

## **GENERAL DESCRIPTION**

EM56000 is a series of single chip Voice synthesizer ICs. It contains one 4-bit input port (not for EM56001), two 4-bit I/O ports and a tiny controller. User's applications, such as section combination, trigger modes, control outputs, keyboard matrix, and other logic functions, are easily implemented by programming through its tiny controller.

## **FEATURES**

- Single power supply 2.4 V ~ 5 V.
- Wide range of ROMs :  
EM56001 - 10Kx10 bits,  
EM56100 - 16Kx10 bits,  
EM56200 - 32Kx10 bits,  
EM56300 - 64Kx10 bits.
- One 4-bit input port (not for EM56001), two 4-bit I/O ports.
- 16x4 bits RAM for EM56001,  
32x4 bits RAM for EM56100, EM56200, EM56300.
- 8K (maximum) program ROM.
- One 6-bit timer overflow control.
- ASPCM, PCM voice synthesizer.
- 4K~32K Hz playing speed for voice play-back.
- Multiple levels of volume control.
- Fixed current D/A output to drive external connected transistor for voice output.
- A pin (P3.2) for EM56100, EM56200, EM56300 can be programmed as an IR communication pin which generate 38KHZ carrier.

## 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.
P3.0	I/O	Bit 0 of Port 3.
P3.1	I/O	Bit 1 of Port 3.
P3.2	I/O	Bit 2 of Port 3. The pin can generate 38KHz square wave.
P3.3	I/O	Bit 3 of Port 3. The pin can be treated as a LED output flashing with volume.
V <sub>DD</sub>	I	Positive power supply.
OSC	I	Oscillation component connection pin.
TEST	I	For testing only.
V <sub>SS</sub>	I	Negative power supply.
VO	O	Voice output.

\* : provided for EM56100 ~ EM56300

## ABSOLUTE MAXIMUM RATINGS

Items	Sym.	Min.	Max.	Unit
Supply Voltage	V <sub>DD</sub> -V <sub>SS</sub>	-0.3	6.0	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.3	V <sub>DD</sub> +0.3	V
Operating Temperature	T <sub>OP</sub>	0	70	°C
Storage Temperature	T <sub>STG</sub>	-55	+125	°C

## ELECTRICAL CHARACTERISTICS (V<sub>DD</sub> = 3V, 25°C unless otherwise specified )

Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating voltage	V <sub>DD</sub>	2.4	3.0	5.1	V	
Standby current	I <sub>DDs</sub>	-	-	1.0	μA	V <sub>DD</sub> =3V
Operating current	I <sub>DDO</sub>	-	-	280	μA	V <sub>DD</sub> =3V, No load
Drive current of P2,P3	I <sub>OD</sub>	1.0	-	-	mA	V <sub>DD</sub> =3V, V <sub>O</sub> =2.4V
Sink current of P2, P3	I <sub>OS</sub>	1.6	-	-	mA	V <sub>DD</sub> =3V, V <sub>O</sub> =0.4V
Input current of P1*	I <sub>IH</sub>	-	3.0	10.0	μA	V <sub>DD</sub> =3V
Output current of VO	I <sub>VO</sub>	2.0	3.0	4.0	mA	V <sub>DD</sub> =3V, V <sub>O</sub> =0.7V (Step 7)
Oscillation resistor	R	-	1.0	-	MΩ	V <sub>DD</sub> =3V
Oscillator frequency	F <sub>osc</sub>	-	1.0	-	MHz	V <sub>DD</sub> =3V

\* : provided for EM56100 ~ EM56300

## APPLICATION CIRCUIT FOR EM56001

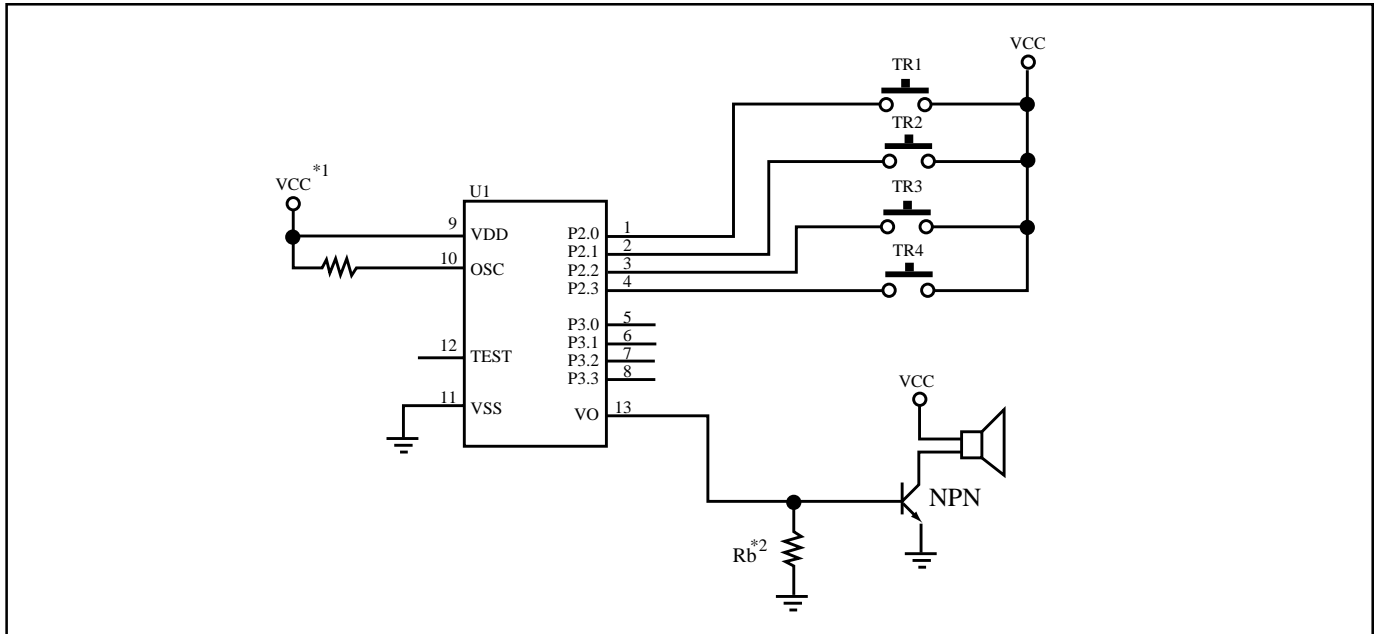
In the following application circuits:

\*1 : For heavy loading application, adding an electrolytic capacitor between Vcc and Ground is recommended.

