■ GENERAL DESCRIPTIONS

SN6B000 is a 8-bit micro controller series with hi-density LCD driver. Combined with one or more SN6BS00 (64-segment drivers), SN6B000 can form one 1024/ 2048/ 4096/ 6144/ 8192 dots LCD system. A dual-tone melody and a voice synthesizer are included in SN6B000. Also, a 7-bit current-type DAC and the PWM circuit are built in SN6B000, so that makes users easily choose a speaker (DA), or a buzzer (PWM) for their applications. SN6B000 only contains 32 COM signals of LCD. All segment signals are provided by SN6BS00. Several different types of LCD applications can be implemented by suitably combining SN6B000 and SN6BS00. SN6B000 not only contains internal mask ROM itself (128K words, MC mode), but also possesses the interface to access external ROM (maximum 512K words, MP mode). A memory chip, SN6B400 consists of 256K-word mask ROM and is available to work with SN6B000 to accomplish the whole micro-processor system.

Dots	Configuration	COM	SEG
1024	*1 SN6B000 + I SN6BS00*	16	64
2048	*1 SN6B000 + I SN6BS00*	32	64
4096	*1 SN6B000 + 2 SN6BS00*	32	128
6144	*1 SN6B000 + 3 SN6BS00*	32	192
8192	*1 SN6B000 + 4 SN6BS00*	32	256

FEATURES

- ROM space: 512K words (=2^{19}*16=2^{20}*8); Program Space: 256K*16
  - MC mode:128K words in SN6B000
  - MP mode: along with SN6B400 to 256K words
- RAM Size:
  - 256 bytes in SN6B000
  - 4*256 bytes in SN6BS00 (2*256 bytes LCD RAM, 2*256 bytes normal RAM)
- I/O Port : There are Port0 and Port1 (total 16 pins I/O)
  - All ports are I/O-type and P0.7 can be modulated with a carry signal
  - Each port can be set as "*H*", "*L*", *floating*, and *high-resistance "H" (150K@5V*)
  - Every port can wake up chip when chip is in power-down mode
- 60 instructions
- 8 levels stack buffer supports interrupt and call subroutine
- System Clock:
  - 2MHz RC oscillator
  - 2M/ 4M(3.58M) crystal
- Low speed clock: Register option, 32768 crystal or RC
- Three different operation modes can be selected:
  - Normal mode (both High/Low osc. On).
  - Slow mode (High osc. Off, Low osc. On).
  - Stop mode (both High and Low osc. Off).
- LCD: 1/16 duty (for 1024) or 1/32 duty, frame rate=64 or 128 Hz.
- A voltage regulator and double voltage circuit is included in SN6BS000
- 8 interrupt sources :
  - 5 internal interrupts: T0, TC0, TC1, TW, SPEECH (non-maskable).
  - 3 external interrupts: INTP0.0 ~ INTP0.2
  - ISR entry location: Reset: 0000, SPEECH: 0018h, and the others: 0008h
- Voice:
  - Built-in voice synthesizer
  - Sampling rate from 4K to 40Khz
  - Dual tone melody with 4 octaves
  - 7-bit DA converter (maximum 3mA)
  - PWM output for Buzzer

■ PIN ASSIGNMENT

SN6B000

Pin Name	I/O	Descriptions	Internal Pull-low
C0~C31	O	Common 0 ~ 31	
VLC1, VLC4, VLC5	I	LCD Bias	
VLCDR	I	LCD Bias	
P/C	I	Micro-processor/Micro-controller	√
A0~A19	O	Address Bus for ROM	
D0~D7	I/O	Data Bus for ROM	
CE1B	O	Chip Enable of External ROM.	
VO/ BUZ1	O	Voice out, 7-bit DA / PWM output	
BUZ2	O	PWM output	
OSC/XIN		High speed Clock input: CKSEL=L, RC oscillator CKSEL=H, Crystal	
XOUT	O	High Speed clock output	
CKSEL	I	High speed clock selection (0:2M RC oscillator, 1: Crystal)	√
LXIN	I	Low speed clock input	
LXOUT	O	Low speed clock output	
P0, P1	I/O	I/O Ports	
XCE_0	O	Chip Enable of SN6BS00 0	
XCE_1	O	Chip Enable of SN6BS00 1	
XCE_2	O	Chip Enable of SN6BS00 2	
XCE_3	O	Chip Enable of SN6BS00 3	
XD7~XD0	I/O	Data Bus to Slave Driver	
XA9~XA0	O	Address Bus to Slave Driver	
WR	O	Read Write signal	
FRAME	O	Frame Synchronous Signal	
CL	O	Display Synchronous Signal	
M	O	Alternating signal for LCD	
SYNC	O	Phase 1 synchronous pin.	
TEST	I	Test Pin	√
RESETB	I	Reset Pin	
VDD	I	Positive power supply	
GND	I	Negative power supply	

