

**Preliminary**

## GENERAL DESCRIPTION

EM56000A is a series of single chip dual channel IC with voice synthesizer. The dual channel can be (voice + voice) simultaneously. That contains some input and I/O ports, and a tiny controller. By programming through the tiny controller, user's application including section combination, trigger modes, control outputs, IR communication, and other logical function can be easily implemented.

## FEATURES

	EM56001A	EM56101A	EM56200A	EM56300A	EM56400A	EM56500A	EM56600A
TOTAL ROM(bits)	10K x 10	16K x 10	32K x 10	64K x 10	128K x 10	256K x 10	512K x 10
PROGRAM ROM(bits)	8K x 10		32K x 10				
RAM(nibbles)	32	64	128				
PORT1 [input](pins)	-		4				
PORT2 [I/O](pins)	2	4					
PORT3 [I/O](pins)	4						
VO(pins)	1		2				

- Single power supply 2.4 V~ 5.5 V.
- Port1 and Port2 with wake-up function, Port3.2 with programmable IR (38 KHz carry) communication function.
- Power down mode for saving power consumption.
- Single ROM for voice program data.
- Readable ROM code data.
- One 6-bit timer overflow control.
- Two stacks for subroutine calling.
- Dual channel output simultaneously : (voice + voice).
- 5-bit ASPCM synthesizer.
- Multiple playing speeds in 2 KHz ~ 32 KHz for voice playback.
- Multiple levels of volume control.
- Fixed current D/A to drive external connected transistor for audio output.

**Preliminary**

**PIN DESCRIPTIONS**

Symbol	I/O	Function
P1.0	I	Bit 0 of Port 1. (not for EM56001A, EM56101A)
P1.1	I	Bit 1 of Port 1. (not for EM56001A, EM56101A)
P1.2	I	Bit 2 of Port 1. (not for EM56001A, EM56101A)
P1.3	I	Bit 3 of Port 1. (not for EM56001A, EM56101A)
P2.0	I/O	Bit 0 of Port 2. (not for EM56001A)
P2.1	I/O	Bit 1 of Port 2. (not for EM56001A)
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 an LED output flashing with volume.
VDD	I	Positive power supply.
OSC	I	Oscillation component connection pin.
VSS	I	Negative power supply.
VO1	O	Audio1 output.
VO2	O	Audio2 output. (not for EM56001A, EM56101A)
TEST		For testing only

**ABSOLUTE MAXIMUM RATINGS**

Items	Sym.	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	$T_{OP}$	-20	70	°C
Storage Temperature	$T_{STG}$	-55	+125	°C

**ELECTRICAL CHARACTERISTICS**

Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating voltage	$V_{DD}$	2.4	3.0	5.5	V	
Standby current	$I_{DDS}$	-	-	1.0	μA	$V_{DD}=3V$
Operating current	$I_{DDO}$	-	-	250	μA	$V_{DD}=3V$ , No load
Drive current of P2,P3	$I_{OD}$	2.0	3.0	-	mA	$V_{DD}=3V$ , $V_O=2.4V$
Sink current of P3	$I_{OS}$	2.3	3.5	-	mA	$V_{DD}=3V$ , $V_O=0.4V$

**Preliminary**

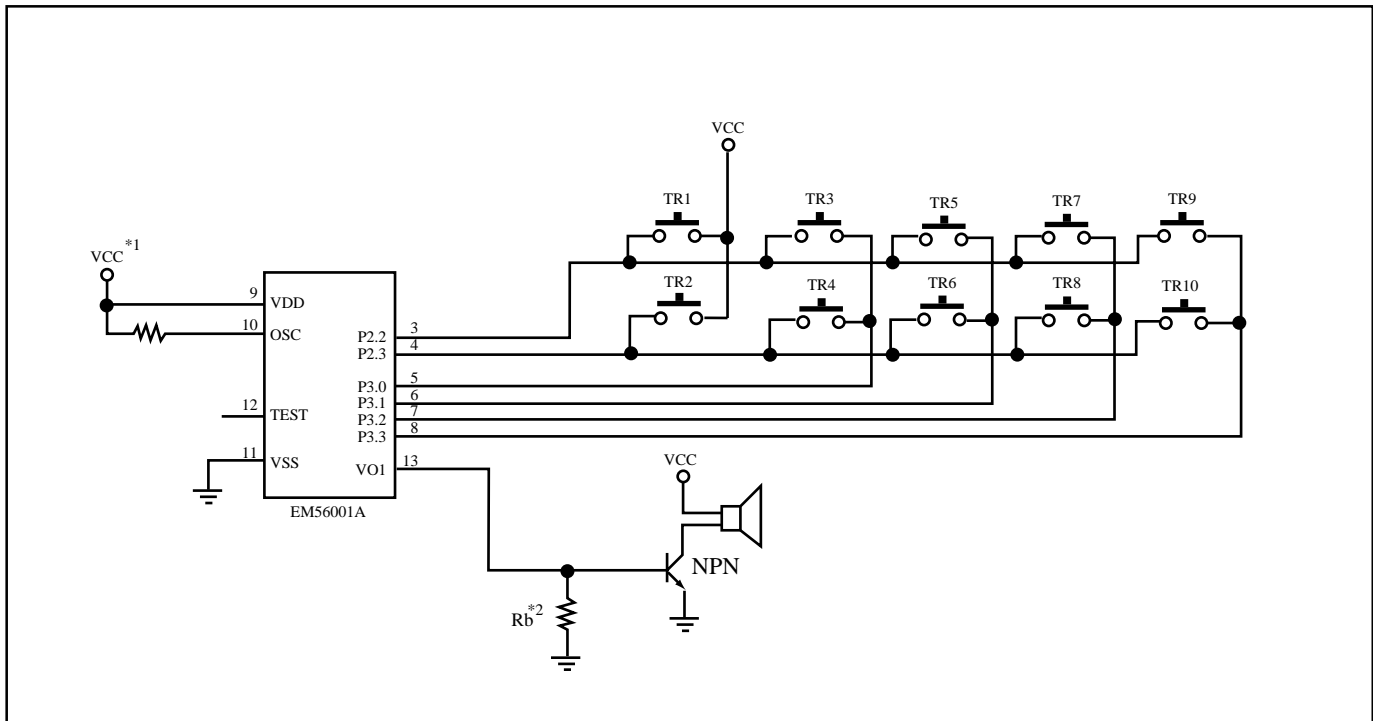
Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Sink current of P2 (after KEYB)	$I_{OS1}$	2.3	3.5	-	mA	$V_{DD}=3V, V_O=0.4V$
Sink current of P2 (before KEYB)	$I_{OS2}$	-	3.0	10	$\mu A$	$V_{DD}=3V, V_O=0.4V$
Input current of P1	$I_{IH}$	-	3.0	10	$\mu A$	$V_{DD}=3V$
Output current of VO1, VO2	$I_{VO}$	4.0	5.0	6.0	mA	$V_{DD}=3V, V_O=0.7V,$ two channel full scale output
Oscillation resistor	$R_{OSC}$	-	470	-	K $\Omega$	$V_{DD}=2.4V \sim 5.5V$
Oscillation frequency	$F_{OSC}$	0.9	1.0	1.1	MHz	$V_{DD}=2.4V \sim 5.5V$
Oscillation frequency deviation	$\frac{\Delta F_{OSC}}{F_{OSC}}$	-10	0	10	%	$V_{DD}=2.4V \sim 5.5V$

## APPLICATION CIRCUIT

In the following application circuits:

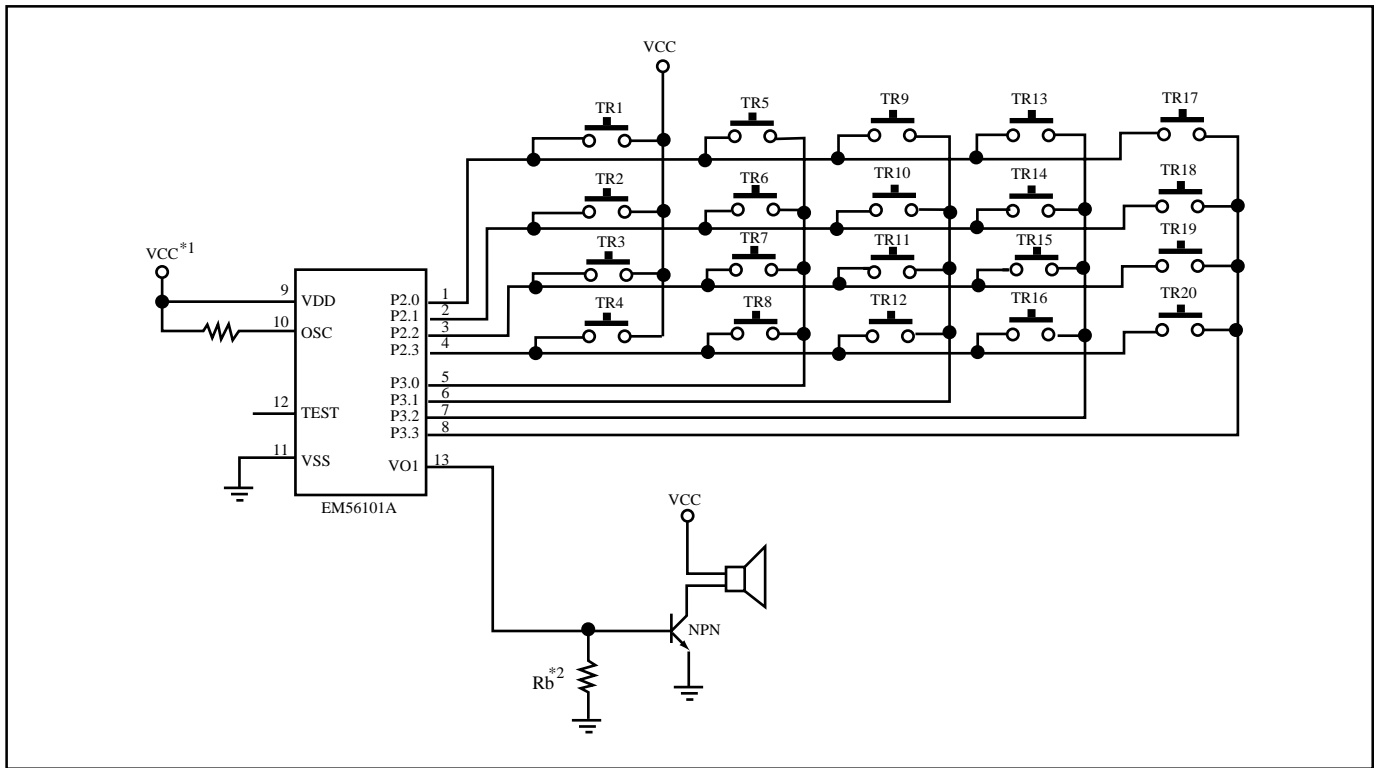
- \*1 : For heavy loading application, adding an electrolytic capacitor between Vcc and Ground is recommended.  
The recommended value for button cell application is 10 $\mu F$ .
- \*2 : The recommended value for button cell application is 750 $\Omega$  or less.

