ESS Technology, Inc.

ES978
Expansion Audio Mixer
Product Brief

DESCRIPTION

The ES978 is an Expansion Audio Mixer for use in a docking station. It provides audio resources to an expansion unit with which a portable unit using the ES1878 *Audio***Drive**® is docked.

The ES978 eliminates the need for bulky discrete components in a docking station. The master volume control of the ES978 is slaved to the ES1878 mixer when the two are docked. Separate record and playback mixers allow for full-duplex operation between the ES1878-based portable unit and the ES978-based docking station.

A 4-wire expansion analog bus and a 2-wire serial control bus connect the ES1878 and ES978. This connection is used for a hot-docking interface. The 2-wire digital status and data communication between the ES978 and ES1878 supports register shadowing. The ES978 registers are continually updated with worst case latency being approximately 140 µsec.

The ES978 offers several advantages, such as a digital joystick interface which reduces host overhead for the dual game port, a selectable interface for either ES689/ES690 wavetable or an I²S Zoom Video port for MPEG audio, as well as 8 general-purpose inputs and 8 general-purpose outputs for flexible board design. These general purpose I/O can be slaved with the corresponding pins of the ES1878.

Advanced power management supports automatic power-down. As long as the ES1878 portable unit and the ES978 docking station are connected, power-down states on both units are executed concurrently. Whenever the docking station is not connected, the ES978 remains in power-down mode.

ES978 is available in an industry-standard 100-pin Plastic Quad Flat Pack (PQFP) package.

FEATURES

Interfaces to ES1878 *Audio***Drive**® Chip

- No bus interface required
- Simple hot-docking interface
- Supports register shadowing between ES978 and ES1878
- Supports two pairs of on-chip analog differential signals for audio I/O with portable audio mixer and a 2-pin serial control bus
- High integration eliminates the need for discrete components in the docking station

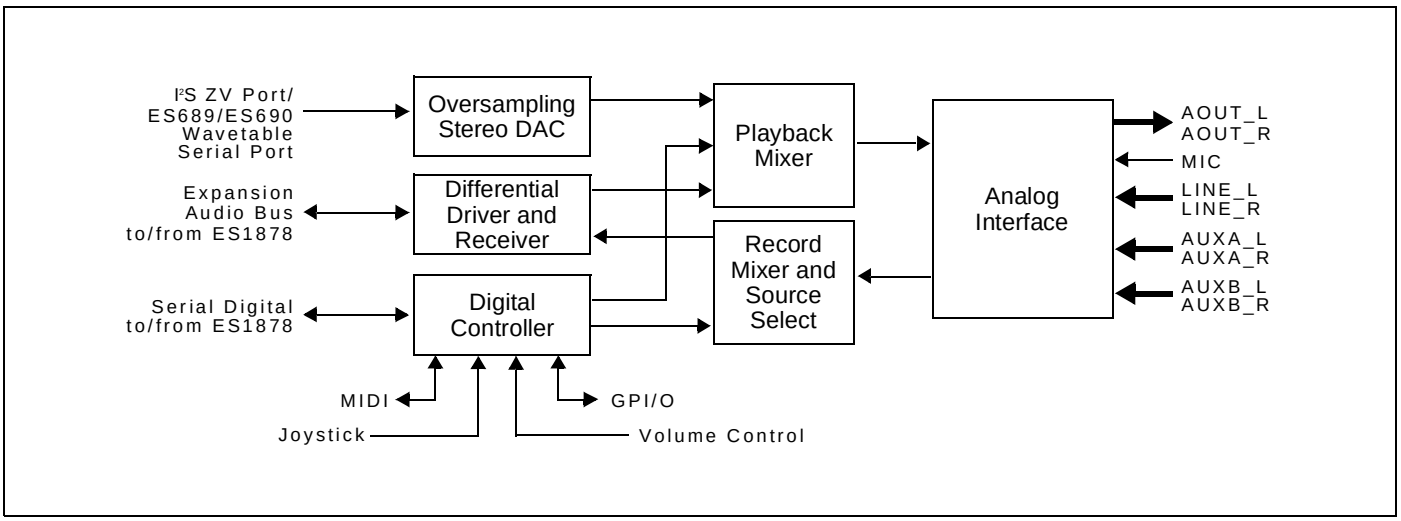
Inputs and Outputs

- Supports up to 8 general-purpose inputs and 8 general-purpose outputs
- Selectable interface for either the ES689/ES690 wavetable or I²S Zoom Video
- MIDI serial port compatible with MPU-401 UART mode
- ESS high performance dual game port with hardware timing

