

### **CDB4811**

### **Evaluation Board for CS4811**

#### **Features**

- Evaluation Platform for the CS4811 Fixed Function Multi-Effects Processor
- Stand-Alone Operation, DSP Boots from Serial EEPROM
- Selection of Up to 8 Different Presets
- On-Board Hardware Wet/Dry Mix Control
- User Adjustable Input and Output Level

#### Description

The CDB4811 is a stand-alone demonstration platform for the CS4811 multi-effects processor system-on-achip. The board is designed to showcase musical effects processing applications including spring reverb, digital reverb, delay, chorus, flange, and tremolo effects. There are different versions of the CDB4811 board, each with DSP code optimized for specific applications. Contact your local Cirrus Logic sales representative to find out about the latest versions offered.

#### ORDERING INFORMATION

CDB4811GTR CDB4811MXR Guitar Effects Evaluation Kit Mixer Effects Evaluation Kit



Preliminary Product Information

This document contains information for a new product. Cirrus Logic reserves the right to modify this product without notice.

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SEP '00 DS486DB2 1



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#### **Contacting Cirrus Logic Support**

For a complete listing of Direct Sales, Distributor, and Sales Representative contacts, visit the Cirrus Logic web site at: http://www.cirrus.com/corporate/contacts/

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#### 1. CDB4811 SYSTEM OVERVIEW

The CDB4811 is a complete, stand-alone digital signal processing (DSP) system based on the CS4811 fixed function multi-effects audio processor. The CS4811 contains an on-chip analog-to-digital converter (ADC), digital to-analog-converter (DAC), and proprietary 24-bit audio processing core with a large amount of on-chip RAM. The CS4811's functionality (changing effects) is controlled during runtime by a rotary DIP switch, allowing up to 8 different presets to be selected. A hardware mix control allows the ratio of processed vs. input signal to be adjusted. The user can also set the level of the analog input and output to optimize the interface with external audio equipment.

#### 2. CS4811 AUDIO PROCESSOR

The processor is capable of self-loading its program from an external serial EEPROM memory at power-up through the control port. In this application the control port uses SPI format. Since the CS4811 is RAM based, it can be configured for different signal processing applications by storing a different Crystal supplied application code module into the external memory.

#### 3. ANALOG INPUT

The analog input to the on-chip ADC (J1) is single ended, with an adjustable voltage gain of -60 to +34 dB. Adjusting the 12-turn INPUT ATTEN potentiometer clockwise will increase the input gain. For best signal-to-noise performance the input gain should be increased until just before audible clipping is encountered with a maximum level input signal. Substantial input clipping is indicated when LED D3 is lit (CLIP). The full scale input of the ADC (driven single ended) is 1.77V RMS (5 V pp). The ADC input signal is anti-aliased with a passive filter, Fc = 480 kHz, as shown in the schematic diagram of Figure 1. The ADC input is protected against overvoltage by diodes D1 and D2.

#### 4. ANALOG OUTPUT

The processed output signal is mixed with the amplified input signal with potentiometer VR3 (MIX). Turning MIX clockwise increases the amount of the processed (wet) signal that appears at the output. The mixed output is then buffered with an output stage that has a variable gain of -60 to +6 dB adjusted via 12-turn potentiometer VR2 (GAIN TRIM). Turning GAIN TRIM clockwise increases the output gain. The best signal-to-noise ratio is obtained when the full scale output of the CDB4811 matches the full scale (non-clipped) amplitude capabilities of the downstream circuitry (ideally 5 V p-p or 1.77 V RMS). The signal-to-noise ratio will decrease when the gain of the output buffer is greater than one.

The differential analog output from the CS4811 DAC is buffered with a 2-pole active butterworth filter U2A, Fc = 16 kHz, Av = 0.83 V/V. The purpose of the filter is to convert the output to single ended prior to mixing, attenuate out-of-band noise generated by the DAC, and limit the signal swing to 5 V p-p.

Q3 acts as a shunt to attenuate any loud pops that may occur during power up/down. Q3 is controlled by a digital output pin on the CS4811 that is asserted at power-up and de-asserted after the DSP has booted.

#### 5. CONTROL

Rotary DIP switch S1 is used to control various aspects of the CS4811 code functionality such as selecting different musical effects presets. Moving a switch to the ON position sets that bit position to zero (low). Header JP2, FOOTSWITCH, is provided to connect an external switch to the system. The header is connected in parallel with S1 switch 3. A 10 k pull-up is attached to the round pad of the FOOTSWITCH header, the other pad is connected to ground. To use the FOOTSWITCH input, connect an external SPST switch between the two ter-



minals of JP2, and place S1 switch 3 to the OFF position.

