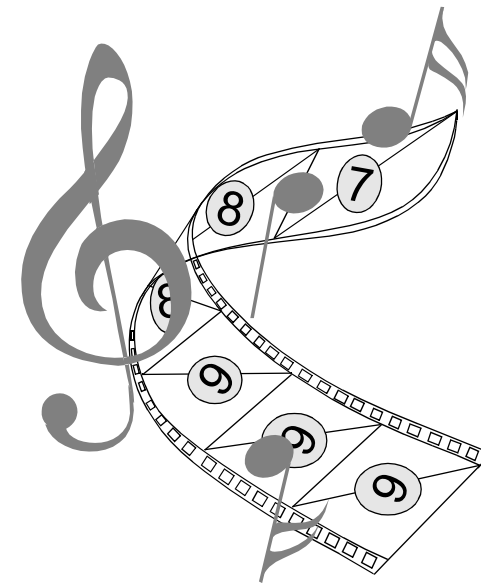


# **ALS100/L/M Integrated Audio Subsystems Design Manual**

**Document Number 10068 2.0**  
**11/07/95**



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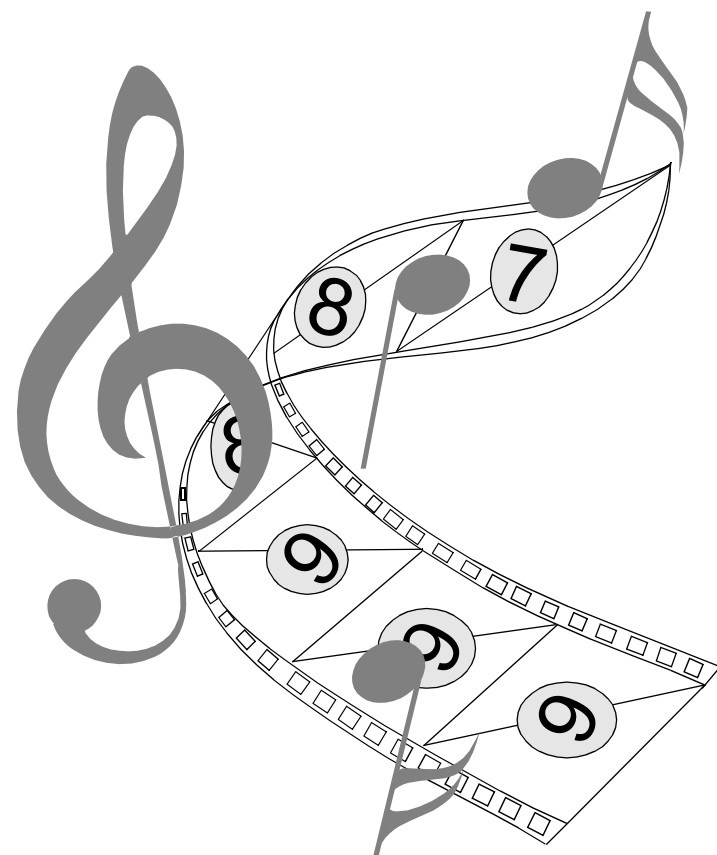
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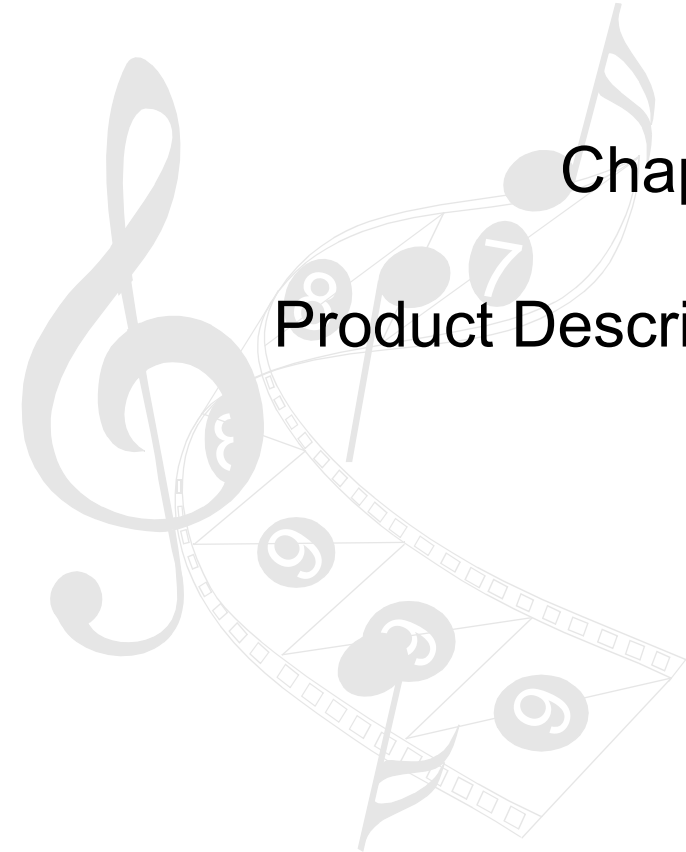
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# Chapter 1

## Product Description





## Introduction

Sound system designs based on the ALS100/L/M Integrated Audio Subsystems are true Plug and Play surround sound systems.

ALS100/L/M Integrated Audio Subsystems bring forth a new age of highly-integrated, single chip sound products. They are cost-efficient audio solutions for motherboard and add-in card implementations. Avance Logic, Inc. has taken the approach of integrating the following functions into a single ASIC.

- Subsystem control logic
- Digital to analog and analog to digital converters
- Mixer functions
- Digital to analog conversion for synthesizer and surround sound functions
- Game/MIDI port (ALS100M requires external circuitry)
- CD-ROM controller (ATAPI IDE - ALS100 and ALS100L/ ATAPI IDE, Sony, Mitsumi, Panasonic, or SCSI II - ALS100M)

By bringing these functions into a single ASIC, the overall product cost is reduced. Additionally, reliability and compatibility are improved by the reduced number of components required to build a sound system.

ALS100/L/M Integrated Audio Subsystems fully support the ISA Plug and Play standard. For non-ISA Plug and Play compatible systems, a software utility is available that sets the IRQ and DMA addresses. Add-in sound cards and motherboard implementations designed around the ALS100/L/M Integrated Audio Subsystems are completely jumper and switch free.

ALS100/L/M Integrated Audio Subsystems support the following functions:

- Audio Input
  - CD-ROM Audio
  - Monaural In
  - Stereo Line In
  - Microphone In
- Audio Output
  - Stereo Line Out
  - Stereo Main/Surround Sound Out
- Game/MIDI Port (ALS100M requires external circuitry)
  - External MIDI input and output
  - Joystick input
- FM/Wavetable
  - Optional Yamaha OPL3 FM synthesizer
  - Optional Yamaha OPL4 Wavetable synthesizer
- CD-ROM Controller
  - ATAPI IDE
  - Sony (ALS100M only)
  - Panasonic (ALS100M only)
  - Mitsumi (ALS100M only)
  - SCSI External Controller Input (ALS100M only)

Support for the SCSI CD-ROM is provided by the built-in support for an external SCSI controller and support for the FM and the wavetable synthesizers is provided by the built-in support for external Yamaha OPL3 FM synthesizer and Yamaha OPL4 Wavetable synthesizer ASICs.

## Hardware Features

- Single, mixed-signal, high performance VLSI sound ASIC
- Six software selectable DMA lines (0, 1, 3, 5, 6, 7)
- Seven software selectable interrupt lines (5, 7, 9, 10, 11, 12, 15)
- 8-bit ISA Plug and Play bus interface
- 8-bit or 16-bit CD-ROM interface
- 8-bit or 16-bit DMA interface with FIFO
- Game port
- MIDI port with input and output FIFO
- 8-bit or 16-bit mono/stereo digital audio from 4 kHz to 48 kHz
- Full duplex for concurrent recording and playback
- 16-bit Type F ISA DMA interface

## Built-in Functional Blocks

- ISA Plug and Play support logic and resource ROM
- High speed 16-bit digital to analog and analog to digital converters with filters
- Yamaha OPL3/4 FM/Wavetable Synthesizer address decode
- Digital to analog converter to support external FM/wavetable synthesis
- Thirty-two level stereo audio mixer with six input sources (DAC, synthesizer, monaural in, microphone in, line in, and CD audio)
- Built-in amplifier for the microphone input
- ADPCM decompression engine
- High speed 8-bit or 16-bit DMA interface with FIFO
- MPU-401 MIDI controller with FIFO
- CD-ROM controller

## Software Support

- Windows 3.1
- Windows 95
- Windows NT 3.5 (future release)
- Windows Sound System
- OS/2 Warp (future release)
- All DOS based games

## Compatibility

- Adlib
- All Sound Blaster Pro applications
- All Sound Blaster 16 applications
- Yamaha OPL3 FM Synthesizer
- Yamaha OPL4 Wavetable Synthesizer
- MPU-401 UART MIDI

## Applications

- 16-bit stereo sound cards
- PC motherboard based sound systems
- PC Notebook sound systems (ALS100L)
- MIDI controller
- Game port
- CD-ROM controller
- Wavetable card support

**Emulation**

- Sound Blaster Pro
- Sound Blaster 16
- Sound Blaster ADPCM
- MPU-401 UART MIDI interface

**External Support**

- Yamaha OPL3 FM Synthesizer
- Yamaha OPL4 Wavetable Synthesizer
- SCSI II CD-ROM controller

## Connector Support

- Wavetable Connector
  - Wavetable cards
- Game/MIDI Port (ALS100M requires external circuitry)
  - External MIDI input and output
  - Joystick
- Audio Out
  - Stereo Line Out
  - Main/SS Out
- Audio In
  - CD-ROM Audio
  - Stereo Line In
  - Microphone In
  - Monaural In
- CD-ROM Control
  - ATAPI IDE
  - Sony (ALS100M only)
  - Mitsumi (ALS100M only)
  - Panasonic (ALS100M only)
- SCSI II CD-ROM (ALS100M only)
  - External controller required

Technical Specifications

Analog Characteristics

- Assumptions:
- Ambient temperature (T<sub>A</sub>) ..... 25 ° C
  - Voltage, Analog (VA)..... +5.0/3.3 V\*
  - Voltage, Digital (VD)..... +5.0/3.3 V\*
  - Voltage, Filtered Digital (VFD) ..... +5.0/3.3 V\*
  - Input levels:
    - Logical 0 ..... 0 V
    - Logical 1 ..... VD
  - Input signal ..... 1 kHz sine wave
  - Sample frequency (F<sub>S1</sub>)..... 48 kHz
  - Sample frequency (F<sub>S2</sub>)..... 8 kHz
  - Measurement bandwidth (16-bit linear coding) ..... 20 Hz to 20 kHz

\* +5.0 V for the ALS100/M and +3.3 V for the ALS100L

Parameter		Min	Typ	Max	Units
Analog Input Characteristics - Minimum Gain Setting (0 dB); unless otherwise specified.					
ADC Resolution		-	16	-	Bits
ADC Differential Non-linearity		-	-	±0.5	LSB
Instantaneous Dynamic Range (IDR)		-	80	-	dB
Total Harmonic Distortion (THD)		-	0.04	-	%
Inter-channel Isolation		-	70	-	dB
Left/right channel separation		-	76	-	dB
Inter-channel Gain Mismatch	Line Inputs	-	-	0.5	dB
	Mic Inputs			0.5	dB
Programmable Input Gain Span	Line Inputs	21.5	22.5	-	dB

(Table continued from previous page.)

Parameter	Min	Typ	Max	Units
Gain Step Size (32 levels)	1.3	1.5	1.7	dB
ADC Offset Error 0 dB gain	-	10	100	LSB
Full Scale Input Voltage (MGE=1) Mic Inputs (MGE=0) Mic Inputs LINE, CD-Audio, Music Inputs	0.26 2.6 2.6	0.28 2.8 2.8	0.31 3.1 3.1	V <sub>PP</sub> V <sub>PP</sub> V <sub>PP</sub>
Gain Drift	-	100	-	ppm/°C
Input Resistance	47	-	-	kΩ
Input Capacitance	-	-	15	pF
<b>Analog Output Characteristics</b> - Minimum attenuation (0 dB); unless otherwise specified.				
DAC Resolution	16	-	-	Bits
ADC Differential Non-linearity	-	-	±0.5	LSB
Total Dynamic Range (TDR) All Outputs	-	95	-	dB
Instantaneous Dynamic Range (IDR) All Outputs	-	80	-	dB
Total Harmonic Distortion (THD)	-	0.04	-	%
Inter-channel Isolation Line Out	-	70	-	dB
Inter-channel Gain Mismatch Line Out	-	-	0.2	dB
Voltage Reference Output - VREF	-	2.25	-	V
Voltage Reference Output Current - VREF	-	100	-	μA
DAC Programmable Attenuation Span	93	94.5	-	dB
DAC Attenuation Step Size 0 dB to -81 dB -82.5 dB to -94.5 dB	1.3 1.0	1.5 1.5	1.7 2.0	dB dB
DAC Offset Voltage	-	1	10	mV

(Table continued from previous page.)

Parameter		Min	Typ	Max	Units
Full Scale Output Voltage	OLB = 0	1.8	2.0	2.25	V <sub>PP</sub>
	OLB = 1     OUT, MOUT	2.6	2.9	3.2	V <sub>PP</sub>
Gain Drift		-	100	-	ppm/°C
Deviation from Linear Phase		-	-	1	degrees
Mute Attenuation (0 dB)		-	80	-	dB
Total Out-of-Band Energy	0.6xFs <sub>1</sub> to 100 kHz	-	-	-45	dB
Audible Out-of-Band Energy	0.6xFs <sub>2</sub> to 22 kHz	-	-	-70	dB
Signal to Noise Ratio		70	-	-	dB
Output Power Rating	Main/SS Out (4Ω speakers)	-	-	2	W/chnl
Power Supply					
Power Supply Current	Digital, Operating	-	61	110	mA
	Analog, Operating	-	41	60	mA
	Total	-	102	170	mA
	Digital, Power Off	-	100	300	μA
	Analog, Power Off	-	100	300	μA
Power Supply Rejection		40	-	-	dB

**Note:** These values are based on characterizations, not on production testing.

Mixers

- Assumptions:
- Ambient temperature (T<sub>A</sub>) ..... 25 ° C
  - Voltage, Analog (VA) ..... +5.0/3.3 V\*
  - Voltage, Digital (VD)..... +5.0/3.3 V\*
  - Voltage, Filtered Digital (VFD) ..... +5.0/3.3 V\*
  - Input levels:
    - Logical 0 ..... 0 V
    - Logical 1 ..... VD
  - Input signal ..... 1 kHz sine wave

\* +5.0 V for the ALS100/M and +3.3 V for the ALS100L

Parameter		Min	Typ	Max	Units
Mixer Gain Range Span	Line, CD-ROM, Music	45	46.5	-	dB
	Monaural	42	45	-	dB
	Master	26	30	-	dB
Step Size	Line, CD-ROM, Music	1.3	1.5	1.7	dB
	Monaural	2.3	3.0	3.4	dB
	Master	1.6	2.0	2.4	dB

**Note:** These values are based on characterizations, not on production testing.

Maximum Ratings

- Assumptions:
- Analog Ground (AGND) ..... 0 V
  - Digital Ground (DGND) ..... 0 V
  - Signal Ground (SGND)..... 0 V
  - All voltages measured with respect to: ..... 0 V

Parameter	Min	Max	Units
Power Supplies			
Digital (VD)	-0.3	6.0	V
Filtered Digital (VFD)	-0.3	6.0	V
Analog (VA)	-0.3	6.0	V
Total Power Dissipation (Supplies, Inputs, Outputs)	-	1.0	W
Input Current per Pin (Except Supply Pins)	-10.0	+10.0	mA
Output Current per Pin (Except Supply Pins)	-50	+50	mA
Analog Input Voltage	-0.3	VA+0.3	V
Digital Input Voltage	-0.3	VD+0.3	V
Operating Temperature Range	0	+70	°C
Storage Temperature	-50	+125	°C
Electrostatic Protection (ESD) c = 100pf, R = 1.5K Ω	2000	-	V

**Warning:** Operation beyond these limits may result in permanent damage to the ASIC.  
Normal operation is not guaranteed at these extremes.

Timing Parameters

- Assumptions:
- Ambient temperature (T<sub>A</sub>) ..... 25 ° C
  - Voltage, Analog (V<sub>A</sub>) ..... +5.0/3.3 V\*
  - Voltage, Digital (V<sub>D</sub>)..... +5.0/3.3 V\*
  - Input levels:
    - Logical 0 ..... 0 V
    - Logical 1 ..... V<sub>D</sub>
  - Outputs loaded with: ..... 30 pF

\* +5.0 V for the ALS100/M and +3.3 V for the ALS100L

Parameter	Symbol	Min	Max	Units
OSC (14.318 MHz) Frequency	tOSCP	14.000	14.500	MHz
OSC High Width	tOSCH	32	40	ns
OSC Low Width	tOSCL	32	40	ns
SYSCLK Frequency	-	8	9	MHz
SYSCLK High Width	-	50	70	ns
SYSCLK Low Width	-	55	70	ns
-IOR/-IOW Command Width	tCMD	120	-	ns
Write Data Setup to -IOW Rising	tWDS	30	-	ns
Write Data Hold from -IOW Rising	tWDH	15	-	ns
Read Access Time	tRAC	20	50	ns
Address Setup to -IOR/-IOW Falling	tAS	50	-	ns
Address Hold from -IOR/-IOW Rising	tAH	30	-	ns
-DACK Setup to -IOR/-IOW Falling	tDKS	40	-	ns
-DACK Hold from -IOR/-IOW Rising	tDKH	160	-	ns

(Table continued from previous page.)

