 16 | LEDB | O | NMOS Open Drain | LED indicator: Idle: LED is turned on Record: LED flashes Play: LED is turned off |
| 17 | START | O | NMOS Open Drain | System start pin |
| 18 | MOTOR | O | CMOS | Motor drive output (active high) when playing back |
| 19 | VSS | I | — | Negative power supply (GND) |
| 20 | BIAS | I | — | For internal AMP bias de-coupling |
| 21 | AIN1 | I | — | Internal AMP first stage input (inverted) |
| 22 | AO1 | O | — | Internal AMP first stage output |
| 23 | AIN2 | I | — | Internal AMP second stage input (inverted) |
| 24 | IOUT (8656A) | O | — | Voltage type audio output for an external power AMP |
| 24 | IOUT (8656B) | O | — | Current type audio output for an external transistor |
| 25 | VDD | I | — | Positive power supply |
| 26 | TESTB | I | Pull-High | For IC test only |
| 27 | 16KB | I | Pull-High | 32Kbps/16Kbps sampling rate selection: Open/high: 32Kbps Low: 16Kbps |
| 28 | MS | I | Pull-High | 64K/256K DRAM size selection: Open/high: 64K Low: 256K |

Absolute Maximum Ratings*

| | | | |
|----------------------|--|----------------------------|----------------|
| Supply Voltage | -0.3V to 6V | Storage Temperature..... | -50°C to 125°C |
| Input Voltage..... | V _{SS} -0.3V to V _{DD} +0.3V | Operating Temperature..... | -20°C to 70°C |

*Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

(Ta=25°C)

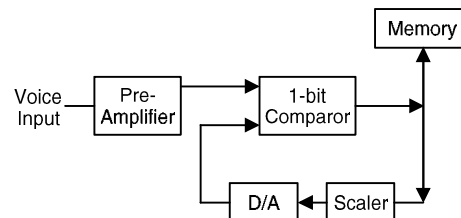
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|------------------|--------------------------------------|-----------------|--------------------------------------|--------------------|------|--------------------|------------------|
| | | V _{DD} | Conditions | | | | |
| V _{DD} | Operating Voltage | — | — | 4.5 | — | 5.5 | V |
| I _{DD} | Operating Current | 5V | No load, f _{OSC} =640kHz | — | 1.5 | 3.0 | mA |
| I _{STB} | Standby Current | 5V | — | — | 600 | 800 | μA |
| I _O | Max. AUD Source Current | 5V | V _{OH} =0.6V | -1.5 | -3.0 | — | mA |
| I _{OL} | MOTOR Source Current | 5V | V _{OH} =4.5V | -1 | -3.5 | — | mA |
| I _{OL} | LED Sink Current | 5V | V _{OL} =0.5V | 3.0 | 5.0 | — | mA |
| V _{IH} | “H” Input Voltage | — | — | 0.7V _{DD} | — | V _{DD} | V |
| V _{IL} | “L” Input Voltage | — | — | 0 | — | 0.3V _{DD} | V |
| V _{OUT} | Max. V _{OUT} Output Voltage | 5V | R _L >50kΩ | — | 1.5 | — | V _{P-P} |
| f _{OSC} | Oscillating Frequency | 5V | R _{OSC} =43kΩ | — | 640 | — | kHz |

Functional Description

The HT8656 is a single chip LSI with an external DRAM. It is designed for talking back applications. The recording length of the IC is determined by the data rate along with the size of an external memory. Sounds coming from an external microphone are coded through an internal ADM algorithm and saved in an external memory until the memory is full or an interval of silence lasts over 0.5 seconds. Once recording is terminated, the IC will play back the recorded sounds automatically.

Record function

The HT8656 provides two kinds of sampling rate and DRAM size selection to determine the recording capacity. The recording capacity is determined as shown on the following table.



| DRAM Type (MS) | Sampling Rate (16KB) | Recording Capacity |
|---------------------------|-------------------------------------|-------------------------------|
| 64Kb | 32Kb | 2 seconds |
| 64Kb | 16Kb | 4 seconds |
| 256Kb | 32Kb | 8 seconds |
| 256Kb | 16Kb | 16 seconds |

Recording starts whenever a sound input is detected. It then stops once a 0.5 seconds silence is detected or the recording capacity is full. After that, talking back comes into play.

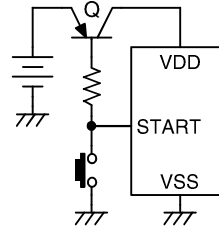
Play function

The HT8656 stops to play back the recorded sounds when an interval of silence lasts 0.5 seconds during recording. Its sampling rate is the same as the rate of recording sounds.

