巨華積体電路股份有限公司
APLUS INTEGRATED CIRCUITS INC.

AU1564/2064□
DATA SHEET

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一般規格:

AU1564, AU1564A, AU2064, AU2064A 乃一具有4-bit微處理器之單晶片語音合成器，它以LOGPCM之編碼方式，可合成長15, 20秒之語音。此4-bit微處理器具有4-bit ALU (算術邏輯單元)、1K＊15 bits ROM、64＊4bits RAM， I/O PORT、計時器、時脈產生器、LCD驅動器等特性，且有78個指令供使用者程式用；其中 Halt function (暫停功能) 可減少功率消耗。

特性：

1. 單一工作電壓範圍爲2.4 - 6 伏特。

2. 語音總長度可達15, 20秒, 且可分割成64語音段(section)。
(AU1564, AU1564A -->15秒； AU2064, AU2064A -->20秒)

3. 可由微處理器指令觸發語音訊號.。

4. 可配電晶體驅動8歐姆之喇叭，或直接驅動蜂鳴器或64歐姆之喇叭.。

5. 提供3x 24=72節(段)LCD驅動器，內裝HALVER電路.。

6. 內含時脈產生器。

7. 內含ROM容量：1024＊15bits。內含RAM容量：64＊4bits。

8. 2個4 bits輸入埠。(其中 AU1564, AU1564A 無 S4 pad)

9. 2個4 bits輸入/出埠。

10. 一個4bits輸出埠。

11. 一個控制輸出接腳。

12. 78個指令。

13. 4個階層副式槽。

14. 2個外部中斷因素 (INT, S&M port)。

15. 2個內部中斷因素 (Timer, Divider)。

16. 3個電流輸出位準 1.5mA, 3mA, 4.5mA 由光罩選定。
(其中AU1564, AU1564A無 COUT 輸出功能)

General Description:

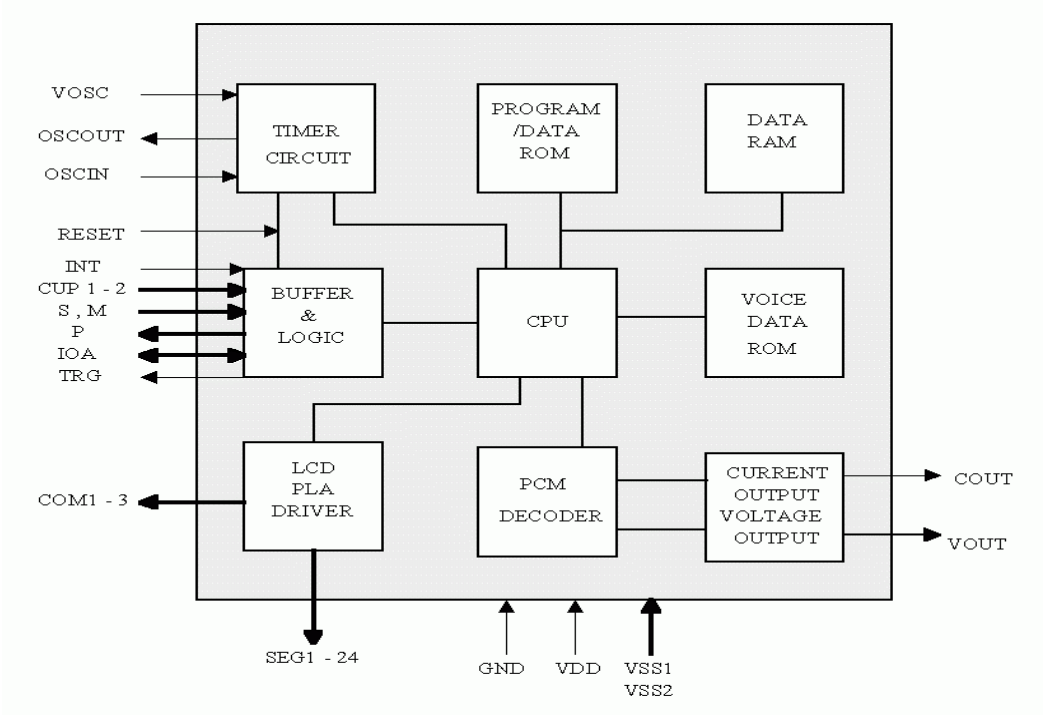
The **AU1564, AU1564A, AU2064, AU2064A** is a single chip voice synthesizer with 4-bit microprocessor. That can synthesize voice up to 15, 20 seconds by ALPHA qualified coding algorithm (LOGPCM).

