## DESCRIPTION

The ES688 *AudioDrive*® is a single, mixed-signal, 16 bit stereo, VLSI chip for adding audio to personal computers. The AudioDrive can record, compress, and playback voice, sound and music with mixer controls. It consists of an embedded microprocessor, 16-bit A/D and D/A, DMA control, internal programmable memory and timer as well as custom logic and PC bus interface logic. In addition, there is built-in circuitry to simplify connections to microphone. It has stereo inputs for CD-audio, line-in, and music synthesis chip, as well as connections to joystick, MIDI and speakers.

The AudioDrive has a built in 5 channel mixer for both record and playback. It has stereo inputs for CD-audio, line-in, music synthesis, and digital audio, and a mono input for a microphone.

It is available in an industry standard surface mount 100 pin plastic quad flat package(PQFP).

A complete set of reference designs, bundled software and drivers is available with the chip.

BLOCK DIAGRAM
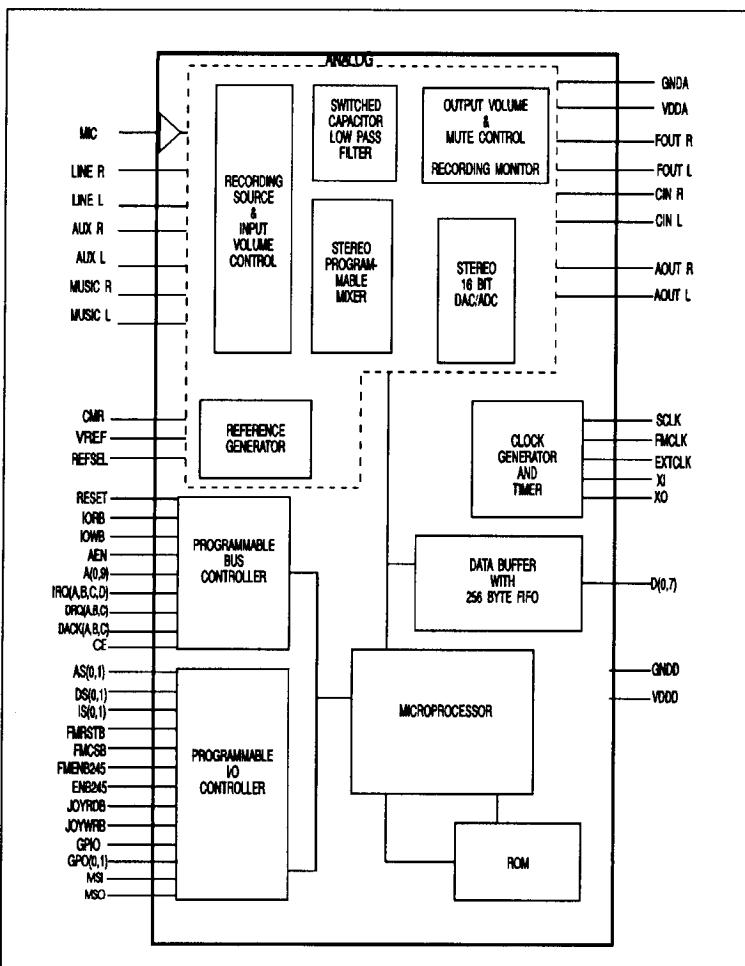
FEATURES

- Single, mixed-signal, high performance VLSI chip
- 16-bit stereo
- Record, compress, and playback voice, sound and music
- 5 channel mixer
- Stereo inputs for line-in, CD-ROM, and music synthesis and a mono input for microphone
- Audio mixer controls for inputs and outputs
- Mixer controlled recording
- Data transfer via DMA or programmed I/O
- Address decode outputs for joystick and music synthesis
- Power management
- Integrated 16-bit A/D and D/A converters
- Patented ESPCM™ compression for lower bit rates
- Programmable volume control for both record and playback.
- Programmable sample rate from 4,000 to 44,100 Hz for record and playback
- Also supports 3.3 volt operation
- Windows compatible and OLE compliant
- Supports The Microsoft® Windows™ Sound System
- Sound Blaster™ compatible(*) and Sound Blaster Pro™ compatible(**) with FM synthesis chips
- MIDI support

