



**===== CONTENTS =====**

<b>1. INTRODUCTION .....</b>	<b>3</b>
<b>2. FEATURES.....</b>	<b>3</b>
2.1. CPU .....	3
2.2. WPU .....	4
2.3. LCD.....	4
<b>3. FLASH MEMORY .....</b>	<b>6</b>
<b>4. RAM.....</b>	<b>6</b>
<b>5. PIN ASSIGNMENT .....</b>	<b>7</b>
<b>6. LQFP-256 OUTLINE .....</b>	<b>9</b>
<b>7. APPLICATION CIRCUIT.....</b>	<b>11</b>
<b>8. CONNECT TO USB ADAPTOR.....</b>	<b>13</b>
<b>9. ELECTRICAL CHARACTERISTICS.....</b>	<b>14</b>



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**AMENDMENT HISTORY**

<b>Version</b>	<b>Date</b>	<b>Description</b>
Ver 1.0	2011/1/14	First issue
Ver 1.1	2011/8/18	1. Add SNL16340 and SNL16340S chip
Ver 1.2	2011/11/28	Update pin assignment table



## **1. INTRODUCTION**

SNL16000\_MTP is the MTP chip with one 32M bit flash memory. It is for emulating the SNL16168, SNL16340 and SNL16340S real chip. SNL16000 supports a MTP (Multiple Time Programming) EV chip for user design his EV boards. Since the MTP chip embedded a flash chip, user can erase/program it multiple-time through SONiX's flash writer.

The following chapter will introduce the each pin function and teach user how to use MTP chip to layout the EV board.

## **2. FEATURES**

### **2.1. CPU**

- ◆ Operation voltage: 2.4V~5.5V
- ◆ System clock: 8MHz Int. Rosc (32.768KHz X'tal)
- ◆ Flash memory: 2M\*16bit(can support SNL16168 / SNL16340 / SNL16340S)
- ◆ 2MIPS CPU performance under 8M Hz.
- ◆ CPU clock is programmable : 8MHz, 4MHz, 2MHz or 1MHz
- ◆ Low Voltage Reset (LVR): Reset at 2.4V
- ◆ Low Voltage Detector (LVD)
  - 4 levels (2.2V/2.4V/2.6V/2.8V). In SNL16000MTP can be programmable LVD all level it only can be achieve 2.6V/2.8V, but in Real chip can be achieve 2.2V/2.4V/2.6V/2.8V.
- ◆ Timer/Counter
  - Timer0
  - Timer1 (1ms,4ms,8ms,16ms)
  - RTC Timer (0.5s,1s, 4s)
  - WDT Timer (0.25s)
- ◆ Operating Mode
  - Normal
  - Idle
  - Sleep
- ◆ General-Purpose I/O ports
  - 16 programmable I/Os for SNL16168.
  - 24 programmable I/Os for SNL16340 and SNL16340S.
- ◆ Serial Peripheral Interface (SPI)
  - Support master mode only
  - Four wire serial pin interface with optional automatic chip selection signal generation.
  - Support 8-bit data length
- ◆ AD bus Interface
  - Three wires serial interface.



- Hardware accelerated interface.
- Eight bits AD resolution.
- Maximum eight channels AD support.
- ◆ Support 4 PWMIO functions for SNL16340/SNL16340S
- ◆ HW Keyboard scan Interface
  - Support 8x8 auto-scan key function and up to 64 keys detection for SNL16168/SNL16340.
  - Support 16x8 auto-scan key function and up to 128 keys detection for SNL16340S.
  - Scan Output signal shared with LCD output.
  - Interrupt supported for easy detect key changed.
- ◆ IR function is provided

## 2.2. WPU

- ◆ Maximum 4 independent music/voice channels.
- ◆ 4 channels with three playing modes:
  - 4-bit ASDPCM
  - 6-bit ASDPCM
  - 10-bit PCM
- ◆ Individual Adaptive playing speed from 4K to 64K Hz for all 4 voice channels.
- ◆ Support Special Mark insert into both Voice(Wave) and Melody
- ◆ Support one channel play wave from SPI Flash
- ◆ 12 bits Push Pull Type DAC