The 4-bit microprocessor has various feature including 4-bit ALU, 1K×15 bits ROM, 64×4 bits RAM, I/O port, timer, clock generator, LCD driver, etc. The instruction set with 78 instructions. With the half function can minimize power dissipation.

Features:

1. Single power supply can operate from 2.4V through 6V
2. The total voice duration is about 15, 20 seconds could be partitioned up to 64 sections (AU1564, AU1564A -->15 seconds, AU2064, AU2064A -->20 seconds)
3. The voice can be triggered by microprocessor instructions
4. Current output could drive 8 ohm speaker with a transistor, VOUT could drive buzzer or 64 ohm directly.
5. LCD driver provided, up to 3× 24=72 segments. Build-in HALVER circuitry.
6. Build-in clock generator
7. Internal ROM: 1024×15 bits
   Internal RAM: 64×4 bits
8. Two 4-bit input ports (AU1564, AU1564A has no S4 pad)
9. Two 4-bit I/O ports
10. One 4-bit output port
11. One control output pins
12. 78 instructions
13. 4-level subroutine nesting (also used for interrupt)
14. Two external factors (INT, S & M port) for interrupt
15. Two internal factors (Timer , Divider) for interrupt
16. Three current output level 1.5mA, 3mA, 4.5mA is mask option (full scale). (AU1564, AU1564A has no COUT output function)

Block Diagram :



LCD Common Plate Usage:

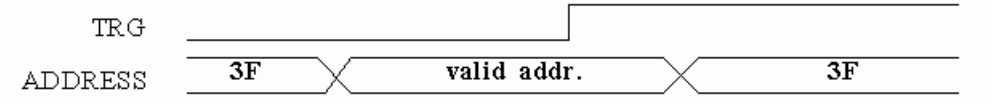
	Static	1/2 duty	1/3 duty
COM1	Yes	Yes	Yes
COM2	No	Yes	Yes
COM3	No	No	Yes
Alternating frequency	32Hz	32Hz	43Hz

Voice Trigger:

The voice circuitry will be Triggered in the rising edge of TRG signal. The Voice section address must be placed on I/OA and I/OB port.

I/OB2 I/OB1 I/OA4 I/OA3 I/OA2 I/OA1
(MSB) (LSB)

a)In power on state, TRG signal is reset to "LOW" level. TRG will stay at low level until the program set it to "HIGH" level.



b) Before triggering the voice circuitry, used the OIOA and OIOB instruction to place the voice section address on I/OA and I/OB port. The voice section address couldn't be changed until the rising edge of TRG signal.

c) After triggering voice, I/OA and I/OB ports must output 3F data or set to input mode. If not, there will be a standby current problem.

d) Example of playing voice subroutine:
Triggering the 26th(1Ah) section

```
LDS  3,1
LDS  4,A
OIOB 3   ; place voice section address to i/o port
OIOA 4
RF   4  ; trigger voice
SF   4
LDS  3,3
LDS  4,F
OIOA 4   ; output 3F data to I/O port
OIOB 3
```

Absolute Maximum Rating: (VDD=3V, VSS2=0V)