Parameter	Symbol	Min	Max	Units
SD Hold from -IOR Rising	tDH	0	20	ns
DRQ Hold from -IOR/-IOW Falling	tDRH	0	25	ns
XTAL Frequency	-	-	14.318	MHz
XTAL High Time	-	18	-	ns
XTAL Low Time	-	18	-	ns
Sample Frequency	-	3.918	50	kHz

**Note:** These values are based on characterizations, not on production testing.

Operating Environment

Assumptions:

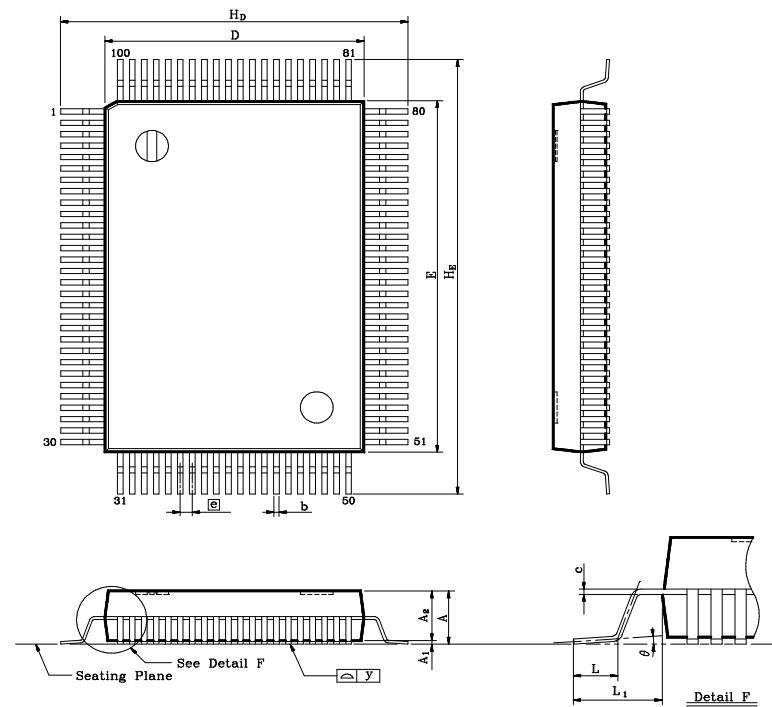
- Analog Ground (AGND) ..... 0 V
- Digital Ground (DGND) ..... 0 V
- Signal Ground (SGND)..... 0 V
- All voltages are measured with respect to: ..... 0 V

Parameter		Min	Typ	Max	Units
Power Supplies (ALS100/M)	Digital (VD)	4.75	5.0	5.25	V
	Filtered Digital (VFD)	4.75	5.0	5.25	V
	Analog (VA)	4.75	5.0	5.25	V
Power Supplies (ALS100L)	Digital (VD)	3.0	3.3	5.25	V
Operating Ambient Temperature (T <sub>A</sub> )		0	25	70	°C

# Operating Systems Supported

- Windows 3.1
- Windows 95
- Windows NT 3.5 (future release)
- DOS
- OS/2 Warp (future release)

ALS100/M Physical Description

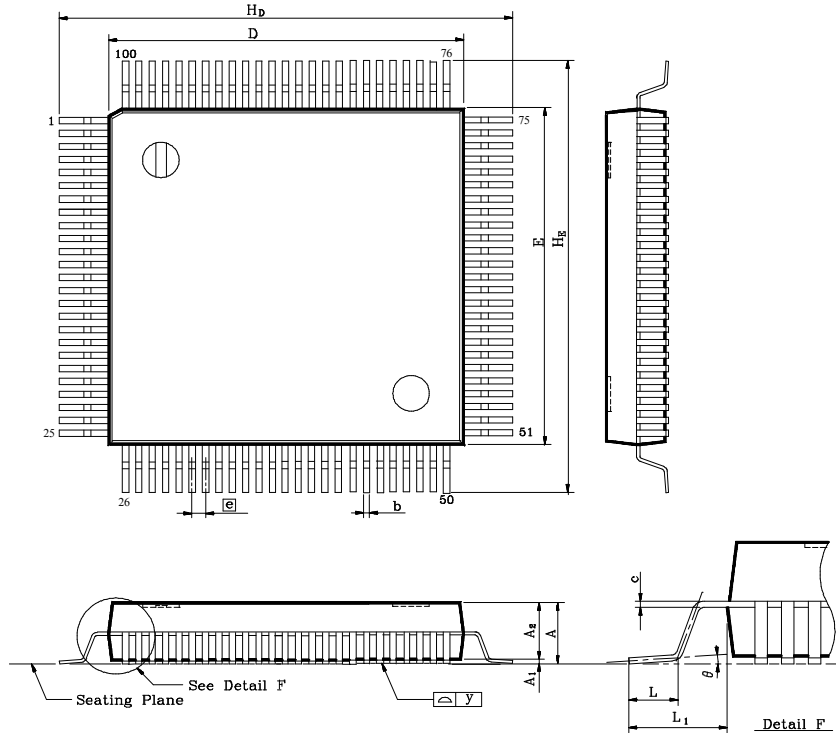


Symbol	Dimensions in inches			Dimensions in mm		
	Min	Typ	Max	Min	Typ	Max
A	0.106	0.118	0.130	2.70	3.00	3.30
A <sub>1</sub>	0.004	0.020	0.036	0.11	0.51	0.91
A <sub>2</sub>	0.102	0.112	0.122	2.60	2.85	3.10
b	0.007	0.012	0.017	0.18	0.30	0.42
c	0.002	0.006	0.010	0.04	0.15	0.26
D	0.541	0.551	0.561	13.75	14.00	14.25
E	0.778	0.787	0.797	19.75	20.00	20.25
$\square$	0.020	0.026	0.031	0.50	0.65	0.80
H <sub>D</sub>	0.726	0.740	0.754	18.45	18.80	19.15
H <sub>E</sub>	0.963	0.976	0.990	24.45	24.80	25.15
L	0.039	0.047	0.055	1.00	1.20	1.40
L <sub>1</sub>	0.089	0.094	0.104	2.25	2.40	2.65
y	-	-	0.04	-	-	0.10
$\theta$	0 to 12°					

- Notes:
- 1.Dimensions D and E do not include interlead flash.
  - 2.Dimension b does not include dambar protrusion/intrusion.
  - 3.Controlling dimension: Millimeter
  - 4.General appearance spec. should be based on final visual inspection spec.

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LEADFRAME MATERIAL			
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Avance Logic, Inc.			

ALS100L Physical Description

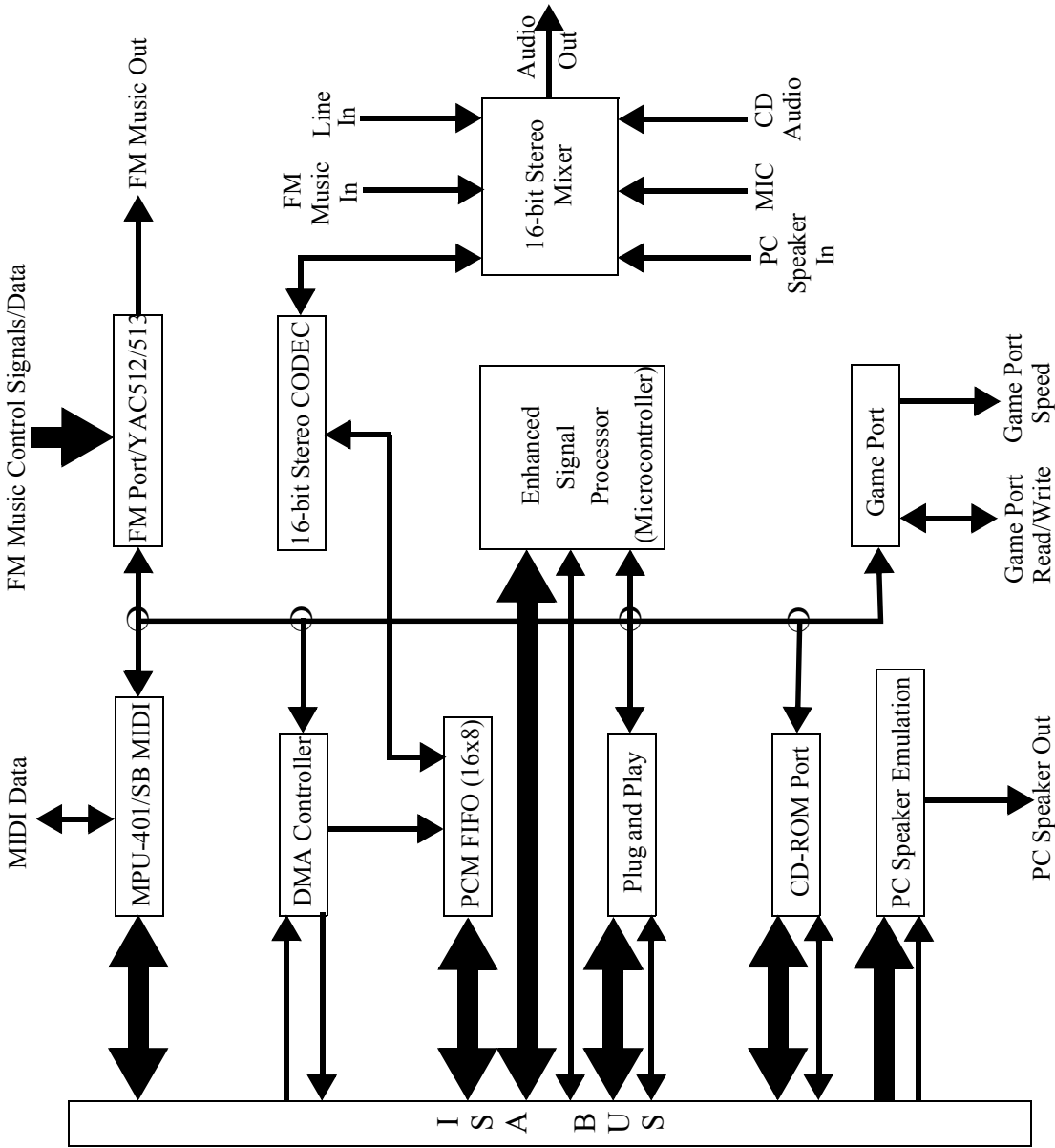


Symbol	Dimensions in inches			Dimensions in mm		
	Min	Typ	Max	Min	Typ	Max
A	-	-	0.063	-	-	1.60
A <sub>1</sub>	0.002	-	-	0.05	-	-
A <sub>2</sub>	0.053	0.055	0.057	1.35	1.4	1.45
b	0.008 BSC			0.20 BSC		
c	0.005	-	0.007	0.12	-	0.17
D	0.547	0.551	0.555	13.90	14.00	14.10
E	0.547	0.551	0.555	13.90	14.00	14.10
⌀	0.020 BSC			0.50 BSC		
H <sub>D</sub>	0.624	0.630	0.636	15.65	16.00	16.15
H <sub>E</sub>	0.624	0.630	0.636	15.65	16.00	16.15
L	0.014	0.020	0.025	0.35	0.50	0.65
L <sub>1</sub>	0.039 REF			1.00 REF		
y	-	-	0.003	-	-	0.008
θ	0 to 7°					

- Notes:
1. Dimensions D and E do not include interlead flash.
  2. Dimension b does not include dambar protrusion/intrusion.
  3. Controlling dimension: Millimeter
  4. General appearance spec. should be based on final visual inspection spec.

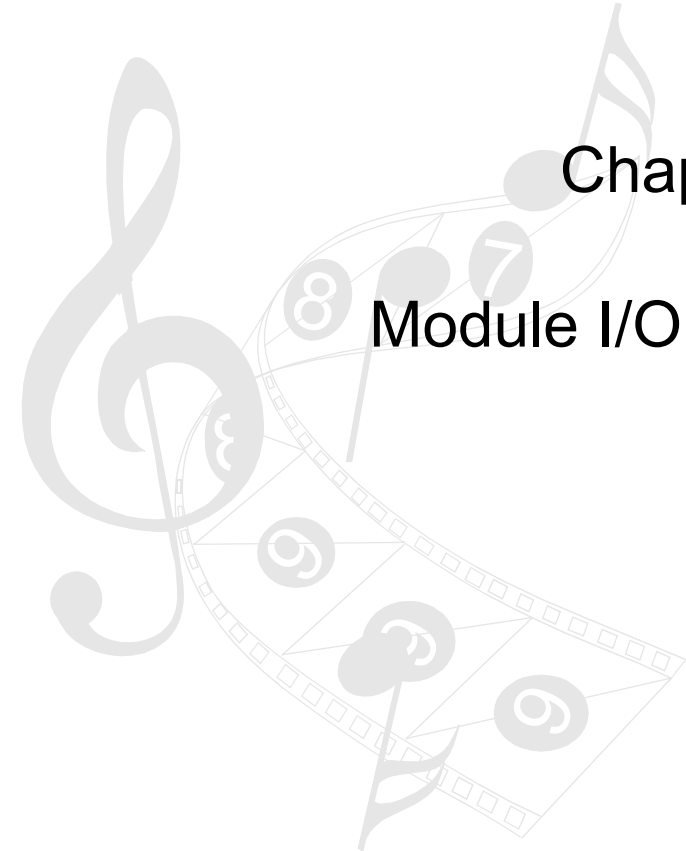
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LEADFRAME MATERIAL			
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		VERSION	1.1
		PAGE	1 OF 1
CHECK		DWG NO.	TQFP100Z.DOC
		DATE	October 26, 1995
Avance Logic, Inc.			

Block Diagram



## Chapter 2

### Module I/O Pins





I/O Pins Chart

ISA Address

Item	Pin Name	Type	Pin No.	Description
1	SA0	I	4	ISA System Address Bit 0
2	SA1	I	5	ISA System Address Bit 1
3	SA2	I	6	ISA System Address Bit 2
4	SA3	I	7	ISA System Address Bit 3
5	SA4	I	8	ISA System Address Bit 4
6	SA5	I	10	ISA System Address Bit 5
7	SA6	I	11	ISA System Address Bit 6
8	SA7	I	13	ISA System Address Bit 7
9	SA8	I	14	ISA System Address Bit 8
10	SA9	I	15	ISA System Address Bit 9
11	SA10	I	16	ISA System Address Bit 10
12	SA11	I	17	ISA System Address Bit 11
13	SAEN	I	18	ISA DMA Address Enable

ISA Data

Item	Pin Name	Type	Pin No.	Description
14	SD0	I/O	96	ISA System Data Bit 0
15	SD1	I/O	97	ISA System Data Bit 1
16	SD2	I/O	98	ISA System Data Bit 2
17	SD3	I/O	99	ISA System Data Bit 3
18	SD4	I/O	100	ISA System Data Bit 4
19	SD5	I/O	1	ISA System Data Bit 5
20	SD6	I/O	2	ISA System Data Bit 6
21	SD7	I/O	3	ISA System Data Bit 7
22	SD8	I/O	95	ISA System Data Bit 8
23	SD9	I/O	94	ISA System Data Bit 9
24	SD10	I/O	93	ISA System Data Bit 10
25	SD11	I/O	89	ISA System Data Bit 11
26	SD12	I/O	88	ISA System Data Bit 12
27	SD13	I/O	86	ISA System Data Bit 13
28	SD14	I/O	85	ISA System Data Bit 14
29	SD15	I/O	84	ISA System Data Bit 15

ISA Control

Item	Pin Name	Type	Pin No.	Description
30	-SIOR	I	25	-ISA I/O Read Strobe
31	-SIOW	I	26	-ISA I/O Write Strobe
32	RESET	I	28	ISA System Reset
33	XCLK	O	81	Oscillator Output
34	XTALO	O	82	Crystal Out
35	XTALI	I	83	Crystal In

ISA DMA

Item	Pin Name	Type	Pin No.	Description
36	DRQ0	hiZ	58	ISA DMA Request 0
37	DRQ1	hiZ	21	ISA DMA Request 1
38	DRQ3	hiZ	23	ISA DMA Request 3
39	DRQ5	hiZ	60	ISA DMA Request 5
40	DRQ6	hiZ	62	ISA DMA Request 6
41	DRQ7	hiZ	64	ISA DMA Request 7
42	-DACK0	I	57	-ISA DMA Acknowledge 0
43	-DACK1	I	22	-ISA DMA Acknowledge 1
44	-DACK3	I	24	-ISA DMA Acknowledge 3
45	-DACK5	I	59	-ISA DMA Acknowledge 5
46	-DACK6	I	61	-ISA DMA Acknowledge 6
47	-DACK7	I	63	-ISA DMA Acknowledge 7

**ISA Interrupt**

Item	Pin Name	Type	Pin No.	Description
48	IRQ5	hiZ	19	ISA Interrupt Request 5
49	IRQ7	hiZ	20	ISA Interrupt Request 7
50	IRQ9	hiZ	27	ISA Interrupt Request 9
51	IRQ10	hiZ	53	ISA Interrupt Request 10
52	IRQ11	hiZ	54	ISA Interrupt Request 11
53	IRQ12	hiZ	55	ISA Interrupt Request 12
54	IRQ15	hiZ	56	ISA Interrupt Request 15

**MIDI Interface**

Item	Pin Name	Type	Pin No.	Description
55	MIDIOUT	I/O	70	MIDI Serial Output/MPU401 Configuration
56	MIDIIN	I	71	MIDI Serial Input

Analog Audio

Item	Pin Name	Type	Pin No.	Description
57	LINE-L	I	43	External Line Input Left
58	LINE-R	I	44	External Line Input Right
59	MIC	I	45	Microphone Input
60	CDL	I	48	External CD Audio Input Left
61	CDR	I	49	External CD Audio Input Right
62	SSRIGHT	O	34	Surround Sound Right Output
63	SSLEFT	O	36	Surround Sound Left Output
64	MUSIC-L	I	39	External Wavetable Synthesizer Input Left
65	MUSIC-R	I	40	External Wavetable Synthesizer Input Right
66	ALEFT	O	41	Audio Mixer Left Output
67	ARIGHT	O	42	Audio Mixer Right Output
68	VREF1	O	30	2.5 V Reference Voltage Output
69	VREF2	O	51	2.5 V Reference Voltage Output
70	ADL-F	I	32	Left A/D Converter Anti-alias Filter
71	ADR-F	I	47	Right A/D Converter Anti-alias Filter
72	DACL	O	37	Left D/A Converter Low-pass Smooth Filter
73	DACR	O	38	Right D/A Converter Low-pass Smooth Filter
74	MONO-I	O	46	PC Speaker Low-pass Smooth Filter

External FM Synthesizer Control/Data

Item	Pin Name	Type	Pin No.	Description
75	FMDATA	I	65	FM Synthesizer Data Input
76	FMSMP	I	66	FM Synthesizer Sample Control Left/Right
77	FMCLK	I	67	FM Synthesizer Clock for YAC512/513
78	-FMCS	I/O	68	-FM Synthesizer OPL3/4 Chip Select/Game Port Configuration

External Game Port, CD-ROM, and Expansion

Item	Pin Name	Type	Pin No.	Description
79	-GAMERD	I/O	72	-Game Port Read/Game Port Data 0
80	-GAMEWR	I/O	74	-Game Port Write/Game Port Data 1
81	-CDRST	O	75	-CD-ROM or Expansion Reset
82	-CDSEL	I/O	76	-CD-ROM or Expansion Select/CD-ROM Configuration 1
83	-CDST0	I/O	77	-CD-ROM Status/Game Port Data 4
84	-CDST1	I/O	78	-CD-ROM Port Read/Game Port Data 5
85	CDDRQ	O	79	CD-ROM DMA Request/Game Port Data 6
86	CDIRQ	I	80	CD-ROM Interrupt Request/Game Port Data 7
87	-CDDAK	I/O	90	-CD-ROM DMA Acknowledge/Game Port Data 2/CD-ROM Configuration 2
88	-CDDEN	I/O	92	-CD-ROM Data Enable/Game Port Data 3