SN6BS00:

Pin Name	I/O	Descriptions
S0~S63	O	Segment 0 ~ 63
VLCDR, VLC2, VLC3, VLC5	I	LCD Bias
VREG	O	Voltage Pumper
VPS	I	Voltage Pumper
VO1, VO2	I	Voltage Pumper
XA0~XA9	I	Address Bus
XD0~XD7	I/O	Data Bus
XCE	I	Chip Enable
WR	I	Read Write signal
FRAME	I	Frame Synchronous Signal
CL	I	Display Synchronous Signal
M	I	Alternating signal for LCD
VDD	I	Positive power supply
GND	I	Negative power supply

SN6B400:

Pin Name	I/O	Function Description
V_{DD}	I	Positive power supply
CEB	I	Chip Enable. (Active Low)
SYNC	I	Clock Pin
D7~D0	O	Data Output
A18~A0	I	Address Input
VSS	I	Negative power supply.

■ ABSOLUTE MAXIMUM RATINGS

(All of the voltages referenced to Vss)

Supply voltage (Vdd) ..... - 0.3V ~ 6.0V
Input in voltage (Vin) Vss ..... - 0.2V ~ Vdd + 0.2V
Operating ambient temperature (Topr) ..... 0°C ~ + 70°C
Storage ambient temperature (Tstor) ..... -30°C ~ + 125°C
Power consumption (Pc) ..... 500 mW

■ ELECTRICAL CHARACTERISTICS

SN6B000

PARAMETER	*SYM.*	*DESCRIPTION*	*MIN.*	*TYP.*	*MAX.*	*UNIT*
Operating voltage	Vdd		3.9	-	5.1	V
Operating current	IddH	Vdd = 5.0V, I/O pin unload, normal mode	-	1	-	mA
	Idds	Vdd = 5.0V,I/O pin unload, slow mode	-	15	-	uA
	Istby	Vdd = 5.0V,I/O pin unload, stop mode	-	-	1	uA
Reset, TEST pin input voltage	ViH		0.7Vdd	-	-	V
	ViL		-	-	0.3Vss	
Reset, TEST leakage current	ILekg	Vin = Vdd	-	-	1	uA
I/P port input voltage	ViH		0.8Vdd	-	-	V
	ViL		-	-	0.2Vss	
I/P port pull-up resistor	Rup	Vin = Vss	-	150	-	KΩ
I/P port input leakage current	Ilekg	Pull-up resistor disable, Vin = Vdd	-	-	1	uA
Port0,1 output source Current	IoH	Vop = Vdd - 0.5V	1	2	-	mA
Port0,1 output sink Current	IoL	Vop = Vss + 0.5V	2	4	-	mA
LCD supply voltage	Vlcd		-	-	6.5	V
LCD frame frequency	Flcd		-	64/128	-	Hz
Vo output Current	Ivo	DA output current	-	3	4	mA
BU1,BU2 Driving Current	IdBU	PWM driving current ability. $V_{BU1/BU2}$=2.5V	-	60	-	mA
BU1,BU2 Sinking Current	IsBU	PWM sinking current ability. $V_{BU1/BU2}$=2.5V	-	60	-	mA
INTP0 trigger pulse width	Tint01	P0.0 ~ P0.2 Interrupt request pulse width	1/fcpu	-	-	S
Oscillator frequency	fHxosc	Rosc=300KΩ	-	2	-	MHz

SN6BS00

(All of voltages referenced to Vss, Vdd = 5.0V, SN6B000@3.58MHz, ambient temperature is 25°C unless otherwise note.)