## 2.3. LCD

- ◆ LCD Power Management
  - Provide voltage booster and selectable 32 output voltage levels for LCD.
  - 1/6 bias, 1/5 bias or 1/4 bias options with voltage followers
- ◆ LCD Driver
  - COM: 4, 8, 12, 16 outputs for SNL16168/SNL16340
  - COM: 4, 8, 12, 16, 20, 24, 28, 32 outputs for SNL16340S
  - SEG: 32, 48, 64 outputs.
  - Clock source can be select from ext. 32KHz X'tal or Int.100KHz ROOSC.
- ◆ LCD Controller (LCDC)
  - SNL16168/SNL16340 LCD resolution: maximum 1024 dots 1/4, 1/8, 1/12, 1/16 duty
  - SNL16340S LCD resolution: maximum 2048 dots 1/4, 1/8, 1/12, 1/16, 1/20, 1/24, 1/28, 1/32 duty



***SNL16000 MTP EV chip  
(with 2Mx16 Flash Memory)***

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- Support B/W only.

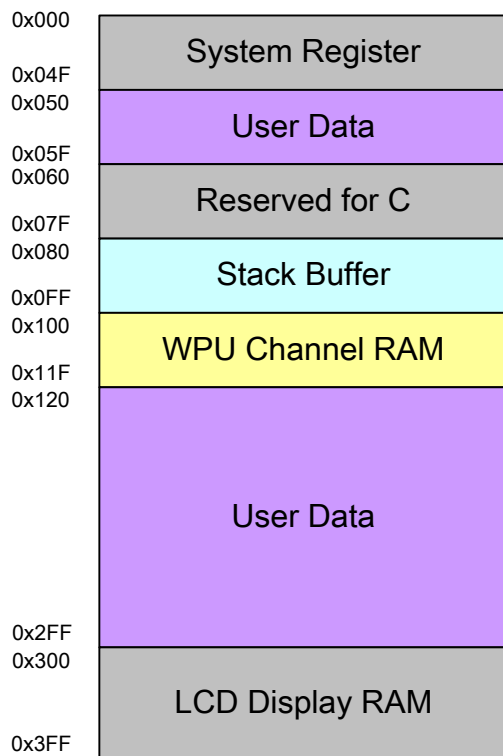
### 3. Flash Memory

SNL16000MTP contain a 2Mx16 bits flash memory which is shared by program and resource data. Program, voice, melodies, data, images and instrument waveforms are shared within this same flash memory area.

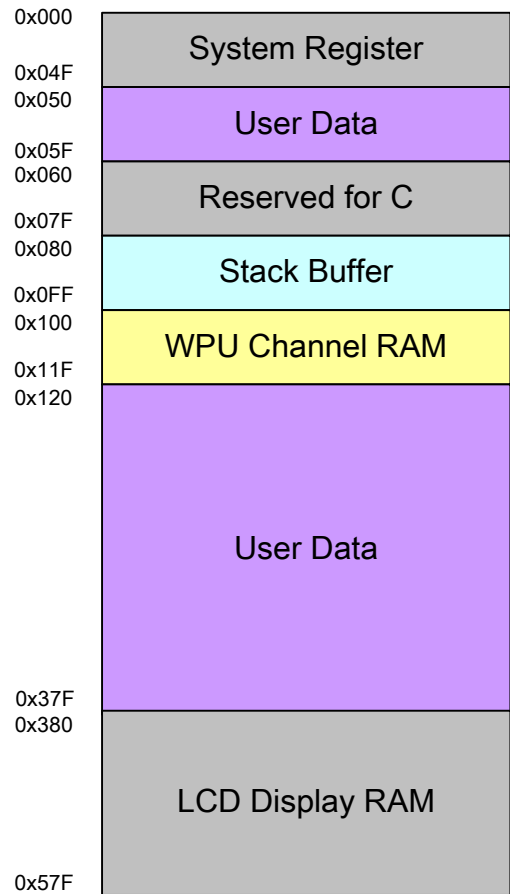
User can use SONiX flash writer to erase and program the flash memory.