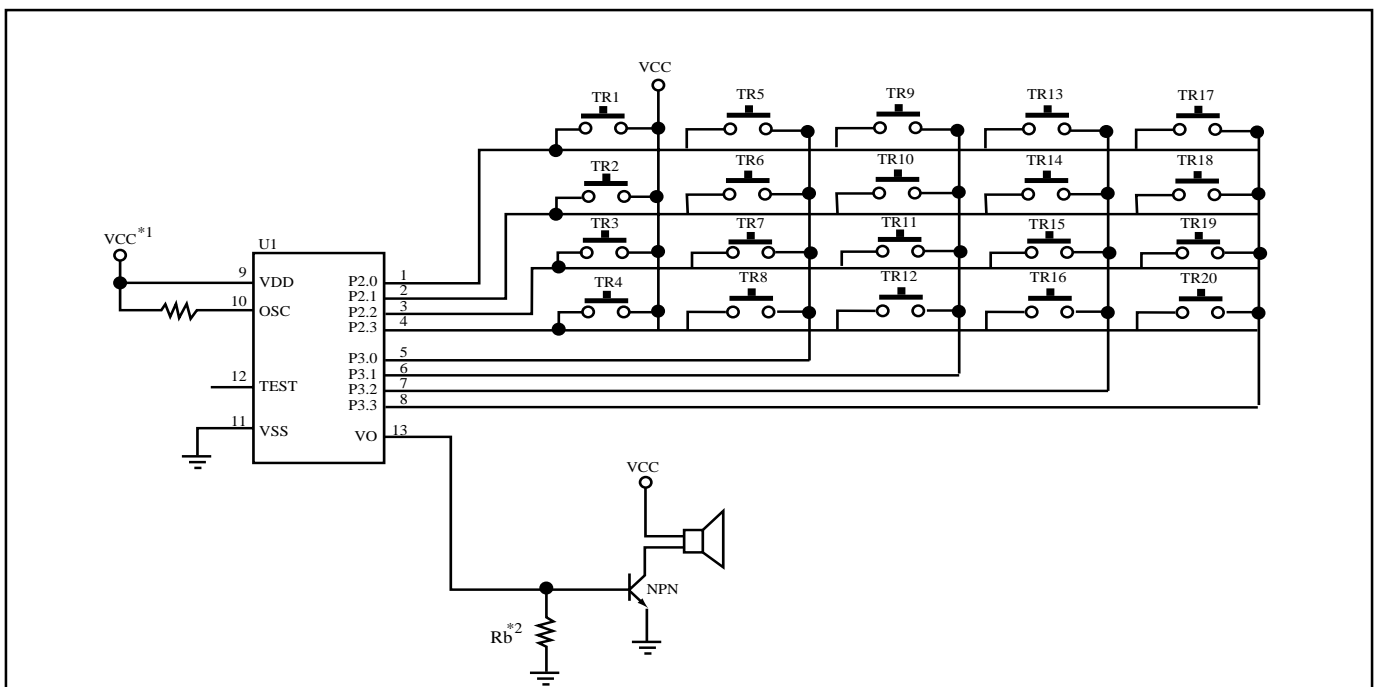
The recommended value for button cell application is 10 $\mu$ F.

\*2 : The recommended value for button cell application is 750 $\Omega$  or less.