Mixer Features

- 5-channel stereo mixer: line, CD audio, auxiliary line, input from ES1878 portable unit, a selectable input from either the ES689/ES690 or the I²S Zoom Video port, plus a mono input for microphone
- Programmable 6-bit logarithmic master volume control
- 3-button hardware volume control with switch inputs for master volume up, down, and mute
- Master volume control: when docked, mixer in ES978 docking station is slaved to mixer in ES1878 notebook
- Symmetrical record and playback mixers for simultaneous full-duplex operation

ES978 FUNCTIONAL BLOCK DIAGRAM



DIGITAL PIN DESCRIPTIONS

Name	I/O	Description
VDDD	I	Digital power supply (3.0 - 5.5 V).
GNDD	I	Digital ground.
MSO	O	MIDI serial output.
MSI	I	MIDI serial input. This pin has an internal pull-up.
XI	I	14.31818 MHz oscillator input (no-connect if ENXOSC=0).
XO	O	14.31818 MHz oscillator output (no-connect if ENXOSC=0).
EXTCLK	I	TTL level 14.31818 MHz clock input if ENXOSC=0.
ENXOSC	I	Active-high external oscillator enable signal. Connect to VDDD to enable oscillator, GNDD if using external clock source or to power down the oscillator.
XSC	I	Expansion audio serial interface clock/sync. This pin has an internal pull-down to GNDD.
XSD	I/O	Bidirectional expansion audio serial interface data line.
XGPI [7:0]	I	General purpose inputs.
XGPO [7:0]	O	General purpose outputs. Driven to zero when undocked or during reset.
MUTE	I	Active-low mute input transmitted to ES1878. This pin has an internal pull-up to VDDD.
VOLUP	I	Active-low volume-up input transmitted to ES1878. This pin has an internal pull-up to VDDD.
VOLDN	I	Active-low volume-down input transmitted to ES1878. This pin has an internal pull-up to VDDD.
SMODE [1:0]	I	Select mode of serial port to internal DAC:
SE	I	Active-high, serial port enable. Connect to VDDD to enable serial port to internal DAC. This pin has an internal pull-down to GNDD.
IISCLK/ MCLK	I	Multipurpose pin, IISCLK or MCLK. When used as IISCLK, is a serial shift clock for I²S interface. When used as MCLK, is a serial shift clock for the ES689/ES690 interface. This pin has an internal pull-down to GNDD.
IISDATA/ MSD	I	Multipurpose pin, IIDATA or MSD. When used as IIDATA, is serial data for I²S interface. When used as MSD, is serial data for the ES689/ES690 interface. This pin has an internal pull-down to GNDD.
IILR	I	Active-high left/right channel select signal for the I²S interface. This pin has an internal pull-down to GNDD and is left unconnected in ES689/ES690 mode.
IIMCLK	I	Oversampling clock for the I²S interface. This pin has an internal pull-down to GNDD and is left unconnected in ES689/ES690 mode.
RESET	I	Active-high power-on reset.
DOCKED	I	Asserted-high when the ES978 is docked to the ES1878. This pin has an internal pull-down to GNDD.
SW(A-D)	I	Joystick switch inputs. These pins have internal pull-ups to VDDD.
T(A-D)	I/O	Joystick timers.
TM, SCSL, SCCK	NC	Test pin; leave unconnected.
SCSO	NC	Test pin; leave unconnected.