Symbol	Rating	Unit
VSS1	1.2-1.8	V
GND	0-0.6	V
CUP1	VSS2-VSS1	V
CUP2	VSS1-VDD	V
OSCIN	GND-VDD	V
OSCOUT	GND-VDD	V
S1-S4	VSS2-VDD	V
M1-M4	VSS2-VDD	V
IOA1-IOA4	VSS2-VDD	V
IOB1-IOB4	VSS2-VDD	V
INT/BUSY	VSS2-VDD	V

Symbol	Rating	Unit
RESET	VSS2-VDD	V
TRG	VSS2-VDD	V
P1-P4	VSS2-VDD	V
SEG1-24	VSS2-VDD	V
COM1-3	VSS2-VDD	V
VOUT1-2	VSS2-VDD	V
T(operating)	-10-+60	℃
T(storage)	-55-+125	℃

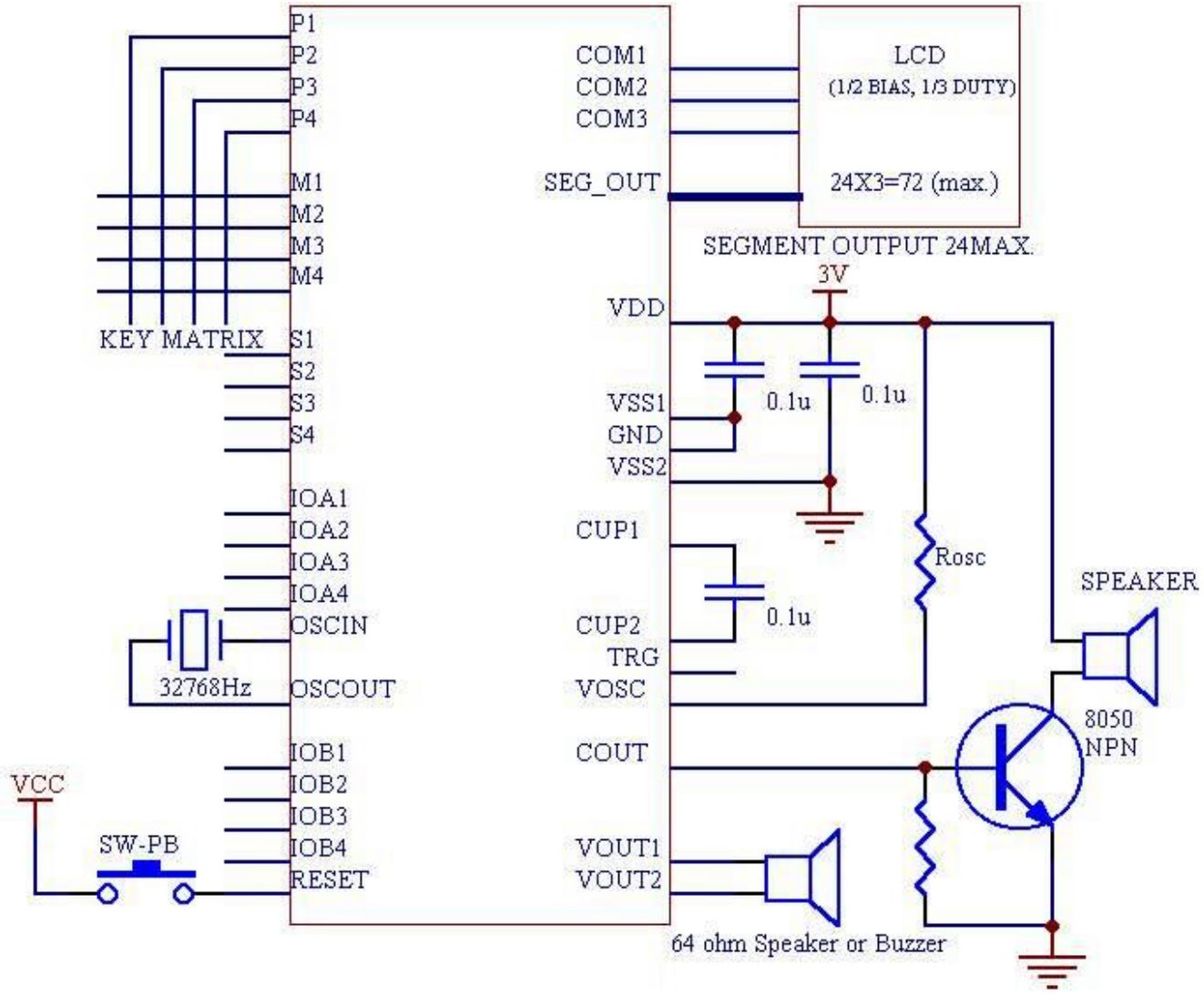
DC Characteristics :(VDD=3V, VSS=0V)