Power control

The HT8656 provides a START pin for power control. The START pin is of high impedance and switch Q is turned off initially. After the START pin is triggered, it will remain at a low level and switch Q is turned on. The START pin is of high impedance and the chip's power is

switched off when a REC/PLAY cycle has been implemented 64 times or an interval of silence lasts over 2 minutes.



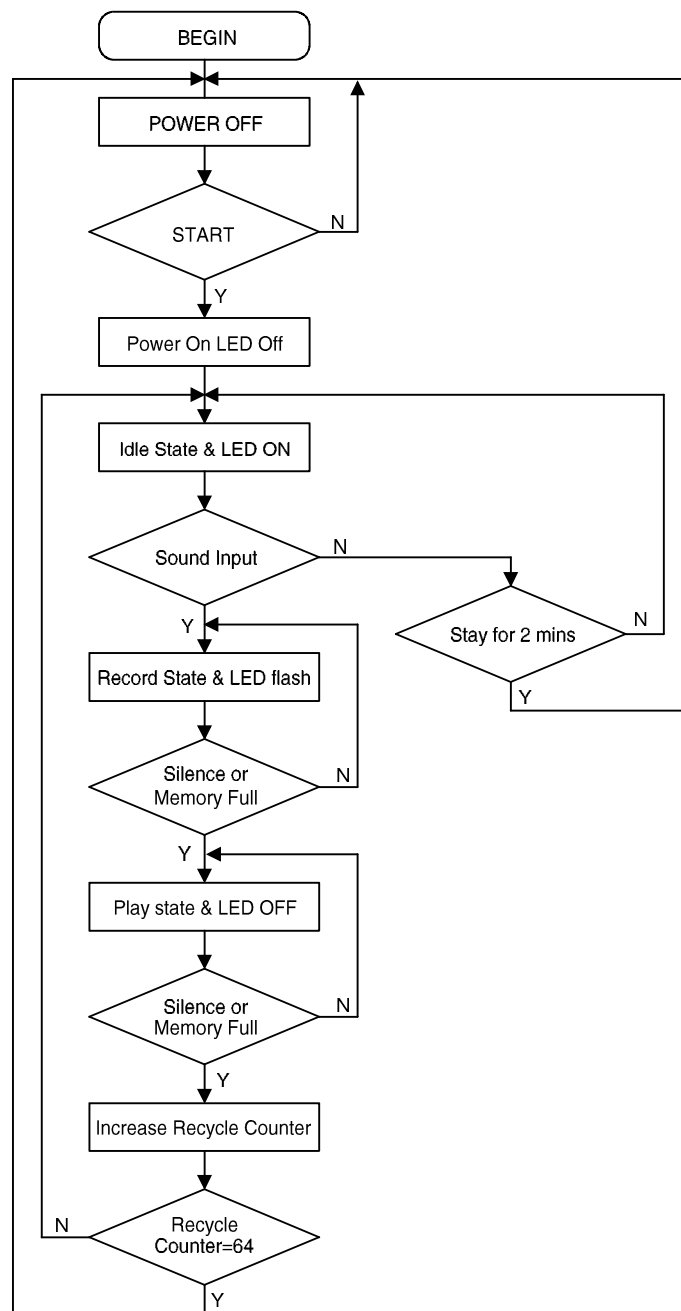
Motor

The HT8656 provides a motor driving pin. The motor is turned on during playing but off once talking back is terminated.

LED

The LED pin displays the status of the HT8656. LED is switched ON when the IC is in the standby state. Its intensity varies inversely with the sound volume when the IC is in the recording state. In the playing state, the LED is switched OFF.