### 4. RAM

**MTP Chip configure to SNL16168/SNL16340**



**MTP Chip configure to SNL16340S**





## 5. PIN ASSIGNMENT

Pin NO	Symbol	I/O	Function Description
1~5	NC		Not connect
6	GNDVR	P	Negative power for high clock
7	LXOUT	O	Low clock crystal output
8	LXIN	I	Low clock crystal input
9	VDDVR	P	Positive power for high clock
10	GND	P	Negative power supply
11~14	NC		Not connect
15	VDD	P	Positive power supply
16~23	NC		Not connect
24	GND	P	Negative power supply
25	VDD	P	Positive power supply
26~33	P27~P20	I/O	GPIO 2.7 ~ 2.0
34	GND	P	Negative power supply
35	RST	I	Chip Reset (Active Low)
36	VDD	P	Positive power supply
37~44	P17~P10	I/O	GPIO 1.7 ~ 1.0
45	GND	P	Negative power supply
46	VDD	P	Positive power supply
47~54	P07~P00	I/O	GPIO 0.7 ~ 0.0
55	GND	P	Negative power supply
56,60	GNDPP	P	Negative power supply for Audio
57,59	BN0, BP0	O	Push-pull Audio Output
58	VDDPP	P	Positive power supply for Audio
61~67	NC		Not connect
68	F_A0	I	Address 0 input of Flash
69	F_CS_	I	Chip select input of Flash
70	VDD	P	Positive power supply
71	GND	P	Negative power supply
72	PWRONLED	O	To indicate chip is in Power on stage
73,74	NC		Not connect
75	A0	O	Address 0 output for Flash
76	CS_	O	Chip select output for Flash
77,78	GND3V	P	Negative power supply for Flash ROM
79~87	NC		Not connect

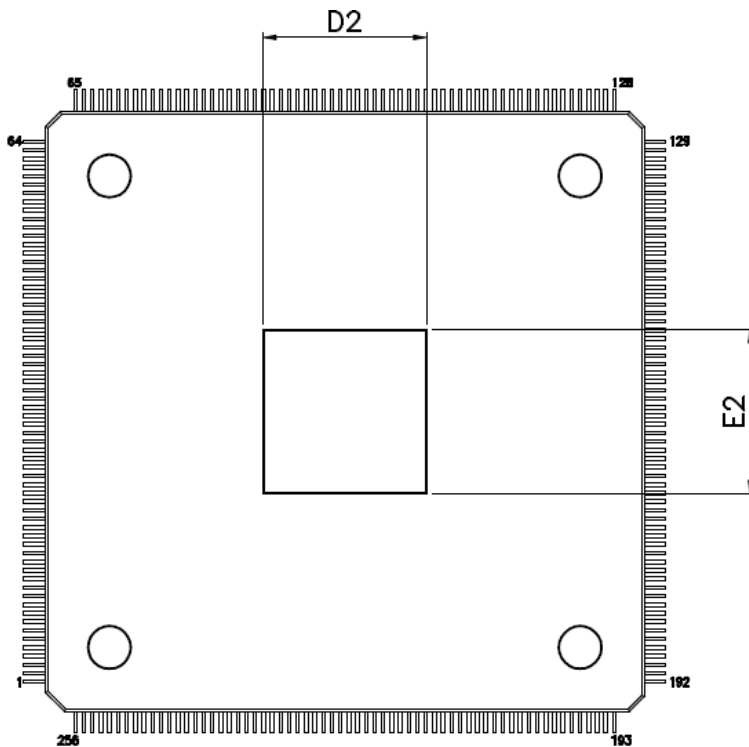
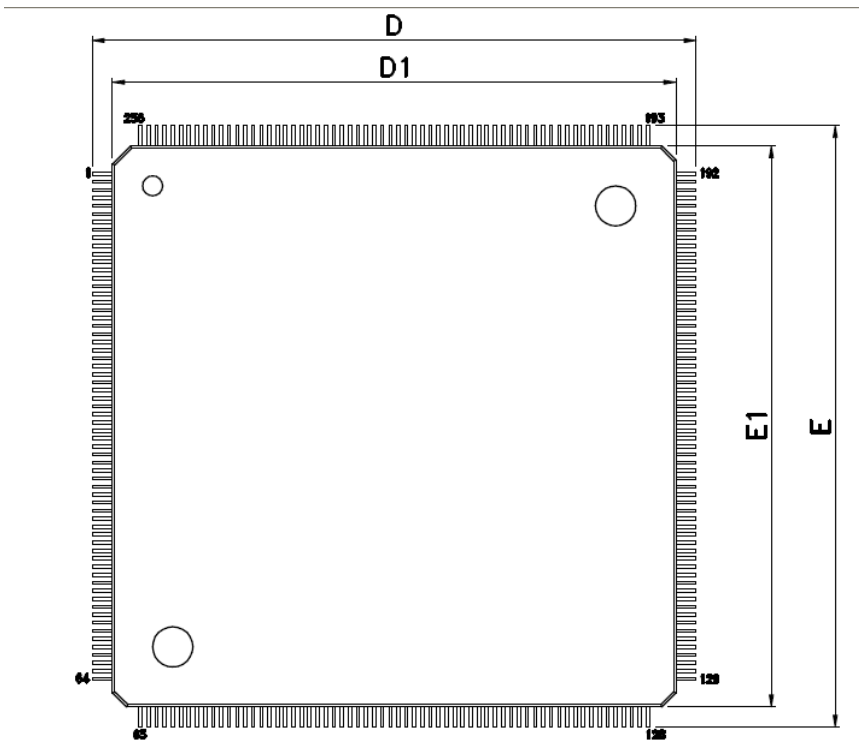