10-key Application Circuit For EM56001A

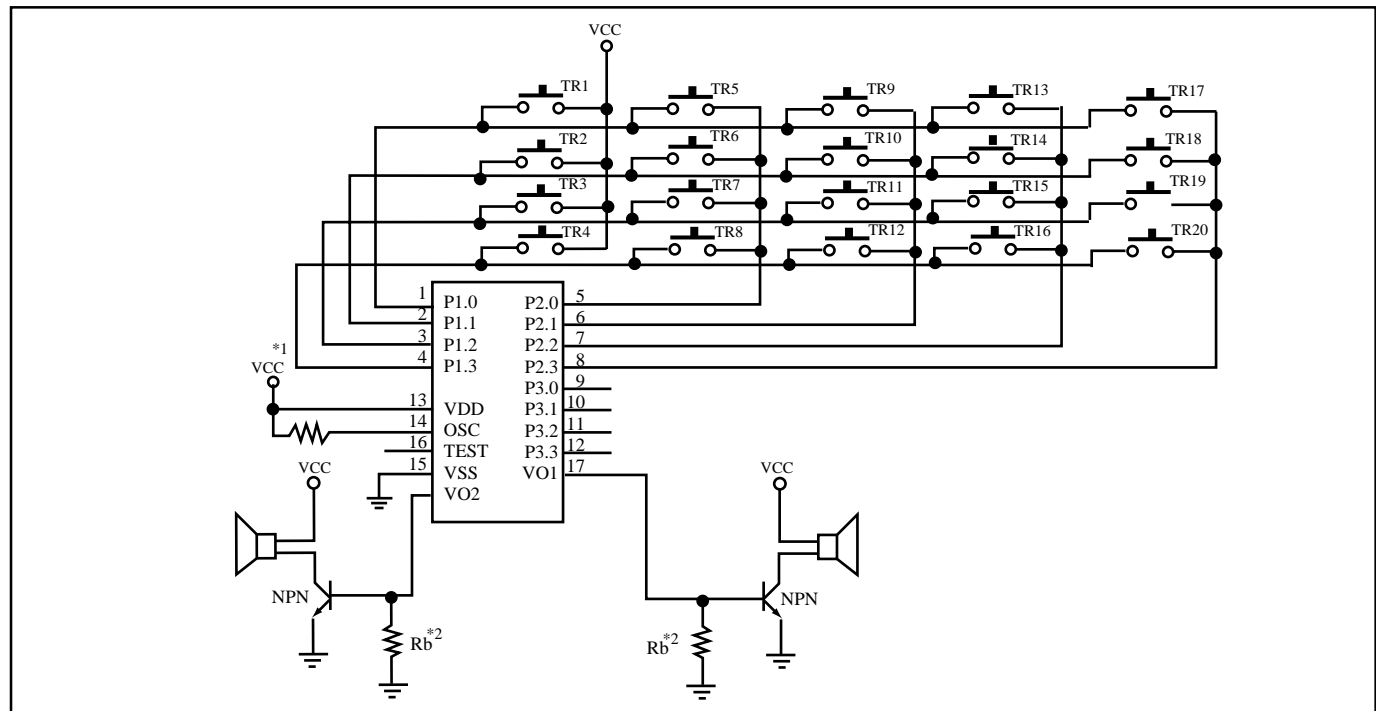


**Preliminary**

20-key Application Circuit For EM56101A

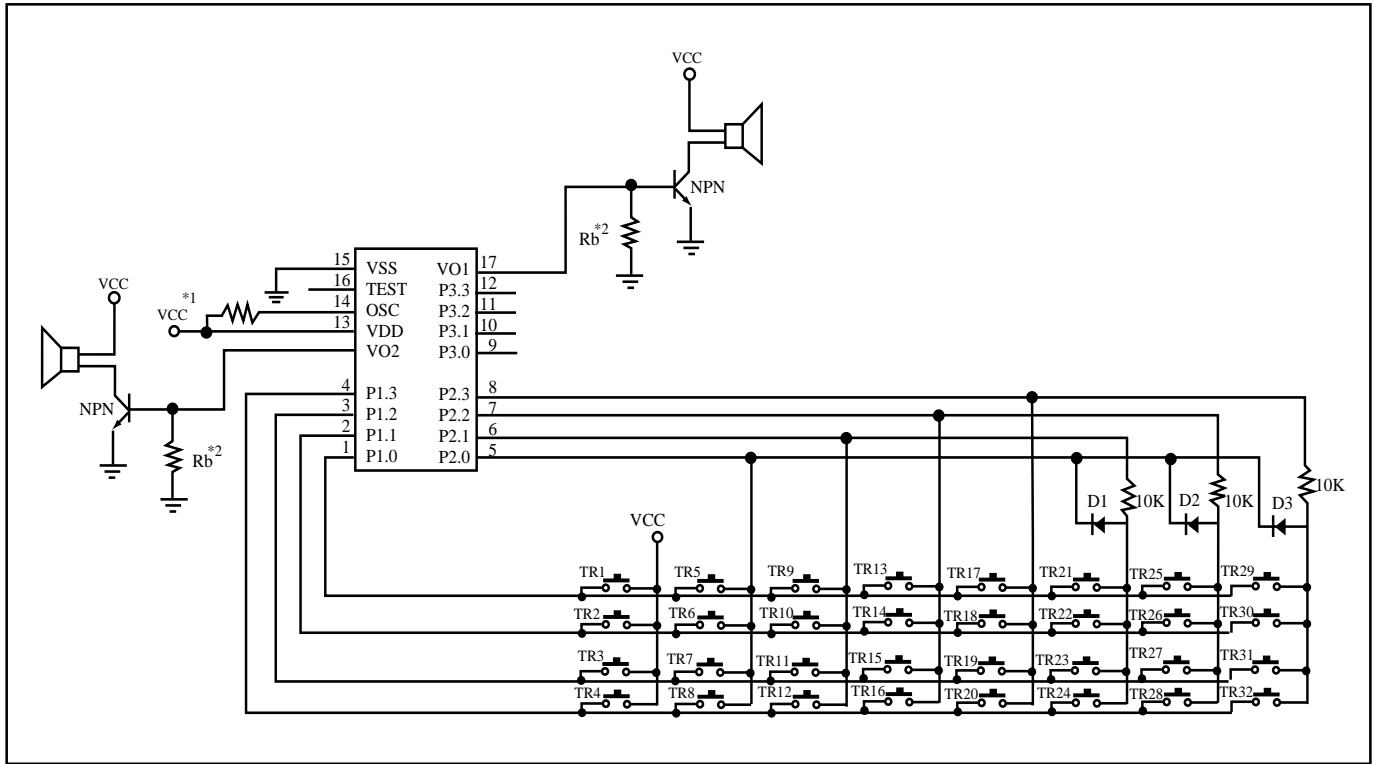


20-key Application Circuit For EM56200A~EM56600A

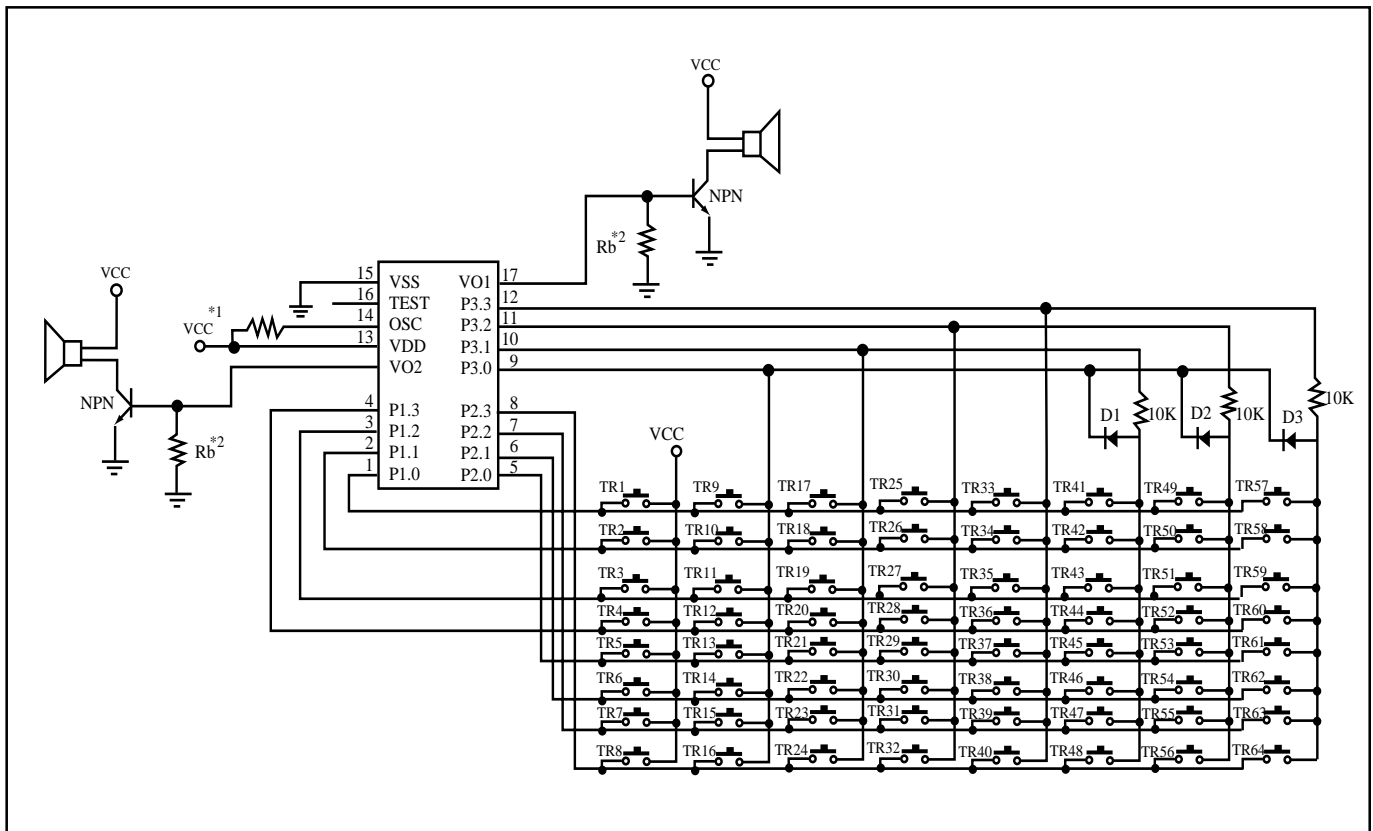


