

Features

- Operating voltage: 4.5V~5.5V
- ADM algorithm
- Auto playback with an echo effect
- DRAM options:
 - 64K
 - 256K
- Sampling rate options:
 - 32Kbps (bits per second)
 - 16Kbps
- Recording capacity: 2, 4, 8, 16 seconds
- Built-in 2-stage microphone amplifier
- Built-in DRAM refresh circuit
- Voltage type D/A output
- Current type D/A output
- Auto power-off
- Low power consumption

Applications

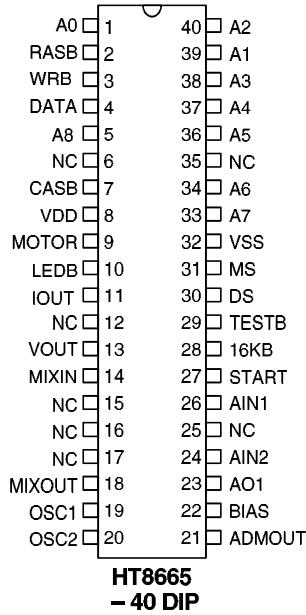
- Toys
- Education
- Games

General Description

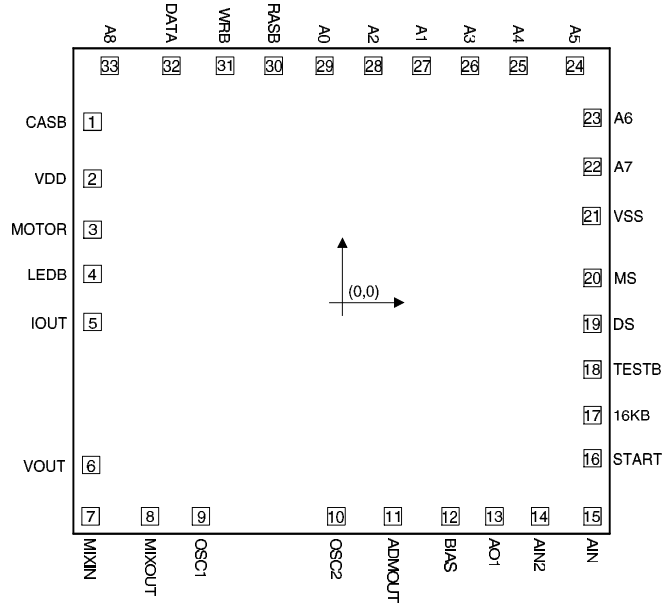
The HT8665 is a single chip CMOS LSI using an ADM algorithm. It is designed for applications on talking back with an echo effect. Functions of the IC consist of recording/playing and auto power off in addition to an echo effect. The IC starts recording when a sound input is detected, and stops to play 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 that exceeds 2 minutes.

The HT8665 provides a recording capacity of 2 seconds at a 32Kbps sampling rate for DRAM of 64K (8 seconds for DRAM of 256K) and 4 seconds at a 16Kbps sampling rate (16 seconds for DRAM of 256Kb). A higher sampling rate will generate sounds of better quality but sacrifice recording time, and vice versa.