### 4-key Application Circuit



### 20-key Application Circuit

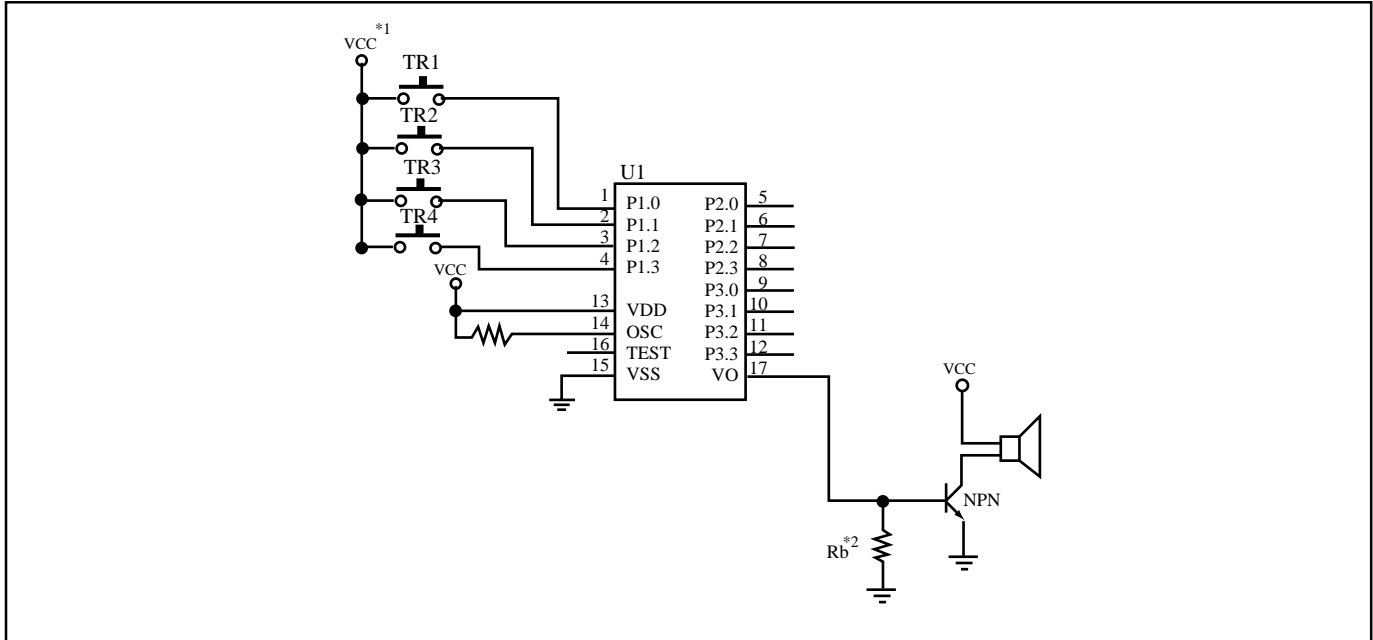


### APPLICATION CIRCUIT FOR EM56100, EM56200, EM56300

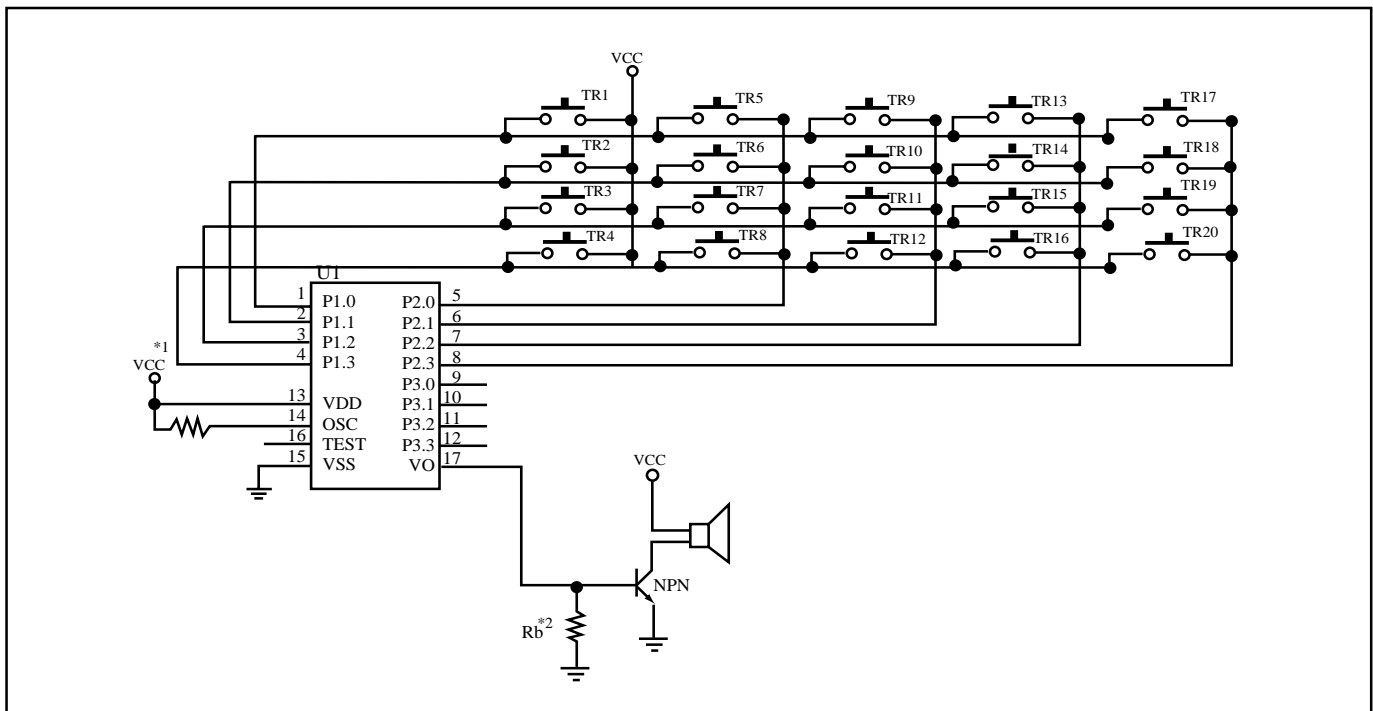
In the following application circuits:

- \*1 : For heavy loading application, adding an electrolytic capacitor between Vcc and Ground is recommended. The recommended value for button cell application is 10 $\mu$ F.
- \*2 : The recommended value for button cell application is 750 $\Omega$  or less.