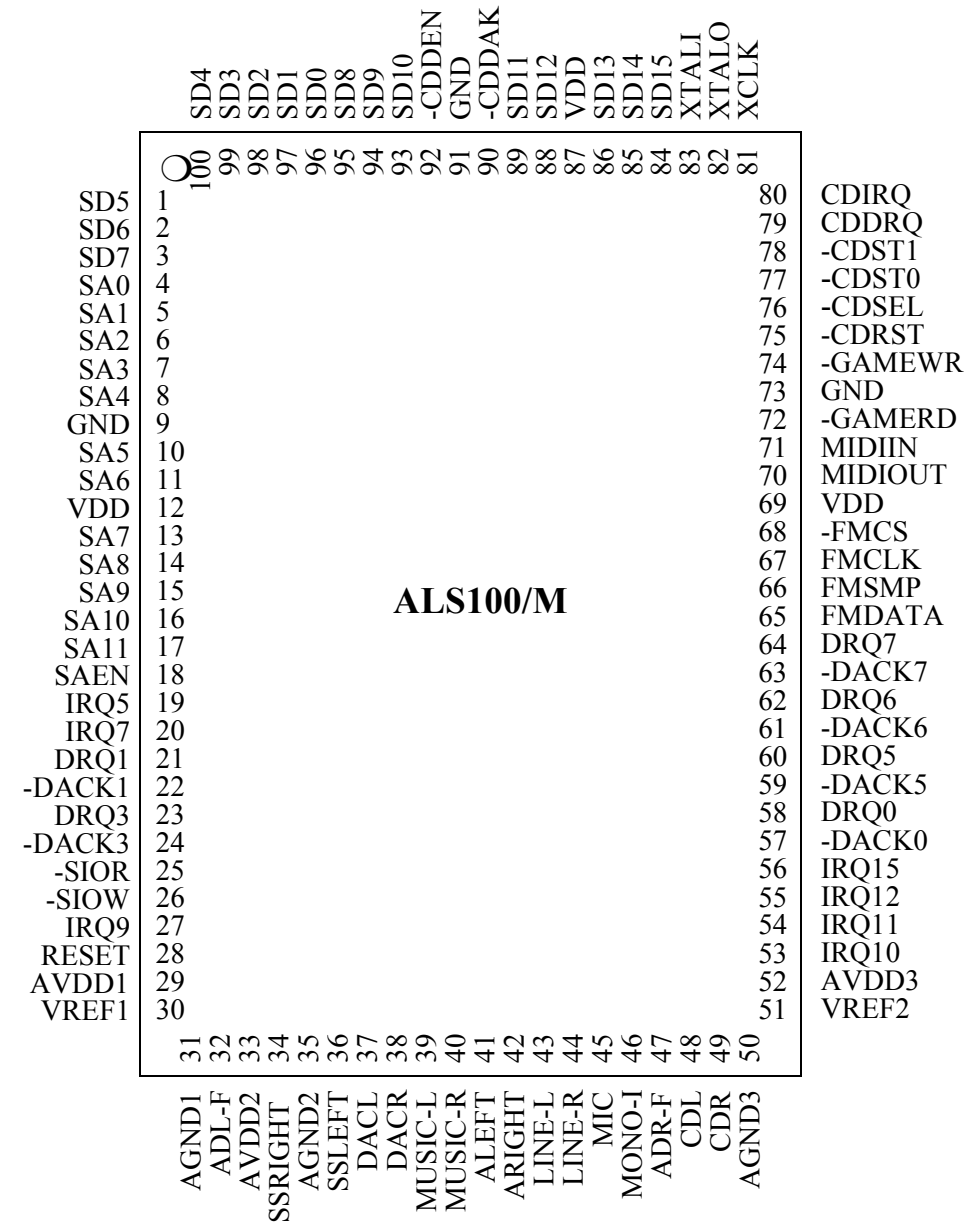
Power

Item	Pin Name	Type	Pin No.	Description
89	VDD	P	12	Digital VCC, 5.0 V (ALS100/M) or 3.3 V (ALS100L)
90	VDD	P	69	Digital VCC, 5.0 V (ALS100/M) or 3.3 V (ALS100L)
91	VDD	P	87	Digital VCC, 5.0 V (ALS100/M) or 3.3 V (ALS100L)
92	AVDD1	P	29	Analog VCC, 5.0 V Only
93	AVDD2	P	33	Analog VCC, 5.0 V Only
94	AVDD3	P	52	Analog VCC, 5.0 V Only
95	GND	P	9	Digital Ground
96	GND	P	73	Digital Ground
97	GND	P	91	Digital Ground
98	AGND1	P	31	Analog Ground
99	AGND2	P	35	Analog Ground
100	AGND3	P	50	Analog Ground

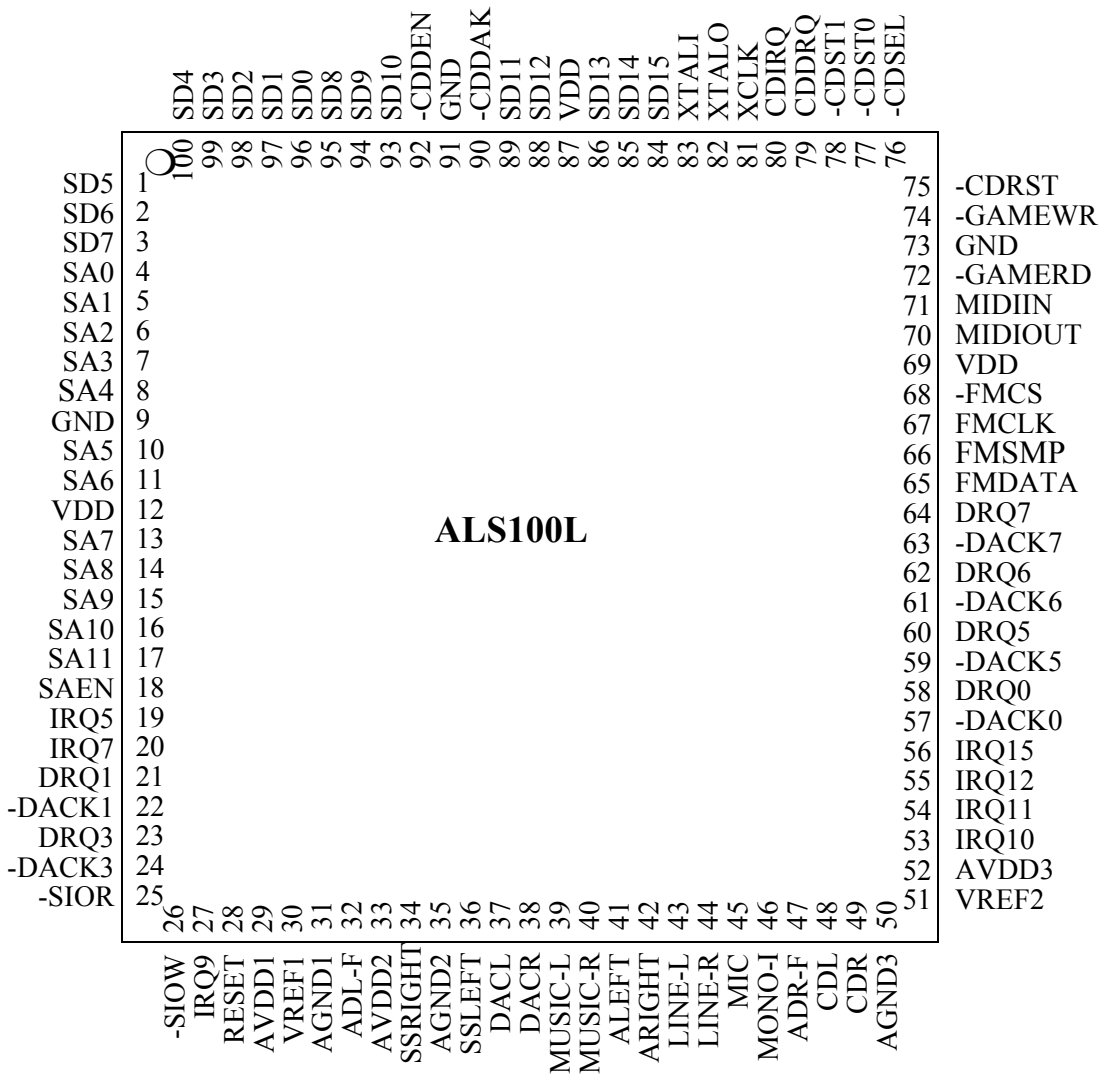
**I/O Pins Diagrams**

The diagrams on the next two pages show the I/O pins for the ALS100/M and the ALS100L modules. These diagrams should be used in conjunction with the preceding I/O pins chart. The I/O pins chart is broken into functional blocks to help the designer understand the signal and power interfaces.

ALS100/M I/O Pins

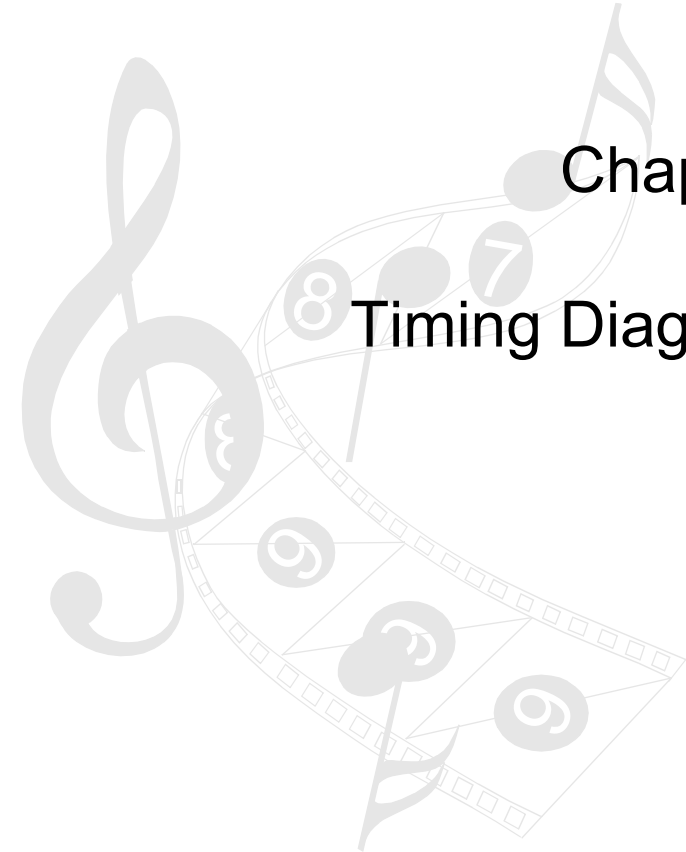


ALS100L I/O Pins



## Chapter 3

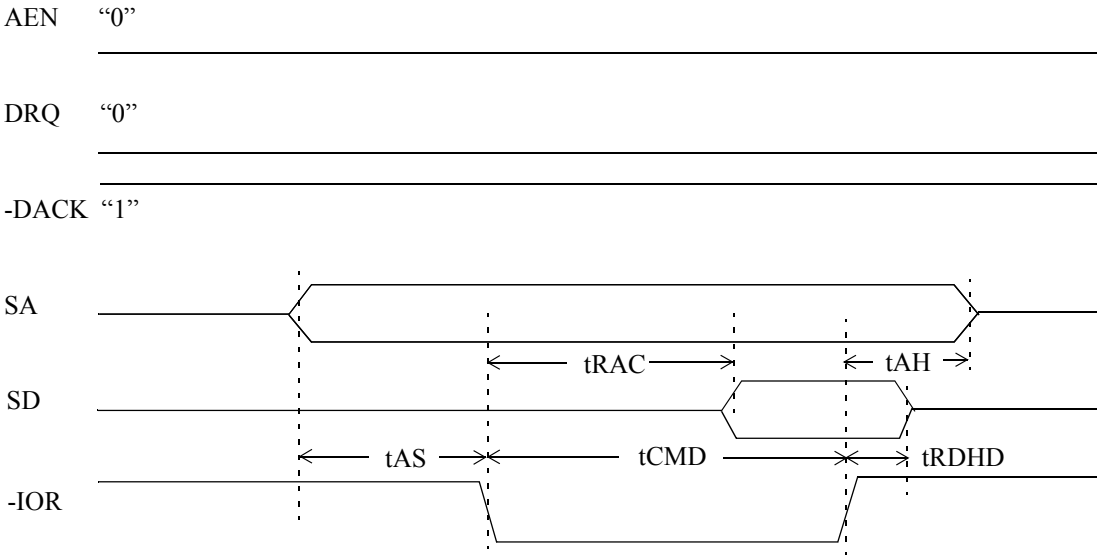
### Timing Diagrams



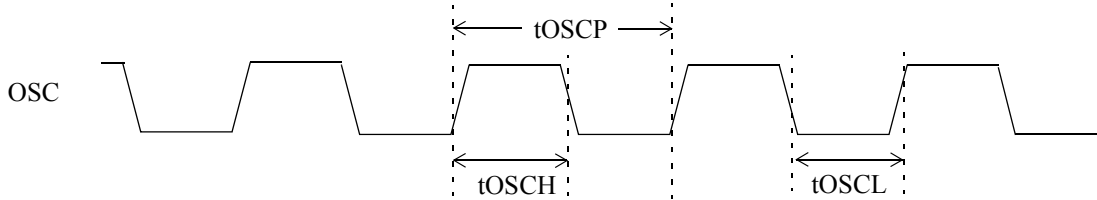


Timing Characteristics

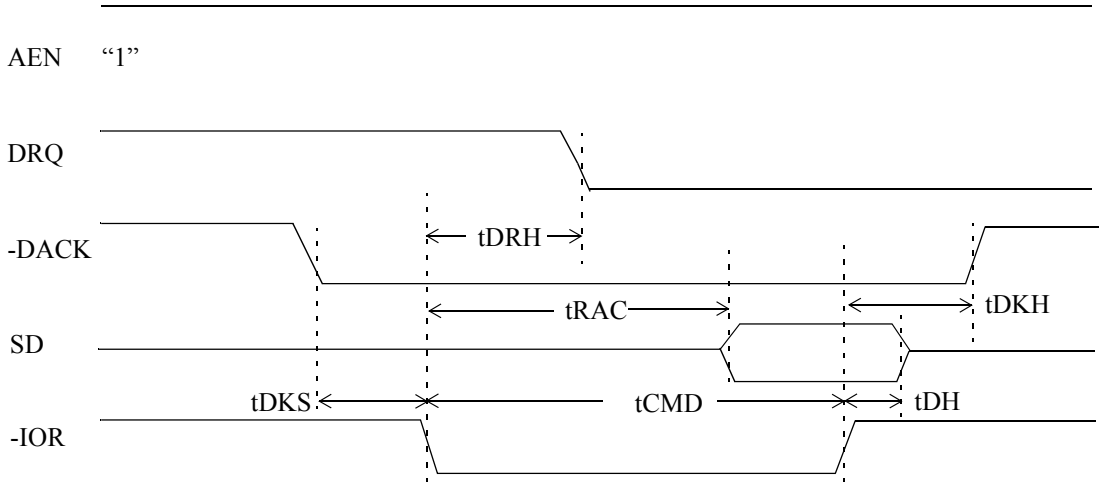
Register/CD/FM/Mixer/Sound Port I/O Read Cycle



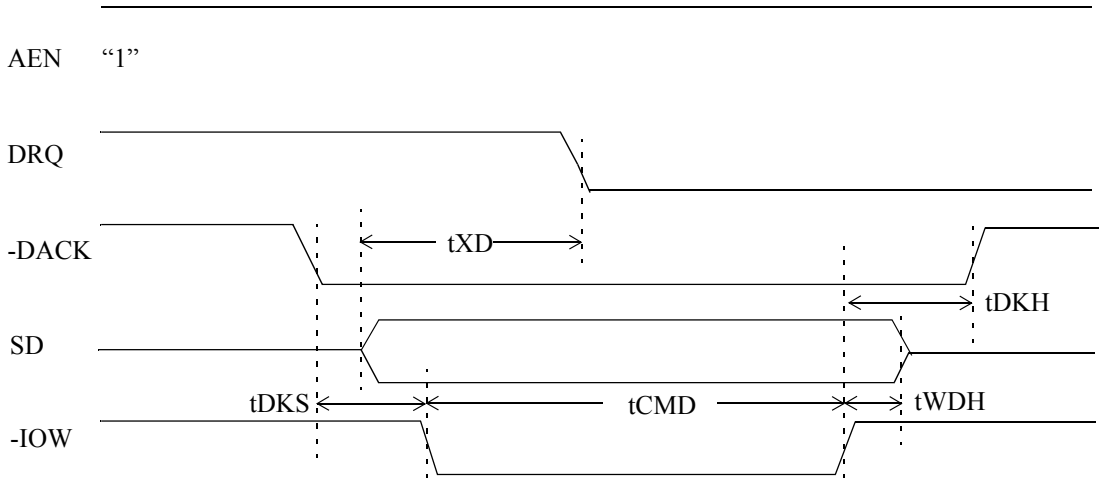
Clock Timing



DMA Read/Capture

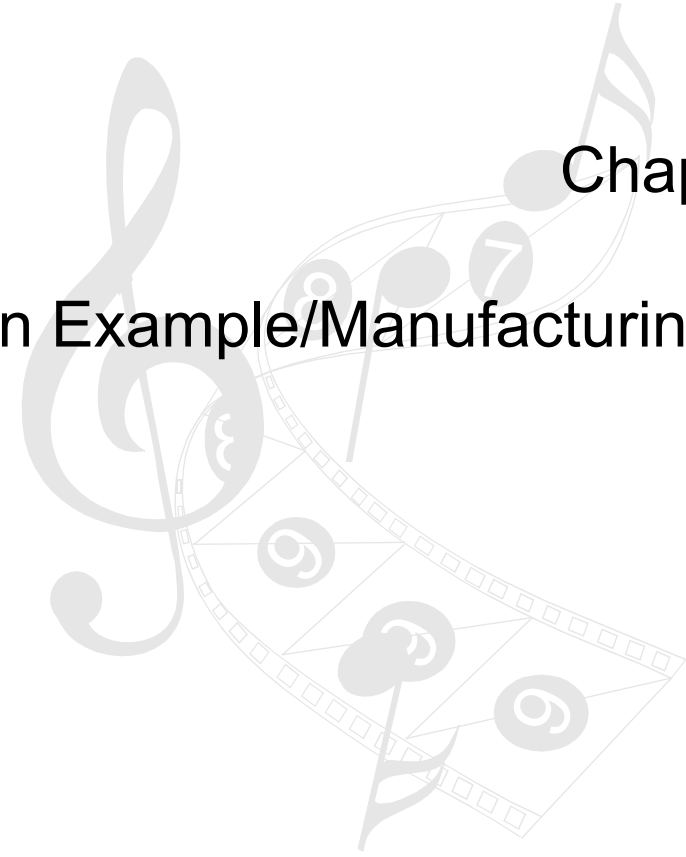


DMA Write/Playback Cycle



## Chapter 4

### Design Example/Manufacturing Kit





## Design Example/Manufacturing Kit

To facilitate the design process, working design examples (AS9520, AS9521, AS9540, and AS9548 sound cards) are available for four of the five ALS100/L/M sound system designs. The AS9520, AS9521, and AS9540 sound cards are design examples for the AS9520, AS9521, and AS9540 sound system designs. The AS9548 sound card is a design example for the AS9538 sound system design. No design example is currently available for the AS9545 sound system design. Additional information about the PC motherboard implementation of the ALS100/M sound system design and the PC Notebook implementation of the ALS100L sound system design is available later in this manual. The design examples are made available to OEMs for design troubleshooting or as an FCC Class B certified manufacturing kit. The Design Example/Manufacturing Kit consists of the following items.

- ALS100/L/M Design Manual
- Assembled and tested AS9520, AS9521, AS9540, or AS9548 sound card
- FCC number
- Technical documentation on diskette (FrameMaker 4 format)
- Gerber files for use in producing film
- Schematics
- Driver object code
- Diagnostic and manufacturing test programs
- Benchmark test results
- Compatibility Test Report
- Quality Control Report

The following chapters contain information that can be used for design and cost analysis before obtaining a Design Example/Manufacturing Kit and committing to an ALS100/L/M based design.