PARAMETER	SYM.	DESCRIPTION	MIN.	TYP.	MAX.	UNIT
Operating voltage	Vdd		3.9	-	5.1	V
Operating current	IddH	LCD pin unload, Voltage-doubler ON	-	3	-	mA
Standby Current	Istby	LCD pin unload, Voltage-doubler OFF, No Data Access from SN6B000.	-	-	1	uA
Output Voltage of VREG	V_{OREG}	VDD=3.9V	-	5.4	-	V
		VDD=4.5V	-	5.9	-	V
		VDD=5.1V	-	6.2	-	V

SN6B400

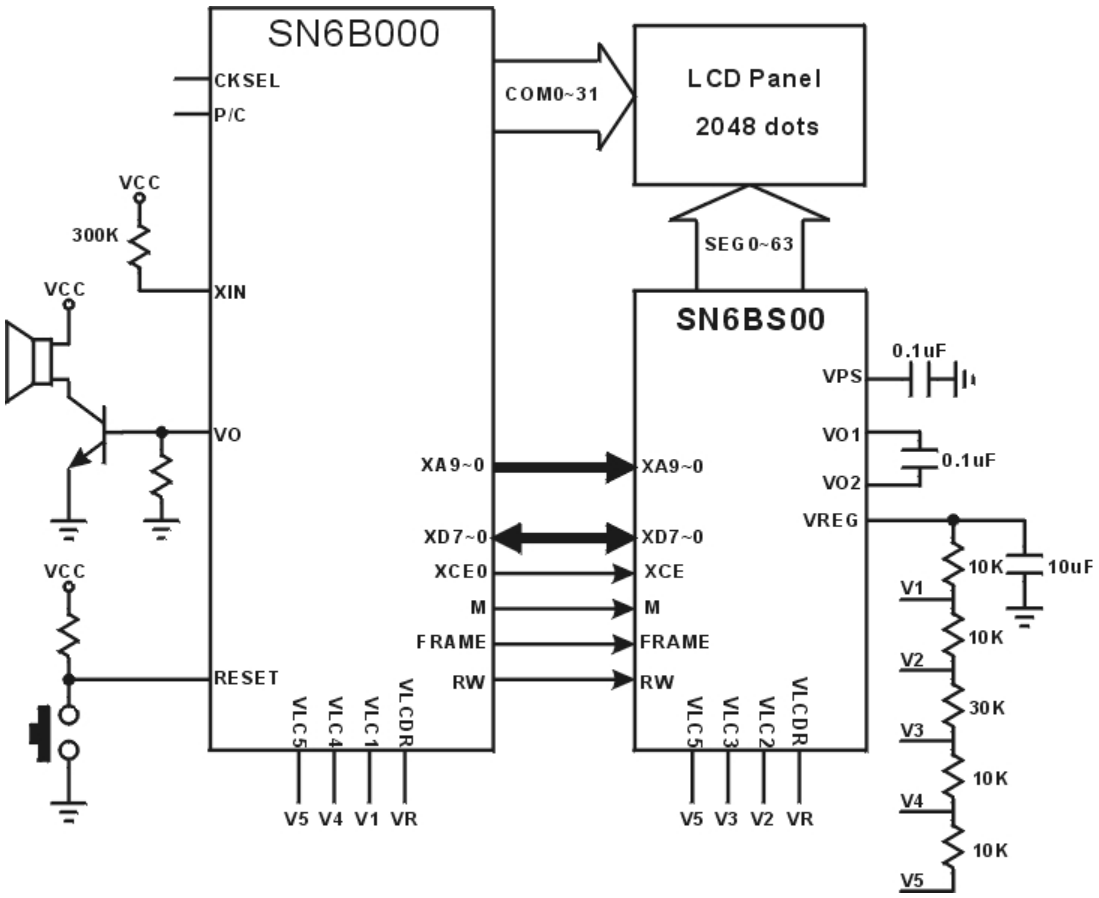
(All of voltages referenced to Vss, Vdd = 5.0V, SN6B000@3.58MHz, ambient temperature is 25°C unless otherwise note.)