#### 4-key Application Circuit

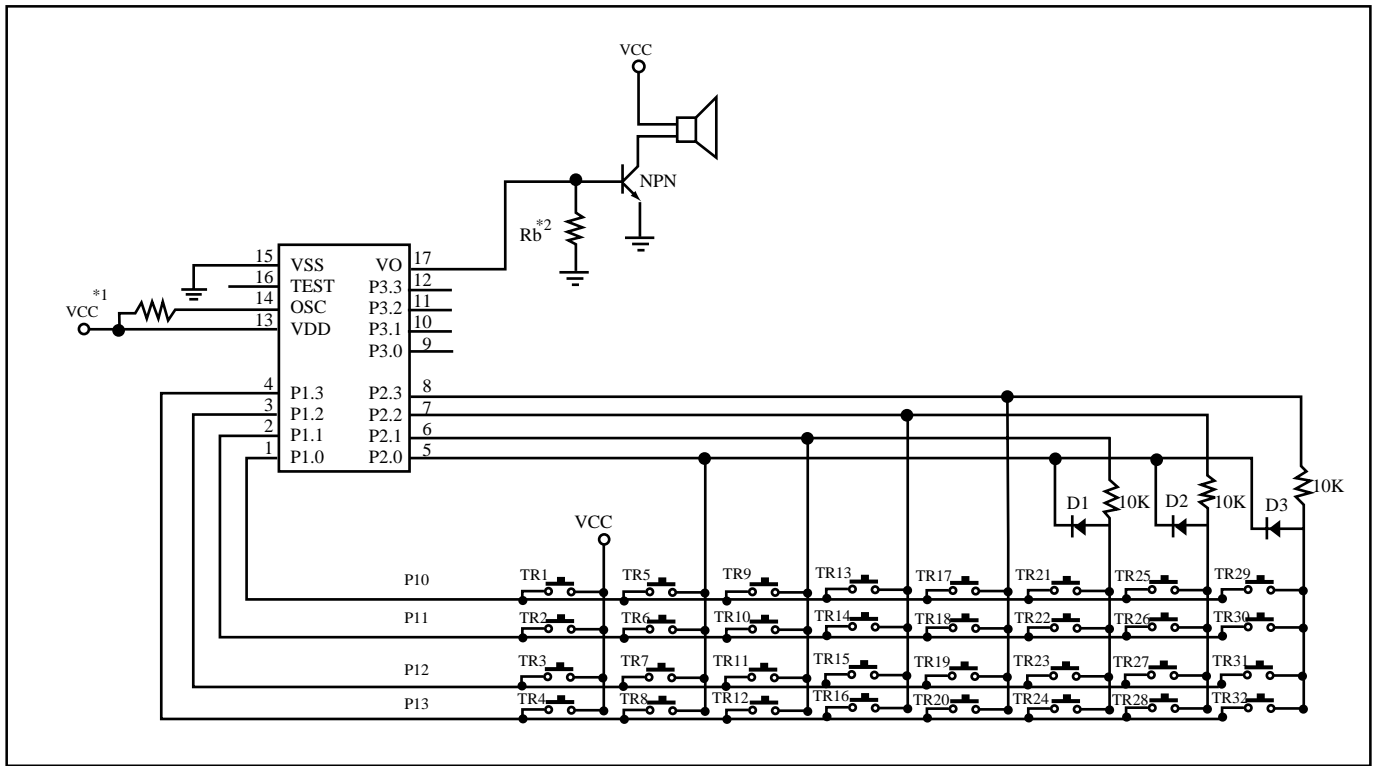


#### 20-key Application Circuit

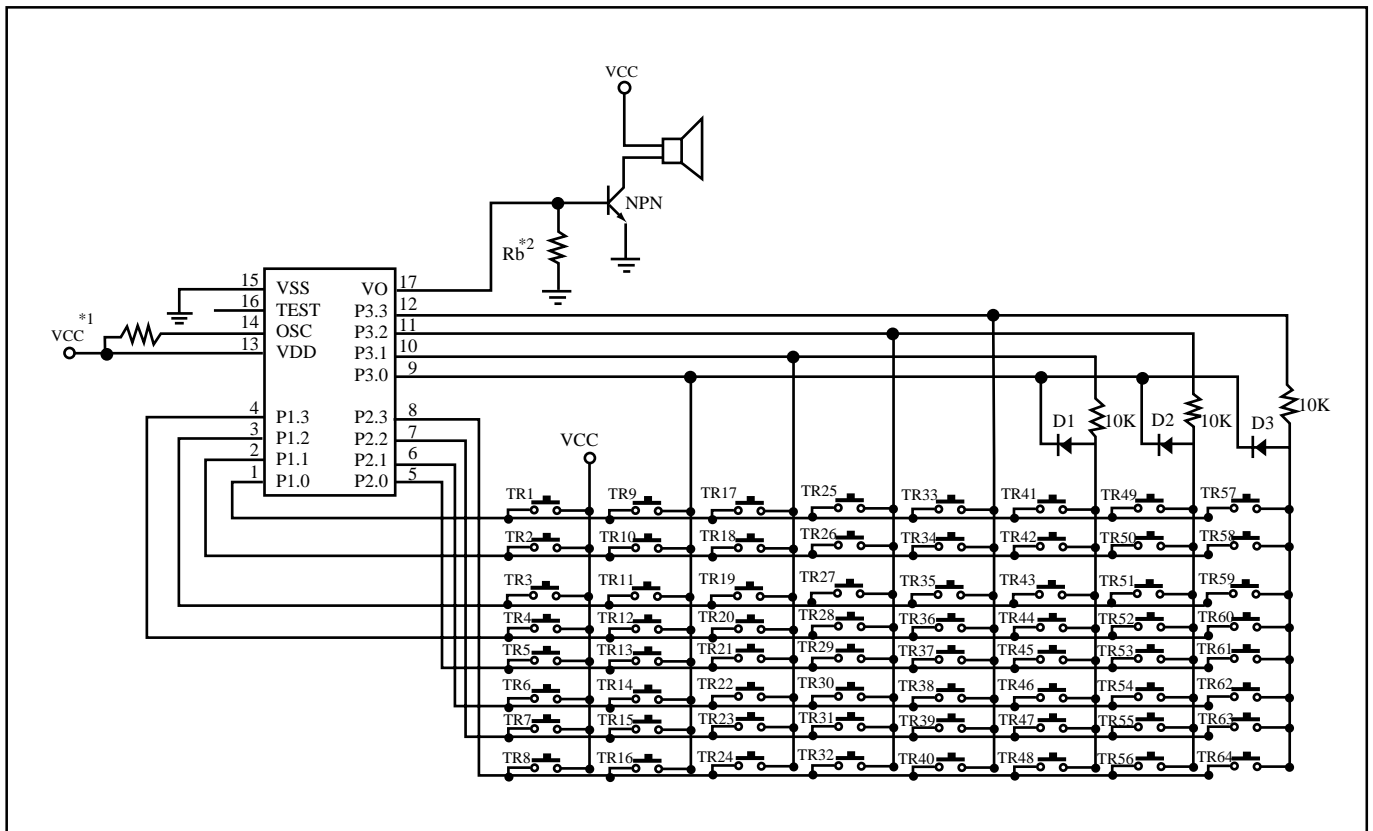


\* This specification are subject to be changed without notice.