Pin Assignment



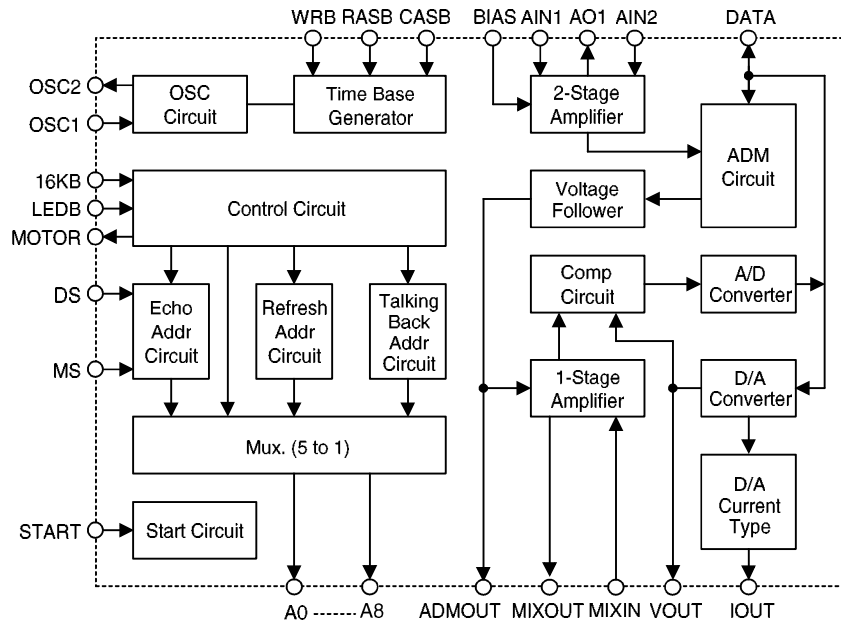
Pad Assignment



Chip size: $3260 \times 3080 (\mu\text{m})^2$

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

Block Diagram



Pad Coordinates

 Unit: μm

Pad No.	X	Y	Pad No.	X	Y
1	-1447.00	977.75	18	1447.00	-452.75
2	-1434.00	648.25	19	1447.00	-189.75
3	-1447.00	354.75	20	1447.00	75.25
4	-1447.00	99.25	21	1442.00	434.25
5	-1429.50	-178.75	22	1447.00	718.75
6	-1447.00	-1004.75	23	1447.00	999.75
7	-1450.00	-1300.75	24	1346.00	1300.75
8	-1106.50	-1300.75	25	1020.00	1300.75
9	-813.00	-1300.75	26	741.00	1300.75
10	-31.00	-1300.75	27	460.00	1300.75
11	296.00	-1300.75	28	181.00	1300.75
12	626.00	-1300.75	29	-100.00	1300.75
13	881.50	-1300.75	30	-393.00	1300.75
14	1143.50	-1300.75	31	-674.00	1300.75
15	1447.00	-1305.75	32	-983.50	1300.75
16	1447.00	-965.25	33	-1340.00	1300.75
17	1447.00	-717.75			

Pin Description

Pin No.	Pin Name	I/O	Internal Connection	Description
1	A0	O	CMOS	DRAM address output
2	RASB	O	CMOS	DRAM row address strobe
3	WRB	O	CMOS	DRAM write enable
4	DATA	I/O	CMOS	DRAM data input/output
5	A8	O	CMOS	DRAM address output
6, 12, 15~17, 25, 35	NC	—	—	No connection
7	CASB	O	CMOS	DRAM column address strobe
8	VDD	I	—	Positive power supply
9	MOTOR	O	CMOS	Motor drive output (active high)
10	LEDB	O	NMOS Open Drain	LED indicator: Idle: LED is turned on Record: LED flashes Play: LED is turned off

Pin No.	Pin Name	I/O	Internal Connection	Description
11	IOUT	O	PMOS Open Drain	Current type audio output for an external transistor
13	VOUT	O	—	Voltage type audio output for an external power AMP
14	MIXIN	I	—	Echo mixer input
18	MIXOUT	O	—	Echo mixer output
19	OSC1	I	—	Oscillator input
20	OSC2	O	—	Oscillator output
21	ADMOUT	O	—	ADM D/A output
22	BIAS	O	—	For OP bias de-coupling
23	AO1	O	—	Internal AMP first stage output
24	AIN2	I	—	Internal AMP second stage input (inverted)
26	AIN1	I	—	Internal AMP first stage input (inverted)
27	START	O	CMOS	System start pin
28	16KB	I	Pull-High	Sampling rate selection: Open/high: 32Kbps Low: 16Kbps
29	TESTB	I	Pull-Low	For IC test only
30	DS	I	Pull-High	Echo delay time selection: 1. DRAM of 64K: Open/high: 256ms Low: 128ms 2. DRAM of 256K: Open/high: 512ms Low: 256ms
31	MS	I	Pull-High	DRAM size selection: Open/high: 64K Low: 256K
32	VSS	I	—	Negative power supply (GND)
33	A7	O	CMOS	DRAM address output
34	A6	O	CMOS	DRAM address output
36~38	A5~A3	O	CMOS	DRAM address output
39~40	A1~A2	O	CMOS	DRAM address output

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.