PARAMETER	SYM.	DESCRIPTION	MIN.	TYP.	MAX.	UNIT
Operating voltage	Vdd		3.6	-	5.1	V
Operating current	IddH		-	400	-	uA
Standby Current	Istby	CEB=5V	-	-	1	uA
Access time	Tac	Loading=10pf, VDD = 3.6V~5V	-	-	300	nS

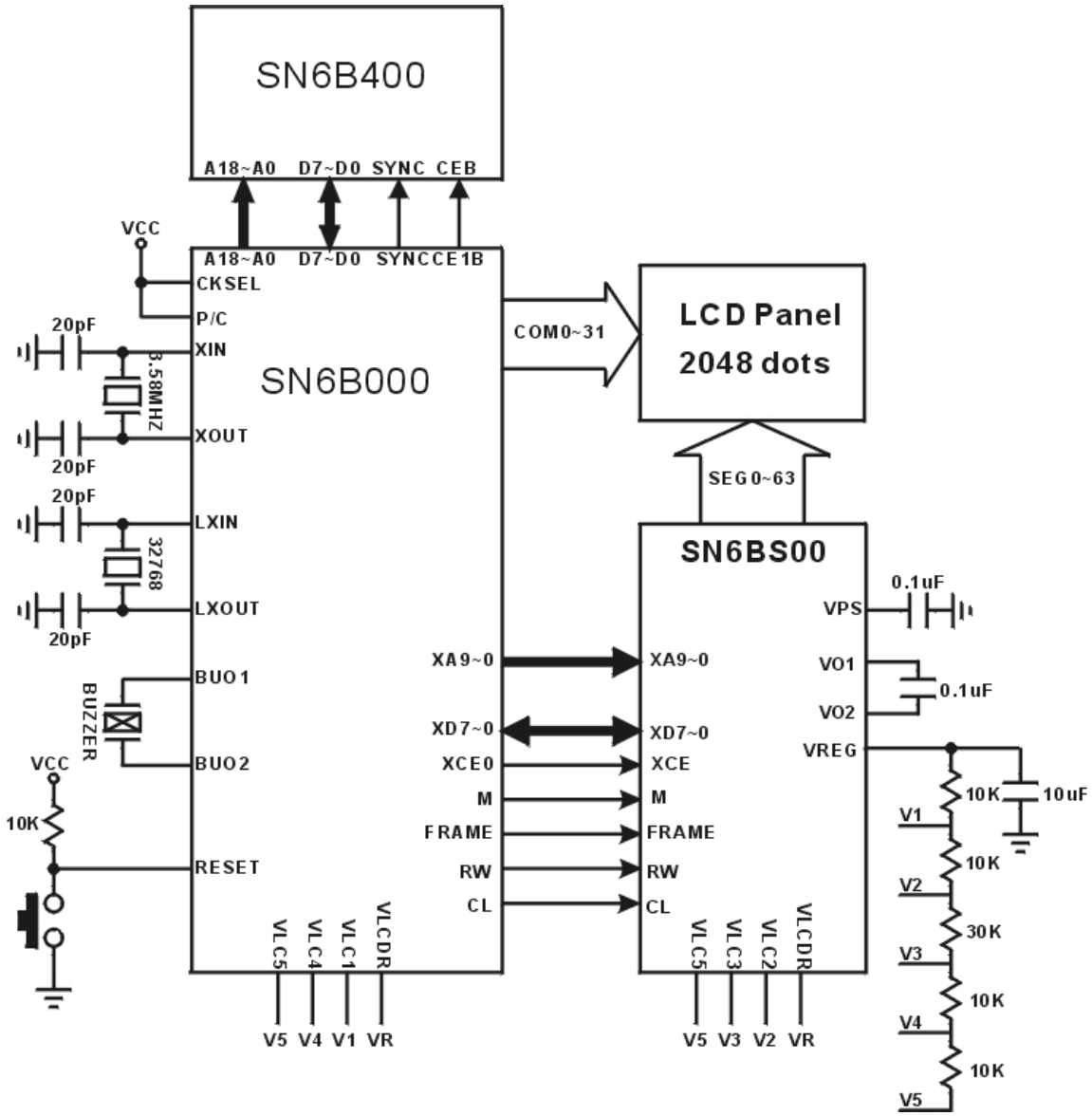
■ APPLICATION CIRCUIT

◆ MC mode with 2048-dot (64 seg X 32 com, 1/7 bias) LCD

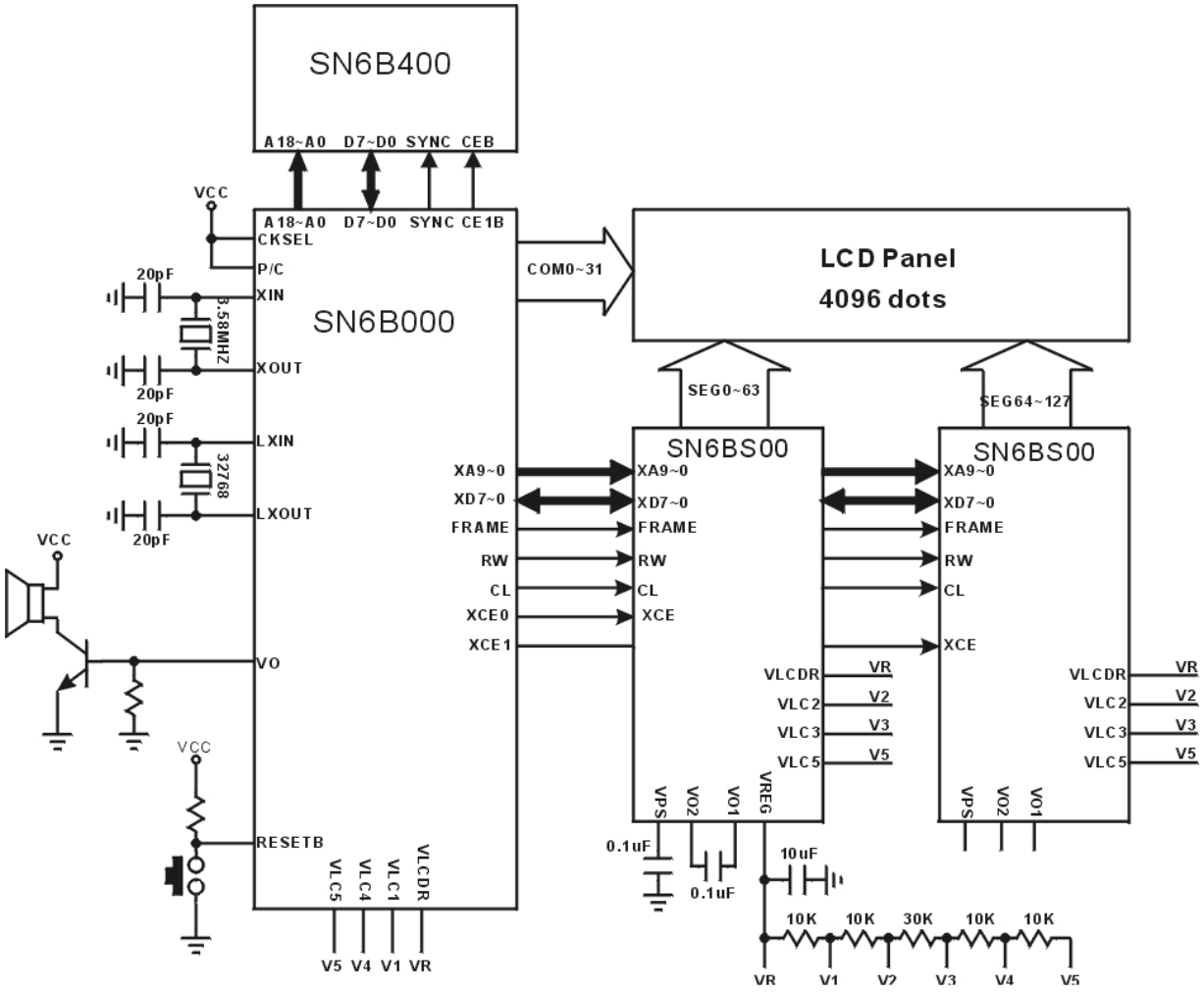
- Clock: RC type (CPU frequency: 2MHZ)
- No low speed clock
- Speaker voice output