**SNL16000 MTP EV chip  
(with 2Mx16 Flash Memory)**

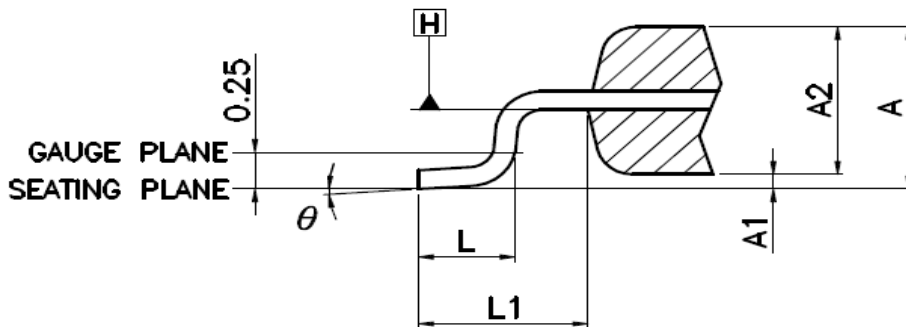
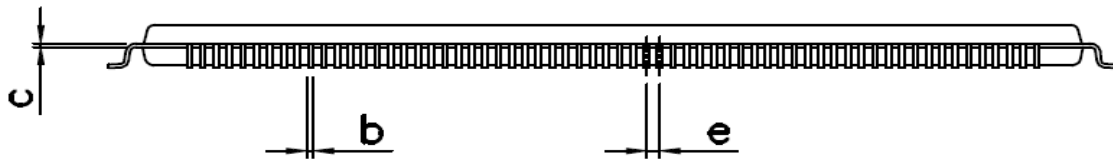
88,89	VDD3V	P	Positive power supply for Flash ROM
90~97	NC		Not connect
98,99	GND3V	P	Negative power supply for Flash ROM
100	VDD3V	P	Positive power supply for Flash ROM
101	NC		Not connect
102	VDDCP	P	Positive power supply for charge pump
103	GNDCP	P	Negative power supply for charge pump
104,105	C2P, C2N	P	Charge pump cap
106,107	C1P, C1N	P	Charge pump cap
108	VLCD	P	LCD voltage generation
109~112	V4, V3, V2, V1	P	LCD voltage generation
113~144	COM0~COM31	O	LCD COM0~COM15 output
145~160	NC		Not connect
161~224	SEG63~SEG0	O	LCD SEG63~SEG0 output
225~235	NC		Not connect
236,237	VDD3V	P	Positive power supply for Flash ROM
238~246	NC		Not connect
247	VDD	P	Positive power supply
248	GND	P	Negative power supply
249	ICECLK	I	ICE clock input
250	VDDVR24	P	Positive power supply for ICE clock
251	GNDVR24	P	Negative power supply for ICE clock
252	SCK	I	SPI ICE clock input
253	ICEEN	O	ICE enable pin
254	ICEDI	I	SPI ICE data input
255	ICEDO	O	SPI ICE data output
256	CSB	I	SPI ICE chip enable