APPLICATIONS

- PC Audio
- Business Audio
- Microsoft's Windows Sound System
- Multimedia PC
- PC Games

IMPLEMENTATION PLATFORMS

- Desktop Systems
- Green PCs
- Notebooks
- Motherboards
- Multifunction Cards
- Sound Cards

DIGITAL PIN DESCRIPTION

VDDD, GNDD	Power	Digital Supply and Ground Pins
FMCLK	Output	Input Clock divided by 4 (3.58 MHz) for external FM synthesis chip such as YM3812
FMCSB	Output	Active low address decode output for external FM synthesis chip. This output is active low when AEN=0 and A[9:0] are among the set 388H-389H, 2x8H-2x9H, 2x0H-2x3H.
JOYWRB	Output	Active low decode for joystick, write to port 201H.
JOYRDB	Output	Active low decode for joystick, read from port 201H.
GPO0	Output	Output that is set low when the ES688 is powered-up and set high when the ES688 is powered-down.
GPO1	Output	MIDI serial data output.
GPI0	Input	Option input: 0: ES688 Emulates Sound Blaster v. 2.11: 1: ES688 Emulates Sound Blaster PRO v. 3.1
GPI1	Input	MIDI serial data input.
RESET	Input	Active high reset from AT bus.
FMRSTB	Output	Inverted RESET output for external FM synthesizer.
SCLK	Input	Option input: 0: Clock from EXTCLK input 1: Clock from crystal connected to pins XI and XO
EXTCLK	Input	14.32 MHz clock input from AT bus. No connection if SCLK=1.
XO	Output	Optional crystal oscillator output.
XI	Input	Optional crystal oscillator input. No connection if SCLK=0.
IORB	Input	Active low read strobe from AT bus.
IOWB	Input	Active low write strobe from AT bus.
A0-A9	Inputs	Address inputs from AT bus.
AEN	Input	Active low address enable from AT bus.
D0-D7	I/O	Bi-directional data bus. These pins have weak pull-up devices to prevent these inputs from floating when not driven.
ENB245	Output	Active low output when ES688 is being read or written to. Intended to be connected to the enable control of an external 74LS245.
FMENB2	Output	Similar to ENB245, except also is active for read/writes to any FM port such that FMCSB is active low.
IS0,IS1	Inputs	Inputs with internal pull-down devices. These inputs select the interrupt request pin: IS1 IS0 IRQx Recommended ISA/ IRQ 0 0 IRQA IRQ9 0 1 IRQB IRQ5 1 0 IRQC IRQ7 1 1 IRQD IRQ10

AS0,AS1	Inputs	Inputs with internal pull-down devices. These inputs select the address bank: AS1 AS0 Address Bank 0 0 22X 0 1 23X 1 0 24X 1 1 25X
DS0,DS1	Inputs	Inputs with internal pull-down devices. These inputs select the DMA channel: DS1 DS0 DRQx/DACKBx Recommended ISA D RQ/DACK 0 0 NONE --- 0 1 DRQA, DACKBA DRQ0/DACK0 1 0 DRQB, DACKBB DRQ1/DACK1 1 1 DRQC, DACKBC DRQ3/DACK3
IRQ A,B,C,D	Outputs	Active high interrupt request to AT bus. Unselected IRQ outputs are high impedance.
DRQ A,B,C	Outputs	Active high DMA request to AT bus. Unselected DRQ outputs are high impedance. When DMA is not active, the selected DRQoutput has a weaker pull down device that holds the DRQ line inactive unless another device that shares the same DRQ line can source enough current to make the DRQ line active.
DACKB A,B,C	Inputs	Active low DMA acknowledge inputs from AT bus.