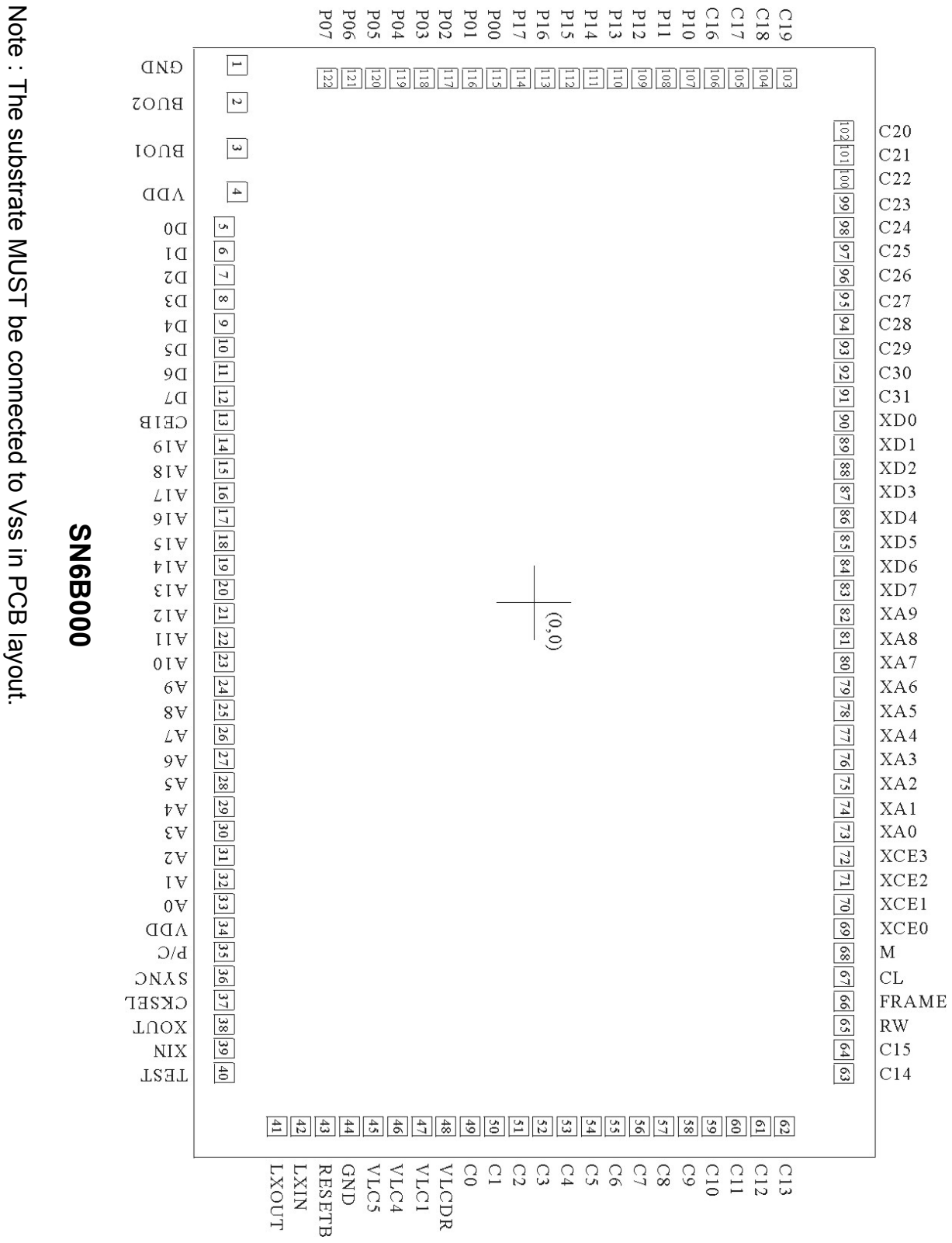
- **MP mode with SN6B400 and 2048-dot (64seg X 32com, 1/7 bias) LCD**
  - Clock: 3.58MHZ crystal (CPU frequency: 3.58MHZ)
  - 32768 low speed clock
  - Buzzer voice output