32-key Application Circuit

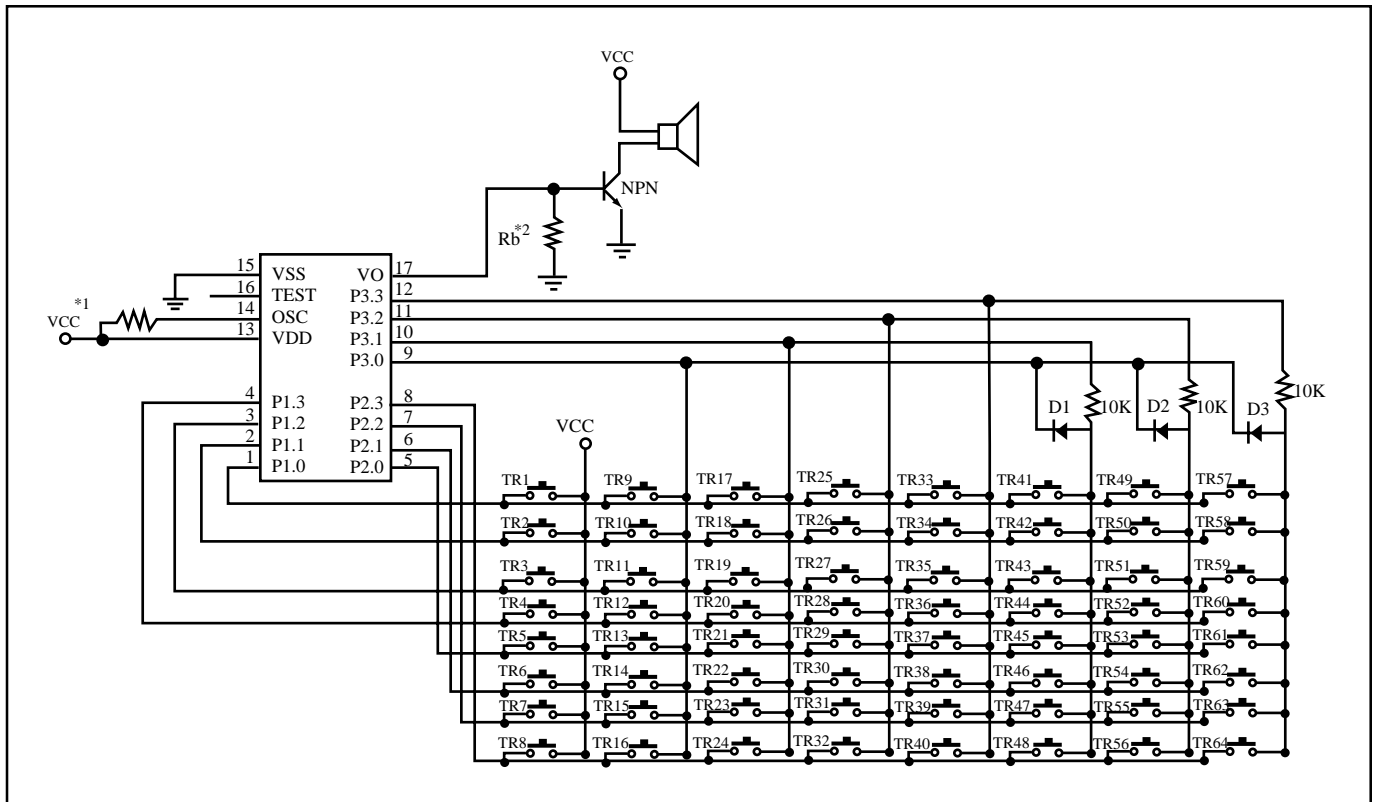


64-key Application Circuit

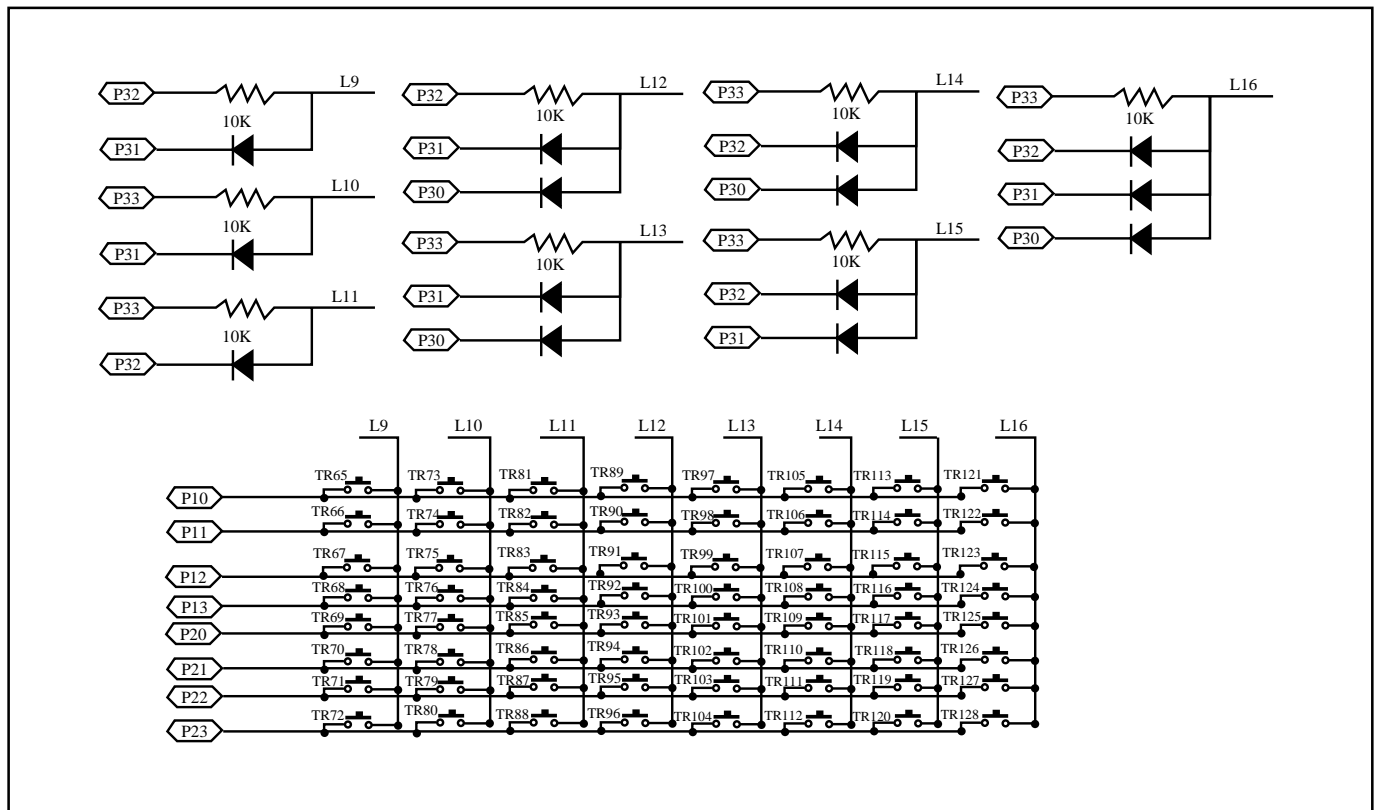


\* This specification are subject to be changed without notice.

128-key Application Circuit (A)



128-key Application Circuit (B)



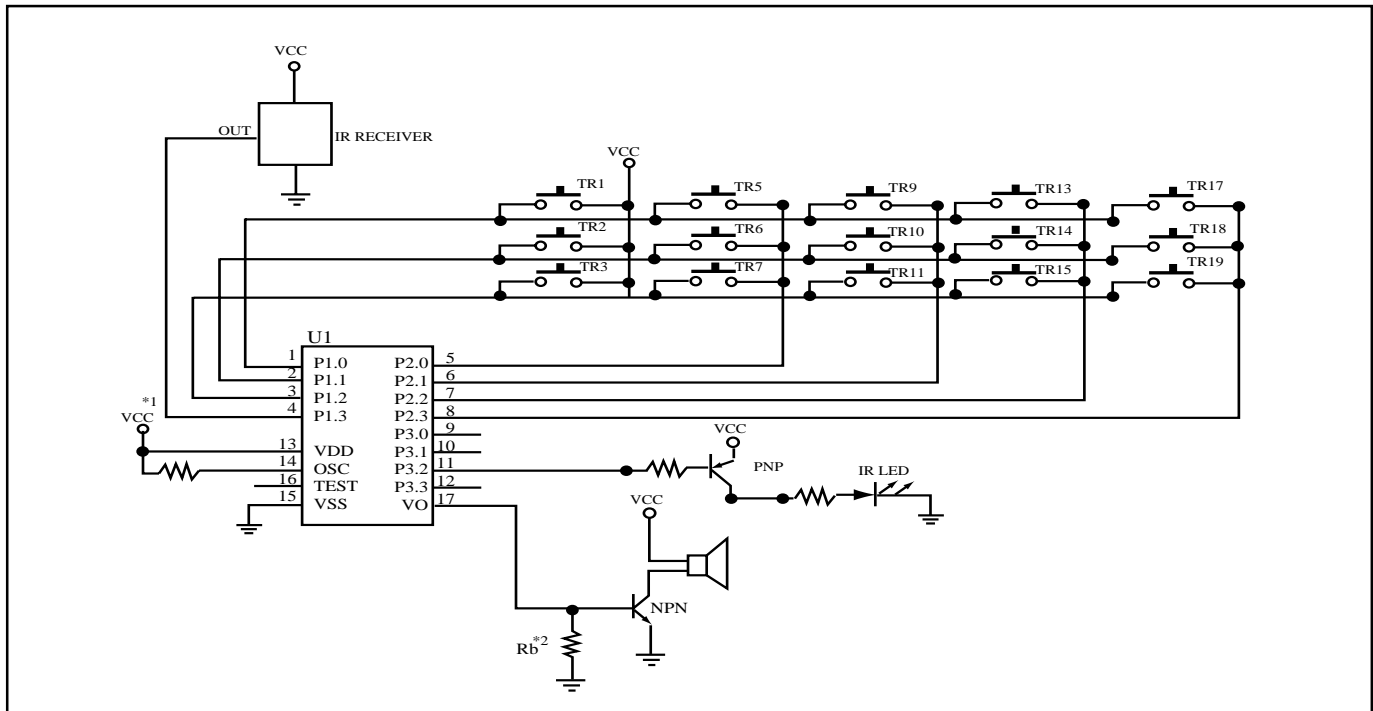
\* This specification are subject to be changed without notice.