## Technical Support

Avance Logic, Inc. is committed to providing the best technical support possible for our products. Our technical support team is standing by to assist you. To better serve you, we suggest that you review our BBS and our WWW Site before requesting assistance. Answers to commonly asked questions and the latest information are posted there for your convenience.

**Avance Logic, Inc.** Technical Support  
47509 Seabridge Drive  
Fremont, CA 94538

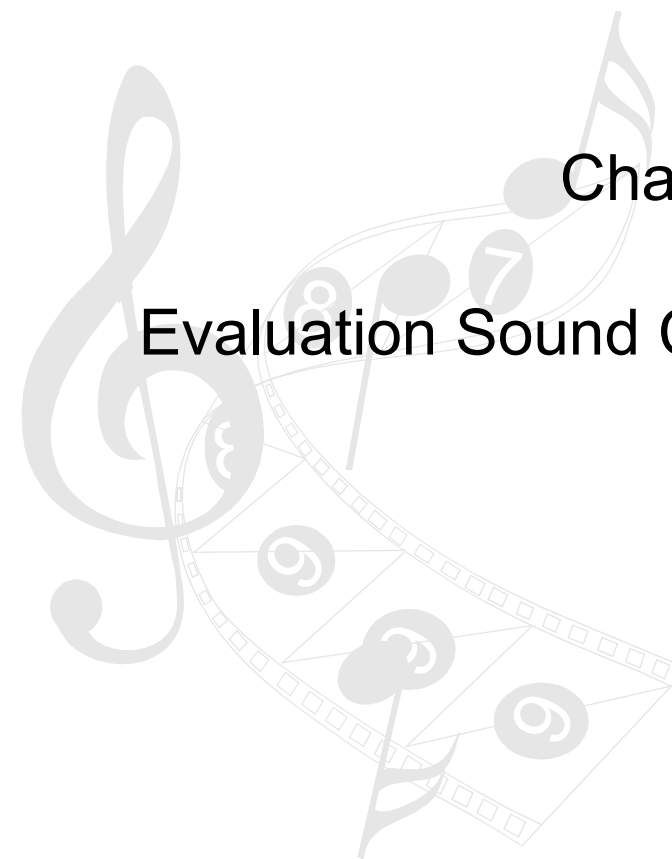
Tel (510) 226-9555  
FAX (510) 226-8039  
BBS (510) 226-7220  
FTP Site: <ftp://ftp.avance.com>  
WWW Site: <http://www.avance.com>

Telephone Hours (Pacific Time)  
Monday - Friday 9:00 am - 6:00 pm  
Closed Holidays



## Chapter 5

### Evaluation Sound Cards





## Introduction

There are five evaluation sound cards. Currently four are available. The sound cards differ in the sound system design that they embody.

### AS9520 Sound Card Description

The AS9520 sound card is an example of the AS9520 sound system design and is intended for the evaluation of that design.

The AS9520 sound system design is based on the ALS100 Integrated Audio Subsystem ASIC and contains the following features.

- 16-bit ISA Plug and Play design
- ATAPI IDE CD-ROM interface
- Game/MIDI port
- Audio inputs from:
  - External Wavetable card
  - ATAPI IDE CD-ROM audio
  - Mitsumi CD-ROM audio
  - Sony CD-ROM audio
  - Microphone
  - Line In
- Audio Outputs to:
  - Line Out
  - Main/SS Speaker Out
- Yamaha OPL3 FM Synthesizer
- Wave Blaster compatible upgrade capability

The AS9520 sound card is constructed on a 4-layer printed circuit board measuring 6.25 inches by 4.0 inches.

## AS9521 Sound Card Description

The AS9521 sound card is an example of the AS9521 sound system design and is intended for the evaluation of that design.

The AS9521 sound system design is based on the ALS100M Integrated Audio Subsystem ASIC, the multiple CD-ROM input version of the ALS100, and contains the following features.

- 16-bit ISA Plug and Play design
- CD-ROM interfaces for:
  - ATAPI IDE CD-ROM
  - Mitsumi CD-ROM
  - Sony CD-ROM
  - Panasonic CD-ROM
- SCSI CD-ROM external controller interface
- Game/MIDI port
- Audio inputs from:
  - External Wavetable card
  - ATAPI IDE CD-ROM audio
  - Mitsumi CD-ROM audio
  - Sony CD-ROM audio
  - Panasonic CD-ROM audio
  - Microphone
  - Line In
- Audio Outputs to:
  - Line Out
  - Main/SS Speaker Out
- Yamaha OPL3 FM Synthesizer
- Yamaha OPL4 Wavetable Synthesizer
- Wave Blaster compatible upgrade capability

The AS9521 sound card is constructed on a 4-layer printed circuit board measuring 8.25 inches by 4.0 inches.

## AS9540 Sound Card Description

The AS9540 sound card is an example of the AS9540 sound system design and is intended for the evaluation of that design.

The AS9540 sound system design is based on the ALS100 Integrated Audio Subsystem ASIC and has the lowest implementation cost of all of the sound system designs. The AS9540 sound system design contains the following features.

- 16-bit ISA Plug and Play design
- ATAPI IDE CD-ROM interface (optional)
- Game/MIDI port
- Audio inputs from:
  - External Wavetable card
  - ATAPI IDE CD-ROM audio
  - Mitsumi CD-ROM audio
  - Sony CD-ROM audio
  - Microphone
  - Line In
- Audio Outputs to:
  - Line Out
  - Main/SS Speaker Out (optional)
- Yamaha OPL3 FM Synthesizer
- Wave Blaster compatible upgrade capability

The AS9540 sound card is constructed on a 2-layer printed circuit board measuring 6.5 inches by 4.0 inches.

## AS9545 Sound Card Description

Hardware implementation of the AS9545 sound card is not currently available. The following functional description and reference to this sound card elsewhere in this manual are for informational use only.

The AS9545 sound card is an example of the AS9545 sound system design and is intended for the evaluation of that design.

The AS9545 sound system design is based on the ALS100 Integrated Audio Subsystem ASIC and contains the following features.

- 16-bit ISA Plug and Play design
- ATAPI IDE CD-ROM interface
- Game/MIDI port
- Audio inputs from:
  - External Wavetable card
  - ATAPI IDE CD-ROM audio
  - Mitsumi CD-ROM audio
  - Sony CD-ROM audio
  - Microphone
  - Line In
- Audio Outputs to:
  - Line Out
  - Main/SS Speaker Out
- Yamaha OPL3 FM Synthesizer
- Yamaha OPL4 Wavetable Synthesizer
- Wave Blaster compatible upgrade capability

The AS9545 sound card is constructed on a 4-layer printed circuit board measuring 6.25 inches by 4.0 inches.

## AS9548 Sound Card Description

The AS9548 sound card contains an example of the AS9538 sound system design and is intended for the evaluation of that design. The AS9538 sound system design is intended for use in PC Notebooks (see “AS9538 PC Notebook Sound System Design” on page 19). The AS9548 sound card has circuitry in addition to the AS9538 sound system design so that it can operate in a standard PC for a more convenient evaluation platform.

The AS9538 sound system design is based on the ALS100L Integrated Audio Subsystem ASIC, the 3.3 V input voltage version of the ALS100, and contains the following features.

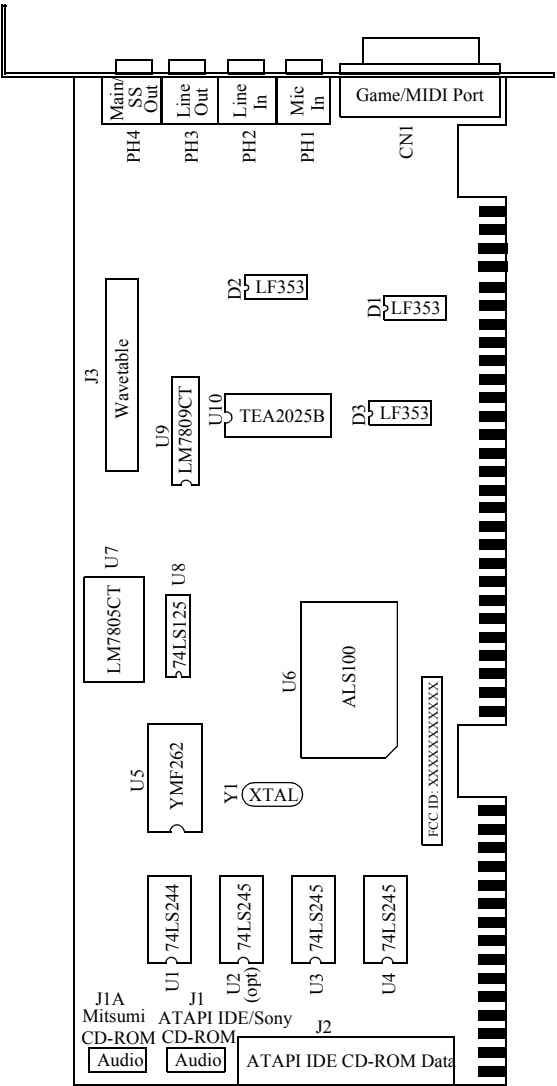
- 16-bit ISA Plug and Play design
- Game/MIDI port
- Audio inputs from:
  - ATAPI IDE CD-ROM audio
  - Sony CD-ROM audio
  - Microphone
  - Line In
- Audio Outputs to:
  - Line Out
  - Speaker Out
- Yamaha OPL3 FM Synthesizer

The AS9548 sound card is constructed on a 2-layer printed circuit board measuring 6.25 inches by 4.0 inches.

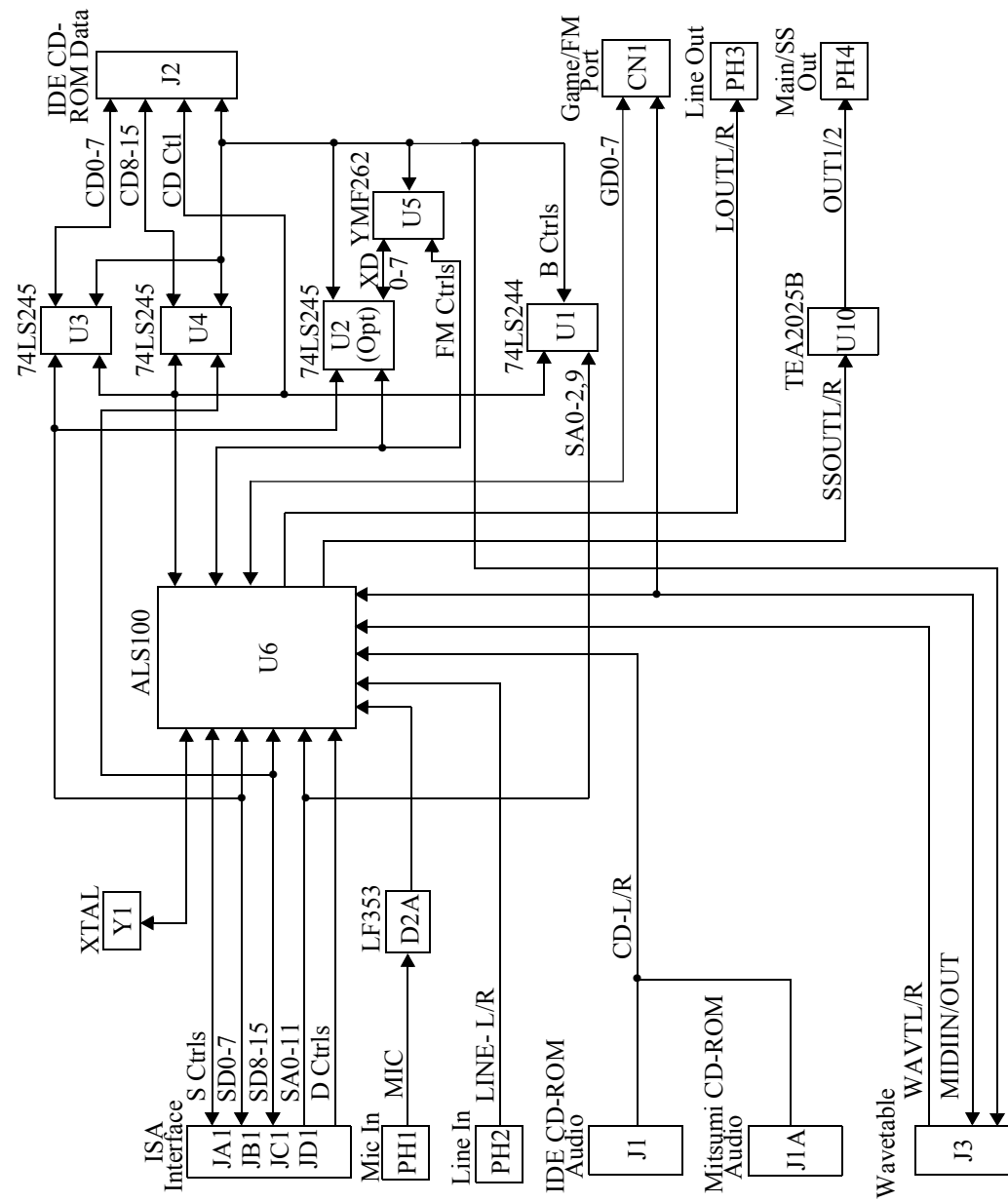
Evaluation Sound Card Summary

Feature	AS9520	AS9521	AS9540	AS9545	AS9548
Integrated Audio Subsystem ASIC	ALS100	ALS100M	ALS100	ALS100	ALS100L
16-bit ISA Plug and Play	○	○	○	○	○
CD-ROM Interfaces					
ATAPI IDE	○	○	Optional	○	
Mitsumi		○			
Sony		○			
Panasonic		○			
SCSI Controller Interface		○			
Game/MIDI Port	○	○	○	○	○
Audio Inputs					
External Wavetable card	○	○	○	○	
ATAPI IDE CD-ROM	○	○	○	○	○
Mitsumi CD-ROM	○	○	○	○	
Sony CD-ROM	○	○	○	○	○
Panasonic CD-ROM		○			
Microphone	○	○	○	○	○
Line In	○	○	○	○	○
Audio Outputs					
Line Out	○	○	○	○	○
Main/SS Speaker Out	○	○	Optional	○	Optional
Yamaha OPL3 FM Synthesizer	○	○	○	○	○
Yamaha OPL4 Wavetable Synthesizer		○		○	
Wave Blaster compatible upgrade	○	○		○	

AS9520 Sound Card



AS9520 Block Diagram



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**AS9520 Schematics**

#include “c:\maker4\s100dm\as9520\as9520b.ps”



#include “c:\maker4\s100dm\as9520\sh2.ps”



#include “c:\maker4\s100dm\as9520\sh3.ps”



#include “c:\maker4\s100dm\as9520\sh4.ps”



#include “c:\maker4\s100dm\as9520\sh5.ps”

AS9520 Bill of Materials

Bill Of Materials for AS9520 rev. B

16 BIT ISA SOUND BOARD w/ IDE CD INTERFACE      Revised: October 6, 1995  
ALSND-S100-9520I      Revision: B.1

Item	Quantity	Reference	Part	Description
1	1	U1	74LS244	20-pin SOIC
2	3	U2	74LS245	20-pin SOIC
		U3	74LS245	
		U4	74LS245	
3	1	U5	YMF262	OPL 3
4	1	U6	ALS100	Avance Logic sound chip
5	1	U7	LM7805CT	TO-220 5V voltage regulator
6	1	U8	74LS125	14-pin SOP
7*	1	U9	LM7809CT	TO-220 9V voltage regulator
8	1	U10	TEA2025B	14-pin DIP
9	3	D1	LF353	8-pin SOP
		D2	LF353	
		D3	LF353	
10	7	R1	47	47 ohm 0805 SMD res
		R14	47	
		R15	47	
		R28	47	
		R30	47	
		R35	47	
		R36	47	

11	4	R2	5.1K	5.1K ohm 0805 SMD res
		R3	5.1K	
		R4	5.1K	
		R5	5.1K	
12	1	R6	4.7K	4.7K ohm 0805 SMD res
13	1	R7	1.8M	1.8M ohm 0805 SMD res
14	2	R8	1K	1K ohm 0805 SMD res
		R34	1K	
15	16	R9	100K	100K ohm 0805 SMD res
		R10	100K	
		R11	100K	
		R12	100K	
		R16	100K	
		R17	100K	
		R18	100K	
		R19	100K	
		R20	100K	
		R21	100K	
		R31	100K	
		R32	100K	
		R38	100K	
		R39	100K	
		R40	100K	
		R41	100K	
16	3	R13	100	100 ohm 0805 SMD res
		R22	100	
		R23	100	
17	2	R25	1.2K	1.2K ohm 0805 SMD res
		R26	1.2K	
18	1	R33	47K	47K ohm 0805 SMD res
19	2	R42	10	10 ohm 0805 SMD res
		R43	10	

20	3	R44 R45 R47	1.2K 1.2K 1.2K	1.2K ohm 0805 SMD res
21	1	R46	10K	10K ohm 0805 SMD res
22	1	RN1	4.7KX9	4.7K ohm 10-pin COM SIP res net
23	1	RN2	3.3X4	3.3 ohm 8-pin ISO SIP res net
24	1	RN3	330x4	330 ohm 8-pin ISO SIP res net
25	1	RN4	4.7KX4	4.7K ohm 8-pin ISO SIP res net
26	1	RN5	2.2KX4	2.2K ohm 8-pin ISO SIP res net
27	25	C1 C2 C3 C4 C9 C10 C12 C14 C16 C19 C27 C28 C31 C33 C46 C53 C54 C55 C56	.1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U .1U	.1uF 0805 SMD cap

28	10	C58	.1U	
		C66	.1U	
		C67	.1U	
		C75	.1U	
		C76	.1U	
		C89	.1U	
		C5	100P	100pF 0805 SMD cap
		C6	100P	
29	2	C26	100P	
		C39	100P	
		C40	100P	
		C68	100P	
		C73	100P	
		C74	100P	
		C77	100P	
		C78	100P	
30	2	C7	4.7P	4.7pF 0805 SMD cap
		C8	4.7P	
31	10	C11	10U	10uF 16V rad elect cap
		C13	10U	
		C15	10U	
		C29	10U	
		C30	10U	
		C38	10U	
		C44	10U	
		C57	10U	
		C60	10U	
		C79	10U	
32	7	C17	330P	330pF 0805 SMD cap
		C20	330P	
		C32	330P	
		C34	330P	
		C35	330P	
		C36	330P	
		C37	330P	
32	6	C18	1000P	1000pF 0805 SMD cap

		C21	1000P	
		C22	1000P	
		C23	1000P	
		C24	1000P	
		C25	1000P	
33	6	C42	100U	100uF 16V rad elect cap
		C43	100U	
		C45	100U	
		C63	100U	
		C64	100U	
		C65	100U	
34	4	C47	.22U	.22uF 0805 SMD cap
		C48	.22U	
		C49	.22U	
		C50	.22U	
35	2	C51	2200P	2200pF 0805 SMD cap
		C52	2200P	
36	2	C61	.15U	.15uF 0805 SMD cap
		C62	.15U	
37	4	C81	47P	47pF 0805 SMD cap
		C83	47P	
		C85	47P	
		C87	47P	
38	2	C71	470U	470uF 16V rad elect cap
		C72	470U	
39	1	C80	1U	1uF 16V tant cap
40	4	C82	.01U	.01uF 0805 SMD cap
		C84	.01U	
		C86	.01U	
		C88	.01U	
41	3	L1	47UH	47uH epoxy thru-hole ind

		L2	47UH	
		L3	47UH	
42	1	J1	AUDIO IN	MITSUMI 4-pin 2mm audio header
43	1	J1A	AUDIO IN	IDE 4-pin .1" audio header
44	1	J2	20X2	20X2 straight dual row male
45	1	J3	13X2	13X2 straight dual row male
46	1	CN1	GAME PORT	D-sub 15-pin female
47	4	PH1 PH2 PH3 PH4	PHONEJACK PHONEJACK PHONEJACK PHONEJACK	SJ-100 5-pin phone jack
48	1	Y1	14.318MHZ	14.31818MHz serial crystal

NOTE:

\* If assembled U7, do NOT install L4 (47), R24 (47) and D4 (9.1V  
zener).