**Preliminary**

32-key Application Circuit For EM56200A~EM56600A



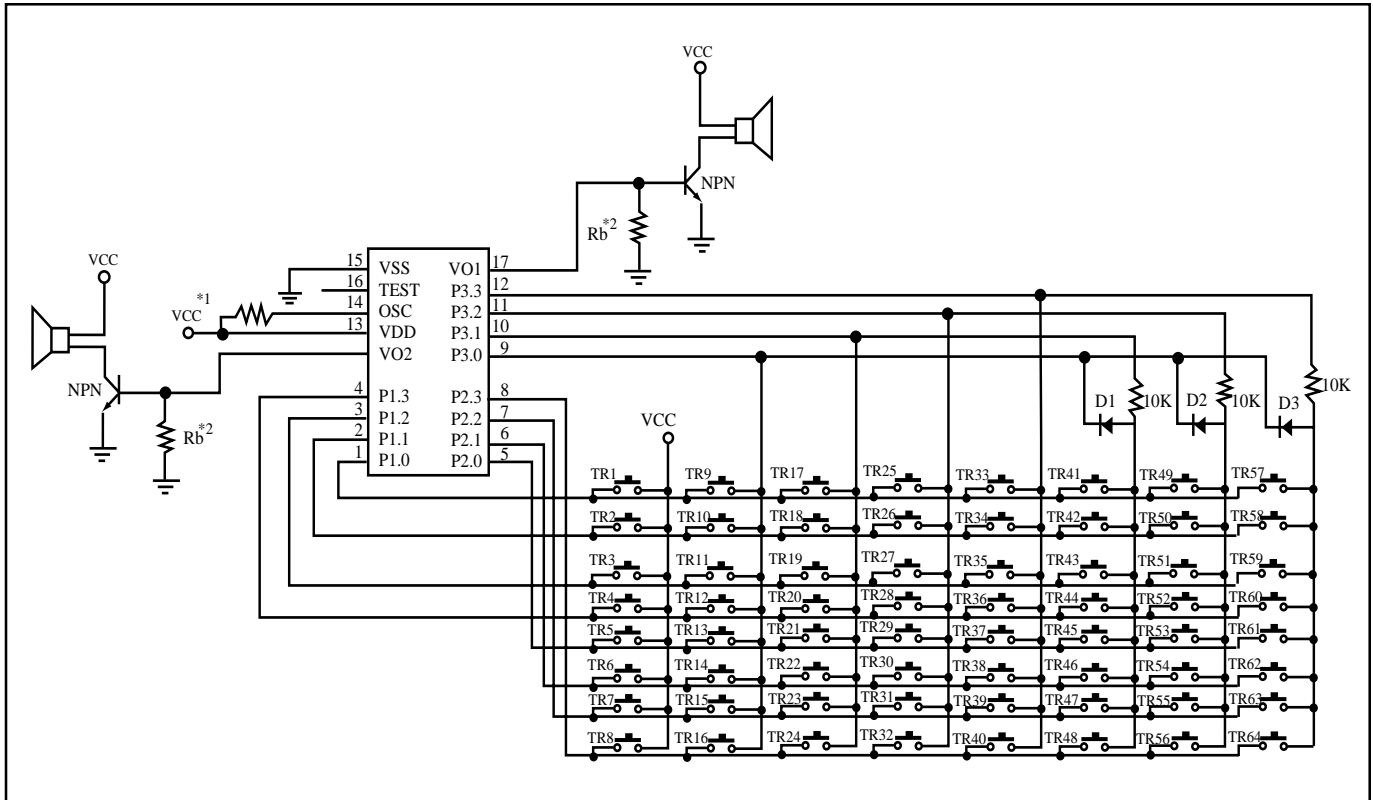
64-key Application Circuit For EM56200A~EM56600A



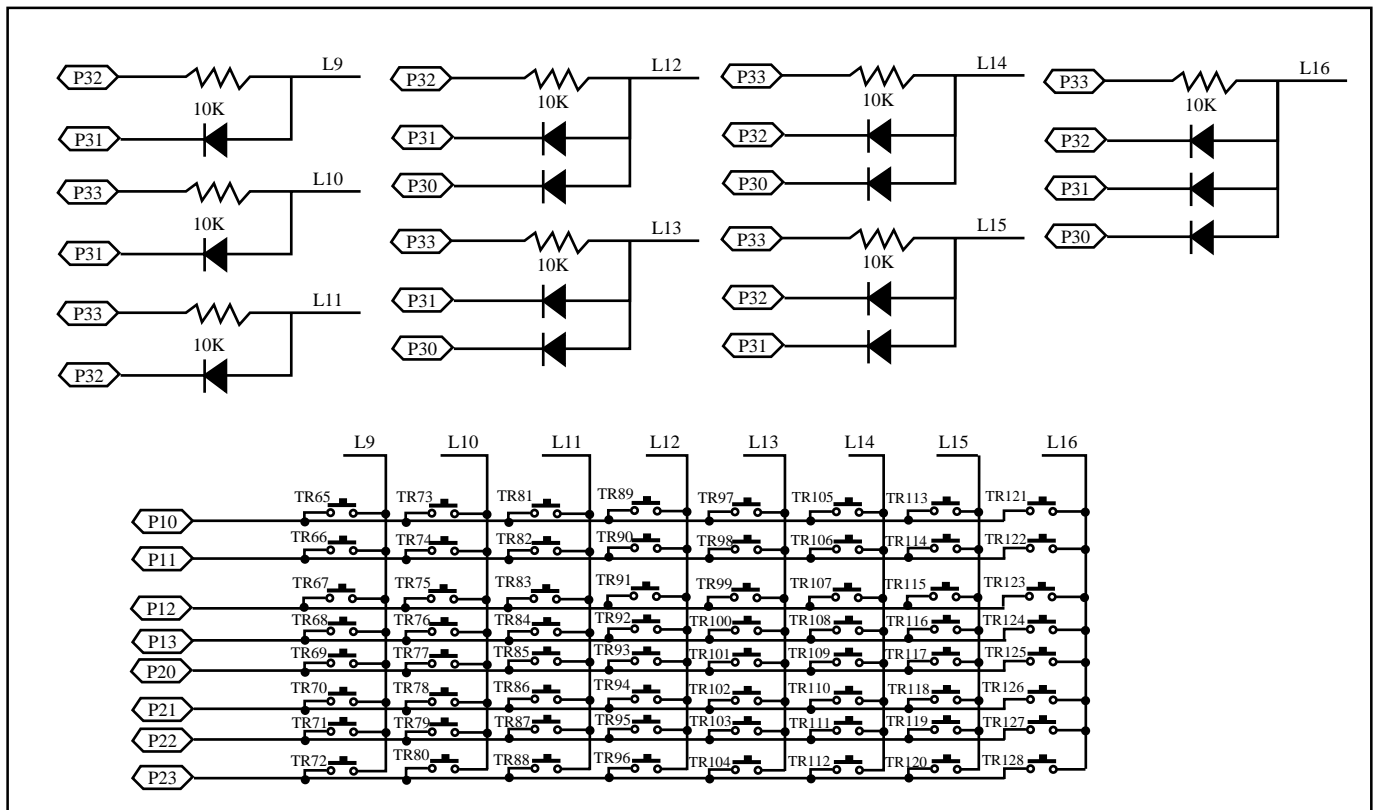
\* This specification are subject to be changed without notice.