6. LQFP-256 Outline



(THERMALLY ENHANCED VARIATIONS ONLY)



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.60
A1	0.00	—	0.15
A2	1.35	1.40	1.45
b	0.13	0.18	0.23
c	0.09	—	0.20
D	30.00 BSC		
D1	28.00 BSC		
E	30.00 BSC		
E1	28.00 BSC		
e	0.40 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
$\theta$	0°	3.5°	7°

THERMALLY ENHANCED DIMENSIONS(SHOWN IN MM)

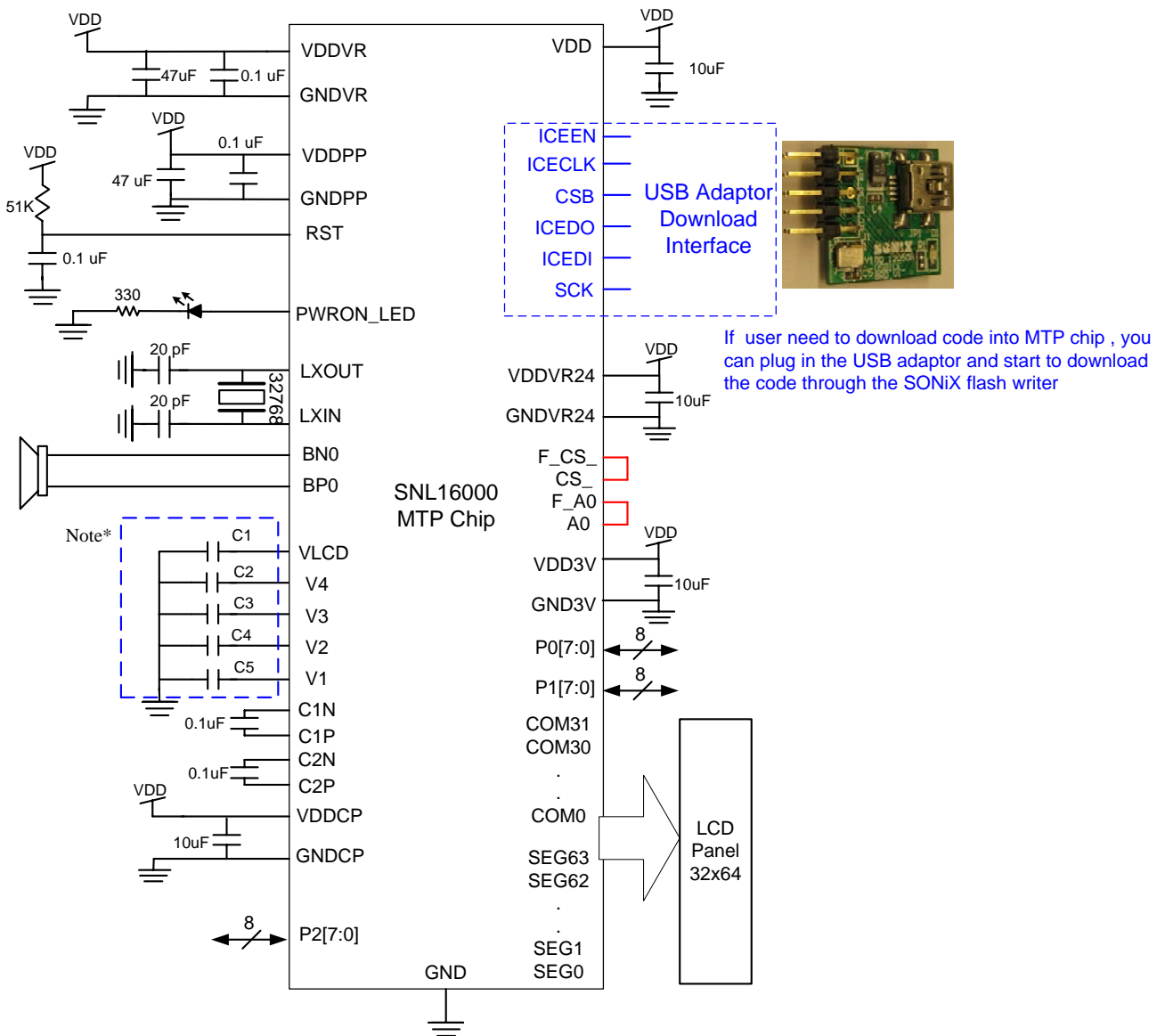
PAD SIZE	E2		D2	
	MIN.	MAX.	MIN.	MAX.
△ 370X370MIL	8.795	9.398	8.795	9.398