BIT		MODE
1	0	
0	0	Auto Detect Mode
0	1	I²S x256 oversampling
1	0	I²S x384 oversampling
1	1	ES689/ES690

ANALOG PIN DESCRIPTIONS

Name	I/O	Description
VDDA	I	Analog power supply (4.75 - 5.25 V).
GNDA	I	Analog ground.
XA[3:0]	I/O	Expansion audio bus. These are analog signals that are DC-coupled to the corresponding XA[3:0] pins of the ES1878.
LINE_L LINE_R	I	Line inputs left and right. These pins have internal pull-ups to CMR.
AUXA_L AUXA_R	I	Aux A (CD) inputs left and right. These pins have internal pull-ups to CMR.
AUXB_L AUXB_R	I	Aux B inputs left and right. These pins have internal pull-ups to CMR.
MIC	I	Mic input to +26 dB internal preamp. This pin has a pull-up to CMR.
MICPAE	I	Microphone preamp enable signal. Connect to VDDA to enable internal preamp. Connect to GNDA to enable bypass preamp.
VREF	I/O	2.25 V reference generator.
CMR	I/O	2.25 V reference buffer output.
MXO_L MXO_R	O	Mixer outputs left and right. Normally AC coupled to MVI_L and MVI_R.
MVI_L MVI_R	I	Master volume inputs left and right. These pins have internal pull-ups to CMR.
AOUT_L AOUT_R	O	Analog outputs, left and right, from master volume.

DIGITAL CHARACTERISTICS

Symbol	Parameter	Min	Max	Unit	Conditions
VIH1	Input high voltage: All except XI	2.0		V	VDDD = min
VIH2	Input high voltage: XI	3.0		V	VDDD = min
VIL	Input low voltage		0.8	V	VDDD = max
VOL1	Output low voltage: All except XSD		0.4	V	IOL = 4 mA, VDDD = min
VOH1	Output high voltage: All except XSD	2.4		V	IOH = -3 mA, VDDD = max
VOL2	Output low voltage: XSD		0.4	V	IOL = 16 mA, VDDD = min
VOH2	Output high voltage: XSD	2.4		V	IOH = -12 mA, VDDD = max
ICC1	VDDD active		10	mA	VDDD = max osc. rate at 14.32 MHz
ICC2	VDDA active		40	mA	VDDA = max
ICC3	VDDD power-down		50		µA
ICC4	VDDA power-down		50		µA