AS9520 Part Descriptions

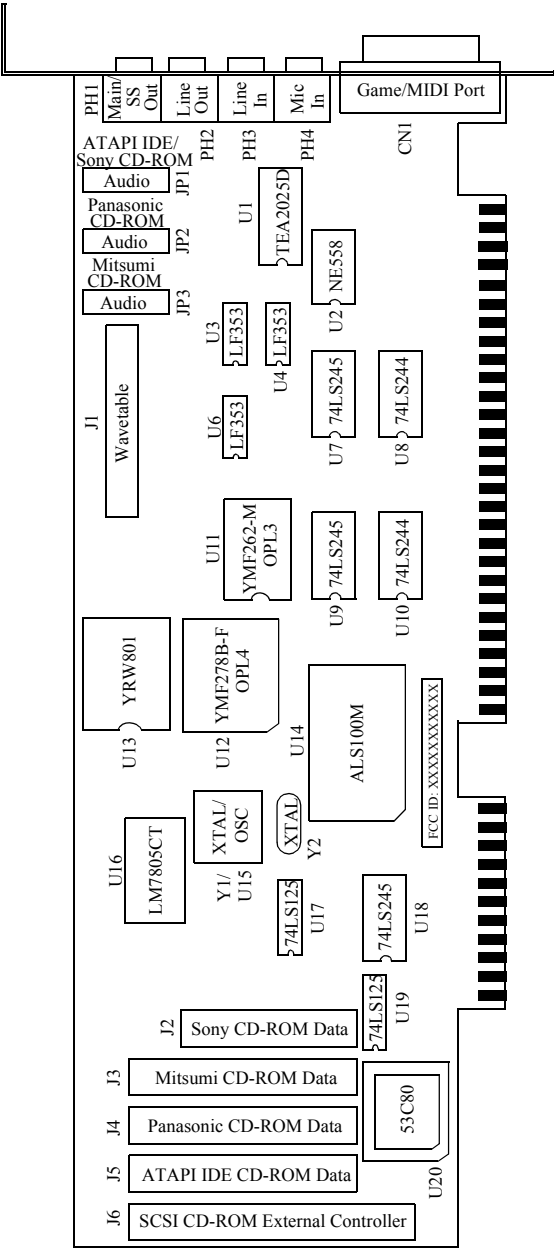
Item	Description	Part Number	Vendor
1	20-pin SOIC	74LS244	Texas Instruments
2	20-pin SOIC	74LS245	Texas Instruments
3	OPL 3	YMF262-M	Yamaha
4	Integrated audio subsystem ASIC	ALS100	Avance Logic, Inc.
5	TO-220 5 V voltage regulator	LM7805CT	National Semiconductor
6	14-pin SOP	74LS125	Texas Instruments
7*	TO-220 9V voltage regulator	LM7809CT	National Semiconductor
8	20-pin SOIC	TEA2025B	SGS Thomson
9	8-pin SOP OP amplifier	LF353	Texas Instruments
10-21	0805 SMD resistor	Note 2	
22	10-pin COM SIP resistor network	Note 4	
23-26	8-pin ISO SIP resistor network	Note 3	
27-29	0805 SMD capacitor	Note 5	
30	16 V radial electrolytic capacitor	Note 6	
31,32	0805 SMD capacitor	Note 5	
33	16 V radial electrolytic capacitor	Note 6	
34-37	0805 SMD capacitor	Note 5	
38	16 V radial electrolytic capacitor	Note 6	
39	16 V tantalum capacitor	Note 7	

Item	Description	Part Number	Vendor
40	0805 SMD capacitor	Note 5	
41	Epoxy thru-hole inductor	Series 1641	Delevan
42	4-pin audio connector (2.0 mm) (Mitsumi)	B4B-PH-K	JST
43	4-pin audio connector (.1 in) (IDE/Sony)	22-28-4043	Molex
44	20 x 2 straight dual row male header	2-102973-5	AMP
45	13 x 2 straight dual row male header	1-102973-3	AMP
46	D-sub 15-pin female connector	2-145782-4	AMP
47	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo
48	14.31818 MHz series crystal	FOX143	Fox

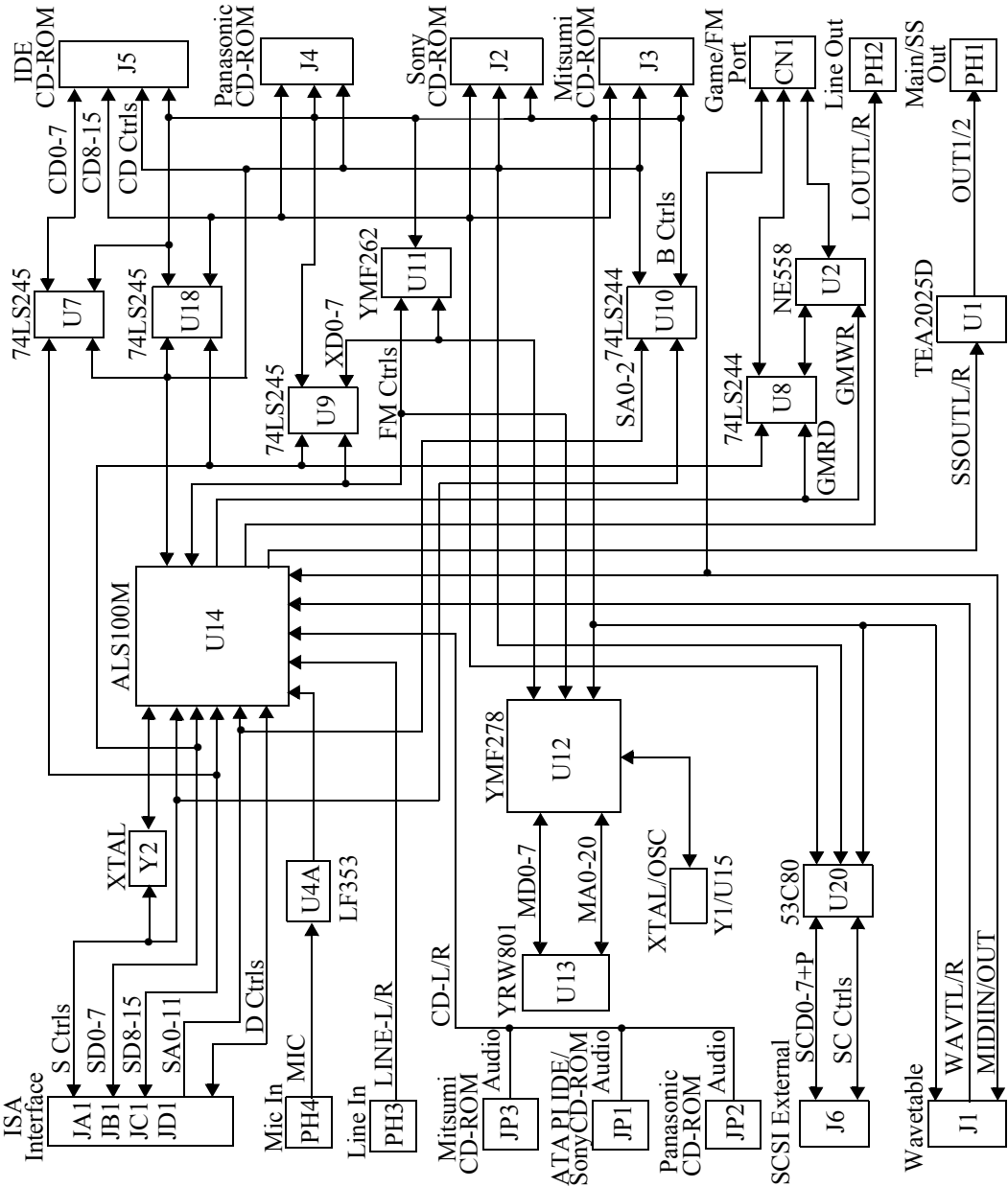
**Notes:**

- 1. Except for Item 4, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4. 1/10 W, 2%, 50 V
- 5. ±5%, 50 V
- 6. ±20%, 16 V
- 7. ±10%, 16 V

AS9521 Sound Card



AS9521 Block Diagram



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**AS9521 Schematics**

#include “c:\maker4\s100dm\as9521\as9521.ps”



#include “c:\maker4\s100dm\as9521\sh2.ps”



#include “c:\maker4\s100dm\as9521\sh3.ps”



#include “c:\maker4\s100dm\as9521\sh4.ps”



#include “c:\maker4\s100dm\as9521\sh5.ps”



#include “c:\maker4\s100dm\as9521\sh6.ps”

AS9521 Bill of Materials

Bill Of Material for AS9521 rev. A

16 BIT ISA SOUND BOARD w/ MULTI-CD INTERFACE Revised: August 11, 1995  
ALSND-M100-9521I Revision: A.2

Item	Quantity	Reference	Part	Description
1	1	U1	TEA2025D	20-pin SOIC stereo amplifier
2	1	U2	NE558	16-pin SOP/SOIC quad timer
3	3	U3 U4 U6	LF353 LF353 LF353	8-pin SOP OP amp
4	3	U7 U9 U18	74LS245 74LS245 74LS245	20-pin SOIC
5	2	U8 U10	74LS244 74LS244	20-pin SOIC
6	1	U11	YMF262-M	OPL 3
7	1	U12	YMF278B-F	OPL 4
8	1	U13	YRW801	wave data ROM
9	1	U14	ALS100M	Avance Logic sound chip
10	1	U16	LM7805CT	TO-220 5V voltage regulator
11	2	U17 U19	74LS125 74LS125	14-pin SOP

12a	1	U20	53C80 (PLCC)	44-pin PLCC socket
12b	1	U20	53C80 (PLCC)	44-pin PLCC SCSI controller
13	5	R1	100	100 ohm 0805 SMD res
		R4	100	
		R34	100	
		R37	100	
		R42	100	
14	6	R2	47	47 ohm 0805 SMD res
		R3	47	
		R18	47	
		R21	47	
		R29	47	
		R30	47	
15	4	R5	5.1K	5.1K ohm 0805 SMD res
		R9	5.1K	
		R14	5.1K	
		R15	5.1K	
16	17	R7	100K	100K ohm 0805 SMD res
		R10	100K	
		R13	100K	
		R19	100K	
		R23	100K	
		R26	100K	
		R27	100K	
		R31	100K	
		R32	100K	
		R33	100K	
		R35	100K	
		R36	100K	
		R38	100K	
		R39	100K	
		R40	100K	
		R41	100K	
		R43	100K	
17	1	R8	6.8K	6.8K ohm 0805 SMD res

18	3	R11 R12 R25	1.2K 1.2K 1.2K	1.2K ohm 0805 SMD res
19	1	R17	47K	47K ohm 0805 SMD res
20	3	R20 R47 R53	10K 10K 10K	10K ohm 0805 SMD res
21	1	R44	3.3M	3.3M ohm 0805 SMD res
22	1	R45	1.8M	1.8M ohm 0805 SMD res
23	3	R48 R49 R52	4.7K 4.7K 4.7K	4.7K ohm 0805 SMD res
24	1	RN1	2.2KX4	2.2K ohm 8-pin ISO res net
25	1	RP1	1KX9	1K ohm 10-pin COM res net
26	1	RP2	4.7KX9	4.7K ohm 10-pin COM res net
27	3	RX1  RX2 RX3	220/330  220/330 220/330	220/330 ohm 8-pin res terminator
28	10	C1 C2 C11 C20 C30 C31 C37 C50	100P 100P 100P 100P 100P 100P 100P 100P	100pF 0805 SMD cap

		C51	100P	
		C72	100P	
29	4	C5	47P	47pF 0805 SMD cap
		C6	47P	
		C7	47P	
		C8	47P	
30	2	C9	470U	470uF 16V rad elect cap
		C10	470U	
31	6	C12	100U	100uF 16V rad elect cap
		C13	100U	
		C14	100U	
		C23	100U	
		C24	100U	
		C25	100U	
32	28	C15	.1U	.1uF 0805 SMD cap
		C27	.1U	
		C29	.1U	
		C32	.1U	
		C34	.1U	
		C40	.1U	
		C42	.1U	
		C44	.1U	
		C47	.1U	
		C48	.1U	
		C52	.1U	
		C53	.1U	
		C55	.1U	
		C60	.1U	
		C61	.1U	
		C67	.1U	
		C69	.1U	
		C70	.1U	
		C73	.1U	
		C74	.1U	
		C76	.1U	
		C77	.1U	
		C79	.1U	

		C85	.1U	
		C86	.1U	
		C87	.1U	
		C88	.1U	
		C90	.1U	
33	4	C16	.01U	.01uF 0805 SMD cap
		C17	.01U	
		C18	.01U	
		C19	.01U	
34	4	C26	.22U	.22uF 0805 SMD cap
		C28	.22U	
		C41	.22U	
		C46	.22U	
35	2	C33	.15U	.15uF 0805 SMD cap
		C38	.15U	
36	7	C22	10U	10uF 16V rad elect cap
		C35	10U	
		C75	10U	
		C80	10U	
		C89	10U	
		C91	10U	
		C93	10U	
37	1	C36	1U TANT	1uF 16V rad elect cap
38	2	C58	2200P	2200pF 0805 SMD cap
		C39	2200P	
39	7	C43	330P	330pF 0805 SMD cap
		C49	330P	
		C54	330P	
		C57	330P	
		C59	330P	
		C63	330P	
		C66	330P	
40	3	C45	10U	10uF 16V rad elect cap

		C83	10U	
		C92	10U	
41	6	C56	1000P	1000pF 0805 SMD cap
		C62	1000P	
		C64	1000P	
		C65	1000P	
		C68	1000P	
		C71	1000P	
42	2	C78	10P	10pF 0805 SMD cap
		C81	10P	
43	2	C82	4.7P	4.7pF 0805 SMD cap
		C84	4.7P	
44	4	L1	10UH	10uH epoxy thru-hole ind
		L2	10UH	
		L3	10UH	
		L4	10UH	
45	1	Y2	14.318MHZ	14.31818MHz series crystal
46*	1	Y1	33.8688MHz	33.8688MHz serial crystal or
		U15	33.8688MHz	33.8688MHz osc
47	1	D1	9.1V	9.1V .5W thru-hole zener diode
48	1	D2	DIODE	1N4001 thru-hole diode
49	1	F1	FUSE	1A thru-hole pico fuse
50	1	JP1	SONY	4-pin .1" audio connector
51	1	JP2	PANASONIC	3-pin audio connector

52	1	JP3	MITSUMI	4-pin 2mm audio connector
53	1	J1	13X2	13X2 straight dual row male
54	1	J2	17X2	17X2 straight dual row male
55	3	J3	20X2	20X2 straight dual row male
		J4	20X2	
		J5	20X2	
56	1	J6	SCSI CONN	25X2 straight dual row male
57	1	CN1	GAME PORT	D-sub 15-pin female DB15
59	4	PH1	PHONEJACK	SJ-100 5-pin phone jack
		PH2	PHONEJACK	
		PH3	PHONEJACK	
		PH4	PHONEJACK	

NOTE:

\* Assemble either crystal Y1 or oscillator U15 for 33.8388MHz frequency, not both.

AS9521 Part Descriptions

Item	Description	Part Number	Vendor
1	20-pin SOIC	TEA2025D	SGS Thomson
2	16-pin SOP/SOIC quad timer	NE558	Philips Semiconductor
3	8-pin SOP OP amplifier	LF353	Texas Instruments
4	20-pin SOIC	74LS245	Texas Instruments
5	20-pin SOIC	74LS244	Texas Instruments
6	OPL 3	YMF262-M	Yamaha
7	OPL 4	YMF278B-F	Yamaha
8	Wave data ROM	YRW801	Yamaha
9	Integrated audio subsystem ASIC	ALS100M	Avance Logic, Inc.
10	TO-220 5 V voltage regulator	LM7805CT	National Semiconductor
11	14-pin SOP	74LS125	Texas Instruments
12a	44-pin PLCC socket	821979-3	AMP
12b	44-pin PLCC SCSI controller	53C80	**TBD**
13-23	0805 SMD resistor	Note 2	
24	8-pin ISO resistor network	Note 3	
25,26	10-pin COM resistor network	Note 4	
27	220/330 ohm 8-pin resistor terminator	Note 4	
28,29	0805 SMD capacitor	Note 5	
30,31	16 V radial electrolytic capacitor	Note 6	

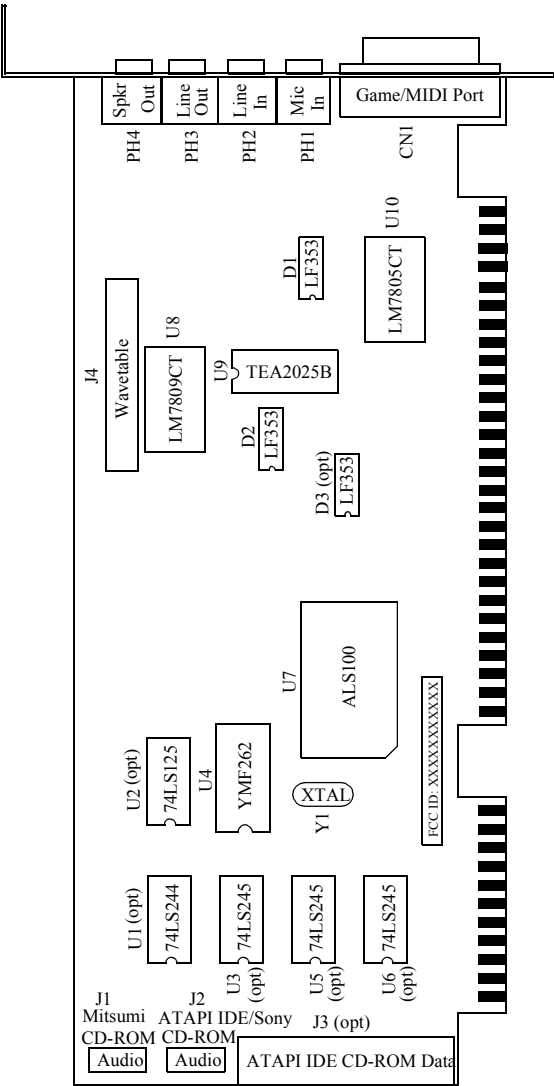
Item	Description	Part Number	Vendor
32,35	0805 SMD capacitor	Note 5	
36,37	16 V radial electrolytic capacitor	Note 6	
38,39	0805 SMD capacitor	Note 5	
40	16 V radial electrolytic capacitor	Note 6	
41,43	0805 SMD capacitor	Note 5	
44	Epoxy thru-hole inductor	Series 1641	Delevan
45	14.31818 MHz series crystal	FOX143	Fox
46	33.8688 MHz series crystal	**TBD**	**TBD**
	or 33.8688 MHz oscillator	**TBD**	**TBD**
47	9.1 V .5 W thru-hole zener diode	1N960B	Motorola Semiconductor
48	Thru-hole diode	1N4001	Motorola Semiconductor
49	Thru-hole pico fuse (1 A 125 V)	251 Series	Littlefuse
50	4-pin audio connector (.1 in) (IDE/Sony)	22-28-4043	Molex
51	3-pin audio connector (2.0 mm)(Panasonic)	B3B-PH-K	JST
52	4-pin audio connector (2.0 mm) (Mitsumi)	B4B-PH-K	JST
53	13 x 2 straight dual row male connector	1-102973-3	AMP
54	17 x 2 straight dual row male connector	TSW-117- 14-L-Q	Samtec
55	20 x 2 straight dual row male connector	2-102973-5	AMP
56	25 x 2 straight dual row male connector (SCSI)	TSW-125- 07-L-D	Samtec