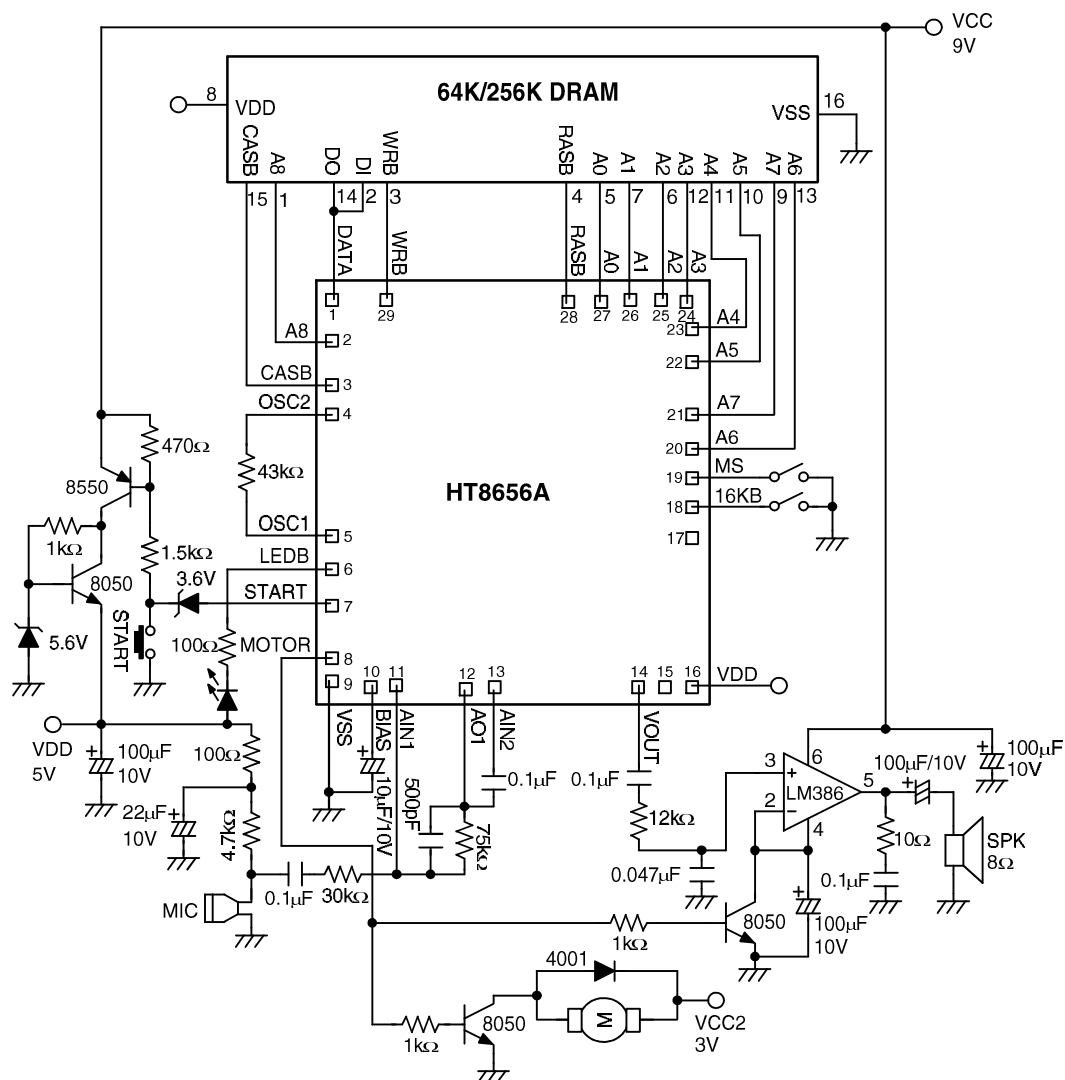
Flowchart



Application Circuits

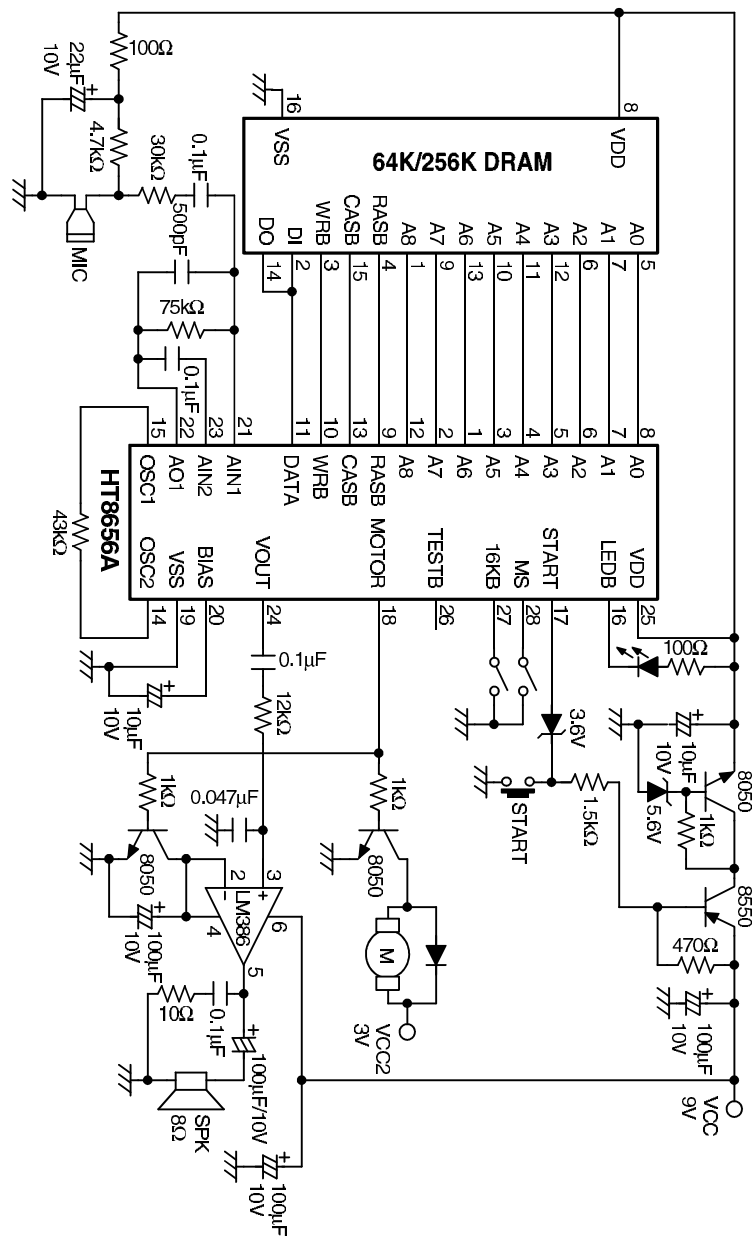
LM386 output

- Dice form



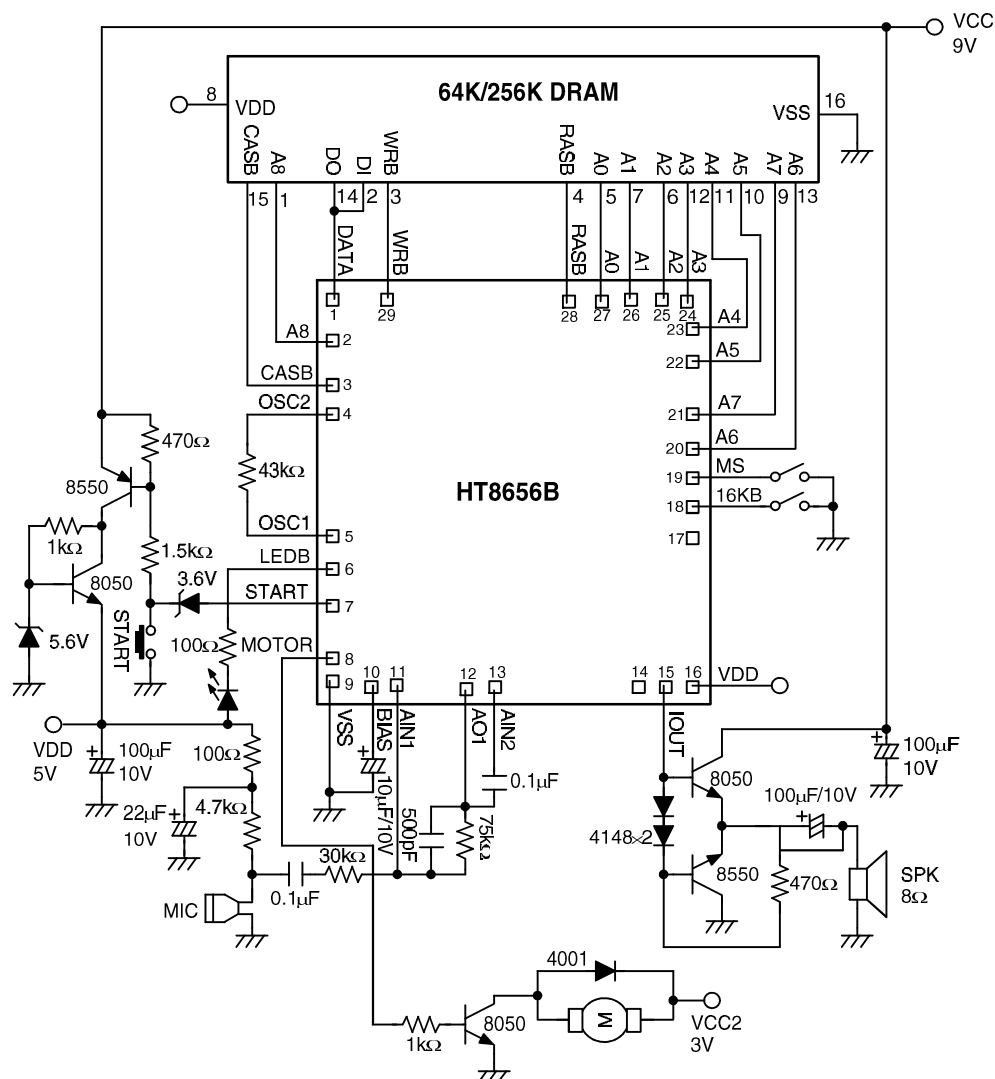
* The IC substrate should be connected to VDD in the PCB layout artwork.

- Package form



two transistor output

- Dice form



* The IC substrate should be connected to VDD in the PCB layout artwork.

- Package form