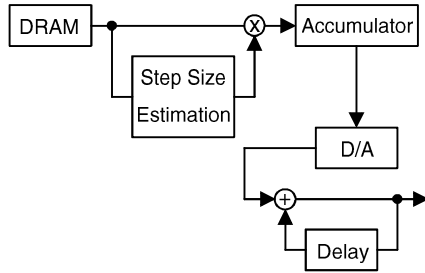
Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V _{DD}	Conditions				
V _{DD}	Operating Voltage	—	—	4.5	—	5.5	V
I _{OP}	Operating Current	5V	No load, f _{OSC} =1MHz	—	3	6	mA
I _{OH1}	IOUT Max. Source Current	5V	V _{OH} =0.5V	-1.5	-3	—	mA
I _{OH2}	MOTOR Source Current	5V	V _{OH} =4.5	-1	-3.5	—	mA
I _{OL}	LED Sink Current	5V	V _{OH} =0.5V	3	-3.5	—	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} =27kΩ	—	1	—	MHz

Functional Description

The HT8665 is a single chip LSI with an external DRAM. It is designed for applications on talking back with an echo effect. The recording length of the IC is determined by the data rate and the size of the 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 automatically play back the recorded sounds with an echo effect.



Record function

The HT8665 provides two kinds of sampling rate as well as DRAM interfaces. The sampling rate (S.R.) along with DRAM determine the recording capacity as shown in the following table: (for $f_{OSC}=640kHz$)

MS (DRAM)	16KB (S.R.)	Recording Capacity
1 (64Kb)	1 (32Kbps)	2 seconds
1 (64Kb)	0 (16Kbps)	4 seconds
0 (256Kb)	1 (32Kbps)	8 seconds
0 (256Kb)	0 (16Kbps)	16 seconds

Notes: "1" is connected to VDD or left open
 "0" is connected to VSS

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

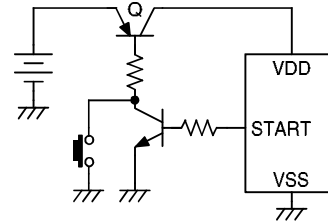
Play function

The HT8665 stops to play back the recorded sounds when an interval of silence lasts 0.5 seconds or the memory is full during recording. Its playing rate is the same as the rates of recording and echo effect. The echo delay time can be set by the DS pin as shown:

DS	1	0
64Kb	256ms	128ms
256Kb	512ms	256ms

Power control

The HT8665 provides a START pin for power control. The START pin is of high impedance and switch Q is turned off initially. After the START key is triggered, it will output a high level signal and switch Q is turned on. This pin outputs a low level signal and the power is switched off when a REC/PLAY cycle has been implemented 64 times or an interval of silence lasts for over 2 minutes.