NOTES:

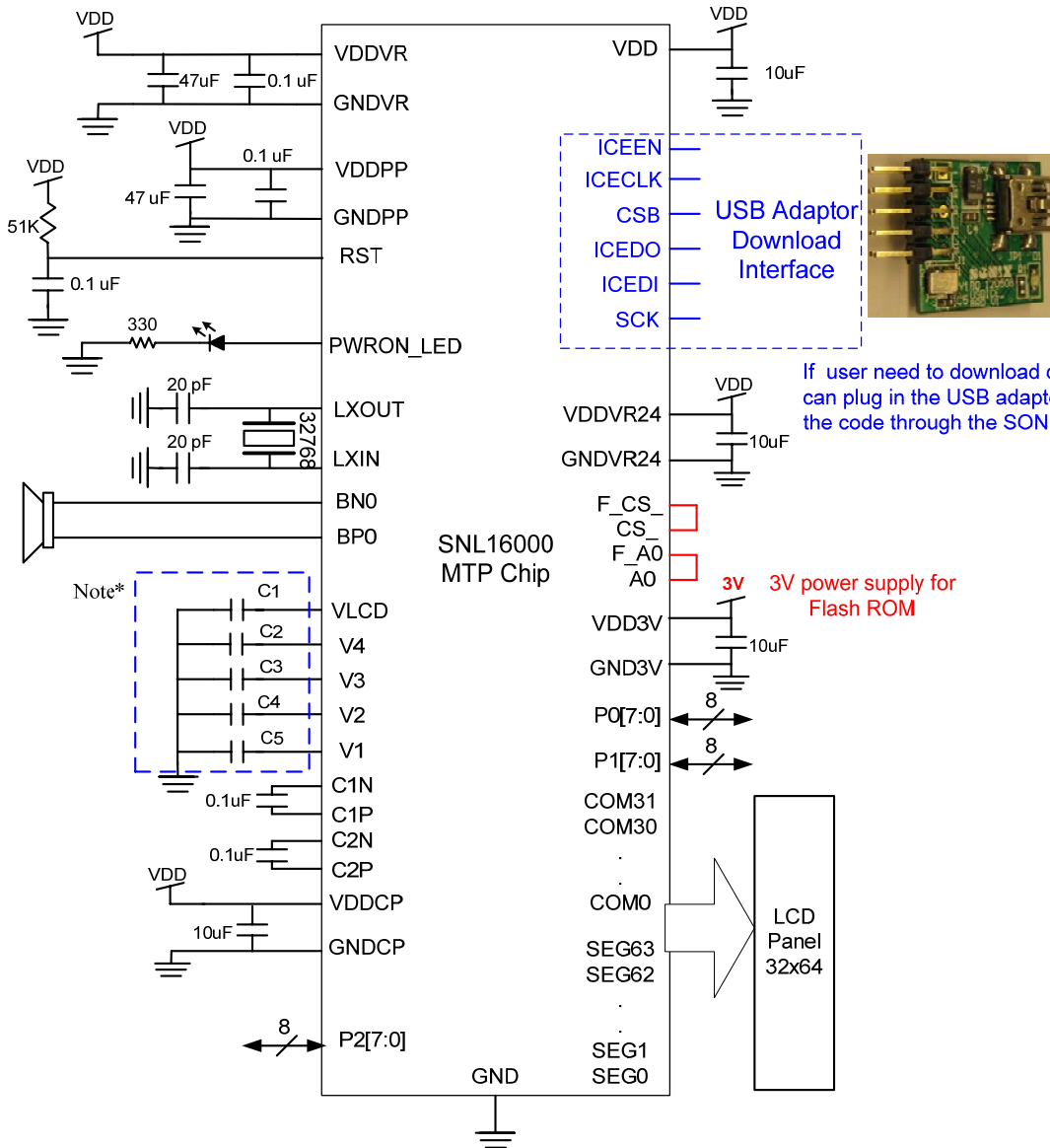
1. JEDEC OUTLINE :  
MS-026 BJC  
MS-026 BJC-HD(THERMALLY ENHANCED VARIATIONS ONLY)
2. DATUM PLANE [H] IS LOCATED AT THE BOTTOM OF THE MOLD PARTING LINE COINCIDENT WITH WHERE THE LEAD EXITS THE BODY.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 mm PER SIDE. DIMENSIONS D1 AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE [H].
4. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION.