Item	Description	Part Number	Vendor
57	D-sub 15-pin female connector	2-145782-4	AMP
58	unused		
59	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo

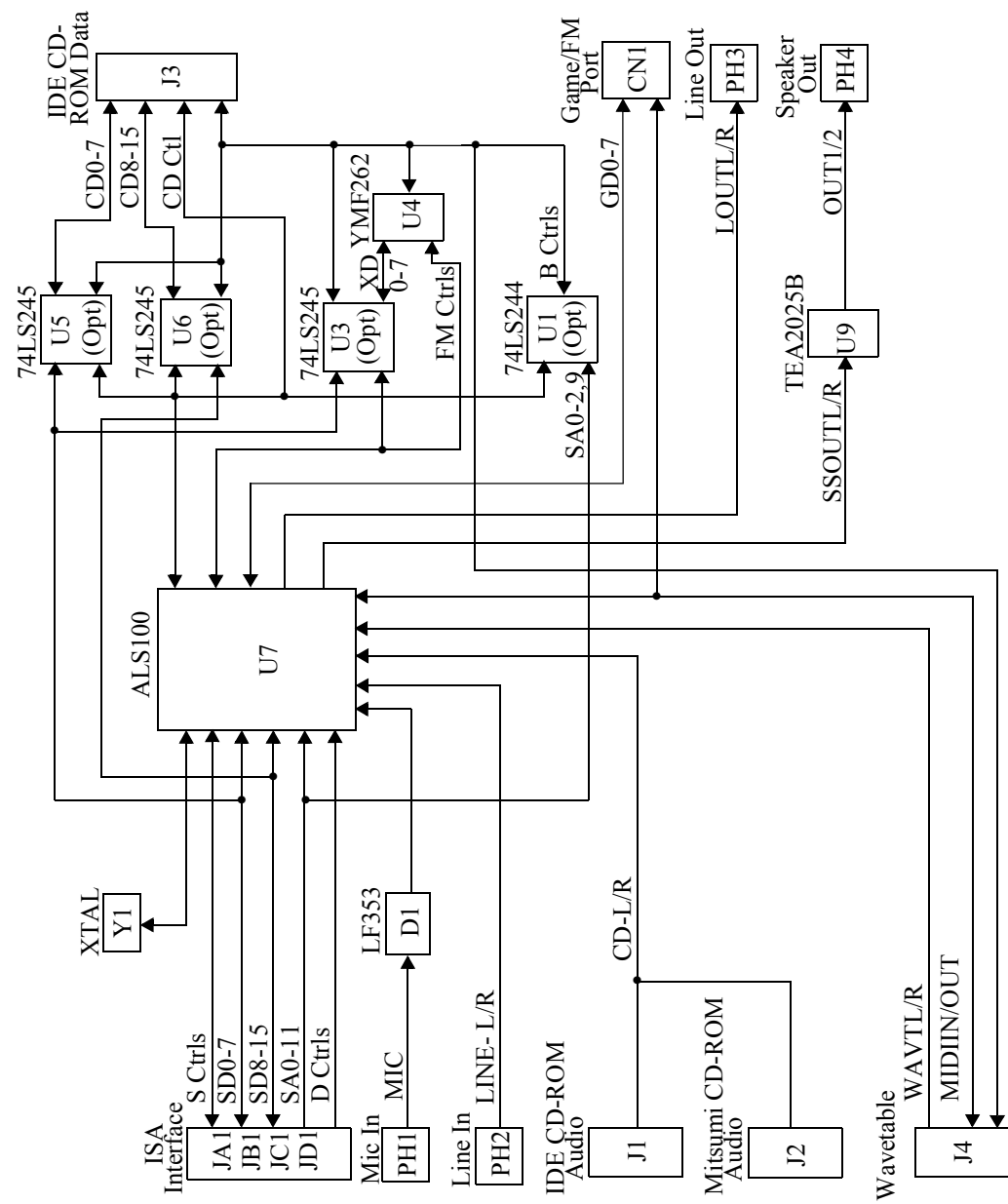
**Notes:**

- 1. Except for Item 9, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4. 1/10 W, 2%, 50 V
- 5. ±5%, 50 V
- 6. ±20%, 16 V

AS9540 Sound Card



AS9540 Block Diagram



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**AS9540 Schematics**

#include “c:\maker4\s100dm\as9540\as9540.ps”



#include “c:\maker4\s100dm\as9540\sh2.ps”



#include “c:\maker4\s100dm\as9540\sh3.ps”



#include “c:\maker4\s100dm\as9540\sh4.ps”



#include “c:\maker4\s100dm\as9540\sh5.ps”

AS9540 Bill of Materials

Bill Of Materials for AS9540 rev. A

16 BIT ISA SOUND BOARD W/ IDE CD INTERFACE Revised: November 6, 1995  
ALSND-S100-9540I Revision: A

Item	Quantity	Reference	Part	Description
1	1	U1 (IDE OPT)	74LS244	20-pin SOIC
2	1	U2 (IDE OPT)	74LS125	14-pin SOP
3	3	U3	74LS245	20-pin SOIC
		U5 (IDE OPT)	74LS245	
		U6 (IDE OPT)	74LS245	
4	1	U4	YMF262	OPL 3
5	1	U7	ALS100	Avance Logic sound chip
6	1	U8	LM7809CT	TO-220 5V voltage regulator
7	1	U9	TEA2025B	14-pin DIP
8	1	U10	LM7805CT	TO-220 5V voltage regulator
9	3	D1	LF353	8-pin SOP
		D2	LF353	
		D3 (SS OPT)	LF353	
10	1	R1	2.2K	2.2K ohm 0805 SMD res
11	1	R2 (IDE OPT)	47	47 ohm 0805 SMD res
12	4	R7	4.7K	4.7K ohm 0805 SMD res
		R8	4.7K	

		R38	4.7K	
		R3 (IDE OPT)	4.7K	
13	1	R4	1.8M	1.8M ohm 0805 SMD res
14	3	R5	100	100 ohm 0805 SMD res
		R6	100	
		R28	100	
15	2	R9	5.1K	5.1K ohm 0805 SMD res
		R10	5.1K	
16	16	R11	100K	100K ohm 0805 SMD res
		R12	100K	
		R14	100K	
		R16	100K	
		R17	100K	
		R18	100K	
		R19	100K	
		R20	100K	
		R21	100K	
		R22	100K	
		R24	100K	
		R31	100K	
		R33	100K	
		R35	100K	
		R23 (SS OPT)	100K	
		R25 (SS OPT)	100K	
17	6	R13	1K	1K ohm 0805 SMD res
		R15	1K	
		R32	1K	
		R34	1K	
		R26 (SS OPT)	1K	
		R27 (SS OPT)	1K	
18	2	R29	1.2K	1.2K ohm 0805 SMD res
		R30	1.2K	
19	1	R36	10K	10K ohm 0805 SMD res

20	1	R37	1.2K	1.2K ohm 0805 SMD res
21	1	RN1 (IDE OPT)	4.7KX9	4.7K ohm 10-pin COM SIP res net
22	1	RN2	2.2KX4	2.2K ohm 8-pin ISO SIP res net
23	1	RN3	330X4	330 ohm 8-pin ISO SIP res net
24	1	RN4	4.7KX4	4.7K ohm 8-pin ISO SIP res net
25	23	C1	.1U	.1uF 0805 SMD cap
		C5	.1U	
		C7	.1U	
		C8	.1U	
		C12	.1U	
		C13	.1U	
		C19	.1U	
		C20	.1U	
		C21	.1U	
		C22	.1U	
		C32	.1U	
		C35	.1U	
		C48	.1U	
		C49	.1U	
		C56	.1U	
		C58	.1U	
		C69	.1U	
		C71	.1U	
		C2 (IDE OPT)	.1U	
		C25 (SS OPT)	.1U	
		C28 (SS OPT)	.1U	
		C37 (IDE OPT)	.1U	
		C59 (OPT)	.1U	
26	2	C3	4.7P	4.7pF 0805 SMD cap
		C4	4.7P	

27	7	C6	100U	100uF 16V tant cap
		C36	100U	
		C40	100U	
		C42	100U	
		C45	100U	
		C47	100U	
		C55	100U	
28	15	C9	1000P	1000pF 0805 SMD cap
		C10	1000P	
		C11	1000P	
		C14	1000P	
		C15	1000P	
		C16	1000P	
		C17	1000P	
		C18	1000P	
		C23	1000P	
		C24	1000P	
		C26	1000P	
		C27	1000P	
		C29	1000P	
		C30	1000P	
		C31	1000P	
29	7	C33	10U	10uF 16V tant cap
		C41	10U	
		C46	10U	
		C54	10U	
		C57	10U	
		C60	10U	
		C70	10U	
30	1	C34	100P	100pF 0805 SMD cap
31	1	C38	220U	220uF 16V rad elect cap
32	2	C43	.15U	.15uF 0805 SMD cap
		C44	.15U	

33	2	C50	470U	470uF 16V rad elect cap
		C51	470U	
34	5	C52	47P	47pF 0805 SMD cap
		C61 (OPT)	47P	
		C63 (OPT)	47P	
		C65 (OPT)	47P	
		C67 (OPT)	47P	
35	2	C53	1U	1uF 16V tant cap
		C56	1U	
36	4	C62	6800P	6800pF 0805 SMD cap
		C64	6800P	
		C66	6800P	
		C68	6800P	
37	1	L1	10MH	10mH epoxy thru-hole ind
38	1	Y1	14.318MHZ	14.31818MHz series crystal
39	1	J1	MITSUMI	4-pin 2mm audio header
40	1	J2	IDE	4-pin .1" audio header
41	1	J3 (IDE OPT)	20X2	20X2 straight dual row male
42	1	J4	13X2	13X2 straight dual row male
43	1	CN1	DB15	D-sub 15-pin femal
44	4	PH1	PHONEJACK	SJ-100 5-pin phone jack
		PH2	PHONEJACK	
		PH3	PHONEJACK	
		PH4	PHONEJACK	

NOTE:

OPT components may not be considered for fair cost comparison.

AS9540 Part Descriptions

Item	Description	Part Number	Vendor
1	20-pin SOIC	74LS244	Texas Instruments
2	14-pin SOP	74LS125	Texas Instruments
3	20-pin SOIC	74LS245	Texas Instruments
4	OPL 3	YMF262-M	Yamaha
5	Integrated audio subsystem ASIC	ALS100	Avance Logic, Inc.
6	TO-220 9V voltage regulator	LM7809CT	National Semiconductor
7	20-pin SOIC	TEA2025B	SGS Thomson
8	TO-220 5 V voltage regulator	LM7805CT	National Semiconductor
9	8-pin SOP OP amplifier	LF353	Texas Instruments
10-20	0805 SMD resistor	Note 2	
21	10-pin COM SIP resistor network	Note 4	
22-24	8-pin ISO SIP resistor network	Note 3	
25-26	0805 SMD capacitor (	Note 5	
27	16 V tantalum capacitor	Note 7	
28	0805 SMD capacitor	Note 5	
29	16 V tantalum capacitor	Note 7	
30	0805 SMD capacitor	Note 5	
31	16 V radial electrolytic capacitor	Note 6	
32	0805 SMD capacitor	Note 5	

Item	Description	Part Number	Vendor
33	16 V radial electrolytic capacitor	Note 6	
34	0805 SMD capacitor	Note 5	
35	16 V tantalum capacitor	Note 7	
36	0805 SMD capacitor	Note 5	
37	Epoxy thru-hole inductor	Series 1641	Delevan
38	14.31818 MHz series crystal	FOX143	Fox
39	4-pin audio connector (2.0 mm) (Mitsumi)	B4B-PH-K	JST
40	4-pin audio connector (.1 in) (IDE/Sony)	22-28-4043	Molex
41	20 x 2 straight dual row male header	2-102973-5	AMP
42	13 x 2 straight dual row male header	1-102973-3	AMP
43	D-sub 15-pin female connector	2-145782-4	AMP
44	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo

**Notes:**

- 1. Except for Item 4, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4. 1/10 W, 2%, 50 V
- 5. ±5%, 50 V
- 6. ±20%, 16 V
- 7. ±10%, 16 V

**AS9545 Sound Card**

Hardware implementation of the AS9545 sound card is not currently available. The functional description (see “AS9545 Sound Card Description” on page 2), the following schematics and bill of materials, and other references to this card elsewhere in this manual are for informational use only.

**AS9545 Schematics**

#include “c:\maker4\s100dm\as9545\as9545.ps”



```
#include "c:\maker4\s100dm\as9545\sh2.ps"
```



#include “c:\maker4\s100dm\as9545\sh3.ps”



```
#include "c:\maker4\s100dm\as9545\sh4.ps"
```



```
#include "c:\maker4\s100dm\as9545\sh5.ps"
```



```
#include "c:\maker4\s100dm\as9545\sh6.ps"
```

# AS9545 Bill of Materials

Bill Of Materials for AS9545 rev. A

16 BIT SOUND w/ IDE CD INTERFACE, OPL3/4      Revised:    October 11, 1995  
ALSND-S100-9545I      Revision: A.1

Item	Quantity	Reference	Part	Description
1	1	U1	74LS244	20-pin SOIC
2	3	U2	74LS245	20-pin SOIC
		U3	74LS245	
		U4	74LS245	
3	1	U5	YMF262	OPL 3
4	1	U6	ALS100	Avance Logic sound chip
5	1	U7	LM7805CT	TO-220 5V voltage regulator
6	1	U8	74LS125	14-pin SOP
7	1	U9	LM7809CT	TO-220 9V voltage regulator
8	1	U10	TEA2025B	16-pin DIP
9	1	U11	YRW801	wave data ROM
10	1	U12	YMF278	OPL 4
11	3	D1	LF353	8-pin SOP OP amp
		D2	LF353	
		D3	LF353	
12	7	R1	47	47 ohm 0805 SMD res
		R14	47	
		R15	47	

		R28	47	
		R30	47	
		R35	47	
		R36	47	
13	4	R2	5.1K	5.1K ohm 0805 SMD res
		R3	5.1K	
		R4	5.1K	
		R5	5.1K	
14	1	R6	4.7K	4.7K ohm 0805 SMD res
15	1	R7	1.8M	1.8M ohm 0805 SMD res
16	1	R8	1K	1K ohm 0805 SMD res
17	16	R9	100K	100K ohm 0805 SMD res
		R10	100K	
		R11	100K	
		R12	100K	
		R16	100K	
		R17	100K	
		R18	100K	
		R19	100K	
		R20	100K	
		R21	100K	
		R31	100K	
		R32	100K	
		R38	100K	
		R39	100K	
		R40	100K	
		R41	100K	
18	3	R13	100	100 ohm 0805 SMD res
		R22	100	
		R23	100	
19	5	R25	1.2K	1.2K ohm 0805 SMD res
		R26	1.2K	
		R44	1.2K	
		R45	1.2K	

		R47	1.2K	
20	1	R33	47K	47K ohm 0805 SMD res
21	3	R42	10	10 ohm 0805 SMD res
		R43	10	
		R49	10	
22	1	R46	10K	10K ohm 0805 SMD res
23	1	R48	3.3M	3.3M ohm 0805 SMD res
24	1	RN1	4.7KX9	4.7K ohm 10-pin COM res net
25	1	RN2	4.7KX4	4.7K ohm 8-pin ISO res net
26	1	RN3	330X4	330 ohm 8-pin ISO res net
27	1	RN5	2.2KX4	2.2K ohm 8-pin ISO res net
28	30	C1	.1U	.1uF 0805 SMD cap
		C2	.1U	
		C3	.1U	
		C4	.1U	
		C9	.1U	
		C10	.1U	
		C12	.1U	
		C14	.1U	
		C16	.1U	
		C19	.1U	
		C27	.1U	
		C28	.1U	
		C31	.1U	
		C33	.1U	
		C46	.1U	
		C53	.1U	
		C54	.1U	

			C55	.1U	
			C56	.1U	
			C58	.1U	
			C66	.1U	
			C67	.1U	
			C75	.1U	
			C76	.1U	
			C89	.1U	
			C90	.1U	
			C91	.1U	
			C94	.1U	
			C95	.1U	
			C96	.1U	
29	10		C5	100P	100pF 0805 SMD cap
			C6	100P	
			C26	100P	
			C39	100P	
			C40	100P	
			C68	100P	
			C73	100P	
			C74	100P	
			C77	100P	
			C78	100P	
30	2		C7	4.7P	4.7pF 0805 SMD cap
			C8	4.7P	
31	10		C11	10U	10uF 16V rad elect cap
			C13	10U	
			C15	10U	
			C29	10U	
			C30	10U	
			C38	10U	
			C44	10U	
			C57	10U	
			C60	10U	
			C79	10U	
32	7		C17	330P	330pF 0805 SMD cap
			C20	330P	

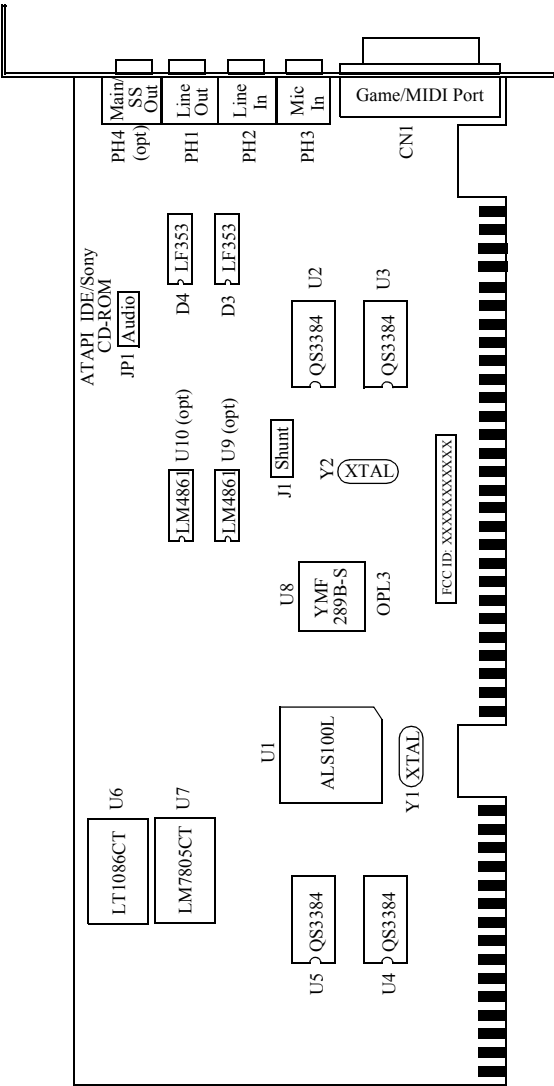
		C32	330P	
		C34	330P	
		C35	330P	
		C36	330P	
		C37	330P	
33	6	C18	1000P	1000pF 0805 SMD cap
		C21	1000P	
		C22	1000P	
		C23	1000P	
		C24	1000P	
		C25	1000P	
34	6	C42	100U	100uF 16V rad elect cap
		C43	100U	
		C45	100U	
		C63	100U	
		C64	100U	
		C65	100U	
35	4	C47	.22U	.22uF 0805 SMD cap
		C48	.22U	
		C49	.22U	
		C50	.22U	
36	2	C52	2200P	2200pF 0805 SMD cap
		C51	2200P	
37	2	C62	.15U	.15uF 0805 SMD cap
		C61	.15U	
38	2	C72	470U	470uF 16V rad elect cap
		C71	470U	
39	1	C80	1U TANT	1uF 16V tant cap
40	4	C81	47P	47pF 0805 SMD cap
		C83	47P	
		C85	47P	
		C87	47P	