## IR APPLICATION CIRCUIT FOR EM56100, EM56200, EM56300

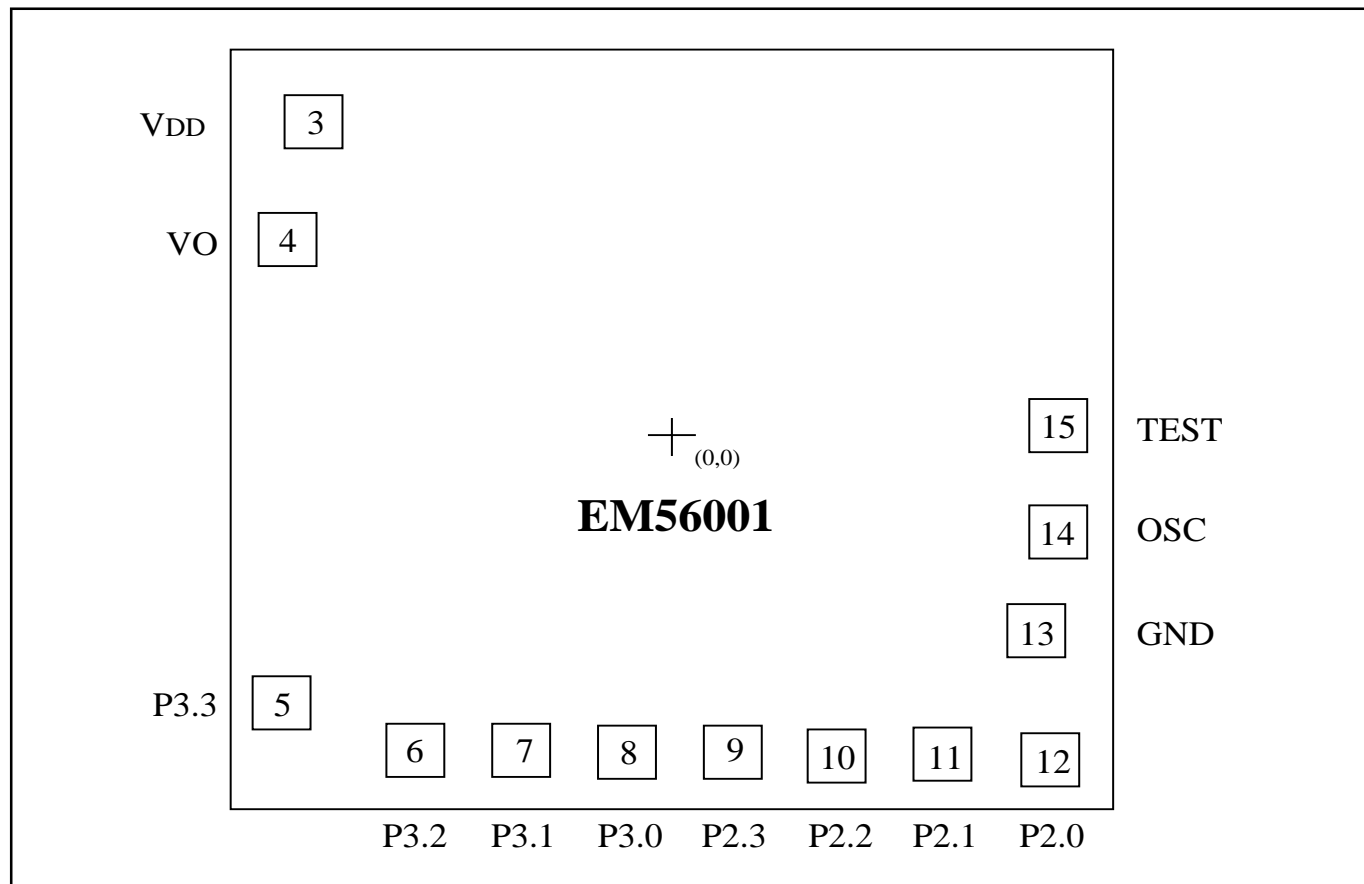
In the following application circuits:

- \*1 : For heavy loading application, adding an electrolytic capacitor between Vcc and Ground is recommended. The recommended value for button cell application is 10 $\mu$ F.
- \*2 : The recommended value for button cell application is 750 $\Omega$  or less.