## 7. Application circuit

- Power Supply: VDD = 3V
- Low Clock: 32.768KHz X' TAL
- Voice output: Push Pull DAC Output



- Power Supply: VDD = 3V ~ 5.5V
- Low Clock: 32.768KHz X' TAL
- Voice output: Push Pull DAC Output

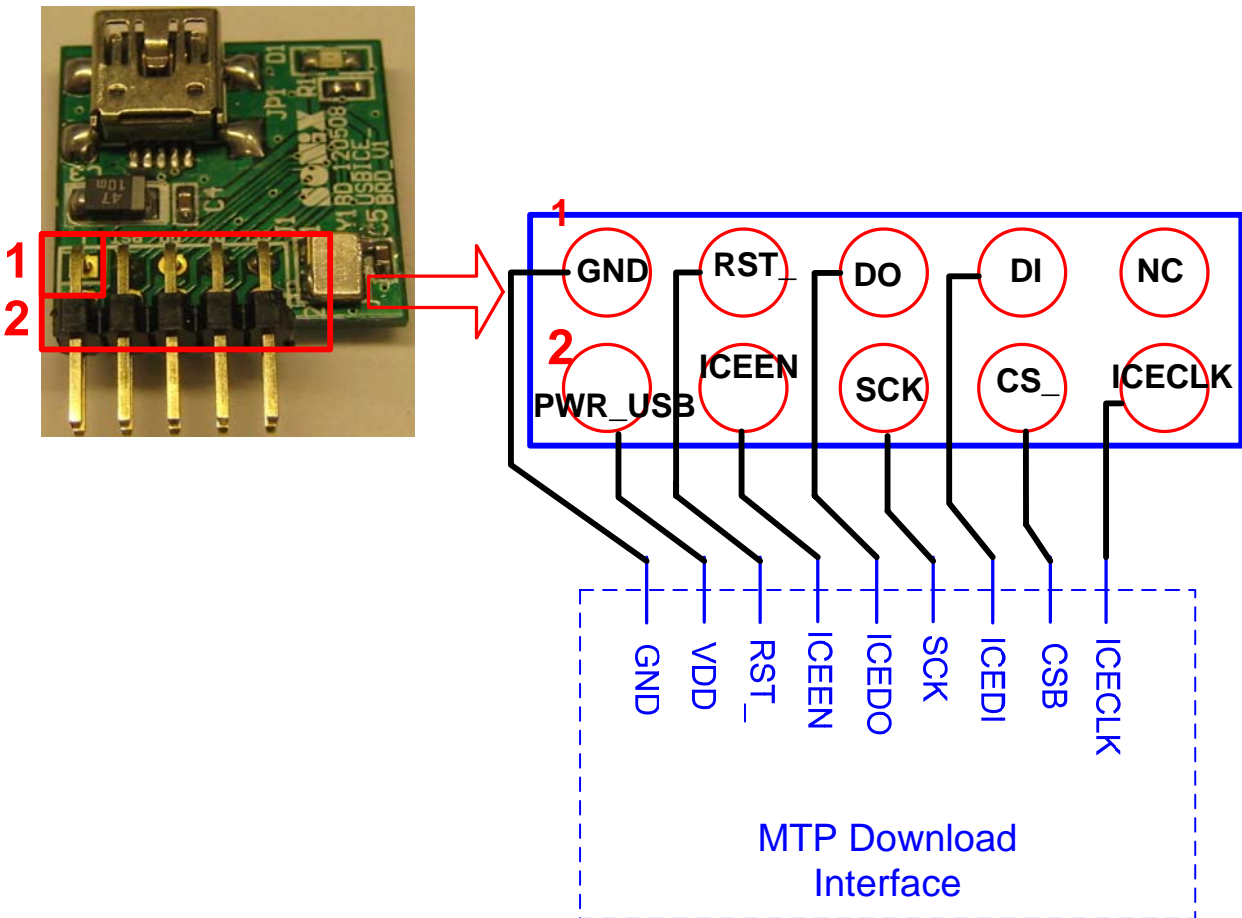


If user need to download code into MTP chip , you can plug in the USB adaptor and start to download the code through the SONiX flash writer

3V 3V power supply for Flash ROM

Note\* :  
The different capacitor values (0.1uF ~ 10uF) of C1 ~ C5 may be required for different LCD panel connected.

8. Connect to USB Adaptor





## 9. ELECTRICAL CHARACTERISTICS

Item	Sym.	Min	Typ.	Max.	Unit	Condition
Operating Voltage	V <sub>DD</sub>	2.4	-	5.5	V	
Standby Current 1	I <sub>SBY</sub>	-	3	-	uA	V <sub>DD</sub> =3V
Standby Current 2	I <sub>SBY</sub>	-	5	-	uA	V <sub>DD</sub> =5V
Normal mode operating current (2MIPS)	I <sub>NOPR</sub>	-	6	-	mA	V <sub>DD</sub> =3V, no load, push pull turned off. Execute "NOP" instruction
Normal mode operating current (1MIPS)	I <sub>NOPR</sub>	-	4	-	mA	
Normal mode operating current (0.5MIPS)	I <sub>NOPR</sub>	-	3	-	mA	