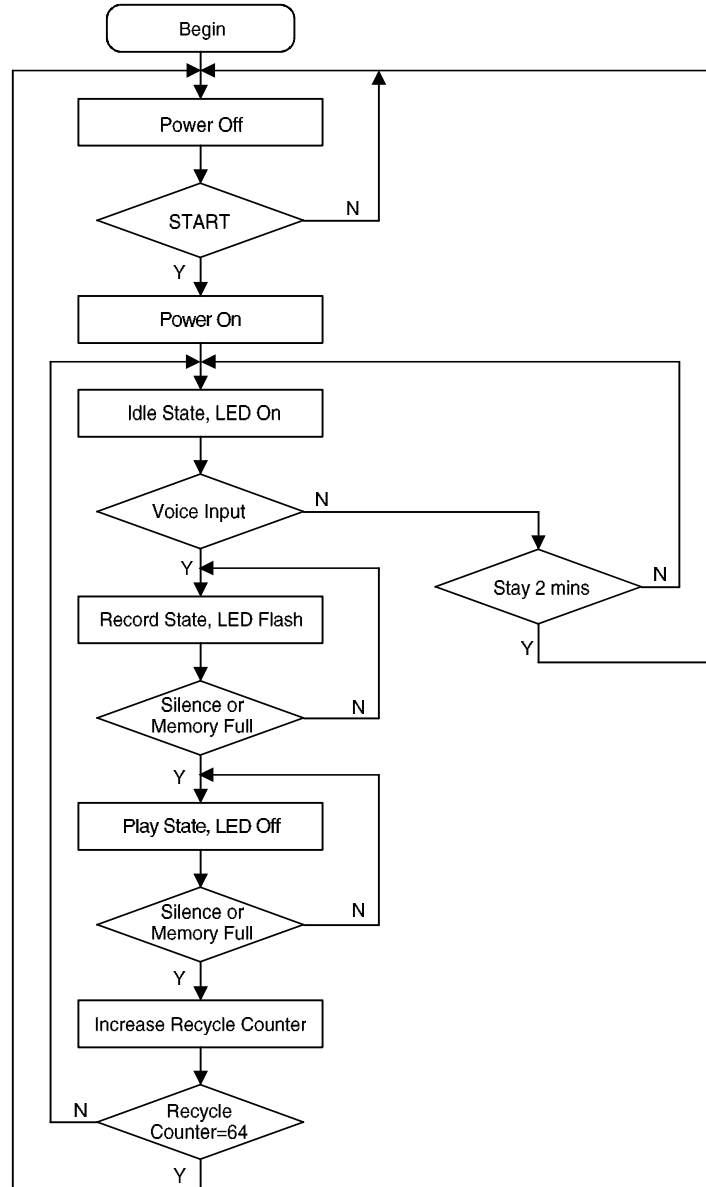
Motor

The HT8665 provides a motor driving pin. The motor is turned on during playing and turned off once talking back is terminated.