41	4	C82 C84 C86 C88	.01U .01U .01U .01U	.01uF 0805 SMD cap
42	2	C92 C93	10P 10P	10pF 0805 SMD cap
43	1	D4	9.1V	9.1V .5W thru-hole zener diode
44	1	J1	MITSUMI	4-pin 2mm SIL connector
45	1	J1A	IDE	4-pin .1" SIL connector
46	1	J2	20X2	20X2 .1" dual row header
47	1	J3	13X2	13X2 .1" dual row header
48	3	L1  L2 L3	47UH  47UH 47UH	47uH epoxy thru-hole ind
49*	1	Y2  U13	33.8688MHZ  33.8688MHZ	33.8688MHz serial crystal 33.8688MHz oscillator
50	1	Y1	14.318MHZ	14.31818MHz serial crystal
51	4	PH1 PH2 PH3 PH4	PHONEJACK PHONEJACK PHONEJACK PHONEJACK	SJ-100 5-pin phone jack
52	1	CN1	DB15	D-sub 15-pin female DB15

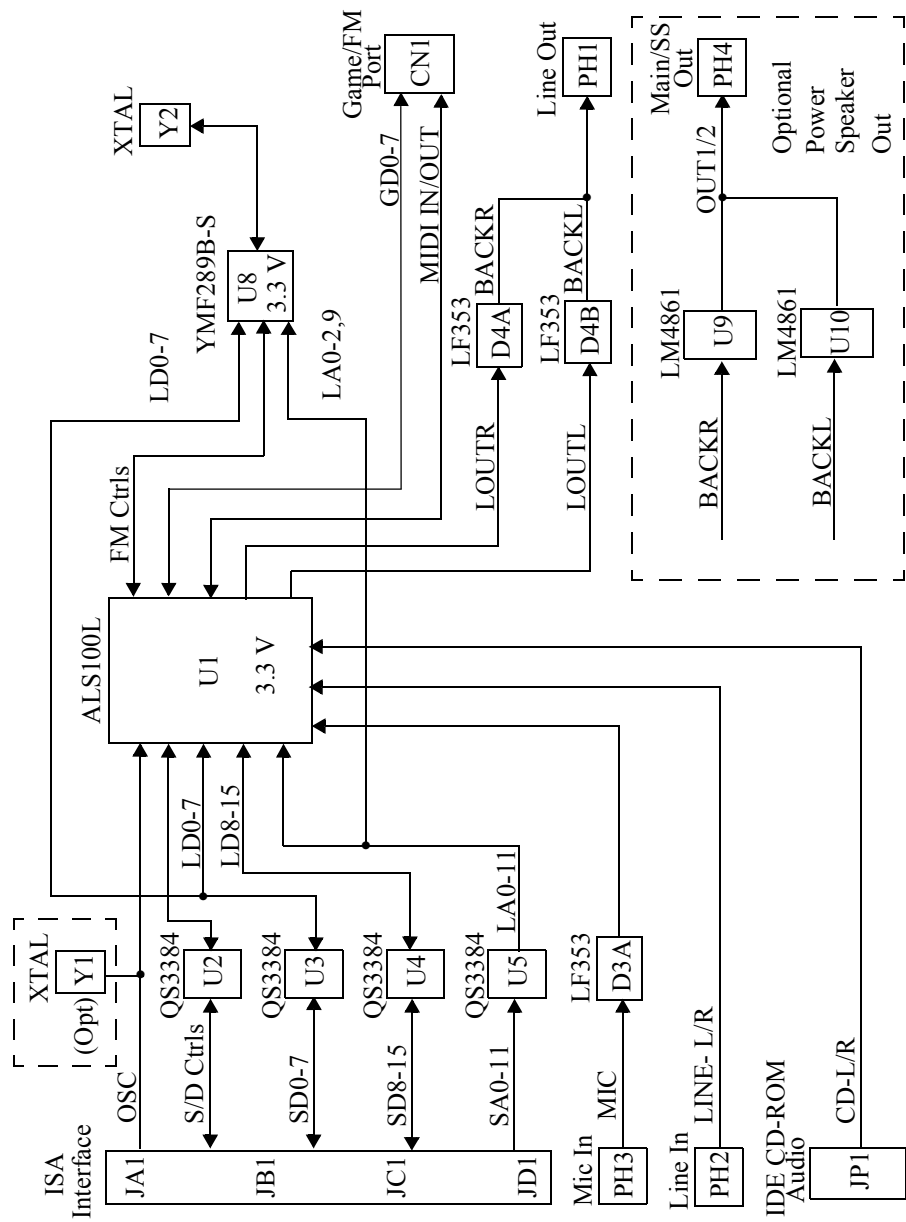
NOTE:

\* Install either Y2 or U13 for 33.8688MHz frequency, not both.

AS9548 Sound Card



AS9548 Block Diagram



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**AS9548 Schematics**

#include “c:\maker4\s100dm\as9548\as9548.ps”



#include “c:\maker4\s100dm\as9548\sh2.ps”



#include “c:\maker4\s100dm\as9548\sh3.ps”

# AS9548 Bill of Materials

Bill Of Materials for AS9548 rev. A

16 BIT ISA SOUND IN NOTEBOOK EVALUATION      Revised:    October 13, 1995  
ALSND-L100-9548I      Revision: A.1

Item	Quantity	Reference	Part	Description
1	1	U1	ALS100L	Avance Logic sound chip
2	4	U2	QS3384	
		U3	QS3384	
		U4	QS3384	
		U5	QS3384	
3	1	U6	LT1086CT-3.3	TO-220 3.3V voltage regulator
4	1	U7	LM7805CT	TO-220 5V voltage regulator
5	1	U8	YMF289B-S	low voltage OPL 3
6	2	U9	LM4861	8-pin SOP, 1/2W power amp
		U10	LM4861	
7	2	D3	LF353	8-pin SOP
		D4	LF353	
8	12	R1	100K	100K ohm 0805 SMD res
		R2	100K	
		R3	100K	
		R4	100K	
		R6	100K	
		R7	100K	
		R8	100K	
		R9	100K	
		R19	100K	

		R20	100K	
		R21	100K	
		R22	100K	
9	1	R5	33	33 ohm 0805 SMD res
10	2	R10	10K	10K ohm 0805 SMD res
		R36	10K	
11	1	R11	1M	1M ohm 0805 SMD res
12	2	R14	47	47 ohm 0805 SMD res
		R15	47	
13	3	R16	1.2K	1.2K ohm 0805 SMD res
		R37	1.2K	
		R38	1.2K	
14	4	R17	5.1K	5.1K ohm 0805 SMD res
		R18	5.1K	
		R32	5.1K	
		R33	5.1K	
15	4	R25	20K	20K ohm 0805 SMD res
		R26	20K	
		R29	20K	
		R30	20K	
16	2	R27	2K	2K ohm 0805 SMD res
		R28	2K	
17	1	R31	47K	47K ohm 0805 SMD res
18	2	R34	10	10 ohm 0805 SMD res
		R35	10	
19	1	RN1	2.2KX4	2.2K ohm 8-pin ISO SIP res net
20	1	RN2	330X4	330 ohm 8-pin ISO SIP res net

21	1	RN3	10KX4	10K ohm 8-pin ISO SIP res net
22	7	C1	330P	330pF 0805 SMD cap
		C2	330P	
		C3	330P	
		C4	330P	
		C15	330P	
		C19	330P	
		C20	330P	
23	23	C5	.1U	.1uF 0805 SMD cap
		C6	.1U	
		C7	.1U	
		C8	.1U	
		C10	.1U	
		C16	.1U	
		C17	.1U	
		C18	.1U	
		C21	.1U	
		C22	.1U	
		C23	.1U	
		C25	.1U	
		C27	.1U	
		C44	.1U	
		C46	.1U	
		C48	.1U	
		C51	.1U	
		C52	.1U	
		C56	.1U	
		C58	.1U	
		C59	.1U	
		C67	.1U	
		C68	.1U	
24	12	C9	10U	10uF 16V rad elect cap
		C11	10U	
		C12	10U	
		C24	10U	
		C26	10U	

		C28	10U	
		C43	10U	
		C45	10U	
		C47	10U	
		C49	10U	
		C50	10U	
		C64	10U	
25	4	C13	1000P	1000pF 0805 SMD cap
		C14	1000P	
		C31	1000P	
		C32	1000P	
26	2	C29	2200P	2200pF 0805 SMD cap
		C30	2200P	
27	4	C33	47P	47pF 0805 SMD cap
		C34	47P	
		C35	47P	
		C36	47P	
28	2	C37	4.7P	4.7pF 0805 SMD cap
		C38	4.7P	
29	4	C39	.01U	.01uF 0805 SMD cap
		C40	.01U	
		C41	.01U	
		C42	.01U	
30	3	C53	1U	1uF 16V tant cap
		C54	1U	
		C60	1U	
31	2	C55	470U	470uF 16V rad elect cap
		C57	470U	
32	7	C61	100P	100pF 0805 SMD cap
		C62	100P	
		C63	100P	
		C65	100P	
		C66	100P	

		C69	100P	
		C70	100P	
33	1	D1	1N4001	1A 1N4001 thru-hole diode
34	1	D2	3.3V	3.3V thru-hole zener diode
35	2	L1	47UH	47uH epoxy thru hole ind
		L3	47UH	
36	1	L2	10UH	10uH epoxy thru hole ind
37	1	Y1	14.31818MHZ	14.31818MHZ serial crystal
38	1	Y2	33.8688MHZ	33.8688MHZ serial crystal
39	1	CN1	DB15	D-sub 15-pin female
40	1	JP1	IDE	4X1 .1" single row header
41	1	J1	CON3	3X1 .1" single row header
42	1	J1	SHUNT	shunt for ALS100 power selection
43	4	PH1 PH2 PH3 PH4	LINE OUT LINE IN MIC IN SPEAKER OUT	SJ-100 5-pin phone jack

AS9548 Part Descriptions

Item	Description	Part Number	Vendor
1	Integrated audio subsystem ASIC	ALS100L	Avance Logic, Inc.
2	Bus Switch	QS3384	Quality Semiconductor
3	TO-220 3.3 V voltage regulator	LM1086CT-3.3	National Semiconductor
4	TO-220 5 V voltage regulator	LM7805CT	National Semiconductor
5	OPL 3 (low voltage)	YMF289B-S	Yamaha
6	8-pin SOP 1/2 W power amplifier	LM4861	National Semiconductor
7	8-pin SOP OP amplifier	LF353	Texas Instruments
8-18	0805 SMD resistor	Note 2	
19-21	8-pin ISO SIP resistor network	Note 3	
22,23	0805 SMD capacitor	Note 4	
24	16 V radial electrolytic capacitor	Note 5	
25,29	0805 SMD capacitor	Note 4	
30	16 V tantalum capacitor	Note 6	
31	16 V radial electrolytic capacitor	Note 5	
32	0805 SMD capacitor	Note 4	
33	Thru-hole diode	1N4001	Motorola Semiconductor
34	3.3 V thru-hole zener diode	1N5226BPH	Philips Semiconductor

Item	Description	Part Number	Vendor
35,36	Epoxy thru-hole inductor	Series 1641	Delevan
37	14.31818 MHz series crystal	FOX143	Fox
38	33.8688 MHz series crystal	**TBD**	**TBD**
39	D-sub 15-pin female connector	2-145782-4	AMP
40	4-pin audio connector (.1 in) (IDE/Sony)	22-28-4043	Molex
41	3 x 1 connector (.1 in)	26-48-1031	Molex
42	Shunt	Shunt	3M
43	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo

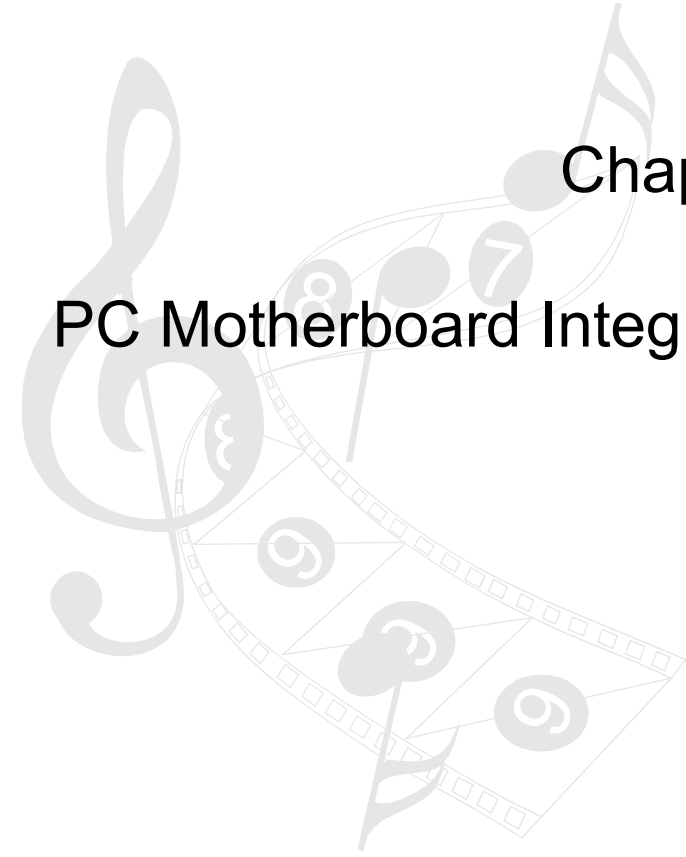
Notes:

- 1. Except for Item 1, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4. ±5%, 50 V
- 5. ±20%, 16 V
- 6. ±10%, 16 V



## Chapter 6

# PC Motherboard Integration



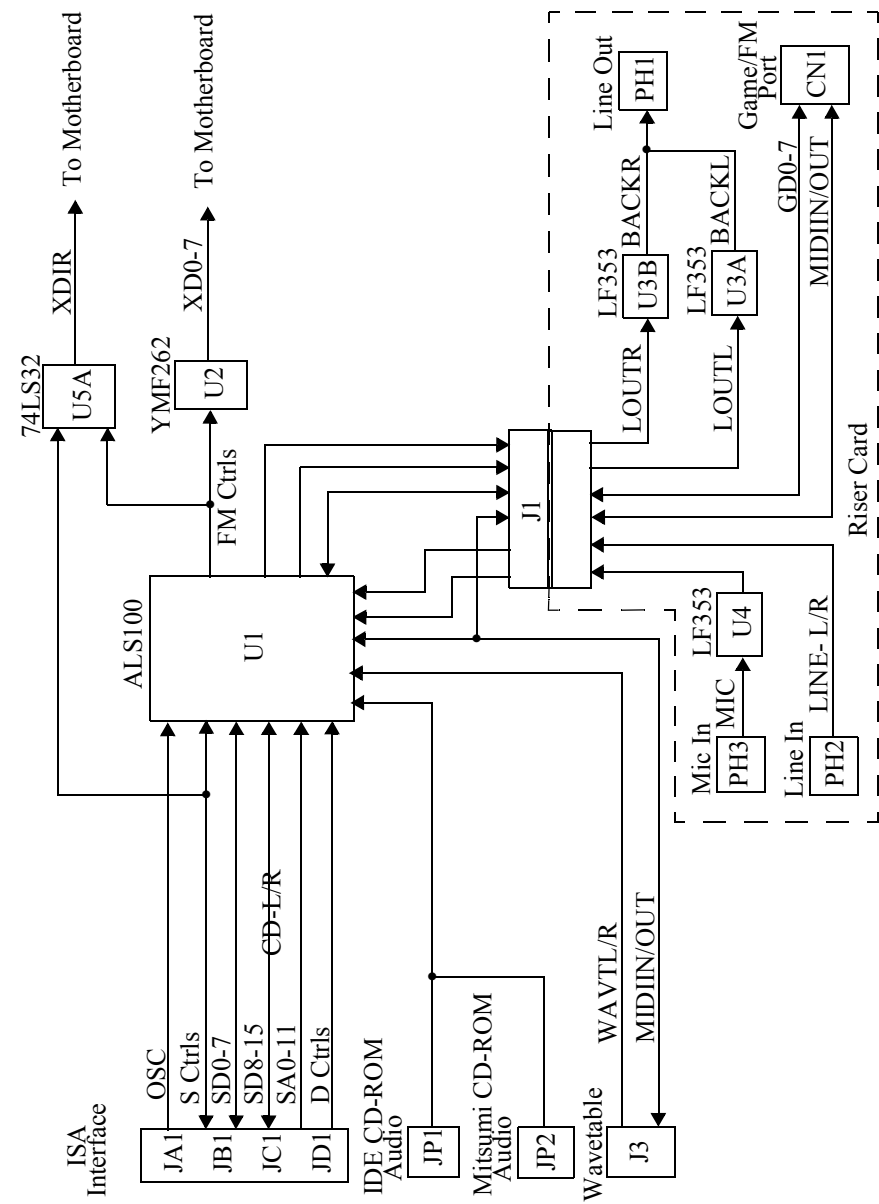


## **AS9539 PC Motherboard Sound System Design**

The AS9539 sound system design is based on the ALS100 Integrated Audio Subsystem ASIC and is a 16-bit ISA Plug and Play design with a Game/MIDI port, audio inputs from IDE and Mitsumi CD-ROM audio connectors, a Wavetable connector, and Microphone In and Line In jacks, and an output from a Line Out jack. The AS9539 sound system design contains a Yamaha OPL3 FM synthesizer and has Wave Blaster compatible upgrade capability.

The AS9539 sound system design includes the Audio I/O and Game/MIDI Port riser card. The riser card contains jacks for Microphone In, Line In, and Line Out and a connector for the Game/MIDI port and plugs onto the motherboard.