ANALOG PIN DESCRIPTION

VDDA, GNDA	Power	Analog supply and ground.
MIC	Input	Microphone input. MIC has an internal pull-up resistor to CMR.
LINE L,R CMR.	Input	Line input left,right. LINE L,R have internal pull-up resistors to CMR
AUX L, R	Input	Aux(CD) input left, right. AUXL, R have internal pull-up resistors to CMR.
MUSIC L,R	Input	Music input left, right. MUSIC L,R have internal pull-up resistors to CMR
FOUT L,R	Output	Filter outputs left, right. A.C. coupled externally to CIN L,R in order to remove DC offsets. These outputs have internal series resistors of about 5K ohms. Capacitors to analog ground on these pins can be used to create a lowpass filter pole that removes switching noise introduced by the switched capacitor filters.
CIN L,R	Input	Capactive coupled inputs left, right. These inputs have internal pull-up resistors to CMR.
VREF	Output	Reference generator resistor divider output. Should be bypassed to analog ground with a .047 uf capacitor.
CMR	Output	Buffered reference output. Should be bypassed to analog ground with a 10 uf tantalum capacitor.
AOUT L,R	Output	Line level stereo outputs, left, right.
MOUT	Output	Mono output of AOUT L and AOUT R summed. MOUT can drive an A.C.-coupled 100 ohm load.
REFSEL	Input	Option input. Analog GND: normal operation Analog VDD: reserved.

ES688
AudioDrive

ESS Technology, Inc.
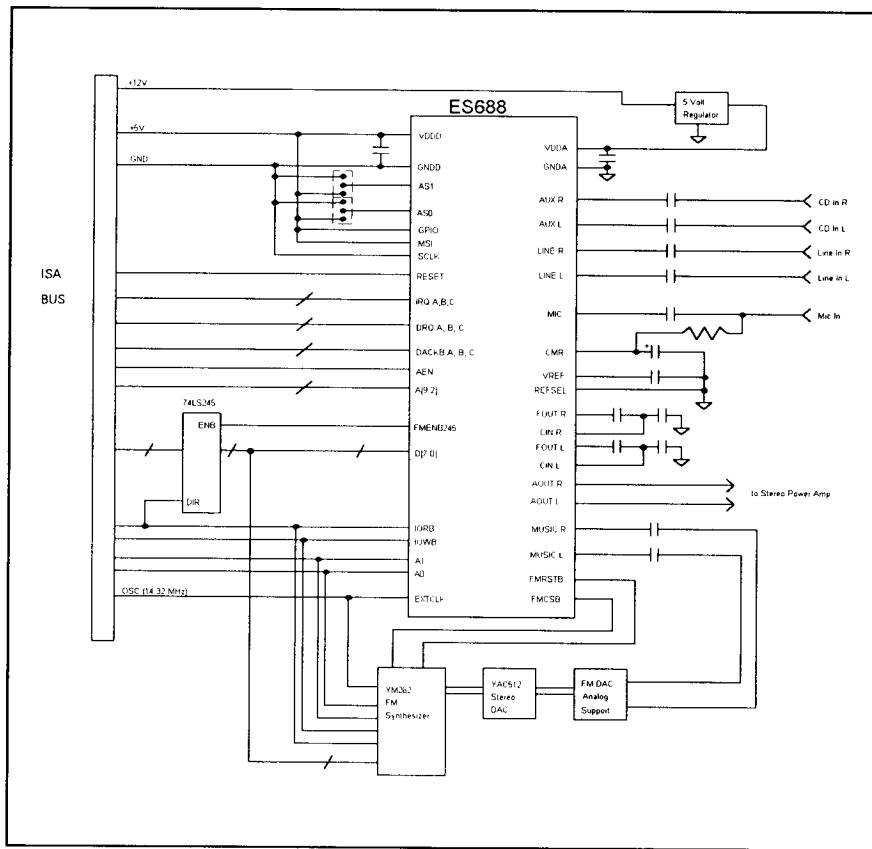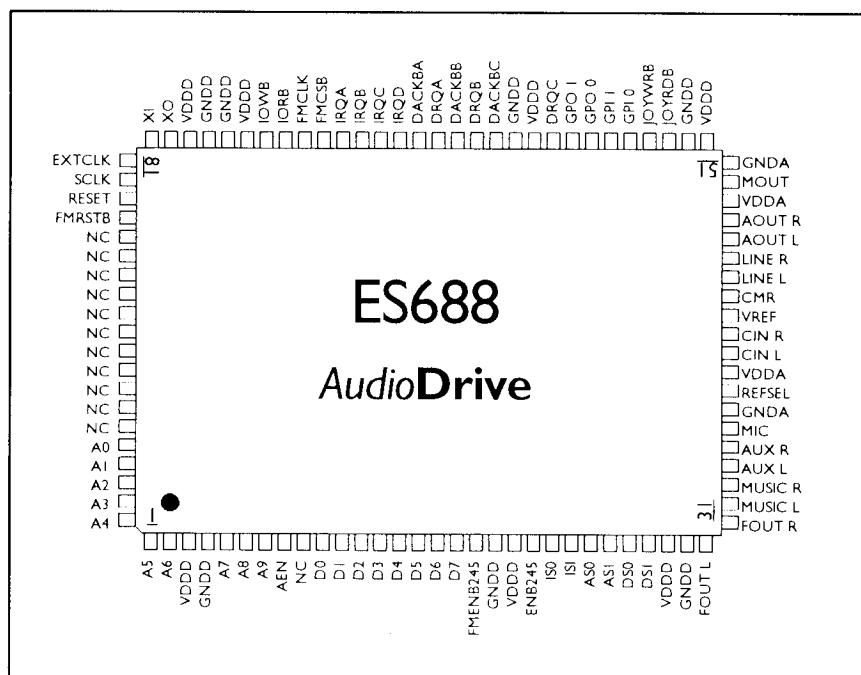
ANALOG CHARACTERISTICS