Status display

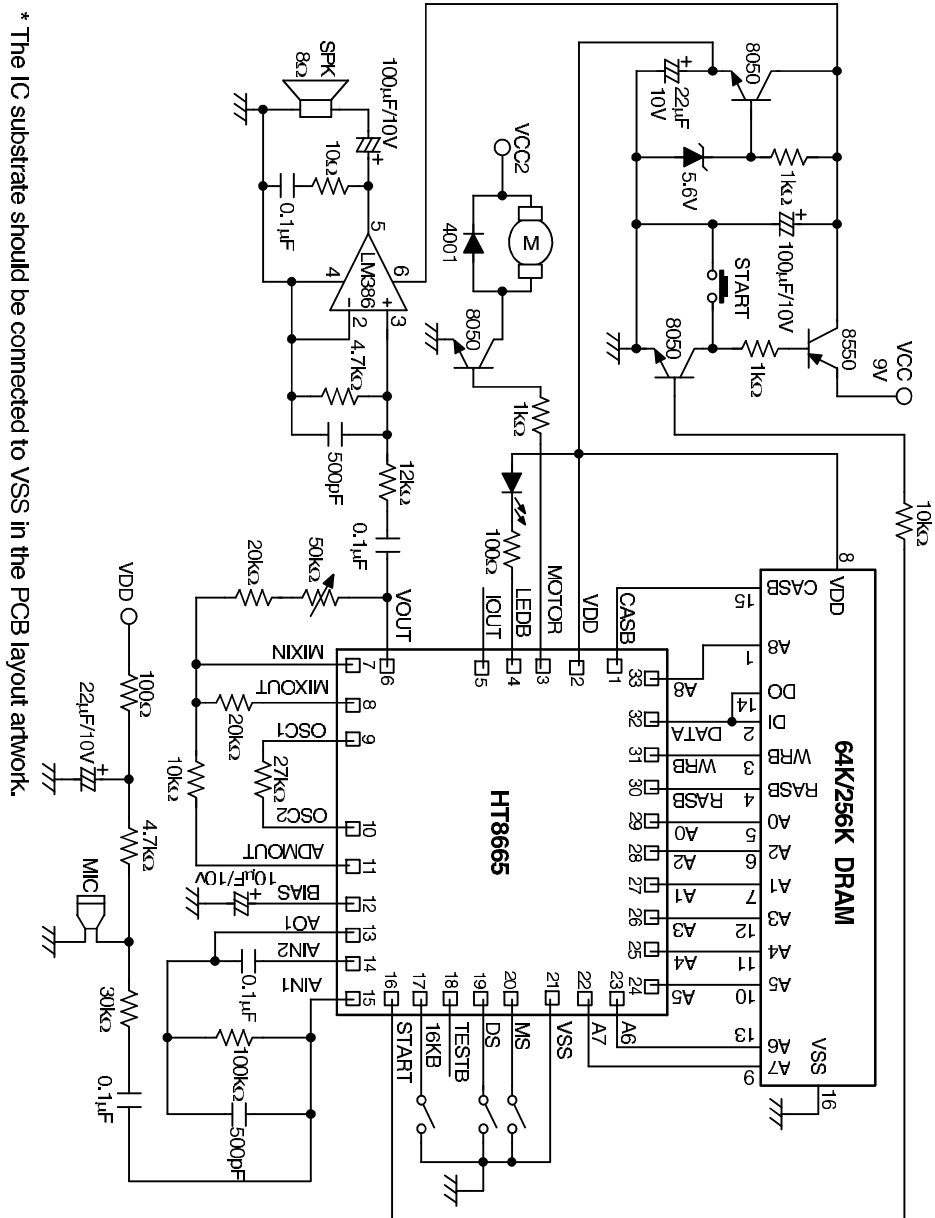
The HT8665 provides an LEDB pin to display its operation status. An external LED is switched on when the IC is in the standby state and switched off when the IC is in the playing state. The LED will flash with the sound volume when the IC is in the recording state, but its intensity will vary inversely with the volume.