AS9539 Block Diagram



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**AS9539 Schematics**

#include “c:\maker4\s100dm\as9539\as9539.ps”



#include “c:\maker4\s100dm\as9539\sh2.ps”



#include “c:\maker4\s100dm\as9539\sh3.ps”

AS9539 Bill of Materials

Bill Of Materials for AS9539 rev. A

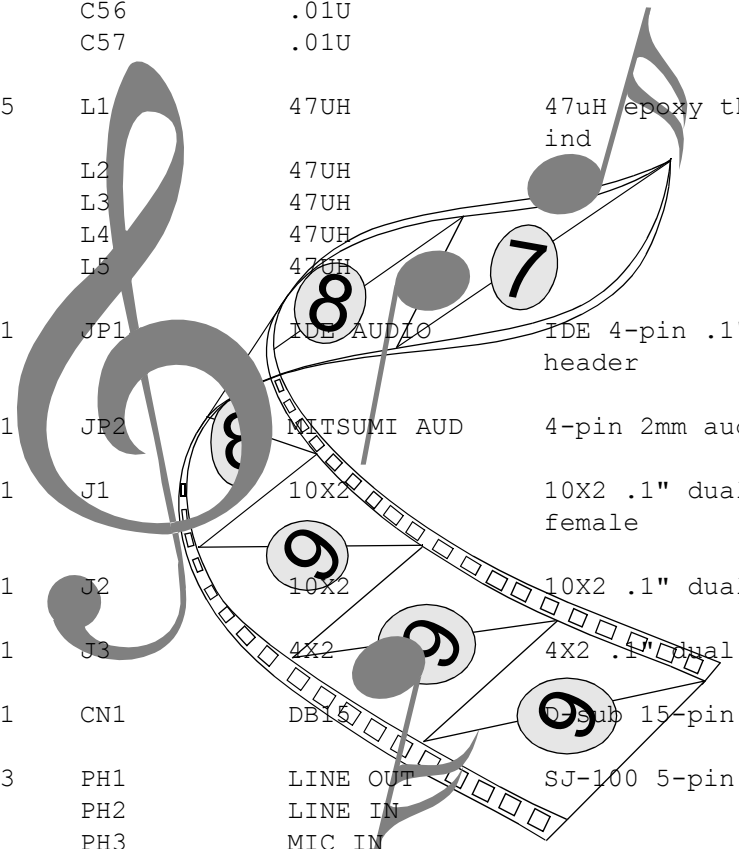
16 BIT ISA SOUND SYSTEM IN MOTHERBOARD      Revised: September 21, 1995  
ALSND-S100-9539I      Revision: A.1

Item	Quantity	Reference	Part	Description
1	1	U1	ALS100	Avance Logic sound chip
2	1	U2	YMF262	OPL 3
3	2	U3	LF353	8-pin SOP
		U4	LF353	
4	1	U5	74LS32	14-pin SOP
5	12	R1	100K	100K ohm 0805 SMD res
		R2	100K	
		R3	100K	
		R4	100K	
		R5	100K	
		R6	100K	
		R7	100K	
		R8	100K	
		R20	100K	
		R21	100K	
		R22	100K	
		R23	100K	
6	1	R9	33	33 ohm 0805 SMD res
7	4	R11	5.1K	5.1K ohm 0805 SMD res
		R12	5.1K	
		R13	5.1K	
		R14	5.1K	
8	1	R15	10K	10K ohm 0805 SMD res

9	3	R16	1.2K	1.2K ohm 0805 SMD res
		R18	1.2K	
		R19	1.2K	
10	1	R17	47K	47K ohm 0805 SMD res
11	2	R24	10	10 ohm 0805 SMD res
		R25	10	
12	2	R27	47	47 ohm 0805 SMD res
		R26	47	
13	1	RN1	2.2KX4	2.2K ohm 8-pin ISO SIP res net
14	1	RN2	330x4	330K ohm 8-pin ISO SIP res net
15	1	RN3	4.7KX4	4.7K ohm 8-pin ISO SIP res net
16	18	C1	.1U	.1uF 0805 SMD cap
		C3	.1U	
		C4	.1U	
		C5	.1U	
		C7	.1U	
		C9	.1U	
		C19	.1U	
		C24	.1U	
		C27	.1U	
		C28	.1U	
		C29	.1U	
		C31	.1U	
		C33	.1U	
		C34	.1U	
		C43	.1U	
		C44	.1U	
		C59	.1U	
		C61	.1U	

17	7	C8	330P	330pF 0805 SMD cap
		C10	330P	
		C11	330P	
		C12	330P	
		C13	330P	
		C23	330P	
		C26	330P	
18	4	C14	1000P	1000pF 0805 SMD cap
		C15	1000P	
		C21	1000P	
		C22	1000P	
19	2	C16	2200P	2200pF 0805 SMD cap
		C17	2200P	
20	1	C32	4.7P	4.7pF 0805 SMD cap
21	12	C2	10U	10uF 16V rad elect cap
		C6	10U	
		C18	10U	
		C20	10U	
		C25	10U	
		C30	10U	
		C35	10U	
		C36	10U	
		C47	10U	
		C58	10U	
		C60	10U	
		C62	10U	
22	7	C37	100P	100pF 0805 SMD cap
		C38	100P	
		C39	100P	
		C40	100P	
		C42	100P	
		C45	100P	
		C46	100P	
23	1	C41	1U TANT	1uF 16V tant cap

24	4	C50	47P	47pF 0805 SMD cap
		C51	47P	
		C52	47P	
		C53	47P	
25	4	C54	.01U	.01uF 0805 SMD cap
		C55	.01U	
		C56	.01U	
		C57	.01U	
26	5	L1	47UH	47uH epoxy thru-hole ind
		L2	47UH	
		L3	47UH	
		L4	47UH	
		L5	47UH	
27	1	JP1	IDE AUDIO	IDE 4-pin .1" audio header
28	1	JP2	4-PIN MITSUMI AUD	4-pin 2mm audio header
29	1	J1	10X2	10X2 .1" dual row female
30	1	J2	10X2	10X2 .1" dual row male
31	1	J3	4X2	4X2 .1" dual row male
32	1	CN1	DB15	DB-15 15-pin female
33	3	PH1	LINE OUT	SJ-100 5-pin phone jack
		PH2	LINE IN	
		PH3	MIC IN	



AS9539 Part Descriptions

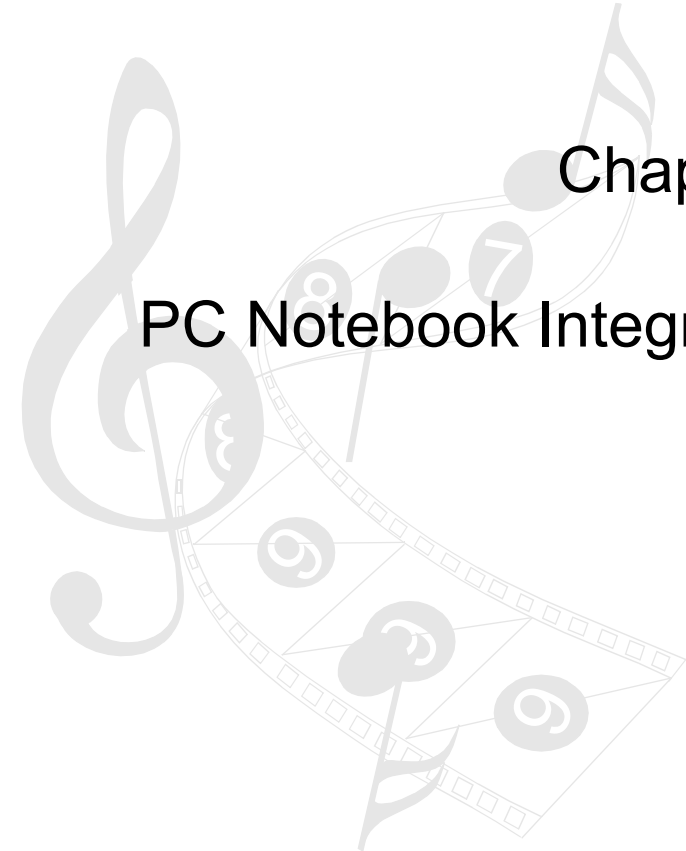
Item	Description	Part Number	Vendor
1	Integrated audio subsystem ASIC	ALS100	Avance Logic, Inc.
2	OPL 3	YMF262-M	Yamaha
3	8-pin SOP OP amplifier	LF353	Texas Instruments
4	14-pin SOP	74LS32	Texas Instruments
5-12	0805 SMD resistor	Note 2	
13-15	8-pin ISO SIP resistor network	Note 3	
16-20	0805 SMD capacitor	Note 4	
21	16 V radial electrolytic capacitor	Note 5	
22	0805 SMD capacitor	Note 4	
23	16 V tantalum capacitor	Note 6	
24,25	0805 SMD capacitor	Note 4	
26	Epoxy thru-hole inductor	Series 1641	Delevan
27	4-pin audio connector (.1 in) (Sony/IDE)	22-28-4043	Molex
28	4-pin audio connector (2.0 mm) (Mitsumi)	B4B-PH-K	JST
29	10 x 2 (.1 in) dual row female header	1-534998-1	AMP
30	10 x 2 (.1 in) dual row male header	1-103777-0	AMP
31	4 x 2 (.1 in) dual row male header	1-103777-4	AMP
32	D-sub 15-pin female connector	2-145782-4	AMP
33	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo

**Notes:**

- 1. Except for Item 1, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4.  $\pm 5\%$ , 50 V
- 5.  $\pm 20\%$ , 16 V
- 6.  $\pm 10\%$ , 16 V

## Chapter 7

# PC Notebook Integration



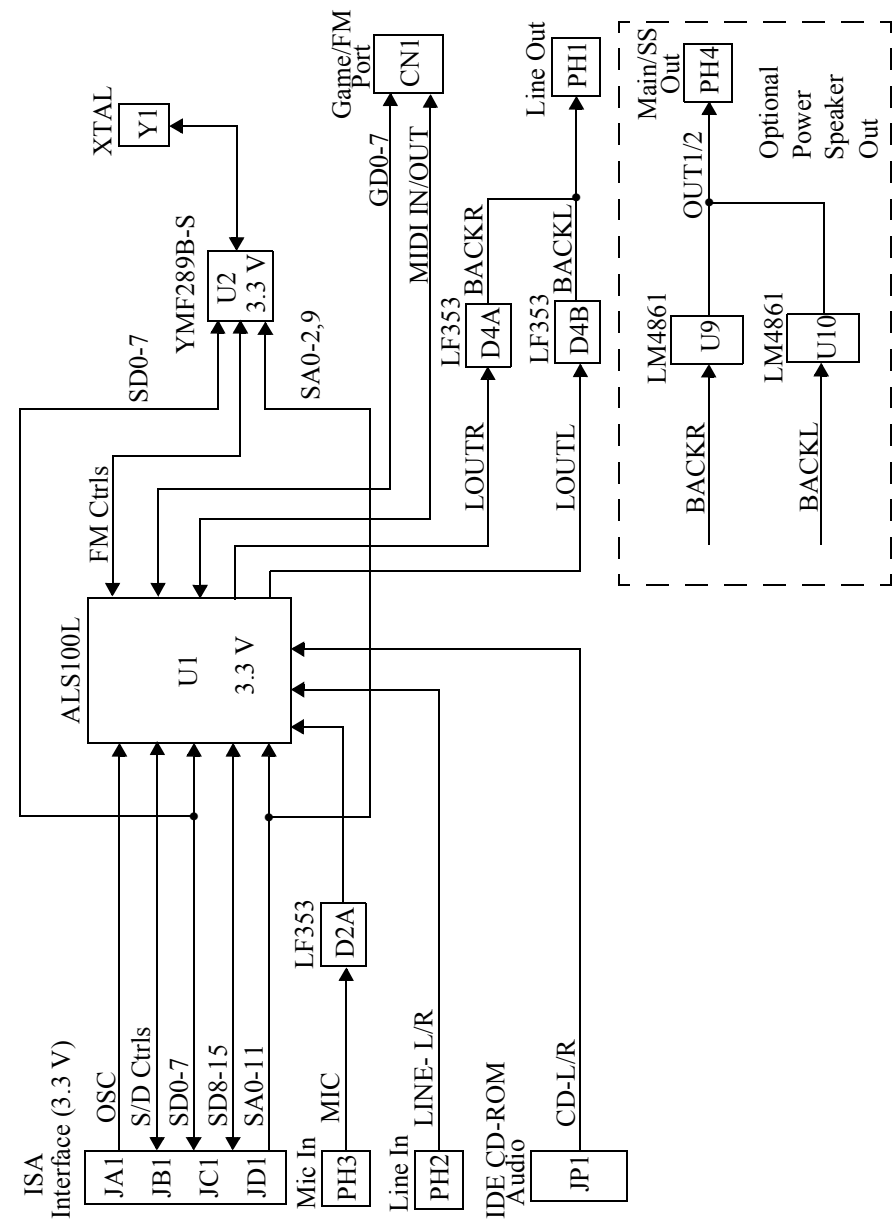


## AS9538 PC Notebook Sound System Design

The AS9538 sound system design is based on the ALS100L Integrated Audio Subsystem ASIC, the 3.3 V input voltage version of the ALS100. It is a 16-bit ISA plug and play design with a Game/MIDI port, audio inputs from an ATAPI IDE CD-ROM audio connector and Microphone In and Line In jacks, and outputs from Line Out and optional Speaker Out jacks. The AS9538 sound system design contains a Yamaha OPL3 FM synthesizer.

The AS9548 sound card contains an example of the AS9538 sound system design and is intended for the evaluation of that design (see “AS9548 Sound Card” on page 6 and “AS9548 Sound Card Design” on page 16). The AS9548 sound card has circuitry in addition to the AS9538 sound system design so that it can operate in a standard PC for a more convenient evaluation platform.

AS9538 Block Diagram



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**AS9538 Schematics**

#include “c:\maker4\s100dm\as9538\as9538.ps”



#include “c:\maker4\s100dm\as9538\sh2.ps”



#include “c:\maker4\s100dm\as9538\sh3.ps”

AS9538 Bill of Materials

Bill Of Materials for AS9538 rev. A

16 BIT ISA SOUND INTERFACE IN NOTEBOOK      Revised: September 21, 1995  
ALSND-S100-9538I      Revision: A.1

Item	Quantity	Reference	Part	Description
1	1	U1	ALS100L	Avance Logic sound chip
2	1	U2	YMF289B-S	low voltage OPL 3
3	2	U3	LM4861	8-pin SOP, 1/2W power amp
		U4	LM4861	
4	2	D2	LF353	8-pin SOP
		D3	LF353	
5	12	R1	100K	100K ohm 0805 SMD res
		R2	100K	
		R3	100K	
		R4	100K	
		R5	100K	
		R6	100K	
		R7	100K	
		R8	100K	
		R20	100K	
		R21	100K	
		R22	100K	
		R23	100K	
6	2	R9	10K	10K ohm 0805 SMD res
		R14	10K	
7	1	R10	1M	1M ohm 0805 SMD res
8	2	R11	47	47 ohm 0805 SMD res
		R12	47	

9	3	R15	1.2K	1.2K ohm 0805 SMD res
		R18	1.2K	
		R19	1.2K	
10	4	R16	5.1K	5.1K ohm 0805 SMD res
		R17	5.1K	
		R33	5.1K	
		R34	5.1K	
11	4	R26	20K	20K ohm 0805 SMD res
		R27	20K	
		R30	20K	
		R31	20K	
12	2	R28	2K	2K ohm 0805 SMD res
		R29	2K	
13	1	R32	47K	47K ohm 0805 SMD res
14	2	R35	10	10 ohm 0805 SMD res
		R36	10	
15	1	RN1	2.2KX4	2.2K ohm 8-pin ISO SIP res net
16	1	RN2	330x4	330 ohm 8-pin ISO SIP res net
17	1	RN3	10KX4	10K ohm 8-pin ISO SIP res net
18	7	C1	330P	330pF 0805 SMD cap
		C2	330P	
		C3	330P	
		C4	330P	
		C5	330P	
		C9	330P	
		C10	330P	

19	2	C6	2200P	2200pF 0805 SMD cap
		C7	2200P	
20	4	C8	1000p	1000pF 0805 SMD cap
		C11	1000p	
		C16	1000p	
		C17	1000p	
21	21	C12	.1U	.1uF 0805 SMD cap
		C13	.1U	
		C18	.1U	
		C19	.1U	
		C20	.1U	
		C21	.1U	
		C22	.1U	
		C23	.1U	
		C24	.1U	
		C25	.1U	
		C27	.1U	
		C28	.1U	
		C30	.1U	
		C33	.1U	
		C36	.1U	
		C49	.1U	
		C53	.1U	
		C55	.1U	
22	9	C14	10U	10uF 16V rad elect cap
		C15	10U	
		C26	10U	
		C29	10U	
		C31	10U	
		C32	10U	
		C34	10U	
		C35	10U	
		C61	10U	

23	4	C37	47P	47pF 0805 SMD cap
		C38	47P	
		C39	47P	
		C40	47P	
24	2	C41	4.7P	4.7pF 0805 SMD cap
		C42	4.7P	
25	4	C43	.01U	.01uF 0805 SMD cap
		C44	.01U	
		C45	.01U	
		C46	.01U	
26	7	C47	100P	100pF 0805 SMD cap
		C48	100P	
		C58	100P	
		C59	100P	
		C60	100P	
		C62	100P	
		C63	100P	
27	3	C50	1U	1uF 16V tant cap
		C51	1U	
		C57	1U	
28	2	C52	470U	470uF 16V rad elect cap
		C54	470U	
29	1	D1	3.3V	3.3V thru hole zener diode
30	1	L1	10mH	10mH epoxy thru hole ind
31	3	L2	470UH	470uH epoxy thru hole ind
		L3	470UH	
		L4	470UH	
32	1	JP1	IDE AUDIO	4X1 .1" single row header

33	4	PH1	LINE OUT	SJ-100 5-pin phone jack
		PH2	LINE IN	
		PH3	MIC IN	
		PH4	SPEAKER OUT	
34	1	CN1	DB15	D-sub 15-pin female
35	1	Y1	33.8688MHZ	33.8688MHz serial crystal

**AS9538 Part Descriptions**

Item	Description	Part Number	Vendor
1	Integrated audio subsystem ASIC	ALS100L	Avance Logic, Inc.
2	OPL 3 (low voltage)	YMF289B-S	Yamaha
3	8-pin SOP 1/2 W power amplifier	LM4861	National Semiconductor
4	8-pin SOP OP amplifier	LF353	Texas Instruments
5-14	0805 SMD resistor	Note 2	
15-17	8-pin ISO SIP resistor network	Note 3	
18-21	0805 SMD capacitor	Note 4	
22	16 V radial electrolytic capacitor	Note 5	
23-26	0805 SMD capacitor	Note 4	
27	16 V tantalum capacitor	Note 6	
28	16 V radial electrolytic capacitor	Note 5	
29	3.3 V thru-hole zener diode	1N5226BPH	Philips Semiconductor
30,31	Epoxy thru-hole inductor	Series 1641	Delevan
32	4-pin audio connector (.1 in) (Sony/IDE)	22-28-4043	Molex
33	SJ-100 5-pin phone jack	SJS-0349A-5P	Shogyo
34	D-sub 15-pin female connector	2-145782-4	AMP
35	33.8688 MHz series crystal	**TBD**	**TBD**

**Notes:**

- 1. Except for Item 1, equivalent parts may be substituted for all items.
- 2. 1/10 W, 5%, 150 V
- 3. 1/5 W, 2%, 50 V
- 4.  $\pm 5\%$ , 50 V
- 5.  $\pm 20\%$ , 16 V
- 6.  $\pm 10\%$ , 16 V