**Preliminary**

128-key Application Circuit (A) For EM56200A~EM56600A



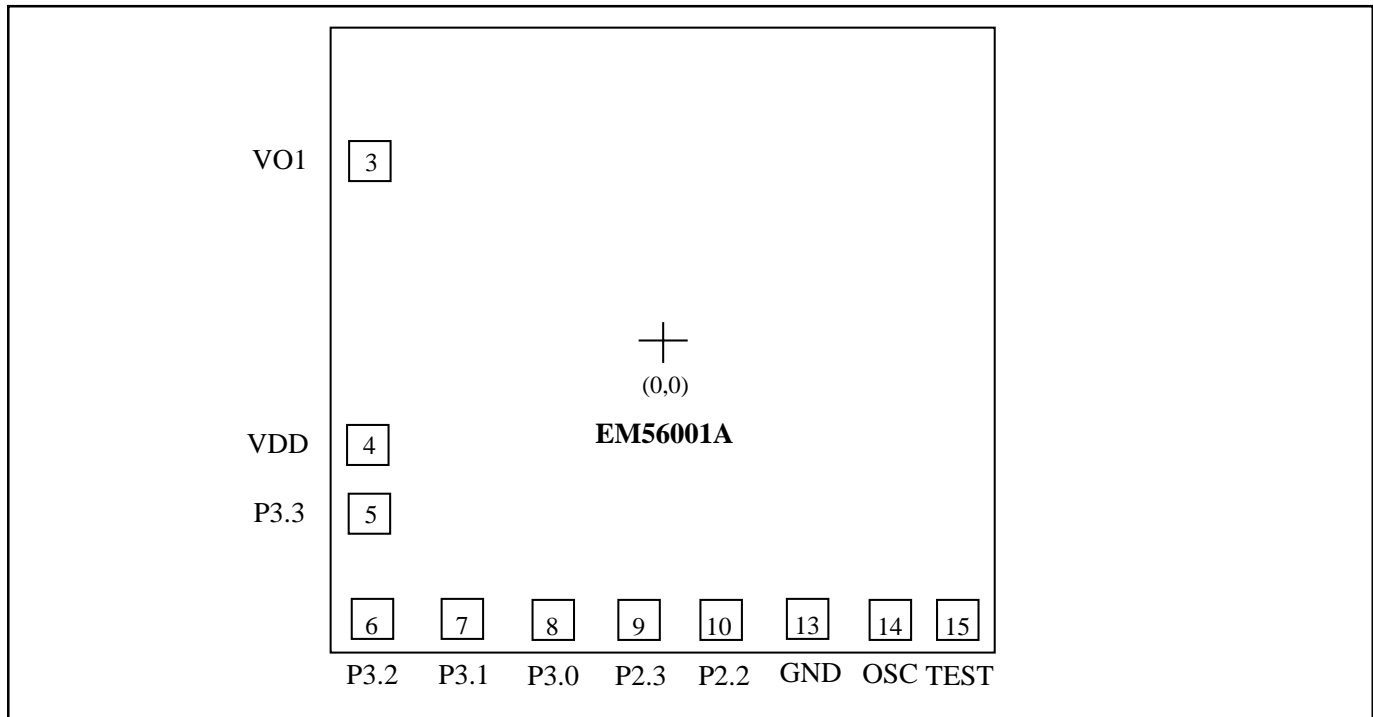
128-key Application Circuit (B) For EM56200A~EM56600A



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**Preliminary**

**PAD DIAGRAM**



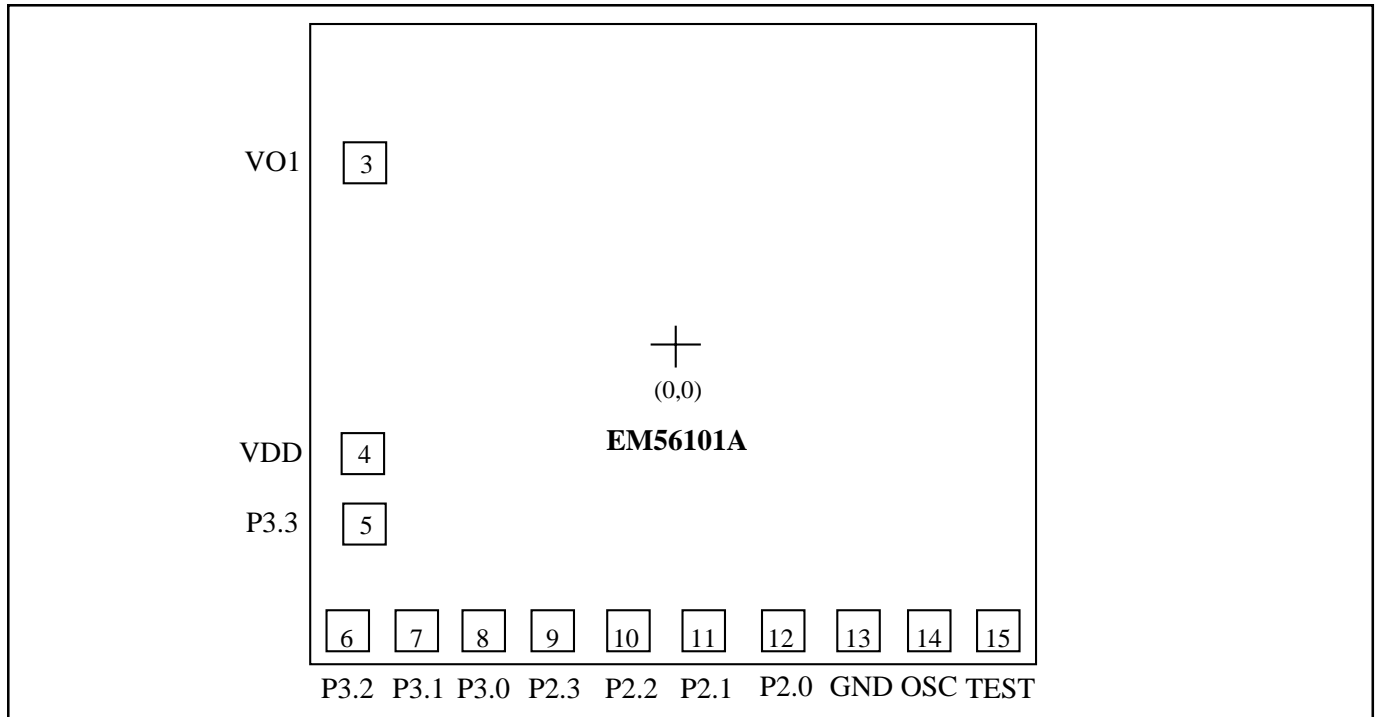
Chip Size : 1300 x 1500 um

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

Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	VO1	-402.0	421.4
4	VDD	-418.4	-125.4
5	P3.3	-418.4	-269.3
6	P3.2	-440.4	-523.4
7	P3.1	-318.8	-523.4
8	P3.0	-198.2	-523.4
9	P2.3	-76.1	-523.4
10	P2.2	46.3	-523.4
11	NC		
12	NC		
13	GND	190.5	-523.4
14	OSC	321.5	-523.4
15	TEST	442.7	-523.4
16	NC		
17	NC		
18	NC		
19	NC		
20	NC		