Normal mode operating current (0.25MIPS)	I <sub>NOPR</sub>	-	2.5	-	mA	
Idle mode operating current 1	I <sub>SOPR</sub>	-	30	-	uA	V <sub>DD</sub> =3V, CPU halt, Push-Pull off, LCD driver on, without panel.
Idle mode operating current 2	I <sub>SOPR</sub>	-	5	-	uA	V <sub>DD</sub> =3V, CPU halt, Push-Pull off, LCD driver off
Input pull high impedance of P0,P1	R <sub>i</sub>	-	650K	-	Ω	V <sub>DD</sub> =3V
Input pull low impedance of P0,P1	R <sub>i</sub>	-	1M	-	Ω	V <sub>DD</sub> =3V
P0,P1 Drive Current	I <sub>OD</sub>	-	4	-	mA	V <sub>DD</sub> =3V, V <sub>O</sub> =2.4V
P0,P1 Sink Current	I <sub>OS</sub>	-	6	-	mA	V <sub>DD</sub> =3V, V <sub>O</sub> =0.4V
Low voltage Reset (LVR)			2.4		V	
Push-Pull current	I <sub>PP</sub>	-	70	-	mA	V <sub>DD</sub> =3V, Output 1Khz Sin wave.
LCD driver voltage	V <sub>LCD</sub>		5		V	± 5% @ V <sub>DD</sub> =3V, 1/5 bias, LCDREGCR register = 0xD4, No load
Frequency shift	R <sub>osc</sub>		16.384		MHz	± 3% @3V
Input Low voltage	V <sub>IL</sub>	V <sub>SS</sub>	-	0.3* V <sub>DD</sub>	V	
Input high voltage	V <sub>IH</sub>	0.7* V <sub>DD</sub>	-	V <sub>DD</sub>	V	



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