Please see the CS4811 firmware code application documents for details of any specific functions which may be assigned to the S1 DIP switch. If S1 functionality is not discussed in the application document then it is not supported.

#### 6. POWER SUPPLY

Power is attached to the board through a 2.5 mm power connector J3, positive is the center contact. An unregulated 9 VDC, 0.5 A wall transformer is supplied with the board.

An on-board voltage regulator supplies 200 mA@5 V to the system from an 8 to 12 VDC input. An external power resistor can be used to limit the input voltage to the board in applications where a 12 V supply is not available. In applications where 5 V is available, the regulator can be removed and a shorting jumper installed at R27. If this modification is done, care must then be taken not to plug the 9 VDC transformer into the board or the CS4811 may be damaged.

#### 7. LAYOUT

The reference filter capacitor C9 must be kept as close as practical to the device, the CMFILT+ signal trace (pin 93) and CMFILT- ground return trace (pin 94) should be on the top side of the board and as short as possible. Keep other traces away from this node, as any noise coupled into the CMFILT+ pin will appear at the DAC outputs with little or no attenuation. If the board environment is noisy, a 0.1 uf capacitor should be added in parallel with C9 to help eliminate noise coupling.

Mount the 0.047 uf surface mount power supply decoupling capacitors as close to the device as possible. Again, keep the traces to these capacitors and the device supply pins and ground pins on the top side of the board and as short as practical.

The anti-aliasing filter capacitor C2 should be mounted as close to the device as practical. The AC shorting capacitor C4 should also be close to the device. All digital traces should be kept away from the analog input and output sections of the board.

A ground fill is used on both top and bottom layers to minimize noise coupling and ground trace impedance. Separate analog and digital grounds are not needed and should not be used. The PCB layout for the board appears in Figures 3, 4, and 5.