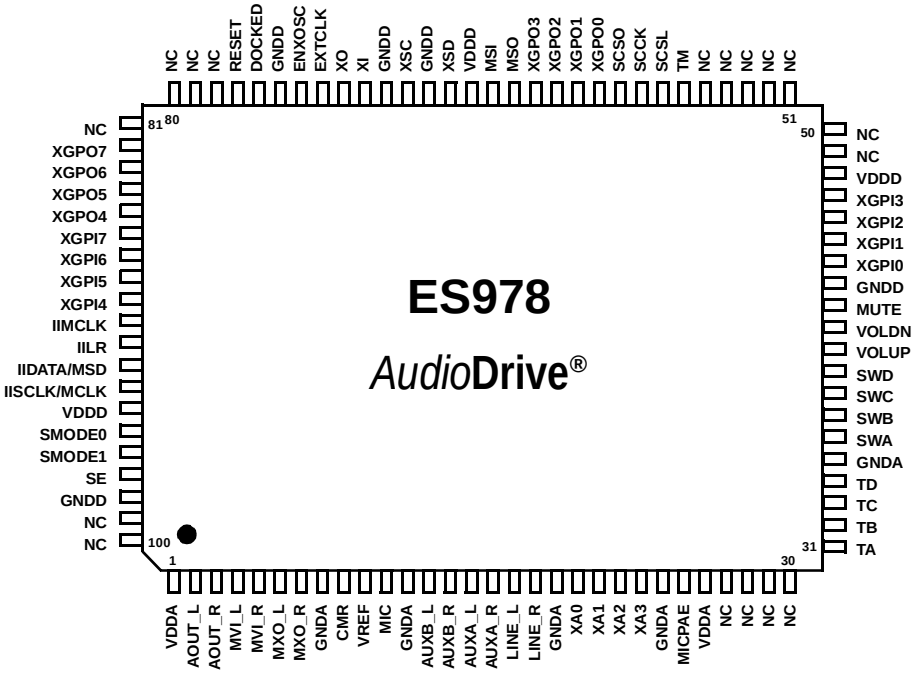
ANALOG CHARACTERISTICS

Parameter	Pins	Min	Typ	Max	Unit
Reference voltage	CMR, VREF (VDDA = 5.0 V)		2.25		V
Input impedance	LINE_L, LINE_R, AUXA_L, AUXA_R, AUXB_L, AUXB_R	50k	80k	110k	Ω
	MIC	30k	50k	80k	Ω
	MVI_L, MVI_R	70k	100k	130k	Ω
Output impedance	AOUT_L, AOUT_R max load for full-scale output range		10k		Ω
Input voltage range	MIC	10		125	mV p-p
	LINE_L, LINE_R, AUXA_L, AUXA_R, AUXB_L, AUXB_R	0.5		VDDA -1.0	V
Output voltage range	AOUT_L, AOUT_R full-scale output range	0.5		VDDA -1.0	V
Gain	Mic preamp		26		dB

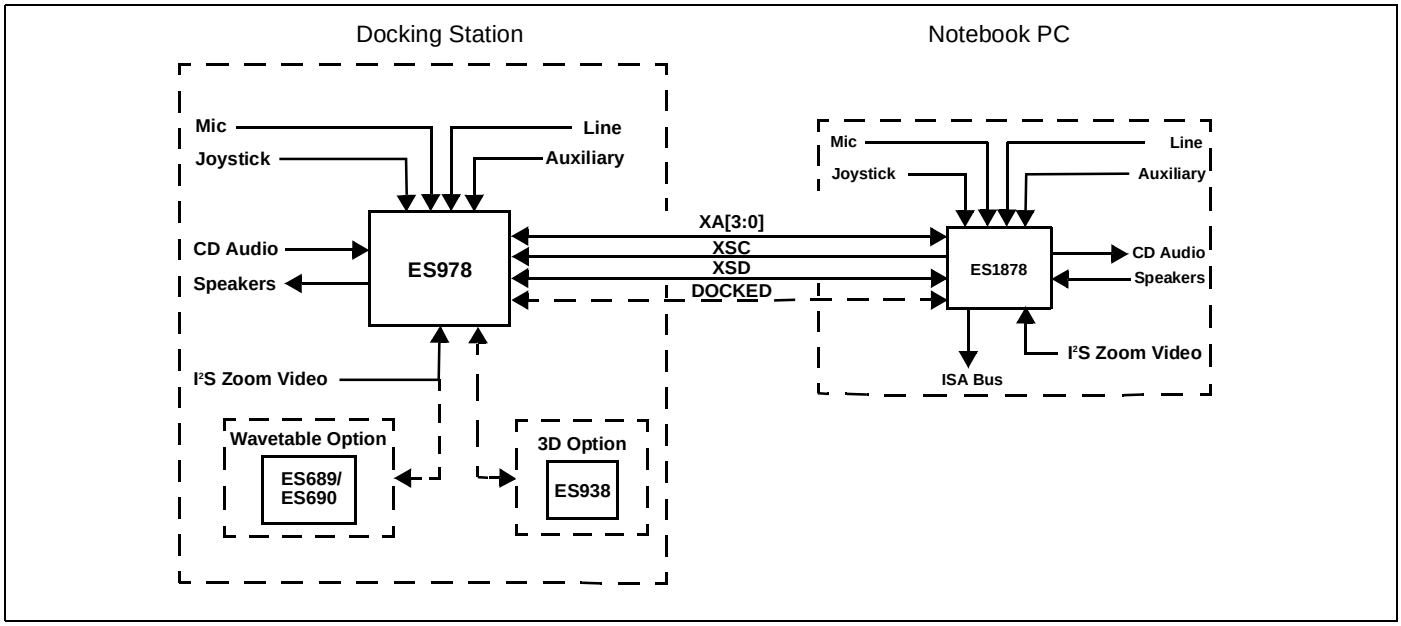
MAXIMUM RATINGS

Ratings	Symbol	Value
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 °C
Storage temperature range	TSTG	-50 to 125 °C

PINOUT



TYPICAL APPLICATION



APPLICATIONS

- Docking stations in conjunction with portable units using the ES1878 *Audio***Drive**®

SERVICE AND SUPPORT

- Evaluation Kit
- Manufacturing Kit
- Reference Design

OPERATING SYSTEMS

- Microsoft® Windows®95
- Microsoft Windows™ 3.1
- Microsoft Windows for Workgroups™
- Microsoft Windows NT™
- IBM® OS/2® Warp™

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