**Preliminary**

**PAD DIAGRAM**



Chip Size : 1500 x 1400 um

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

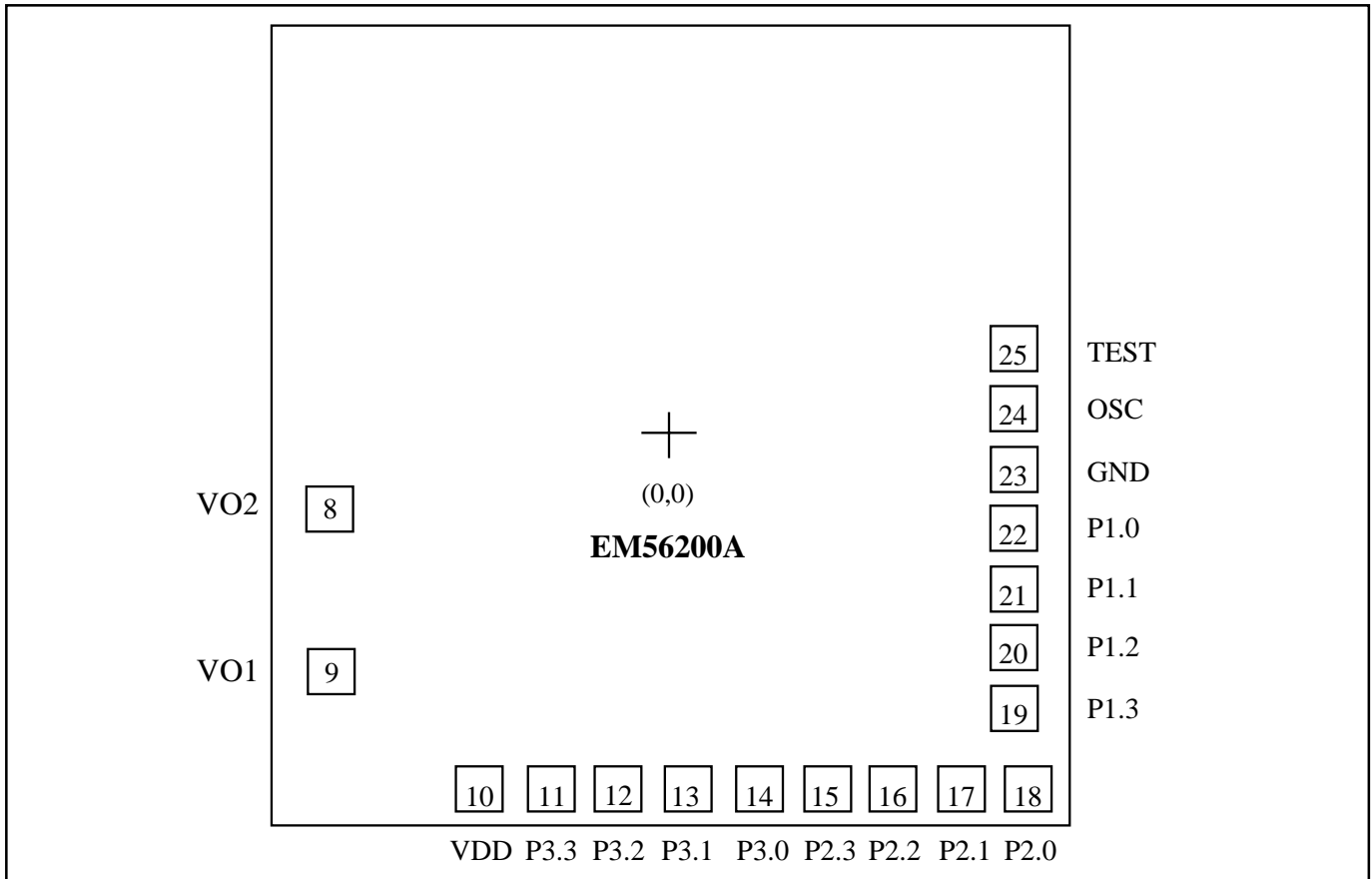
Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	VO1	-512.0	391.0
4	VDD	-528.4	-153.7
5	P3.3	-528.4	-284.7
6	P3.2	-564.8	-498.4
7	P3.1	-443.9	-498.4
8	P3.0	-323.0	-498.4
9	P2.3	-200.9	-498.4
10	P2.2	-78.5	-498.4
11	P2.1	43.9	-498.4
12	P2.0	166.3	-498.4
13	GND	310.5	-498.4
14	OSC	441.5	-498.4
15	TEST	562.7	-498.4
16	NC		
17	NC		
18	NC		
19	NC		
20	NC		

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**Preliminary**

**PADDIAGRAM**



Chip Size : 1700 x 1750 um  
For PCB layout, IC substrate must be connected to Vss.

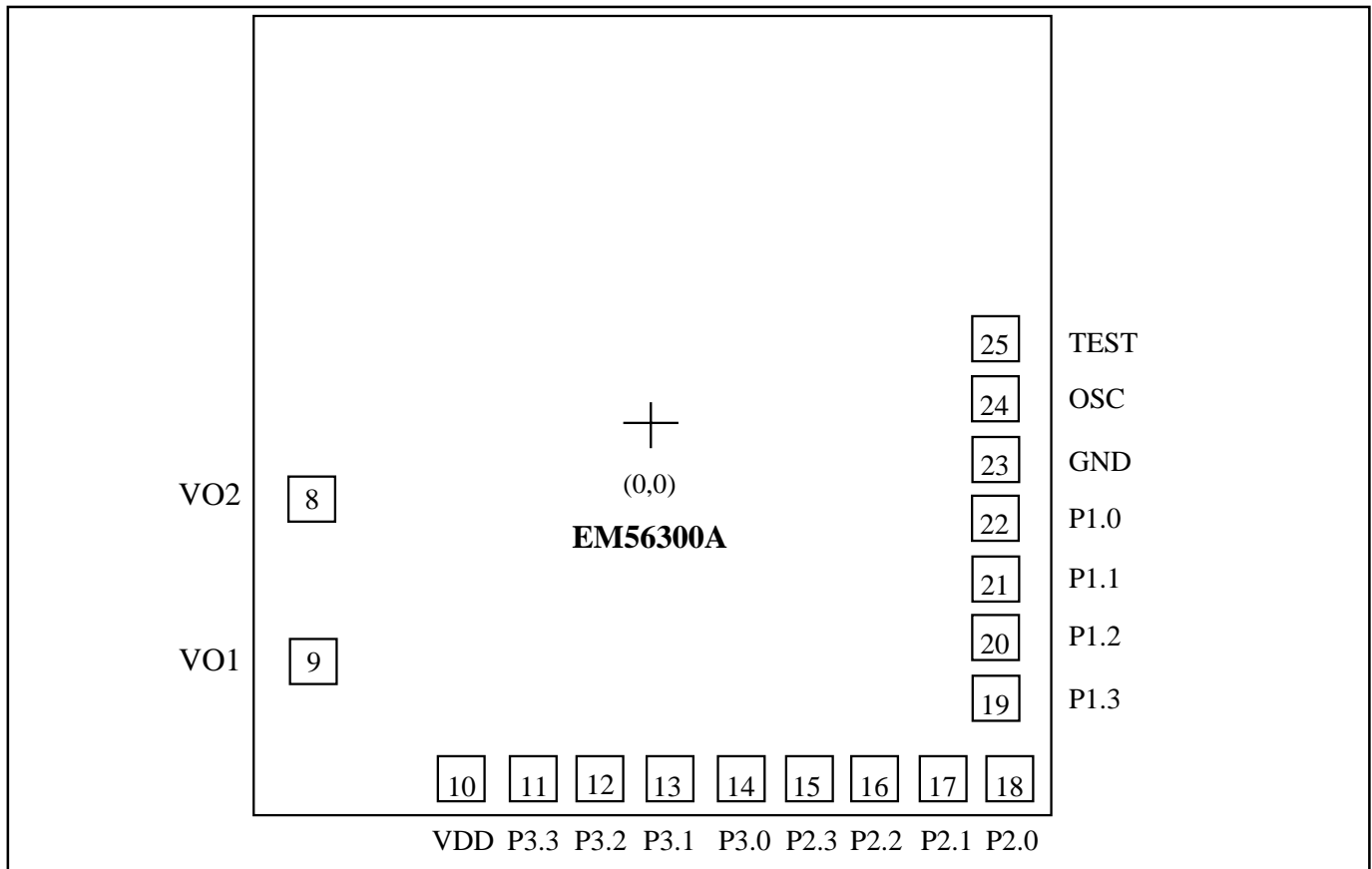
Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	NC		
4	NC		
5	NC		
6	NC		
7	NC		
8	VO2	-572.0	-17.2
9	VO1	-572.0	-401.5
10	VDD	-383.4	-628.4
11	P3.3	-252.4	-628.4
12	P3.2	-131.5	-628.4
13	P3.1	-10.6	-628.4
14	P3.0	110.3	-628.4

Pad No.	Symbol	X	Y
15	P2.3	232.4	-628.4
16	P2.2	354.8	-628.4
17	P2.1	477.2	-628.4
18	P2.0	599.6	-628.4
19	P1.3	588.4	-453.7
20	P1.2	588.4	-331.3
21	P1.1	588.4	-208.9
22	P1.0	588.4	-86.5
23	GND	588.4	57.7
24	OSC	588.4	188.7
25	TEST	588.4	309.9
26	NC		
27	NC		
28	NC		