Figure 1. Schematic Diagram

CDB4811

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C54611 1	KEVERB DEI	Devised: Idesday, May	10, 2000					
CDB4811	1	Revision: B						
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Cirrus I	Jogic							
4210 S.	Industria	al Dr.						
Austin,	'l'x 78744							
Bill Of	Materials	May 10,2000	11:27:21					
						- · · · ·		
ltem	Quantit	Reference	Value	Mig	Mig Part Number	Description	Footprint	Notes
1	13		47ni	PANASONIC	ECU-VIH473KBW	CAP, CERAMIC, 47NF, 50V, 10%, X7R, 1206 C	SN_1206 NC	POP C27
		020,023,024,025,026,027,						
0	4		16	DAVIA GOVIE G	201 111100 201	CAR CERANTO 100 1000 FL NEO 1000 C	1000	
2	4		1ni 20. f	PANASONIC	ECU-VIHIUZJCH	CAP, CERAMIC, INF, 100V, 5%, NPO, 1206 C	SN_1206	
3	3		39pi	PANASONIC	ECU-VIH390JCM	CAP, CERAMIC, 39PF, 100V, 5%, NPO, 1206 C	SN_1206	
4	6	C4,C8,C17,C18,C21,C22	10UI/25	PANASONIC	ECE-VIEAIUUSR	CAP, ELECT, 100F, 25V, 10%, AL, SM C	SP_ELEC_208SQ	
5	2	09,05	101/50	PANASONIC	ECE-VIHAUIUSR	CAP, ELECT, IUF, 50V, IU%, AL, SM C	SP_ELEC_17USQ	
0	2	D1,D2	IN4148	VISHAY	LL4148DIC	DIODE, HS SWITCHING, MELF, SOD-80	SOD-80	
/	1	22	RED LED	CHICAGO MINI	CMD20-21SRC/1R0/11	DIODE, LED, RED, IMA, SM	LED_CMD28-21	NO DOD
0	1	0P1	HEADER 5AZ	NA	NA	HEADER, MALE, SAZSM	HDR5AZ5M	NO POP
9	1	JP2	HEADER Z	NA N/D ELECT	NA ADT2010	HEADER, 2 PIN, U.I IN CENTER	HDRZXI GON DGA DA	NO POP
10	2	1,02	PHONO JACK RA	A/D ELECI	ARJ 2018	PHONO JACK, RA, GOLD	CON_RCA_RA	
11	1	13	PWRJACK	CUISTACK	PJ 202A	JACK, POWER, PWB, SM	CON_PJ-202A	
12	1	22 01 TT	Bead	PANASONIC	EXC-ML45A9100	FERRITE BEAD, 1812	IND_1812	
13	2	Q3,Q1	MMBT3906	MOTOROLA	MMBT3906LT1	BJT, PNP, GENERAL PURPOSE, SOT23	S0123	
14	1	Q 2	MMB13904	MOTOROLA	MMBT3904LT1	BJT, NPN, GENERAL PURPOSE,	SUT23	DOD
15	1	R1	270K	PANASONIC	ERJ-8GEIJ2/4	RES, IHICK FILM, 270K, 1/8W, 5%, 1206 R	LS_1206 NO	POP
17	1	R 2	330	PANASONIC	ERU-OGEIUSSI	RES, IHICK FILM, 330, 1/8W, 5%, 1206 R	45_1206	
17	1	R 3	4/K	PANASONIC	ERJ-8GEIJ473	RES, IHICK FILM, 4/K, 1/8W, 5%, 1206 R	LS_1206	
18	6	R4,R5,R8,R12,R19,R26	3.3K	PANASONIC	ERJ-8GEYJ332	RES, THICK FILM, 3.3K, 1/8W, 5%, 1206 R	S_1206	
19	11	R6,R9,R10,R15,R16,R1/,	IUK	PANASONIC	ERJ-8GEYJ1U3	RES, THICK FILM, IUK, 1/8W, 5%, 1206 R	S_1206	
20	2	R10,R21,R23,R24,R25	1.0.01-	DANAGONIC	EDI OCEVIIOA	DEG BUIGK ETIM 100K 1/0M 5% 1006 D	1006	
20	2	R13,R7	100K	PANASONIC	ERJ-8GEIJ104	RES, IHICK FILM, 100K, 1/8W, 5%, 1206 R	45_1206	
21	1	R11 P22	1 Ol-	PANASONIC	ERJ-8GEIJIUZ	RES, IHICK FILM, IK, 1/8W, 5%, 1200 R	45_1206	
22	1	R14, R22	126	PANASONIC	ERU-SGETUIZS	RES, INICK FILM, 12K, 1/0W, 5%, 1200 R	10_1200	DOD
23	1	R27	SMITCH DOTARY D	CDAVUTIT	GAUX OBM	RES, INICK FILM, U, 1/0W, 5%, 1200 R	MC_1200 NC	POP
25	1	11 1	25LC640CSN	MICROCHIP	251.C640CSN	TC FEDROM SERIAL SDI 64KBIT SOR	S08-150	
25	2	115 112	000234000	RIERBROWN	007234007	IC ODAMD DUAL SOR	S08-150	
20	1	113	CS4811	CRYSTAL	CS4811CM	DSP/CODEC MONO 100MOEP	OFP100 14x20	
28	1	114	MN13821T	DANASONIC	MN13821T	IC VOLTAGE DETECTOR OD 4 4-4 7V SC59A	SC202	
20	1	116	NTM78M05EA	NTD	NT78M05EA	IC, VOLTAGE DETECTOR, OD, 4.4-4.77, SCISA	TO-22010	
30	1	VR1	POT500k/10T	BOURNS	3266W-504	POTENTIOMETER 500K LIN 10THEN TOPADJ T	POT-BRNS-3266W	
31	1	VR2	POT20k/10T	BOURNS	3266W-203	POTENTIOMETER 20K LIN 10TURN TOPADU TH	POT-BRNS-3266W	
32	1	VR3	POT20k/1T	BOURNS	3352H-203	POTENTIOMETER, 20K, LIN, 17URN, TOPADJ TH	POT-BRNS-3352H	
33	1	¥1	8 192MHz	VISHAY	XT49S-20_8_192M	CRYSTAL PARALLEL CUT 8 192MHZ 20DF HC49	TTL HC49S	
	+ -					the second s		
100	1			CUI STACK	DPD090050-P-5	Wall Transformer, 9VDC, 500mA, unregulated.	2-1mm fem	
101	4			Kevstone	4801K-ND	Hex threaded standoff, Nylon, $4-40 \times 0.375$ "		
102	4			Building Fas	<b>H5r4</b> 4-ND	machine screw, pan head, Nylon, $4-40 \times 0.37$	"	
103	1	S1		Gravhill	947706-005	knob, gray with black arrow	IN	STALL ON S1

Figure 2. Bill of Materials



### CRYSTAL SEMICONDUCTOR CORPORATION CDB4811-1 REV.B



TOP SIDE

SILKSCREEN TOP

ASSEMBLY DRAWING TOP

Figure 3. Silkscreen and Pads



# CRYSTAL SEMICONDUCTOR CORPORATION CDB4811-1 REV.B



TOP SIDE

Figure 4. Top Layer



# CRYSTAL SEMICONDUCTOR CORPORATION CDB4811-1 REV.B



BOTTOM SIDE

Figure 5. Bottom Layer