Parameter	Pins	Min	Typ	Max	Unit (Conditions)
Reference Voltage	CMR, VREF		2.25		Volts (VDDA = 5.0 V)
Input Impedance	LINE L/R, AUX L/R, MUSIC L/R, MIC	30K		100K	Ohms
	CIN L/R	35K	50K	65K	Ohms
Output Impedance	FOUT L/R	3.5K	5K	6.5K	Ohms
	AOUT L/R max load for full-scale output range		5K		Ohms
Input Voltage Range	MIC	10		125	mVp-p
	LINE L/R, AUX L/R, MUSIC L/R	0.5		VDDA-0.5	Volts
Output Voltage Range	AOUT L/R, full-scale output range	0.5		VDDA-1.0	Volts
Gain	Mic Preamp		26		dB
I/O Range	Input Volume Range	0		22.5	dB
	Output Volume Range	-46.5		+10	dB

DIGITAL

Symbol	Parameter	Min	Max	Unit	Conditions
VIH1	Input High Voltage: All except GPI1	2.0		V	VDDD=min
VIH2	Input High Voltage: GPI1	3.0		V	VDDD=min
VIL	Input Low Voltage		0.8	V	VDDD=max
VOL1	Output Low Voltage, All except D[7:0], DRQx, IRQx		0.4	V	IOL= 4mA, VDDD=min
VOH1	Output High Voltage, All except D[7:0], DRQx, IRQx	2.4		V	IOH = -3 mA, VDDD=max
VOL2	Output Low Voltage,D[7:0], DRQx, IRQx		0.4	V	IOL = 16 mA, VDDD=min
VOH2	Output High Voltage, D[7:0], DRQx, IRQx	2.4		V	IOH = -12 mA, VDDD=max
VOL3	Output Low Voltage,Select DRQx when DMA inactive.		0.4	V	IOL = 0.8 mA
ICC1	VDDD,VDDA Standby Current		40	uA	VDDD= max, D[7:0] high or floating,Other inputs at VDDD or GND and static.
ICC2	VDDD,VDDA Active		50	mA	VDDD= max, Oscillator rate at 14.32 MHz

MAXIMUM RATINGS

Ratings	Symbol	Value	Units
Analog Supply Voltage	VDDA	-0.3 to 7.0	V
Digital Supply Voltage	VDDD	-0.3 to 7.0	V
Input Voltage	VIN	-0.3 to 7.0	V
Operating Temperature Range	TA	0 to 70	Deg C
Storage Temperature Range	TSTG	-50 to 125	Deg C

SERVICE & SUPPORT

- Bundled Drivers:
    Microsoft Windows
    Microsoft Windows NT
    Microsoft Windows Sound System
    IBM® OS/2®
- Evaluation Kit
- Manufacturing Kit
- Bundled Audio Application Software
- Reference Design

BUNDLED SOFTWARE

- Audio Recorder
- Audio Reminder
- Audio Clip Library
- Chime
- Mixer
- Stopwatch
- Talking Calculator
- Talking Clock
- Timer

AudioDrive®

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