Flowchart

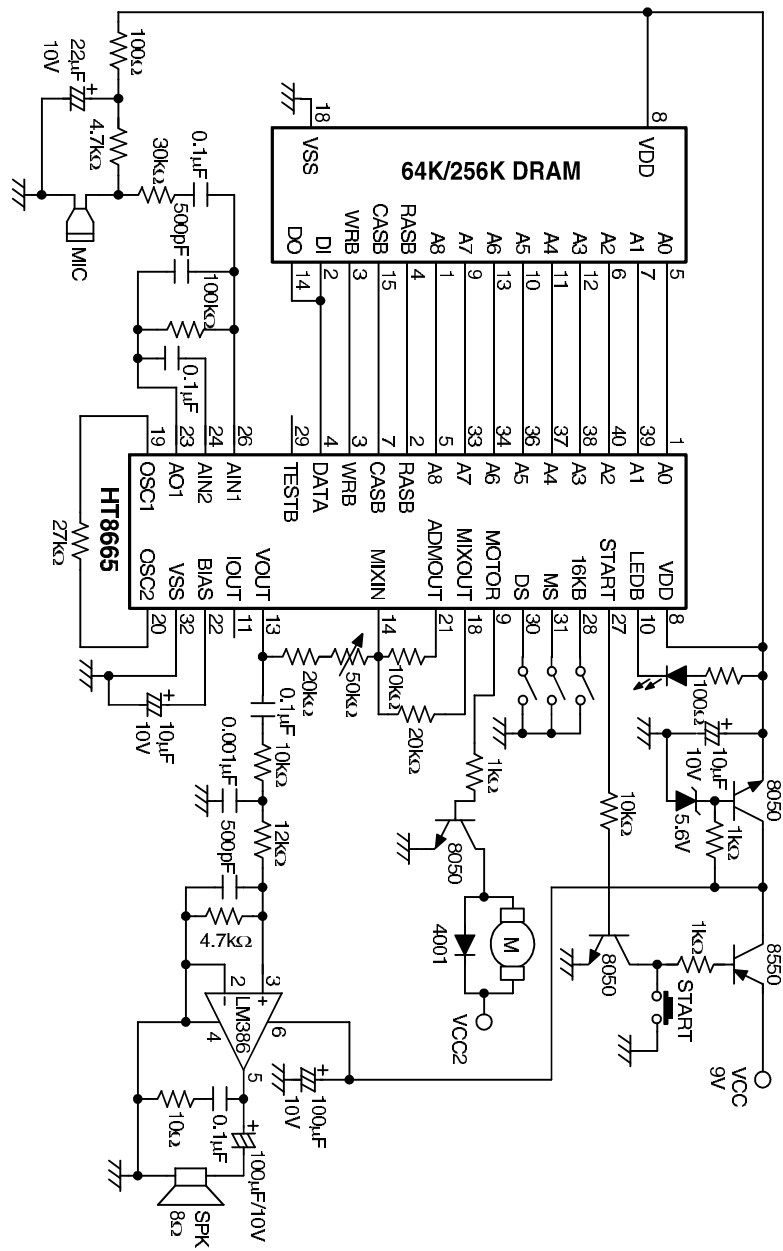


Application Circuits

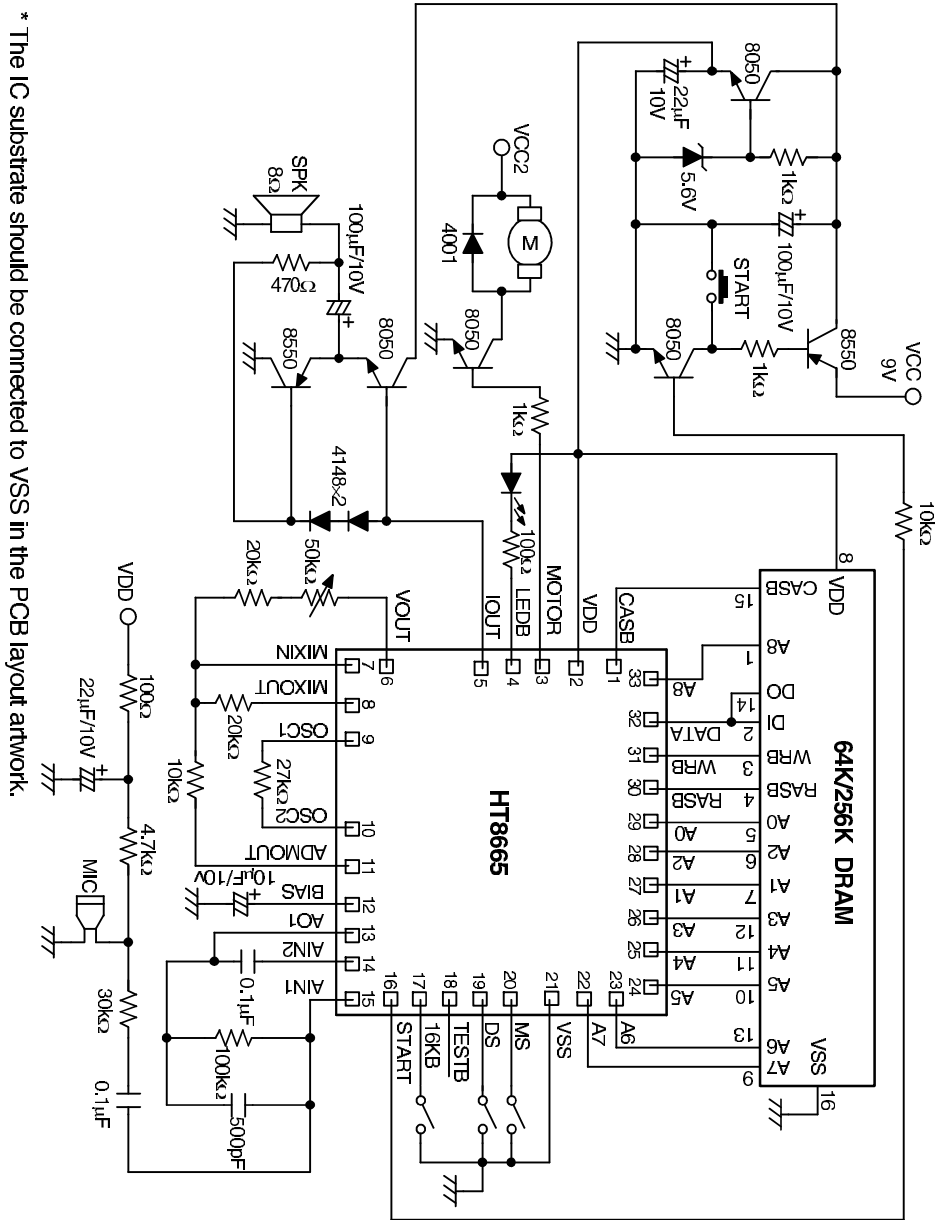
LM386 output