### 20-key IR Application Circuit



### PAD DIAGRAM



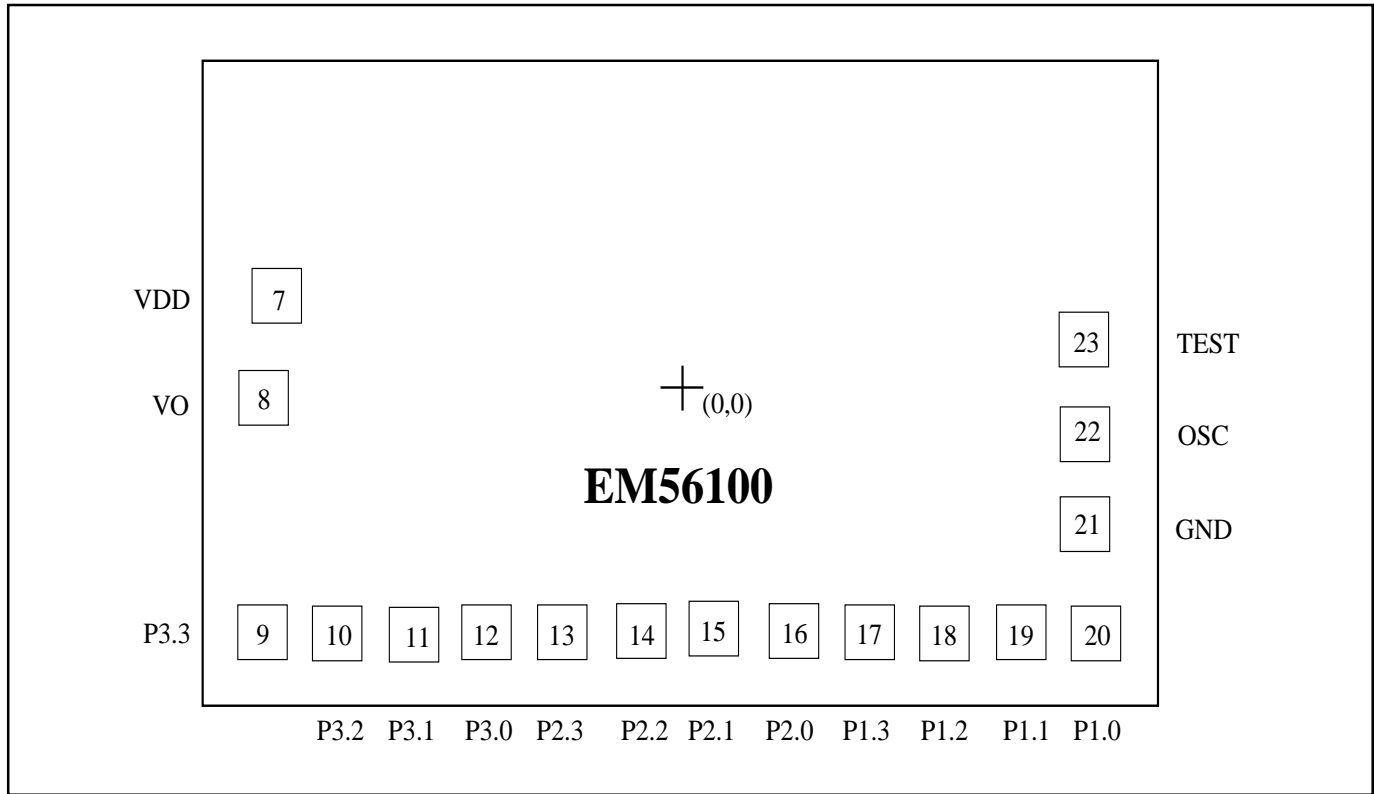
Chip Size : 1600um x 1400um

This IC substrate should be connected to Vss.

Pad No.	Symbol	X	Y
3	VDD	-569.5	486.0
4	VO	-602.5	304.0
5	P3.3	-602.5	-463.4
6	P3.2	-437.0	-522.5
7	P3.1	-271.2	-522.5
8	P3.0	-105.6	-522.5
9	P2.3	60.2	-522.5
10	P2.2	225.7	-522.5
11	P2.1	391.5	-522.5
12	P2.0	557.1	-522.5
13	GND	580.2	-360.4
14	OSC	607.6	-40.4
15	TEST	607.6	130.7



**PAD DIAGRAM**

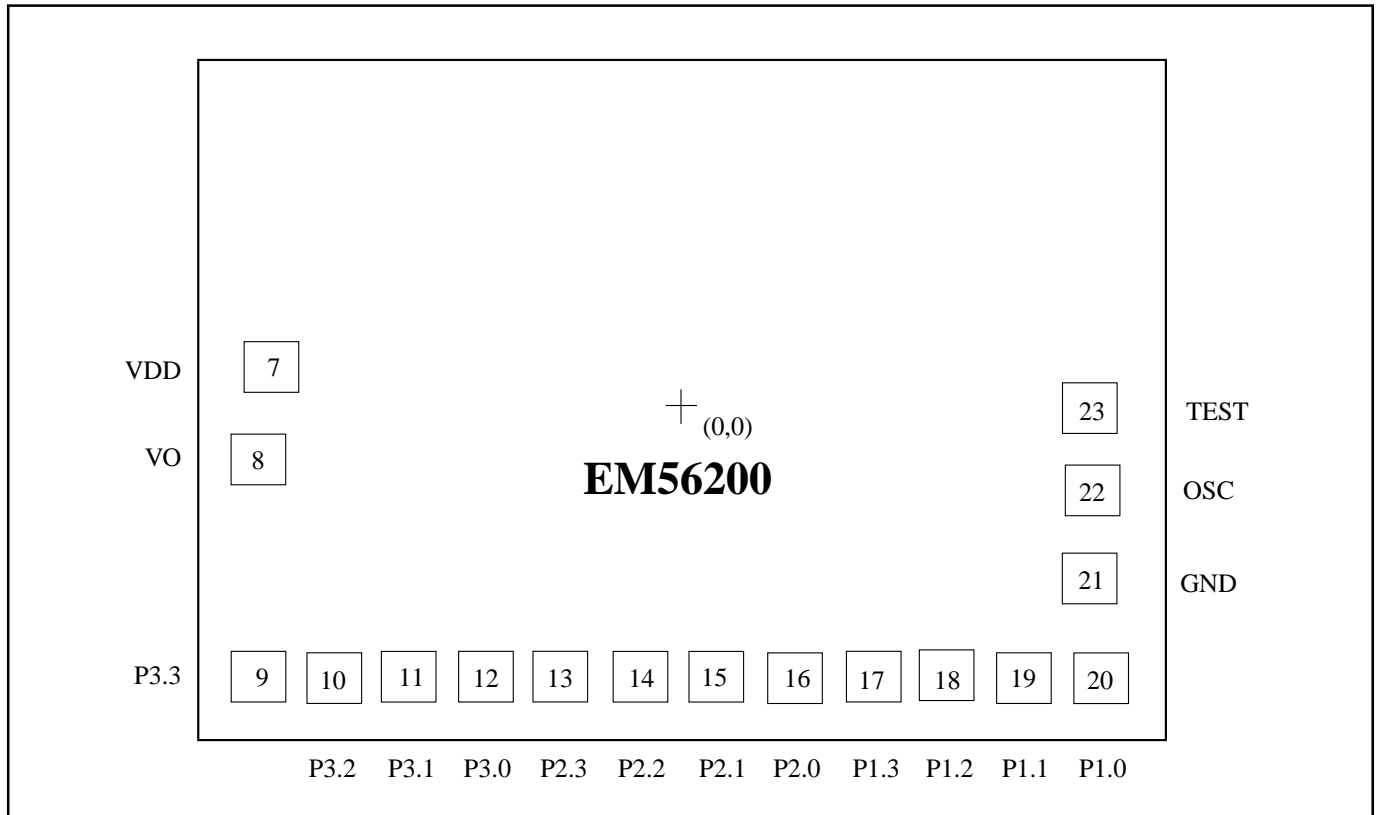


Chip Size : 1900um x 1200um

This IC substrate should be connected to Vss.