Symbol	Parameter	Min.	Tpy.	Max.	Unit	Condition
VDD	Operating Voltage	2.4	3	6	V	
ISB	Standby Current		1		uA	VDD=3V, no load
IOP	Operation Current				uA	
VOH1	Output High Voltage (IOA, IOB, P)		3		V	
VOL1	Output Low Voltage (IOA, IOB, P)		0		V	
VOH2	Output High Voltage (TRG)		3		V	
VOL2	Output Low Voltage (TRG)		0		V	
RI1	Input Resistance (S, M)		1.3		Mohm	"L"-level hold Tr.=OFF Pull-down Tr.=ON
R12	Input Resistance (S, M)		230		Kohm	"L"-level hold Tr.=ON Pull-down Tr.=OFF
R13	Input Resistance (INT/BUSY)				Kohm	
R14	Input Resistance (RESET)		16.8		Kohm	
IO1	O/P Current VOUT1, VOUT2					
ICO	O/P Current (COUT)		-1.5		mA	full scale
			-3			
			-4.5			
△F/F	Crystal Oscillator Frequency Stability				%	
△F/F	Voice Oscillator Frequency Variation				%	

Pad Description:

Pad No.	Pad Name	I/O	Function Description
1	VDD	P	Positive Power supply
2-3	CUP1-2	I	Voltage Halver Capacitor
4	OSCIN	I	Crystal Oscillator Input, 32768Hz
5	OSCOUT	I	Crystal Oscillator Output, 32768Hz
6	COM1	O	Common plate for LCD panel
7-30	SEG1-24	O	24 segment outputs for LCD panel
31	VDD	P	Positive Power supply
32-33	COM2-3	O	Common plate for LCD panel
34	GND	G	Backup negative power supply
35-36	VSS1-2	G	Negative power supply
37-38	S4-3	I	Input port
39	TRG	I	Audio output enable signal. Latch voice Section address
40-43	IOA1-4/S0-3	I/O	Voice section address. Internal pull-up
44	RESET	I	System reset
45	VOSC	I	Voice oscillator input
46	COUT	O	Audio signal current output
47	VOUT1	O	Audio signal voltage output
48	VSS2	G	Negative power supply
49	VOUT2	O	Audio signal voltage output
50-51	IOB1-2/S4-5	I/O	Voice section address. Internal pull-up.
52-53	IOB3-4	I/O	I/O port, 2 bits
54	INT/BUSY	I/O	Voice busy status, CPU interrupt request
55-58	P1-4	O	Output port
59-62	M1-4	I	Input port
63	N.C.	N.C.	
64-65	S2-1	I	Input port

Typical Application:

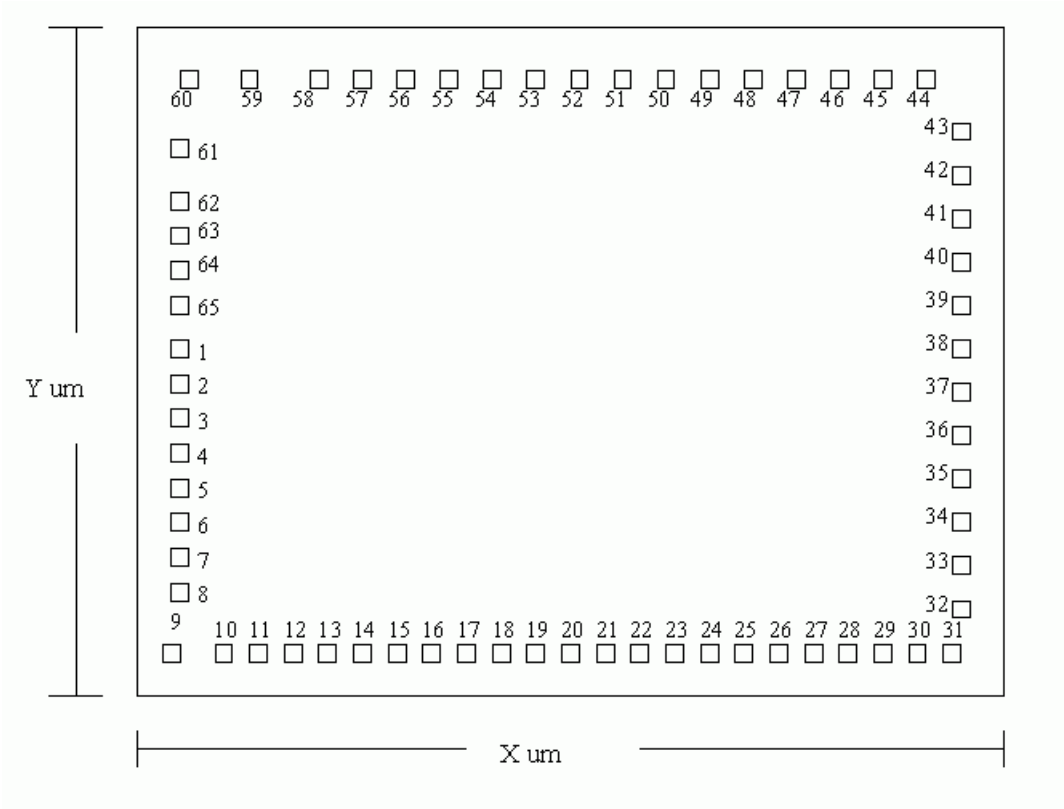


※ AU1564, AU1564A has no COUT output function

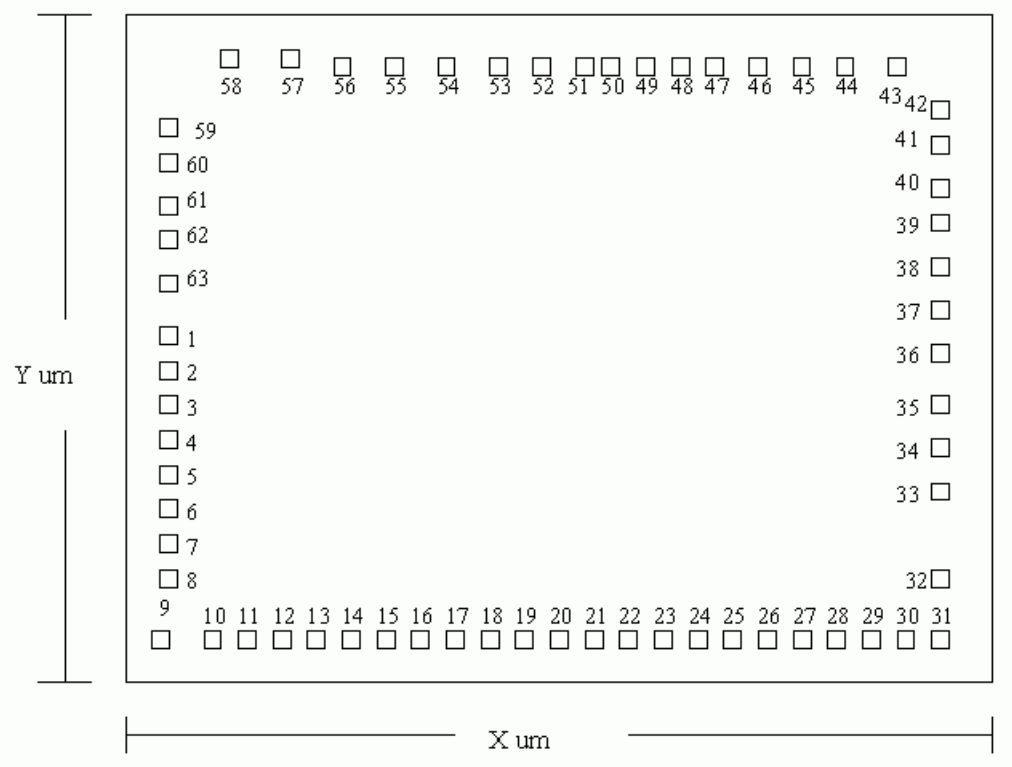
Bonding Diagram:

PRODUCT	X	Y	PAD Size (um^2)	Substrate	UNIT
AU2064 **AU2064A**	3530	2750	85 * 85	VDD	um
AU1564 **AU1564A**	3050	2540	80 * 80	VDD	um

FOR AU2064, AU2064A:



FOR AU1564, AU1564A:



AU2064, AU2064A pad location							
Pad No.	**Pad Name**	**X**	**Y**	**Pad No.**	**Pad Name**	**X**	**Y**
1	VDD	-1614.2	174.6	**34**	GND	1595.4	-455.1
2	CUP1	-1614.2	21.6	**35**	VSS1	1601.8	-302.1
3	CUP2	-1612.5	-131.4	**36**	VSS2	1618.1	-149.1
4	OSCIN	-1631.7	-284.4	**37**	S4	1631.7	3.9
5	OSCOUT	-1632.6	-530.2	**38**	S3	1631.7	190.1
6	CON1	-1631.7	-750.9	**39**	TRG	1631.7	343.1
7	SEG1	-1632.6	-903.9	**40**	IOA1	1631.7	496.1
8	SEG2	-1632.6	-1056.9	**41**	IOA2	1631.7	649.1
9	SEG3	-1632.6	-1209.9	**42**	IOA3	1631.7	802.1
10	SEG4	-1479.6	-1209.9	**43**	IOA4	1631.7	1070.2
11	SEG5	-1335.1	-1209.9	**44**	RESET	1364.4	1216.2
12	SEG6	-1190.6	-1209.9	**45**	VOSC	1146.8	1216.2
13	SEG7	-1046.1	-1209.9	**46**	COUT	757.5	1216.2
14	SEG8	-901.6	-1209.9	**47**	VOUT1	510.7	1188.6
15	SEG9	-757.1	-1209.9	**48**	VSS2	339.1	1192.0
16	SEG10	-612.6	-1209.9	**49**	VOUT2	167.5	1188.6
17	SEG11	-468.1	-1209.9	**50**	IOB1	-38.5	1216.2
18	SEG12	-323.6	-1209.9	**51**	IOB2	-191.5	1216.2
19	SEG13	-179.1	-1209.9	**52**	IOB3	-344.5	1216.2
20	SEG14	-34.6	-1209.9	**53**	IOB4	-497.5	1216.2
21	SEG15	109.9	-1209.9	**54**	INT	-667.5	1216.2
22	SEG16	254.4	-1209.9	**55**	P1	-820.5	1216.2
23	SEG17	398.9	-1209.9	**56**	P2	-973.5	1216.2
24	SEG18	543.4	-1209.9	**57**	P3	-1126.5	1216.2
25	SEG19	687.9	-1209.9	**58**	P4	-1279.5	1216.2
26	SEG20	832.4	-1209.9	**59**	M1	-1432.5	1216.2
27	SEG21	976.9	-1209.9	**60**	M2	-1603.4	1216.2
28	SEG22	1121.4	-1209.9	**61**	M3	-1631.7	972.7
29	SEG23	1265.9	-1209.9	**62**	M4	-1631.7	819.7
30	SEG24	1410.4	-1209.9	**63**	TESTA	-1631.7	666.7
31	VDD	1554.9	-1209.9	**64**	S2	-1631.7	513.7
32	COM3	1631.7	-1056.9	**65**	S1	-1631.7	327.6
33	COM2	1631.7	-608.1				