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**Preliminary**

**PAD DIAGRAM**



Chip Size : 1700 x 2000 um

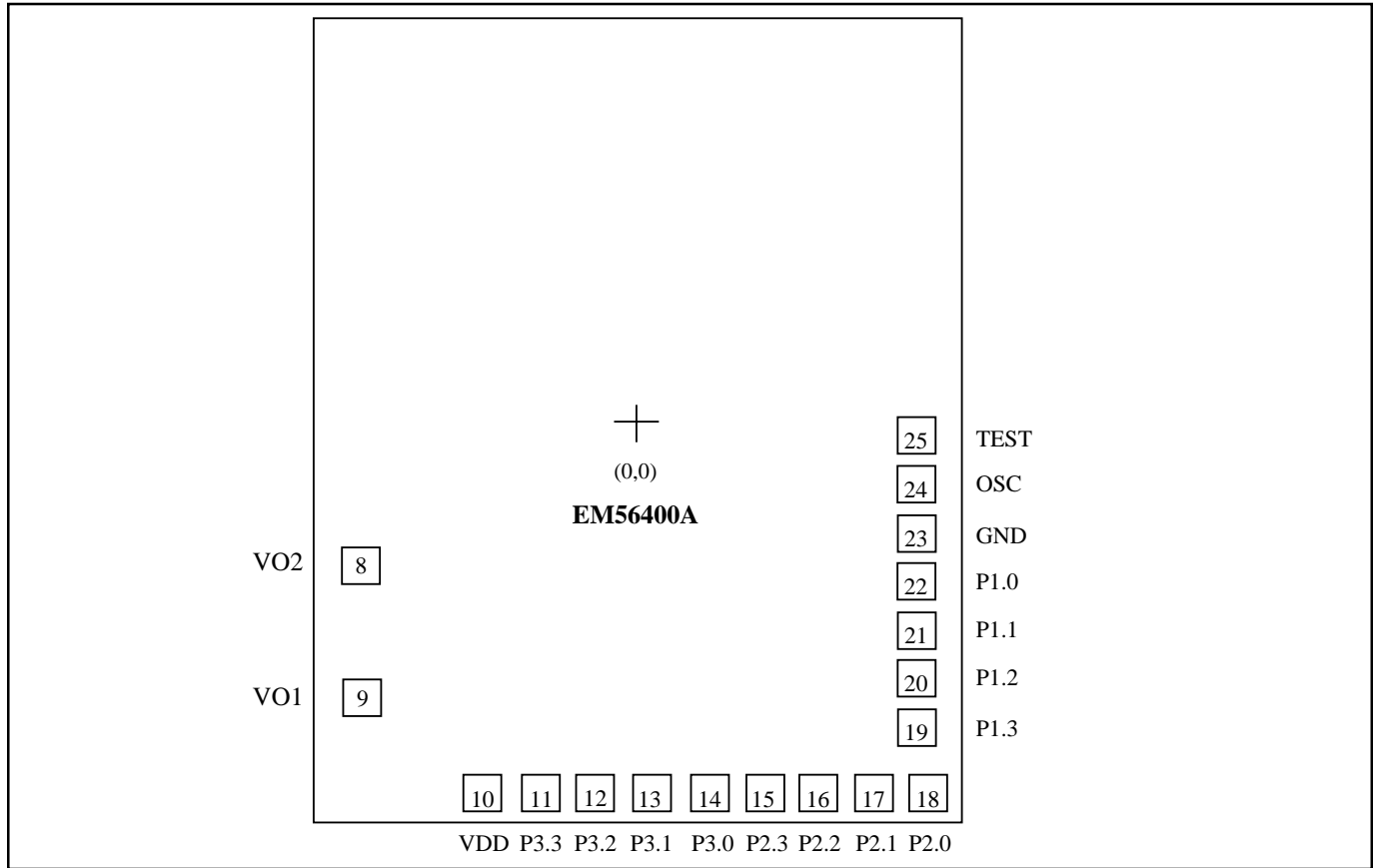
For PCB layout, IC substrate must be connected to Vss.

Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	NC		
4	NC		
5	NC		
6	NC		
7	NC		
8	VO2	-572.0	-147.2
9	VO1	-572.0	-531.6
10	VDD	-383.4	-758.4
11	P3.3	-252.4	-758.4
12	P3.2	-131.5	-758.4
13	P3.1	-10.6	-758.4
14	P3.0	110.3	-758.4

Pad No.	Symbol	X	Y
15	P2.3	232.4	-758.4
16	P2.2	354.8	-758.4
17	P2.1	477.2	-758.4
18	P2.0	599.6	-758.4
19	P1.3	588.4	-583.7
20	P1.2	588.4	-461.3
21	P1.1	588.4	-338.9
22	P1.0	588.4	-216.5
23	GND	588.4	-72.3
24	OSC	588.4	58.7
25	TEST	588.4	179.9
26	NC		
27	NC		
28	NC		

**Preliminary**

**PAD DIAGRAM**



Chip Size : 1700 x 2500 um

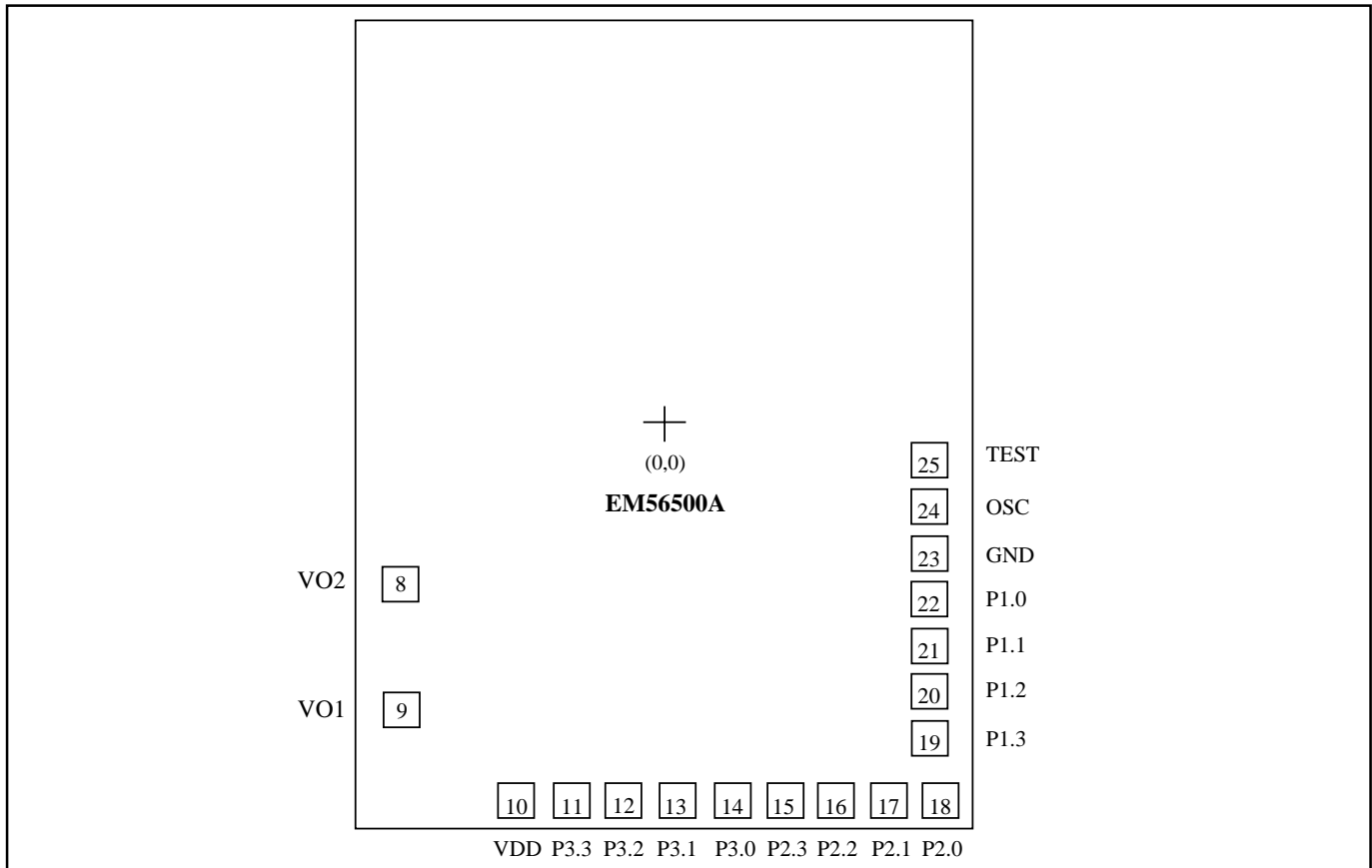
For PCB layout, IC substrate must be connected to Vss.

Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	NC		
4	NC		
5	NC		
6	NC		
7	NC		
8	VO2	-572.0	-412.2
9	VO1	-572.0	-796.5
10	VDD	-383.4	-1023.4
11	P3.3	-252.4	-1023.4
12	P3.2	-131.5	-1023.4
13	P3.1	-10.6	-1023.4
14	P3.0	110.3	-1023.4

Pad No.	Symbol	X	Y
15	P2.3	232.4	-1023.4
16	P2.2	354.8	-1023.4
17	P2.1	477.2	-1023.4
18	P2.0	599.6	-1023.4
19	P1.3	588.4	-848.7
20	P1.2	588.4	-726.3
21	P1.1	588.4	-603.9
22	P1.0	588.4	-481.5
23	GND	588.4	-337.3
24	OSC	588.4	-206.3
25	TEST	588.4	-85.1
26	NC		
27	NC		
28	NC		

**Preliminary**

**PADDIAGRAM**



Chip Size : 1700 x 3600 um

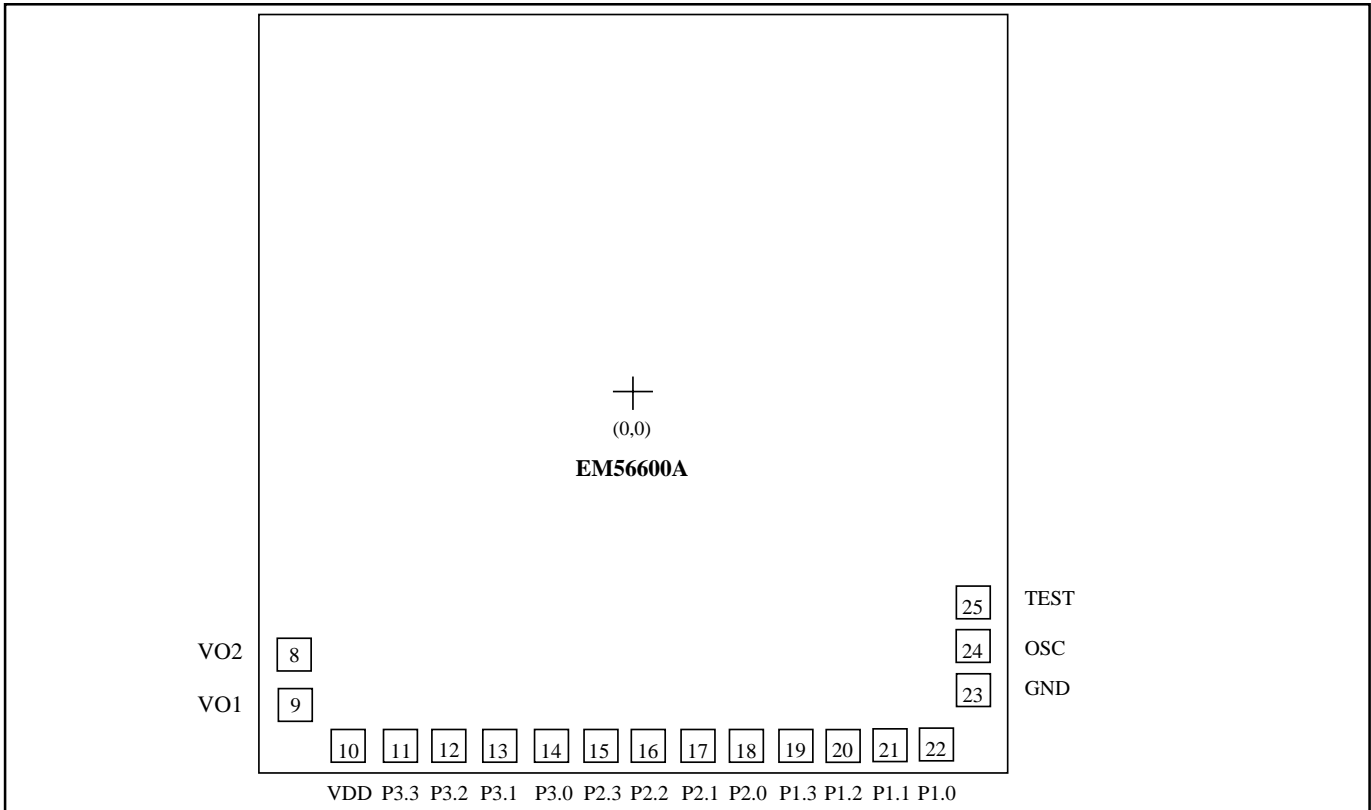
For PCB layout, IC substrate must be connected to Vss.

Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	NC		
4	NC		
5	NC		
6	NC		
7	NC		
8	VO2	-572.0	-932.2
9	VO1	-572.0	-1316.6
10	VDD	-383.4	-1543.4
11	P3.3	-252.4	-1543.4
12	P3.2	-131.5	-1543.4
13	P3.1	-10.6	-1543.4
14	P3.0	110.3	-1543.4

Pad No.	Symbol	X	Y
15	P2.3	232.4	-1543.4
16	P2.2	354.8	-1543.4
17	P2.1	477.2	-1543.4
18	P2.0	599.6	-1543.4
19	P1.3	588.4	-1368.7
20	P1.2	588.4	-1246.3
21	P1.1	588.4	-1123.9
22	P1.0	588.4	-1001.5
23	GND	588.4	-857.3
24	OSC	588.4	-726.3
25	TEST	588.4	-605.1
26	NC		
27	NC		
28	NC		

**Preliminary**

**PAD DIAGRAM**



Chip Size : 3050 x 3100 um

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

Pad No.	Symbol	X	Y
1	NC		
2	NC		
3	NC		
4	NC		
5	NC		
6	NC		
7	NC		
8	VO2	-1285.0	-1111.6
9	VO1	-1285.0	-1241.6
10	VDD	-884.3	-1340.0
11	P3.3	-695.7	-1340.0
12	P3.2	-519.2	-1340.0
13	P3.1	-342.7	-1340.0
14	P3.0	-166.2	-1340.0
15	P2.3	15.0	-1340.0
16	P2.2	191.5	-1340.0

Pad No.	Symbol	X	Y
17	P2.1	377.4	-1340.0
18	P2.0	553.9	-1340.0
19	P1.3	739.8	-1340.0
20	P1.2	916.3	-1340.0
21	P1.1	1102.2	-1340.0
22	P1.0	1278.7	-1340.0
23	GND	1293.4	-1138.0
24	OSC	1293.4	-1007.0
25	TEST	1293.4	-885.8
26	NC		
27	NC		
28	NC		
29	NC		
30	NC		
31	NC		
32	NC		