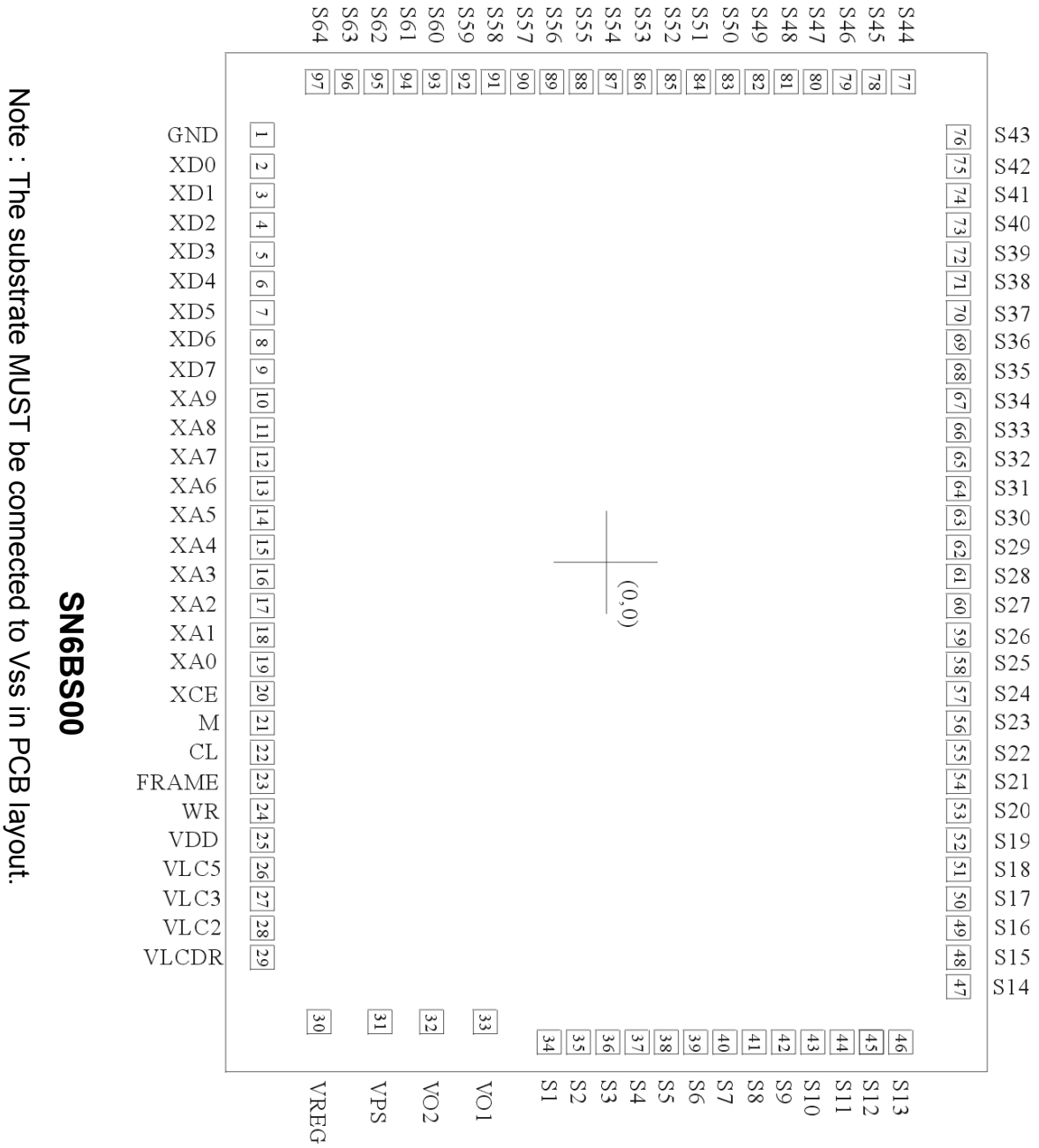
- MP mode with SN6B400 and 4096-dot (128seg X 32com, 1/7 bias) LCD
  - Clock: 3.58MHZ (CPU frequency: 3.58MHZ)
  - 32768 low speed clock
  - Speaker voice output