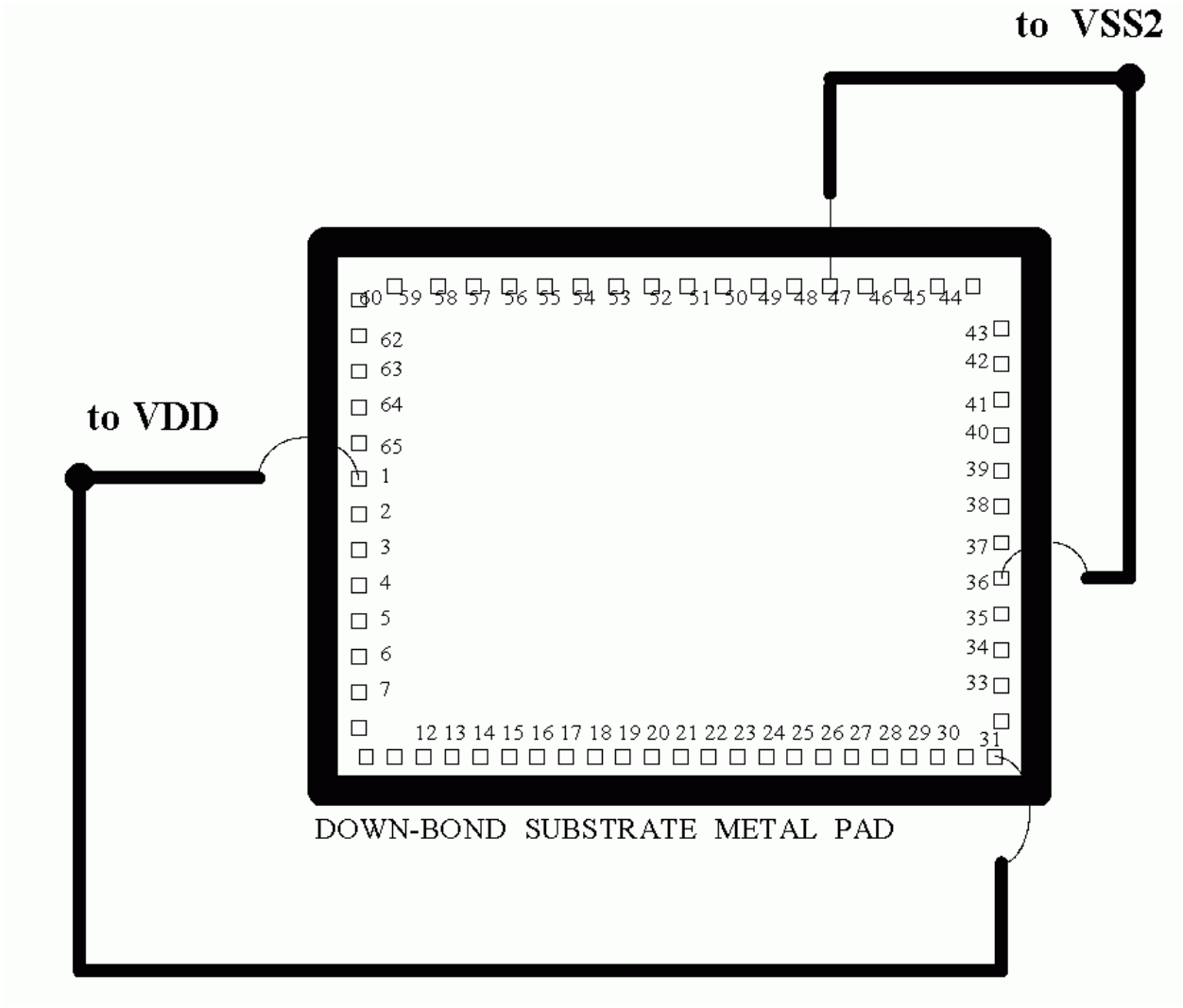
AU1564, AU1564A pad location							
Pad No.	**Pad Name**	**X**	**Y**	**Pad No.**	**Pad Name**	**X**	**Y**
1	VDD	-1380.6	164.3	**33**	COM2	1397.16	-232.64
2	CUP1	-1380.6	20.3	**34**	GND	1362.92	-83.84
3	CUP2	-1379	-123.7	**35**	VSS1	1369	52.16
4	OSCIN	-1397.16	-267.7	**36**	VSS2	1384.36	188.16
5	OSCOUT	-1397.96	-496.72	**37**	S3	1397.16	357.76
6	COM1	-1397.16	-695.92	**38**	TRG	1397.16	484.96
7	SEG1	-1397.96	-830.32	**39**	IOA1	1397.16	614.56
8	SEG2	-1397.96	-968.72	**40**	IOA2	1397.16	743.2
9	SEG3	-1397.96	-1127.92	**41**	IOA3	1397.16	872.8
10	SEG4	- 1273.96	-1138.72	**42**	IOA4	1397.16	1012.8
11	SEG5	-1149.96	-1138.72	**43**	RESET	1154.2	1144.6
12	SEG6	-1025.96	-1138.72	**44**	VOSC	946.6	1144.6
13	SEG7	-901.96	-1138.72	**45**	VOUT1	692.28	1118.7
14	SEG8	-777.96	-1138.72	**46**	VSS2	530.76	1121.8
15	SEG9	-653.96	-1138.72	**47**	VOUT2	369.24	1118.7
16	SEG10	-529.96	-1138.72	**48**	IOB1	70.92	1144.6
17	SEG11	-405.96	-1138.72	**49**	IOB2	-66.68	1144.6
18	SEG12	-281.96	-1138.72	**50**	IOB3	-199.48	1144.6
19	SEG13	-157.96	-1138.72	**51**	IOB4	-337.08	1144.6
20	SEG14	-33.96	-1138.72	**52**	INT	-491.48	1144.6