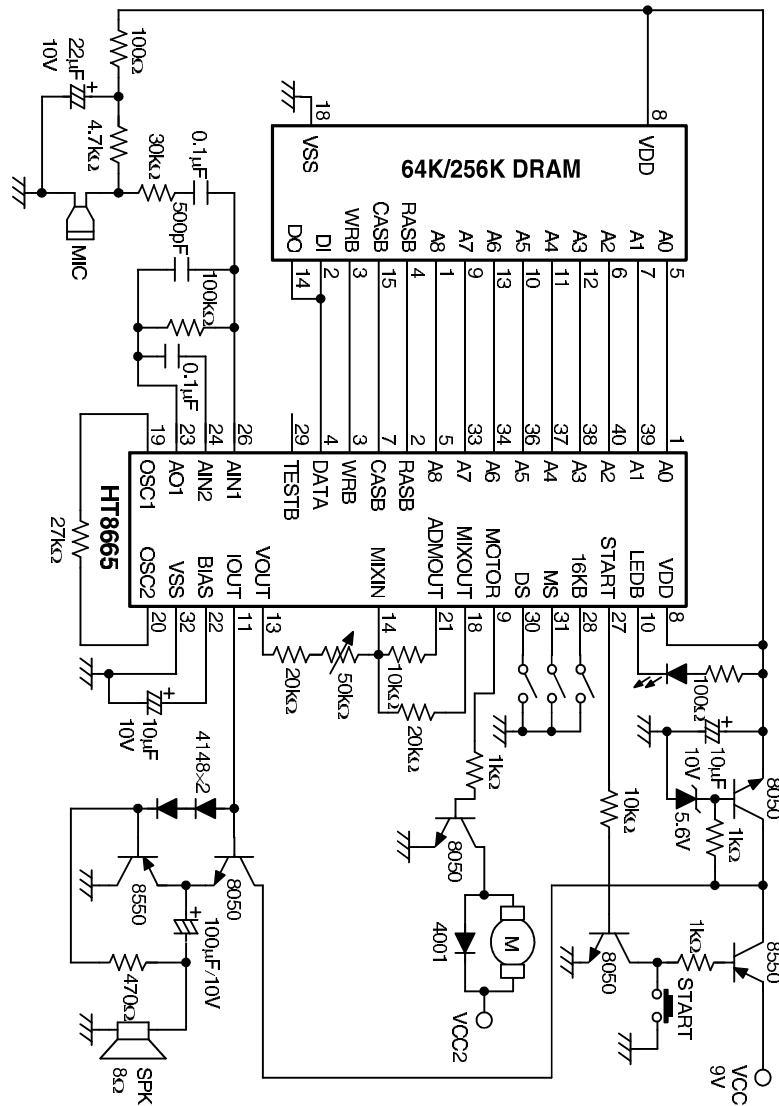
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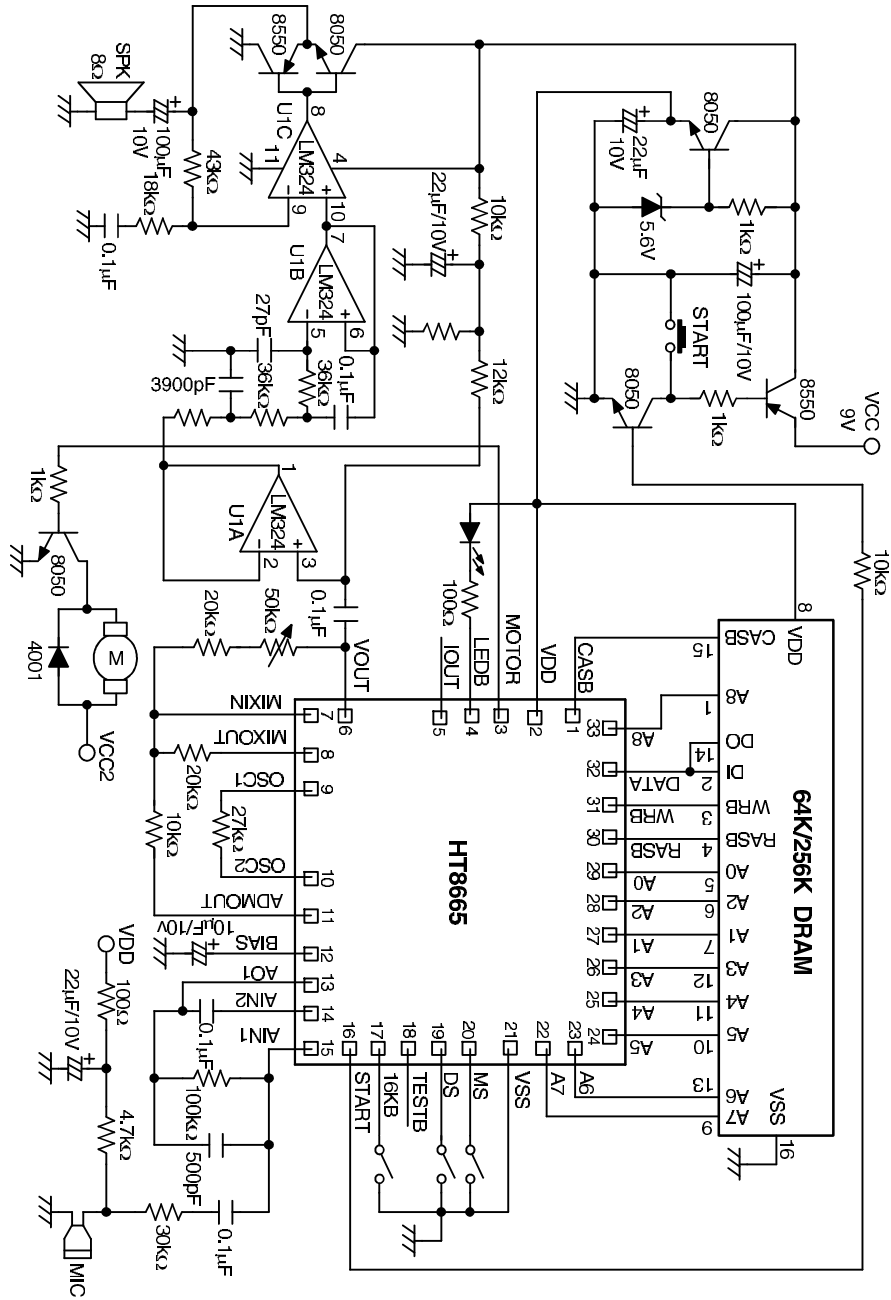
Two transistor output



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



LM324 output



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