■ BONDING PAD

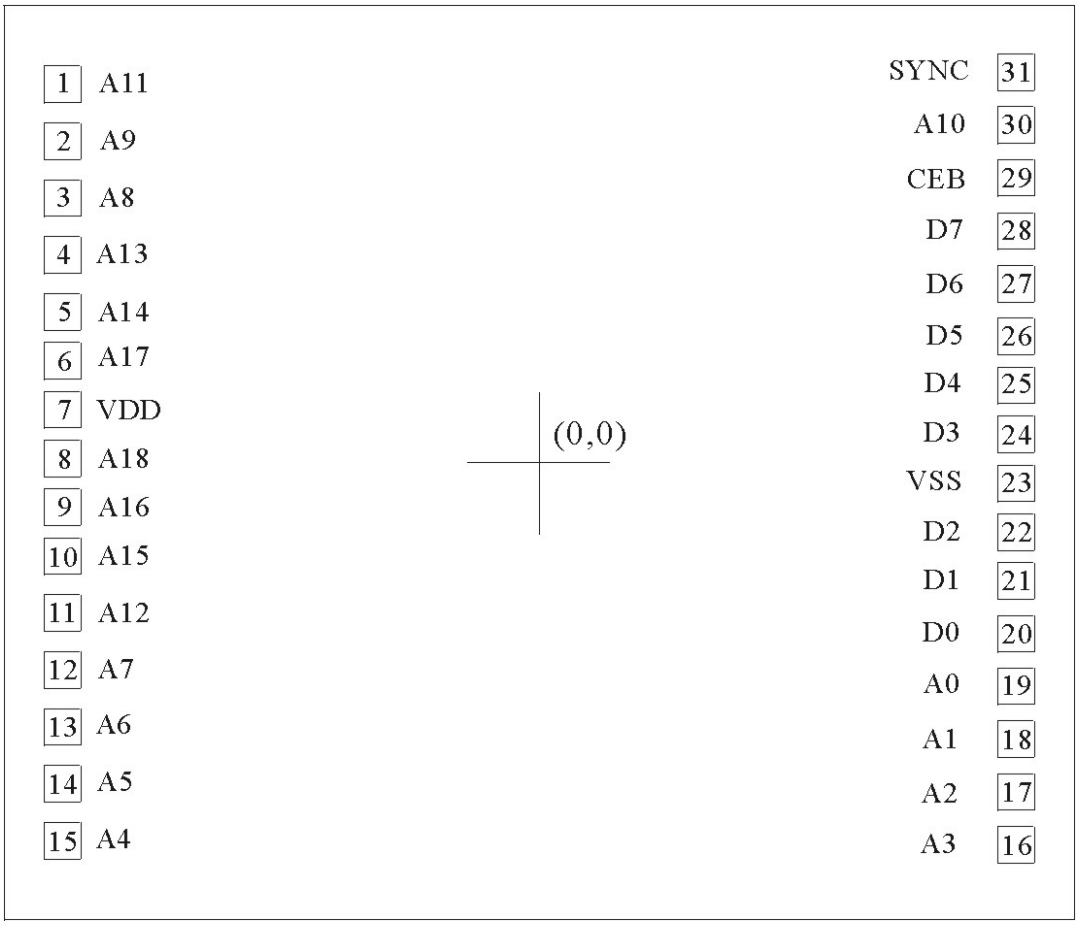


Note : The substrate MUST be connected to Vss in PCB layout.



SN6BS00

Note : The substrate MUST be connected to Vss in PCB layout.



SN6B400

Note : The substrate MUST be connected to Vss in PCB layout.

DISCLAIMER

The information appearing in SONiX web pages ("this publication") is believed to be accurate.

However, this publication could contain technical inaccuracies or typographical errors.

The reader should not assume that this publication is error-free or that it will be suitable for any particular purpose. SONiX makes no warranty, express, statutory implied or by description in this publication or other documents which are referenced by or linked to this publication. In no event shall SONiX be liable for any special, incidental, indirect or consequential damages of any kind, or any damages whatsoever, including, without limitation, those resulting from loss of use, data or profits, whether or not advised of the possibility of damage, and on any theory of liability, arising out of or in connection with the use or performance of this publication or other documents which are referenced by or linked to this publication.

This publication was developed for products offered in Taiwan. SONiX may not offer the products discussed in this document in other countries. Information is subject to change without notice. Please contact SONiX or its local representative for information on offerings available. Integrated circuits sold by SONiX are covered by the warranty and patent indemnification provisions stipulated in the terms of sale only.

The application circuits illustrated in this document are for reference purposes only.

SONIX DISCLAIMS ALL WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE. SONIX reserves the right to halt production or alter the specifications and prices, and discontinue marketing the Products listed at any time without notice. Accordingly, the reader is cautioned to verify that the data sheets and other information in this publication are current before placing orders.

Products described herein are intended for use in normal commercial applications. Applications involving unusual environmental or reliability requirements, e.g. military equipment or medical life support equipment, are specifically not recommended without additional processing by SONIX for such application.