21	SEG15	90.04	-1138.72	**53**	P1	-635.48	1144.6
22	SEG16	214.04	-1138.72	**54**	P2	-779.48	1144.6
23	SEG17	338.04	-1138.72	**55**	P3	-923.48	1144.6
24	SEG18	462.04	-1138.72	**56**	P4	-1067.48	1144.6
25	SEG19	586.04	-1138.72	**57**	M1	-1211.48	1144.6
26	SEG20	710.04	-1138.72	**58**	M2	- 1372.36	1144.6
27	SEG21	834.04	-1138.72	**59**	M3	-1397.16	915.5
28	SEG22	958.04	-1138.72	**60**	M4	- 1397.16	771.5
29	SEG23	1082.04	-1138.72	**61**	TESTA	-1397.16	627.5
30	SEG24	1206.04	-1138.72	**62**	S2	-1397.16	483.5
31	VDD	1330.04	-1138.72	**63**	S1	-1397.16	308.3
32	COM3	1397.16	-645.44				

PCB layout notice:

1. Use two lines to connect PAD1 and PAD31. The VDD line connected to PAD31 should be wider than another one. Because PAD31 must supply the higher current.

2. Use two VSS2 lines to connect PAD36 and PAD48 (for AU1564 and AU1564A, connect PAD 36 and PAD 46). The VSS2 line connected to PAD48 (for AU1564 and AU1564A, connect PAD 46) should be wider than another one. Because PAD48(for AU1564 and AU1564A, PAD 46) must sink the higher current.

3. Use the VDD line connected to PAD1 as the down-bond substrate.



***NOTE : all data and specification are subject to change without notice.**