Pad No.	Symbol	X	Y
7	VDD	-738.1	143.3
8	VO	-764.2	-22.4
9	P3.3	-764.2	-402.5
10	P3.2	-626.2	-402.5
11	P3.1	-491.4	-398.3
12	P3.0	-353.5	-398.3
13	P2.3	-217.9	-398.3
14	P2.2	-72.9	-398.3
15	P2.1	62.8	-398.3
16	P2.0	207.8	-398.3
17	P1.3	343.4	-399.7
18	P1.2	482.0	-399.7
19	P1.1	616.1	-399.7
20	P1.0	754.7	-399.7
21	GND	733.1	-222.0
22	OSC	737.2	-67.0
23	TEST	737.2	77.2

**PAD DIAGRAM**

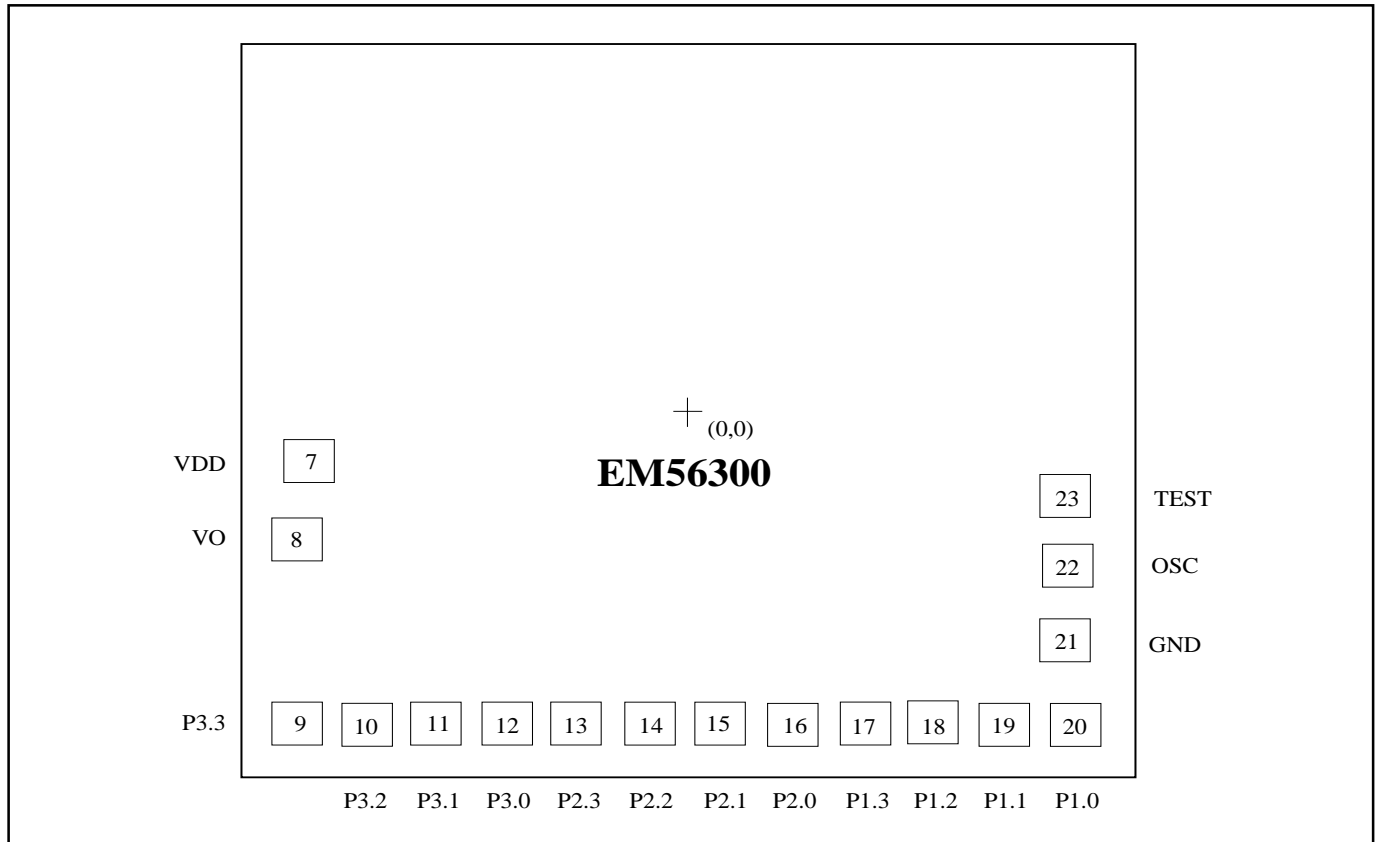


Chip Size : 1900um x 1400um

This IC substrate should be connected to Vss.

Pad No.	Symbol	X	Y
7	VDD	-738.1	63.3
8	VO	-764.2	-102.4
9	P3.3	-764.2	-482.5
10	P3.2	-626.2	-482.5
11	P3.1	-491.4	-478.3
12	P3.0	-353.5	-478.3
13	P2.3	-217.9	-478.3
14	P2.2	-72.9	-478.3
15	P2.1	62.8	-478.3
16	P2.0	207.8	-478.3
17	P1.3	343.4	-479.7
18	P1.2	482.0	-479.7
19	P1.1	616.1	-479.7
20	P1.0	754.7	-479.7
21	GND	733.1	-302.0
22	OSC	737.2	-147.0
23	TEST	737.2	-2.8

## PAD DIAGRAM



Chip Size : 1900um x 1700um

This IC substrate should be connected to Vss.

Pad No.	Symbol	X	Y
7	VDD	-738.1	-101.7
8	VO	-764.2	-267.4
9	P3.3	-764.2	-647.5
10	P3.2	-626.2	-647.5
11	P3.1	-491.4	-643.3
12	P3.0	-353.5	-643.3
13	P2.3	-217.9	-643.3
14	P2.2	-72.9	-643.3
15	P2.1	62.8	-643.3
16	P2.0	207.8	-643.3
17	P1.3	343.4	-644.7
18	P1.2	482.0	-644.7
19	P1.1	616.1	-644.7
20	P1.0	754.7	-644.7
21	GND	733.1	-467.0
22	OSC	737.2	-312.0
23	TEST	737.2	-167.8